

U-109 Endeless/Kwanza

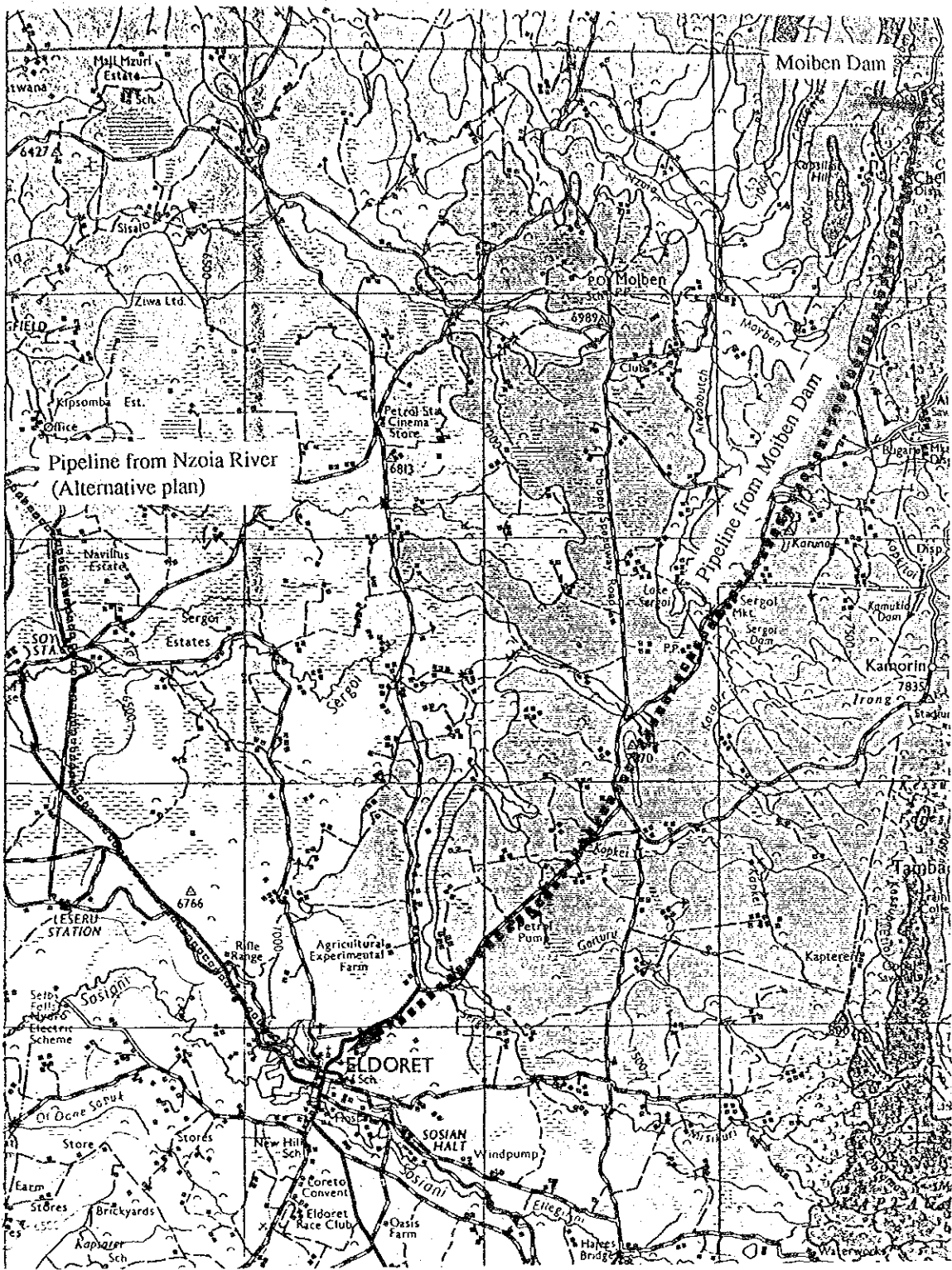
R 763.5 75/3 1BE

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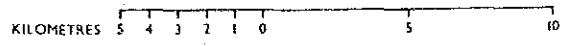
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i	
2						National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92	
4	Code No.	770	U- 110			Rate		25.2	
5	-----								
6	Name of Urban:		Eldoret		LGL Notice No:				
7	Organization:								
8	Per Capita GRDP in 1988 ( guess ):								
9	District:		Uasin Gishi Locataion :		772.5		Eldoret Municipality		
10	Map ( 1/50,000 ) :		89/4	Coordinates X:		35°14'	Y:	N 00°33'	
11	Sub-basin Code:		ICB	Elevation (El. m):					
12	-----								
13	Existing Facilities								
14	Raw Water Source:		Twin Rivers Dam, Ellgirini Dam, Borcholes						
15	Raw Water System:		H (m)=		L (m)=				
16	Treatment:			Capacity (m3/d)		16250			
17	Distribution System:								
18	-----								
19						1990	2000	2010	
20	-----								
21	Projected Population		(no)		112,900	272,500	486,800		
22	Residential Demand		(m3/d)		13,985	34,505	62,980		
23	Non-residential Demand		(m3/d)		2,340	5,647	10,089		
24	Livestock Demand		(m3/d)		581	1,450	2,971		
25	Industrial Demand		(m3/d)		3,468	6,153	8,375		
26	Total Demand		(m3/d)		20,374	47,755	84,415		
27	Area Served ( estimated net )		(ha)		843	2,035	3,635		
28	-----								
29	Future Development Plan								
30	Raw Water Source:		Moiben Dam + Nzoia river			River No:			
31	Raw Water System:		H (m)=	410	L (m)=	100,000			
32	Treatment:								
33	Distribution System:								
34	-----								
35	Incremental Capital Cost				1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)		4,124.5	27,380.8	36,659.4	68,164.8	
37	Source Works		(US\$'000)		30.6	126.7	157.7	315.1	
38	Pump Cost		(US\$'000)		20.5	207.0	277.2	504.7	
39	Raw Water Main		(US\$'000)		6,561.0	13,991.9	16,320.7	36,873.6	
40	Treatment		(US\$'000)		862.7	2,786.0	3,730.1	7,378.8	
41	Storage		(US\$'000)		177.6	1,179.2	1,578.8	2,935.6	
42	Distribution		(US\$'000)		6,745.1	9,535.1	12,803.1	29,083.2	
43	Miscellaneous (20%)		(US\$'000)		2,879.5	5,565.2	6,973.5	15,418.2	
44	Admi. & Engineering		(US\$'000)		1,727.7	3,339.1	4,184.1	9,250.9	
45	Contingency		(US\$'000)		3,800.9	7,346.0	9,205.0	20,352.0	
46	Total Cost		(US\$'000)		22,805.6	44,076.2	55,230.2	122,112.1	
47	Cost per Capita		(US\$/c)		202.0	276.2	257.7		
48	Cost per ha		(US\$/ha)		27,048.7	36,980.3	34,510.6		
49	Cost per m3		(US\$/m3)		5.5	1.6	1.5	1.8	
50	-----								
51	Present Value of Water at DF=10 %				1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)		1,140.3	2,203.8	2,761.5		
53	Capital Costs		(US\$'000)		2,349.0	4,539.9	5,688.7		
54	Total Annual Cost		(US\$'000)		3,489.3	6,743.7	8,450.2		
55	Unit Cost per m3		(US\$/m3)		2.3	0.7	0.6		
56	-----								
57	Remarks:		(1) Source works cost does not include the cost of Moiben dam, which should be added separately						
58			(see Sectoral Report M).						
59			(2) Water yield from Moiben dam (51,000 m3/d) cannot meet the demand up to year 2010.						
60			Water transfer from Nzoia river will be additionally required.						
61			(3) Pipeline length : 50 km from Moiben + 50 km from Nzoia river.						
62	-----								
63	-----								

Fig.

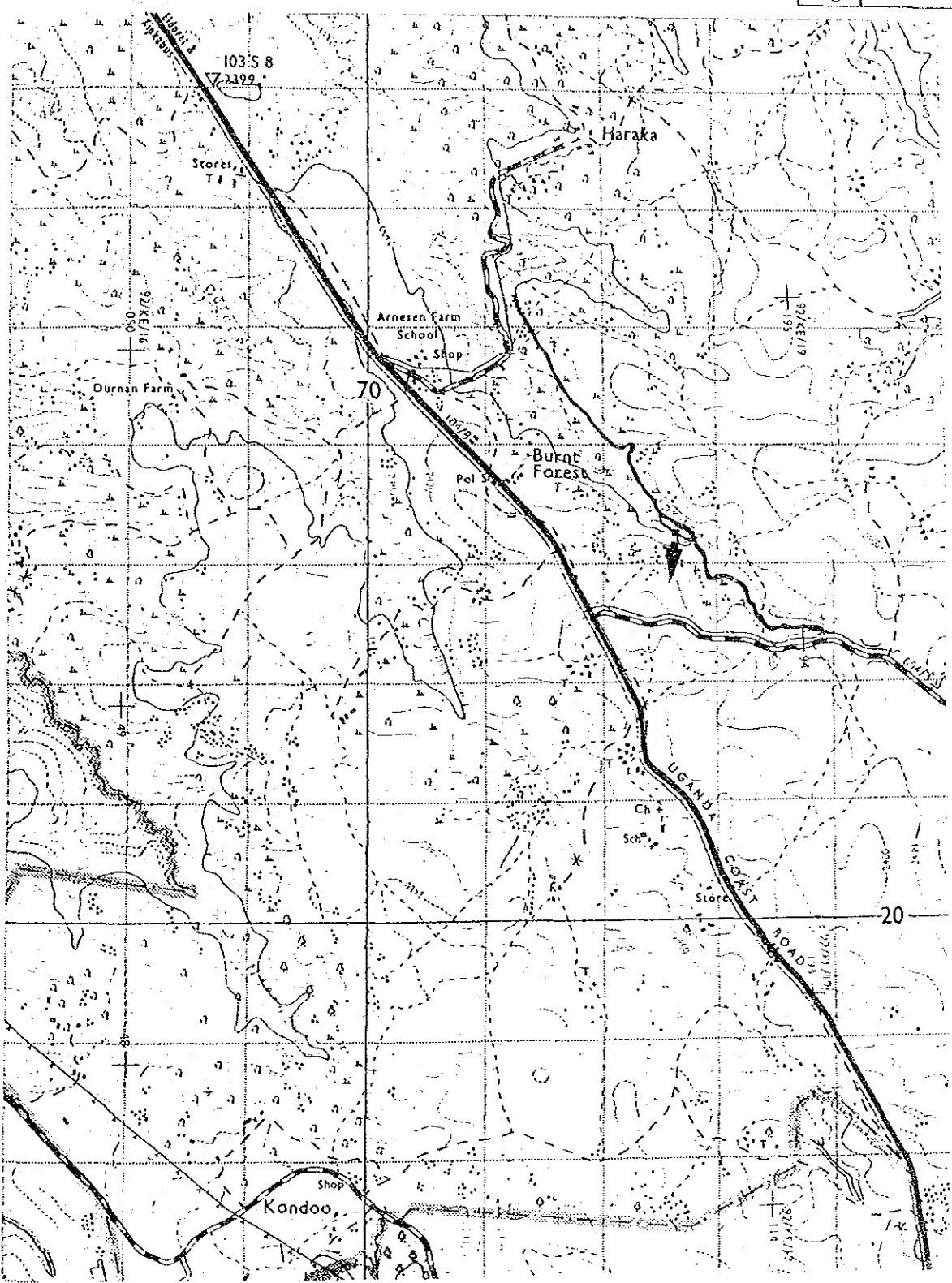


U-110 Eldoret G 772.5 89/4 1CB



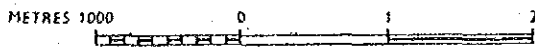
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							Feb-92
4	Code No. 770		U- 111			Rate		25.2
5	-----							
6	Name of Urban:		Burnt Forest		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Uasin Gishu Locataion :		774.6		Olare	
10	Map ( 1/50,000 ) :		103/4	Coordinates X:		35°29'	Y:	N 00°14'
11	Sub-basin Code:		1CC	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Borcholes			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		65		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		2,200	4,500	7,200	
22	Residential Demand		(m3/d)		273	570	932	
23	Non-residential Demand		(m3/d)		46	93	148	
24	Livestock Demand		(m3/d)		11	24	44	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		330	687	1,124	
27	Area Served ( estimated net )		(ha)		16	34	54	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Kipkaren river			River No:		
31	Raw Water System:		H (m)=	50 L (m)=		400		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		264.5	357.3	436.7	1,058.5
37	Source Works		(US\$'000)		3.9	4.9	5.7	14.5
38	Pump Cost		(US\$'000)		1.8	1.9	2.1	5.8
39	Raw Water Main		(US\$'000)		15.9	16.4	16.8	49.1
40	Treatment		(US\$'000)		198.1	236.9	266.5	701.4
41	Storage		(US\$'000)		33.4	40.3	45.5	119.2
42	Distribution		(US\$'000)		131.4	137.4	161.3	430.2
43	Miscellaneous (20%)		(US\$'000)		76.9	87.6	99.6	264.0
44	Admi. & Engineering		(US\$'000)		46.1	52.5	59.8	158.4
45	Contingency		(US\$'000)		101.5	115.6	131.5	348.5
46	Total Cost		(US\$'000)		609.1	693.4	788.7	2,091.2
47	Cost per Capita		(US\$/e)		276.8	301.5	292.1	
48	Cost per ha		(US\$/ha)		37,070.8	40,370.5	39,116.7	
49	Cost per m3		(US\$/m3)		2.3	1.9	1.8	2.0
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		30.5	34.7	39.4	
53	Capital Costs		(US\$'000)		62.7	71.4	81.2	
54	Total Annual Cost		(US\$'000)		93.2	106.1	120.7	
55	Unit Cost per m3		(US\$/m3)		1.0	0.8	0.8	
56	-----							
57	Remarks:							
58								
59								
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61								
62								



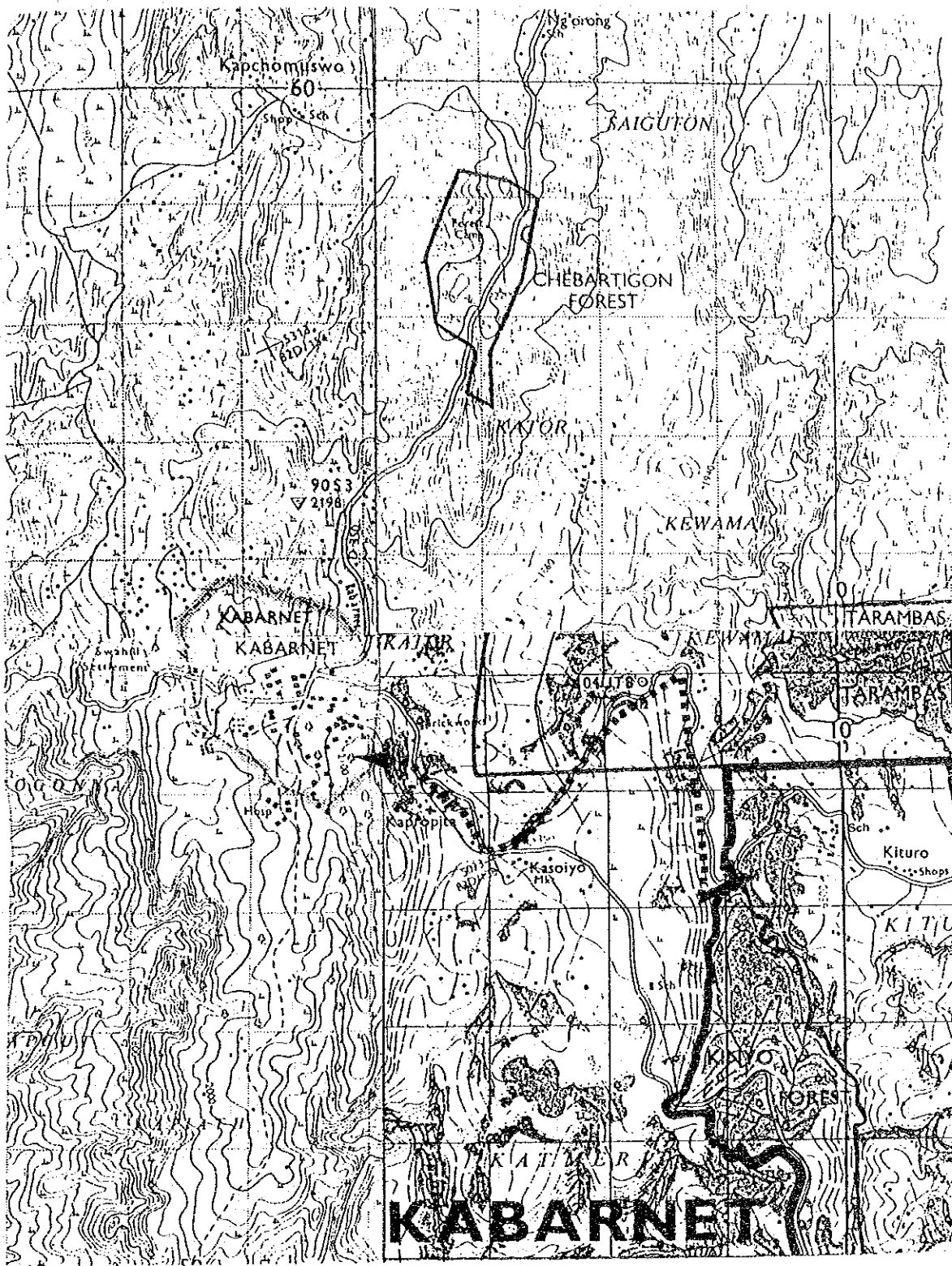
U-111 Burnt Forest

R 774.6 103/4 100



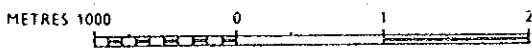
THE STUDY  
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a	b	c	d	e	f	g	h	i
2						National Water	Master Plan	
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	810	U-112			Rate		25.2
5	-----							
6	Name of Urban:		Kabarnet			LGL Notice No:		
7	Organization:							
8	Per Capita GRDP in 1988 ( guess):							
9	District:		Baringo	Locataion :	812.5		Kabarnet Mosop	
10	Map ( 1/50,000 ):		104/1	Coordinates X:		35°46'	Y:	N 00°29'
11	Sub-basin Code:		2EH	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Boreholes (C4722,3506)			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:		Capacity (m3/d)			1312		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		9,400	20,500	34,700	
22	Residential Demand		(m3/d)		1,164	2,596	4,489	
23	Non-residential Demand		(m3/d)		195	426	716	
24	Livestock Demand		(m3/d)		54	111	185	
25	Industrial Demand		(m3/d)		62	116	168	
26	Total Demand		(m3/d)		1,475	3,249	5,558	
27	Area Served ( estimated net )		(ha)		70	153	259	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Kirandich Dam			River No:		
31	Raw Water System:		H (m)=	250 L (m)=		5,800		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		163.4	1,773.4	2,309.5	4,246.3
37	Source Works		(US\$'000)		2.7	16.3	19.8	38.8
38	Pump Cost		(US\$'000)		7.4	14.0	15.1	36.5
39	Raw Water Main		(US\$'000)		221.0	306.9	326.0	853.9
40	Treatment		(US\$'000)		148.0	578.4	660.4	1,386.8
41	Storage		(US\$'000)		24.5	98.6	111.3	234.4
42	Distribution		(US\$'000)		561.6	663.2	848.4	2,073.1
43	Miscellaneous (20%)		(US\$'000)		193.0	335.5	396.2	924.7
44	Admi. & Engineering		(US\$'000)		115.8	201.3	237.7	554.8
45	Contingency		(US\$'000)		254.8	442.8	523.0	1,220.6
46	Total Cost		(US\$'000)		1,528.9	2,657.0	3,137.9	7,323.8
47	Cost per Capita		(US\$/c)		162.6	239.4	221.0	
48	Cost per ha		(US\$/ha)		21,779.1	32,053.2	29,590.5	
49	Cost per m3		(US\$/m3)		9.4	1.5	1.4	1.7
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		76.4	132.9	156.9	
53	Capital Costs		(US\$'000)		157.5	273.7	323.2	
54	Total Annual Cost		(US\$'000)		233.9	406.5	480.1	
55	Unit Cost per m3		(US\$/m3)		3.9	0.6	0.6	
56	-----							
57	Remarks: Source works cost does not include the cost of Kirandich dam, which should be added separately							
58	(see Sectoral Report M).							
59								
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62								
63	-----							



U-112 Kabarnet &

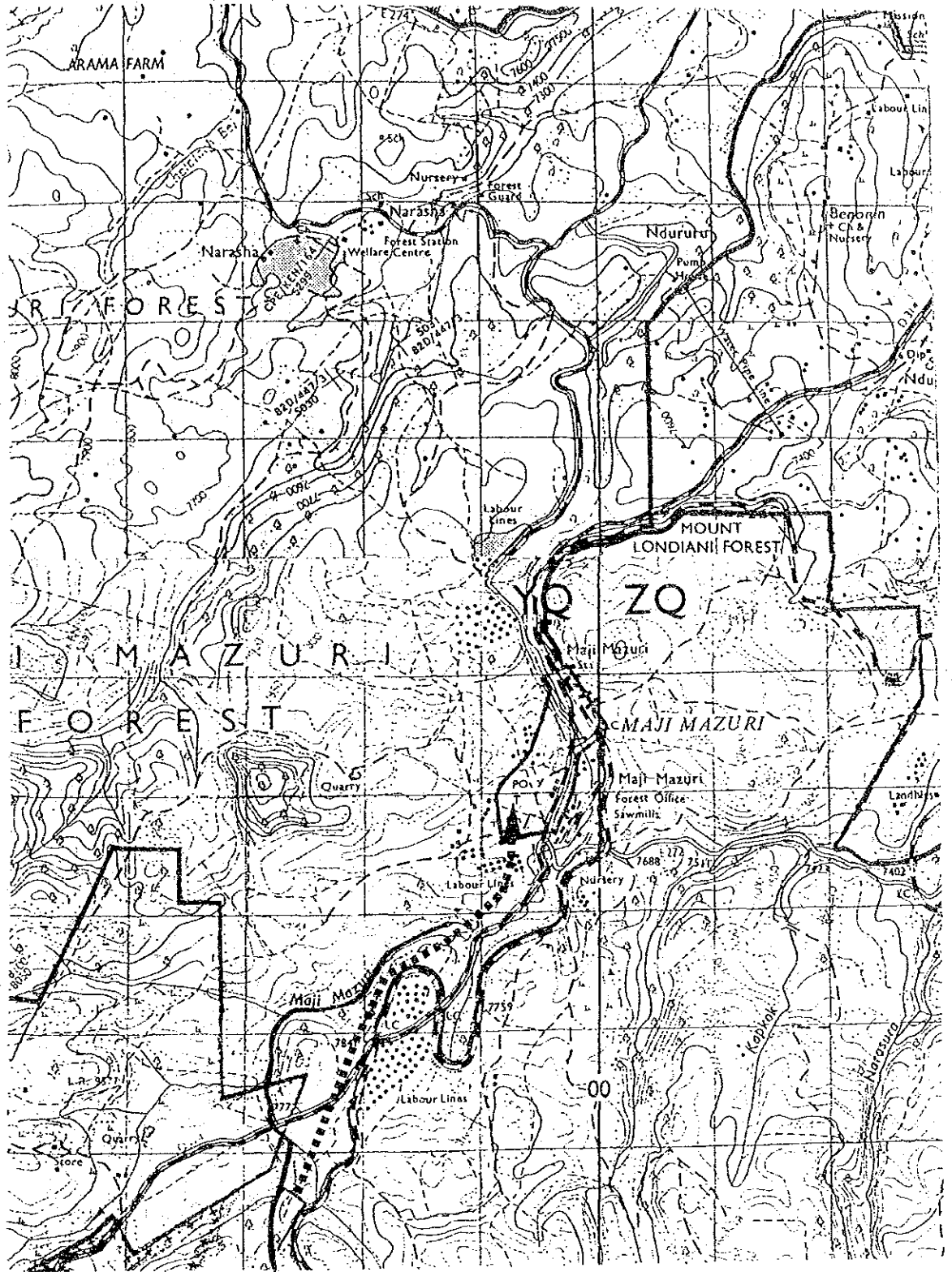
U 812.5 104/1 2EH



THE STUDY  
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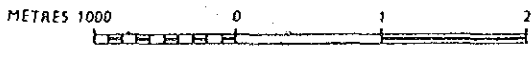
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 810	U-113				Rate		Feb-92 25.2
5	-----							
6	Name of Urban:	Maji Mazuri	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Baringo	Locataion :	814.3	Maji Mazuri			
10	Map ( 1/50,000 ):	118/2	Coordinates X:		35°42'		Y:	S 00°00'
11	Sub-basin Code:	2ED	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Maji Mazuri River	River No					
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		96				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)	5,200	11,400	19,200			
22	Residential Demand	(m3/d)	644	1,444	2,484			
23	Non-residential Demand	(m3/d)	108	235	397			
24	Livestock Demand	(m3/d)	30	61	102			
25	Industrial Demand	(m3/d)	3	5	8			
26	Total Demand	(m3/d)	785	1,745	2,991			
27	Area Served ( estimated net )	(ha)	39	85	143			
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Maji Mazuri river	River No:					
31	Raw Water System:	H (m)=	0 L (m)=	4,500				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost		1990	2000	2010		Total	
36	Incremental Capacity	(m3/d)	689.2	959.4	1,246.5		2,895.0	
37	Source Works	(US\$'000)	8.0	10.3	12.5		30.8	
38	Pump Cost	(US\$'000)	0.0	0.0	0.0		0.0	
39	Raw Water Main	(US\$'000)	200.8	211.6	221.7		634.1	
40	Treatment	(US\$'000)	346.6	417.0	480.7		1,244.3	
41	Storage	(US\$'000)	59.6	71.8	82.6		214.1	
42	Distribution	(US\$'000)	310.7	370.4	466.0		1,147.1	
43	Miscellaneous (20%)	(US\$'000)	185.1	216.2	252.7		654.1	
44	Admi. & Engineering	(US\$'000)	111.1	129.7	151.6		392.4	
45	Contingency	(US\$'000)	244.4	285.4	333.6		863.4	
46	Total Cost	(US\$'000)	1,466.3	1,712.4	2,001.6		5,180.2	
47	Cost per Capita	(US\$/c)	282.0	276.2	256.6			
48	Cost per ha	(US\$/ha)	37,757.7	36,983.9	34,361.7			
49	Cost per m3	(US\$/m3)	2.1	1.8	1.6		1.8	
50	-----							
51	Present Value of Water at DF=10 %		1990	2000	2010		Total	
52	Direct O & M Costs	(US\$'000)	73.3	85.6	100.1			
53	Capital Costs	(US\$'000)	151.0	176.4	206.2			
54	Total Annual Cost	(US\$'000)	224.3	262.0	306.2			
55	Unit Cost per m3	(US\$/m3)	0.9	0.7	0.7			
56	-----							
57	Remarks:							
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63	-----							





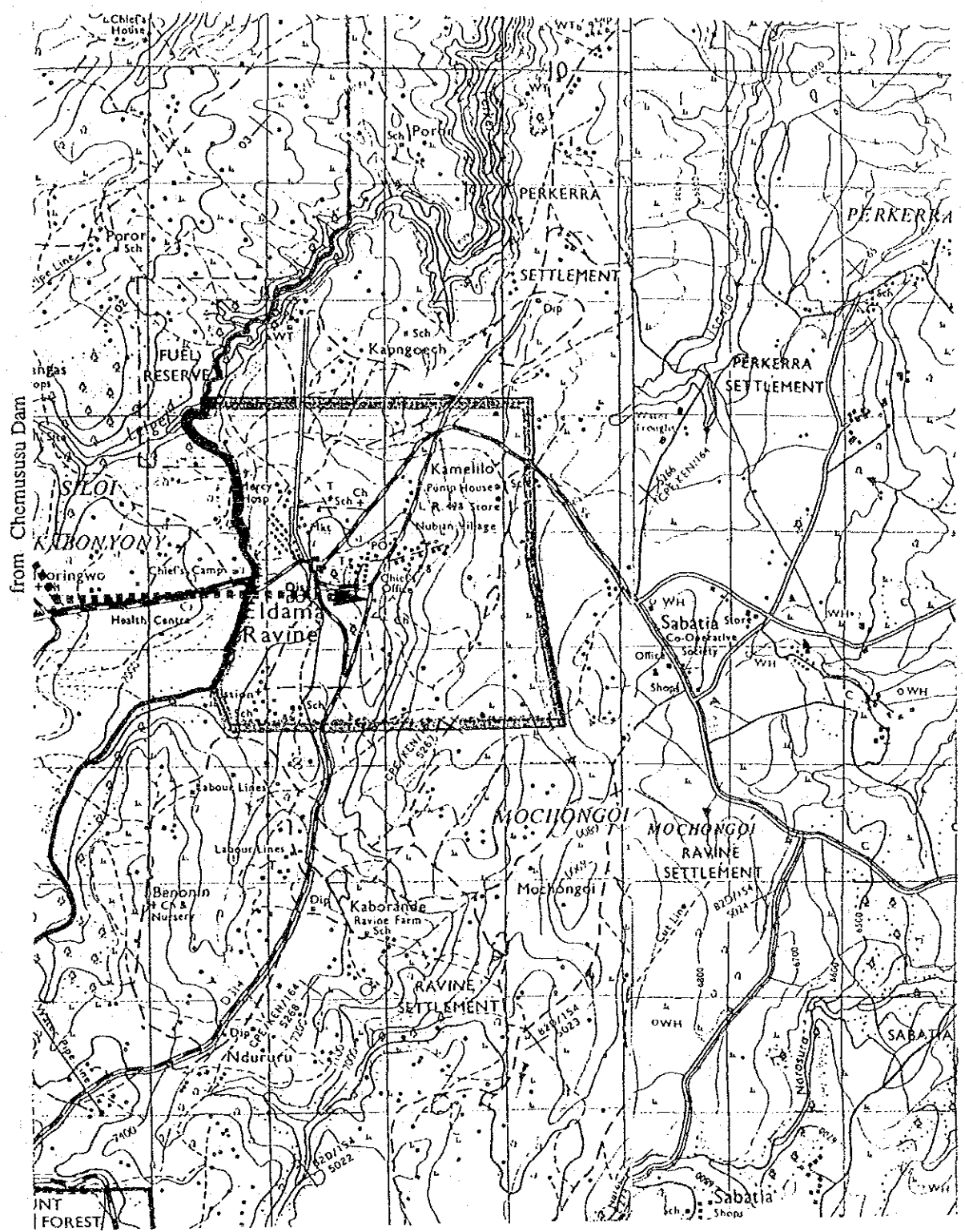
U-113 Maji Mazuri

814.3 118/2 2ED



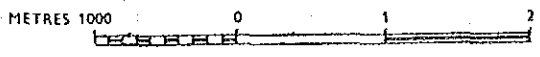
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a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	810	U-114			Rate		25.2
5	-----							
6	Name of Urban:		Eldama Ravine		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Baringo	Locataion :	814.5		Eldama Ravine		
10	Map ( 1/50,000 ) :	104/3	Coordinates X:		35°45'	Y:		N 00°03'
11	Sub-basin Code:	2EF	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Chemususu River			River No		
15	Raw Water System:		H (m)=		L (m)=			
16	Treatment:				Capacity (m3/d)		522	
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)	5,600	12,300	20,700		
22	Residential Demand		(m3/d)	694	1,557	2,678		
23	Non-residential Demand		(m3/d)	116	253	427		
24	Livestock Demand		(m3/d)	33	66	110		
25	Industrial Demand		(m3/d)	59	109	157		
26	Total Demand		(m3/d)	902	1,985	3,372		
27	Area Served ( estimated net )		(ha)	42	92	155		
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Chemususu Dam			River No:		
31	Raw Water System:		H (m)=	0	L (m)=	12,700		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	379.7	1,985.5	3,372.1	5,737.3	
37	Source Works		(US\$'000)	5.1	17.7	26.3	49.2	
38	Pump Cost		(US\$'000)	0.0	0.0	0.0	0.0	
39	Raw Water Main		(US\$'000)	524.3	689.1	786.8	2,000.2	
40	Treatment		(US\$'000)	245.5	612.6	789.6	1,647.8	
41	Storage		(US\$'000)	41.8	104.0	129.4	275.2	
42	Distribution		(US\$'000)	334.6	734.8	1,236.7	2,306.1	
43	Miscellaneous (20%)		(US\$'000)	230.3	431.7	593.8	1,255.7	
44	Admi. & Engineering		(US\$'000)	138.2	259.0	356.3	753.4	
45	Contingency		(US\$'000)	303.9	569.8	783.8	1,657.5	
46	Total Cost		(US\$'000)	1,823.7	3,418.7	4,702.7	9,945.1	
47	Cost per Capita		(US\$/c)	325.7	277.9	227.2		
48	Cost per ha		(US\$/ha)	43,607.6	37,218.4	30,420.9		
49	Cost per m3		(US\$/m3)	4.8	1.7	1.4	1.7	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	91.2	170.9	235.1		
53	Capital Costs		(US\$'000)	187.8	352.1	484.4		
54	Total Annual Cost		(US\$'000)	279.0	523.1	719.5		
55	Unit Cost per m3		(US\$/m3)	2.0	0.7	0.6		
56	-----							
57	Remarks:	Source works cost does not include the cost of Chemususu dam, which should be added separately						
58		(see Sectoral Report M). The pipeline will be extended to Nakuru.						
59								
60								
61								
62								
63	-----							



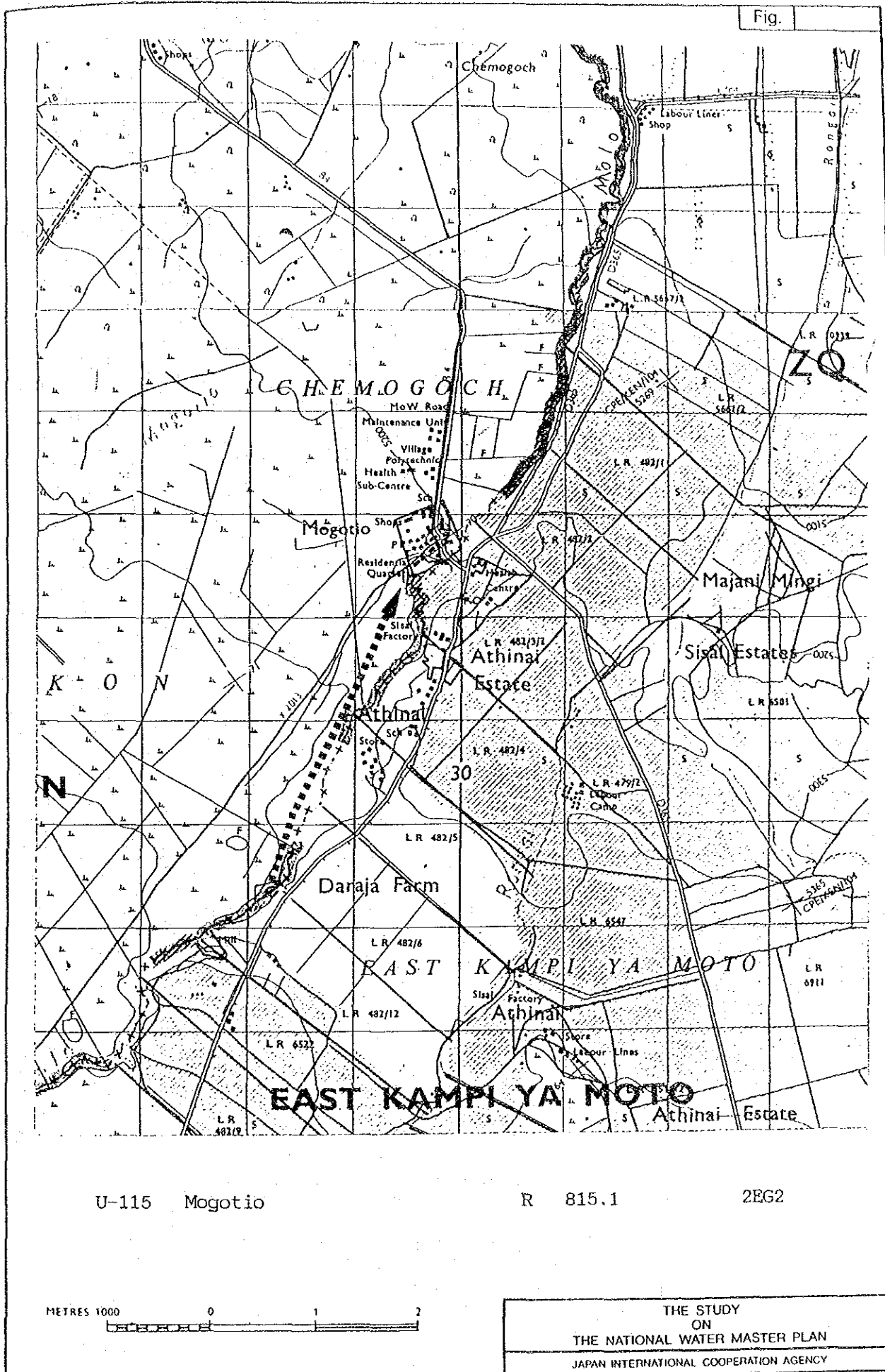
U-114 Eldana Ravine

U 814.5 104/3 2EF

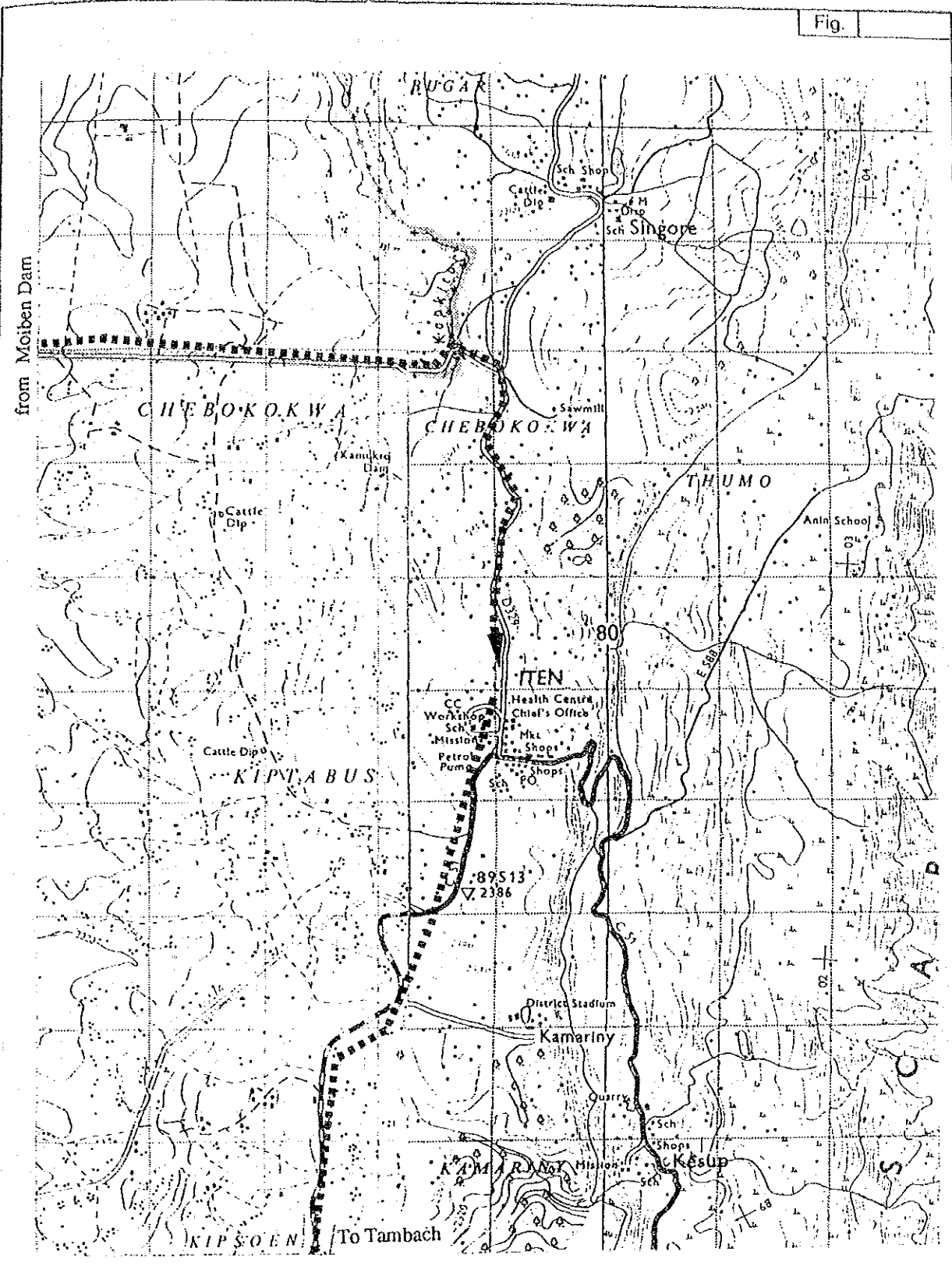


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a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No.	810	U-115			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:	Mogotio		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Baringo	Locataion :	815.1		Lembus Soi		
10	Map ( 1/50,000 ) :	118/2	Coordinates X:		35°55'	Y:		N 00°00'
11	Sub-basin Code:	2EG2	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Molo River		River No				
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		442				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	2,900	6,400	10,700		
22	Residential Demand		(m3/d)	359	810	1,384		
23	Non-residential Demand		(m3/d)	60	131	221		
24	Livestock Demand		(m3/d)	17	34	57		
25	Industrial Demand		(m3/d)	0	0	0		
26	Total Demand		(m3/d)	436	975	1,662		
27	Area Served ( estimated net )		(ha)	22	48	80		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Molo river /Chemususu Dam		River No:				
31	Raw Water System:	H (m)=	0 L (m)=	3,300				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	0.0	539.2	686.9	1,226.1	
37	Source Works		(US\$'000)	0.0	6.7	8.0	14.6	
38	Pump Cost		(US\$'000)	0.0	0.0	0.0	0.0	
39	Raw Water Main		(US\$'000)	0.0	142.3	147.2	289.4	
40	Treatment		(US\$'000)	0.0	301.2	345.9	647.1	
41	Storage		(US\$'000)	0.0	51.7	59.5	111.2	
42	Distribution		(US\$'000)	0.0	209.1	256.9	466.0	
43	Miscellaneous (20%)		(US\$'000)	0.0	142.2	163.5	305.7	
44	Admi. & Engineering		(US\$'000)	0.0	85.3	98.1	183.4	
45	Contingency		(US\$'000)	0.0	187.7	215.8	403.5	
46	Total Cost		(US\$'000)	0.0	1,126.1	1,294.9	2,421.0	
47	Cost per Capita		(US\$/c)	0.0	321.7	301.1		
48	Cost per ha		(US\$/ha)	0.0	43,081.4	40,325.6		
49	Cost per m3		(US\$/m3)	0.0	2.1	1.9	2.0	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	0.0	56.3	64.7		
53	Capital Costs		(US\$'000)	0.0	116.0	133.4		
54	Total Annual Cost		(US\$'000)	0.0	172.3	198.1		
55	Unit Cost per m3		(US\$/m3)	0.0	0.9	0.8		
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							

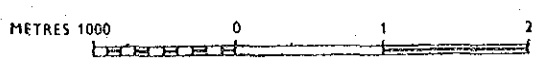


a	b	c	d	e	f	g	h	i	
2						National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92	
4	Code No.	820	U-116			Rate		25.2	
5	-----								
6	Name of Urban:		Iten+Tambach		LGL Notice No:				
7	Organization:								
8	Per Capita GRDP in 1988 ( guess ):								
9	District:		Elgeyo-Mar Lokataion :		822.4		Kiptuilong		
10	Map ( 1/50,000 ) :		90/3		Coordinates X:		35°32'	Y: N 00°41'	
11	Sub-basin Code:		2CB		Elevation (El. m):				
12	-----								
13	Existing Facilities								
14	Raw Water Source:		Kamariny Spring			River No			
15	Raw Water System:		H (m)=		L (m)=				
16	Treatment:				Capacity (m3/d)		550		
17	Distribution System:								
18	-----								
19						1990	2000	2010	
20	-----								
21	Projected Population		(no)		6,300	13,000	19,700		
22	Residential Demand		(m3/d)		780	1,646	2,549		
23	Non-residential Demand		(m3/d)		126	268	406		
24	Livestock Demand		(m3/d)		44	118	234		
25	Industrial Demand		(m3/d)		2	3	5		
26	Total Demand		(m3/d)		952	2,035	3,194		
27	Area Served ( estimated net )		(ha)		47	97	147		
28	-----								
29	Future Development Plan								
30	Raw Water Source:		Moiben Dam			River No:			
31	Raw Water System:		H (m)=		40 L (m)=		35,200		
32	Treatment:								
33	Distribution System:								
34	-----								
35	Incremental Capital Cost					1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		402.4	1,082.7	1,158.6	2,643.7	
37	Source Works		(US\$'000)		5.3	11.2	11.8	28.4	
38	Pump Cost		(US\$'000)		1.7	2.6	2.7	6.9	
39	Raw Water Main		(US\$'000)		1,462.9	1,690.3	1,711.1	4,864.4	
40	Treatment		(US\$'000)		254.1	445.5	462.2	1,161.8	
41	Storage		(US\$'000)		43.3	76.7	79.5	199.6	
42	Distribution		(US\$'000)		376.4	400.3	400.3	1,176.9	
43	Miscellaneous (20%)		(US\$'000)		428.8	525.3	533.5	1,487.6	
44	Admi. & Engineering		(US\$'000)		257.3	315.2	320.1	892.6	
45	Contingency		(US\$'000)		566.0	693.4	704.2	1,963.6	
46	Total Cost		(US\$'000)		3,395.7	4,160.6	4,225.5	11,781.8	
47	Cost per Capita		(US\$/c)		539.0	621.0	630.7		
48	Cost per ha		(US\$/ha)		72,175.8	83,152.5	84,449.7		
49	Cost per m3		(US\$/m3)		8.4	3.8	3.6	4.5	
50	-----								
51	Present Value of Water at DF=10 %					1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		169.8	208.0	211.3		
53	Capital Costs		(US\$'000)		349.8	428.5	435.2		
54	Total Annual Cost		(US\$'000)		519.5	636.6	646.5		
55	Unit Cost per m3		(US\$/m3)		3.5	1.6	1.5		
56	-----								
57	Remarks:	Water will be taken from Moiben dam - Eldoret pipeline system. Source works cost above does not							
58		include the cost of Moiben dam, which should be added separately (see Sectoral Report M).							
59									
60									
61									
62									
63	-----								



U-116 Iten+Tambach

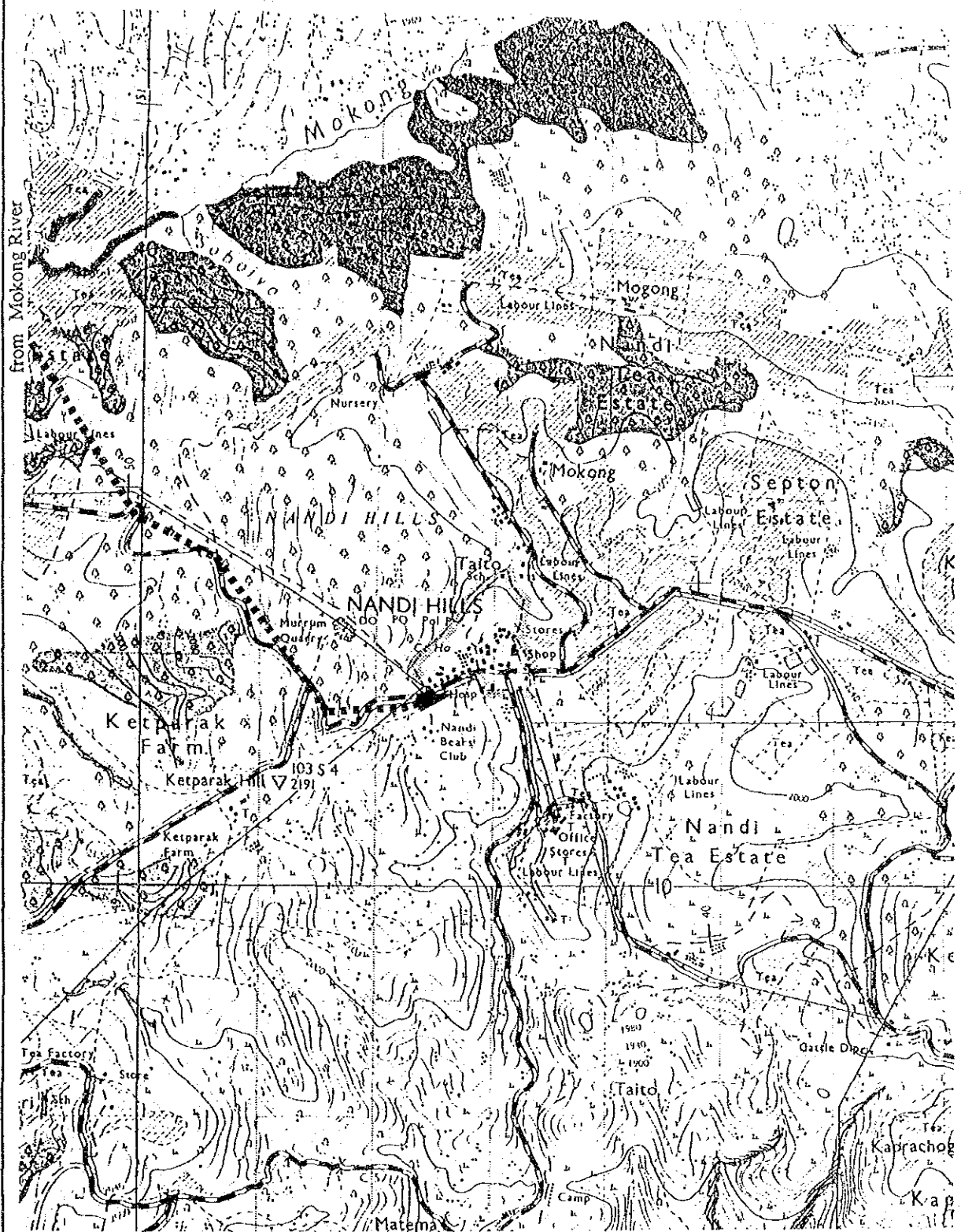
U 822.4 90/3 2CB



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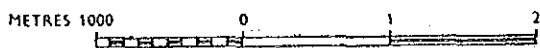
a	b	c	d	e	f	g	h	i
2						National Water Master Plan		
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	830	U-117			Rate		25.2
5	-----							
6	Name of Urban:		Nandi Hills			LGL Notice No:		
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Nandi	Locataion :	831.3		Chemelil	
10	Map ( 1/50,000 ) :		103/3	Coordinates X:		35°12'	Y:	N 00°07'
11	Sub-basin Code:		1FD	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Taito River			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		200		
17	Distribution System:							
18	-----							
19						1990	2000	2010
20	-----							
21	Projected Population			(no)	1,300	2,800	4,200	
22	Residential Demand			(m3/d)	161	355	543	
23	Non-residential Demand			(m3/d)	27	56	86	
24	Livestock Demand			(m3/d)	6	12	18	
25	Industrial Demand			(m3/d)	683	1,264	1,820	
26	Total Demand			(m3/d)	877	1,687	2,467	
27	Area Served ( estimated net )			(ha)	10	21	31	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Mokong River			River No:		
31	Raw Water System:		H (m)=	170 L (m)=		7,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity			(m3/d)	677.0	809.5	780.8	2,267.4
37	Source Works			(US\$'000)	7.9	9.0	8.8	25.7
38	Pump Cost			(US\$'000)	6.6	7.0	7.0	20.6
39	Raw Water Main			(US\$'000)	311.5	320.1	318.3	950.0
40	Treatment			(US\$'000)	343.1	379.4	371.9	1,094.4
41	Storage			(US\$'000)	59.0	65.4	64.0	188.4
42	Distribution			(US\$'000)	77.7	89.6	83.6	250.9
43	Miscellaneous (20%)			(US\$'000)	161.2	174.1	170.7	506.0
44	Admi. & Engineering			(US\$'000)	96.7	104.5	102.4	303.6
45	Contingency			(US\$'000)	212.7	229.8	225.4	667.9
46	Total Cost			(US\$'000)	1,276.4	1,379.0	1,352.2	4,007.6
47	Cost per Capita			(US\$/c)	981.9	919.3	965.8	
48	Cost per ha			(US\$/ha)	131,477.3	123,102.8	129,330.6	
49	Cost per m3			(US\$/m3)	1.9	1.7	1.7	1.8
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct G & M Costs			(US\$'000)	63.8	68.9	67.6	
53	Capital Costs			(US\$'000)	131.5	142.0	139.3	
54	Total Annual Cost			(US\$'000)	195.3	211.0	206.9	
55	Unit Cost per m3			(US\$/m3)	0.8	0.7	0.7	
56	-----							
57	Remarks:							
58								
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62								
63	-----							





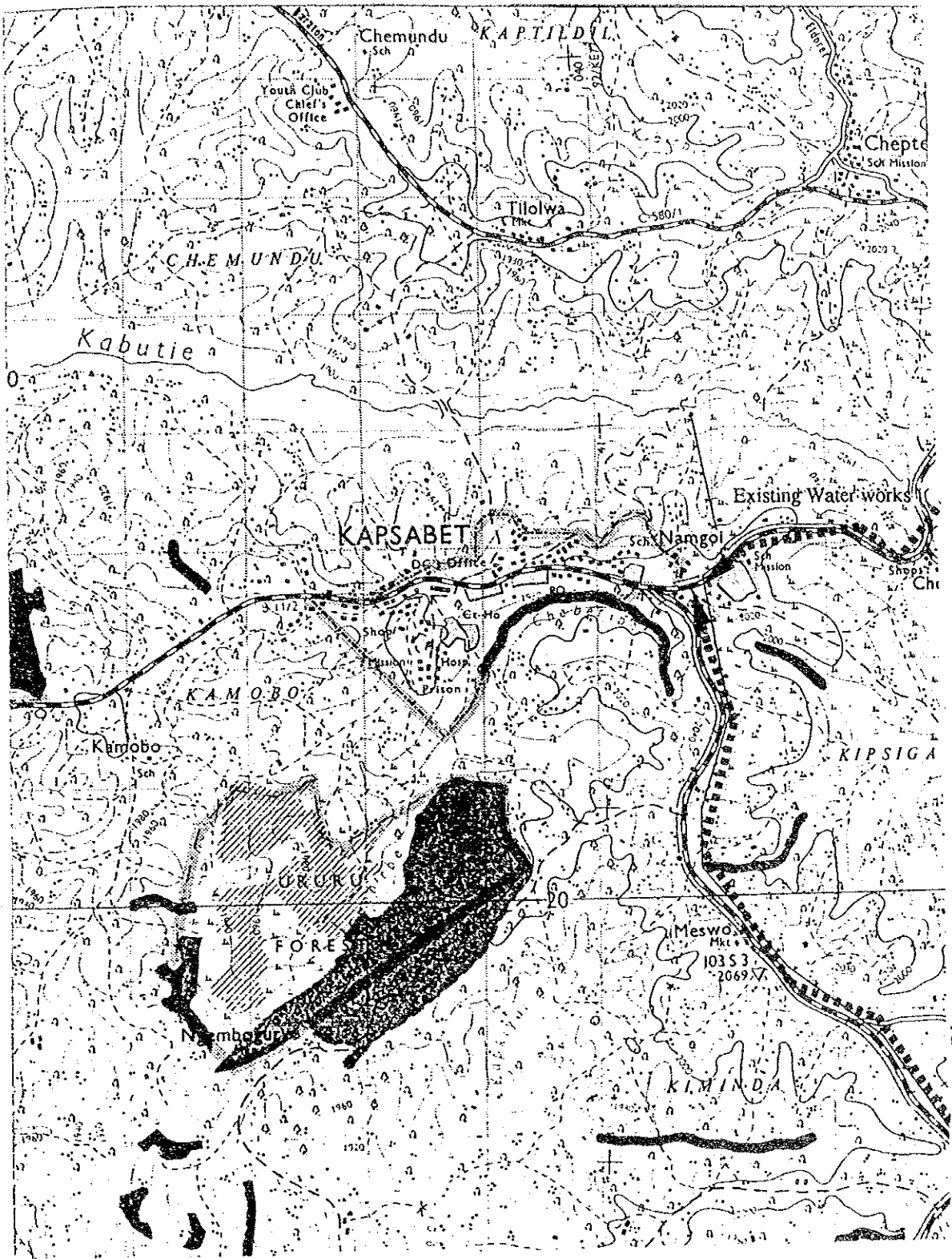
U-117 Nandi Hills

U 831.3 103/3 1FD



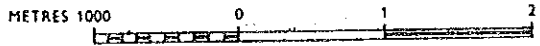
THE STUDY  
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a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 830		U-118			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:	Kapsabet+Baraton		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Nandi	Locataion :	832.2		Chemundu		
10	Map ( 1/50,000 ) :	103/3	Coordinates X:		35°08'		Y:	N 00°13'
11	Sub-basin Code:	1FC	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Kabutie River		L (m)=		River No		
15	Raw Water System:	H (m)=						
16	Treatment:	Capacity (m3/d)		830				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	13,400	33,100	56,300		
22	Residential Demand		(m3/d)	1,660	4,191	7,284		
23	Non-residential Demand		(m3/d)	274	685	1,165		
24	Livestock Demand		(m3/d)	65	150	247		
25	Industrial Demand		(m3/d)	115	212	306		
26	Total Demand		(m3/d)	2,114	5,238	9,002		
27	Area Served ( estimated net )		(ha)	100	247	420		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Mokong river		L (m)=		River No:		
31	Raw Water System:	H (m)=	170		8,800			
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010		Total
36	Incremental Capacity		(m3/d)	1,283.9	3,124.4	3,763.5		8,171.8
37	Source Works		(US\$'000)	12.8	24.9	28.6		66.3
38	Pump Cost		(US\$'000)	8.1	13.6	15.7		37.4
39	Raw Water Main		(US\$'000)	436.1	534.0	562.2		1,532.3
40	Treatment		(US\$'000)	488.4	762.6	829.2		2,080.2
41	Storage		(US\$'000)	83.9	134.6	162.1		380.6
42	Distribution		(US\$'000)	800.6	1,176.9	1,386.1		3,363.6
43	Miscellaneous (20%)		(US\$'000)	366.0	529.3	596.8		1,492.1
44	Admi. & Engineering		(US\$'000)	219.6	317.6	358.1		895.2
45	Contingency		(US\$'000)	483.1	698.7	787.7		1,969.5
46	Total Cost		(US\$'000)	2,898.5	4,192.2	4,726.4		11,817.1
47	Cost per Capita		(US\$/c)	216.3	212.8	203.7		
48	Cost per ha		(US\$/ha)	28,964.5	28,495.4	27,279.7		
49	Cost per m3		(US\$/m3)	2.3	1.3	1.3		1.4
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010		Total
52	Direct O & M Costs		(US\$'000)	144.9	209.6	236.3		
53	Capital Costs		(US\$'000)	298.5	431.8	486.8		
54	Total Annual Cost		(US\$'000)	443.5	641.4	723.1		
55	Unit Cost per m3		(US\$/m3)	0.9	0.6	0.5		
56	-----							
57	Remarks:	Pump-up from Mokong river was tentatively assumed above. However, Kabutie river appears to have surplus supply capacity and hence the primary approach will be to augment the abstraction from Kabutie river; then from Mokong river.						
58								
59								
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63	-----							



U-118 Kapsabet+Baraton

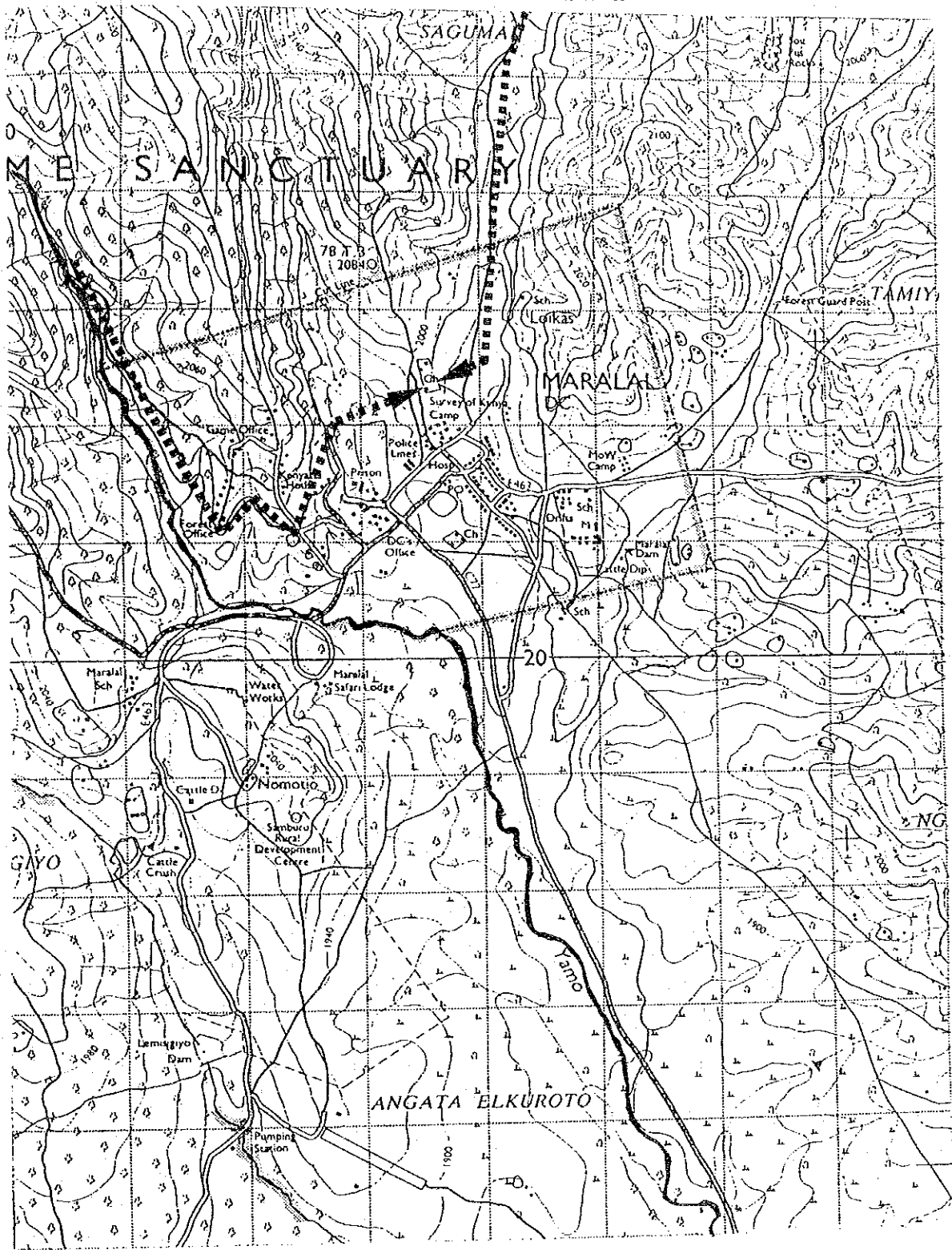
U 832.2 103/3 1FC



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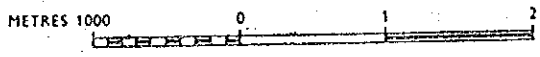
a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	840	U-119			Rate		25.2
5	-----							
6	Name of Urban:	Maralal		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Samburu	Locataion :	841.4		Maralal		
10	Map ( 1/50,000 ) :	78/3	Coordinates X:		36°41'		Y:	N 01°05'
11	Sub-basin Code:	5CA	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Nundoto Dam			River No			
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)			600			
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	17,800	42,300	74,800		
22	Residential Demand		(m3/d)	2,205	5,356	9,677		
23	Non-residential Demand		(m3/d)	369	876	1,549		
24	Livestock Demand		(m3/d)	278	735	1,497		
25	Industrial Demand		(m3/d)	184	329	454		
26	Total Demand		(m3/d)	3,036	7,296	13,177		
27	Area Served ( estimated net )		(ha)	133	316	559		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Loikas/Yamo river			River No:			
31	Raw Water System:	H (m)=	0 L (m)=	9,800				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	2,436.0	4,260.3	5,881.0	12,577.3	
37	Source Works		(US\$'000)	204.6	215.4	224.0	644.0	
38	Pump Cost		(US\$'000)	0.0	0.0	0.0	0.0	
39	Raw Water Main		(US\$'000)	558.0	649.2	718.6	1,925.8	
40	Treatment		(US\$'000)	677.8	874.6	993.8	2,546.2	
41	Storage		(US\$'000)	104.9	183.5	253.3	541.7	
42	Distribution		(US\$'000)	1,063.4	1,463.7	1,941.7	4,468.8	
43	Miscellaneous (20%)		(US\$'000)	521.8	677.3	826.3	2,025.3	
44	Admi. & Engineering		(US\$'000)	313.1	406.4	495.8	1,215.2	
45	Contingency		(US\$'000)	688.7	894.0	1,090.7	2,673.4	
46	Total Cost		(US\$'000)	4,132.4	5,364.0	6,544.1	16,040.4	
47	Cost per Capita		(US\$/c)	232.2	218.9	201.4		
48	Cost per ha		(US\$/ha)	31,086.8	29,317.1	26,962.7		
49	Cost per m3		(US\$/m3)	1.7	1.3	1.1	1.3	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	206.6	268.2	327.2		
53	Capital Costs		(US\$'000)	425.6	552.5	674.0		
54	Total Annual Cost		(US\$'000)	632.2	820.7	1,001.2		
55	Unit Cost per m3		(US\$/m3)	0.7	0.5	0.5		
56	-----							
57	Remarks:	Water sources will be small dams to be constructed on several streams in the Maralal Game Sanctuary area.						
58		Construction of 6 small dams each having 3.5 km of pipeline was assumed above. Attached figure shows						
59		a very tentative plan of 2 small dams which should subject to further study.						
60								
61								
62								
63	-----							

from Loikas River



U-119 Maralal

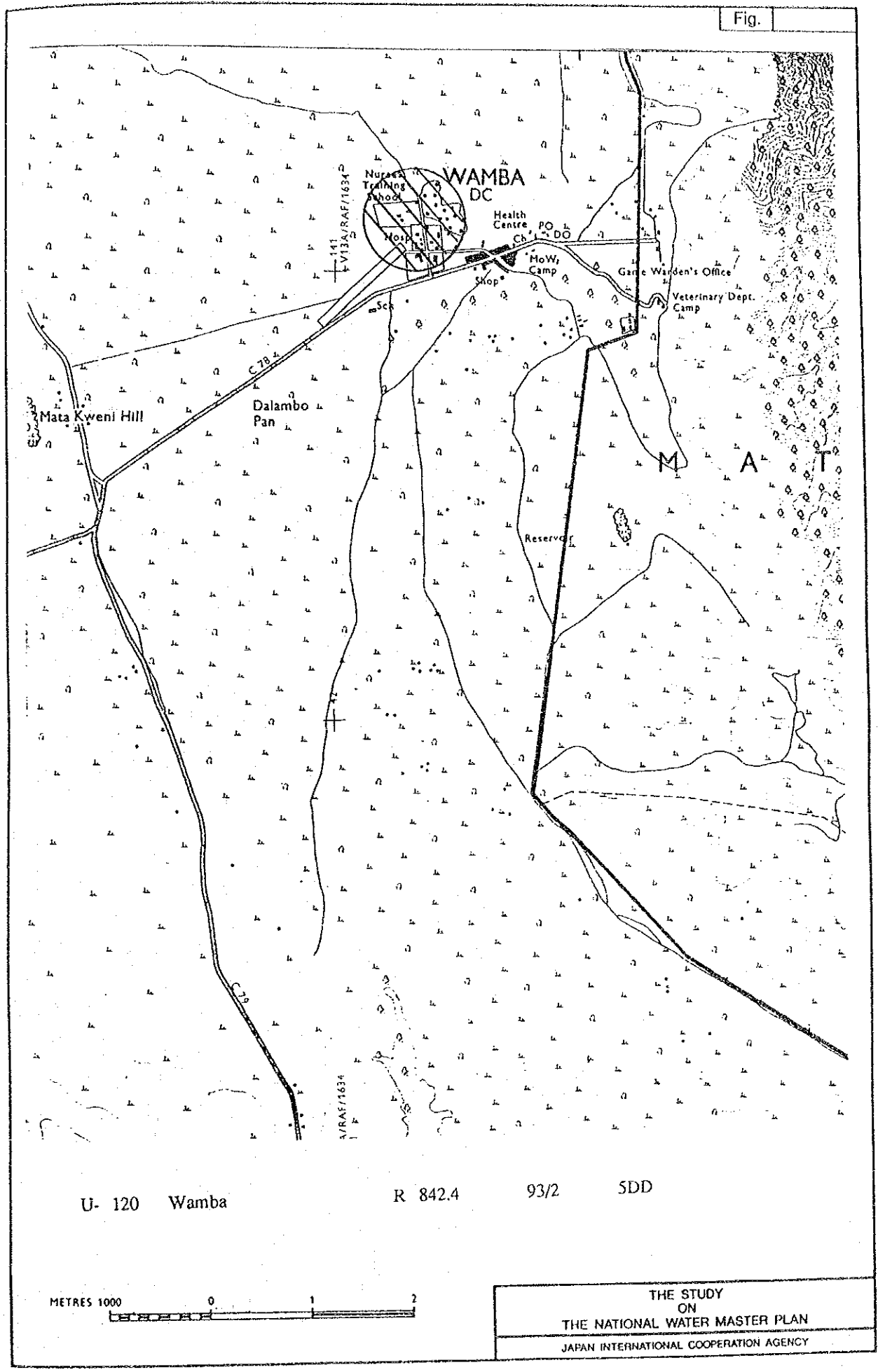
U 841.4 78/3 5CA



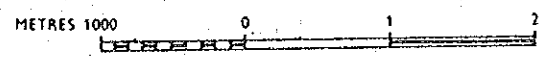
THE STUDY  
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a	b	c	d	e	f	g	h	i
2								
3								
4	Code No.	840	U-120			Rate		Jul-92 25.2
5	-----							
6	Name of Urban:	Wamba				LGL Notice No:		
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Samburu	Locataion :	842.4		Wamba		
10	Map ( 1/50,000 ) :	93/2	Coordinates X:			37°19'	Y:	N 00°59'
11	Sub-basin Code:	5DD	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Borehole (C4513)				River No		
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:		Capacity (m3/d)			100		
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	3,700	8,800	15,600		
22	Residential Demand		(m3/d)	458	1,114	2,018		
23	Non-residential Demand		(m3/d)	77	182	322		
24	Livestock Demand		(m3/d)	58	153	311		
25	Industrial Demand		(m3/d)	0	0	0		
26	Total Demand		(m3/d)	593	1,449	2,651		
27	Area Served ( estimated net )		(ha)	28	66	117		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Boreholes				River No:		
31	Raw Water System:	H (m)=	0 L (m)=			1,033,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	493.3	856.0	1,202.0	2,551.3	
37	Source Works		(US\$'000)	2,321.9	4,028.5	5,656.9	12,007.3	
38	Pump Cost		(US\$'000)	0.0	0.0	0.0	0.0	
39	Raw Water Main		(US\$'000)	7,027.9	12,512.1	17,916.6	37,456.6	
40	Treatment		(US\$'000)	286.1	391.4	471.4	1,149.0	
41	Storage		(US\$'000)	49.0	67.4	81.1	197.5	
42	Distribution		(US\$'000)	221.1	304.7	406.3	932.0	
43	Miscellaneous (20%)		(US\$'000)	1,981.2	3,460.8	4,906.5	10,348.5	
44	Admi. & Engineering		(US\$'000)	1,188.7	2,076.5	2,943.9	6,209.1	
45	Contingency		(US\$'000)	2,615.2	4,568.3	6,476.5	13,660.0	
46	Total Cost		(US\$'000)	15,691.0	27,409.8	38,859.2	81,960.0	
47	Cost per Capita		(US\$/c)	4,240.8	5,374.5	5,714.6		
48	Cost per ha		(US\$/ha)	567,869.2	719,671.9	765,215.3		
49	Cost per m3		(US\$/m3)	31.8	32.0	32.3	32.1	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	784.6	1,370.5	1,943.0		
53	Capital Costs		(US\$'000)	1,616.2	2,823.2	4,002.5		
54	Total Annual Cost		(US\$'000)	2,400.7	4,193.7	5,945.5		
55	Unit Cost per m3		(US\$/m3)	13.3	13.4	13.6		
56	-----							
57	Remarks:							
58								
59								
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62								
63	-----							

Fig.



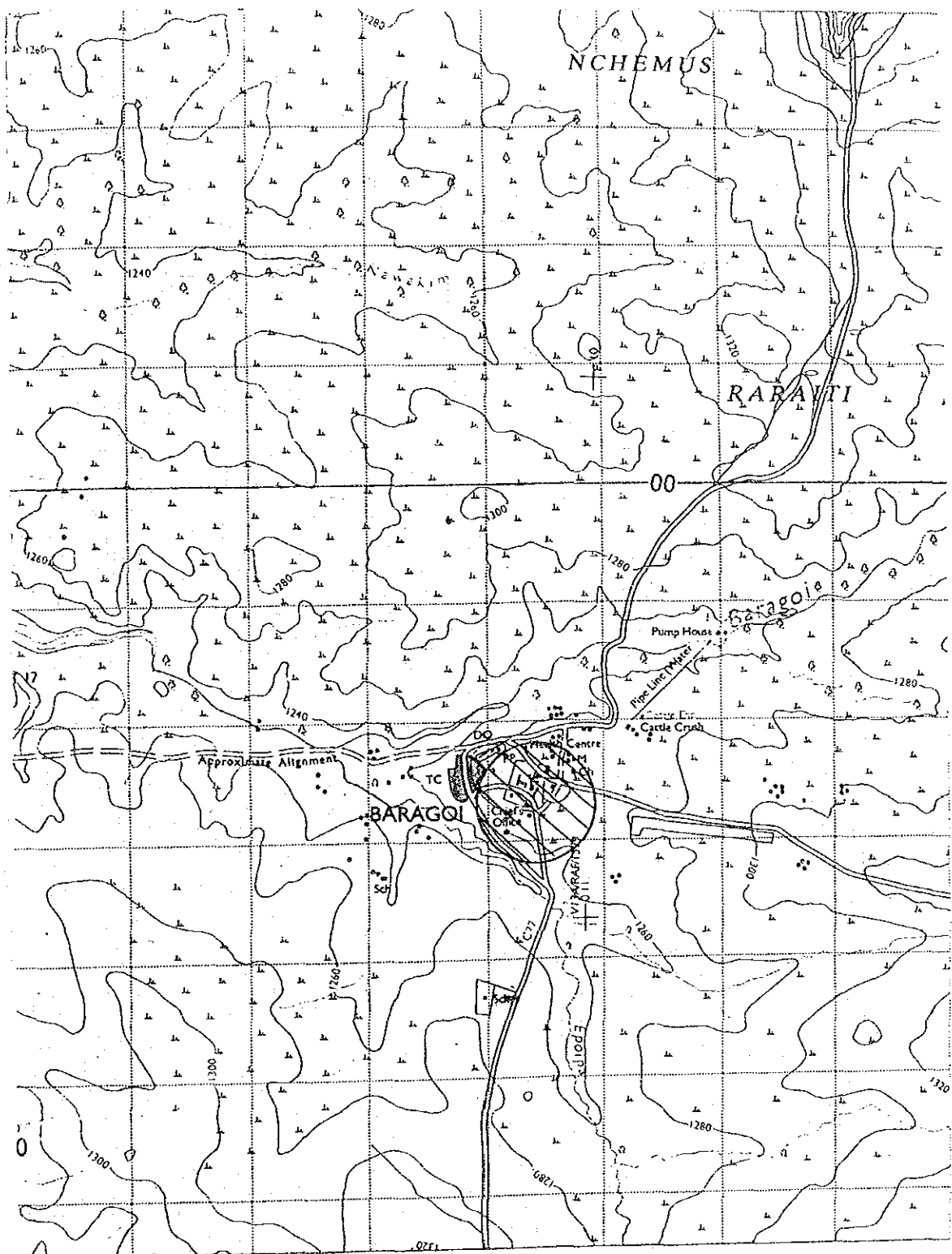
U- 120 Wamba R 842.4 93/2 SDD



THE STUDY  
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THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

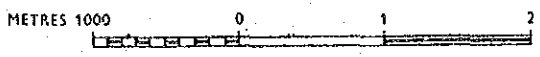
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 840		U-121			Rate		Jul 92 25.2
5	-----							
6	Name of Urban:	Baragoi		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Samburu	Locataion :	843.6		Elbarta		
10	Map ( 1/50,000 ) :	65/2	Coordinates X:		36°47'		Y:	N 01°47'
11	Sub-basin Code:	2D	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Boreholes (C4530)			River No			
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)			50			
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	3,200	7,700	13,500		
22	Residential Demand		(m3/d)	396	975	1,747		
23	Non-residential Demand		(m3/d)	66	158	278		
24	Livestock Demand		(m3/d)	50	132	269		
25	Industrial Demand		(m3/d)	0	0	0		
26	Total Demand		(m3/d)	512	1,265	2,294		
27	Area Served ( estimated net )		(ha)	24	58	101		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Boreholes + Sub-surface dam			River No:			
31	Raw Water System:	H (m)=	L (m)=	1,640,000				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	462.4	752.6	1,028.6	2,243.6	
37	Source Works		(US\$'000)	3,505.2	5,705.1	7,796.8	17,007.1	
38	Pump Cost		(US\$'000)	0.0	0.0	0.0	0.0	
39	Raw Water Main		(US\$'000)	11,861.1	19,729.8	27,421.2	59,012.1	
40	Treatment		(US\$'000)	275.6	364.2	433.2	1,073.0	
41	Storage		(US\$'000)	47.1	62.7	74.6	184.5	
42	Distribution		(US\$'000)	191.2	268.8	346.5	806.5	
43	Miscellaneous (20%)		(US\$'000)	3,176.0	5,226.1	7,214.5	15,616.6	
44	Admi. & Engineering		(US\$'000)	1,905.6	3,135.7	4,328.7	9,370.0	
45	Contingency		(US\$'000)	4,192.4	6,898.5	9,523.1	20,614.0	
46	Total Cost		(US\$'000)	25,154.2	41,391.0	57,138.6	123,683.8	
47	Cost per Capita		(US\$/c)	7,860.7	9,198.0	9,851.5		
48	Cost per ha		(US\$/ha)	1,052,588.9	1,231,664.7	1,319,168.7		
49	Cost per m3		(US\$/m3)	54.4	55.0	55.6	55.1	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	1,257.7	2,069.6	2,856.9		
53	Capital Costs		(US\$'000)	2,590.9	4,263.3	5,885.3		
54	Total Annual Cost		(US\$'000)	3,848.6	6,332.8	8,742.2		
55	Unit Cost per m3		(US\$/m3)	22.8	23.1	23.3		
56	-----							
57	Remarks: Cost estimate above assumes tentatively that whole demand would be met by groundwater exploitation.							
58	A potential water source may be subsurface dam on the Baragoi river, which should be surveyed.							
59								
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61								
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63	-----							





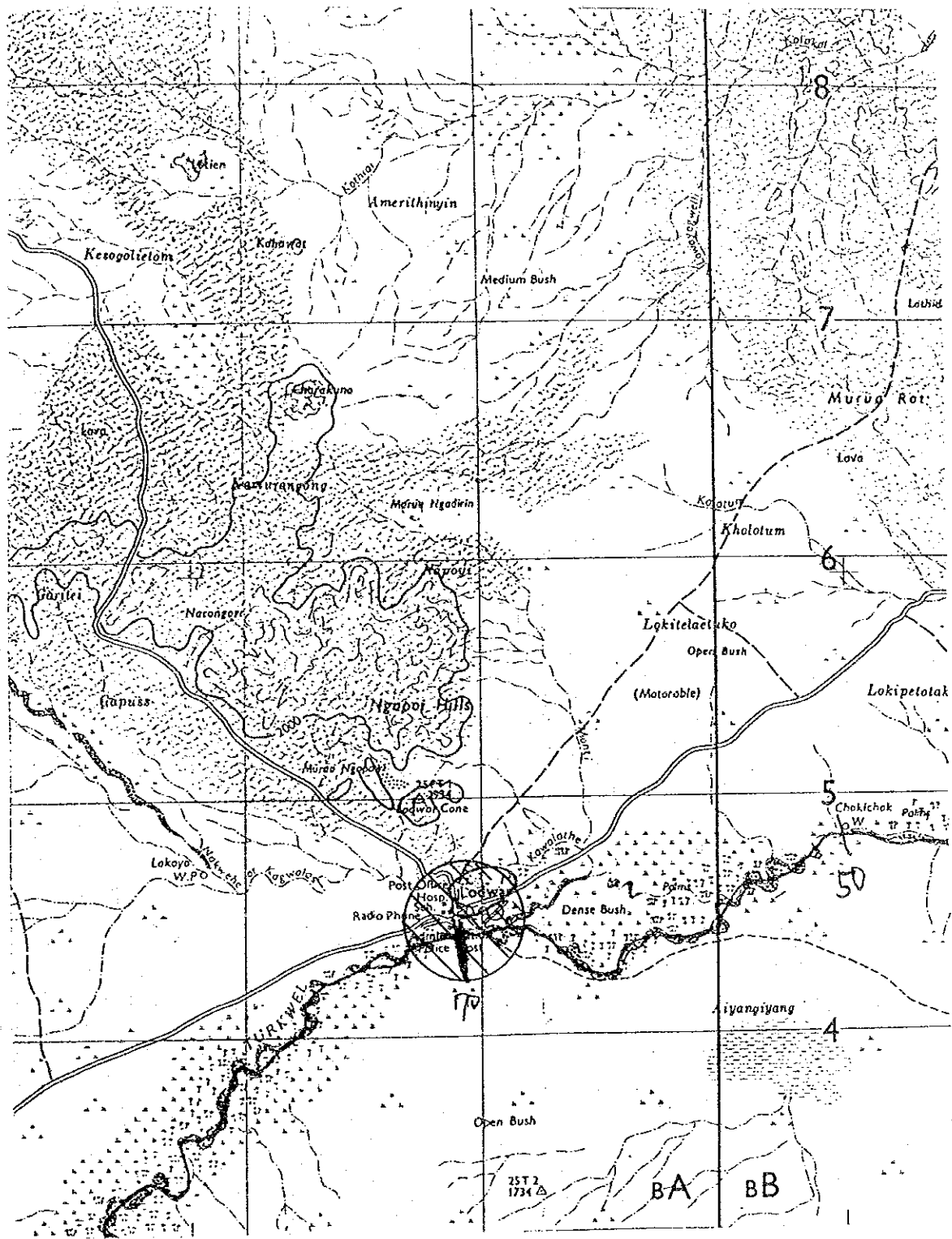
U-121 Baragoi

R 843.6 65/2 2D



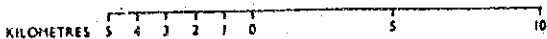
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 850		U-122			Rate		Jul-92 25.2
5	-----							
6	Name of Urban:		Lodwar		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess):							
9	District:		Turkana	Location :	853.5		Lodwar	
10	Map ( 1/50,000 ):		NA-36-4	Coordinates X:		35°32'	Y:	N 03°08'
11	Sub-basin Code:		2BD	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Boreholes			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		1250		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		9,300	21,300	33,400	
22	Residential Demand		(m3/d)		1,152	2,697	4,321	
23	Non-residential Demand		(m3/d)		193	441	691	
24	Livestock Demand		(m3/d)		260	878	2,111	
25	Industrial Demand		(m3/d)		285	527	758	
26	Total Demand		(m3/d)		1,890	4,543	7,881	
27	Area Served ( estimated net )		(ha)		69	159	249	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Boreholes & sub-surface dam			River No:		
31	Raw Water System:		H (m)=	0 L (m)=		1,343,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		640.0	2,653.1	3,338.0	6,631.1
37	Source Works		(US\$'000)		2,777.7	11,514.3	14,486.9	28,778.9
38	Pump Cost		(US\$'000)		0.0	0.0	0.0	0.0
39	Raw Water Main		(US\$'000)		4,612.7	20,996.6	26,997.2	52,606.4
40	Treatment		(US\$'000)		0.0	0.0	0.0	0.0
41	Storage		(US\$'000)		57.1	118.0	143.8	318.9
42	Distribution		(US\$'000)		555.6	716.9	722.9	1,995.4
43	Miscellaneous (20%)		(US\$'000)		1,600.6	6,669.2	8,470.1	16,739.9
44	Admi. & Engineering		(US\$'000)		960.4	4,001.5	5,082.1	10,044.0
45	Contingency		(US\$'000)		2,112.8	8,803.3	11,180.6	22,096.7
46	Total Cost		(US\$'000)		12,677.0	52,819.7	67,083.5	132,580.2
47	Cost per Capita		(US\$/c)		1,363.1	4,401.6	5,544.1	
48	Cost per ha		(US\$/ha)		182,529.6	589,404.6	742,384.6	
49	Cost per m3		(US\$/m3)		19.8	19.9	20.1	20.0
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		633.9	2,641.0	3,354.2	
53	Capital Costs		(US\$'000)		1,305.7	5,440.4	6,909.6	
54	Total Annual Cost		(US\$'000)		1,939.6	8,081.4	10,263.8	
55	Unit Cost per m3		(US\$/m3)		8.3	8.3	8.4	
56	-----							
57	Remarks:	Cost estimate above assumes that whole demand would be met by groundwater exploitation, since potential						
58		water yield from subsurface dam is not known. Initial approach would be to study the development potential						
59		of subsurface dam and assess how much of water could be exploited by subsurface dams.						
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62								
63	-----							



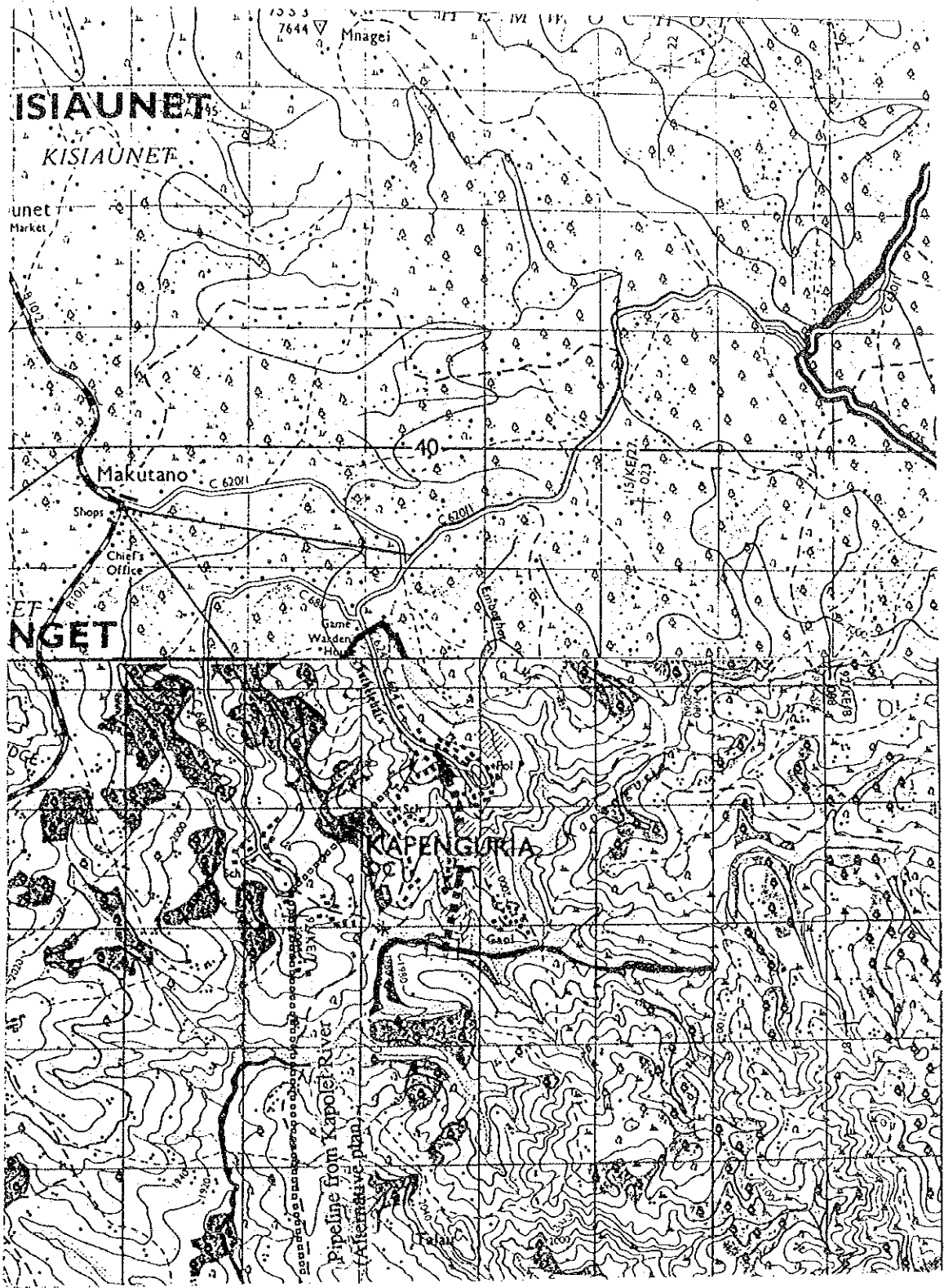
U-122 Lodwar

U 853.5 NA-36-4 2BD



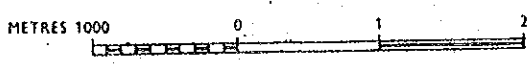
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 860		U-123			Rate		Feb-92 25.2
6	Name of Urban:	Kapenguria/Makutano		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	West Pokot	Locataion :	861.1		Kapenguria		
10	Map ( 1/50,000 ) :	75/3	Coordinates X:		35°07'	Y:	N 01°16'	
11	Sub-basin Code:	2BC	Elevation (El. m):					
13	Existing Facilities							
14	Raw Water Source:	Kapenguria Stream		River No				
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		180				
17	Distribution System:							
19				1990	2000	2010		
21	Projected Population	(no)		12,000	28,000	48,200		
22	Residential Demand	(m3/d)		1,487	3,546	6,236		
23	Non-residential Demand	(m3/d)		249	579	998		
24	Livestock Demand	(m3/d)		53	102	152		
25	Industrial Demand	(m3/d)		57	105	152		
26	Total Demand	(m3/d)		1,846	4,332	7,538		
27	Area Served ( estimated net )	(ha)		90	209	360		
29	Future Development Plan							
30	Raw Water Source:	Kapenguria River		River No:				
31	Raw Water System:	H (m)=	170 L (m)=	1,700				
32	Treatment:							
33	Distribution System:							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity	(m3/d)		1,665.5	2,486.0	3,206.4	7,357.9	
37	Source Works	(US\$'000)		15.5	21.0	25.4	61.8	
38	Pump Cost	(US\$'000)		9.1	11.7	14.0	34.8	
39	Raw Water Main	(US\$'000)		88.8	97.3	103.9	289.9	
40	Treatment	(US\$'000)		560.0	684.6	771.7	2,016.3	
41	Storage	(US\$'000)		95.7	114.9	138.1	348.6	
42	Distribution	(US\$'000)		716.9	955.9	1,206.8	2,879.6	
43	Miscellaneous (20%)	(US\$'000)		297.2	377.1	452.0	1,126.2	
44	Admi. & Engineering	(US\$'000)		178.3	226.2	271.2	675.7	
45	Contingency	(US\$'000)		392.3	497.7	596.6	1,486.6	
46	Total Cost	(US\$'000)		2,353.9	2,986.3	3,579.7	8,919.8	
47	Cost per Capita	(US\$/c)		196.2	186.6	177.2		
48	Cost per ha	(US\$/ha)		26,266.3	24,992.3	23,729.6		
49	Cost per m3	(US\$/m3)		1.4	1.2	1.1	1.2	
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs	(US\$'000)		117.7	149.3	179.0		
53	Capital Costs	(US\$'000)		242.4	307.6	368.7		
54	Total Annual Cost	(US\$'000)		360.1	456.9	547.7		
55	Unit Cost per m3	(US\$/m3)		0.6	0.5	0.5		
57	Remarks: Construction of a small dam on the Kapenguria river could augment the supply capacity, though the water yield should be assessed in a detailed hydrological study. Alternatively water transfer from Kapolet river appears to be prospective.							



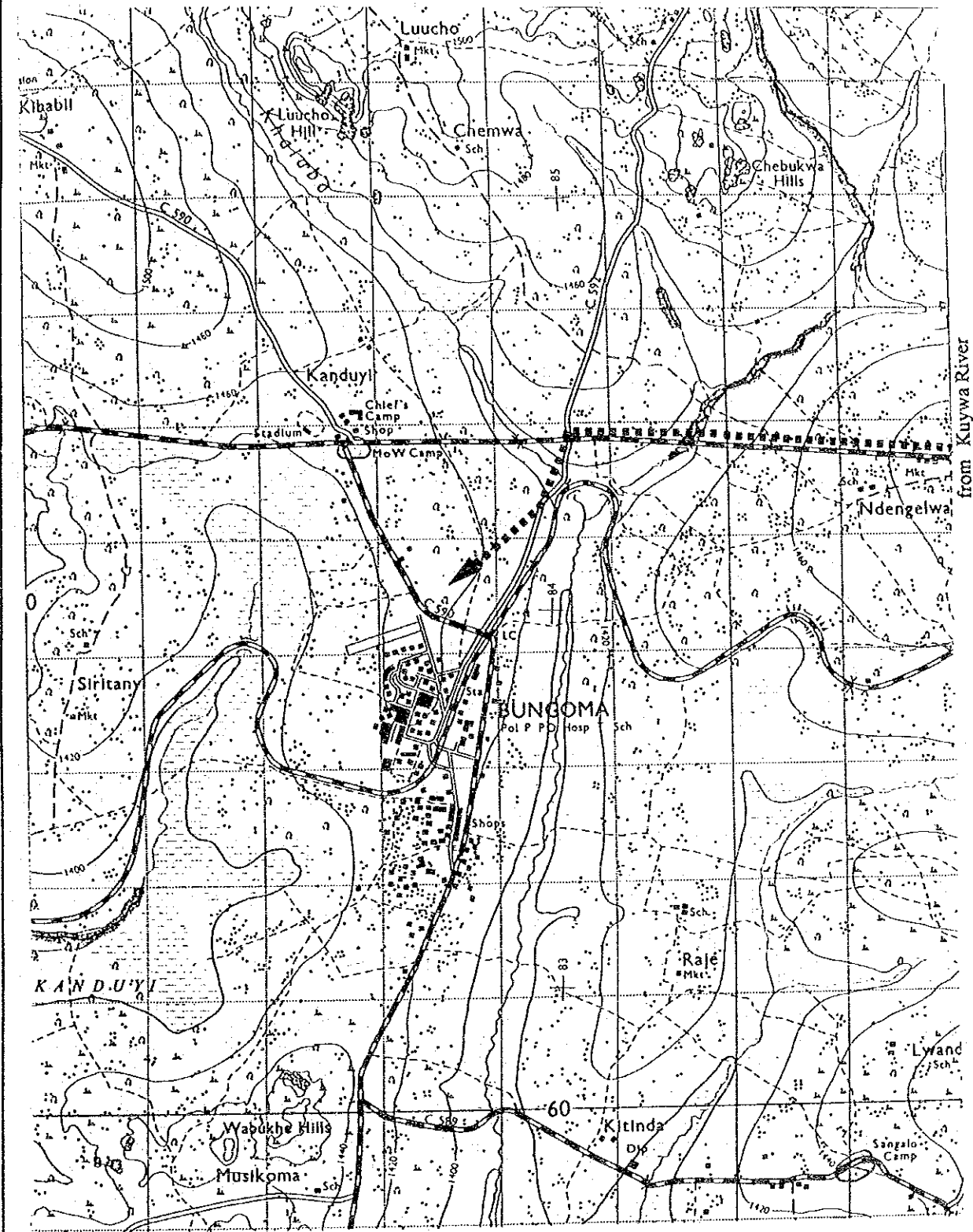
U-123 Kapenguria/Makutano

U 861.1 75/3 2BC



THE STUDY  
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JAPAN INTERNATIONAL COOPERATION AGENCY

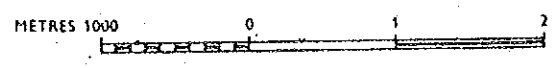
a	b	c	d	e	f	g	h	i
2						National Water Master Plan		
3			URBAN WATER SUPPLY					Jul 92
4	Code No.	910	U-124			Rate		25.2
5	-----							
6	Name of Urban:		Bungoma		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Bungoma	Locataion :	912.4		Musikoma	
10	Map ( 1/50,000 ) :		88/3	Coordinates X:		34°34'	Y:	N 00°35'
11	Sub-basin Code:		1AG	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Kuywa River			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		2500		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		29,500	83,100	142,700	
22	Residential Demand		(m3/d)		3,654	10,523	18,462	
23	Non-residential Demand		(m3/d)		611	1,721	2,957	
24	Livestock Demand		(m3/d)		67	179	311	
25	Industrial Demand		(m3/d)		766	1,353	1,831	
26	Total Demand		(m3/d)		5,098	13,776	23,561	
27	Area Served ( estimated net )		(ha)		220	621	1,066	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Kuywa River			River No:		
31	Raw Water System:		H (m)=	60 L (m)=		18,700		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		2,598.3	8,677.2	9,785.3	21,060.8
37	Source Works		(US\$'000)		21.7	53.5	58.6	133.8
38	Pump Cost		(US\$'000)		5.5	13.4	15.1	34.0
39	Raw Water Main		(US\$'000)		1,081.8	1,573.5	1,647.5	4,302.9
40	Treatment		(US\$'000)		699.3	1,128.7	1,164.8	2,992.8
41	Storage		(US\$'000)		117.0	373.7	421.4	912.1
42	Distribution		(US\$'000)		1,762.4	3,202.3	3,560.7	8,525.4
43	Miscellaneous (20%)		(US\$'000)		737.5	1,269.0	1,373.6	3,380.2
44	Admi. & Engineering		(US\$'000)		442.5	761.4	824.2	2,028.1
45	Contingency		(US\$'000)		973.6	1,675.1	1,813.2	4,461.9
46	Total Cost		(US\$'000)		5,841.4	10,050.7	10,879.2	26,771.2
47	Cost per Capita		(US\$/c)		198.0	187.5	182.5	
48	Cost per ha		(US\$/ha)		26,515.1	25,108.9	24,442.6	
49	Cost per m3		(US\$/m3)		2.2	1.2	1.1	1.3
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		292.1	502.5	544.0	
53	Capital Costs		(US\$'000)		601.7	1,035.2	1,120.6	
54	Total Annual Cost		(US\$'000)		893.7	1,537.8	1,664.5	
55	Unit Cost per m3		(US\$/m3)		0.9	0.5	0.5	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



from Kuywa River

U-124 Bungoma

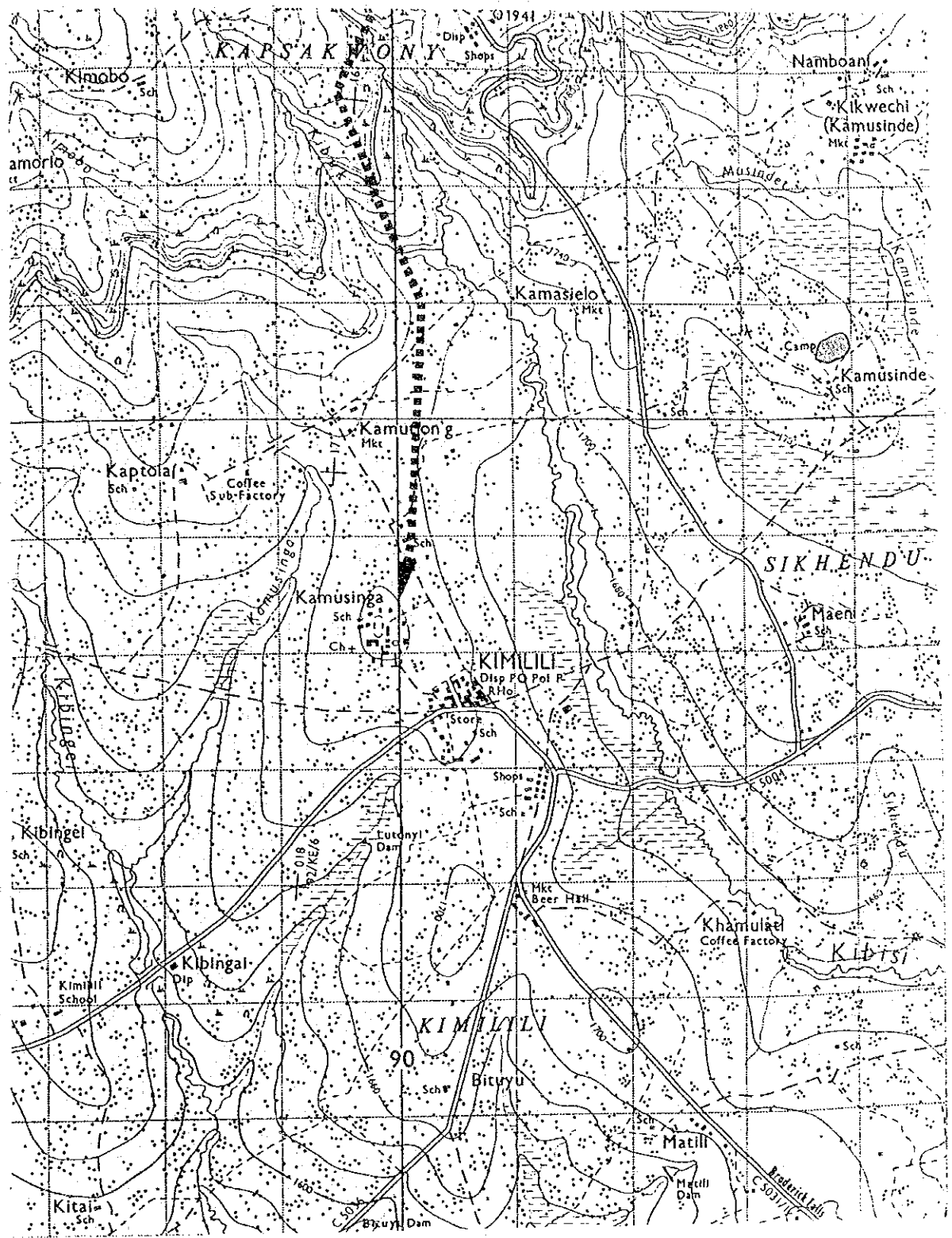
U 912.4 88/3 1AG



THE STUDY  
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JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 910	U-125				Rate		Fcb-92 25.2
5	-----							
6	Name of Urban:	Kimilili	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Bungoma	Locataion :	913.1		Kimilili		
10	Map ( 1/50,000 ):	88/1	Coordinates X:		34°44'	Y:	N 00°48'	
11	Sub-basin Code:	1DB	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Kimilili River	River No					
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		152				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)		6,500	18,300	31,500		
22	Residential Demand	(m3/d)		805	2,317	4,075		
23	Non-residential Demand	(m3/d)		135	379	652		
24	Livestock Demand	(m3/d)		15	39	68		
25	Industrial Demand	(m3/d)		0	0	0		
26	Total Demand	(m3/d)		955	2,735	4,795		
27	Area Served ( estimated net )	(ha)		49	137	235		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Kimilili River	River No:					
31	Raw Water System:	H (m)=	0 L (m)=	5,500				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity	(m3/d)		803.2	1,780.0	2,060.1	4,643.3	
37	Source Works	(US\$'000)		9.0	16.3	18.2	43.5	
38	Pump Cost	(US\$'000)		0.0	0.0	0.0	0.0	
39	Raw Water Main	(US\$'000)		251.2	291.3	301.0	843.5	
40	Treatment	(US\$'000)		377.8	579.5	624.1	1,581.4	
41	Storage	(US\$'000)		65.1	98.8	105.8	269.6	
42	Distribution	(US\$'000)		388.3	705.0	788.6	1,881.9	
43	Miscellaneous (20%)	(US\$'000)		218.3	338.2	367.5	924.0	
44	Admi. & Engineering	(US\$'000)		131.0	202.9	220.5	554.4	
45	Contingency	(US\$'000)		288.1	446.4	485.1	1,219.7	
46	Total Cost	(US\$'000)		1,728.7	2,678.4	2,910.8	7,317.9	
47	Cost per Capita	(US\$/c)		266.0	227.0	220.5		
48	Cost per ha	(US\$/ha)		35,613.7	30,394.7	29,527.7		
49	Cost per m3	(US\$/m3)		2.2	1.5	1.4	1.6	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs	(US\$'000)		86.4	133.9	145.5		
53	Capital Costs	(US\$'000)		178.1	275.9	299.8		
54	Total Annual Cost	(US\$'000)		264.5	409.8	445.3		
55	Unit Cost per m3	(US\$/m3)		0.9	0.6	0.6		
56	-----							
57	Remarks:							
58								
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63	-----							

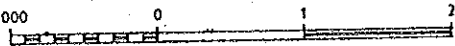




U-125 Kimilili

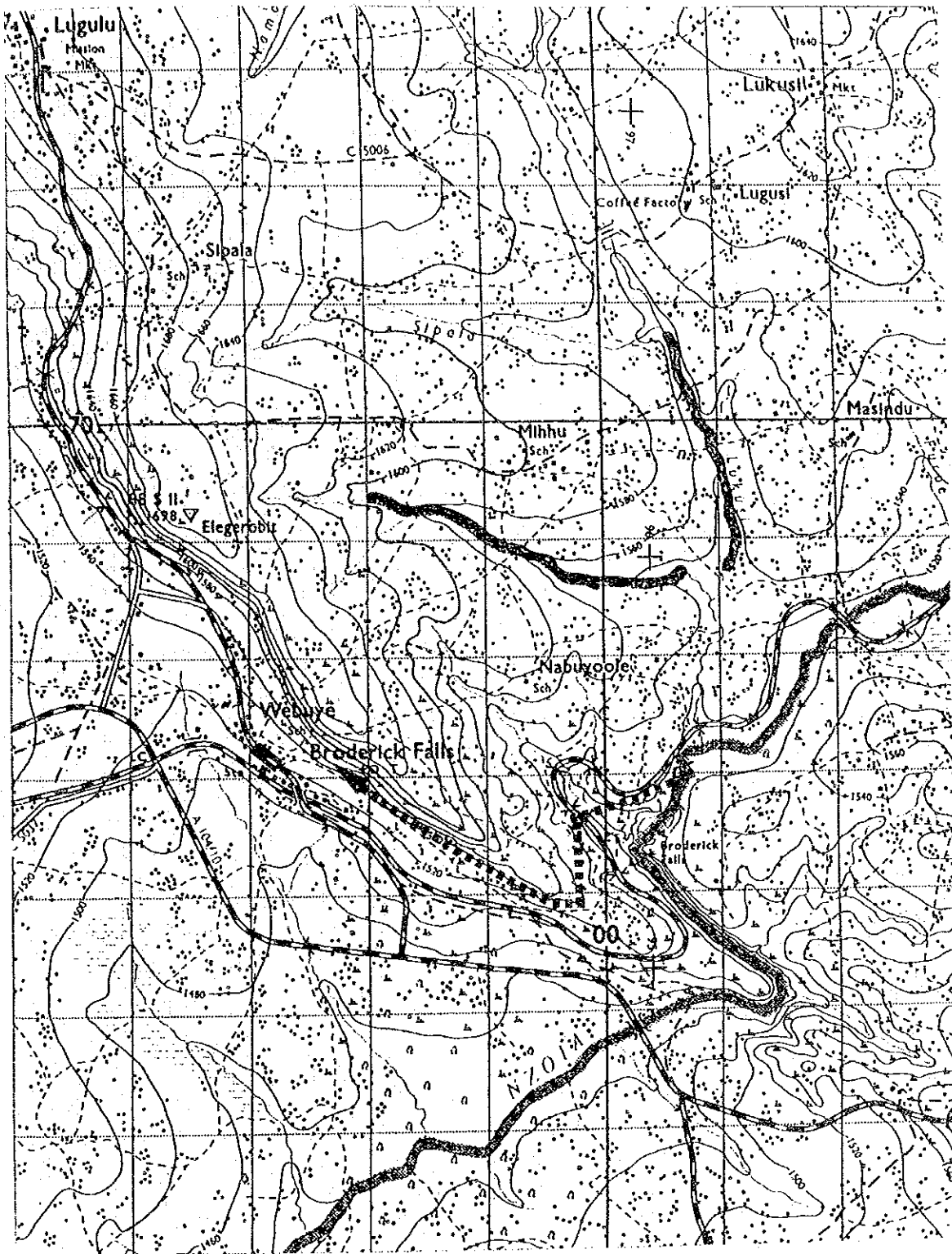
U 913.1 88/1 1DB

METRES 1000



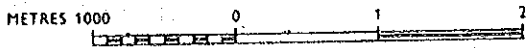
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 910		U-126			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Webuye		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Bungoma	Locataion :	914.2		Webuye	
10	Map ( 1/50,000 ) :		88/4	Coordinates X:		34°47'		Y: N 00°37'
11	Sub-basin Code:		1DA	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Nzoia River			River No		
15	Raw Water System:		H (m)=		L (m)=			
16	Treatment:			Capacity (m3/d)		1250		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population			(no)	26,600	74,900	128,700	
22	Residential Demand			(m3/d)	3,295	9,484	16,651	
23	Non-residential Demand			(m3/d)	551	1,552	2,666	
24	Livestock Demand			(m3/d)	60	162	280	
25	Industrial Demand			(m3/d)	148	274	394	
26	Total Demand			(m3/d)	4,054	11,472	19,991	
27	Area Served ( estimated net )			(ha)	199	559	961	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Nzoia River			River No:		
31	Raw Water System:		H (m)=		100 L (m)=	4,800		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity			(m3/d)	2,804.1	7,418.1	8,518.4	18,740.6
37	Source Works			(US\$'000)	22.9	47.6	52.8	123.3
38	Pump Cost			(US\$'000)	7.3	15.5	17.6	40.4
39	Raw Water Main			(US\$'000)	283.1	381.3	401.1	1,065.6
40	Treatment			(US\$'000)	725.1	1,076.8	1,122.8	2,924.7
41	Storage			(US\$'000)	120.7	319.5	366.9	807.0
42	Distribution			(US\$'000)	1,589.2	2,885.6	3,214.2	7,689.0
43	Miscellaneous (20%)			(US\$'000)	549.7	945.3	1,035.1	2,530.0
44	Admi. & Engineering			(US\$'000)	329.8	567.2	621.0	1,518.0
45	Contingency			(US\$'000)	725.6	1,247.7	1,366.3	3,339.6
46	Total Cost			(US\$'000)	4,353.4	7,486.4	8,197.8	20,037.6
47	Cost per Capita			(US\$/c)	163.7	155.0	152.4	
48	Cost per ha			(US\$/ha)	21,915.1	20,755.2	20,403.9	
49	Cost per m3			(US\$/m3)	1.6	1.0	1.0	1.1
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs			(US\$'000)	217.7	374.3	409.9	
53	Capital Costs			(US\$'000)	448.4	771.1	844.4	
54	Total Annual Cost			(US\$'000)	666.1	1,145.4	1,254.3	
55	Unit Cost per m3			(US\$/m3)	0.7	0.4	0.4	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



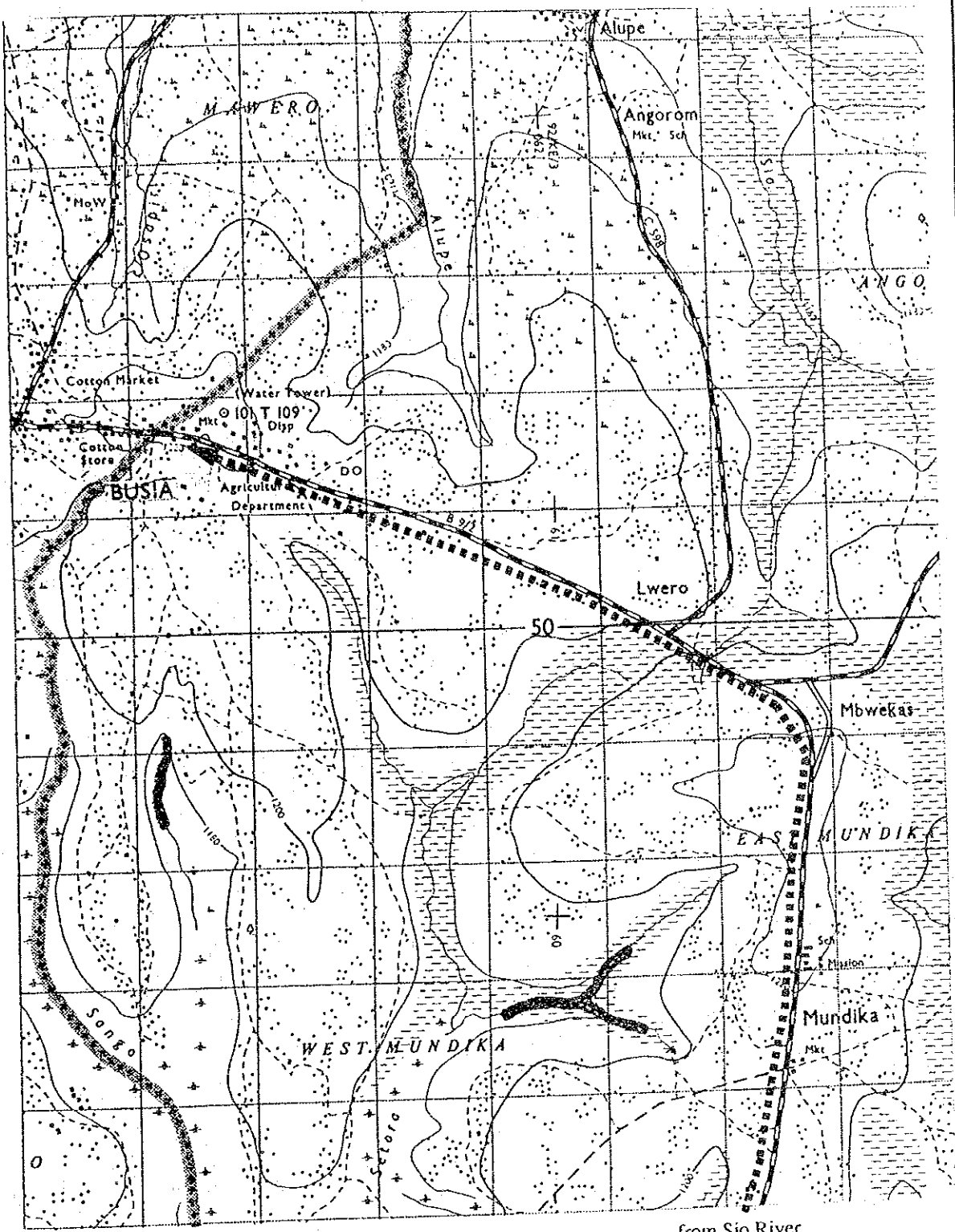
U-126 Webuye

U 914.2 88/4 1DA



THE STUDY  
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THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

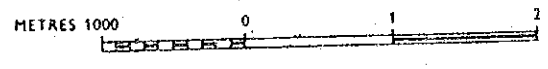
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 920		U-127			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Busia		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Busia	Locataion :	921.5		South Teso	
10	Map ( 1/50,000 ) :		101/1	Coordinates X:		34°07'	Y:	N 00°29'
11	Sub-basin Code:		1AH	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Sio River			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		2000		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		13,300	41,500	70,200	
22	Residential Demand		(m3/d)		1,648	5,255	9,082	
23	Non-residential Demand		(m3/d)		276	859	1,453	
24	Livestock Demand		(m3/d)		28	88	157	
25	Industrial Demand		(m3/d)		153	287	421	
26	Total Demand		(m3/d)		2,105	6,489	11,113	
27	Area Served ( estimated net )		(ha)		99	310	524	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Sio river			River No:		
31	Raw Water System:		H (m)=	100 L (m)=		13,400		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		104.5	4,384.4	4,624.2	9,113.1
37	Source Works		(US\$'000)		1.9	32.1	33.4	67.4
38	Pump Cost		(US\$'000)		2.6	10.2	10.6	23.4
39	Raw Water Main		(US\$'000)		494.6	895.3	910.0	2,300.0
40	Treatment		(US\$'000)		112.4	885.2	904.9	1,902.5
41	Storage		(US\$'000)		18.3	188.8	199.1	406.3
42	Distribution		(US\$'000)		794.6	1,684.8	1,714.6	4,194.0
43	Miscellaneous (20%)		(US\$'000)		284.9	739.3	754.5	1,778.7
44	Admi. & Engineering		(US\$'000)		170.9	443.6	452.7	1,067.2
45	Contingency		(US\$'000)		376.1	975.8	996.0	2,347.9
46	Total Cost		(US\$'000)		2,256.4	5,855.1	5,975.8	14,087.3
47	Cost per Capita		(US\$/c)		169.7	207.6	208.2	
48	Cost per ha		(US\$/ha)		22,717.3	27,802.4	27,881.4	
49	Cost per m3		(US\$/m3)		21.6	1.3	1.3	1.5
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		112.8	292.8	298.8	
53	Capital Costs		(US\$'000)		232.4	603.1	615.5	
54	Total Annual Cost		(US\$'000)		345.2	895.8	914.3	
55	Unit Cost per m3		(US\$/m3)		9.0	0.6	0.5	
56	-----							
57	Remarks:	Water source of the Sio river may be critical in the dry season, which should be subject to further study.						
58		Alternative solution will be either groundwater exploitation or water transfer from either Nzoia river						
59		or Malaba river (at Malaba town).						
60								
61								
62								
63	-----							



from Sio River

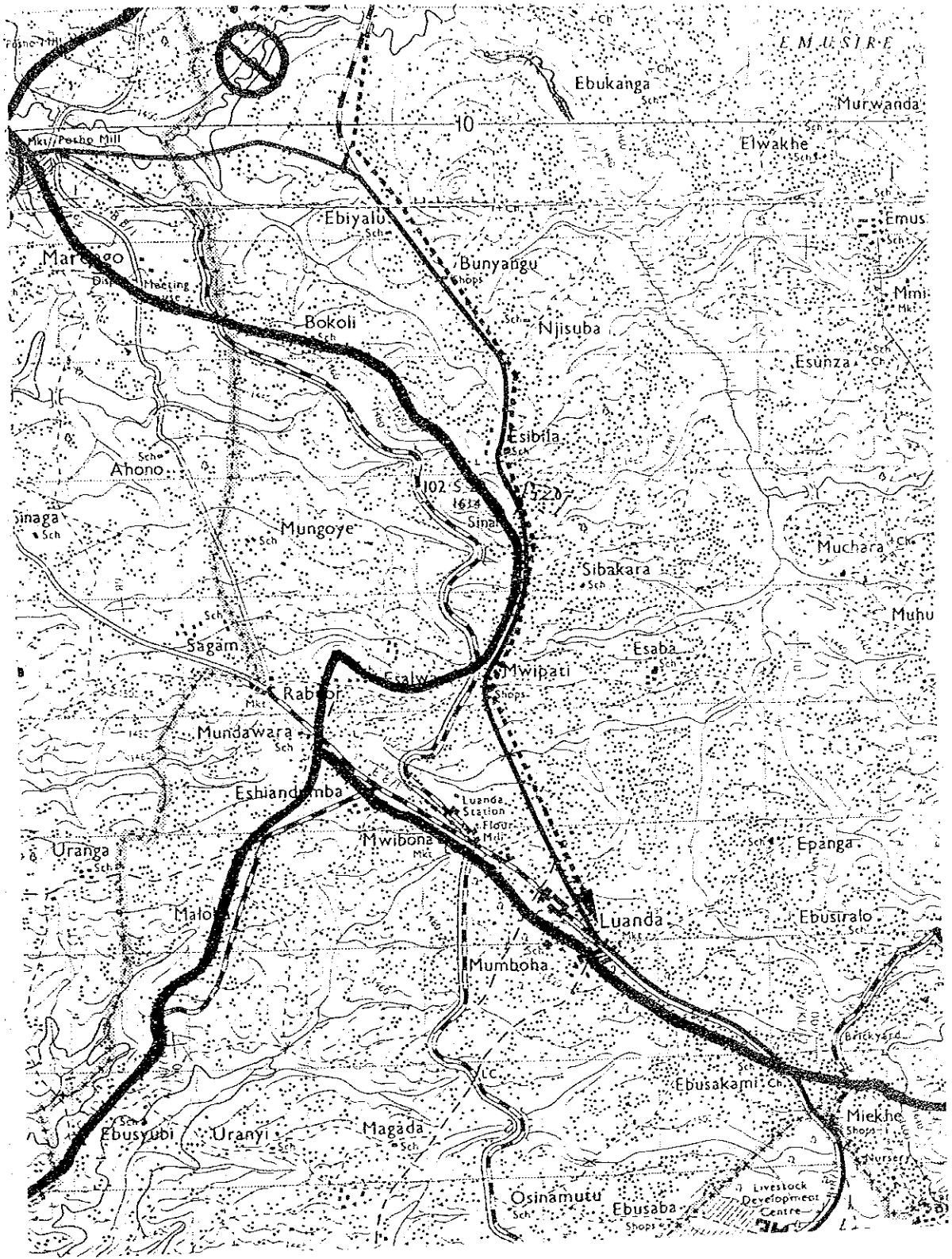
U-127 Busia

U 921.5 101/1 1AH



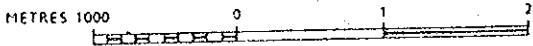
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
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a	b	c	d	e	f	g	h	i	
2					National Water Master Plan				
3			URBAN WATER SUPPLY					Jul-92	
4	Code No.	930	U-128			Rate		25.2	
5	-----								
6	Name of Urban:		Luanda		LGL Notice No:				
7	Organization:								
8	Per Capita GRDP in 1988 ( guess):								
9	District:		Kakamega	Locataion :		931.3	West Bunyore		
10	Map ( 1/50,000 ) :		102/3	Coordinates X:		34°36'	Y:	N 00°02'	
11	Sub-basin Code:		1FF	Elevation (El. m):					
12	-----								
13	Existing Facilities								
14	Raw Water Source:		Edzawa river			River No			
15	Raw Water System:		H (m)=	L (m)=					
16	Treatment:			Capacity (m3/d)		1770			
17	Distribution System:								
18	-----								
19						1990	2000	2010	
20	-----								
21	Projected Population			(no)		3,300	7,900	12,600	
22	Residential Demand			(m3/d)		409	1,000	1,630	
23	Non-residential Demand			(m3/d)		68	162	261	
24	Livestock Demand			(m3/d)		5	12	20	
25	Industrial Demand			(m3/d)		208	389	567	
26	Total Demand			(m3/d)		690	1,563	2,478	
27	Area Served ( estimated net )			(ha)		25	59	94	
28	-----								
29	Future Development Plan								
30	Raw Water Source:		Edzawa river			River No:			
31	Raw Water System:		H (m)=	170 L (m)=		9,000			
32	Treatment:								
33	Distribution System:								
34	-----								
35	Incremental Capital Cost					1990	2000	2010	Total
36	Incremental Capacity			(m3/d)		0.0	0.0	708.1	708.1
37	Source Works			(US\$'000)		0.0	0.0	8.2	8.2
38	Pump Cost			(US\$'000)		0.0	0.0	6.1	6.1
39	Raw Water Main			(US\$'000)		0.0	0.0	403.2	403.2
40	Treatment			(US\$'000)		0.0	0.0	351.9	351.9
41	Storage			(US\$'000)		0.0	0.0	60.6	60.6
42	Distribution			(US\$'000)		0.0	0.0	280.8	280.8
43	Miscellaneous (20%)			(US\$'000)		0.0	0.0	222.2	222.2
44	Admi. & Engineering			(US\$'000)		0.0	0.0	133.3	133.3
45	Contingency			(US\$'000)		0.0	0.0	293.2	293.2
46	Total Cost			(US\$'000)		0.0	0.0	1,759.5	1,759.5
47	Cost per Capita			(US\$/c)		0.0	0.0	374.4	
48	Cost per ha			(US\$/ha)		0.0	0.0	50,128.4	
49	Cost per m3			(US\$/m3)		0.0	0.0	2.5	2.5
50	-----								
51	Present Value of Water at DF=10 %					1990	2000	2010	Total
52	Direct O & M Costs			(US\$'000)		0.0	0.0	88.0	
53	Capital Costs			(US\$'000)		0.0	0.0	181.2	
54	Total Annual Cost			(US\$'000)		0.0	0.0	269.2	
55	Unit Cost per m3			(US\$/m3)		0.0	0.0	1.0	
56	-----								
57	Remarks:	In view of relatively small augmentation requirement, water can be supplied by augmenting the existing							
58		system. The corresponding cost was estimated for Luanda. In actual implementation, this system will be							
59		integrated into the Maseno system (see U-78).							
60									
61									
62									
63	-----								



U- 78 Maseno - (Kisumu)  
 U-128 Luanda

U 622.1 116/1 1FB  
 U 931.3 102/3 1FF

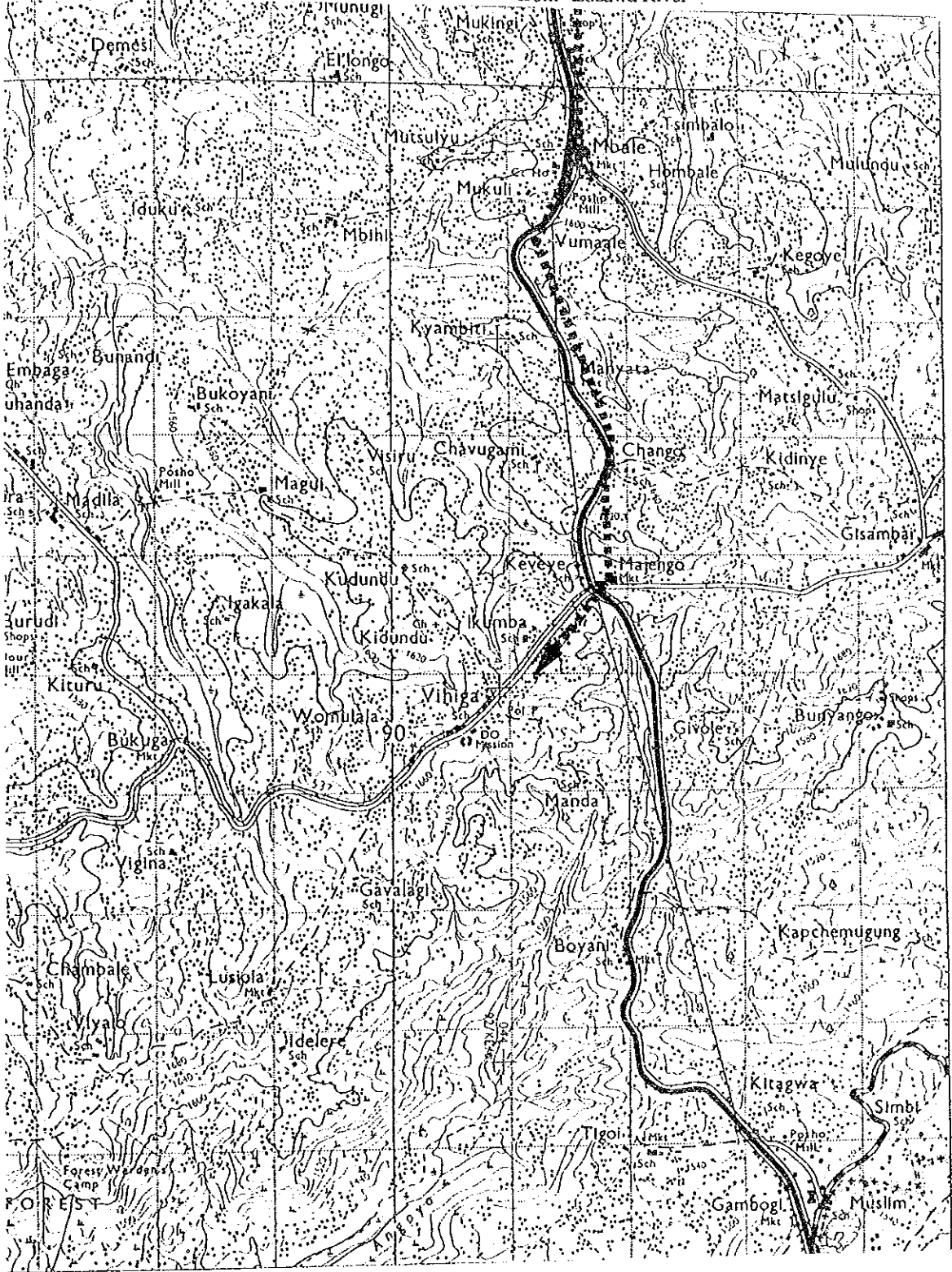


THE STUDY  
 ON  
 THE NATIONAL WATER MASTER PLAN  
 JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No.	930	U-129			Rate		Jul-92 25.2
5	-----							
6	Name of Urban:	Vihiga+Majengo		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Kakamega	Locataion :	932.5			Central Maragoli	
10	Map ( 1/50,000 ) :	102/3	Coordinates X:		34°44'		Y:	N 00°03'
11	Sub-basin Code:	1FF	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Spring		L (m)=		River No		
15	Raw Water System:	H (m)=						
16	Treatment:			Capacity (m3/d)		120		
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	5,100	9,900	14,400		
22	Residential Demand		(m3/d)	632	1,254	1,863		
23	Non-residential Demand		(m3/d)	93	205	298		
24	Livestock Demand		(m3/d)	7	15	23		
25	Industrial Demand		(m3/d)	69	117	148		
26	Total Demand		(m3/d)	801	1,591	2,332		
27	Area Servcd ( estimated net )		(ha)	38	74	108		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Edzawa River (Kimondi River)			River No:			
31	Raw Water System:	H (m)=		170	L (m)=		7,700	
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	680.8	789.8	741.4	2,212.0	
37	Source Works		(US\$'000)	7.9	8.9	8.5	25.3	
38	Pump Cost		(US\$'000)	5.7	6.6	6.4	18.7	
39	Raw Water Main		(US\$'000)	343.0	350.8	347.4	1,041.1	
40	Treatment		(US\$'000)	344.2	374.3	361.2	1,079.6	
41	Storage		(US\$'000)	59.2	64.5	62.2	185.9	
42	Distribution		(US\$'000)	304.7	286.8	268.8	860.3	
43	Miscellaneous (20%)		(US\$'000)	212.9	218.3	210.9	642.2	
44	Admi. & Engineering		(US\$'000)	127.8	131.0	126.5	385.3	
45	Contingency		(US\$'000)	281.1	288.2	278.4	847.7	
46	Total Cost		(US\$'000)	1,686.4	1,729.3	1,670.2	5,085.9	
47	Cost per Capita		(US\$/c)	330.7	360.3	371.2		
48	Cost per ha		(US\$/ha)	44,279.0	48,241.7	49,700.4		
49	Cost per m3		(US\$/m3)	2.5	2.2	2.3	2.3	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	84.3	86.5	83.5		
53	Capital Costs		(US\$'000)	173.7	178.1	172.0		
54	Total Annual Cost		(US\$'000)	258.0	264.6	255.5		
55	Unit Cost per m3		(US\$/m3)	1.0	0.9	0.9		
56	-----							
57	Remarks:	It was suggested by the District Water Engineer that the Kimondi river is the possible future water source for the urban centre though the river name is not shown on the 1/50,000 map.						
58								
59								
60								
61								
62								
63	-----							

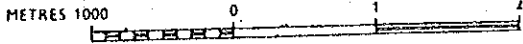


from Edzawa River



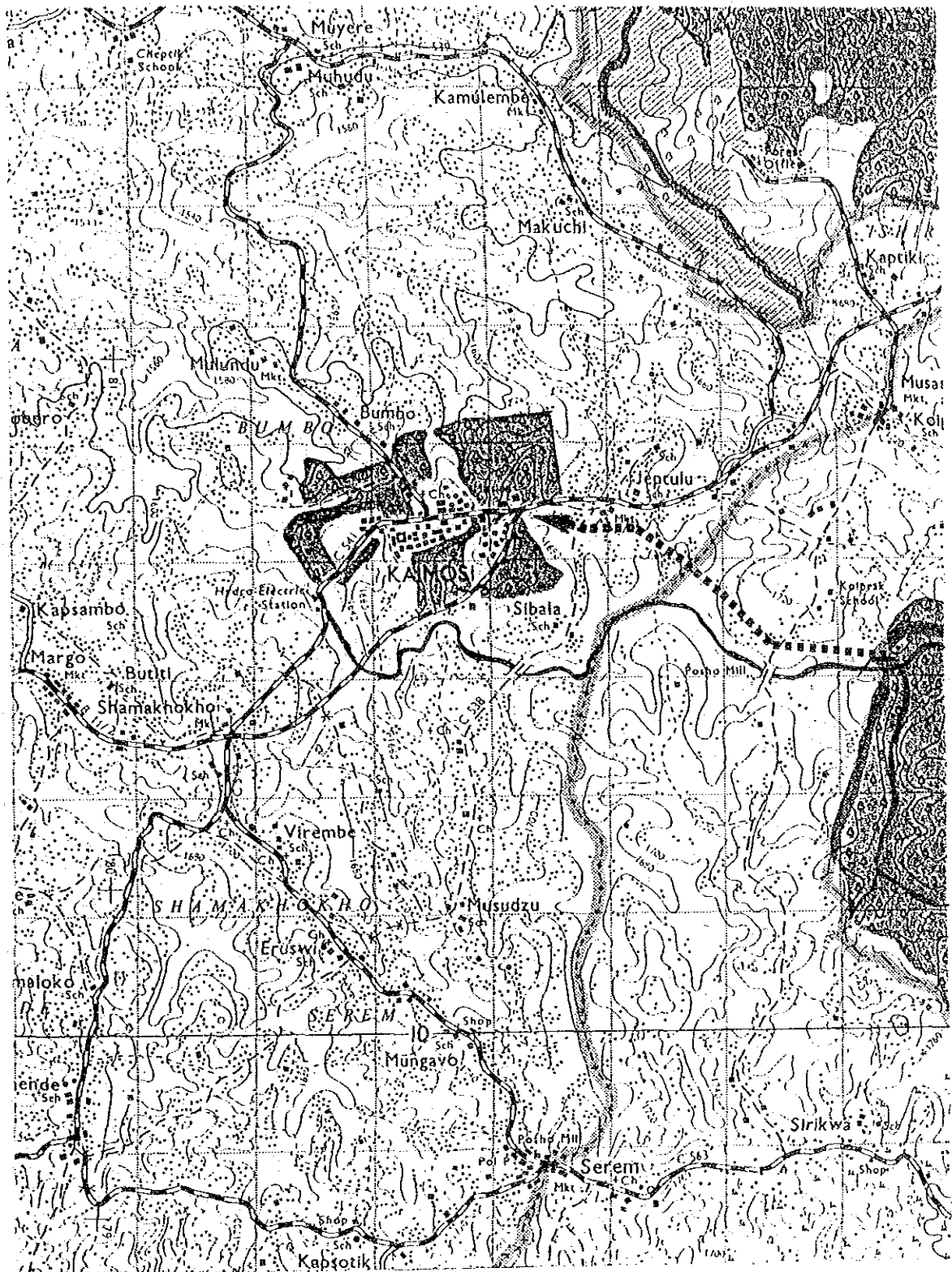
U-129 Vihiga+Majengo

U 932.5 102/3 1FF



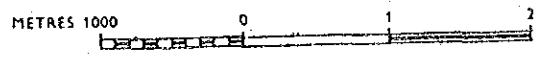
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	930	U-130			Rate		25.2
5	-----							
6	Name of Urban:		Kaimosi		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Kakamega	Locataion :	933.1	Shamakhokho		
10	Map ( 1/50,000 ):		102/4	Coordinates X:		34°51'	Y:	N 00°08'
11	Sub-basin Code:		1FE	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Dam			River No.		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		660		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		600	1,000	1,300	
22	Residential Demand		(m3/d)		74	127	168	
23	Non-residential Demand		(m3/d)		0	19	25	
24	Livestock Demand		(m3/d)		0	1	2	
25	Industrial Demand		(m3/d)		114	211	303	
26	Total Demand		(m3/d)		188	358	498	
27	Area Aerved ( estimated net )		(ha)		4	7	10	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Galagoli river			River No:		
31	Raw Water System:		H (m)=	0 L (m)=		3,500		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		0.0	0.0	0.0	0.0
37	Source Works		(US\$'000)		0.0	0.0	0.0	0.0
38	Pump Cost		(US\$'000)		0.0	0.0	0.0	0.0
39	Raw Water Main		(US\$'000)		0.0	0.0	0.0	0.0
40	Treatment		(US\$'000)		0.0	0.0	0.0	0.0
41	Storage		(US\$'000)		0.0	0.0	0.0	0.0
42	Distribution		(US\$'000)		0.0	0.0	0.0	0.0
43	Miscellaneous (20%)		(US\$'000)		0.0	0.0	0.0	0.0
44	Admi. & Engineering		(US\$'000)		0.0	0.0	0.0	0.0
45	Contingency		(US\$'000)		0.0	0.0	0.0	0.0
46	Total Cost		(US\$'000)		0.0	0.0	0.0	0.0
47	Cost per Capita		(US\$/c)		0.0	0.0	0.0	
48	Cost per ha		(US\$/ha)		0.0	0.0	0.0	
49	Cost per m3		(US\$/m3)		0.0	0.0	0.0	0.0
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		0.0	0.0	0.0	
53	Capital Costs		(US\$'000)		0.0	0.0	0.0	
54	Total Annual Cost		(US\$'000)		0.0	0.0	0.0	
55	Unit Cost per m3		(US\$/m3)		0.0	0.0	0.0	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



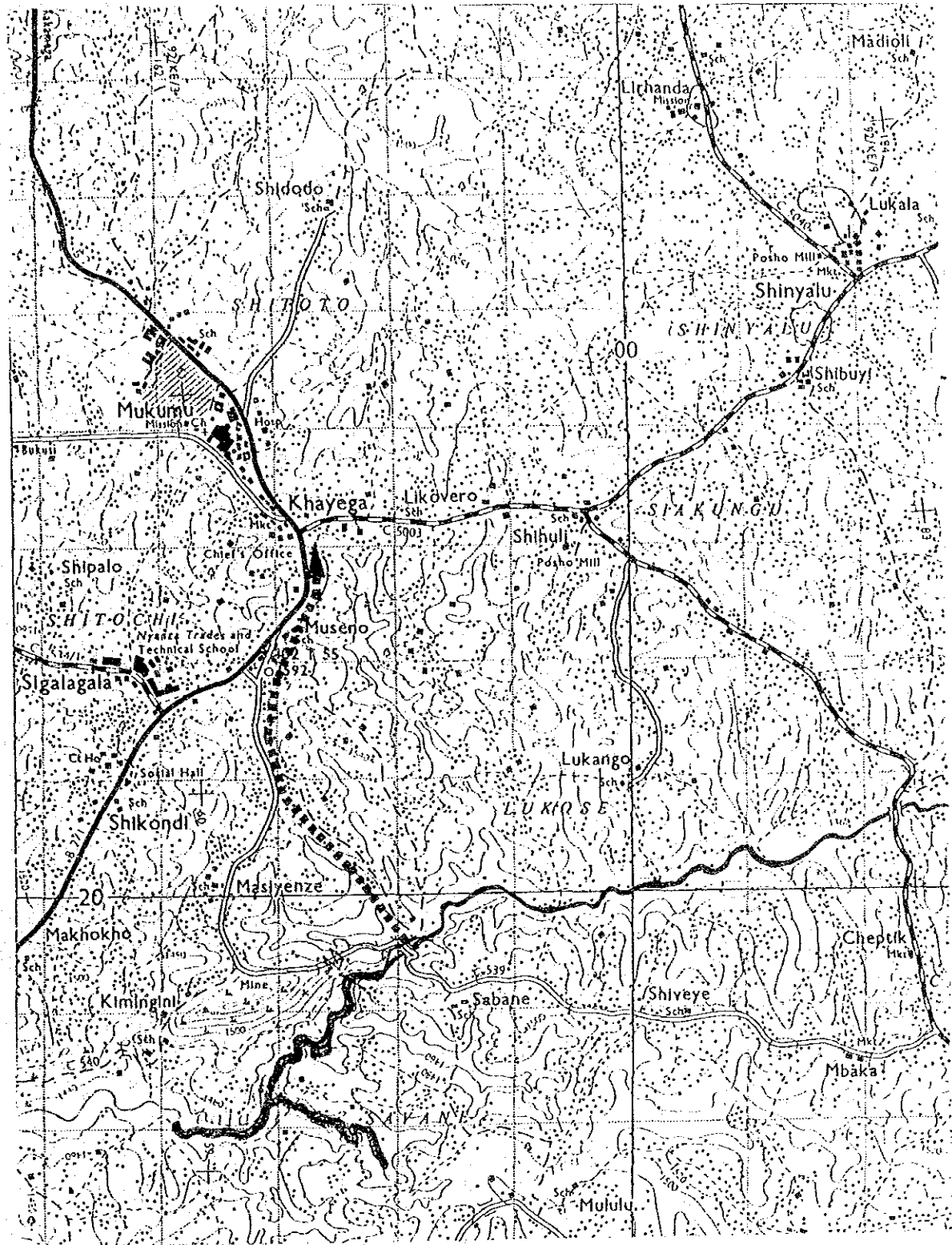
U-130 Kaimosi

U 933.1 102/4 1FE



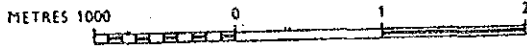
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 930		U-131			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Khayega		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Kakamega	Locataion :	934.3		West Isukha	
10	Map ( 1/50,000 ):		102/4	Coordinates X:		34°47'	Y:	N 00°13'
11	Sub-basin Code:		1EB	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:					River No		
15	Raw Water System:		H (m)=		L (m)=			
16	Treatment:			Capacity (m3/d)				
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		600	1,000	1,400	
22	Residential Demand		(m3/d)		74	127	181	
23	Non-residential Demand		(m3/d)		0	20	27	
24	Livestock Demand		(m3/d)		0	2	2	
25	Industrial Demand		(m3/d)		114	211	303	
26	Total Demand		(m3/d)		188	360	513	
27	Area Served ( estimated net )		(ha)		4	7	10	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Yala river			River No:		
31	Raw Water System:		H (m)=	170 L (m)=		4,200		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		188.3	171.3	153.5	513.1
37	Source Works		(US\$'000)		3.0	2.8	2.6	8.4
38	Pump Cost		(US\$'000)		4.7	4.8	4.7	14.2
39	Raw Water Main		(US\$'000)		161.9	160.6	159.2	481.7
40	Treatment		(US\$'000)		161.3	152.3	142.4	456.0
41	Storage		(US\$'000)		26.9	25.3	23.6	75.8
42	Distribution		(US\$'000)		35.8	23.9	23.9	83.6
43	Miscellaneous (20%)		(US\$'000)		78.7	73.9	71.3	224.0
44	Admi. & Engineering		(US\$'000)		47.2	44.4	42.8	134.4
45	Contingency		(US\$'000)		103.9	97.6	94.1	295.6
46	Total Cost		(US\$'000)		623.6	585.6	564.5	1,773.7
47	Cost per Capita		(US\$/c)		1,039.3	1,464.1	1,411.4	
48	Cost per ha		(US\$/ha)		139,161.8	196,044.6	188,987.7	
49	Cost per m3		(US\$/m3)		3.3	3.4	3.7	3.5
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		31.2	29.3	28.2	
53	Capital Costs		(US\$'000)		64.2	60.3	58.1	
54	Total Annual Cost		(US\$'000)		95.4	89.6	86.4	
55	Unit Cost per m3		(US\$/m3)		1.4	1.4	1.5	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



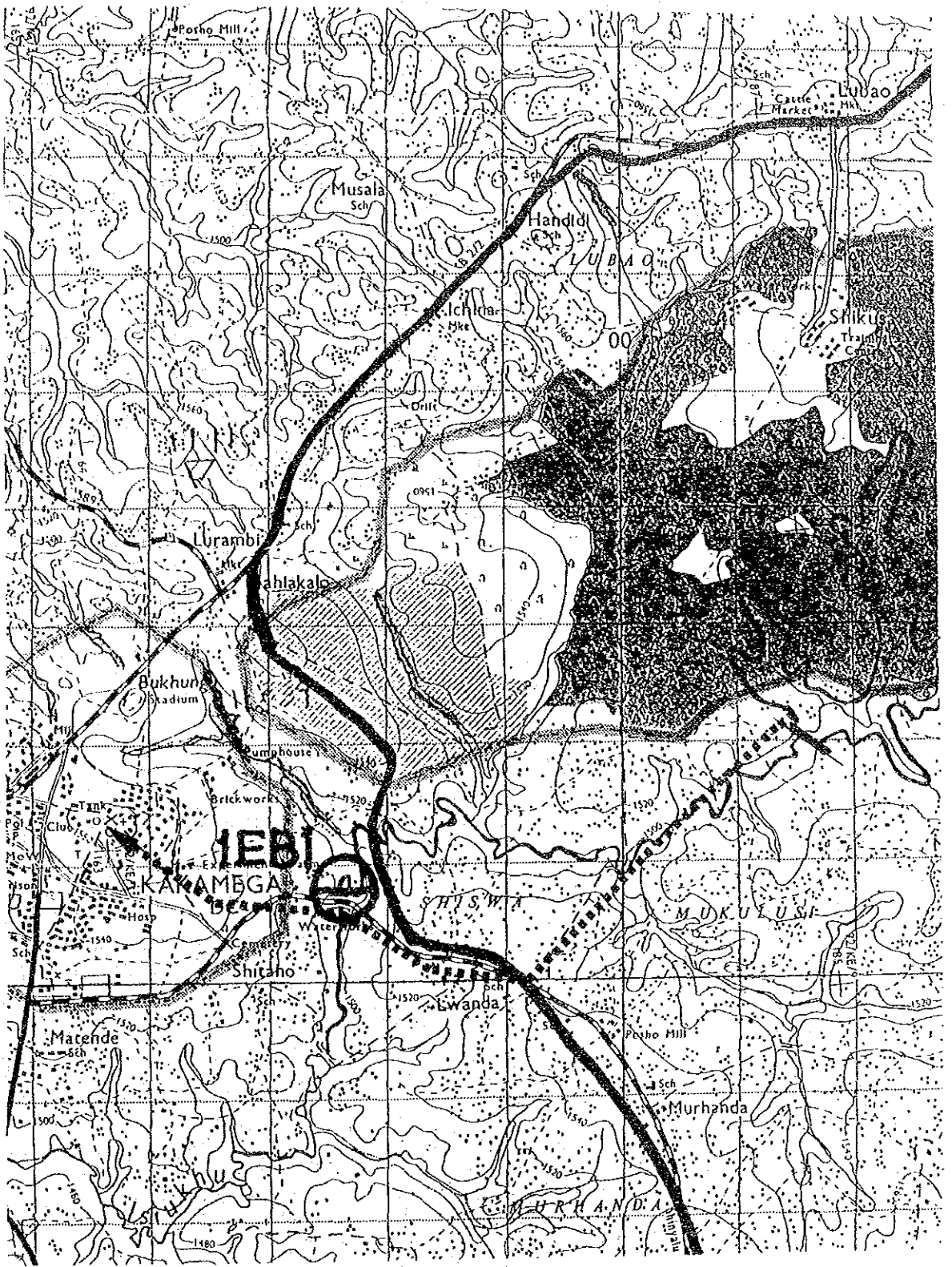
U-131 Khayega

U 934.3 102/4 1EB



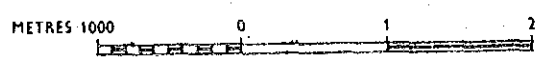
THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2						National Water Master Plan		
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	930	U-132			Rate		25.2
5	-----							
6	Name of Urban:		Kakamega		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:		Kakamega	Locataion :	935.4		Kakamega Municipality	
10	Map ( 1/50,000 ) :		102/2	Coordinates X:		34°46'	Y:	N 00°18'
11	Sub-basin Code:		1EB	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Isiukhu River			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		2760		
17	Distribution System:							
18	-----							
19						1990	2000	2010
20	-----							
21	Projected Population			(no)	49,200	116,700	187,500	
22	Residential Demand			(m3/d)	6,095	14,777	24,258	
23	Non-residential Demand			(m3/d)	1,020	2,417	3,885	
24	Livestock Demand			(m3/d)	78	181	296	
25	Industrial Demand			(m3/d)	691	1,273	1,820	
26	Total Demand			(m3/d)	7,884	18,648	30,259	
27	Area Served ( estimated net )			(ha)	367	872	1,400	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Isiukhu River, Mukulusi Dam			River No:		
31	Raw Water System:		H (m)=	100 L (m)=		7,700		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity			(m3/d)	5,123.7	10,764.5	11,610.7	27,498.8
37	Source Works			(US\$'000)	36.1	62.9	66.6	165.5
38	Pump Cost			(US\$'000)	16.5	21.8	23.9	62.2
39	Raw Water Main			(US\$'000)	539.9	704.4	726.3	1,970.7
40	Treatment			(US\$'000)	942.9	1,095.3	1,181.4	3,219.6
41	Storage			(US\$'000)	220.7	463.6	500.0	1,184.3
42	Distribution			(US\$'000)	2,939.4	4,032.7	4,229.8	11,201.9
43	Miscellaneous (20%)			(US\$'000)	939.1	1,276.1	1,345.6	3,560.8
44	Admi. & Engineering			(US\$'000)	563.5	765.7	807.4	2,136.5
45	Contingency			(US\$'000)	1,239.6	1,684.5	1,776.2	4,700.3
46	Total Cost			(US\$'000)	7,437.5	10,107.0	10,657.3	28,201.9
47	Cost per Capita			(US\$/c)	151.2	149.7	150.5	
48	Cost per ha			(US\$/ha)	20,242.5	20,050.2	20,156.3	
49	Cost per m3			(US\$/m3)	1.5	0.9	0.9	1.0
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs			(US\$'000)	371.9	505.4	532.9	
53	Capital Costs			(US\$'000)	766.1	1,041.0	1,097.7	
54	Total Annual Cost			(US\$'000)	1,137.9	1,546.4	1,630.6	
55	Unit Cost per m3			(US\$/m3)	0.6	0.4	0.4	
56	-----							
57	Remarks:	The proposed plan envisages augmentation of dry season flow by constructing Mukulusi dam						
58		(technical feasibility subject to confirmation on field). Source works cost above does not include						
59		the cost of Mukulusi dam, which should be added separately (see Sectoral M).						
60								
61								
62								
63	-----							



U-132 Kakamega

G 935.4 102/2 1EB



THE STUDY  
ON  
THE NATIONAL WATER MASTER PLAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 930	U-133				Rate		Feb-92 25.2
5	-----							
6	Name of Urban:	Butere	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 ( guess ):							
9	District:	Kakamega	Locataion :	939.2		Central Marama		
10	Map ( 1/50,000 ) :	101/4	Coordinates X:		34°30'	Y:	N 00°13'	
11	Sub-basin Code:	1EG	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Boreholes	River No					
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		170				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)		2,500	5,100	7,400		
22	Residential Demand	(m3/d)		310	646	957		
23	Non-residential Demand	(m3/d)		52	104	152		
24	Livestock Demand	(m3/d)		4	8	12		
25	Industrial Demand	(m3/d)		0	0	0		
26	Total Demand	(m3/d)		366	758	1,121		
27	Area Served ( estimated net )	(ha)		19	38	55		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Viratsi River	River No:					
31	Raw Water System:	H (m)=	80 L (m)=	1,300				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity	(m3/d)		195.7	392.1	363.6	951.4	
37	Source Works	(US\$'000)		3.1	5.2	5.0	13.3	
38	Pump Cost	(US\$'000)		2.3	2.7	2.7	7.7	
39	Raw Water Main	(US\$'000)		50.3	53.9	53.4	157.5	
40	Treatment	(US\$'000)		165.1	250.2	239.3	654.7	
41	Storage	(US\$'000)		27.6	42.7	40.7	111.0	
42	Distribution	(US\$'000)		149.4	155.3	137.4	442.1	
43	Miscellaneous (20%)	(US\$'000)		79.5	102.0	95.7	277.3	
44	Admi. & Engineering	(US\$'000)		47.7	61.2	57.4	166.4	
45	Contingency	(US\$'000)		105.0	134.6	126.3	366.0	
46	Total Cost	(US\$'000)		630.0	807.9	758.0	2,195.9	
47	Cost per Capita	(US\$/c)		252.0	310.7	329.6		
48	Cost per ha	(US\$/ha)		33,745.0	41,606.3	44,129.6		
49	Cost per m3	(US\$/m3)		3.2	2.1	2.1	2.3	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs	(US\$'000)		31.5	40.4	37.9		
53	Capital Costs	(US\$'000)		64.9	83.2	78.1		
54	Total Annual Cost	(US\$'000)		96.4	123.6	116.0		
55	Unit Cost per m3	(US\$/m3)		1.3	0.9	0.9		
56	-----							
57	Remarks: For cost estimate, water abstraction from Firatsi river was planned. Depending on availability							
58	of water in the river, groundwater exploitation (shallow well) should also be considered.							
59								
60								
61								
62								
63	-----							