P-16-78

REPUBLIC OF KENYA

MINISTRY OF WORKS

ROADS DEPARTMENT

RURAL ACCESS ROADS PROGRAMME
EVALUATION OF ROADS IN KISII
REVISED

MAY 1978

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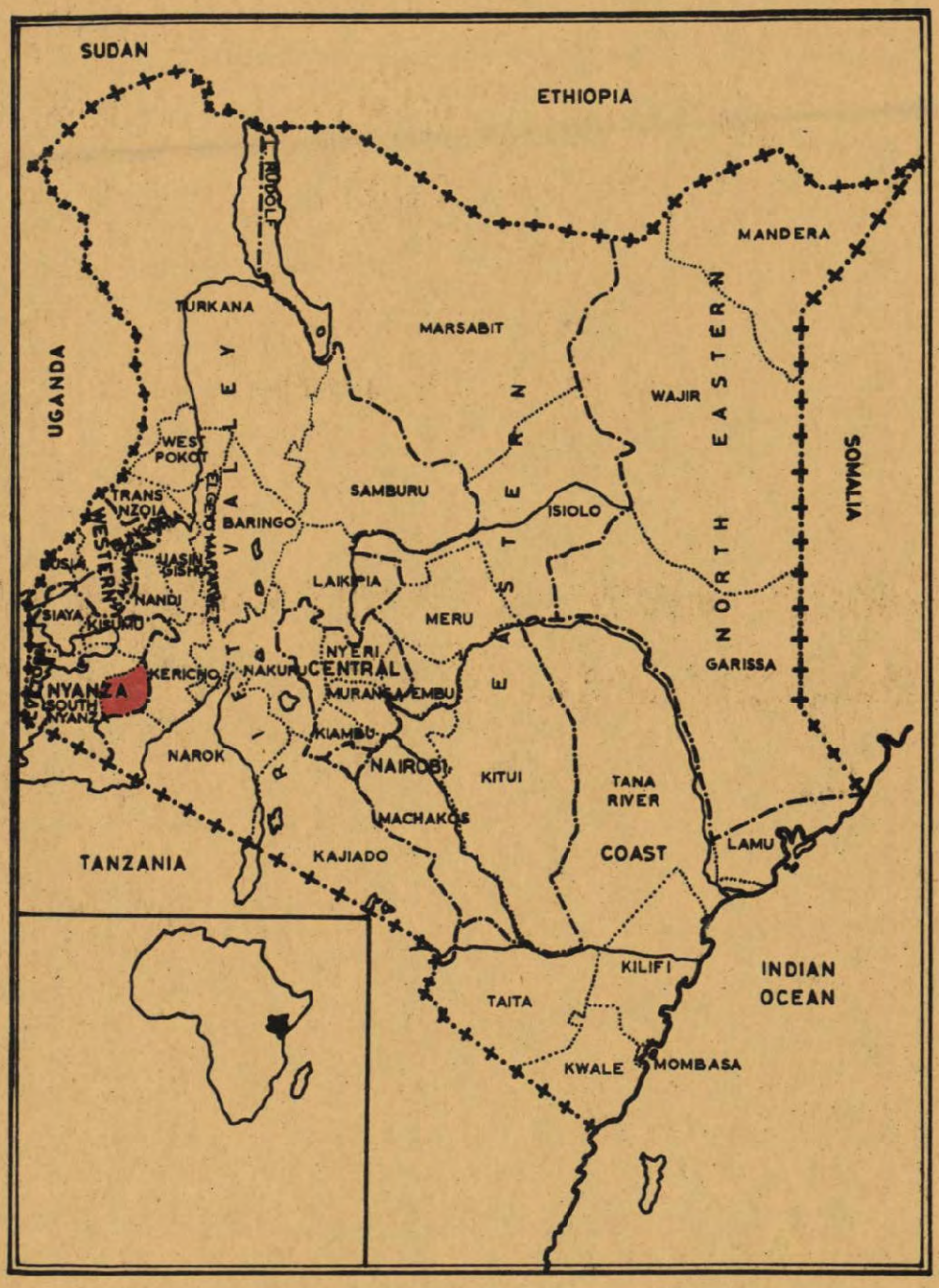
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TAITA
KWALE
MOMBASA

Rural Access Roads Programme

Evaluation of Rural Access Roads in Kisii District

Ministry of Works Roads Department

Revised report, april 1978

PART I

Appendix

Maps

EVALUATION OF RURAL ACCESS ROADS IN KISII DISTRICT.

1. INTRODUCTION.

This report pertains to the evaluation of the first 183 km of rural access roads within the District. The roads evaluated in this report were selected by the District Development Committee (D.D.C.) as being the top priority routes in terms of much needed access in the whole of Kisii District.
All roads are situated in Bosongo Division.
Feeder roads in the western and central parts of the District in areas coinciding with Bosongo, Manga and Ogembo divisions are relatively undeveloped as compared to the feeder roads in the teagrowing areas which comprise of the rest of the District where the tea roads programme has brought about an appreciable improvemer in the condition of feeder roads. It was for this reason that the D.D.C. decided to start the R.A.R. programme in Bosongo division.*)

All the procedures and guidelines which were to be followed were followed, however a number of roads of less than the stipulated minimum length (i.e. 5 km) were included where it was felt that the roads in question were of unique importance.

The integrated Agricultural Development Programme (I.A.D.P.) will eventually cover the whole District but has so far been started in Bosongo Division and parts of Manga division. The aim of the programme is to facilitate promotion of food crops where productivity is at present low. There is also a cattle dipping project, initiated this year to cover the whole district. Through this project the government aims to provide and maintain dipping facilities at a level whereby farmers will be able to improve the quality of their livestock and hence the products therefrom in a gainful manner.

These roads were for the first time inspected in September 1976 by a member of the Planning Section Staff of the Roads Department, Ministry of Works, Nairobi. After a first screening of the roads by the rural access roads engineer and the member of the planning section staff, a number of kilometers of roads were eliminated from the original list. Leaving a total of 125.5 km only. The roads excluded from the original list had any or a combination of the following characteristics: (see also appendix I, for a more detailed description and maps No. VI to IX)

*) This information has been provided by the District Development Officer Kisii.

- too close to an existing road. This will generate very limited impact on agricultural development.
- the existing condition of the road compairs favourably with roads built to Rural Access standards.
- involves the construction of very expensive bridge structures at the expense of the Access Roads.

The roads which passed the initial screening process are coloured in red on map VI to IX

The roads which were short-listed for further evaluation are as shown below:

ROAD NUMBER	DESCRIPTION OF THE ROAD	APPROX LENGTH	DIVISION	LOCATION
1	Nyamatutu up North	3.5	Bosongo	Bomariba
5	Riana - Kamejii	4	id	Bogitaa
6	Nyamiobo - Gesonso Market	8	id	Bomariba
7	Ingeli - Itobo	3.5	id	Bokeire
8	Gunga - Gasero	4.5	id	Bokeire
9/10	Motonto - Betoro - Itiero	10	id	Bomorenda
11	Tabaka - Miororí-Gasero	7.5	id	Kanyimbo
12	Miororí - Nyachenge	2.5	Bosongo	Bokeire
14	Kagambo - Nyatike	5	id	Bosinange
15	Riosiri - Ikoba Market	6	id	Bogetenga
16	Ikoba Market - Marongo	4	id	Bogetenga
17	Nyamarambe coffee factory Marango	3.5	id	Bogetenda
18	Nyamarambe Market-Marango	6.5	id	Bogetenga
19	Nyangweta - Marango	8	id	Boikanga
20	Nyangweta - Nyamkembene	10.5	id	Boikanga
21A	Nyamasege - Nyangweta	10	id	Boikanga
21B	Nyangweta - Ibencho - Nyamasege	10	id	Boikanga
22	Nyangweta - Nyabera	5.5	id	Nyataaro
23	Nyabera - Marigwa	6.5	id	Nyataaro
25	Naroo - Muma	6.5	id	Nyataaro
27	Muma-Ndongo-Nyamaiya	8	id	Botabori
29	Muma-Nyamondo	2	id	Botabori

The resulting report, completed in December 1976, has been submitted to the donoragency USAID for their perusal.

After inspection of the proposed alignments by representatives of USAID and extensive deliberations with the M.O.W., USAID forwarded detailed comments as listed below:

Road No.	Approved kms.	Comments.
1.		Rejected, too short and not connected to a classified road.
5.	4	In principle approved, but road should be connected to Kameji: meaningful. The rural access road engineer should however prepare a short technical feasibility report. (see appendix VI)
6.		Rejected, X-road 1017.
7.	3.5	Accepted.
8.	4.5	Accepted.
9.	5.5	Accepted.
10.		Rejected, the road has not enough impact on the area if road no. 9 is built.
11.		Rejected, partly X-1122 . The beginning has a too small zone of influence to justify construction.
12.		Rejected, only function is short cut, almost no impact expected due to overlap of zones of influence of several classified roads.
14.		Rejected, classified road D 205.
15.	6	Approved. The rural access road engineer in cooperation with the DDC/DDO should propose definite alignment. (see appendix VI)
16/19/20.		The alignment of X-1108 should be checked and a proposal for a new alignment should be prepared, presumably along 16 and part of 20. The Western part of 19 and 20 could be combined. (see appendix VI)
17	4.5	Approved as construction is justified by the existing coffee factory.
18.	7	Approved.
19.	3	The lower part climbing the escapment is rejected. The upper part on the plateau needs some additional justification (see appendix . VI)
21A/21B		A new technical feasible alignment has to be proposed and a short report should be produced. (see appendix VI)

Road no.	Approved kms.	Comments
22.	6	Approved.
23.	6.5	Approved.
25.	6.5	Approved.
27/29	10.	Approved. The alignment of road X-1131 has to be checked. If X-1131 connects to no.29 in Nyamondo leave no.29 out and call the whole length from Maroo to Nyamondo no. 25. This has been done.

Besides the comments pertaining to specific proposed alignments also more general remarks on the evaluation of RAR have been made by USAID.
All this is incorporated in this revised report.
The roads evaluated in this report together with some relevant data are listed below:

Road Number	Description of the road	approximate length	length division	location
5.	Riana-Kamejii	5 20 ?	Bosongo	Bogitaa
7.	Ingeli - Itobo	3.5	Bosongo	Bokeire
8.	Gunga - Gasero	4.5	Bosongo	Bokeire
9.	Motonto-Itiero	5.5	Bosongo	Bomorenda
15.	Riosiro- Ikoba Market	.6	Bosongo	Bogetenga
16.	Ikoba Market - Marongo	.7	Bosongo	Bogetenga
17.	Nyamarambe coffee factory-Marango	4.5	Bosongo	Bogetenga
18.	Nyamarambe Market-Marango	7	Bosongo	Bogetenga
22.	Nyangweta-Nyabera	5.5	Bosongo	Nyataaro
23.	Nyabera - Marigwa	6.5	Bosongo	Nyataaro
25.	Maroo-Nyamondo	.12	Bosongo	Nyataaro/ Botabori
27.	Muma-Ndongo-Nyamaiya	8.5	Bosongo	Botabori

The adjusted alignments together with the reviewed zones of influence are depicted in map X to map XII
A detailed narrative description of each road is contained in appendix II.
All roads have been inspected by the rural access roads engineer and found to be technical feasible (see appendix VI).
As he saw no possibility of providing the requested report on 21A/21B these roads are withdrawn from this evaluation exercise.

II A QUICK IMPRESSION

In order to get a quick impression of the selected 12 rural access roads some indicators which are useful for comparison purposes are given below.

The average annual population growth in Kisii District is 3.8%

TABLE I

ROAD NO	LENGTH KM	ZONE OF INFLUENCE ha	POPULATION DENSITY P/KM^2 1978	POPULATION INZONE OF INFLUENCE 1978	ZONE OF INFLUENCE ha/KM ROAD	POPULATION PER KM ROAD
5	5	700	287	2009	140	402
7	3.5	425	337	1432	121	409
8	4.5	650	337	2191	144	487
9	5.5	600	437	2622	109	477
15	6	800	343	2744	133	457
16	7	600	343	2058	86	294
17	4.5	700	343	2401	156	534
18	7	875	343	3001	125	429
22	6	950	322	3059	158	510
23	6.5	700	322	2254	108	347
25	12	1750	322	5635	146	470
27	8.5	1500	370	5550	176	653

III. ACCESS - INDICATOR

The Access indicator is a criterion by which the adequacy of the access system to the local residents and Government administrative officers is measured.

Only those social service facilities for which a road is relevant are taken into account. The social services which will be supplied as part of another serivce (e.g. telephone services which is part of Post Office) have not been taken into account.

Four social service facilities have been selected. These services include:

- Hospital (H)
- Post Office (P.O)
- Divisonal Headquarters (D.HQ.)
- Health Centre (H.C.)

The relative importance of the above stipulated services are determined by the frequency with which they are utilised. The following subjective weights are attached to each facility of service. The scale is chosen between 1 to 10 indicating higher rating for increasing frequency.

(a)	Hospital (low frequency)	- 2
(b)	Post Office (Medium frequency)	- 5
(c)	Div. Headquarters (high frequency)	- 10
(d)	Health Centre (Medium frequency)	5

The actual distance from a Zone of influence to a social service facility will be multiplied by the weight attached to that facility. The sum of the weighted distances gives the total weighted distance for the Zone of influence and this total weighted distance gives the access-indicator for the zone.

Table 2 below shows the calculated Access Indicators for each selected road and within each zone of influence.

The location of the various social service facilities is also depicted on map IV.

TABLE II

ACCESS INDICATOR

ROAD No	POPULATION INZONE OF INFLUENCE I	AVERAGE DISTANCE TO IN KM				WEIGHTED DISTANCE IN KM				TOTAL WEIGHTED DISTANCE II	ACCESS INDICATOR I X II	PRIORITY RATING BASED ON ACCESS INDICATOR
		HOSP.	P.O	DIV HQ	H.C.	HOSP.	P.O	DIV. HQ	H.C.			
5	2009	20	20	32	20	40	100	320	100	560	1,125,040	5
7	1432	19	19	31	19	38	95	310	95	538	770,416	11
8	2191	11	22	20	11	22	110	200	55	387	847,917	9
9	2622	11	17	20	11	22	85	200	55	362	949,164	7
15	2744	10	36	9	10	20	180	90	50	340	932,960	8
16	2058	8	33	11	8	16	165	110	40	331	681,198	12
17	2401	10	35	13	5	20	175	130	25	350	840,350	10
18	3001	10	35	13	3	20	175	130	15	340	1,020,340	6
22	3059	23	45	23	15	46	225	230	75	576	1,761,984	3
23	2254	29	51	30	15	58	255	300	75	688	1,550,752	4
25	5635	35	56	37	20	70	280	370	100	820	4,620,700	2
27	5550	37	60	38	20	74	300	380	100	854	4,739,700	1

HOSP = Hospital

P.O. = Post Office

DIV HQ = Divisional Headquarter

H.C. = Health Centre.

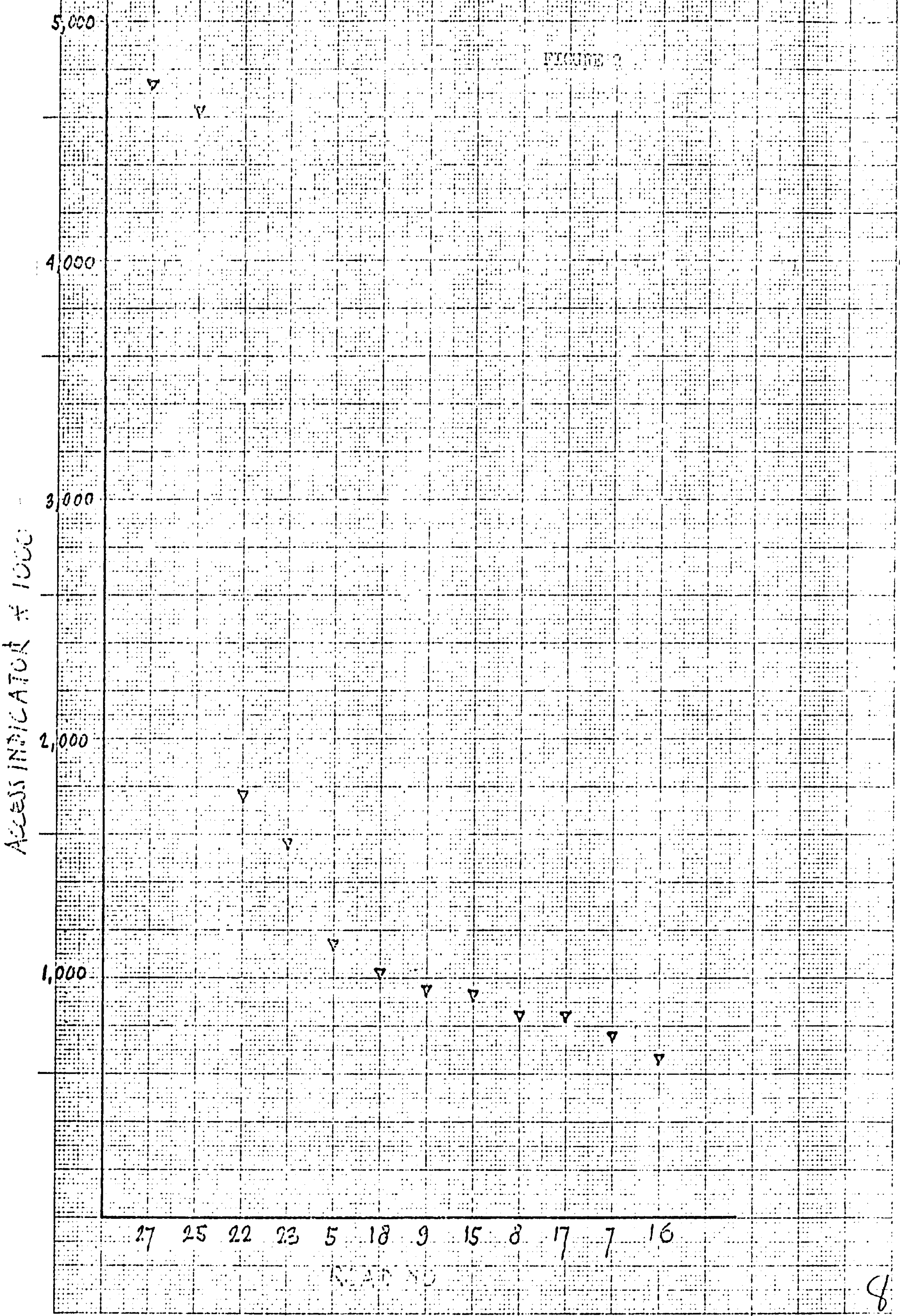


FIGURE 2

IV. POTENTIAL FOR DEVELOPMENT

The potential for development is directly related to the agricultural development prospects within each zone of influence. The present and future land utilization are shown in the tables below:

SU = Subsistence
G = Groundnuts
M = Maize
S = Sugarcane
C = Coffee
P = Present Land Utilization
F = Future Land Utilization
Ba = Bananas
Be = Beans
P = Pyrethrum
O = Other crops most subsistence
T = Total

The data have been provided by the District Agricultural Officer, Kisii District.

TABLE III

	ROAD NO 5				ROAD NO 7				ROAD NO 8			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
C	28	56	4	8	19	31	4.5	7.3	14	44	2.2	6.7
S	42	112	6	16					14	44	2.2	6.7
M					20	24	4.7	5.6				
G	42	63	6	9	15	27	3.5	6.4	11	33	1.7	5
Ba	35	49	5	7	17	29	4	6.8	11	36	1.7	5,6
Be												
P												
O	28	70	4	10	56	101	13.2	23.8	14	177	2.2	27.2
Su	525	350	75	50	298	213	70.1	50.1	585	318	90	48.9
T	700	700	100	100	425	425	100	100	650	650	100	100

TABLE IV

	ROAD NO 9				ROAD NO 15				ROAD NO 16			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
C	27	53	4.5	8.8	62	68	7.7	8.5	26	41	4.4	6.9
S	7	23	1.2	3.9								
M	19	37	3.1	6.1	55	110	6.9	13.8	30	61	5.0	10.1
G									4	8	0.7	1.4
Ba	21	43	3.5	7.1	43	12	5.4	1.5	20	52	3.4	8.7
Be					25	6	3.1	0.8	5	8	0.8	1.4
P	14	28	2.4	4.7					4	8	0.7	1.4
O	62	146	10.4	24.3	14	242	1.8	30.3	4	95	0.6	15.9
Su	451	271	75.1	45.1	601	361	75.1	45.1	506	326	84.4	54.3
T	600	600	100	100	800	800	100	100	600	600	100	100

TABLE V.

	ROAD NO 17				ROAD NO 18				ROAD NO 22			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
C	41	39	5.8	5.5	45	48	5.1	5.5	14	19	1.5	2.0
S					8	6	0.9	0.7	20	65	2.1	6.8
M	25	36	3.6	5.1	39	41	4.4	4.7	38	67	4.0	7.0
G	9	4	1.3	0.5	25	6	2.9	0.7	29	40	3.0	4.2
Ba	23	32	3.3	4.5	22	32	2.5	3.6	24	38	2.5	4.0
Be	23	13	3.3	1.8	19	16	2.2	1.8	33	48	3.5	5.0
P	9	11	1.3	1.6	11	14	1.3	1.6				
O		134		12.1	24	229	2.7	26.2	32	57	3.4	6.0
Su	571	433	81.5	61.8	683	482	78	55.1	760	6.8	80	65
T	700	700	100	100	875	875	100	100	950	950	100	100

TABLE VI

	ROAD NO 23				ROAD NO 25				ROAD NO 27			
	P ha	F ha	P %	F %	P ha	F ha	P %	F %	P ha	F ha	P %	F %
C	20	41	2.9	5.9	54	95	3.1	5.4	56	86	3.7	5.7
S	22	50	3.1	7.1	61	117	3.5	6.7	74	120	4.9	8
M	34	56	4.9	8	88	121	5	6.9	71	113	4.7	7.5
G	18	32	2.5	4.6	39	67	2.2	3.8	39	35	2.6	2.3
Ba	25	46	3.5	6.5	81	103	4.6	5.9	57	111	3.8	7.4
Be	20	33	2.8	4.7	42	70	2.4	4	45	57	3.0	3.8
P	13	8	1.8	1.1	37	39	2.1	2.2	39	38	2.6	2.5
O	24	120	3.4	17.2	37	350	2.1	20	102	344	6.8	22.9
Su	525	315	75.0	45.0	1313	788	75	45	1020	600	68	40
T	700	700	100	100	1750	1750	100	100	1500	1500	100	100

V. CONSTRAINTS ON DEVELOPMENT

1. TYPES OF CONSTRAINTS

The constraints on (agricultural) development fall into two categories:

(a) Natural Constraints

- The constraints which can not be removed by man (such as soil, rainfall and topography characteristics

(b) Rescurce Constraints

- the constraints which can be removed when enough capital is available (such as land registration, agricultural credit, agricultural inputs, marketing of produce, agro-industry, road infrastructure, attitude of the people towards modernisation and agriculture)

2. CONSTRAINTS AS THEY EXIST NOW

(a) SOIL:
The soil along the roads is mostly of the ferrugious tropical type.

(b) RAINFALL:

Rainfall ranges between 1016 and 2286 mm per year and is very well distributed throughout the year and most of the rains falling in the afternoons. It is difficult to differentiate long and short rains.

(c) TOPOGRAPHY:

In most areas the amount of land that can be cultivated is around 90%.

(d) LAND REGISTRATION:
In the whole of Kisii district the land is registered. But not everyone has title deed. If someone has a title deed then it is easier for him to secure a loan to improve his land.

(e) AGRICULTURAL EXTENSION SERVICES:

At the divisional level the extension staff was available. But due to the lack of transport they are mostly available at the divisional headquarters only.

(f) MECHANISATION ON THE FARMS

Farmers are ploughing and harrowing their land using either tractors or Ox-ploughs whereas the other activities such as planting, weeding and harvesting are non-mechanized.

(g) MARKETING OF PRODUCE:

Already some 35% of the area is under cash crop. The main bottle neck in reaching the markets is the existing poor condition of the access roads which render the transportation of agricultural produce quite difficult especially during the rainy season.

(h) ROAD INFRASTRUCTURE:

All the proposed rural access roads will be linked with all weather classified roads in reasonable good condition.

(i) ATTITUDE OF THE PEOPLE:

There appears to be a positive attitude on the part of the local population towards modernizing their agricultural production and they seem to realize the great advantages of cash cropping as new life.

VI IMPACT OF THE ROAD ON RURAL DEVELOPMENT

1. THE RURAL ACCESS ROAD CONSTRUCTION COST COMPONENTS

Based on past experience in similar roads the following assumptions have been made on construction costs per kilometre

Flat to rolling terrain K£ 1800 road no 8

rolling to hilly terrain K£ 2000 road no: 5; 7, 9, 16, 27

hilly terrain K£ 2500 road no: 15, 17, 18, 22, 23, 25

A break down of this total cost into the different component will roughly comprise the following items:

COST COMPONENT	%		COST £/KM ROAD	
Wages permanent staff	8	144	160	200
Wages casual labour force	40	720	800	1000
Tools and equipment	27	486	540	1350
Sand, ballast and cement	6	108	120	150
Construction materials	7	126	140	175
Transport	10	180	200	250
	2	36	40	50
	100%	K£1800	K£2000	K£2500

- Wages of the casual labour force will all be spent in the rural area adjacent to the selected access road;
- Wages of the permanent staff will be spent within the district at large;
- Sand, ballast are available within the district
- Tools, equipment, vehicles for transportation will all be imported and as such have little bearing on the rural and district economy;
- The maintenance expenditures are estimated at £ 80/km road. Out of this amount about 75% is paid to the casual labour force each year. Table VII shows a breakdown of the relevant cash component for the selected access roads.

TABLE VII

ROAD NO	CONSTRUCTION COSTS K£	MAINTENANCE K£ /YEAR	CONSTRUCTION WAGES K£	CASUAL LABOUR MAN DAYS	MAINTENANCE WAGES K£	MAINTENANCE - MAN DAYS PER YEAR	PERMANENT STAFF WAGES CONSTRUCTION
5	10000	400	4000	10127	300	760	800
7	7000	280	2800	7089	210	532	560
8	8100	360	3240	8203	270	684	648
9	11000	440	4400	11139	330	835	880
15	15000	480	6000	15190	360	911	1200
16	14000	560	5600	14177	420	1063	1120
17	11250	360	4500	11392	270	684	900
18	17500	560	7000	17722	420	1063	1400
22	15000	480	6000	15190	360	911	1200
23	16250	520	6500	16456	390	987	1300
25	30000	960	12000	30380	720	1825	2400
27	17000	680	6800	17215	510	1291	1360

2. SHORT TERM EFFECTS OF THE RURAL ACCESS ROAD

The short term effects of opening up of rural access roads will be substantial for the mobility of the divisional officers. The roads will provide the agricultural, educational, and health officers etc. an all weather mobility to the areas, which will enable them to carry out their duties more effectively.

3. LONG TERM EFFECTS OF THE RURAL ROAD

The long term effects stem from the development of the agricultural potential for the expansion of cash crops within the zones of influence is shown in the table VIII.

Appendix V contains the gross margins as used in the report.
The whole of Bosongo district is under I.A.D.P.
The present value of the agricultural production is calculated over 20 years between 1978 and 1997. It is assumed that the prices over this period will remain reasonable constant.
The development of the agricultural potential will take 10 years, it is assumed that this potential will develop equally during the 10 years, starting in 1979. More over the value of the subsistence crops has not been taken into account in the economic analysis. The total increment in agricultural production will be k£ 299170 (see table X)
Whereas only part of the increment can be set against the investments in rural access roads, from the increments only 60% will be discounted. The total increment to discount will be K£179500. During the first 10 years (from 1979 up to 1989) this agricultural potential will develop equally with an increment of K£17950 annually.

TABLE VIII

POTENTIAL FOR CASH CROP EXPANSION (IN HA)

ROAD NO	C	S	M	G	Ba	Be	P	TOTAL
5	28	70		21	14			133
7	12		4	12	12			40
8	30	30		22	25			107
9	26	16	18		22		14	96
15	6		55		-31	-19		11
16	15		31	4	32	3	4	89
17	-2		11	-5	9	-10	2	5
18	3	-2	2	-19	10	-3	3	-6
22	5	45	29	11	14			119
23	21	28	22	14	21	13	-5	114
25	41	56	33	28	22	28	2	210
27	30	46	42	-4	54	12	-1	176

C = Coffee
S = Sugarcane
M = Maize
G = Groundnuts
Ba = Bananas
Be = Beans
P = Pyrethrum

TABLE IX EXISTING AND FUTURE CASH CROP AREA (HA)

ROAD NO	EXSTING CASH AREA UNDER							FUTURE CASH AREA UNDER						
	C	S	M	G	Ba	Be	P	C	S	M	G	Ba	Be	P
5	28	42	.	42	35			56	112		63	49		.
7	19		20	15	17			31		24	27	29		
8	14	14						44	44		33	36		
9	27	7	19		21		14	53	23	37		43		28
15	62		55		43	25		68		110		12	6	
16	26		30	4	20	5	4	41		61	8	52	8	8
17	41		25	9	23	23	9	39		36	4	32	13	11
18	45	8	39	25	22	19	11	48	6	41	6	32	16	14
22	14	20	38	29	24	33		19	65	67	40	38	48	
23	20	22	34	18	25	20	13	41	50	56	32	46	33	8
25	54	61	88	39	81	42	37	95	117	121	67	103	70	39
27	56	74	71	39	57	45	39	86	120	113	35	111	57	38

C = Coffee
S = Sugarcane
M = Maize
G = Groundnuts
Ba = Bananas
Be = Beans
P = Pyrethrum

TABLE X

EXISTING GROSS MARGINS

AND FUTURE CROSS MARGINS

ROAD NO	EXISTING GROSS MARGINS K£							
	C	S	M	G	Ba	Be	P	Total
5	15520	4200		1516	163			21399
7	10532		1164	542	792			13030
8	7760	1400						9160
9	14966	700	1106		979		840	18591
15	34367		3201		2004	588		40160
16	14412		1746	144	932	118	240	17592
17	22726		1455	325	1072	541	540	26659
18	24944	800	2270	903	1025	447	660	31049
22	12195	2000	2212	1047	1118	776		19348
23	11086	2200	1980	650	1165	470	780	18331
25	29932	6100	5122	1408	3775	987	2220	49544
27	31041	7400	1432	1408	2656	1058	2340	50035
Total	229481	24800	24388	7943	15681	4985	7620	314898

C = Coffee

S = Sugarcane

M = Maize

G = Groundnuts

Ba = Bananas

Be = Beans

P = Pyrethrum

ROAD NO	FUTURE GROSS MARGINS Kč								Total Increment
	C	S	M	G	Ba	Be	P	Total	
5	31041	11200		7176	6390			55807	34408
7	17183		2671	3075	3782			26711	13681
8	24389	4400		3759	4694			37242	28082
9	29378	2300	4118		5607		1680	43083	24492
15	37692		12243		1565	511		52011	11051
16	22726		6789	911	6781	681	480	38368	20776
17	21618		4007	456	4173	1106	660	32020	5361
18	26606	600	4563	683	4173	1362	840	38827	7778
22	10532	6500	7457	4556	4955	4085		38085	18757
23	22726	5000	6233	3645	5998	2808	480	46890	28559
25	52659	11700	13467	7631	13431	5957	2340	107185	57641
27	47670	12000	12577	3987	14474	4851	2280	97839	47804
Total	344220	53700	74125	35879	76023	21361	8760	614068	299170

DISCOUNTED COSTS AND BENEFITS OF THE PROPOSED INVESTMENTS

The road construction has many impacts on the rural economy and rural welfare. Many of these impacts can not (yet) be measured, let alone quantified in terms for this reason the present monetary evaluation criteria for rural access road investments can be considered as an art rather than a scientific approach.

Since it is rather unrealistic to calculate the internal rate of return of each road in view of the very short lengths involved the internal rate of return of the whole package of roads has been calculated. The cost of road construction and maintenance and the benefits of agricultural development are discounted to the base year 1978. The project gestation period has been assumed as 20 year (up to and including 1997).

The total costs shadowprices for the construction of the roads are K£ 172100* 0.83 = K£ 142843 to be spent wholly in 1978.

The yearly maintenance costs are in shadow prices K£ 6080 * 0.61 = K£ 3709 annually starting in 1979. The yearly increment in agricultural production during the first 10 years to be discounted is 60%* 299170/10 = K£ 17950.

From 1989 onwards the full benefits of 60% * 299170 = K£ 179500 will be gained annually.

In table XI are indicated the discounted costs and benefits in various discounting rates.

The IRR (internal rate of return) is 40%
On the basis of the analysis, the calculated internal rate of return is over two and a half the opportunity cost of capital (14%), and as such the investment is highly beneficial to undertake.

YEAR	COSTS	BENEFITS	DISCOUNTED AT 14%		DISCOUNTED AT 40%		DISCOUNTED AT	
			COSTS	BENEFITS	COSTS	BENEFITS	COSTS	BENEFITS
1978	142843		142843		142843			
1979	3709	17950	3253	15742	2648	12816		
1980	3709	35900	2852	27607	1892	18309		
1981	3709	53850	2504	36349	1350	19601		
1982	3709	71800	2196	42506	964	18668		
1983	3709	89750	1925	46580	690	16694		
1984	3709	107700	1691	49111	493	14324		
1985	3709	125650	1484	50260	352	11934		
1986	3709	143600	1302	50404	252	9765		
1987	3709	161550	1142	49757	178	7754		
1988	3709	179500	1001	48465	120	6283		
1989	3709	179500	879	42542	93	4488		
1990	3709	179500	775	37336	67	3231		
1991	3709	179500	675	32669	48	2334		
1992	3709	179500	593	28720	33	1616		
1993	3709	179500	519	25130	22	1077		
1994	3709	179500	456	22079	19	898		
1995	3709	179500	401	19386	11	539		
1996	3709	179500	352	17053	7	359		
1997	3709	179500	308	14899	7	359		
TOTAL NET PRESENT WORTH			167147	656595	152099	151049		

VIII DEVELOPMENT OF RURAL INCOME

Given the development of the agricultural potential and the growth of the population within the zones of influence of the roads, the rural cash income per capita can be calculated.

The income per capita has been calculated for the year 1989 when the agricultural potential will be fully developed.

For the porposes of this submission, it is assumed that the Gross Margin of the agricultural output is equal to the income of the farmers. The population growth rate over the period of 1978 to 1989 is assumed to be 4% per annum.

Therefore, the population growth and the rural per capita income for 1989 is as shown in the Table below :

TABLE XII

RURAL PER CAPITA INCOME IN 1989

ROAD NO	GROSS MARGIN CASH PRODUCTION 1988 K£	POPULATION IN ZONE OF INFLUENCE		INCOME PER CAPITA 1989 K£
		1978	1989	
5	55,807	2009	3093	18.0
7	26,711	1432	2205	12.1
8	37,242	2191	3373	11.04
9	43,083	2622	4037	10.7
15	52,011	2744	4225	12.3
16	38,368	2058	3153	12.2
17	32,020	2401	3697	8.7
18	38,827	3001	4620	8.4
22	38,085	3059	4710	8.1
23	46,890	2254	3470	13.5
25	107,185	5635	8676	12.4
27	97,839	5550	8545	11.4

APPENDIX 1

DESCRIPTION OF THE PRESENT CONDITION OF THE PROPOSED AND SELECTED RURAL ACCESS ROADS. (copied from the original report, December 1976)

After a first screening of the roads by the rural access roads engineer in the district and the evaluator, a number of kilometres of road were eliminated from the list. The reasons for doing so are mentioned below.
The roads which passed the initial screening are coloured in red on maps VI to IX (125.5 kms)

proposed road no.	length km	remarks	length after screening km
1	6	Only the upper part of the road, above road no.3, is useful, and a short section of the lower part, as it connects a coffee factory to a main road. The middle part of the road is too close to the existing road in order to generate any impact on agricultural development.	2 + 1.5
2	9	The part of the road Bogitaa to Mogumu is at present in a relatively good condition and only needs regravelling; therefore it should not be included in the rarp. The lower part of the road is too close to roads no. 3 7 6; the impact of this road will therefore be too small.	-
3	13	This road is in good condition and only needs regravelling. Like road no.2 it should be included in the Regravelling Programme.	-
4	4.5	The road crosses the Riana River; therefore it needs a bridge with a span of approx. 6 m. Such a structure is too expensive, especially in relation to the small zone of influence of the road (close to the A1). Roads no.3 & 6 offer a good alternative for reaching a destination that road no.4 covers.	-
5	4	-	4
6	8	Although this road runs parallel to the Riana River, the people can cross the river by means of trees which they put across. The zone of influence surpasses therefore the river.	8
7	3.5	-	3.5
			4.5

Proposed road no	length km	remarks	length after screening km
9	5.5	Preferably one of these roads should be constructed instead of both, since their individual zones	5.5
10	4.5	of influence are rather small. Nevertheless they are both included in the evaluation.	4.5
11	7.5	-	7.5
12	2.5	This road is not very useful when road no.11 is constructed, as its main purpose is to connect Kiororí. Nevertheless it has been included in the evaluation.	2.5
13	6	The major part of this road already exist, and is in good condition; it coincides with the road from the C20 via Tabaka Hospital to the A1 (Nyachenge). Therefore only the part of the road from no.14 to the coffee factory should be constructed.	1
14	4	-	4
15	6	-	6
16	4	-	4
17	3.5	-	3.5
18	6.5	-	6.5
19	8	-	8
20	10.5	-	10.5
21	10	There are two alternative alignments for this road: 21A & B. Their length is approx. the same, but their zones of influence differ. As the zone of 21B is rance; although a final decision should depend on a technical assessment of the road construction in this hilly terrain.	10
22	7	The lower part of the road runs almost parallel to the D204 to Nyabera. Therefore the road is directly connected to the D204. Access to Nyabera is possible over road no. 23.	5.5
23	6.5	-	
24	3.5	This road runs almost parallel to the D204, and is therefore quite unseless.	-
25	6.5	A prerequisite for the construction of roads no. 22,23 and 25 is the reconstruction of the D204, which is at present in a very bad condition.	6.5
26	6	This road is in good condition and only needs some culverts in the lower part; it should be classified as soon as possible.	-

proposed road no.	length km	remarks	legnth after screening km
27	10	The proposed road makes a circle around the Ndonyo hill. This alignment is at this stage of development not very useful; therefore it has been changed as indicated.	8
28	5	This road makes the same connection as road no. 2' At this stage of development this does not seem very useful.	
29	7.5	The road connects a number of roads with the E203: Magencho market area. But this area already has an access through the E203. Road no. 29 thus means an expensive duplication. For this reason only a small part is proposed for construction; the rest may follow in a later phase of the RARP.	2
29	183 km		22 125.5 km
average: 6.3 km/road			average: 5.7 km/ro

APPENDIX II.

Description of the roads.

Some of the information pertaining to the described alignments is displayed in appendix III and appendix IV. All roads have beeninspected by the Rural Access Road Engineer Kisii and found technical feasible

Road no 5: Riana-Kamejii

This road links at one end to the D215 near Riana and at the other end to a proposed Rural Access Road in South Nyanza District near Kamejii Market. The E201 at Kamejii is inaccessible for motorized traffic from the south, as there is no motorable bridge over the Riana River. From the north this classifi road is inaccessible as a small river, with muddy banks and washed away culverts halts all motorized traffic.

The proposed alignment follows an existing track and has to cross some minor rivers by means of culverts. The soils are of a sandy loamy type and there are no engineering problems expected. The area opened up by this road shows promising agricultural potential and is at places densily populated. Presently motorized traffic is hampered by the bad condition of the existing track.

Road no 7: Ingeli-Itobo

The road follows an existing track in a fair condition. The alignment slopes down gently and passes a school and a small market. Along the road various agricultural activities can be seen. Past the school and the small market the track is virtually non-existent, the area opened up by the proposed road lacks accessibility by motorvehicles which hitherto hampered agricultural development. There are no engineering problems expected.

Road no 8: Gasero-Gunga

Directly at the beginning of the proposed alignment a small river has to be crossed by means of a combined culvert/drift. Then the alignment follows a narrow track in a fair condition with occasionally short stretches which are motorable with difficulty by four wheel drive vehicles. At both sides of the road numerous small holdings are situated.

The alignment follows the contours and ends at a small market.

No engineering problems are likely to be encountered.

Road no 9: Itiero-Botoro-Motonto.

The road start at the Itiero Health Centre, follows an existing track and has to across a minor river by means of a drift.. The roads opens up the hinterland for Itiero Health Centre.

for motorvehicles. Also the fertile and hitherto inaccessible valley is made accessible for motorvehicles. The terrain is rather severe as the alignment is situated on steep slopes of dark red clay.
There are however no engineering problems expected.

Road no 15: Riosiri Market-Ikoba

This road follows an existing track branching from the C20 at Riosiri Market. At the other end Ikoba Market is reached via the proposed Rural Access Road no 16. The track is motorable with some difficulty by four wheel drive vehicles up to the junction with a track which passes south of the hills. As indicated on the map the alignment of road no 15 should pass at the north sides of the hill This track is only open for pedestrians and inaccessible for any motorized traff Around the alignment numerous small holdings are situated. The soil is of the de red clay type and very favourable for agricultural purposes.

Road no 17: junction D 205- road no 18

In the middle of this alignment is a coffee factory, which justifies the short length of the road. The road follows partly an existing track and has to cross severe terrain on steep slopes of deep red clay.
No engineering problems are expected.

Road no 16: Ikoba Market- Nyakembene School.

This road functions as a collector for road no 17 and 18. The small zone of influence stems from the severe physical circumstances, the alignment being situated on top of a ridge, which at the east side falls back quite drastically. The track as it is now is motorable up to the school and is relatively horizontal There are no engineering problems expected.

Road no 18: Nyamarambe Chiefs Office- Marongo.

Starting from the Chiefs Office at Nyamarambe Market (D205) the road climbs the escarpment up to Marongo School. The terrain is severe, with steep slopes and some rocky patches. The road opens up a virtually inaccessible area and gives access to the school. The zone of influence is occupied by numerous smallholder: There are no engineering problems expected.

Road no 22: Nyangweta - junction D204.

The beginning of this road is motorable up to the Nyangweta river which has to be crossed by means of a minor bridge. After this river the proposed alignme follows partly an existing track. As can be seen from the map, the proposed alignment opens up virtually for motorvehicles inaccessible area of great agricultural potential. The soil is of the clay type. There are no engineering problems expected.

Road no 23: Nyabera-Mangwa.

The short access road from D204 to Nyabere market will provide reliable motorabl access to this market place. At the other side of D204, the proposed alignment follows partly an existing track and slopes down towards a minor river which has to be crossed by means of culverts.

There are no engineering problems expected.

Road No 25: Maroo-Nyamondo

The proposed alignment links up to the D 204 in Maroo and to an X- road at Nyamondo.

In between an existing motorable track crosses partly severe terrain. At Maroo this Rural Access Road will link to other Rural Access roads as proposed for South Nyanza District.

The road opens up for motorvehicles difficult accessible area. There are no engineering problems to be expected.

Road No 27: Ndonyo - Muma-Monianku:

At Ndonyo a for South - Nyanza proposed Rural Access road links up to this road. Two markets places are linked to each other and a school. The Western part from junction of road No 25 follows first the contours and after Muma School slopes down to Minianku. There are no engineering problems to be expected.

APPENDIX III (Source DDC)

Road no	Present land Utilizatio	agricultural potential	settlement potential	Topography	Comparative Population density
1	Medium	high	low	moderate	high
5				severe	high
6				moderate	low
7				severe	low
8					medium
9/10					low
11					low
12					low
14					low
15					low
16					low
17					medium
18					low
19		medium			medium
20					medium
21A				very severe	low
21B				Very severe	low
22				severe	medium
23					
24					medium
25					medium
27				moderate	
29				severe	high

APPENDIX IV

SOCIAL SIGNIFICANCE OF THE ROADS AND PRIORITY RANKING

RD NO	HOST	H.O	Disp.	Div-HQ	P.O	School	Cattle Dip	Priority
1						2	1	19
5						1		20 ✓
6			1			4		13
7			1			1		12 ✓
8			1			2	1	11 ✓
9/10		2				5	1	1 ✓
11	1				1	2	1	2
12	1						1	6
13	1				1			
14	1				1			3
15						3	1	9 ✓
16						5	1	7 ✓
17						2		8 ✓
18		1				1	1	10 ✓
19						2	1	22
20								14
21A		1			1	5	1	21
21B					1	5	1	15
22			1			3	1	16 ✓
23			1			4		18 ✓
24						1		
25		1	1			11	1	17 ✓
26		1			1	3		
27						1		5 ✓
28						4		
29								4

APPENDIX V

GROSS MARGINS

	PRESENT	WITH IADP FUTURE	SOURCE
COFFEE	554.3	554.3	C
SUGAR	100	100	D
MAIZE	58.2	111.3	B
GROUNDNUTS	36.1	113.9	C
BANANAS	46.6	130.4	A
BEANS	23.5	85.1	B
PYRETHRUM	60	60	D

A: COMMERCIAL FARMING PROJECT (1976)

B: IADP (1976)

C: MINISTRY OF AGRICULTURE (1977)

D: ESTIMATED

MINISTRY OF WORKS

INTERNAL MEMO

FROM: RAR ENGINEER,
MOW, Box 317, KISII.

TO: Chief Engineer Roads,
MOW, Box 30260, NAIROBI.

REF: Q: 3.3.

Date: 9th March, 1978

Rural Access Roads Programme

Re: Comments to RARP- Kisii District

Reference to your request about comments to certain roads in RARP Kisii District.

I Have the following comments:

Road No. 5

The road has been surveyed up to Kamejii in South Nyanza. It is running on red soil in gently rolling terrain. Partly there is a motorable track. The existing track is some places below the surrounding terrain, thus the rain water flows it and makes it booklet. There is one swampy section (about 100 m), consisting of black soil.

There are no major engineering problems in constructing the road. It is necessary with wider and deeper ditches than normaly used on RARP, and the cross section will require some additional land from the neighbouring farms.

The whole road need to be gravelled.It seems however that it will be difficult to find gravel in the surroundings and it may be necessary to transport it from far.

Because the matter of gravel I am slightly doubtful about the feasibility of constructing this road under RARP. But as this problem will occur to several of the proposed roads in Kisii District, the concerned road should not be worse off than others as far as gravel is concerned. The construction of road no 5 is therefore under doubt recommended by the RAR-Engineer.

Road No 15

The alignment has been discussed between the D.D.O. and RAR-Engineer. The conclusion is that the already proposed alignment will serve the area best. The road going on the north side of hill as proposed, will open up area which have no access today. The population and agriculture potential seem to be more or less the same on both sides, but the south side they do already have access to market by a small possible motorable track, while the north side is without.

Road No. 16/19/20

Road No. 20 follows the alignment for X1108. The matter of No. 16 and 19 has been discussed between the D.D.O. and RARE. It has been agreed that road No. 16 should run from Ikoba to Masongo and 19 from Masongo to Nyakembone School.

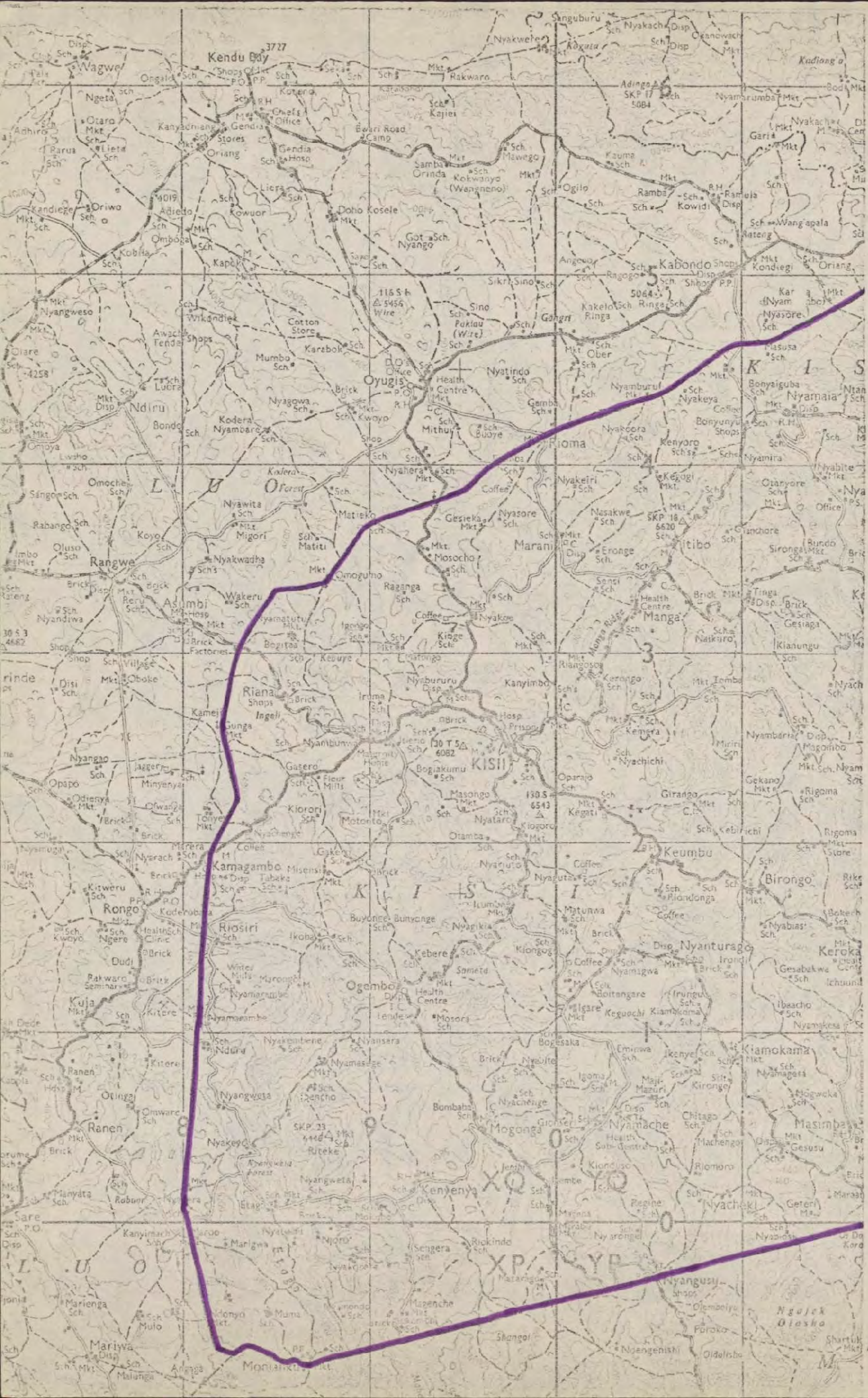
Road No. 19

The area has no access. Since No 20 will fall out, no. 19 is the only one to serve the area.

Road No. 21A/21B

X 1108 runs from Nyangweta to Ogembo, and is thus on the opposite side of the river compared with 21A/21B. The proposed alignment for 21A/21B is not technical feasible. It has however not been possible on this short time to find a new technical feasible alignment. It is proposed that 21A/21B is left out now, and a new alignment is taken into account in phase II.

Odd Morkrid
RAR ENGINEER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Marani
Manga
Rangwe
Riana
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Rongo
Riosiri
Ogembo
Keumbu
Birongo
Nyanturago
Kiamokama
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Nyamache
Kenyenya
Ranen
Mariwa
Nyangusu
Ngojek Olosho
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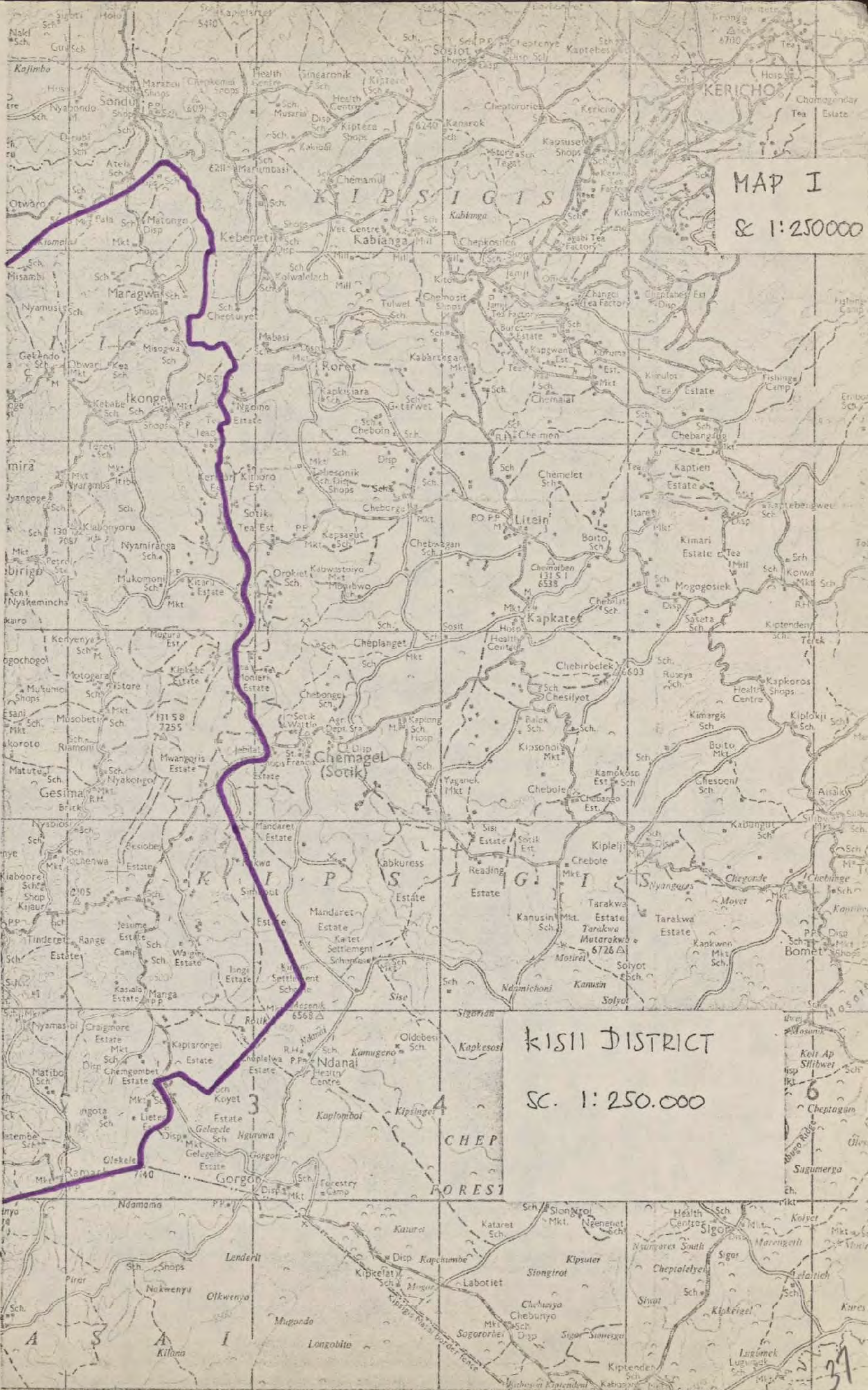
LUO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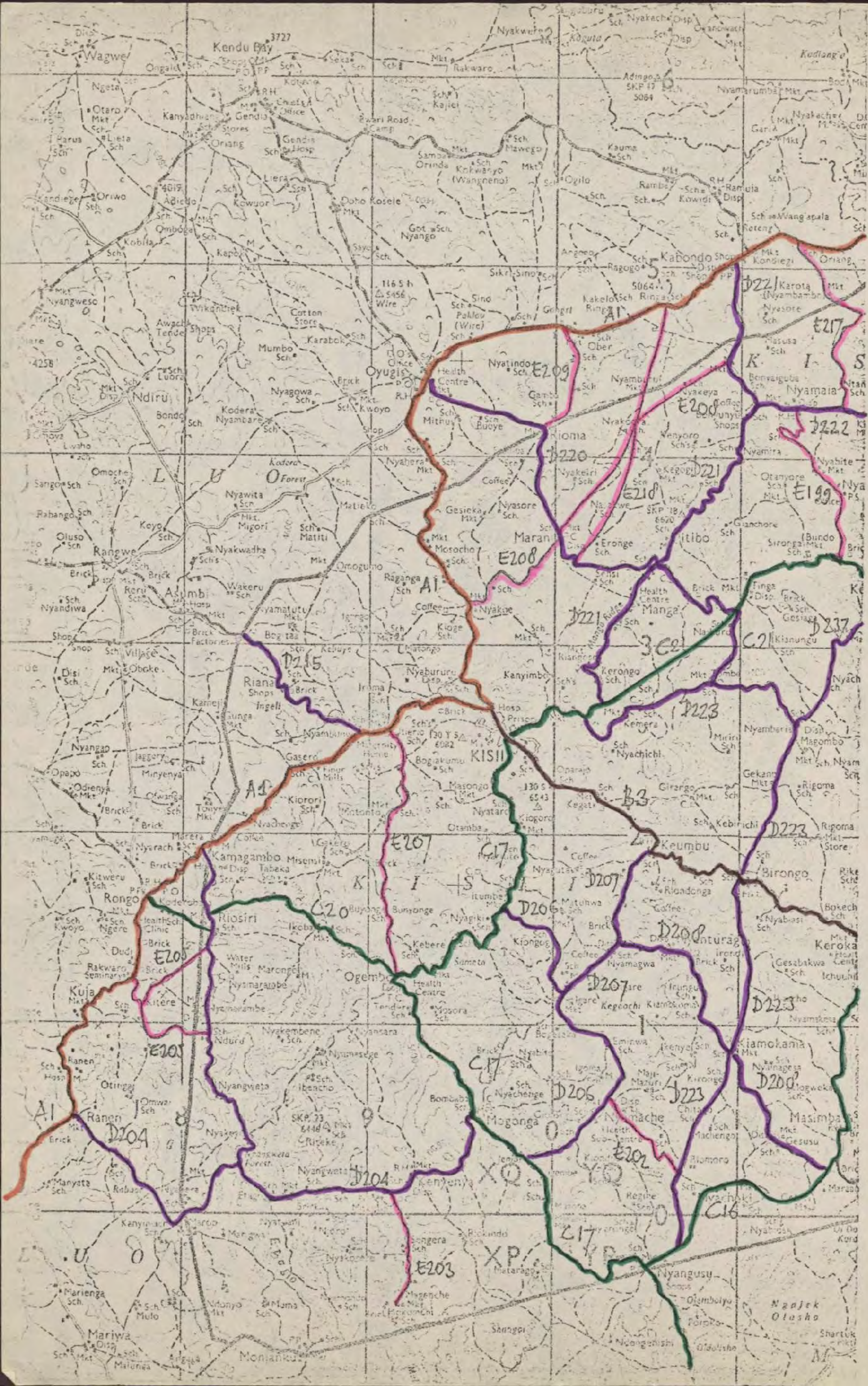
Litein
Kapkatet
Chemagel
(Sotik)
Ndanai
Gorgon
Bomet
Sigor
Sondu
Ikonge
Maragwa
Gesima
K I P S I G I S
CHEP
FOREST
A S A I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Ngeta
Otaro
Kanyadhiang
Gendia
Oriang
Parus
Lieta
Kandiege
Oriwo
Adiedo
Kowuor
Ombogo
Kobila
Liera
Doho Kosele
Got Nyango
Nyakweri
Rakwaro
Kajiei
Rusari Road Camp
Samba Orinda
Kokwanyo (Wangnenoi)
Mawego
Ogilo
Kauma
Rambe
Kowidi
Ramula
Adingo
SKP 17
5064
Nyamarumba
Kodiang'o
Nyakach
Wang'apala
Roteng
Kabondo
Ragogo
Rinya
Konsiegi
Oriang
Karota (Nyambambe)
Nyasore
Sikri
Sino
Paklov (Wire)
Wire
Nyangweso
Wikondiek
Cotton Store
Awach Tende
Mumbo
Karabok
Ndiru
Bondo
Kodera Nyambare
Nyagowa
Oyugis
Health Centre
Kwoyo
Mithui
Buoye
Nyatindo
E209
Gamba
Rioma
Ober
Nyambunui
E208
Nyakeya
Nrakaka
Nyamaia
D222
D221
E217
Lwaho
Omoche
Sango
Rabango
Oluso
Rangwe
Koyo
Nyawita
Migori
Matiti
Nyakwadha
L U O
Kodera Forest
Nyahera
Matieko
Gesieka
Nyasore
Coffee
Marani
D220
Nyakeiri
E218
Kegogi
Nyamira
Otanyore
E199
Mosocho
Omogumo
Raganga
A1
Eronge
Itibo
Sirongo
Bundo
Keru
Asumbi
Wakeru
Nyandiwa
Nyamatutu
Bogitaa
Nyakoe
Kiogo
Coffee
Health Centre
Manga
Mango Ridge
3 C21
Kisinungu
D237
Nyamache
Riana
D215
Ingeli
Iroma
Nyabururu
Kanyimbo
Keroongo
D223
Kemera
Nyachichi
Disi
Oboke
Village
Kameji
Gunga
Nyamarimba
Nyangao
Opapo
Odienya
Brick
Jaggery
Minyenya
Gasero
Kiorori
Nyachenge
Marera
Kamagambo
Tabaka
Misesi
Hosp
Prison
KISII
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Boglakumu
Masongo
Nyataro
Otamba
Kiogoro
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Oparajo
Kegati
B3
Girango
Kebirichi
Rigoma
Nyamberia
Magombo
Gekano
Rigoma
D223
Keumbu
Coffee
Nyaguta
D207
Rioadonga
Birongo
Bokech
Kerooka
E207
K I S I I
C17
Itumbe
Nyagiki
Kitweru
Rongo
Koderoh
Kwoyo
Ngere
Dudi
Rakwaro Seminary
Kuja
E205
Kitere
Riosiri
Ikoba
C20
Buyonge
Bunyonge
Kebere
Sameta
Ogembo
Health Centre
Tendere
Mosora
Kiongoi
D206
Matunwa
Coffee
Nyamagwa
D208
Nturaga
D207
Kegochi
Kiamokama
Gesabakwa
D223
Nyameya
Kiamokania
Nyakembene
Ndurd
Nyangweta
Nyamasege
Ibencho
SKP 23 6448
Riseke
Ranen
Otinga
Omwari
Bombaba
C17
Nyabita
Nyachenge
Mogonga
Igoma
Maji Mazuri
D223
Chitago
Nyamache
Health Centre
E202
Machengo
Masimba
Gesusu
D206
D200
Nyanagesa
Mogweka
A1
Ranen
D204
Brick
Manyata
Rabaan
Nyangweta
D204
Kenyenya
Nyakwana Forest
Kanyimach
Ngorop
Etago
Riomoro
Nyachoki
C16
Nyabasi
Songera
E203
Magenche
Riokindo
Nyakorere
XP
Matarago
C17
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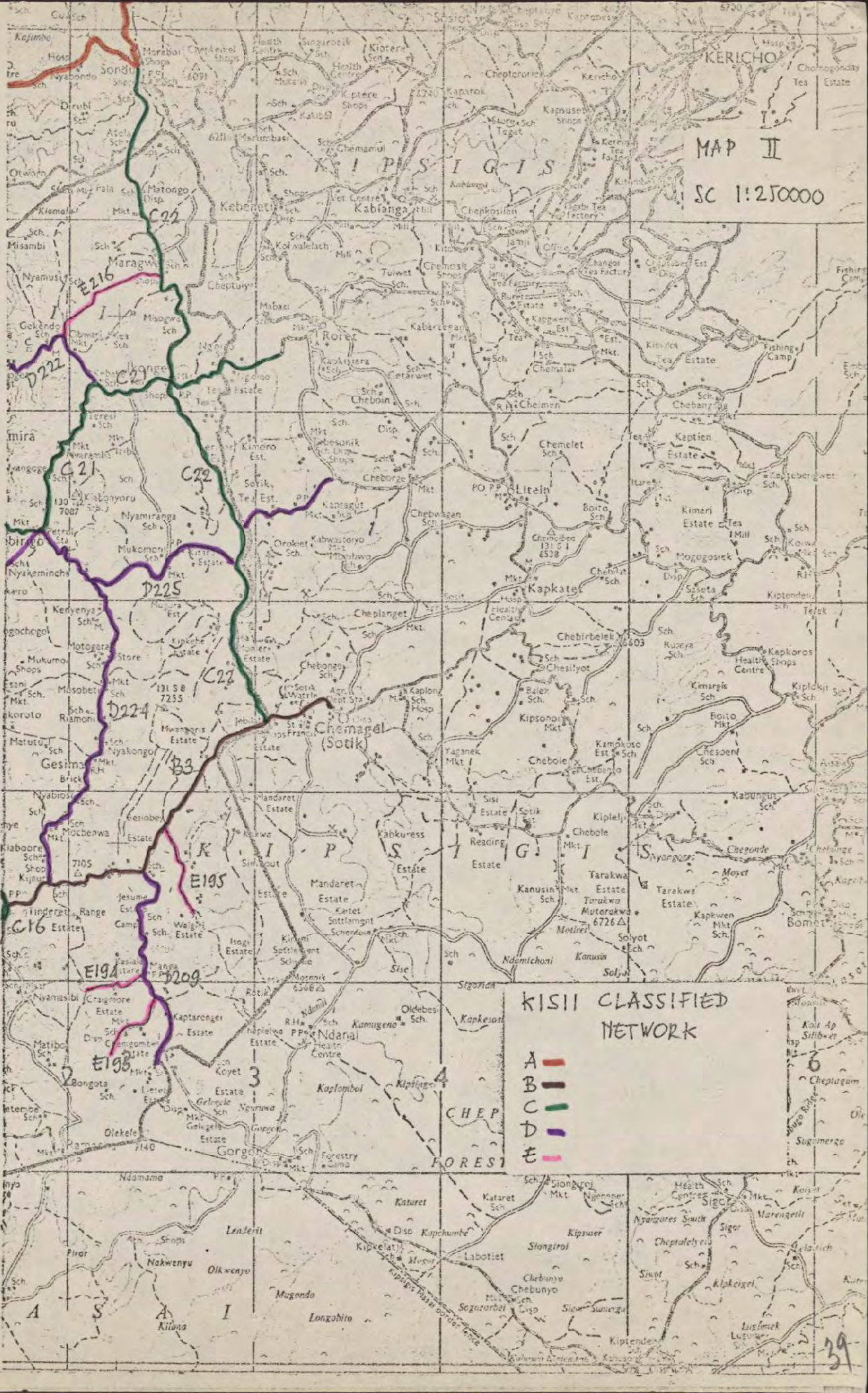
Mariwa
Mulo
Monianku
Oisuguya
Ntongonishi
Nadek Olasho
M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A
B
C
D
E
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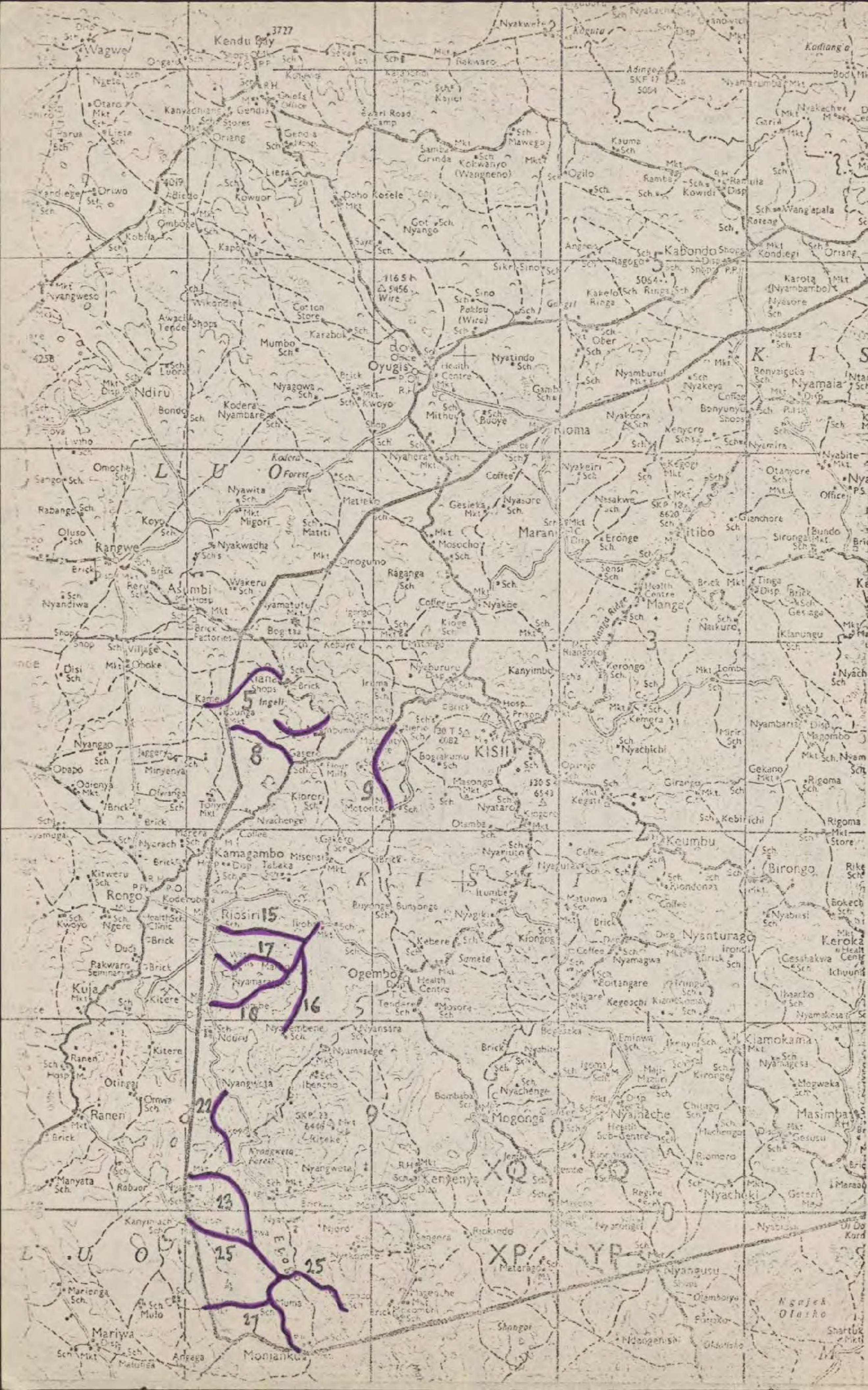
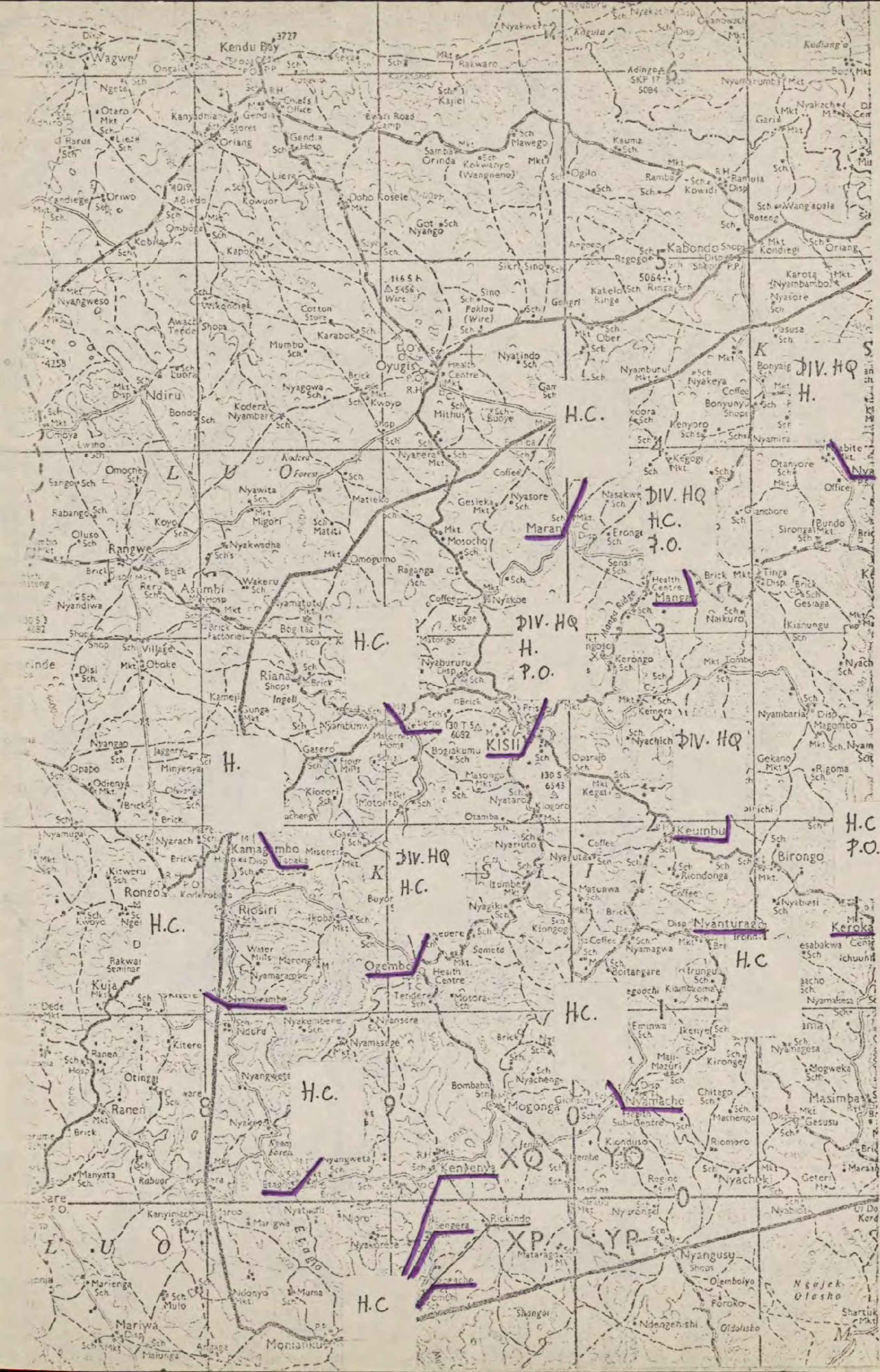
KIPSIGIS
Kabianga
Kebeneti
Roret
Litein
Kapkatet
Chemagel (Sotik)
Gesima
Ndanai
Gorgor
Kaplomboi
CHEP
FOREST
Kataret
Longobito
Mugondo
Olkwenyo
Nakwenyu
Lesirit
Kipsigis-Maasai border fence
C22
C21
C23
C16
D222
D225
D224
B3
E195
E194
E193
D209
E216



Kendu Bay
Wagwe
Oriang
Kowuor
Abiedo
Kosele
Kobila
Kabondo
Oyugis
Ndiru
Rioma
Nyamaia
L
U
O
Kodera Forest
Rangwe
Asumbi
Marani
Itibo
Manga
Kanyimbo
KISII
Kiana
Ingeli
Keumbu
Kamagambo
Rongo
Riosiri
Ogembo
Nyansiongo
Kuja
Ranen
Mogonga
Nyamache
Kenyenya
Kiamokama
Masimba
Keroka
Nyanturago
Birongo
Nyangusu
Nyachoki
Kegogi
Kitwero
Mariwa
Monianku
XQ
YQ
XP
YP
K
I
S
5
8
9
15
16
17
18
21
23
25
27

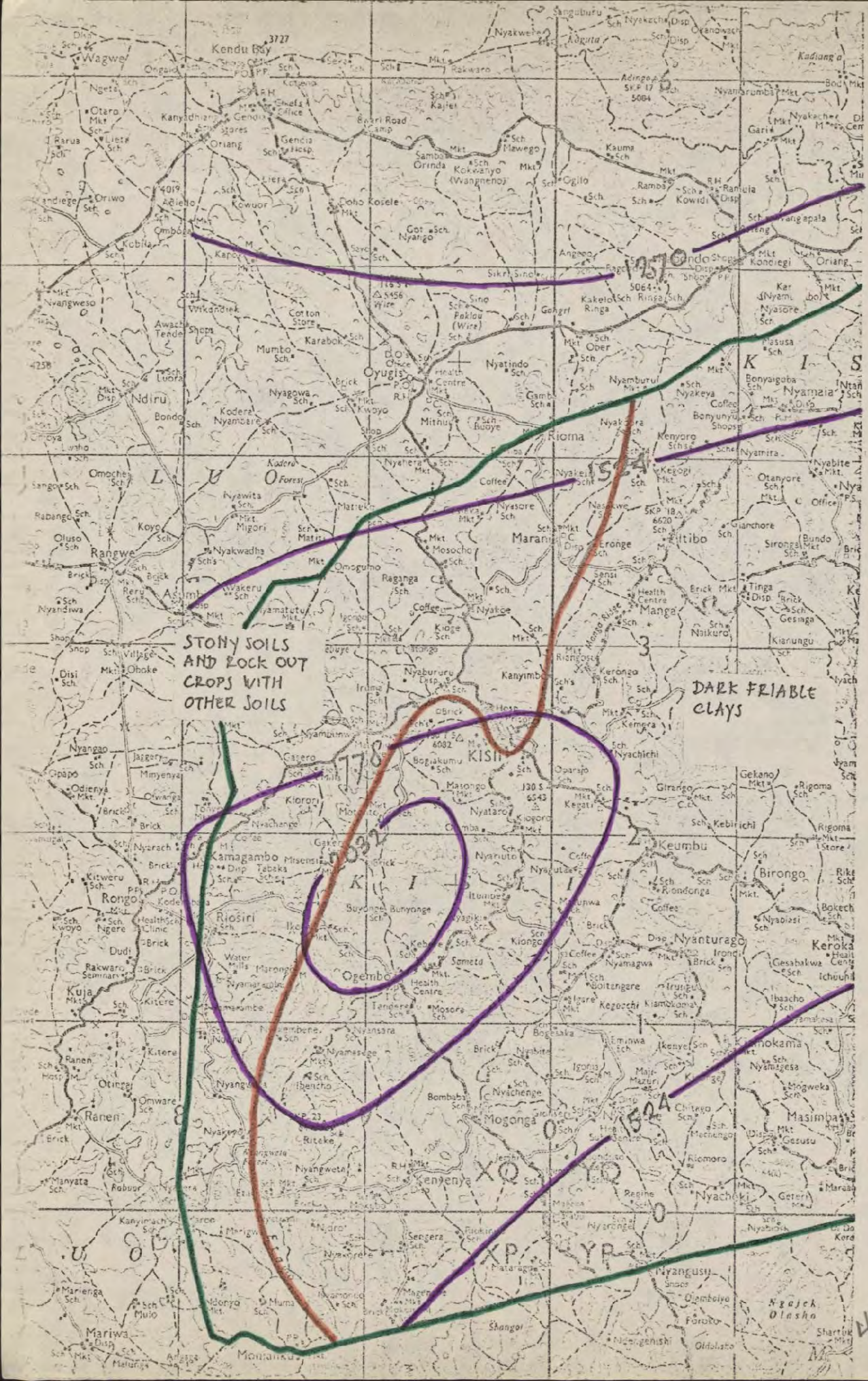
40

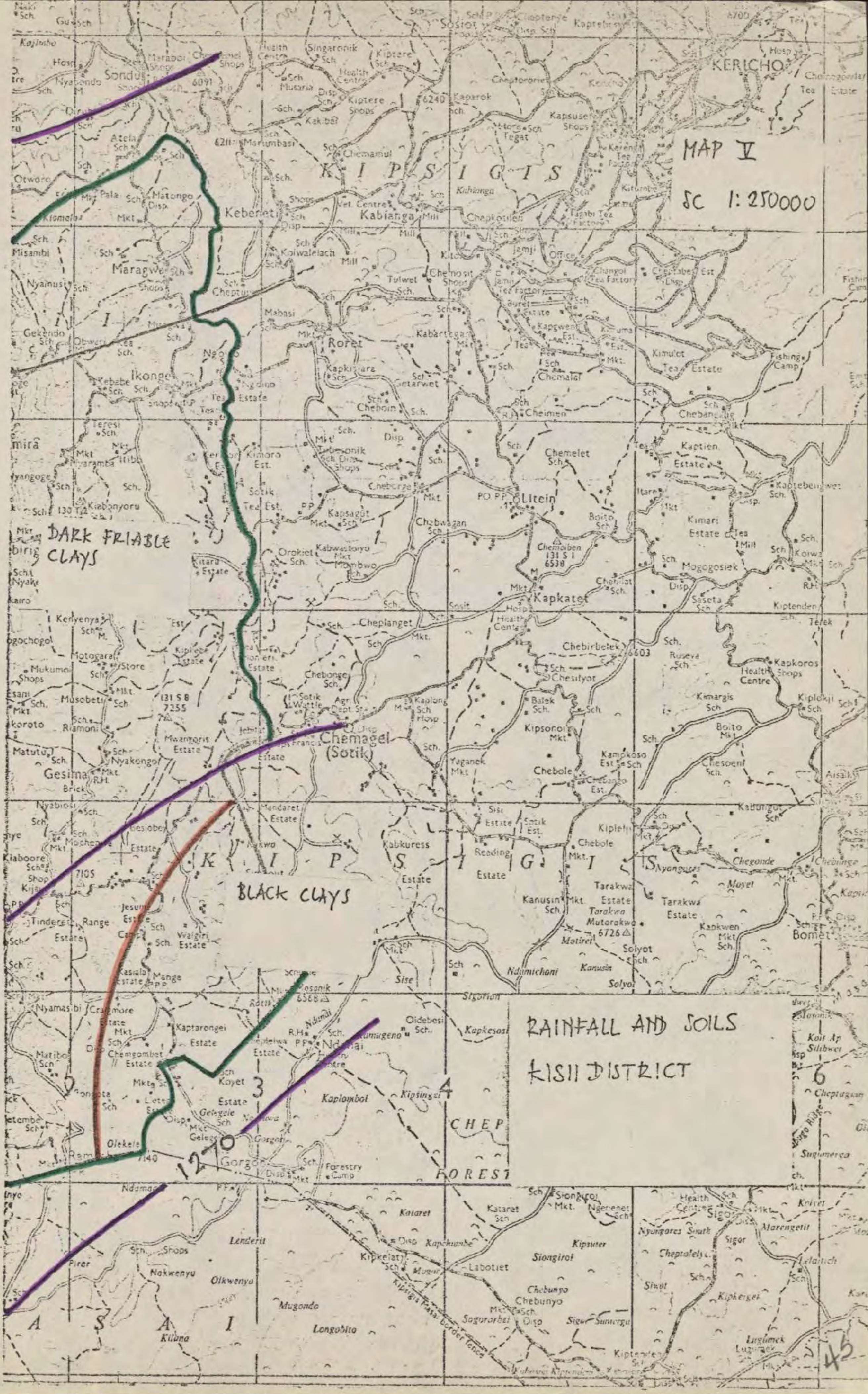

MAP III
SC 1:250000
EVALUATED RURAL ACCESS ROADS KISII DISTRICT
KERICHO
KIPSIGIS
Kabianga
Roret
Kapkatet
Litein
Chemagel (Sotik)
Ndanai
Gorgor
Bomet
Sigor
FOREST
MASAI

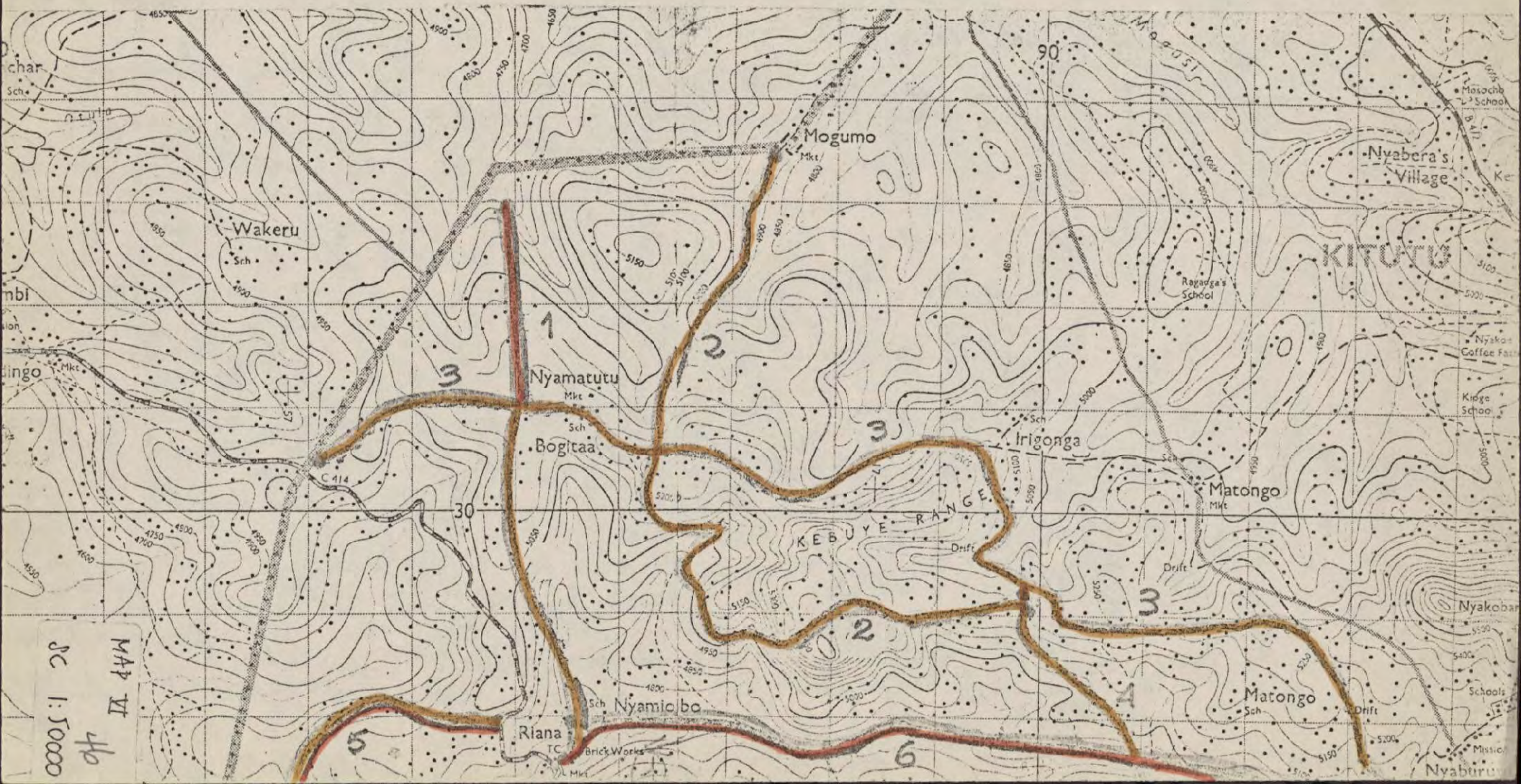

Kendu Bay
Wagwe
Ongalo
Rakwaro
Nyakwere
Adingo
Kanyadhiang
Gendia
Oriang
Kowuor
Ombogo
Kobila
Kapok
Nyangweso
Wikondiek
Cotton Store
Karabok
Mumbo
Ndiru
Bondo
Kodera
Nyambare
Oyugis
Health Centre
Kwoyo
Mithui
Nyangowa
Sino
Paklou (Wire)
Gongri
Ober
Nyatindo
Kabondo
Kakelo
Ringa
Nyambururu
Nyakeya
Bonyunyu
Kenyoro
Kegogi
Rangwe
Asumbi
Migori
Koyo
Omoche
Oluso
Rabango
Nyawita
Matieko
Mosocho
Gesieka
Nyasore
Maran
Eronge
Sensi
Manga
Manga Ridge
Naikuro
Omogumo
Raganga
Nyakoe
Kioge
Riana
Obeke
Kameji
Gunga
Nyamburu
Nyaburuna
Kerongo
Kemera
Nyachich
Keumbu
Bogiakumu
KISII
Masongo
Nyataro
Kiogoro
Oparajo
Kegati
Gekano
Rigoma
Nyambaria
Magombo
Birongo
Keroka
Kamagambo
Rongo
Kitweru
Riosiri
Kuja
Ogembo
Nyamarambe
Nyakembene
Nduru
Nyansera
Nyamesege
Tendere
Itumbe
Nyagiki
Sameta
Kiongongi
Nyanturago
Nyamagwa
Boitangare
Matunwa
Riondonga
Kiambokoma
Eminwa
Ikenye
Maji-Mazuri
Kironge
Nyamache
Chitago
Machengo
Riomoro
Mogonga
Nyacheng
Bombaba
Nyangweta
Kenyenya
Rickindo
Sengera
Nyachoki
Regina
Nyangusu
Mataraga
Masimba
Gesusu
Mogweka
Nyamaiesa
Kitere
Ranen
Otinga
Rabuor
Manyata
Kanyimach
Mariwa
Mulo
Ndonyo
Marienga
Monianku
Shangoi
Ndengenshi
Olengoi
Foroko
Oldolisho
Ngojek Olosho
Sare P.O.
L U O
K I S I I
XQ
XP
YQ
YP
DIV. HQ
H.C.
H.
P.O.
H.C.
DIV. HQ
H.
P.O.
DIV. HQ
H.C.
P.O.
DIV. HQ
H.C.
DIV. HQ
H.C.
H.C.
H.C.
H.C.
P.O.
H.C.
H.C
H.C.
H.

42

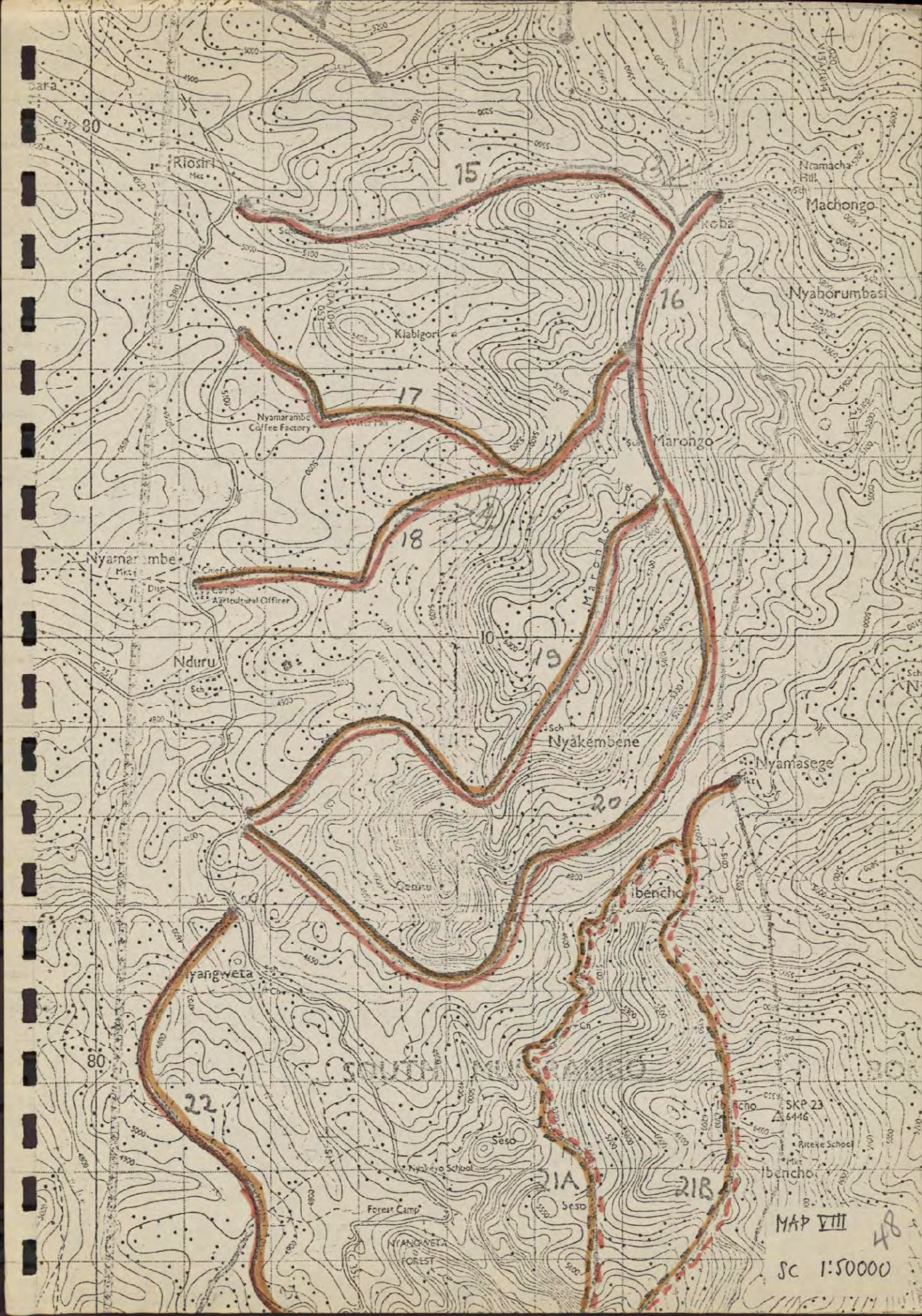
MAP IV
Sc 1:250000
SOCIAL SERVICE CENTRES
KISII DISTRICT
H.C.
P.O.
H.C.
KERICHO
KIPSIGIS
Kebeneti
Kabianga
Litein
Kapkatet
Chemagel
(Sotik)
Roret
Ikonge
Gesima
Ndanai
Gorgor
Sigor
Bomet
Kebirigo
Nyamira
CHEP FOREST
MASAI
43

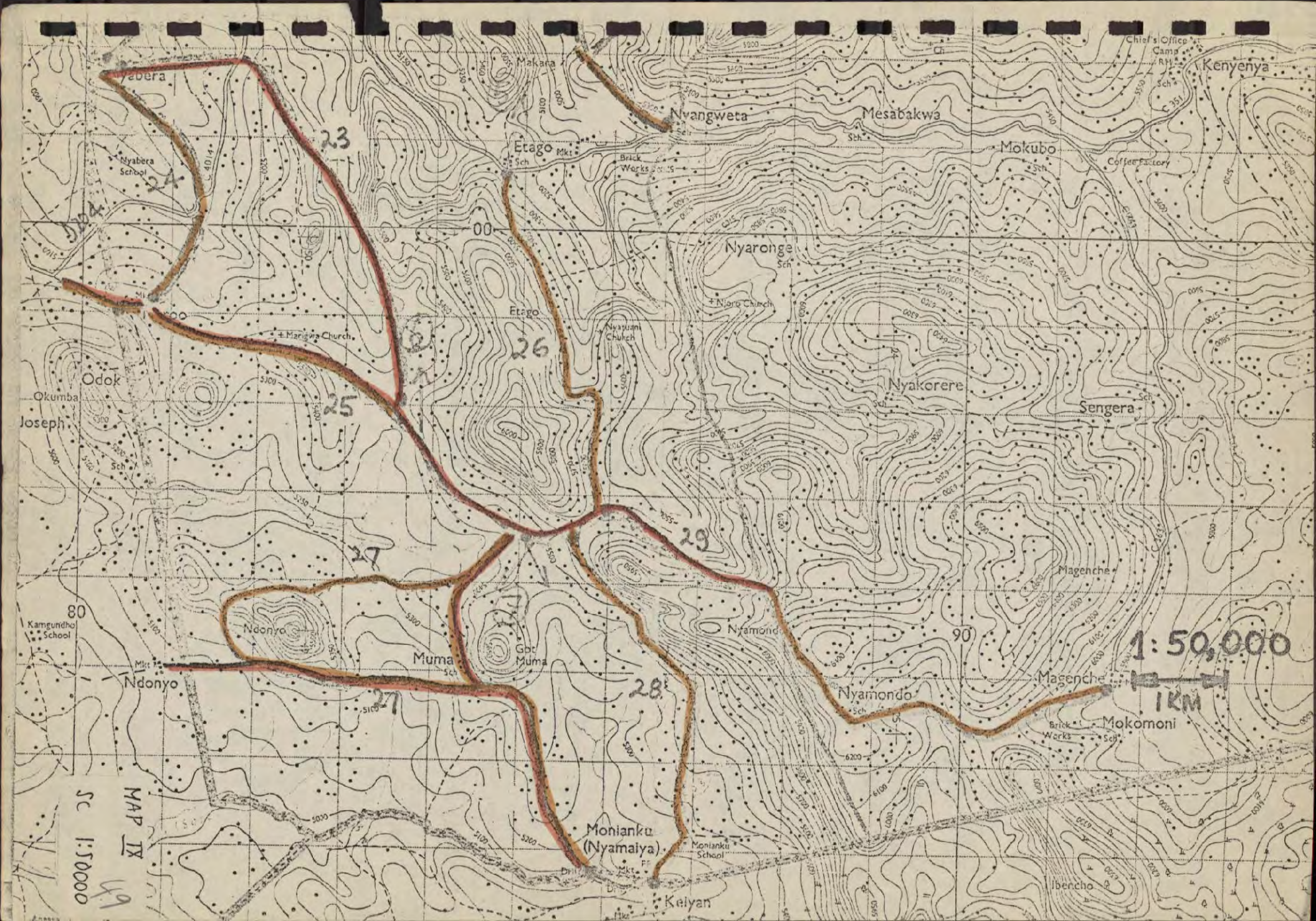

STONY SOILS AND ROCK OUT CROPS WITH OTHER SOILS
DARK FRIABLE CLAYS

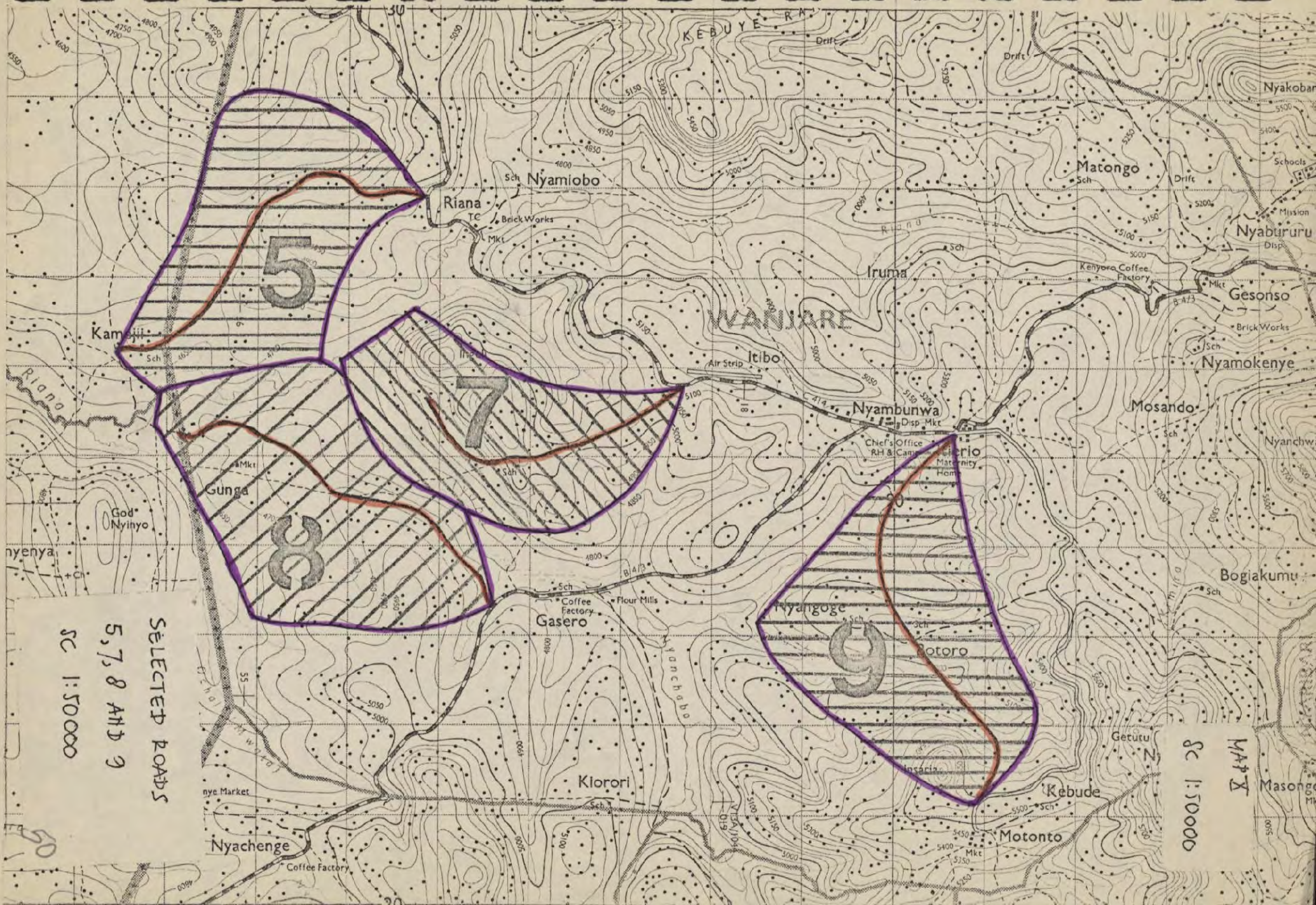

MAP V
SC 1: 250000
DARK FRIABLE CLAYS
BLACK CLAYS
RAINFALL AND SOILS
KISII DISTRICT
1270
KERICHO
K I P S I G I S
Kabianga
Litein
Kapkatet
Chemagel (Sotik)
Bomet
Sigor
CHEP
FOREST
A S A I


Mogumo
Mkt
Wakeru
Sch
Nyamatutu
Mkt
Bogitaa
Sch
C414
Irigonga
Sch
Matongo
Mkt
KEBUYE RANGE
Drift
Matongo
Sch
Drift
Nyamiobo
Sch
Riana
TC
Brick Works
Nyabera's Village
KITUTU
Ragadga's School
Nyakoba
Schools
Nyaburu
90
30
1
2
3
4
5
6


Iruma
Kenyoro Coffee Factory
Gesonso
Brick Works
Nyamokenye
Kamejji
Sch
Ingeli
Air Strip
Itibo
Nyambunwa
Disp
Mkt
Chief's Office
RH & Camp
Mosando
Nyanchw
Gunga
Mkt
God Nyinyo
Minyenya
Ch
Sch
Coffee Factory
Flour Mills
Gasero
Nyangoge
Bogiakumu
Inseria
Getutu
Nyamonema
Kebude
Masong
Motonto
Tonye Market
Nyachenge
Coffee Factory
Norori
Gakero
Misensi
Brick Works
Itumbe Hill
Nyatike
Nyamue
Tabaka
SOUTH MUGIRANGO
KOMASOGE
BOBASI
(MASOGE)
4
2
7
8
9
10
11
12
13
14
17
20
SS
C414
B4/13
M4 III SC 1:50000

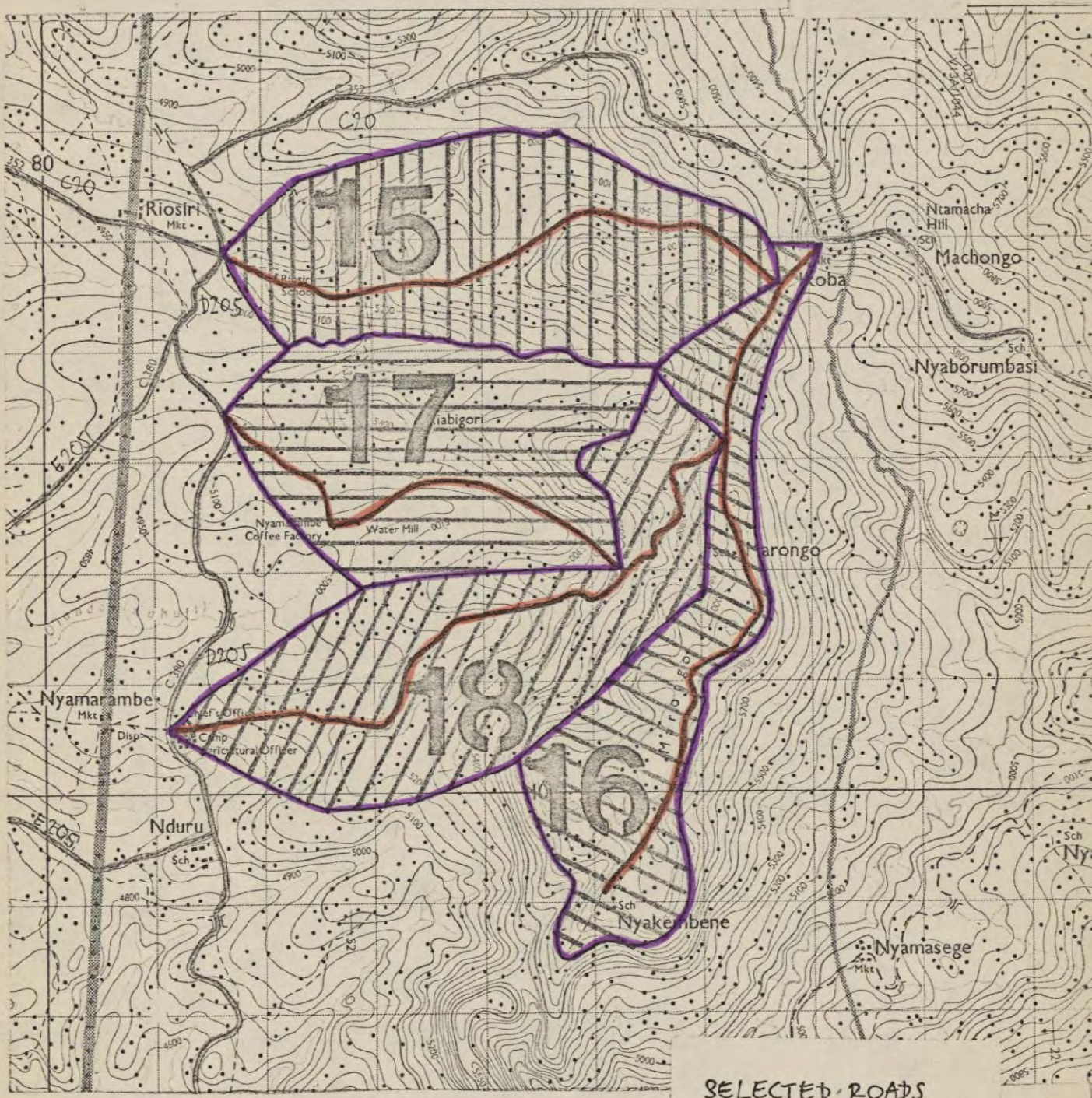

Riosiri
Ntamacha Hill
Machongo
Koba
Nyaborumbasi
Kiabigori
Nyamarambe Coffee Factory
Marongo
Nyamarambe
Agricultural Officer
Nduru
Nyakembene
Nyamasege
Ibencho
Nyangweta
Seso
Nyakeyo School
Forest Camp
NYANGWETA FOREST
Ibencho
SKP 23
△6446
Riteke School
15
16
17
18
19
20
21A
21B
22
80
10
MAP VIII
48
Sc 1:50000


Yabera
Nyabera School
Makara
Nyangweta
Mesabakwa
Kenyenya
Chief's Office & Camp
Etago
Mkt
Sch
Brick Works
Mokubo
Coffee Factory
Nyaronge
+ Nioro Church
Nyasuani Church
+ Marigwa Church
Odok
Okumba
Joseph
Nyakorere
Sengera
Magenche
Kamgundho School
Ndonyo
Muma
Got Muma
Nyamondo
Mokomoni
Brick Works
Monianku (Nyamaiya)
Monianku School
Kelyan
Ibencho
23
24
25
26
27
28
29
80
90
00
1:50,000
1KM
MAP IX
SC 1:50000


KEBUYE R.
Riana
Nyamiobo
Sch
TC
Brick Works
Mkt
Drift
Matongo
Nyakobar
Schools
Mission
Nyabururu
Disp
Kenyoro Coffee Factory
Gesonso
Brick Works
Iruma
KAMJARE
Itibo
Air Strip
Nyambunwa
Disp
Mkt
Chief's Office
RH & Cam
Maternity
Hom
Nyamokenye
Mosando
Nyanchw
Kamaji
Riana
Gunga
God Nyinyo
nyenya
Gasero
Coffee Factory
Flour Mills
Nyangoge
Sch
Bogiakumu
Kiorori
Nyachenge
Coffee Factory
nye Market
Getutu
Kebude
Motonto
Masong
Insaria
5
7
8
9
B/4/3
C/414
SELECTED ROADS
5, 7, 8 AND 9
SC 1:50000
MAP X
SC 1:50000

MAP XI

SC 1:50000



SELECTED ROADS

15, 17, 16 AND 18

SC 1:50000

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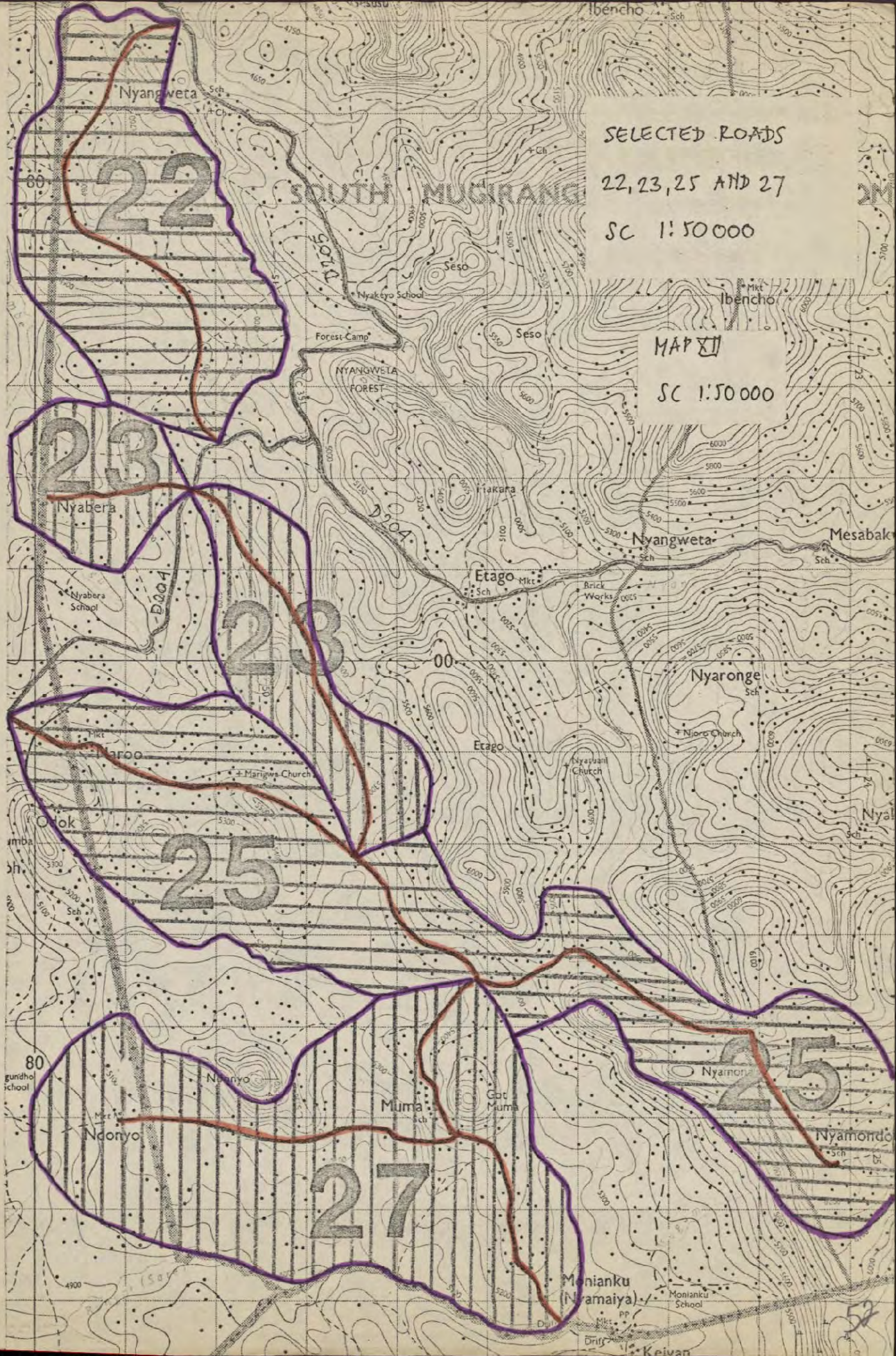
SELECTED ROADS
22, 23, 25 AND 27
SC 1:50000
MAP XII
SC 1:50000
22
23
25
27
SOUTH MUGIRANGO
NYANGWETA FOREST
Nyangweta
Ibencho
Seso
Nyakeyo School
Forest Camp
Nyabera
Nyabera School
Etago
Brick Works
Nyangweta
Mesabaki
Nyaronge
Njoro Church
Nyasuani Church
Maroo
Marigwa Church
Orok
Ndonyo
Muma
Got Muma
Nyamondo
Monianku (Nyamaiya)
Monianku School
Keiyan
D204
C35