1923

KENYA

307

C O
49557

REC'D 10 OCT 23

FROM
GOVERNOR
CORYNDON

CONF
508

DATE
14TH SEPTEMBER 1923

FOR CIRCULATION :—

Mr.

Mr.

Mr.

Asst. U.S. of S.

.....

.....

Perm^t. U.S. of S.

Parl^y. U.S. of S.

Secretary of State.

SUBJECT

RAILWAY ESTIMATES 1924

Trs 3 copies of draft. Explanatory desp. will be forwarded.

2 Copies to Library

Previous Paper

Conf. 45790

MINUTES

Desp fm
See on 58079/23.

Recd
24.10.23

S.R.A.

Subsequent Paper

Conf 50079

KENYA.

No. 508.

CONFIDENTIAL.

C.O. 49557 10 OCT 23

GOVERNMENT HOUSE,
NAIROBI,
KENYA.

14th September, 1923.

308

6.A.G
on 70104
Estimates.
copies.

My Lord Duke,

With reference to Your Grace's Confidential despatch of the 23rd ultimo, I have the honour to transmit three copies of the draft Estimates of Revenue and Expenditure submitted by the General Manager, Uganda Railway, for the year 1924.

2. The estimates have been considered by the Railway Council and will be laid before Legislative Council at the first opportunity.

3. An explanatory despatch will be forwarded in due course.

I have the honour to be,

My Lord Duke,

Your Grace's most devoted and most obedient servant,

R. T. Coryndon

GOVERNOR.

S GRACE

THE DUKE OF DEVONSHIRE, K.G., P.C., G.C.M.G., G.C.V.O.,

SECRETARY OF STATE FOR THE COLONIES,

DOWNING STREET, LONDON, S. W.,

COLONY & PROTECTORATE
OF KENYA.

UGANDA RAILWAY.

THIKA-NYERI EXTENSION C.O.

METRE GAUGE.

LENGTH 75·49 MILES

REPORT ESTIMATES & APPENDICES.

W. Robertson

ENAROSURA.

AUGUST. 1923

310 4893/26

74 September 3

The Hon:General Manager,
Uganda Railway,
Nairobi.

[redacted]

Ref: Your No.

Before finally deciding [illegible], I should be well advised to carry out [illegible] sections, in order to make quite sure, [illegible] reasonable with the same ruling grade.

Mr.Robertson's location [illegible] parts which it might be found [illegible] the intensive surveys; his [illegible]

His proposed Railway is estimated [illegible] per mile but has now been reduced to [illegible]. The greater part of this difference is due to [illegible] material.

In submitting a revised estimate [illegible], I have the following [illegible]

(a) Preliminary expenses

Considering the [illegible] of removing [illegible] £150 per mile for the final location [illegible]. These figures have not been [illegible].

(b) Land

Compensation for damage done to [illegible] crops will be heavy; £14 per mile is their estimate.

(c) Formation

The revised figures are based on the actual contract prices paid to the Contractors on the Thika diversions which are now under constructions, and there is no reason to suppose that these prices should go up, bearing in mind that most of the labour will be obtained locally, thus cutting out heavy recruiting fees, and railway charges. The earthwork quantities have not been checked.

(d) Bridgework

The bridgework is exceptionally heavy. Col.Robertson's estimate of £1600 per mile. In the revised estimate

the quantities remain the same, but prices have been lowered, bringing the cost per mile down to £1350 a saving of £530 per mile.

311

(d) 1. Concrete The revised figures for concrete are based on the actual cost of the new bridges and culverts now being built on the Thika Diversions, plus freight on the cement and sand to site. All sand will have to be railed from Kima Station.

It is assumed stone will be available near sites.

2. Steelwork Steelwork has been estimated at £20 a ton instead of £30, based on present home prices, plus 25/- shs a ton Sea Freight (Conference Lines quotations for rails) and 4 cents per ton mile railage, Kilindini to site.

3. Pipe Culverts A reduction of 20 in cost has been shown by proposing to put in concrete culverts, instead of the 'Armco type".

£315 per mile against £394.

(e) Fencing.

These figures have not been revised.

(f) Telegraphs

These figures have not been revised.

(g) Ballast and Permanent Way.

By utilising the second-hand rails [illegible] will become available when the [illegible] Uganda Railway, a saving of £30,000 is [illegible]

The material is valued at £70 per mile, [illegible] in the track at £980.

The prices for stone ballast remain the same.

(h) Station Buildings and Staff Quarters

These prices remain the same. A larger [illegible] could be built with the money provided.

(i) Plant

Under 'Construction' a sum of £24 per mile is provided to cover the cost of 10 miles of decauville track, and cost for the erection of steelwork.

(j) General Charges.

These figures have been reduced from £1401 to £1094 per mile.

In Col:Robertson's analysis (Appendix 2) the total amount under this head is divided by 83 miles, whereas in the revised estimate the total is divided by 88 making the cost per mile appear to be comparatively higher in proportion.

I do not consider the all time services of a Railway Magistrate be required, 1 Labour Inspector and 1 Police Inspector would le to deal with all cases.

6. Two Sub-Asst-Surgeons should be able to attend to all medical requirements.

7. The Engineering, Stores, and Accounts Staff have been reduced by about half.

8. The provision allowed for staff quarters and office accommodation has been considerably reduced on the assumption that grass bandas will be used instead of permanent buildings.

9. The Revised Estimate amounts to £691,9[illegible] against Col: Robertson's figure of £841,664 shewing a possible saving of £149,742.

10. I have made no reference to the survey beyond the [illegible] Valley as there will be ample time to consider this later on.

11. The taking off point on the Nzoia Railway [illegible] and the termination of the 1st Section, [illegible] definately fixed, the latter point [illegible] that whichever route is selected beyond the [illegible] the first section.

12. Mr. [illegible] of the [illegible] Route, and suggests [illegible] using Garratt Locomotives and special [illegible] to negotiate the sharp curves.

13. [illegible] ledge, and obtain his views on the [illegible]

14. If further recommendations [illegible] services of this office [illegible]

15. I regret that I am not able [illegible] and concent on the merits or otherwise [illegible] pared by Col:Robertson, but I understand [illegible] and plans are being sent home to [illegible] ted with all the problems involved.

16. Col: Robertson is to be [illegible] corner in which his [illegible] features of the country [illegible] ent time we can know [illegible].

Yours [illegible]

Encls.

-:-

THIKA - NYERI EXTENSION

KIAMBU TO TANA VALLEY SECTION

LENGTH 58 MILES

REPORT AND REVISED ESTIMATE BY THE AG.CHIEF ENGINEER,UGANDA RLY.

-:-

Note:- The numbered sheets of the tabulated details herein, correspond with the sheets in the Report, Estimate & Appendices, submitted by Col:Robertson, August, 1923.

Chief Engineer's Office,
Uganda Railway,
Nairobi.

September, 1923.

UGANDA RAILWAY — METRE GAUGE

THIKA-NYERI EXTENSION — 58 MILES

NDARUGU TO TANA VALLEY

SUMMARY OF COL. ROBERTSON'S & AG.CHIEF ENGINEER'S ESTIMATES OF COST OF RAILWAY

314

Head of Account and Sub-Head.	Estimate of Cost Col:Robertson's Estimate £	Ag C.E's (U.R) Est. £	Savings £
PRELIMINARY EXPENSES:-			
(a) Survey Expenses	1,902	1,902	
(b) Plant	1,079	1,079	
(c) Establishment	3,675	3,675	
Total I.	6,656	6,656	
LAND :-			
Total II	6,603	6,603	
	6,603	6,603	
I. FORMATION:-			
(a) Earthwork	97,111	89,239	7,872
(b) Drains	2,683	1,816	867
(c) Maintenance	9,605	9,605	-
(d) Cleaning	300	300	-
(e) Road Diversions	157	147	10
Total III	109856	101,107	8,749
BRIDGEWORK :-			
(a) Major Bridges	60639	43,778	16,861
(b) Minor Bridges	25,453	16,564	8,889
(c) Culverts	22,839	18,271	4,568
Total IV	108,931	78,613	30,318
FENCING:-			
(a) Fencing	769	769	
(b) Boundary Posts	116	116	
(c) Gradient Posts	148	148	
(d) Mile Posts	52	52	
(e) Level Crossing	146	146	
Total V	1,231	1,231	
ELECTRIC TELEGRAPH:-	5,185	5,185	
Total VI	5,185	5,185	
BALLAST & PERMANENT WAY			
(a) Main Line:-			
1. Permanent Way	146,630	56,846	89,784
2. Ballast	9,844	9,828	16
(b) Sidings:-			
1. Permanent Way	9,161	3,538	5,623
2. Ballast	-	-	-
(c) Points & Crossings	3,798	3,798	-
Total VII	169,433	74,010	95,423

STATION BUILDINGS			
(a) Station Offices	6,164	6,164	-
(b) Workshop & Stores	-	-	-
(c) Staff Quarters	20,234	20,234	-
(d) Station Machinery	12,002	12,002	-
Total VIII	38,400	38,400	
PLANT:-			
(a) Engineering	960	960	-
(b) Construction	13,940	13,940	-
(c) Locomotive	250	250	-
(d) Carriage & Wagon	250	250	-
(e) Station & Office Furniture	1,200	1,200	-
Total IX	16,600	16,600	-
FERRIES:-	Nil	Nil	-
ROLLING STOCK :-	Nil	Nil	Nil
GENERAL CHARGES:-			
(a) Direction	6,963	5,500	1,463
(b) Engineering	35,809	30,245	5,564
(c) Stores	8,003	7,437	566
(d) Audit & Accounts	10,848	8,605	2,243
(e) Native Administration	5,908	3,605	2,303
(f) Medical & Sanitation	11,238	8,125	3,113
	78,769	63,517	15,252
GRAND TOTALS	£541,664	£391,922	£149,742
RATE PER MILE	£ 9,376	£ 6,757	

316

UGANDA RAILWAY.
THIKA NYERI EXTENSION.
NDAROGO TO TANA VALLEY.
GENERAL ABSTRACT OF COST OF RAILWAY.

METRE GAUGE.
58 MILES.

Head of Account & Sub Head.	Sub Head Cost Shs.	Sub Head Rate per mile Shs.	Main Head Cost Shs.	Main Head Rate per mile Shs.
PRELIMINARY EXPENSES.				
(a) Survey Expenses	38048	656		
(b) Plant	21576	372		
(c) Establishment	73504	1267	133,128	2295
LAND.			132,060	2277
FORMATION.				
(a) Earthwork	1,784,770	30772		
(b) Drains	36,311	626		
(c) Maintenance	192,098	3312		
(d) Clearing	6000	104		
(e) Road Diversion	2943	51	2,022,122	34865
BRIDGEWORK.				
(a) Major bridges	875,568	15096		
(b) Minor bridges	331,271	5712		
(c) Culverts	365,421	6300	1,572,260	27108
FENCING.				
(a) Fencing	15,378	266		
(b) Boundary Posts	2320	40		
(c) Gradient Posts	2960	51		
(d) Mile Posts	1044	18		
(e) Level Crossings	2916	51	24,618	426
TELEGRAPH.			103,689	1787
BALLAST & PERMANENT WAY.				
(a) Main Line				
(1) Permanent Way	1,136,916	19602		
(2) Ballast	196,560	3389		
(b) Sidings				
(1) Permanent Way	70,764	1220		
(2) Ballast				
(c) Points & Crossings	75,960	1310	1,480,200	25521
STATION BUILDINGS.				
(a) Station & Offices	123,280	2126		
(b) Workshop & Stores	Nil			
(c) Staff Quarters	404,685	6978		
(d) Station Machinery	240,030	4138	767,995	13242
PLANT.				
(a) Engineering	19,200	332		
(b) Construction	278,797	4807		
(c) Locomotive	5000	87		

Head of Account Sub Head	Sub Head Cost Shs.	Sub Head Rate per mile Shs.	Main Head Cost Shs.	Main Head Rate per mile Shs.
PLANT (CONTD):				
(d) Carriage & Wagon	5000	87		
(e) Station & Office Furniture	24,000	415	331,997	572
FERRIES.	Nil		Nil	
ROLLING STOCK.	Nil		Nil	
GENERAL CHARGES.				
(a) Direction	110,000	1896		
(b) Engineering	604,900	10429		
(c) Stores	148,760	2564		
(d) Audit & Accounts	172,100	2967		
(e) Native Administration	72,100	1243		
(f) Medical & Sanitation	162,500	2800	1,270,360	21900
			7,838,429	135142
			£ 391,922	£ 6757

Uganda Railway.
Thika Nyeri Extension.
Nderugu to Tana Valley.
III Formation.

Metre Gauge.
Length 57. 78 miles.

Sub-Head	Quantity	Rate Shs.Cts.	Unit.	Amount Shs.C
Earthwork				
Kds. earth	17,117,271.	27.00	27 Cuft	462,166.3
" Soft rock	12,690,567	45.00	"	571,075.5
S. earth	8,618,589	27.00	"	232,701.9
Soft rock	2,844,477	45.00	"	128,001.4
Hard rock	4,236,327	90.00	"	381,269.4
earth	353,892	27.00	"	9555.0
Drains.				
drains earth	190,440.	27.00	"	5141.8
" Soft rock	63,480	45.00	"	2856.6
" hard rock	63,480	90.00	"	5713.2
water drains earth.	398,250	27.00	"	10752.7
" " soft rock	62,750	45.00	"	2823.7
" " hard rock	100,250	90.00	"	9022.5
Maintenance & Contingencies.				1
Clearing Light	12,000	50.00	1in ft	6000.0
Road Diversions				
" earth	64,000	27.00	27 Cuft	1728.0
" Soft rock	27,000	45.00	"	1215.0
	46842,773.			2,022,121.40

UGANDA RAILWAY.
Thika - Nyeri Extension.
Nderugu - to Tana Valley.

IV Brickework.
(A) 40' Span and over
Abstract of Cost.
For details see Appendix "K"

Bridge No.	Mileage.	Name.	Spans.		Cost. Shs.
7	1.11	Nderugu	1-60'& 2-40'	Girder	101136
30	9.78	Thika	1-60'& 2-40'	"	98671
54	18.60	Kabuku	3-40'	"	52829
10	30.62	Thara	3-20'	"	26173
27	33.15	Saba - Saba	1-40'	"	62560
39	44.15	Maragua	10-40' 10-20' 1-60'	"	327e2.
47	50.00	Kathioya	2-40' 2-20'	"	51656
61	54.20	Tana	1-60'	"	70494
67	57.40	Kagati	2-20'	"	14128
			Cont.Agencies		375808
					375808

IV Bridgework.
(B) Minor Bridges.
Under 40' ft to 6 ft Span
Abstract of Cost
For details see Appendix "L"

320

erial No.	Name.	Mileage.	Span.		Cost Shs.
8	Karamaini	1.50	1-12'	Arch	29736
18	Komo	5.28	1-20'	"	53230
33	Lawfords stream	10.60	1-6'	"	20494
38	Thika Sisal	12.15	1-12'	Girder	10270
42	Samuru	13.16	1-20'	Arch	45007
67	Kitina	19.25	1-6'	"	12149
72	Genia Valley	20.34	2-12'	Girder	10203
73	do	20.79	1-12'	"	9219
99	Mukuyu	27.42	do	"	10286
111	do	29.68	do	"	9042
131	Little Saba - Saba	33.76	1-20'	Arch	23315
138	Ithera	36.57	2-12'	Girder	9252
139	do	37.48	1-12'	"	4153
14.	Mithanji	38.40	1-20'	"	13.7e
164	do	4 .63	1-20'	Arch	46893
191	Fort Hall	45.96	1-6'	"	10v 8
				Tot L.	1 71

(85-103)

UGANDA RAILWAY
THIKA NYERI EXTENSION
NDARUGU TO THIKA VALLEY

METRE GAUGE
56 MILES

IV BRIDGEWORK

321

(c) CULVERTS UNDER 6' SPAN

Description		Amount
s per Col:Robertson's e (Page 103 of report)	=	Shs.435,024.25
% due to saving by using ted Iron Culverts (of anufacture) encased in e instead of imported Pipes.	=	Shs. 87,004.85
		Shs.348,019.40
Contingencies @ 5%	=	" 17,401.60
	TOTAL =	Shs.365,421.00
	=	hs. 6,300 per mile.

Description	Quantity	Rate	Unit	Amount
Line				
Permanent Way 50 lb.Rail	58.00	19602.00	Mile	1136916.00
Ballast (Cuttings only)	24.00	8190.00	Mile	196560.00
Sidings				
Permanent Way 50 lb. Rails	3.61	19602.00	Mile	70764.00
Points & Crossings				
No 12 Complete	12.00	2509.48	Set	30114.00
No 8¼ Complete	39.00	1175.54	Set	45846.
			Total	1,480,200.00
				£ 74,010

Uganda Railway.

Thika Nyeri Extension.

Ndarugu to Tana Valley. Metre Gauge.

XII General Charges. 58 miles.

For details see Appendix "P"

Items.	Rate per mile.	Amount.
Direction.	£98	£5800
Engineering	£521	£30.245
Stores	£136	£7.436
Audit and Accounts	£148	£8605
Native Administration	£62	£3.600
Medical & Sanitation	£140	£8120
Total.	£1094	£63.516

UGANDA RAILWAY
THIKA - NYERI EXTENSION
GENERAL CHARGES

NDARUGU TO TANA VALLEY

METRE GAUGE
LENGTH 25 MILES

ITEM	NO	SALARIES Years	SALARIES Rate (1)	SALARIES Amount	Sea passage (2)	Allowance (3)	Quarters (4)	Other charges	Instruments (6)	Stores & Workshops (7)	Office Expenses (8)	TOTAL	RATE PER MILE
			£	£	£	£	£	£	£	£	£	£	£
ing Engineers	L.S.		[illegible]	500									
ants	L.S.			5000									
				5500								[illegible]	95
ING													
ngineer	1	3	1000	3000	150	400	200						
ngineer	2	3	700	4200	150	400	200						
"	2	2½	500	2500	150	250	150						
	1	2	400	800			40						
Works	4	3	350	4200			200						
	3	3	350	3150			150						
t.	1	3	550	1650	150		100						
	2	3	200	1200			150						
	1	3	600	1800	150		100						
	2	3	300	1800			80						
	10	2½	15	375									
				24,675	750	1050	1370		[illegible]00	500	600	30,245	31
	1	3	600	1800	150		150						
	2	3	400	2400			150						
	2	2½	300	1500			100						
	1	2½	250	625			50						
	3	2½	15	113									
				6438	150		450				[illegible]0	[illegible]438	180
	1	3	700	2100	150		200						
	1	3	500	1500			75						
	1	2½	450	1125		150	70						
	2	3	400	2400			100						
	13	3	15	135									
				7260	150	150	445				400	8000	17
RATION													
tor	1	2½	450	1125			180						
tor	1	2½	450	1125			50						
	1	2½	250	625			50						
	4	2½	20	200			40						
				3075			220	1 [illegible]			500	[illegible]03	4
MITATION													
oons	2	2½	400	2000	100		90						
	3	2½	300	2250	100		50						
	1	2½	250	625			50						
	1	2½	250	625			50						
tor	1	2½	300	750			75						
	2	2½	12	60			-						
				6310	200		315	10	[illegible]00	500	500	[illegible]125	130
Grand Total.				53,258	1,250	1,200	2,810	1,000	[illegible],000	1,000	2,000	63,518	1094

UGANDA RAILWAY — Metre Gauge

KENYA MYERU EXTENSION — Length 27.78 Miles

MARUGU - TANA VALLEY

IV BRIDGEWORK

325

APPENDIX "K"

(A) Major Bridges 40' Span & Over

Description of Work.		
Name	-	MARUGU
Serial No	-	7
Mileage	-	1- 11
Height from bed of River to Formation.	-	62'0"
Foundations	-	2 ft on rock
Span	-	1-60' Girders 2-40' Girders.

No.	Rate	Unit	Quantity	Total Cost
Excavation Earth	27.00	per c.ft	8	216
" Soft Rock	45.00	per c.ft	4	180
Concrete Founds 1:3:6	1.50	per c.ft	2280	3420
Concrete Superstructure 1:3:5	1.75	per c.ft	27344	47852
Extra to Concrete for Height 1:3:5	1.75	per c.ft	1575	2756
Concrete in Piers 1:2:4	2.00	per c.ft	-	-
Dry Stone Backing & Pitching	40.00	per c.ft	40	1920.00
Pitching(Hand Set)	1.33	per sq.ft	-	-
Girder Blocks	6.00	each	64	384
Steelwork Complete erected.	40.00	per ton	2550.4	102016
(Mild Steel Iron) (Ballast Wall)	-	-	-	102
Bridge Gleeres	17.	each	100	1700
Keeper Bolts	1.	each	42	42
" Plates	1.	each	21	21
Earthworks to approaches	27.	per c.f	-	-
Temporary Works				5
Piling	6.00	per c.ft		-
Works Establishment			Lump sum	1200
				96320
		Contingencies 5%		4816
				101136

MIKA	KABOKO	CHARA
No.30	No.54	No.116
Mile 9.76	Mile 16.60	Mile 30.62
52 Feet	46 Feet	18 Feet
5 feet on rock	2 feet on Rock	4 feet on 18' Piles
2-60' Girders & 2-40' Girders	3-40' Girders	3-20' Girders.

No.	Quantity	Shs.	Quantity	Shs.	Quantity	Shs.
	7	189	8	216	9	243
	1.2	54	8	360	-	-
	4318	6477	1735	2603	3046	4569
	18312	32046	14300	25025	3688	6454
	5000	8750	2100	3675	-	-
	-	-	-	-	-	-
	30	1440	24	1152	10	480
	-	-	-	-	-	-
	112	392	48	168	48	168
	67.48	26992	33.90	13560	11.04	4416
	L.S.	182	L.S.	182	L.S.	142
	150	2550	90	1530	45	765
	600	600	360	360	180	180
	300	300	180	180	90	90
	-	-	-	-	-	-
	L.S.	8000	L.S.	102	L.S.	1000
	-	-	-	-	1740	8220
	L.S.	6000	L.S.	1200	L.S.	1200
		95972		50313		34927
Contingencies 5%		4699		2516		1246
TOTAL		98671		52829		36173

	Maragua Viaduct		Mathioya	
...ba-Saba	No. 179		No.227	
...127	Mile 44.15		Mile 50.00	
...eet	108 feet		37 feet.	
...feet on rock	2 feet on rock		4 feet on rock	
...' Girder	11-40' Girders		2-40' Girders	
	1-60' Girder		~~2-40' Girders~~	
	11-80' Girders		2-20' Girders.	

...o.	Quantity	Shs.	Quantity	Shs.	Quantity	Shs.
	7	189	10	270	7	189
	2	90	10	450	10	450
	3793	5690	6625	9938	4003	6004
	20167	35292	4015	7026	10700	18725
	5000	8750	-	-	4000	7000
	-	-	8618	17236	-	-
	50	2400	7	336	15	72
	-	-	-	-	500	668
	16	56	16	56	64	224
	11.3	4520	795.40	318160	29.96	11984
	L.S.	182	L.S.	182	L.S.	142
	30	510	480	8160	82	1394
	120	120	1920	1920	328	328
	60	60	960	960	164	164
	-	-	-	-	-	-
	-	591	L.S.	6000	L.S.	200
	-	-	-	-	-	-
	L.S.	1200	L.S.	8000	L.S.	1200
		69600		390894		49369.00
...tingencies 5%		2980		18936		2469.00
Total		72080		409829		51838.00

IV BRIDGEWORK Appendix "B" (continued).
A Major Bridges 40' Span and over (continued).

TARA	MAOATI	Name
No.251	No.257	Serial No.
Mile 54.20.	Mile 57.40	Mileage
26 feet	9 feet	Height Bed of River to Formation.
5 feet on rock. 2-60' Girders	4 feet on rock 2-20' Girders	Foundations. Span.

No.	Quantity.	Shs.	Quantity.	Shs.	Rate. Shs.Cts.	Unit.
	6	162	5	135	27.00	c Cuft
	6	270	-	-	45.00	"
	5580	8370	1080	1566	1.50	Cub:ft
	15173	26553	2067	3617	1.75	"
	2000	3500	-	-	1.75	"
	-		-	-	2.00	"
	40	1920	18	720	48.00	c Cuft
	500	665	-	-	1.33	Super ft:
	32	118	32	118	3.80	Cub Ft
	4488	17952	736	944	800.00	Ton
	L.S.	812	L.S.	142	-	L. Sum
	82	1394	30	510	17.00	each
	328	328	120	120	1.00	"
	164	164	60	60	1.00	"
	L.S.	1338	48	1296	27.00	c Cuft
	L.S.	3000	L.S.	800	-	L.Sum
	-	-	-	-	3.90	Cu:ft
	L.S.	1800	L.S.	1200	-	L.Sum
		67137		13832		
Contingencies 5%		3357		692		
Total.		70494		14198		

IV Bridgework.
(B) Minor Bridges under 40' to 6' Spans (Continued)

Description of Work.		Name	Karamaini.	
		Serial No.	8	
		Mileage.	1.50	
		Height:- Bed of River to Formation	39 feet.	
		Depth of Founds.	1 foot on rock.	
		Remarks.	1-12' Sur: Arch.	
	Shs. Cts.	Unit.	Quantity	Amount.
Excavation Earth.	27	%o Cuft.	-	
" Soft rock	45	"	12	54
Concrete in Founds (1:3:6)	1.50	Cub:ft	1688	2532
Concrete in Super-structure. (2:1)	1.75	"	6890	11858
Concrete in Arches etc. (4:1)	2.00	"	4400	8800
Dry stone Backing & Pitching.	48	"	50	2400
Pitching (hand set)	1.33	Sup:ft.	1200	1596
Girder Blocks.	3.50	Cubift	-	-
Steelwork complete.	400	ton	-	-
Channel Iron Ballast wall.		L Sum	-	-
Bridge sleepers.	19.00	each	-	-
Sleeper bolts.	1.00	"	-	-
Sleeper plates.	1.00	"	-	-
Arch centres & Lagging	8.10	Lin:ft	100	810
Earthwork to approaches	27.00	%o Cuft	10	270
Temporary works.	-	L. sum	-	-
Extra to concrete for height.	1.22	Cuft	-	-
Works Establishment.	-	L. sum	-	-
				28320
		Contingencies 5%		1416
		Total.		29736

IV Bridgework Appendix "L"
(B) Minor Bridges under 40' to 6' Span (Continued)

	Lawford's Stream.		Thika Siding Tramline.		Sasuru.	
	No.33 Mile 10.60 46 feet 1 foot on rock. 1-6' Surcharged arch.		No.38. Mile 12.15 12 feet 2 feet on Murrum 1-12' Girder.		No.42 Mile 13.16 34 feet 4 feet on rock 1-20' Sur: arch.	
No.	Quantity.	Shs.	Quantity	Shs.	Quantity	Shs.
	115	31	12	32	6,000	162
	2	90	-	-	-	-
	1350	2025	1504	2256	6804	10206
	4000	7000	3306	5786	9680	16853
	2950	5900	-	-	6120	12240
	40	1920	12	576	3500	168
	900	1197	-	-	2000	2660
	-	-	16	56	-	-
	-	-	188	752	-	-
	-	-	L.S.	116	-	-
	-	-	9	153	-	-
	-	-	36	36	-	-
	-	-	18	18	-	-
	134	1005	-	-	71	575
	10	270	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
		19518		9781		43854
Contingencies 5%		976		489		2143
Total.		20494		10270		45997

Kitina.	Genia Valley.	Genia Valley.
No.67 Mile 19.25 22 feet 2 feet on rock 1-16' Surcharged arch.	No.72. Mile 20.34 5 feet 4 feet on rock 2-12' Girders	No.73 Mile 20.79 7 feet 4 feet on rock 1-12' Girder

No.	Quantity.	Shs.	Quantity.	Shs.	Quantity	Shs.
	5	135	36	97	30	81
	-	-	-	-	-	-
	1442	2163	2960	4440	2720	4080
	2410	4218	1368	2394	1600	2800
	1320	2640	-	-	-	-
	18	864	5	240	6	288
	500	665	-	-	-	-
	-	-	32	112	16	56
	-	-	376	1504	188	752
	-	-	L.S.	116	L.S.	116
	-	-	18	306	9	153
	-	-	72	72	36	36
	-	-	36	36	18	18
	60	486	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	L.S.	400	L.S.	400	L.S.	400
		11571		9717		8780
	Contingencies	578		486		439
	5%					
	Total.	12149		10203		9219

IV Bridgework Appendix "D"
(B) Minor Bridge under 40' to 6' Span (Continued)

Makuyu Tramline.	Makuyu	Little Saba - Saba.
No.99 Mile 27.42. 10 feet 4 feet on murrum 1-12' Girder	No.111 Mile 29.68. 5 feet 4 feet on Hard pan 1-12' Girder	No.131 Mile 33.76 25 feet 1 foot on rock 1-20' Sur: Arch.

Item No.	Quantity	Shs.	Quantity	Shs.	Quantity	Shs.
1	3	81	3	81	-	-
2	-	-	-	-	3	185
3	2720	4080	2720	4080	-	1922
4	2354	4120	1180	1965	-	14082
5	-	-	-	-	-	7414
6	8	384	5	240	35	1680
7	-	-	-	-	900	1197
8	16	56	16	56	-	-
9	188	752	188	752	-	-
10	L.S.	116	L.S.	116	-	-
11	9	153	9	153	-	-
12	36	36	36	36	-	-
13	18	18	18	18	-	-
14	-	-	-	-	43	348
15	-	-	6	162	7	189
16	-	-	-	-	-	-
17	-	-	-	-	-	-
18	-	-	-	-	-	-
		9796		8659		26967
Contingencies 5%		490		383		1348
		10286		8042		28315

(B) Minor Bridges under 40' to 6' Span (Continued)

Itheru (1)	Itheru (11)	Kithanji (1)
No.138 Mile 36.57 8 feet 2 feet on rock. 2-12' Girders.	No.139. Mile 37.48. 5 feet Surface rock 1-12' Girder	No.143 Mile 38.46 10 feet 4 feet on hard pan 1-20' Girder

ar No.	Quantity.	Shs.	Quantity	Shs.	uantity	Shs.
1	5	135	-	-	6	162
2	-	-	1	45	-	-
3	1480	2220	-	-	3008	4512
4	1368	2394	1940	3176	2550	4463
5	-	-	-	-	-	-
6	5	240	5	240	10	480
7	-	-	-	-	-	-
8	32	112	16	56	16	56
9	376	1504	188	752	368	1472
10	L.S.	116	L.S.	116	L.S.	142
11	18	306	9	153	18	306
12	72	72	36	36	60	60
13	36	36	18	18	30	30
14	-	-	-	-	-	-
15	15	375	-	-	15	412
16	-	-	-	-	L.S.	200
17	-	-	-	-	-	-
18	L.S.	400	L.S.	400	L.S.	400
		7840		3986		13644
	Contingencies 5%	392		199		632
	Total.	8232		4185		13276

IV BRIDGEWORK APPENDIX "L"
(B) MINOR BRIDGES UNDER 40' to 6' SPAN (CONTINUED)

	lthanji (II)		Fort Hall		Komo River.	
	No.164 Mile 48.63. 40 feet 1 foot on rock urcharged Arch.		No.191. Mile 45.96 33 feet 4 feet on clay 1-6' Surcharged Arch.		No.18 Mile 5.28 35 feet 4 feet on rock 1-30' Surcharged arch.	
.	Quantity.	Shs.	Quantity.	Shs.	Quantity.	Shs.
	15	41	12	324	8	216
	3	135	-	-	-	-
	3090	5135	4084	6126	6944	10416
	11098	19422	3054	5345	9800	17150
	8360	16720	1980	3960	6380	12760
	80	3840	30	1440	85	4080
	-	-	600	798	2000	2660
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	97	786	90	729	74	599
	-	-	-	-	60	1620
	L.S.	1000	-	-	-	-
	-	-	-	-	-	-
	L.S.	1200	L.S.	352	L.S.	1200
		46279		19074		50701
ngencies 5%		2314		954		2535
		48593		20028		53236.

UGANDA RAILWAY

THIKA - NYERI EXTENSION

NDARUGU TO TANA VALLEY

MAJOR BRIDGES

ABSTRACT OF QUANTITIES STEEL & CONCRETE WORK

Serial No.	Steelwork tons	Concrete Quantity	cu.ft Total Quantity
	45.04	2,280	
		27,344	
		11,500	
		84 =	41,208
	67.48	4,318	
		18,312	
		5,000	
		112	27,742
	33.90	1,735	
		14,300	
		2,100	
		48	18,183
	11.04	3,046	
		3,688	
		48	5,782
	11.30	3,793	
		20,167	
		5,000	
		16	28,976
	795.40	6,628	
		4,015	
		8,618	
		16	19,274
	29.96	4,008	
		10,700	
		4,000	
		64	18,767
	44.88	5,580	
		15,173	
		2,000	
257	7.36	1,066	
		2,067	
		32	3,165
Brought Forward	1039.00		163,717
Total	1046.36	Total	186,882

KENYA RAILWAY

THIKA - NYERI EXTENSION

NDARUGU TO TANA VALLEY

MINOR BRIDGES

ABSTRACT OF QUANTITIES OF STEELWORK & CONCRETE

Steelwork Tons	Concrete C.ft Quantity	Concrete C.ft Total Quantity
	1,688	
	6,890	
	4,400	12978
	6,944	
	9,800	
	6,380	23,124
	1,350	
	4,000	
	2,950	8,300
1.88	1,504	
	3,306	
	16	4,826
	6,804	
	9,630	
	6,120	22,554
	1,442	
	2,410	
	1,320	5,172
3.76	2,960	
	1,368	
	32	4,360
1.88	2,720	
	1,600	
	16	4,336
1.88	2,720	
	2,354	
	16	5,090
1.88	2,720	
	1,180	
	16	3,916
t Fd.11.28		94,656

Serial No.	Steelwork Tons	Concrete C.ft Quantity	Concrete C.ft Total Quantity
Brought Forward	11.28		94656
131		1281	
		8047	
		3,707	13,035
138	3.76	1,480	
		1,368	
		32	2,880
139	1.88	1,240	
		16	1,256
143	3.68	3,008	
		2,550	
		16	5,574
164		2,090	
		11,098	
		8,360	21,548
191		4,084	
		3,054	
		1,980	9,118
Total	20.60		148,067

APPENDIX

COST OF STEELWORK.

DESCRIPTION		Cost. Shs. Cts.
lwork Cost in England F.O.B. £12.10.0 per ton.		205. 00
n Freight £1-5-0 per ton.		25. 00
ing Charges	per ton.	6. 00
way Freight		
KDN to NRB	330 miles	
NRB to TMA	32 "	
Allow 30 miles on new Construction	30 "	
	392 "	
392 miles @ -/04 cents per ton per mile		15.68
ing & unloading at Coast & Thika per ton		4.00
n Agents & Consulting Engineer's charges		5.00
our Erecting Steelwork		100.00
Contingencies		39.32
Total cost per ton =		400.00

APPENDIX "J"

DETAILED COST OF CONCRETE

Description.	Amount.
Cost of Cement Concrete Average 5:1	Shs. Cts.
Ballast 100 c.ft @ Shs.11/- per 100 c.ft	11. 00
Sand 50 c.ft @ Shs.6/- per 100 c.ft	3. 00
Cement 20 c.ft @ Shs.4.44 per cask @ Shs. 17/46 per cask	77. 52
Labour Mixing & Depositing	9. 40
Shuttering for use of per 100 c.ft	3. 30
Railway Freight	
Cement	
4.44 Cask will weigh @ 400 lbs each.	
1776 lbs = .8 tons	
Distance from NRB to KIN = 330 miles	
" " NRB to TKA = 32 "	
362 "	
362 x .8 x .04 per 100 c.ft =	11. 58
Sand.	
Kima to Nairobi = 70 miles	
NRB to Thika = 32 "	
102 "	
Taking sand as 2.5 tons per 50.ct	
= 2.5 x 102 x .04 per 100 c.ft =	10. 20
Road Transport	
Cement	
.8 tons x .50shs. per ton x 30 miles	12. 00
Sand	
2.5 x .50 shs. per ton x 30 miles	37. 00
per 100 cu.ft	175. 00
Averages 1-3-6 1/50 per.ct. 1-2-5 1/75 per c.ft for 1 1-2-4 2/- per c.ft) c.ft	1. 75.

COST OF PERMANENT WAY PER MILE

		Shs.
Permanent Way from Uganda Railway Main Line	=	15,000.00
Freight 322 Miles @ -/04 per ton per mile. Weight of one mile 154.11 tons		
322 x 154.11 x .04	=	1,985.00
Loading & Unloading 4/- per ton		
4 x 154.11	=	617.00
Labour Laying, Linking, Packing & Boxing, including 1st & 2nd. lift £100 per mile	=	2,000.00
		Shs19,602.00
	=	£980. per mile.

COLONY & PROTECTORATE

OF KENYA

340

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge

Length 75.49 Miles.

REPORT, ESTIMATES AND APPENDICES

Enarosura

August, 1923.

THIKA - NYERI EXTENSION.

Metre Gauge: **Length 75.49 miles.**

REPORT AND ESTIMATES.

1. PRELIMINARY.

References.

Report on the Reconnaissance Survey of the proposed Nairobi - Kikuyu - Fort Hall - Kenya Railway, 1907, by Captain A. C. Stevenson, R.E.

Report on the Construction of the Thika Railway by the Director of Public Works, Kenya, contained in the annual Report of the Public Works Department, 1913 - 1914.

Report on the Preliminary Survey of the proposed Thika - Punda Milia Railway by Mr. A. F. Church, C.E.A., Chief Engineer, Uganda Railway, 1919.

Report on the Reconnaissance Survey of a proposed line from Punda Milia to Kambicho Falls, 1920, by Mr. H. M. Birch.

Report on the Reconnaissance Survey from Kambicho Falls to Nyeri, 1920, by Captain A. L. Cunningham.

THIKA - NYERI EXTENSION.

Metre Gauge: Length 75.49 miles.

REPORT AND ESTIMATES.

1. PRELIMINARY.

References. Report on the Reconnaissance Survey of the proposed Nairobi - Kikuyu - Fort Hall - Kenya Railway, 1907, by Captain A. C. Stevenson, R.E.

Report on the Construction of the Thika Railway by the Director of Public Works, Kenya, contained in the Annual Report of the Public Works Department, 1913 - 1914.

Report on the Preliminary Survey of the proposed Thika - Fumda Milia Railway by Mr. A. J. Church, C.E.E., Chief Engineer, Uganda Railway, 1919.

Report on the Reconnaissance Survey of a proposed line from Fumda Milia to Kambicho Falls, 1920, by Mr. H. M. Birch.

Report on the Reconnaissance Survey from Kambicho Falls to Nyeri, 1920, by Captain A. L. Cunningham.

Report by a Departmental Committee convened to make an economic survey of the district proposed to be served by the proposed Thika-Nyeri Railway, 1921.

Report on the Reconnaissance Survey of the district between Kambicho and Nyeri to ascertain the best route for a Railway, 1922 - by Mr. H. M. Birch.

Cablegram dated 27th. June, 1922, from the Right Honourable Secretary of State for the Colonies to His Excellency The Governor of Kenya, stating that he cannot agree to the construction of the Thika-Nyeri Railway being commenced until a detailed survey has been made and plans, specifications and estimates prepared and proposing that Lt. Colonel J. K. Robertson undertake the survey.

Cablegram No. 222, dated 21st. July, 1922, from The Honourable Colonial Secretary, Kenya, to the Right Honourable Secretary of State for the Colonies, requesting authority to proceed with the survey of the proposed Thika-Nyeri Railway.

Cablegram dated 5th. July, 1922, from the Right Honourable Secretary of State for the Colonies to His Excellency The Governor of Kenya, authorising the survey of the proposed Thika-Nyeri Survey.

Letter No. 18187/5/62 of the 1st. August, 1922, from the Honourable Colonial Secretary to the Chief Engineer, Construction and Survey of Railways conveying His Excellency, The Governor's instructions as to the character of the proposed Railway.

Cablegram dated 27th. March, 1923, from the Right Honourable The Secretary of State for the Colonies to His Excellency, The Governor of Kenya, instructing that the particulars of the route proposed and of alternative routes and the estimated cost of the construction should be submitted for approval.

II. GENERAL SUMMARY.

The Thika-Nyeri Railway is designed to form an extension of the Thika Branch Railway of the Uganda Railway. It has, therefore, been surveyed for a metre gauge Railway.

III. HISTORY OF PROJECT.

pletion of the nda Railway, 1903.

The completion of the Uganda Railway in 1903 and the expansion of European settlement in East Africa led to extensive agricultural development in the fertile Highland areas around Nairobi, the eastern slopes of the Kikuyu Escarpment, the eastern slopes of the Aberdare Range around Nyeri, and the western slopes of Mount Kenya. Following this development the increasing production of maize, coffee and sisal within these areas necessitated the constant improvement of means of transport.

leading, within four years of the opening of the Uganda Railway, to the inception and consideration of schemes for the construction of Railways to serve these rapidly developing areas.

onnaissance
vey by Capt.
venson, R.E.
1907.

The earliest proposal was put forward in 1907 by Captain A. C. Stevenson, R.E., who submitted a report to the Administration of the Protectorate recording the results of a reconnaissance carried out by himself and Lt. H. A. L. Hall, R.E., with the object of ascertaining how best railways could be laid out to serve the area lying to the North-east of Nairobi in the Thika, Fort Hall, Embu and Nyeri districts.

In his report, Captain Stevenson describes a number of distinct and separate alignments; the principal proposals advanced refer to :-

Route No. 1. A line from Nairobi to the Tiba River on the slopes of Mount Kenya.

The proposed line is 99 miles long, with a maximum degree of curvature of 10 degrees, (573 feet radius), and a ruling gradient of 1½ per cent, with an extension of the line from the Tiba River to a point where the Rupingazi River debouches from the forest. The length of the extension is 23 miles, the ruling grade 3 per cent with the traffic from the forest and 1½ per cent against the forest, maximum degree of curvature 10 degrees.

These lines are shown in red on the attached plan.

Route No. 2. A line from Nairobi to Fort Hall.

This line is shown in purple on the attached plan.

Discussing this Route, Captain Stevenson writes:-

"A Line starting from Kikuyu or Nairobi Stations "on the Uganda Railway, and running towards "Fort Hall and Kenya has to cross the drainage "from the Kikuyu Escarpment. A line from "Kikuyu is accordingly absolutely impracticable "as it would have to cross valley after valley; "in some places as many as three per mile "falling to a depth from 100' - 800' with steep "sides. These valleys are further too narrow "to take a curve, some of them being barely "50' wide in the bed."

Later, when discussing viaducts Captain Stevenson states :-

"The principal difficulty in the construction "of the Kikuyu - Thika - Fort Hall line lies in "the crossing of the narrow deep valleys which "are met with on the route chosen."

Route No. 3. A line from Athi River Station on the Uganda Railway to the Tiba River.

The length of this proposed Railway is 92 miles, a ruling gradient of 1½ per cent, maximum degree of curvature 10 degrees. This line is coloured blue on the attached plan.

Western Branch. A line commencing from Mile 81 on Route No.1 and passing up the Ragati River Valley and thence along the Western slopes of Mount Kenya.

Captain Stevenson refers to this line as the "Western Branch". The length of this line is 62½ miles. A gradient of 4 per cent (compensated) is reported necessary between Mile 8 and Mile 20. The remainder of the line, it is stated, should not have a gradient greater than 2 per cent.

By the use of reversing stations to cross the rivers at Miles 25 and 27, a minimum curvature of 10 degrees will permit of cheap construction. This branch line, it is considered, may eventually become the main line running to Lake Rudolf and the Abyssinian Border. The branch would open up the Highlands lying between Kenya and the Aberdare Range and the area to the North along the Guaso Nyiro. This line is coloured black on the attached plan.

Discussing this line Captain Stevenson writes:-

"There does not appear to be sufficient "prospects of traffic to warrant the construction "of the 'Western Branch' for many years to "come - a road could easily be made along "practically the same route."

Western Branch. A line commencing from Mile 81 on Route No.1 and passing up the Ragati River Valley and thence along the Western slopes of Mount Kenya.

Captain Stevenson refers to this line as the "Western Branch". The length of this line is 62½ miles. A gradient of 4 per cent (compensated) is reported necessary between Mile 8 and Mile 20. The remainder of the line, it is stated, should not have a gradient greater than 2 per cent.

By the use of reversing stations to cross the rivers at Miles 25 and 27, a minimum curvature of 10 degrees will permit of cheap construction. This branch line, it is considered, may eventually become the main line running to Lake Rudolf and the Abyssinian Border. The branch would open up the Highlands lying between Kenya and the Aberdare Range and the area to the North along the Guaso Nyiro. This line is coloured black on the attached plan.

Discussing this line Captain Stevenson writes:-

"There does not appear to be sufficient "prospects of traffic to warrant the construction "of the 'Western Branch' for many years to "come - a road could easily be made along "practically the same route."

struction of
robi - Thika
lway, 1910.

The next definite step in the development of transport facilities in the district was the construction of the Nairobi-Thika Railway, which was authorised and commenced in 1910, during the period of administration of the Protectorate by Sir E. P. Girouard. The route adopted for the Railway follows the alignment recommended by Captain Stevenson in his Report of 1907 for a Railway from Nairobi to the Tiba River via Thika and Fort Hall - Route No. 1.

The Railway was completed towards the end of 1913. It is 32 miles long, the ruling gradient is 3 per cent, and maximum radius of curvature 10 degrees. The characteristics of the Railwway closely approximate those of the Uganda Railway.

liminary
rvey for Ex-
sion of
ka Rly. to
nda Milia.
1919

On the completion of the Thika Branch Railway, consideration of its extension arose almost immediately, and a project for a district Railway commencing at Thika and terminating in the vicinity of Punda Milia was prepared in 1919 by Mr. A. E. Hamp, under the Uganda Railway Administration. The route of the proposed Railway followed a most circuitous alignment down the valley of the Thika River and thence back to Punda Milia, being designed in the nature of an agricultural light Railway laid out to serve a large number of sisal plantations. The distance from Thika to Punda Milia by an air line is 14 miles.

nstruction of
irobi - Thika
lway, 1910.

The next definite step in the development of transport facilities in the district was the construction of the Nairobi-Thika Railway, which was authorised and commenced in 1910, during the period of administration of the Protectorate by Sir E. P. Girouard. The route adopted for the Railway follows the alignment recommended by Captain Stevenson in his Report of 1907 for a Railway from Nairobi to the Tiba River via Thika and Fort Hall - Route No. 1.

The Railway was completed towards the end of 1913. It is 32 miles long, the ruling gradient is 3 per cent, and maximum radius of curvature 10 degrees. The characteristics of the Railwway closely approximate those of the Uganda Railway.

eliminary
rvey for Ex-
nsion of
ika Rly. to
nda Milia.
1919

On the completion of the Thika Branch Railway, consideration of its extension arose almost immediately, and a project for a district Railway commencing at Thika and terminating in the vicinity of Punda Milia was prepared in 1919 by Mr. A. E. Hamp, under the Uganda Railway Administration. The route of the proposed Railway followed a most circuitous alignment down the valley of the Thika River and thence back to Punda Milia, being designed in the nature of an agricultural light Railway laid out to serve a large number of sisal plantations. The distance from Thika to Punda Milia by an air line is 14 miles.

The length of the proposed Railway is 32½ miles with a ruling gradient of 1 per cent. This Railway is shown green on the attached plan.

The results obtained from this survey, together with the results of Captain Stevenson's reconnaissance of 1907 indicated the feasibility of the construction of a Railway to Punda Milia with a ruling gradient of 1½ per cent, of a not very expensive character.

connaissance rvey, Punda lia to Kam- ho Hill, 1920.

In 1920 a reconnaissance survey of a proposed further extension was carried out by Mr. H. M. Birch of the Public Works Department, commencing from the point at which Mr. Hamp's survey of 1919 terminated near Punda Milia. The reconnaissance was directed along a line towards Kambicho Falls, which occur on the Tana River, two miles above the confluence of that river with the Mathioya River and directly east of Kambicho Hill. The route reconnoitered by Mr. Birch followed closely the alignment described by Captain Stevenson in his Report on the reconnaissance survey of 1907 for a line from Nairobi to the Tiba River via Thika and Fort Hall, Route No. 1.

The chief object of this reconnaissance was to ascertain whether or not an alignment on a 2 per cent or 1½ per cent grade could be obtained between Punda Milia and Kambicho Falls, for if the results of this reconnaissance survey disclosed the feasibility of the extension of the Thika Branch Line to Fort Hall being obtained on an alignment with a ruling gradient of 1½ per cent, it was becoming apparent that the re-alignment of the Thika

The length of the proposed Railway is 32½ miles with a ruling gradient of 1 per cent. This Railway is shown green on the attached plan.

The results obtained from this survey, together with the results of Captain Stevenson's reconnaissance of 1907 indicated the feasibility of the construction of a Railway to Punda Milia with a ruling gradient of 1½ per cent, of a not very expensive character.

onnaissance rvey, Punda lia to Kam- ho Hill, 1920.

In 1920 a reconnaissance survey of a proposed further extension was carried out by Mr. H. M. Birch of the Public Works Department, commencing from the point at which Mr. Hamp's survey of 1919 terminated near Punda Milia. The reconnaissance was directed along a line towards Kambicho Falls, which occur on the Tana River, two miles above the confluence of that river with the Mathioya River and directly east of Kambicho Hill. The route reconnoitered by Mr. Birch followed closely the alignment described by Captain Stevenson in his Report on the reconnaissance survey of 1907 for a line from Nairobi to the Tiba River via Thika and Fort Hall, Route No. 1.

The chief object of this reconnaissance was to ascertain whether or not an alignment on a 2 per cent or 1½ per cent grade could be obtained between Punda Milia and Kambicho Falls, for if the results of this reconnaissance survey disclosed the feasibility of the extension of the Thika Branch Line to Fort Hall being obtained on an alignment with a ruling gradient of 1½ per cent, it was becoming apparent that the re-alignment of the Thika

Branch line to secure the elimination of the 3 per cent portions would have to be undertaken.

In reporting on this reconnaissance survey Mr. Birch states that in his opinion :-

"(1) The proposed alteration of the existing "3 per cent gradient of the Thika Line to "that of a 1½ per cent or 2 per cent is not "advisable as it would prove cheaper to build "a new 1½ per cent line on another alignment."

(2) The proposed extension of the Thika Line to "Punda Milia on a 1 per cent gradient is not "justifiable in that it is too circuitous "for a main line route."

(3) The route via Saba-Saba and Kambicho is "worth consideration, but only in conjunction "with other surveyed lines. The great draw-"back being that the level of the Tana Valley "is reached on a falling grade involving "heavy work, only to be confronted with the "practically inaccessible Nyeri country "looming ahead."

nnaissance
rey from Kam-
o Hill to
i by Capt.
ingham, 1920.

The "inaccessible Nyeri country" north, and beyond the Tana River and Kambicho Hill, was examined in 1920 by Captain C. L. Cunningham with the object of investigating the feasibility of routes for the continuation of the Railway beyond Kambicho Falls on the Tana River towards Nyeri.

Captain Cunningham's main conclusions are :-

Branch line to secure the elimination of the 3 per cent portions would have to be undertaken.

In reporting on this reconnaissance survey Mr. Birch states that in his opinion :-

"(1) The proposed alteration of the existing "3 per cent gradient of the Thika Line to "that of a 1½ per cent or 2 per cent is not "advisable as it would prove cheaper to build "a new 1½ per cent line on another alignment."

(2) The proposed extension of the Thika Line to "Punda Milia on a 1 per cent gradient is not "justifiable in that it is too circuitous "for a main line route."

(3) The route via Saba-Saba and Kambicho is "worth consideration, but only in conjunction "with other surveyed lines. The great draw-"back being that the level of the Tana Valley "is reached on a falling grade involving "heavy work, only to be confronted with the "practically inaccessible Nyeri country "looming ahead."

nnaissance ey from Kam- o Hill to i by Capt. ingham, 1920.

The "inaccessible Nyeri country" north, and beyond the Tana River and Kambicho Hill, was examined in 1920 by Captain C. L. Cunningham with the object of investigating the feasibility of routes for the continuation of the Railway beyond Kambicho Falls on the Tana River towards Nyeri.

Captain Cunningham's main conclusions are :-

(1) " That the choice of routes from Kambicho "Hill onwards is exceedingly limited, be- "ing confined to a compromise between the "mountainous and broken country of the "Tana River, and its numerous tributaries, "and the folded slopes and corrugations of "Mount Kenya."

(2)" That it appears to be possible to effect "such a compromise and remain within the "reasonable limits of cost and grade by "selecting a route passing through the "neighbourhood of Karatina, the first ob- "jective, and thence to a point on the spur "of Itatite, somewhere about the junction "of the Mesara and the Kathita Rivers, the "second objective."

(3)" That between the Ragati and Tana Rivers "watershed there is no obvious or definite "route over which a line could reach Kara- "tina."

(4)" That the Ragati-Sakumi watershed might "possibly afford such an opportunity."

(5)""That the country is much broken and inter- "sected by numberless streams and valleys, "and a line could only be traced by an in- "tensive and careful survey which might "disclose a series of fortuitous accidents "in the formation enabling the surveyor to "maintain an up-grade over the greater length "of the section."

(1) " That the choice of routes from Kambicho "Hill onwards is exceedingly limited, be- "ing confined to a compromise between the "mountainous and broken country of the "Tana River, and its numerous tributaries, "and the folded slopes and corrugations of "Mount Kenya."

(2)" That it appears to be possible to effect "such a compromise and remain within the "reasonable limits of cost and grade by "selecting a route passing through the "neighbourhood of Karatina, the first ob- "jective, and thence to a point on the spur "of Itatite, somewhere about the junction "of the Mesara and the Kathita Rivers, the "second objective."

(3)" That between the Ragati and Tana Rivers "watershed there is no obvious or definite "route over which a line could reach Kara- "tina."

(4)" That the Ragati-Sakumi watershed might "possibly afford such an opportunity."

(5)""That the country is much broken and inter- "sected by numberless streams and valleys, "and a line could only be traced by an in- "tensive and careful survey which might "disclose a series of fortuitous accidents "in the formation enabling the surveyor to "maintain an up-grade over the greater length "of the section."

The first and fourth of these conclusions will be recognised as approximating to the route referred to by Captain Stevenson as his "Western Route."

ond Reconnaiss-
e Survey, Punda
ia via Fort Hall
bicho to Nyeri
Mr. Birch, 1922.

The further examination of this sub-montane district was undertaken in 1922 by Mr. H. M. Birch, who was requested by the Administration of the Uganda Railway to "reconnoitre the whole area between Kambicho and Nyeri district to ascertain the best route for a Railway."

To ascertain the best route for a Railway Mr. Birch proceeded to establish whether or not it was feasible :-

(1) "To eliminate the necessity for going "down and around Kambicho Hill and so save "both height and distance."

(2) "To find, for economies sake, a 2 per cent "(compensated) ridge route."

(3) "If (2) failed, to find a valley or inter-"mediate 1.5 per cent (compensated) line."

(1) and (3) were accomplished but (2) was not accomplished.

In discussing (1) Mr. Birch writes :-

"It should be noticed that by going around "Kambicho Hill both distance and height "are sacrificed."

Mr, Birch further writes :-

"The topography of the country lends itself "to a direct 1.5 per cent high level line "nearly six miles shorter than the Kambicho "Line, but obviously only at the cost of heavy "construction. It may be definitely asserted "that no intermediate alignment is practicable "between these routes."

In summing up the results of his investigations as to the feasibility of the Ridge Route, Mr. Birch states :-

"The country between the watershed of the Tana "and Ragati is much broken, and only by follow- "ing a "natural road" along the ridge on the "western bank of the Sakumi River is a direct "4 per cent grade to Karatina possible. The "immediate development on the falling maximum "grade is then necessary to make good the "junction of the Mesara River at Mile 27 on "Captain Stevenson's route line, only to rise "again to a second summit near the headwaters "of the Rongai River."

During the reconnaissance of the Valley Route referred to in (3) a 1½ per cent grade route was traced from the summit 10 miles north of Nyeri, which forms the watershed between the river systems of the Uaso Nyiro and Tana Rivers, to a point 68 miles south where the trace is able to get on terms with the proposed alignment at Bunda Milia.

The trace of this "Valley Route" lies entirely in the valleys of the rivers Rongai, Amboni, Chania and Sagana, which form the headwaters of the Tana River and which flow southwards in a great deep valley which bisects the Kikuyu Native Reserve.

Throughout the greater part of the length of the valley the river courses are tortuous; the valley sides are rocky and precipitous and intersected by a constant succession of deep ravines between which project abrupt spurs; the floor of the valley is not much more in width than the river bed.

The final crossing of the Tana River is at the point where the trace, leaving the Tana Valley, crosses to the right bank and continues along the high level route to avoid the detour to the East of Kambicho Hill, thereby effecting a saving of six miles of distance and 640 feet of fall. Discussing the bridge site, Mr. Birch writes :-

> "The Tana River, although at this point only 90
> "feet wide is liable to heavy floods and a bridge
> "of a clear span of 100 metres would be necessary."

Continuing along the 1.5 per cent high level route, the trace, lying between Kangure and Kituri Hills, approaches the Mathioya River near Fort Hall where it is reported that :-

> "In order to cross the Mathioya River under
> "Fort Hall the choice lies between a tunnel
> "some 2,000 feet long and two short viaducts
> "or a viaduct on the curve some 90' high and
> "800' long with heavy approaches in rock
> "cuttings at both ends."

The construction of a railway following this route would therefore be attended with very great difficulties and entail heavy expenditure.

Mr. Birch's recommendations are :-

(1) "Captain Stevenson's line around Kambicho "be abandoned, entailing as it does, the "sacrifice of some six miles in distance "and 640 feet in height; and also that the "Ridge Route be rejected on account of "excessive grade and unnecessary rise and "fall."

(2) "The suggested 1.5 per cent compensated "Valley Line be approved wholly on account "of its reasonable ruling grade."

(3) "The suggested 1.5 per cent compensated "high level line from Punda Milia to the "Saddle being constructed as being direct and "economical in regard to both height and "distance."

(4) "A Changing Station or Terminus be built "at Mile 22, near the Tana River crossing, "and within Government Reserve Land in the "vicinity for a township area."

(5) "That all bridges and viaducts be a "combination of rail and road, or rail and "bridge for the use of the vehicular and "pedestrian traffic."

(6) "A complete and detailed survey of the approved "route to be made as being desirable from a "business and financial point of view, notwith- "standing the possible curtailment from the "Terminus of some two miles of construction."

(7) "If it is not possible to construct the entire "project by one appropriation, items (3) and (6) "should take precedence.

"Should sufficient funds not be forthcoming to "build a Railway further than in the vicinity "of Fort Hall, the topography of the country "clearly indicates that the Terminus both of "road and rail should be on the Tana River, about "one mile above its confluence with the Ragati "River," - thus concurring with a similar suggestion made by Captain Stevenson in his Report on the Reconnaissance Survey of 1907.

IV. SURVEY OF 1922 - 1923.

In July, 1922, instructions were issued to Lieutenant Colonel Robertson to carry out a survey for a railway from a suitable point on the Thika Branch Railway to the vicinity of Nyeri, a distance of about 81 miles. These orders necessitated the examination and survey of the country for a distance of 18 miles north of Nyeri to the watershed dividing the Uaso Nyiro and the Tana River systems.

During August and September the Chief Engineer accompanied by Mr. Pollok, made a careful reconnaissance of the whole country from Ndungu, Mile 25

on the Thika Branch Railway, to Fort Hall, and from Fort Hall to the Uaso Nyiro Watershed. This reconnaissance had valuable results. It led to a careful study in the field of the Reports on the previous reconnaissances and the examination of the routes proposed and disclosed the extent of operations to be undertaken to establish the merits of the alternative proposals and the problems to be studied and solved by the Survey.

In September, two divisions were in the field; one, under Mr. H. F. Birchal, commenced preliminary survey early in August, working from Ndrugu, Mile 25 on the Thika Branch Railway to Fort Hall, the other under Mr. J. Pollok, commenced survey early in September, working from the Uaso Nyiro Watershed towards Fort Hall.

By 15th. December, Mr. Birchal's division had completed the preliminary survey on a 1.5 per cent grade of the section Ndrugu to the Tana River, a distance of 56 miles, and Mr. Pollok's division had carried the survey from the Watershed down the Valley of the Rongai, Amboni, Nairobi and Saguna Rivers to the junction of the Chania and Saguna Rivers, a distance of 15.6 miles on a 1.5 per cent grade.

Mr. Birchal's division then took over the survey of the Valley Route from Mr. Pollok's division, which returned to a point on the Valley Route, Mile 111, and commenced the preliminary survey of a High Level Route towards Fort Hall.

The survey of these routes was continued during December, 1922, and January, 1923. Mr. Birchal's division had, by that date, carried the survey down the Valley to the junction of the Saguna and Gura Rivers, a further distance of 10½ miles, and Mr. Pollok's division had completed the survey of the High Level Route on a 1.5 per cent grade to a point on the east side of the Ragati River opposite the junction of the Ithanga and Ragati Rivers, a distance of 16 miles. At the middle of January, therefore, Mr. Birchal's division was at the junction of the Gura and Saguna Rivers and Mr. Pollok's division in the Ragati Valley, about 5 miles north of Kiangai Hill, both working south towards Fort Hall.

On the 13th. January, 1923, a meeting was held at Government House for the consideration of a programme for the preparation of projects for the construction of additional railways in the Colony. With reference to the Nyeri Railway it was decided that the final survey, including staking out, preparation of Working Plans, Sections and Estimates of the Section, Ndrugu to Tana River, should be proceeded with at once and instructions to this effect were conveyed to the Chief Engineer.

Towards the end of January the Chief Engineer visited the survey to make the necessary arrangements

The survey of these routes was continued during December, 1922, and January, 1923. Mr. Birchal's division had, by that date, carried the survey down the Valley to the junction of the Sagana and Gura Rivers, a further distance of 10½ miles, and Mr. Pollok's division had completed the survey of the High Level Route on a 1.5 per cent grade to a point on the east side of the Ragati River opposite the junction of the Ithanga and Ragati Rivers, a distance of 16 miles. At the middle of January, therefore, Mr. Birchal's division was at the junction of the Gura and Sagana Rivers and Mr. Pollok's division in the Ragati Valley, about 5 miles north of Kiangai Hill, both working south towards Fort Hall.

On the 13th. January, 1923, a meeting was held at Government House for the consideration of a programme for the preparation of projects for the construction of additional railways in the Colony. With reference to the Nyeri Railway it was decided that the final survey, including staking out, preparation of Working Plans, Sections and Estimates of the Section, Nairugu to Tana River, should be proceeded with at once and instructions to this effect were conveyed to the Chief Engineer.

Towards the end of January the Chief Engineer visited the survey to make the necessary arrangements

to comply with these instructions. Mr. Pollok was then transferred to the Trans Nzoia Railway Survey and the two divisions combined under the charge of Mr. Birchal.

One party then commenced the final survey and staking out from the Tana River, Mile 56, towards Fort Hall, and one from Ndrugu towards Fort Hall. The parties met on 28th. March at the crossing of the Tara River, Mile 30; and thereafter the division proceeded in recess at quarters near Thika with the preparation of Working Plans, Sections and Estimates. This work was completed on 30th. April, 1923.

Previous to the completion of the Final Survey of the Ndrugu - Tana River Section, instructions were received from the Secretary of State for the Colonies, directing the submission of a report on the projected Railway based upon a Preliminary Survey. Representations were then made to the Secretary of State that the Final Survey of the first section was well advanced, and proposals submitted for the completion of the Final Survey of the first section and the Preliminary Survey of the second, Tana River - Nyeri Section, from which would be prepared the estimate and report for the whole project. These proposals were approved on 27th. March, 1923.

The reconnaissance survey of 1922, as also the reports of Captain Stevenson in 1907 and Captain Cunningham in 1920, agreed in indicating and emphasising the difficulty of arriving at a decision as to the best route to be followed for a Railway through the difficult country from the Tana River or Kambicho Hill, northwards to the Uaso Nyiro Watershed. Reconnaissance and survey up to April, 1923, had disclosed three distinct and separate routes through this country; they are :-

(1) A Valley Route, commencing on the Uaso Nyiro Watershed and following down the Valley of the Tana River and its headwaters, to near Fort Hall.

(2) A High Level Route leaving the Valley Route at Mile 111 and following the highlands towards the Naguti River Valley.

(3) A Ridge Route on the ridge between the Tana and Sakumi Rivers.

All these routes joined the terminus of the first section near the Tana River, north of Fort Hall, at a controlling "saddle" at Mile 58.

Early in May, 1923, a further reconnaissance of the Ridge Route was carried out by the Chief Engineer, accompanied by Mr. Birchal, and a party was placed in the field to complete the Preliminary Survey of the Ridge Route towards Nyeri and the Valley Route.

These surveys were completed on 27th. June 1923; The division thereafter proceeding with the preparation of Preliminary Plans, Sections and Estimates for these sections. These were completed in August, 1923. Good progress had,

however, been made with the Estimates while the parties were in the field.

During survey, the total amount of field work done, excluding reconnaissance, was as follows:-

	Preliminary Survey	Final Survey
Mr. Pellek's division:-		
Valley Route	24.4	---
High Level Route	33.5	---
Mr. Birchal's division & Combined divisions:-		
Ndrugu-Tana Section	103.00	58.00
Valley Route	28.00	
Ridge Route	25.00	
Total	213.90	58.00

The expenditure incurred on the execution of the Survey to 31st. July, 1923, was approximately £7,800. The estimated final cost of the survey after allowing for credit value of Instruments, Tents and Plant is £7,900.

The total length of line located from the Preliminary Survey and Final Survey is :-

	Preliminary Survey	Final Survey
Ndrugu - Tana Section	58 miles	58 miles
Valley Route to Nyeri Terminus	23	
Valley Route, Nyeri Terminus to Coles' Furrow	21.0	
High Level Route	11.5	
Ridge Route to Kampi - wa-Baruse	22.5	
Total	136.0	58

The cost per mile of the survey is, therefore, about £41.0.0.

The cost of the Nakuru - Mumias Railway Survey, 1914 - 15 was at the rate of £60 per mile.

All members of the staff worked well in a country by no means easy and the survey has been carefully and thoroughly done. The excellent services rendered by Mr. Birchal, both in a professional and an executive capacity call for special mention.

V. FIXED POINT, DATUM AND LENGTH.

The fixed point from which the mileage is calculated is a point on the Thika Branch Railway at a distance of 25 miles 11 feet from the commencement of that Railway.

The levels of the Ndrugu - Tana Section are referred to the level of the rails on the Ndrugu Railway Bridge on the Thika Branch Railway, which is 4969.25 feet above the Uganda Railway Datum.

The levels of the Valley Route and the High Level Route are referred to a Bench Mark at the head of "Coles' Furrow" near the Uaso Nyiro Watershed, the value of which is 6178 feet above the Trigonometrical Survey Datum. The Uganda Railway Datum is 125 feet above the Trigonometrical Survey Datum.

The co-ordinates of the survey stations on the Preliminary Survey Traverse and the points of intersection of the tangents on the staked out alignment form an extension of the Secondary and Tertiary Survey systems of the Colony and are referred to a longitude 37 degrees east of Greenwich and the Equator.

The length of the first or Ndrugu - Tana Section is 57.78 miles and of the second, Tana - Nyeri Section, 23 miles; the total length of the proposed Railway on the Valley Route is, therefore, 80.78 miles. On the Ridge Route the length of the proposed Railway to the Karatina Terminus is 75.49 miles and 80.89 miles to the Kampi-wa-Guruwe terminus.

VI. DESCRIPTION OF COUNTRY.

GENERAL.

Throughout the first, Ndrugu - Tana Section the route of the proposed Railway lies along the lower slopes of the eastern side of the Kikuyu peneplane at a general elevation ranging from 5,100 feet above M.S.L. at Ndrugu, to about 4050 feet above M.SL. at the Tana River. The summit of the peneplane rises to an elevation of just over 8000 feet above M.S.L. about 35 miles west of the proposed Railway.

The whole of this stretch of country consists of a succession of quickly falling parallel valleys

and intervening ridges. The lines defining the main axis of the valleys and ridges maintain a remarkable directness, approaching the general direction of the proposed railway at an angle of about 90 degrees. On the upper elevations of the hill sides the streams and rivers flow in deep steep, narrow valleys, separated by long, narrow flat-topped ridges. In the lower slopes the valleys open out, the floors are of more width and the sides less steep, the intervening ridges being flat-topped or gently rounded.

In the settled areas, sisal, coffee and maize are extensively cultivated along the tops of the ridges and upper sides of the valleys, dotted amongst which are numerous homesteads, surrounded by plantations and gardens. In the native reserves similar fertile areas are extensively cultivated and closely populated.

From the Tana River to the Uaso Nyiro Summit, 14 miles north of Nyeri, the route follows up the great trough lying between the Aberdare Range on the West and Mount Kenya on the East, lying for the most part on the eastern or Kenya side of the trough. Ascending to the summit forming the watershed dividing the headwaters of the Uaso Nyiro River and the Tana River, the trace terminates at an elevation of 6200 feet above M.S.L.

Westwards, 25 miles, towers the lofty summit of the Aberdare Range rising to an elevation of 13,003 feet, while eastwards, 25 miles away, at an elevation of 17,040 feet , is the still loftier snow-clad summit of Mt. Kenya.

The main axis of the great trough or valley lying between the Aberdare Range and Mt. Kenya follows a direction running almost due north and south. To the east and west, the sides of the great mountains are scarred in every direction by numberless deep, steep, wide ravines and valleys of almost formidable size and aspect, which, traced from their source to the valley foot, ever increase in size and wildness and in which flow rivers of great size, not a few of which find their sources in the glaciers of Mt. Kenya.

VII NDRUGU TO TANA RIVER.

Thika, the terminus of the Branch Railway, stands on the right side of the Chania River Valley. The railway approaches it rising and falling over a succession of valleys and ridges. Immediately before Thika are the Ndrugu and Komo Rivers, over which the Railway,developed on a 3 per cent grade, passes to reach its terminus, Thika, around which a small trading station consisting of a few stores and Indian Traders' shops, has grown up.

Close to the Station lies the Main Road from Nairobi, which leads to Fort Hall, whence branches circle east and west round Mt. Kenya, the latter passing through Nyeri Township and thence to Rumuruti and Nanyuki and Archers' Post. In the settled areas branch roads give access from sisal mills and coffee estates, which cover extensive areas.

Leading from Thika Station, the road dips steeply down to the Chania and Thika Rivers which are spanned each by a 60 feet arch bridge. Immediately below the bridges the rivers pour over great falls, 90 feet high, and thereafter unite as the Thika River, which flows in a great deep, wooded gorge, which opens out later to a wide valley.

Within a distance of 4 miles north of the Thika River flow the Samuru River, the Kabuku River and the Genia River, and some smaller streams, which are tributaries of the Thika River.

From the Genia River, the country northwards consists of gently rising undulating plains as far as M'Kuyu. Here, at an elevation of 4890 feet above M.S.L. the topography changes and the country drops down steeply to the Thara River.

From the Thara River the country again consists of a series of valleys and ridges. Passing northwards the country gradually becomes more rough and broken until in the vicinity of Fort Hall it presents a very wild appearance.

Fort Hall, the Headquarters of the Civil Administration of the District, is an important trade centre for the collection and exchange of the produce from the surrounding Native Reserve. The Township stands on the extremity of a steep, rocky spur to the north and south of which lie the deep rocky gorges down which flow the Mathioya and Maragua Rivers.

Looking north from Fort Hall over the Mathioya Gorge rise three hills. From west to east they are :- Kangure, 5046 feet, Kituri, 4692 feet and Kiambicho, 4553 feet.

Below Fort Hall, the road divides; one branch turning down the valley of the Mathioya, leads over the western slope of Kituri eastwards to Embu. The Main Road, up the Mathioya Gorge, leads through a wild country up to Nyeri Township. Kiambicho Hill marks the easterly limit of the slopes of the Aberdare Range. Immediately below Kiambicho flows the Tana River, east of which spread out the great Kapiti Plains.

South of Fort Hall the Maragua River marks the boundary between the settled area and the Kikuyu Native Reserve.

The Tana River approaches Kanguri, Kituri and Kiambicho from the north until met by their northern slopes. The river is forced round and flows in an easterly direction until, flanking Kiambicho, it is able to resume its general south-easterly direction

TANA RIVER TO UASO NYIRO SUMMIT.

For a short distance immediately north of the river and far towards the east, stretch plains, which, rising towards the north and north-east, merge in the foot slopes of Mt. Kenya.

To the west of the river, the country presents an aspect, which for wildness and disorder, makes description difficult. There are the foot slopes of the Aberdare Range cut and scarred in every direction by wild and deep gorges; the intervening ridges present a chaotic aspect of great wild hills, apparently divorced from all system and order.

The foot slopes of Mt. Kenya are steep and much scarred and cut by deep ravines, while here and there project outliers from the main mass of the mountains.

Between the lofty Aberdare Range and the loftier snow-clad Kenya, in a valley cut deep, tortuous and precipitous, flows the drainage from mountains and melting snows. Picture a vastly deep, rapidly descending, tortuous, narrow footed valley, flanked with lofty, steep, almost precipitous sides, rock strewn and often bare or covered with dense low growing bush, gnashed and scarred by numberless deep steep gorges placed in a setting similar in wildness. Here and there cultivated patches in valley bottom or on lofty ridge mark the site of a Native village grass hutted and surrounded by banana plantations.

Ascending, it is not until almost the top of the valley is reached that the wild character of topography changes, giving place to gentler conditions which gradually merge in the wide rolling plains, which mark the watershed between the headwaters of the Uaso Nyiro and Tana Rivers, which stretch out wide and undulating between the slopes of the flanking mountains.

Without the valley and its immediate vicinity, the hill slopes, although steep, rough and much broken, are fertile, the cultivation on which supports a dense native population.

The boundary of the Native Reserve lies just north of Nyeri. Northwards, a further settled area stretches for a distance of over 70 miles down the valley of the Uaso Nyiro. Westwards, it is bounded by the forests covering the higher slopes of the Aberdare Range, and eastwards its confines merge in the borders of the great forests covering the middle slopes of Mt. Kenya.

VIII. LOCATION OF ALIGNMENT.

The Thika Branch of the Uganda Railway runs north-east from Nairobi Station for a distance of 32 miles along the slopes of the Kikuyu peneplane. The ruling gradient of the Branch Railway is 3 per cent, which is liberally used in falling into and rising out of the numerous valleys crossed. The elimination of the ruling gradient and its conversion to a 1.5 per cent, (compensated) gradient by

realignment is an integral though separate part of the Thika-Nyeri Railway Project. The location of the point of commencement of the new Railway is governed by the incidence of the maximum rate of grade on the final lengths of the Thika Railway.

From Mile 25 to Thika, Mile 32, the Railway crosses the Ndrugu and Komo Rivers on gradients of 3 per cent, while Thika Station stands close up to the steep valleys of the Chania River. The selection of a point for the commencement of the proposed Railway is therefore necessarily confined to a point on the existing railway somewhere on the ridge between the Thiririka and Ndrugu Rivers. At Mile 25 on the Thika Railway the descent to the Ndrugu River is commenced on a 3 per cent grade. From this point the alignment of the proposed railway commences and falling on a 1.5 per cent grade, crosses the Ndrugu River at Mile 1. Rising out of the valley, the alignment, passing up a small flanking valley, gains a comparatively even stretch of country which gives easy access to the Komo River Valley; falling down the valley the alignment crosses the river at Mile 5½.

Rising from the valley, the alignment runs over a long stretch of country gently falling towards the south-east and along the ridge between the Komo and Thika Rivers. On this open and flat stretch at Mile 9 is located the site of the new Thika Station.

The site of the new station lies 8277 feet south-east from the existing station and 47 feet lower in close proximity, to the Thika-Donya Sabuk Road, along which access is gained to the Nairobi-Fort Hall-Nyeri Road.

The location of the station site and the alignment from the Komo Valley is influenced by the existance of a low saddle at Mile 9½, which gives access down a small side valley to the confined deep and steep sided Thika River Valley.

The saddle and subsidiary valley form an important sub-feature of topography, for only by aligning the route through the saddle and down the valley and thence along the side slopes of the Thika Valley can sufficient distance be obtained to get on reasonable terms with the valley bottom where it can be turned and the River crossed at Mile 9¾.

Crossing the Thika River the alignment rises up the left bank along which it passes until at Mile 13 it is able to get on terms with the valley of the Samuru River.

Falling against this valley the alingment turns and crossing the river at Mile 13¾ and running up the valley slopes, crosses a flat topped ridge to a low saddle, which leads into the valley of the Kabuku River. At Mile 15 on the ridge top, a station site is located at an elevation of 5015 feet.

The site of the new station lies 8277 feet south-east from the existing station and 47 feet lower in close proximity, to the Thika-Donya Sabuk Road, along which access is gained to the Nairobi-Fort Hall-Nyeri Road.

The location of the station site and the alignment from the Komo Valley is influenced by the existance of a low saddle at Mile 9½, which gives access down a small side valley to the confined deep and steep sided Thika River Valley.

The saddle and subsidiary valley form an important sub-feature of topography, for only by aligning the route through the saddle and down the valley and thence along the side slopes of the Thika Valley can sufficient distance be obtained to get on reasonable terms with the valley bottom where it can be turned and the River crossed at Mile 9¾.

Crossing the Thika River the alignment rises up the left bank along which it passes until at Mile 13 it is able to get on terms with the valley of the Samuru River.

Falling against this valley the alingment turns and crossing the river at Mile 13¾ and running up the valley slopes, crosses a flat topped ridge to a low saddle, which leads into the valley of the Kabuku River. At Mile 15 on the ridge top, a station site is located at an elevation of 5015 feet.

The site of the new station lies 8277 feet south-east from the existing station and 47 feet lower in close proximity, to the Thika-Donya Sabuk Road, along which access is gained to the Nairobi-Fort Hall-Nyeri Road.

The location of the station site and the alignment from the Komo Valley is influenced by the existance of a low saddle at Mile 9½, which gives access down a small side valley to the confined deep and steep sided Thika River Valley.

The saddle and subsidiary valley form an important sub-feature of topography, for only by aligning the route through the saddle and down the valley and thence along the side slopes of the Thika Valley can sufficient distance be obtained to get on reasonable terms with the valley bottom where it can be turned and the River crossed at Mile 9¾.

Crossing the Thika River the alignment rises up the left bank along which it passes until at Mile 13 it is able to get on terms with the valley of the Samuru River.

Falling against this valley the alingment turns and crossing the river at Mile 13¾ and running up the valley slopes, crosses a flat topped ridge to a low saddle, which leads into the valley of the Kabuku River. At Mile 15 on the ridge top, a station site is located at an elevation of 5015 feet.

The site of the new station lies 8277 feet south-east from the existing station and 47 feet lower in close proximity, to the Thika-Donya Sabuk Road, along which access is gained to the Nairobi-Fort Hall-Nyeri Road.

The location of the station site and the alignment from the Komo Valley is influenced by the existance of a low saddle at Mile 9½, which gives access down a small side valley to the confined deep and steep sided Thika River Valley.

The saddle and subsidiary valley form an important sub-feature of topography, for only by aligning the route through the saddle and down the valley and thence along the side slopes of the Thika Valley can sufficient distance be obtained to get on reasonable terms with the valley bottom where it can be turned and the River crossed at Mile 9¾.

Crossing the Thika River the alignment rises up the left bank along which it passes until at Mile 13 it is able to get on terms with the valley of the Samuru River.

Falling against this valley the alingment turns and crossing the river at Mile 13¾ and running up the valley slopes, crosses a flat topped ridge to a low saddle, which leads into the valley of the Kabuku River. At Mile 15 on the ridge top, a station site is located at an elevation of 5015 feet.

Falling into the valley of the Kabuku River on the right side, the alignment, rounding a low knoll, falls against the valley and crosses the river at Mile 17¼ at a level of 4888 feet. Continuing up the left side of the valley the alignment is able to turn out of the valley at Mile 18½, and following a northerly direction, passes into the valley of the Genia River at Mile 20½.

Rising up the Genia Valley the alignment gradually gets on terms with the great flat plain which rises gently up to M'Kuyu, Mile 24, where at an elevation of about 5000 feet the topography of the country suddenly changes.

North of M'Kuyu lie the valleys of the Thara, Saba-Saba and Maragua Rivers; to the east the country drops down to the plains. To the west the country rises to the broken slopes of the Kikuyu peneplane. The Northern boundary of the Genia Plain is clearly defined by a low escarpment running through M'Kuyu in a general direction of N.W. - S.E. With the exception of one defile the face of the escarpment presents a steep and unbroken obstacle to an easy descent from the plain. To the east the escarpment may be outflanked as was proposed by Capt. Stevenson in his No. 3 Route and by Mr. Hamp in his survey of 1919, but only one direct route exists and this was taken advantage of by Capt. Stevenson in his proposed No.1 Route. The incidence of the valley is therefore a very salient feature of the location of the entire Ndrugu - M'Kuyu section of the railway, indeed,

Falling into the valley of the Kabuku River on the right side, the alignment, rounding a low knoll, falls against the valley and crosses the river at Mile 17¼ at a level of 4888 feet. Continuing up the left side of the valley the alignment is able to turn out of the valley at Mile 18½, and following a northerly direction, passes into the valley of the Genia River at Mile 20½.

Rising up the Genia Valley the alignment gradually gets on terms with the great flat plain which rises gently up to M'Kuyu, Mile 24, where at an elevation of about 5000 feet the topography of the country suddenly changes.

North of M'Kuyu lie the valleys of the Thara, Saba-Saba and Maragua Rivers; to the east the country drops down to the plains. To the west the country rises to the broken slopes of the Kikuyu peneplane. The Northern boundary of the Genia Plain is clearly defined by a low escarpment running through M'Kuyu in a general direction of N.W. - S.E. With the exception of one defile the face of the escarpment presents a steep and unbroken obstacle to an easy descent from the plain. To the east the escarpment may be outflanked as was proposed by Capt. Stevenson in his No. 3 Route and by Mr. Hemp in his survey of 1919, but only one direct route exists and this was taken advantage of by Capt. Stevenson in his proposed No.1 Route. The incidence of the valley is therefore a very salient feature of the location of the entire Ndrugu - M'Kuyu section of the railway, indeed,

so important a feature is it that its existence governs and controls, so far as direction is concerned, the entire section from the Thika River to M'Kuyu.

The descent of the M'Kuyu Escarpment commences at Mile 23½ on the alignment. Turning into the valley head at an elevation of 5000 feet, the alignment is first developed across the top of the valley to the left side down which it is developed on the Ruling Grade at Mile 30½, where, at an elevation of 4590 feet, a station site is located, close to the right bank of the Thara River which flows through a wide papyrus swamp.

Eastwards, the country falls gently. Westwards, the country rises quickly. Northwards, the country is easy as an alignment in this direction can be maintained by co-ordinating the attractive features of the secondary valley systems and the saddles lying at the valley tops on the ridges of the primary valley system. From Mile 30½, therefore, to Mile 38½, the route requiring a minimum of expenditure is developed up and down a series of gentle valleys and over the dividing saddles. At Mile 34 the Saba-Saba River is crossed.

From about Mile 38 onwards to near the Maragua River, the general river system is disturbed and throughout a confined local area, entirely distorted. This is due to the existence of Karua Hill lying immediately to the East only three to

so important a feature is it that its existence governs and controls, so far as direction is concerned, the entire section from the Thika River to M'Kuyu.

The descent of the M'Kuyu Escarpment commences at Mile 23½ on the alignment. Turning into the valley head at an elevation of 5000 feet, the alignment is first developed across the top of the valley to the left side down which it is developed on the Ruling Grade at Mile 30½, where, at an elevation of 4590 feet, a station site is located, close to the right bank of the Thara River which flows through a wide papyrus swamp.

Eastwards, the country falls gently. Westwards, the country rises quickly. Northwards, the country is easy as an alignment in this direction can be maintained by co-ordinating the attractive features of the secondary valley systems and the saddles lying at the valley tops on the ridges of the primary valley system. From Mile 30½, therefore, to Mile 38½, the route requiring a minimum of expenditure is developed up and down a series of gentle valleys and over the dividing saddles. At Mile 34 the Saba-Saba River is crossed.

From about Mile 38 onwards to near the Maragua River, the general river system is disturbed and throughout a confined local area, entirely distorted. This is due to the existence of Karua Hill lying immediately to the East only three to

four miles distant. Under the influence of this Hill the direction of flow of the rivers and streams is deflected from the normal direction.

The alignment, therefore, passing through a low saddle at Mile 36 is immediately able to gain the valley of the Itheru River. Crossing the Itheru River at Mile 37½, the alignment, falling through a low saddle at Mile 38½ at an elevation of 4588 feet, enters the Kithanji River Valley, a tributary of the Maragua River, along which the alignment is developed to Mile 42½, where the Maragua River is met.

Here, the topographical and geological features of the country change abruptly. Behind southwards, lies a not difficult or exaggerated systems of valleys divided by easy spurs and ridges, on which lie an easy secondary system of valleys, divided by flat saddles.

In front, northwards from the Maragua River to the Tana River, 6 miles by an air line, the country is cut by the deep and rocky gorges of the Maragua and Mathioya Rivers and the valley of the Tana River.

Between the Maragua and Mathioya Rivers rises the steep rocky spur on which stands Fort Hall, and between the Mathioya and Tana Rivers the rocky ridge, which culminates in the peaks of three hills:- Kangure, Kituri and Kiambicho.

four miles distant. Under the influence of this Hill the direction of flow of the rivers and streams is deflected from the normal direction.

The alignment, therefore, passing through a low saddle at Mile 36 is immediately able to gain the valley of the Itheru River. Crossing the Itheru River at Mile 37½, the alignment, falling through a low saddle at Mile 38½ at an elevation of 4588 feet, enters the Kithanji River Valley, a tributary of the Maragua River, along which the alignment is developed to Mile 42½, where the Maragua River is met.

Here, the topographical and geological features of the country change abruptly. Behind southwards, lies a not difficult or exaggerated systems of valleys divided by easy spurs and ridges, on which lie an easy secondary system of valleys, divided by flat saddles.

In front, northwards from the Maragua River to the Tana River, 6 miles by an air line, the country is cut by the deep and rocky gorges of the Maragua and Mathioya Rivers and the valley of the Tana River.

Between the Maragua and Mathioya Rivers rises the steep rocky spur on which stands Fort Hall, and between the Mathioya and Tana Rivers the rocky ridge, which culminates in the peaks of three hills:- Kangure, Kituri and Kiambicho.

Turning into the right side of the Maragua River at Mile 42½, the alignment is developed on the maximum grade along the steep rocky valley side, which is serrated with a succession of stream beds and ridges. At Mile 45 the gorge is crossed, requiring a viaduct 720 feet long and 100 feet high. Rising out of the valley the alignment is contoured round the rocky, abrupt spur lying between the river and the Mathioya River and on which stands Fort Hall. At Mile 49, the spur is turned and the descent to the Mathioya River commenced. The river is crossed at Mile 50½, at an elevation of 3940 feet. The bridging proposed is 2 spans of 40 feet and 2 of 20 feet about 30 feet high. The approaches on both banks are masked by spurs necessitating approach cuttings of about 30 feet maximum depth and 700 and 500 feet respectively, in length. The actual length of the alignment from the point where the Maragua River is met to the left bank of the Mathioya River is 8½ miles, throughout which the work required, although not heavy, excepting the Maragua Viaduct, will necessitate a greater rate of expenditure than in the previous section.

On the left bank of the Mathioya immediately after the river is crossed, the alignment is carried along parallel to the river to provide a station site convenient to Fort Hall.

Rising out of the valley, the alignment, passing in an easterly direction, finds support on the southern slopes of Kituri, round which it develops northwards, between Kiambicho on the east and Kituri on the west, reaching an elevation of 4056 feet at

Turning into the right side of the Maragua River at Mile 42½, the alignment is developed on the maximum grade along the steep rocky valley side, which is serrated with a succession of stream beds and ridges. At Mile 45 the gorge is crossed, requiring a viaduct 720 feet long and 100 feet high. Rising out of the valley the alignment is contoured round the rocky, abrupt spur lying between the river and the Mathioya River and on which stands Fort Hall. At Mile 49, the spur is turned and the descent to the Mathioya River commenced. The river is crossed at Mile 50¾, at an elevation of 3940 feet. The bridging proposed is 2 spans of 40 feet and 2 of 20 feet about 30 feet high. The approaches on both banks are masked by spurs necessitating approach cuttings of about 30 feet maximum depth and 700 and 500 feet respectively, in length. The actual length of the alignment from the point where the Maragua River is met to the left bank of the Mathioya River is 8¾ miles, throughout which the work required, although not heavy, excepting the Maragua Viaduct, will necessitate a greater rate of expenditure than in the previous section.

On the left bank of the Mathioya immediately after the river is crossed, the alignment is carried along parallel to the river to provide a station site convenient to Fort Hall.

Rising out of the valley, the alignment, passing in an easterly direction, finds support on the southern slopes of Kituri, round which it develops northwards, between Kiambicho on the east and Kituri on the west, reaching an elevation of 4056 feet at

Mile 52½. From here the alignment passes to the site selected for the crossing of the Tana River.

At the site selected, the river flows between well defined banks. In the channel are two islands. It is proposed to close the northern channel and carry the Railway over the river on a bridge consisting of two spans of sixty feet. The difference in level of the channels of the Mathioya River and the Tana River is 114 feet, being respectively 3902 and 4016 feet above Mean Sea Level.

The alignment of the route from the Tana River onwards is governed by two factors, the location of a site for an Engine Changing Station and the existence of a low saddle at 1½ miles northwards from which must debouch the only two economically feasible routes which the proposed railway may follow onwards towards Nyeri.

From the Tana River crossing, therefore, the alignment passes in a northerly direction over the flat country lying between the Tana and Ragati Rivers. At Mile 57½ the alignment is deflected to the east and crossing the Ragati River, turns through an open grass plain on which is the site proposed for the Engine Changing Station.

The site is a healthy one, lying beyond the low lying valley bottom of the Tana River; a good gravity supply of water is available from the Sakumi River.


Plan
Shewing
Alternative Routes
From
Tana Change Station
to
Coles' Furrow.
Scale: 1 Inch = 4 Miles.
@ = Station Sites.
N.
Coles' Furrow
Hairaki River
Thara River
Sagana River
Mt Niana
Mt Kenya
Nyeri River
Mathioya River
NYERI TOWNSHIP
KARATINA
Ridge Route
Thara River
Mathioya River
0°10'
0°20'
0°30'
0°40'
0°50'


Plan
showing
Alternative Routes
from
Tana Change Station
to
Colee Furrow.
Scale: 1 inch = 4 Miles.
Station Sites.
NYERI TOWNSHIP
KARATINA
Ridge Route
Valley Route
Mathioya River
Mt Kenya
Mt Nianja
Ombe River
Sagana River
Thara River
Hunyuki River
Amboni River
Nithi River
Nyeri River
Tana River
TANA VALLEY
STATION
0°10
0°20
0°30
0°40

From the saddle immediately north of the Engine Changing Station, two routes may be followed by the proposed Railway, one rising on a 1.5 per cent grade up the valley of the Tana, the other rising on a 2.5 per cent grade banking section 14½ miles long following the upper slopes of the Tana Valley and thence to the ridge lying between the Sakumi and Tana Rivers.

THE RIDGE ROUTE.

The Ridge Route follows an alignment on a 2.5 per cent compensated grade which forms a banking section 14½ miles in length. The alignment surveyed is designed so that the maximum load hauled by one locomotive on a 1.5 per cent compensated grade will be hauled on the banking section by two locomotives.

Reporting on this Route Captain Stevenson, in 1907, and Mr. Birch, in 1924, state that the adoption of this Route would necessitate a ruling grade of 4 per cent compensated.

The reasons which recommend the selection of the Ridge Route are :-

(1) That the 2.5 per cent grade is with the load.
(2) That the banking section commences immediately at the Engine Station.
(3) That the length of the route to the proposed terminus at Karatina is 4¾ miles shorter than the Valley Route.
(4) That by adopting this Route as against the Valley Route a saving of £[illegible] is effected.
(5) That this alignment is close to the forests of Kenya.

A reason in favour of the Valley Route is that Nyeri Township will be 15 miles distant from the Karatina terminus as against 7¼ miles from the Valley Route terminus. If, however, the Ridge Route is extended from Karatina to Kampi-wa-Guruwe, about 3 miles east of Koinyu Hill, an additional length of 4¾ miles, Nyeri Township would then be 11 miles from the terminus of the Ridge Route.

Description of Ridge Route.

The Ridge Route commences at Mile 57.78, the terminus of the Ndrugu - Tana River Route. Leaving the Engine Station the alignment turns abruptly to the west and rises along the end of the long spur which forms the watershed between the Ragati and Tana Rivers, over which it continues to Mile 1½, where the valley of the Sakumi River, a tributary of the Ragati River, is entered. To Mile 3¾ the alignment finds support on the right side of the Valley, at which point the Valley floor rises abruptly, due to the incidence of a series of high falls and increased rate of declivity of the bed of the river. The alignment is, therefore, forced out of the Sakumi Valley at Mile 3¾ and, passing over a saddle, gains the upper slopes of the Tana Valley along which it passes to Mile 8¾, where the Sakumi Valley is again entered over a saddle on the watershed.

Within the length Mile 4¾ to Mile 8 the trace crosses the heads of many of the deep ravines which are characteristic of the side slopes of the Tana Valley. Throughout this length of 3¼ miles the work is therefore heavy.

A reason in favour of the Valley Route is that Nyeri Township will be 15 miles distant from the Karatina terminus as against 7½ miles from the Valley Route terminus. If, however, the Ridge Route is extended from Karatina to Kampi-wa-Guruwe, about 3 miles east of Koinyu Hill, an additional length of 4½ miles, Nyeri Township would then be 11 miles from the terminus of the Ridge Route.

Description of Ridge Route.

The Ridge Route commences at Mile 57.78, the terminus of the Ndrugu - Tana River Route. Leaving the Engine Station the alignment turns abruptly to the west and rises along the end of the long spur which forms the watershed between the Ragati and Tana Rivers, over which it continues to Mile 1½, where the valley of the Sakumi River, a tributary of the Ragati River, is entered. To Mile 3½ the alignment finds support on the right side of the Valley, at which point the Valley floor rises abruptly, due to the incidence of a series of high falls and increased rate of declivity of the bed of the river. The alignment is, therefore, forced out of the Sakumi Valley at Mile 3½ and, passing over a saddle, gains the upper slopes of the Tana Valley along which it passes to Mile 8½, where the Sakumi Valley is again entered over a saddle on the watershed.

Within the length Mile 4½ to Mile 6 the trace crosses the heads of many of the deep ravines which are characteristic of the side slopes of the Tana Valley. Throughout this length of 3½ miles the work is therefore heavy.

Regaining the comparatively easy side slopes of the Sakumi Valley, the trace follows up the valley till at Mile 13½ the Valley head is reached. One mile further on the ascent on the 2.5 per cent grade terminates and the alignment passes on a 1.5 per cent grade to Karatina, Mile 17½, over a series of ridges and saddles, marking the watershed between the Hagati and Tana Rivers.

Karatina lies about 15 miles south-west of Nyeri Township and 17.71 miles from Tana Station and is the market centre of the surrounding district. Here several Indian Traders have established shops. Through Karatina passes the main road from Nyeri Township and Tuma-Tuma towards Embu and the east.

Karatina is therefore well situated for development as a Trade Centre, while the incidence of a comparatively extensive area of flat ground close to the Hagati River, from which a plentiful supply of water can be obtained, makes the site very suitable for the location of a Railway terminus.

A continuation of this Route was surveyed to Kampi-wa-Guruwe, about three miles east of Koinyu Hill and 4¾ miles from Karatina and 22.5 miles from Tana Station.

Regaining the comparatively easy side slopes of the Sakumi Valley, the trace follows up the valley till at Mile 13½ the Valley head is reached. One mile further on the ascent on the 2.5 per cent grade terminates and the alignment passes on a 1.5 per cent grade to Karatina, Mile 17½, over a series of ridges and saddles, marking the watershed between the Ragati and Tana Rivers.

Karatina lies about 15 miles south-west of Nyeri Township and 17.71 miles from Tana Station and is the market centre of the surrounding district. Here several Indian Traders have established shops. Through Karatina passes the main road from Nyeri Township and Tuma-Tuma towards Embu and the east.

Karatina is therefore well situated for development as a Trade Centre, while the incidence of a comparatively extensive area of flat ground close to the Ragati River, from which a plentiful supply of water can be obtained, makes the site very suitable for the location of a Railway terminus.

A continuation of this Route was surveyed to Kampi-wa-Guruwe, about three miles east of Konyu Hill and 4½ miles from Karatina and 22.5 miles from Tana Station.

Kampi-wa-Guruwe is about 11 miles distant from Nyeri Township and as a site for a Railway terminus it is much inferior to the Karatina Site. The area available for a station site is restricted in size and consists of side slopes. Water might be available by pumping from an adjacent swamp, but investigation requires to be carried out to ascertain if a permanent supply is available.

VALLEY ROUTE.

Guaso Nyiro Watershed to Proposed Nyeri Terminus.

It will be convenient to consider the alignment of the Valley Route commencing at the summit and following it down the valley towards the Tana Terminus of the Ndrugu-Tana Section.

The point at which the survey of the Valley Route commenced lies on the southern side of the Guaso Nyiro Watershed in the valley of a tributary of the Rongai River, locally known as "Coles' Furrow".

The general level of the Guaso Nyiro Watershed is about 6350 feet above the T.S.Survey Datum. The point at which the alignment commences is 6183 feet above the T.S.Datum. From this point the distance to the watershed is about 3 miles. The country between consists of gently rolling, wide, grassy plains, rising to the summit.

The distance from the point at which the alignment commences to the proposed terminus in the vicinity of Nyeri is 20.74 miles and to the Tana Station, 43.74 miles.

Kampi-wa-Guruwe is about 11 miles distant from Nyeri Township and as a site for a Railway terminus it is much inferior to the Karatina Site. The area available for a station site is restricted in size and consists of side slopes. Water might be available by pumping from an adjacent swamp, but investigation requires to be carried out to ascertain if a permanent supply is available.

VALLEY ROUTE.

Guaso Nyiro Watershed to Proposed Nyeri Terminus.

It will be convenient to consider the alignment of the Valley Route commencing at the summit and following it down the valley towards the Tana Terminus of the Nidrugu-Tana Section.

The point at which the survey of the Valley Route commenced lies on the southern side of the Guaso Nyiro Watershed in the valley of a tributary of the Rongai River, locally known as "Coles' Furrow".

The general level of the Guaso Nyiro Watershed is about 6350 feet above the T.S.Survey Datum. The point at which the alignment commences is 6183 feet above the T.S.Datum. From this point the distance to the watershed is about 3 miles. The country between consists of gently rolling, wide, grassy plains, rising to the summit.

The distance from the point at which the alignment commences to the proposed terminus in the vicinity of Nyeri is 20.74 miles and to the Tana Station, 43.74 miles.

The fall from "Coles' Furrow" to the Nyeri Terminus is 854 feet and from Nyeri Terminus to Tana Station, 1278 feet, equivalent to continuous grades of 1 in 130 and 1 in 95. Owing, however, to the varying inclination of the channels of the rivers in the valleys in which the trace passes it is not practical to realise these uniform grades. The Ruling Grade of the whole Valley Route is 1.5 per cent, compensated, or 1 in 66.6.

From "Coles' Furrow" the trace passes into the Rongai River Valley, 4½ miles from its commencement, down which it passes into the Amboni River Valley.

At Mile 8½ the trace turns into the valley of the Nairobi River, down which it passes into the valley of the Sagana River, which, after its junction with the Chania River is known as the Tana River. The trace, finding support on the right side of the valley, follows down to Mile 20.74, where the proposed Nyeri Terminus of the Valley Route is located.

The alignment, for the most part, finds support on the steep slopes of confined valleys, cut deeply with innumerable cross drainage channels and broken by abrupt rocky spurs. The whole character of these upper valleys is similar to that of the lower valley, the plans of which accompany this Report. The construction of a Railway following this route would necessitate heavy work for a distance of 15 miles, the probable cost being approximately at the rate of £12,000 per mile. The work in the remaining 6 miles

The fall from "Coles' Furrow" to the Nyeri Terminus is 854 feet and from Nyeri Terminus to Tana Station, 1278 feet, equivalent to continuous grades of 1 in 130 and 1 in 95. Owing, however, to the varying inclination of the channels of the rivers in the valleys in which the trace passes it is not practical to realise these uniform grades. The Ruling Grade of the whole Valley Route is 1.5 per cent, compensated, or 1 in 66.6.

From "Coles' Furrow" the trace passes into the Hongai River Valley, 4½ miles from its commencement, down which it passes into the Amboni River Valley.

At Mile 8½ the trace turns into the valley of the Nairobi River, down which it passes into the valley of the Saguna River, which, after its junction with the Chania River is known as the Tana River. The trace, finding support on the right side of the valley, follows down to Mile 20.74, where the proposed Nyeri Terminus of the Valley Route is located.

The alignment, for the most part, finds support on the steep slopes of confined valleys, cut deeply with innumerable cross drainage channels and broken by abrupt rocky spurs. The whole character of these upper valleys is similar to that of the lower valley, the plans of which accompany this Report. The construction of a Railway following this route would necessitate heavy work for a distance of 15 miles, the probable cost being approximately at the rate of £12,000 per mile. The work in the remaining 6 miles

is comparatively light, the probable rate of expenditure being in the region of £8,000 per mile.

Nyeri Terminus to Tana Station.

The site proposed for the Nyeri Terminus is situated on the right side of the Tana River immediately below the junction of the Chania and Sagana Rivers. Here the valley opens out, thus permitting the station site being located on a small area of comparatively even ground. Here, too, the bridge spanning the Tana River carries the Main Road from Nyeri Township, 7½ miles distant, over the river to Karatina, Embu and Eastern Kenya. The site, therefore, is suitable for a terminus as an ample water supply is available, and there is an open healthy site for the location of quarters and it is approached from two directions by good roads giving direct access to the road system of the adjacent country.

From the station site the alignment keeps to the right side of the valley, finding support on the floor of the valley. One mile below the station site the river is crossed twice at a sharp bend, necessitating the diversion of the river. Continuing along the right bank the river is again crossed at Mile 1½ from the terminus, the proposed bridge consisting of 2 spans of 40 feet each.

Within a distance of half a mile the river is again crossed twice at a sharp bend requiring a further river diversion. Here the alignment passes to the

is comparatively light, the probable rate of expenditure being in the region of £8,000 per mile.

Nyeri Terminus to Tana Station.

The site proposed for the Nyeri Terminus is situated on the right side of the Tana River immediately below the junction of the Chania and Sagana Rivers. Here the valley opens out, thus permitting the station site being located on a small area of comparatively even ground. Here, too, the bridge spanning the Tana River carries the Main Road from Nyeri Township, 7½ miles distant, over the river to Karatina, Embu and Eastern Kenya. The site, therefore, is suitable for a terminus as an ample water supply is available, and there is an open healthy site for the location of quarters and it is approached from two directions by good roads giving direct access to the road system of the adjacent country.

From the station site the alignment keeps to the right side of the valley, finding support on the floor of the valley. One mile below the station site the river is crossed twice at a sharp bend, necessitating the diversion of the river. Continuing along the right bank the river is again crossed at Mile 1½ from the terminus, the proposed bridge consisting of 2 spans of 40 feet each.

Within a distance of half a mile the river is again crossed twice at a sharp bend requiring a further river diversion. Here the alignment passes to the

is comparatively light, the probable rate of expenditure being in the region of £8,000 per mile.

Nyeri Terminus to Tana Station.

The site proposed for the Nyeri Terminus is situated on the right side of the Tana River immediately below the junction of the Chania and Sagana Rivers. Here the valley opens out, thus permitting the station site being located on a small area of comparatively even ground. Here, too, the bridge spanning the Tana River carries the Main Road from Nyeri Township, 7½ miles distant, over the river to Karatina, Embu and Eastern Kenya. The site, therefore, is suitable for a terminus as an ample water supply is available, and there is an open healthy site for the location of quarters and it is approached from two directions by good roads giving direct access to the road system of the adjacent country.

From the station site the alignment keeps to the right side of the valley, finding support on the floor of the valley. One mile below the station site the river is crossed twice at a sharp bend, necessitating the diversion of the river. Continuing along the right bank the river is again crossed at Mile 1½ from the terminus, the proposed bridge consisting of 2 spans of 40 feet each.

Within a distance of half a mile the river is again crossed twice at a sharp bend requiring a further river diversion. Here the alignment passes to the

steep rocky left side of the valley along which it continues for a distance of 3½ miles. Within this length the river is crossed no fewer than 5 times, requiring one river diversion and 3 bridges aggregating 6 spans of 40 feet each.

Five and a half miles below the terminus the alignment passes to the right side of the valley, along which it continues for a distance of 2 miles. Within this length the river is crossed 5 times requiring two river diversions and one bridge of 3 spans of 40 feet each, while the Gura River, a tributary, is crossed by a bridge of one span of 60 feet.

At Mile 7½ from the Terminus, the alignment passes to the left side of the valley, along which it continues for a distance of 1½ miles, when the river is crossed twice in quick succession. About one mile further down the river is again crossed twice within a distance of 1000 feet.

From the Nyeri Terminus to a point 15 miles down valley, the alignment finds support on the valley floor and is thus in a position to take advantage of the attractive sub-features of topography on either side of the valley. At this point, however, the steep valley sides which are the chief characteristic of the topography above, become even more steep and precipitous and more intensely scarred with cross drainage channels, while the river bed commences to fall rapidly, compelling and confining the alignment to find support along the high steep slopes of the left side of the valley.

steep rocky left side of the valley along which it continues for a distance of 3½ miles. Within this length the river is crossed no fewer than 5 times, requiring one river diversion and 3 bridges aggregating 6 spans of 40 feet each.

Five and a half miles below the terminus the alignment passes to the right side of the valley, along which it continues for a distance of 2 miles. Within this length the river is crossed 5 times requiring two river diversions and one bridge of 3 spans of 40 feet each, while the Gura River, a tributary, is crossed by a bridge of one span of 60 feet.

At Mile 7½ from the Terminus, the alignment passes to the left side of the valley, along which it continues for a distance of 1½ miles, when the river is crossed twice in quick succession. About one mile further down the river is again crossed twice within a distance of 1000 feet.

From the Nyeri Terminus to a point 15 miles down valley, the alignment finds support on the valley floor and is thus in a position to take advantage of the attractive sub-features of topography on either side of the valley. At this point, however, the steep valley sides which are the chief characteristic of the topography above, become even more steep and precipitous and more intensely scarred with cross drainage channels, while the river bed commences to fall rapidly, compelling and confining the alignment to find support along the high steep slopes of the left side of the valley.

steep rocky left side of the valley along which it continues for a distance of 3½ miles. Within this length the river is crossed no fewer than 5 times, requiring one river diversion and 3 bridges aggregating 6 spans of 40 feet each.

Five and a half miles below the terminus the alignment passes to the right side of the valley, along which it continues for a distance of 2 miles. Within this length the river is crossed 5 times requiring two river diversions and one bridge of 3 spans of 40 feet each, while the Gura River, a tributary, is crossed by a bridge of one span of 60 feet.

At Mile 7½ from the Terminus, the alignment passes to the left side of the valley, along which it continues for a distance of 1½ miles, when the river is crossed twice in quick succession. About one mile further down the river is again crossed twice within a distance of 1000 feet.

From the Nyeri Terminus to a point 15 miles down valley, the alignment finds support on the valley floor and is thus in a position to take advantage of the attractive sub-features of topography on either side of the valley. At this point, however, the steep valley sides which are the chief characteristic of the topography above, become even more steep and precipitous and more intensely scarred with cross drainage channels, while the river bed commences to fall rapidly, compelling and confining the alignment to find support along the high steep slopes of the left side of the valley.

At Mile 17 from Nyeri Terminus, the side slopes become less steep, the section to Mile 23, Tana Station site, presenting a less wild outline.

From the results of the survey of the Valley Route, it is apparent that the alignment of a Railway within the valleys of the Tana River and its head-waters, requires still much study and considerable further survey. The best alignment is in many places yet to be determined and many problems remain to be solved. The procedure necessary to obtain an alignment best fitting the contour and topography of the country is the location of the alignment and subsequent study thereof in the light of longitudinal and cross sections; what improvements are possible will thus be disclosed, the process being repeated until the most perfect alignment is obtained.

At the best, however, the construction of such a Railway will be a costly undertaking. The alignment for practically the entire length finds support on steep side slopes, in some places precipitous, necessitating the introduction of walling for support. Deep ravines are crossed and abrupt spurs pierced, entailing heavy earthwork. The river itself is crossed no fewer than 19 times in a distance of 6 miles, requiring 5 river diversions and 9 bridges aggregating 11 spans of 40 feet and 11 spans of 60 feet. Tributaries and cross drainage channels to be crossed are considerable necessitating heavy expenditure, including two large viaducts, estimated to cost £30,000 and £40,000 respectively. Access for purposes of construction and

traffic will be difficult and entail considerable expenditure on temporary and permanent roads. Station sites are inconvenient and far apart. A further matter which calls for careful study is the effect likely to be produced on the permanent regime of the river if it be diverted as proposed.

The introduction of sharper curvature would reduce the intensity of the work considerably and had no alternative route been possible, might have been considered.

It is problematical if the construction of a Railway along the Valley Route is financially a sound proposition. In the absence of detailed estimates it may be anticipated that the cost of a Railway on the Valley Route alignment would cost about £15,000 per mile, or in all, for the distance of 23 miles, £345,000.

IX. ALTERNATIVE ROUTES.

The alternative Routes are :-

(a) Capt. Stevenson's No.2 Route to Fort Hall.

(b) Mr. Hamp's Route from Ndrugu to Thika River.

(c) Mr. Hamp's Route from Thika to Punda Milia.

(d) Capt. Stevenson's and Mr. Birch's Route, Punda Milia to Kiambicho.

(e) High Level Route, Maragua River to Mathioya River.

(f) Mr. Birch's Route, Mathioya River to Saddle at Mile 56.

traffic will be difficult and entail considerable expenditure on temporary and permanent roads. Station sites are inconvenient and far apart. A further matter which calls for careful study is the effect likely to be produced on the permanent regime of the river if it be diverted as proposed.

The introduction of sharper curvature would reduce the intensity of the work considerably and had no alternative route been possible, might have been considered.

It is problematical if the construction of a Railway along the Valley Route is financially a sound proposition. In the absence of detailed estimates it may be anticipated that the cost of a Railway on the Valley Route alignment would cost about £15,000 per mile, or in all, for the distance of 23 miles, £345,000.

IX. ALTERNATIVE ROUTES.

The alternative Routes are :-

(a) Capt. Stevenson's No.2 Route to Fort Hall.

(b) Mr. Hamp's Route from Ndrugu to Thika River.

(c) Mr. Hamp's Route from Thika to Punda Milia.

(d) Capt. Stevenson's and Mr. Birch's Route, Punda Milia to Kiambicho.

(e) High Level Route, Maragua River to Mathioya River.

(f) Mr. Birch's Route, Mathioya River to Saddle at Mile 56.

A. Capt. Stevenson's No.2 Route to Fort Hall.

A Reconnaissance of this route confirms the opinion expressed by Capt. Stevenson in his Report that a line on this alignment is unpractical, as it would have "to cross valley after valley; in some "places as many as three per mile, falling to a depth "of from 100 feet to 800 feet, with steep sides. "The valleys are, further, too narrow to take a "curve, some of them being barely 50 feet wide in "the bed." A Railway on this route would, therefore, be more costly to construct than a Railway on the alignment proposed.

B. Mr. Hamp's Route, Ndrugu to Thika.

During the re-survey of the Thika Branch Railway in 1922, for the elimination of all 3 per cent portions and the substitution of a 1.5 per cent ruling gradient, Mr. A. E. Hamp proposed a re-alignment from Ndrugu to Thika, following a route lying along the existing Railway and crossing the Chania and Thika Rivers above their junction. The cost of the alignment as far as the Thika crossing, 9¼ miles, is estimated by the Chief Engineer, Uganda Railway, at £159,438, for earthwork, bridging and permanent way only, excluding the credit value of permanent way and girders in the existing line and any allowances for contingencies. The length of a route on this alignment extended to join the alignment recommended at Mile 10¾ is 11¼ miles in length or 1¼ miles greater in distance than the route

A. Capt. Stevenson's No.2 Route to Fort Hall.

A Reconnaissance of this route confirms the opinion expressed by Capt. Stevenson in his Report that a line on this alignment is unpractical, as it would have "to cross valley after valley; in some "places as many as three per mile, falling to a depth "of from 100 feet to 800 feet, with steep sides. "The valleys are, further, too narrow to take a "curve, some of them being barely 50 feet wide in "the bed." A Railway on this route would, therefore, be more costly to construct than a Railway on the alignment proposed.

B. Mr. Hamp's Route, Ndrugu to Thika.

During the re-survey of the Thika Branch Railway in 1922, for the elimination of all 3 per cent portions and the substitution of a 1.5 per cent ruling gradient, Mr. A. E. Hamp proposed a re-alignment from Ndrugu to Thika, following a route lying along the existing Railway and crossing the Chania and Thika Rivers above their junction. The cost of the alignment as far as the Thika crossing, 9½ miles, is estimated by the Chief Engineer, Uganda Railway, at £159,438, for earthwork, bridging and permanent way only, excluding the credit value of permanent way and girders in the existing line and any allowances for contingencies. The length of a route on this alignment extended to join the alignment recommended at Mile 102 is 11½ miles in length or 1½ miles greater in distance than the route

proposed. The estimated cost of Mr. Hamp's proposed route extended to join the route now proposed is £213,303.

The estimated cost of the proposed Railway on the route recommended on a similar basis to that of the Chief Engineer, Uganda Railway, is £70,000, showing a difference in favour of the latter of £143,303.

The direct route is therefore adopted.

C. Mr. Hamp's Route, Thika to Punda Milia.

This route was proposed for an Agricultural Light Railway designed to serve a large number of sisal estates lying between the Athi and Tana Rivers. The length of the proposed railway from Thika Station to the Thara River is 32¼ miles. The distance between the two points by an air line is 14 miles. On the route now proposed the distance from the new Thika Station site to a point equivalent to Mr. Hamp's terminus is 23 miles. The adoption of so circuituous a route, necessitating nearly 10 miles additional distance, is not justified in that the present project is for a main line route.

D. Capt. Stevenson's & Mr. Birch's 1920 Route, Punda Milia to Kiambicho

The distance from Punda Milia to Kiambicho Falls on the Tana River along Capt. Stevenson's Route is 21½ miles. On Mr. Birch's Route the distance is 23 miles. From Kiambicho Falls to the "Saddle",

proposed. The estimated cost of Mr. Hamp's proposed route extended to join the route now proposed is £213,303.

The estimated cost of the proposed Railway on the route recommended on a similar basis to that of the Chief Engineer, Uganda Railway, is £70,000, showing a difference in favour of the latter of £143,303.

The direct route is therefore adopted.

C. Mr. Hamp's Route, Thika to Punda Milia.

This route was proposed for an Agricultural Light Railway designed to serve a large number of sisal estates lying between the Athi and Tana Rivers. The length of the proposed railway from Thika Station to the Thara River is 32¼ miles. The distance between the two points by an air line is 14 miles. On the route now proposed the distance from the new Thika Station site to a point equivalent to Mr. Hamp's terminus is 23 miles. The adoption of so circuituous a route, necessitating nearly 10 miles additional distance, is not justified in that the present project is for a main line route.

D. Capt. Stevenson's & Mr. Birch's 1920 Route, Punda Milia to Kiambicho

The distance from Punda Milia to Kiambicho Falls on the Tana River along Capt. Stevenson's Route is 21½ miles. On Mr. Birch's Route the distance is 23 miles. From Kiambicho Falls to the "Saddle",

Mile 58, the controlling point north of the Tana River, the distance on Mr. Birch's Route is 7.3 miles, or in all from Punda Milia to the "Saddle" via Kiambicho Falls, 30.3 miles. The distance from an equivalent point at Punda Milia to the "Saddle" by the route now proposed is 25.5 miles. The difference in favour of the route now proposed is, therefore, 4.8 miles, but as the distance on Capt. Stevenson's and Mr. Birch's routes are measured on a traverse line and not on a staked out line, it may be assumed that the difference in favour of the latter is not less than 5½ miles.

On the section accompanying Capt. Stevenson's Report, the fall from Punda Milia to the Maragua River is shown as 640 feet, and the rise from the Maragua River to the Tana River crossing at the Kiambicho Falls as 160 feet. On Mr. Birch's reconnaissance of 1922, the rise from the Tana Crossing at Kiambicho Falls is given as 314 feet. The total rise from the Maragua River to the "Saddle" is, therefore, 474 feet.

On the route now proposed the fall from Punda Milia to the Mathioya River is 636 feet and the rise from the river to the "Saddle" 253 feet.

The difference in Rise and Fall one way in favour of the route now proposed is therefore, 225 feet.

Mile 58, the controlling point north of the Tana River, the distance on Mr. Birch's Route is 7.3 miles, or in all from Punda Milia to the "Saddle" via Kiambicho Falls, 30.3 miles. The distance from an equivalent point at Punda Milia to the "Saddle" by the route now proposed is 25.5 miles. The difference in favour of the route now proposed is, therefore, 4.8 miles, but as the distance on Capt. Stevenson's and Mr. Birch's routes are measured on a traverse line and not on a staked out line, it may be assumed that the difference in favour of the latter is not less than 5½ miles.

On the section accompanying Capt. Stevenson's Report, the fall from Punda Milia to the Maragua River is shown as 640 feet, and the rise from the Maragua River to the Tana River crossing at the Kiambicho Falls as 160 feet. On Mr. Birch's reconnaissance of 1922, the rise from the Tana Crossing at Kiambicho Falls is given as 314 feet. The total rise from the Maragua River to the "Saddle" is, therefore, 474 feet.

On the route now proposed the fall from Punda Milia to the Mathioya River is 636 feet and the rise from the river to the "Saddle" 253 feet.

The difference in Rise and Fall one way in favour of the route now proposed is therefore, 225 feet.

Referring to improvements on his Route, Mr. Birch considers that by adopting a rising grade on the falling valley the Maragua River could be crossed above Capt. Stevenson's crossing and a saving of 3½ miles of permanent way effected. There is still, however, a saving in distance of the route proposed of 1.75 miles.

From a revenue earning point of view and as designed to meet the convenience of the public and trader, the route now proposed has many advantages in that is passes through the fertile areas and close to the trade and administrative centre at Fort Hall and at many points is easily accessible from the road system of the district. The alternative routes, in that they detour to the east, fail to achieve these objects.

A Railway on this alignment would, therefore, be more costly to construct and operate and earn less traffic than a Railway following the route proposed.

E. High Level Route, Maragua River to Mathioya River.

During the progress of the survey to which this Report refers the advantage or otherwise likely to accrue from the adoption of a High Level Route from the Maragua River to the Mathioya River was investigated. The alternative alignment deviates from the selected route at Mile 42½ and crosses the Maragua River on a 60 ft. span girder bridge, 20 feet above H.F.L. as

Referring to improvements on his Route, Mr. Birch considers that by adopting a rising grade on the falling valley the Maragua River could be crossed above Capt. Stevenson's crossing and a saving of 3½ miles of permanent way effected. There is still, however, a saving in distance of the route proposed of 1.75 miles.

From a revenue earning point of view and as designed to meet the convenience of the public and trader, the route now proposed has many advantages in that is passes through the fertile areas and close to the trade and administrative centre at Fort Hall and at many points is easily accessible from the road system of the district. The alternative routes, in that they detour to the east, fail to achieve these objects.

A Railway on this alignment would, therefore, be more costly to construct and operate and earn less traffic than a Railway following the route proposed.

E. High Level Route, Maragua River to Mathioya River.

During the progress of the survey to which this Report refers the advantage or otherwise likely to accrue from the adoption of a High Level Route from the Maragua River to the Mathioya River was investigated. The alternative alignment deviates from the selected route at Mile 42½ and crosses the Maragua River on a 60 ft. span girder bridge, 20 feet above H.F.L. as

against a viaduct 720 feet long and 100 feet high on the selected route - passes up the valley of the Kiahwey River, which is crossed on a viaduct 400 feet in length and 120 feet high.

Passing over a saddle dividing the Kiahwey River from the Kithambia River, the alignment passes down the left side of the valley and contouring round the Fort Hall spur, crosses the Mathioya River on a viaduct 580 feet in length and 67 feet high as against two spans of 40 feet and two of 20 feet on the selected route, after which it joins the adopted route at the Mathioya Station site. The length of the alternative alignment is 3½ miles longer than the corresponding distance on the route selected and its adoption would entail an additional first expenditure of £18,000. As the High Level Route therefore compares unfavourable with the Low Level Route in first cost, revenue earning capacity and cost of operation, it is not adopted.

F. Mr. Birch's 1922 Route. Sapa-Saba to "Saddle"

The distance from Punda Milia to the "Saddle" by the route of Mr. Birch's reconnaissance of 1922 is 24.6 miles. On the route selected this distance is 25 miles on the staked out alignment; a difference in distance in favour of the selected route of from 2 to 3 miles may therefore be assumed. From a comparison of the sections of the alternative routes

it appears that the length of heavy work on the route of the reconnaissance of 1922 is 14 miles, against 7½ miles on the route now proposed.

On the route of the reconnaissance of 1922, the crossing of the Saba-Saba River necessitates long cuttings in rock, about 500 feet in length and a 40 feet bridge or, alternatively, a viaduct 500 feet in length and 70 feet high, as against one span of 40 feet in a low bank on the route now proposed.

The crossing of the Maragua River on both alignments necessitates a long and high viaduct.

In the Report of the Reconnaissance Survey of 1922, discussing the Mathioya River Crossing, Mr. Birch writes:- "In order to cross the Mathioya River "under Fort Hall, the choice lies between either "a tunnel some 2000 feet long and two short via- "ducts, or a viaduct on the curve some 90 feet high "and 500 feet long, with heavy approaches, in rock "cutting, at both ends. Further heavy bank and "cutting is necessary before it is possible to get "out of the Mathioya Valley."

On the route now proposed there is no tunnel and the Mathioya River may be crossed by a bridge consisting of two spans of 40 feet and two spans of 20 feet, about 30 feet above H.F.L., approached from either direction through soft cuttings of a maximum depth of 30 feet and 700 feet and 500 feet in length respectively.

Discussing the Tana River Crossing, Mr. Birch reports:- "The Tana River, although at this "point only 90 feet wide, is liable to heavy "floods and a bridge of a clear span of 100 metres "would be necessary."

At the site selected for the crossing of the Tana River on the route now proposed, the river is contained in a well defined channel, the river bank rising to a height of at least 10 feet above H.F.L. The proposed bridge consists of two spans of 60 feet about 16 feet above H.F.L.

Inspection of the 1922 route shows that much of the heavy work consists of deep rock cuttings and fills. The latter would be expensive to form owing to the absence of soil in their vicinity.

Comparing the route proposed by Mr. Birch in 1922, from the Mathioya River to the "Saddle" with the route round Kiambicho Hill, Mr. Birch writes :-

"It should be noticed that by going round "Kiambicho Hill both distance and height are "sacrificed. In the writer's opinion the topo- "graphy of the country lends itself to a direct "1.5 per cent High Level Line, nearly six miles "shorter than the Kiambicho Line, but obviously "only at the cost of heavy construction. It can "be definitely asserted that no intermediate "alignment is practicable between these extreme "routes."

Discussing the Tana River Crossing, Mr. Birch reports:- "The Tana River, although at this "point only 90 feet wide, is liable to heavy "floods and a bridge of a clear span of 100 metres "would be necessary."

At the site selected for the crossing of the Tana River on the route now proposed, the river is contained in a well defined channel, the river bank rising to a height of at least 10 feet above H.F.L. The proposed bridge consists of two spans of 60 feet about 16 feet above H.F.L.

Inspection of the 1922 route shows that much of the heavy work consists of deep rock cuttings and fills. The latter would be expensive to form owing to the absence of soil in their vicinity.

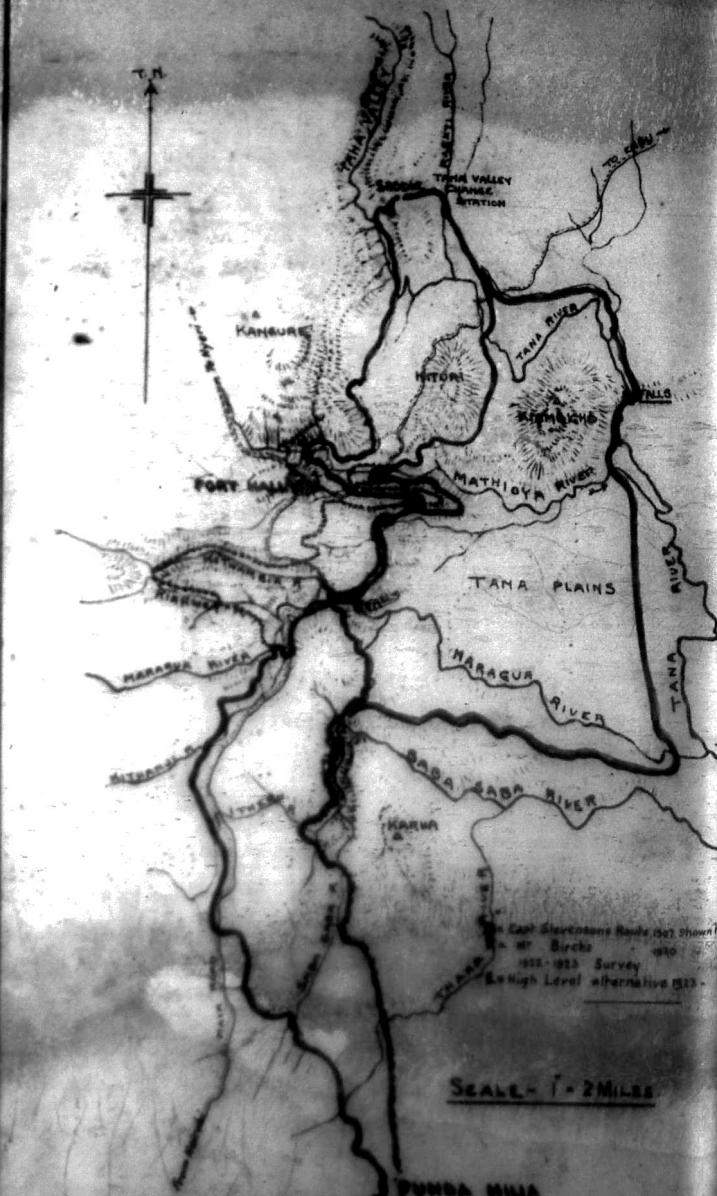
Comparing the route proposed by Mr. Birch in 1922, from the Mathioya River to the "Saddle" with the route round Kiambicho Hill, Mr. Birch writes :-

"It should be noticed that by going round "Kiambicho Hill both distance and height are "sacrificed. In the writer's opinion the topo- "graphy of the country lends itself to a direct "1.5 per cent High Level Line, nearly six miles "shorter than the Kiambicho Line, but obviously "only at the cost of heavy construction. It can "be definitely asserted that no intermediate "alignment is practicable between these extreme "routes."

PLAN SHEWING ALTERNATIVE ROUTES

PUNDA - MILIA TO SADDLE.

PLAN SHEWING ALTERNATIVE ROUTES
PUNDA - MILIA TO SADDLE.



The route now proposed does follow an alignment intermediate between Mr. Birch's proposed line and the route round Kiambicho; the length of which from a point on the right bank of the Mathioya River to the "Saddle" is 7½ miles as against a length of 9½ miles in Mr. Birch's proposed High Level Line. Within this portion of the route proposed by Mr. Birch, 3½ miles consists of heavy work, including the 2000 feet tunnel and the viaducts over the Mathioya River. On the route now proposed only 2½ miles of heavy work will be incurred, including the Mathioya Bridge and approach cuttings; the remaining 5 miles being practically a surface line.

From this comparison of the relative merits of the alternative routes it emerges that the route now proposed is in every respects a better route than the route of the reconnaissance of 1922.

The Routes D, E, F and the Route proposed are shown on the attached map.

X. POSSIBLE EXTENSIONS.

East Kenya Railway.

With the continued development of the country will arise consideration of extensions and the construction of Branch lines. Amongst the earliest of such proposals may be schemes for the projection of a branch railway along the fertile, well watered and densely populated southern and eastern slopes of Mt. Kenya by way of Embu, Chuka to Meru and thence towards the Abyssinian border.

The route now proposed does follow an alignment intermediate between Mr. Birch's proposed line and the route round Kiambicho; the length of which from a point on the right bank of the Mathioya River to the "Saddle" is 7¼ miles as against a length of 9½ miles in Mr. Birch's proposed High Level Line. Within this portion of the route proposed by Mr. Birch, 3¾ miles consists of heavy work, including the 2000 feet tunnel and the viaducts over the Mathioya River. On the route now proposed only 2½ miles of heavy work will be incurred, including the Mathioya Bridge and approach cuttings; the remaining 5 miles being practically a surface line.

From this comparison of the relative merits of the alternative routes it emerges that the route now proposed is in every respects a better route than the route of the reconnaissance of 192[illegible].

The Routes D, E, F and the Route proposed are shown on the attached map.

X. POSSIBLE EXTENSIONS.

ast Kenya
ailway.

With the continued development of the country will arise consideration of extensions and the construction of Branch lines. Amongst the earliest of such proposals may be schemes for the projection of a branch railway along the fertile, well watered and densely populated southern and eastern slopes of Mt. Kenya by way of Embu, Chuka to Meru and thence towards the Abyssinian border.

During the survey to which this Report refers, the possibility of such a Branch Railway has received consideration. The Engine Changing Station being located on a site suitable for the commencement of a line towards Embu.

Extension Northwards.

A further possible development which may eventuate in the not distant future may be the extension of the railway from the Nyeri Terminus northwards over the Guaso Nyiro Watershed towards Rumuruti or Nanyuki and the North. From the anticipation of such an extension materialising flows at once a consideration of in how far the route to be followed by the extension influences the selection of the Route to be followed now north of the Tana River. The question resolves itself into the relative merits of the Valley Route and the Ridge Route each considered as commencing at the Tana Station and terminating on the Guaso Nyiro Summit.

The survey of the Valley Route has been completed to Coles' Furrow, lying on the southern side of the watershed, a distance of 44 miles from Tana Station.

No survey on the continuation of the Ridge Route past Kampi-wa-Guruwe, 22.5 miles from Tana Station has been made, but a reconnaissance on this route to the Guaso Nyiro Watershed has been completed. The length of the Route, Tana Station to a point in the vicinity of Coles' Furrow is 40.5 miles.

A survey of the route from the Nyeri Terminus on the Ridge Route - Kampi-wa-Guruwe, to join the Valley Route at a point 11½ miles down from Coles' Furrow or 33½ miles from Tana Station was also made. The length of this route from Tana Station is 46 miles.

From a consideration of the survey of the Valley Route it emerges that the length of the extension of the Valley Route from the proposed Nyeri Terminus to Coles' Furrow on a 1.5 per cent grade is 21 miles. The probable cost of such an extension would be at the rate of

6	miles @ £ 8,000	- £	48,000
15	" 12,000		180,000
		£	228,000

In reporting on the Ridge Route in 1922, Mr. Birch states that after reaching Itiati Hill - Kampi-wa-Guruwe on the Ridge Route:- "Immediate development "on a falling maximum gradient is necessary to "make good the junction of the Mesara and Kathita "Rivers at Mile 27 on Captain Stevenson's line "only to rise again to a second summit near the "headwaters of the Rongai River."

The level of the summit of the terminus on the Ridge Route at Kampi-wa-Guruwe is 6050 feet above T.S.Datum. The level of the Guaso Nyiro Summit north of Coles' Furrow is 6350 feet above T.S.Datum.

If, therefore, the alignment north of Kampi-wa-Guruwe towards the Guaso Nyiro Watershed was developed on the western slopes of Mt. Kenya, continuous support could be obtained and no fall would be required. For reasons of economy, however, the alignment would require to be developed up and down over the spurs lying between the streams carrying the drainage from the slopes of Mt. Kenya, thus presenting a switchback profile.

The serious obstacle to adopting this route is the incidence of the Mesara, Kathita, Ombe and Thaga Rivers and one deep defile having its head below Nisma Hill, all of which will require to be crossed by long viaducts.

The length of a Railway on this Route, commencing from Kampi-wa-Guruwe and terminating in the vicinity of Coles' Furrow, is approximately 18 miles, the probable cost being :-

5 miles @ £12,000 per mile	£	60,000
13 " " 9,000 "		117,000
5 viaducts @ £30,000 each		150,000
Total.	£	327,000

The extension of the Ridge Route on a 1.5 per cent grade from the Terminus at Kampi-wa-Guruwe to join the Valley Route at Mile 32½ from Tana Station would be 22½ miles in length from Kampi-wa-Guruwe to Coles' Furrow, and would entail a fall of 550 feet from Kampi-wa-Guruwe to the Saguna River

crossing near the junction of the route in the Valley, whence the ascent of 683 feet to the summit at Coles' Furrow is commenced. Owing to the great amount of rise and fall and length, this route will not be further considered.

The relative costs of the competing routes as commencing from Tana Station are :-

Valley Route.

From Tana Station to Nyeri Terminus 23 miles @ £15,000 per mile	£	345,000
Extension to Guaso Nyiro Watershed		228,000
	£	573,000

Ridge Route.

From Tana Station to Kampi-wa-Guruwe 22½ miles @ £9,000 per mile.	£	202,500
Kampi-wa-Guruwe to Watershed.		327,000
	£	529,500

These two routes are shown on the attached map.

The adoption of the Ridge Route would therefore, result in a saving in first expenditure of £43,500. Against this saving, however, must be put the additional cost of working assistant locomotives on the 14½ miles banking section.

Assuming that the average cost of running a locomotive with load, and light, is Shs.1.50 per mile and that three trains would require to ascend the Banking Section daily with assistant engines, the annual charge for the service would be £2382.

In the absence of detailed estimates prepared from the Preliminary Survey Plans and Sections, the above estimates can only be considered as of the nature of a careful guess and the arguments to which the figures are applied will require to be reconsidered in the light of the results of the detailed estimates to be made later.

XI. GRADIENTS, CURVATURE & STANDARD DIMENSIONS.

Gradients.

The ruling gradient of the proposed Railway is 1.5 per cent or 1 in 66.6.

All gradients have been compensated for curvature, where otherwise the ruling gradient would be exceeded. Compensation has been effected at the rate of 0.03 per cent per degree.

On the sections relating to the final survey of the section Mile 0 to Mile 57.78, vertical curves are introduced at all changes of grades where the rate of change of gradient is 1 per cent or over. The length of the vertical curve is 400 feet.

On the ruling gradient the loads which the various types of locomotives in use on the Uganda Railway will haul behind tender are :-

Type of Loco.	P. & E. CLASS	MALLET CLASS.	TANK CLASS.	G CLASS
Load behind tender	304	428	241	302 TONS

400

Curvature.

The maximum degree of curvature throughout the Railway is 10 degrees or 572.958 feet radius. This curvature has been freely used to reduce work.

Transition curves are introduced at the commencement and termination of all curves of 5 degrees radius and over. The "Shift" is calculated from the expression $S = \frac{L^2}{24R}$. The length of transition curve allowed is 20 feet per degree of curvature except in a few instances where 15 feet per degree is allowed.

It has been found impracticable at reasonable expense to avoid curves near stations.

Standard Dimensions.

The Standard Dimensions adopted are those of the Uganda Railway as approved by His Excellency the Governor-in-Council on the 16th. March, 1911.

XII. DEMARCATION AND PLANS.

Demarcation.

From Ndrugu, Mile 0, to the site of the Engine Changing Station at the Tana River, Mile 58, the centre line has been marked on the ground by a trench about 12" wide and 6" deep. Masonry pillars are built round the pegs at even thousands of feet, at tangent points, at the points of commencement and

termination of transition curves, and at intersections of tangents, when accessible. The pegs have been stamped with the chainages in units of thousands of feet, the commencements and terminations of the approaching transition curves are indicated respectively by pegs stamped P.C., P.C.C., and of terminating transition curves by pegs marked P.T.C. and P.T. The off-setted tangent points of circular curves are indicated by pegs stamped B.C. and E.C.

On the traverse of the Preliminary Survey the stations are marked on the ground with concrete and masonry pillars built round pegs on which are stamped the number of the station.

Bench marks have been established at intervals of 2000 feet. As a rule they are cut on trees on which is painted the number of the bench mark. When convenient trees did not exist, bench marks are on short lengths of angle iron driven into the ground and surrounded with concrete and numbered.

PLANS.

The Working Plans and Sections of the first section, Zero to Mile 58, are prepared to a scale of 400 feet to one inch horizontal and 40 feet to one inch vertical on 23 sheets of mounted paper.

For the second section, Mile 58 to the terminus, the Route is shown on the Valley and Ridge Routes on the Preliminary Survey sheets, numbered

1 to 42 and 1 to 21 and 01 to 06 respectively, and two rolls of Sections.

An Index Plan prepared to a scale of 1/250,000 shows these various routes and places referred to in this Report.

An Index Section prepared to a scale 1" to 4 miles horizontal and 400 feet to 1" vertical shows the incidence of gradients and the positions of stations and station sites.

Enlarged plans to a scale of 200 feet to one inch have been prepared of the sites of important bridges and of the route followed by the alignment between the Maragua and Mathioya Rivers and will be found in the records of the survey.

Cross sections were taken along the located line when the side slope was 2 degrees or more. These will be found in the records. Cross sections have only been plotted when the side slope is broken or irregular or over 12 degrees.

XIII. CONSTRUCTION AND ENGINEERING.

Preliminary Survey.

To determine the route to be followed by the Railway, Preliminary Survey was completed along one route from Ndrugu to the Tana River and three routes from the Mana River towards Nyeri. In all, the

length of survey traverse completed on these routes together with a large number of alternative alignments traverses was 214 miles.

The length of the alignment to Karatina Terminus on the Ridge Route is 75.49 miles, of which 58 miles were staked out, leaving 17½ miles to be staked out. Working Plans and Sections for this section will also have to be prepared.

The cost of the survey is £7,900. To complete the stakingout and Working Plans and Sections a further sum of £1,365 is provided in the estimates.

Land.

Hitherto, it has been the custom in the Colony to resume or acquire for Railway purposes a minimum uniform width of land. As long lengths of the proposed Railway pass through valuable land on which Sisal and Coffee are cultivated, it is recommended that in these areas only the width of land actually required permanently by the Railway be resumed, and that in other areas a minimum width of 200 feet be resumed out of station and 600 feet at station sites. The estimated cost of the land required for the Railway is based upon information supplied by the Commissioner of Lands.

Earthwork.

Forest clearing. Throughout almost the entire length of the proposed Railway the route lies in open country, almost entirely free of forest or scrub. Little

timber will therefore be available for fuel from clearing.

Cuttings & Embankments.

The estimates provide for excavating cuttings to a width of 16 feet, including side drains with slopes 1 - 1 in soft material and ¼ - 1 in rock and forming embankments to a width of 14 feet at formation level with slopes of 1½ horizontal to 1 vertical.

Catchwater Drains.

Throughout almost the entire length of the Railway a good system of Catchwater Drains is required.

Tunnels.

There are no tunnels on the proposed Railway.

Walling.

In no place on the Ndrugu - Tana Section and Ridge Route have cross sections disclosed the necessity for the construction of Retaining Walls. Considerable Walling will be necessary on the Valley Route, if adopted.

Bridging.

There are no fewer than 256 openings on the Ndrugu - Tana Section.

Viaducts.

The type of viaduct proposed consists of steel trestles supporting 40 feet and 20 feet girders similar to the viaducts on the Uganda Railway.

Girder Bridges.

For crossing large rivers the design proposed consists of Plate Girders carried on masonry abutments and piers. Pier abutments have generally

been designed owing to the large saving in cost accruing by the elimination of high wing walls; this course, however, has made the bridging apparently heavier than would have been the case had a more expensive, but technically, smaller bridge been designed.

Culverts. The type of culvert proposed is a semi-circular arch springing from one feet above the floor, built in concrete.

Pipe Openings. For small openings provision is made for the use of "Armco Pipes" of various diameters, singly or in groups, with concrete head walls.

Notes on Large Bridges.

The system of rivers and streams crossed by the route of the proposed Railway from Ndrugu to the Mathioya River, Mile 0 to Mile 50, have their sources in the upper slopes of the Aberdare Range; they flow rapidly, confined in straight channels, all to unite in the Tana River, with the exception of the Ndrugu and Komo Rivers, which are tributaries of the Athi River.

Ndrugu. The river flows in a deep valley and is contained in a well-defined, rocky channel. In flood the river is about 35 feet wide and 10 feet deep. The height of underside of girders above H.F.L. is about 50 feet. The design provides for one span of sixty and two of forty feet girders carried on masonry faced concrete piers and pier abutments, the foundations being on rock at no great depth from ground surface.

Komo. At this crossing the height of formation level above H.W.L. is 34 feet. The bridge across the river on the public road is 18' wide. The bridge provided for in the estimate is a 20 ft. span arch bridge.

Thika. At the point where crossed, the river, emerging from a gorge, flows in a wide, deep valley. About two miles below the point of crossing is the Dam and Power House of the East African Electric Light and Power Company. The crossing is, therefore, in the reservoir above the dam, the width of which, from bank to bank at H.W.L. is 180 feet. The actual width of the river channel which is submerged at H.W.L. is 100 feet. At periods of floods the depth of water is 15 feet and at normal storage level, 12 feet. From H.W.L. to the under side of girders the height is 32 feet. The proposed bridge consists of two spans of 60 feet and two shore spans each of 40 feet, all carried on piers and pier abutments built in concrete with masonry face work, founded on rock which is found at no great depth.

Thara. The Thara River is crossed at Mile 30½, where the river flows through a wide shallow swamp covered from bank to bank with papyrus of tall and dense growth.

An embankment, 2000 feet long and ranging from 3 to 13 feet High, will carry the Railway over

the swamp. The opening proposed consists of two spans of 20 feet girders. A firm bottom is obtained at no great depth.

Saba-Saba. The Saba-Saba River is crossed at Mile 33 by one 40 feet girder span bridge, 30 feet above H.F.L. The river, at the site of the bridge, flows in a narrow, rocky valley.

Maragua. The Maragua River is crossed at Mile 44¢. At the site of the crossing the river flows in a deep steep sided, rocky gorge. The width of the river channel is about 55 feet, the depth at periods of flood is 9 feet. The river flows with a great velocity over a clean, rocky bed.

The Route, crossing from the right side to the left side of the valley, follows a straight and level alignment, the level of formation being 100 feet above H.F.L. at the point the river is crossed. The designs and estimates provide for the erection of a steel trestle viaduct 720 feet long, consisting of one central span of 60 feet and 11 spans of 40 feet and 11 of 20 feet.

athioya. The river is crossed at Mile 50¢, where, emerging from a great, deep, steep sided, wild gorge and falling over a series of falls and rapids, it flows with great velocity in a well defined high banked, rocky, island studded channel. Approaching the river on either side through cuttings, the alignment crosses the river on a 10 degree radius curve at the height of 32 feet above H.F.L. At the

point of crossing the channel is divided by the incidence of an island. It is proposed to close the smaller or left channel and bridge the river with two spans of 40 feet and two of 20 feet, carried on concrete piers and pier abutments founded on rock.

Tana.

The Tana River is crossed at Mile 55. At the site selected for the crossing, the river flows over a rocky bottom in three channels round two islands which permit of the construction of a bridge of short spans. Bridged below or above the island site, a long span, not less than 100 feet would be required.

It is proposed to close the left channel and carry the Railway over the river on a bridge consisting of two spans each of 60 feet, The headway between H.F.L. and the bottom of the girders is 16 feet.

As the smaller island rises to no great height and consists of light alluvial material it is anticipated that on the closing of the left channel it will be entirely removed by scour, thereby increasing the waterway of the bridged channel. There is no indication of surface flooding in the vicinity of the bridge site as the river flows in a well defined channel, the banks rising well above H.F.L.

Fencing.

No provision is made to fence the Railway except in the vicinity of dwelling houses, factories and important bridges.

Road crossings are estimated as level crossings without gates and lodges.

The number of gradient posts is considerable but by considering compensated grades as ruling grades the number is considerably reduced.

Electric Telegraphs.

The estimates provide for the erection of a three wire line, consisting of 400 lb. galvanised iron wire carried on cedar posts 25 feet long, spaced about 80 yards apart, the estimated cost of which, excluding instruments, is £87. 10. 0. per mile. Provision is also made for installing Tyers No. 5 Absolute or Permissive Tablet instruments at all stations.

Permanent Way & Ballast.

It is proposed to lay the line with 50 lbs. British Standard F. F. Rails and steel sleepers of the type used on the Uasin Gishu Railway.

The estimated cost of a mile of permanent way is shown in the appendix, and amounts to £2,538 per mile.

Provision is made for ballasting cuttings only with stone ballast, 6" deep below sleepers. Requiring 40,000 cu.ft. of ballast per mile, the cost is estimated at £420 per mile.

Plant.

Plant required for the construction of the Railway will be obtained by transfer from the Uasin Gishu Railway.

No provision is made for the supply of Rolling Stock required for construction, it being presumed that as in the case of the Uasin Gishu Railway Construction the Uganda Railway will supply the necessary equipment. Provision, however, is made for reconditioning the stock previous to its return to the Uganda Railway.

Plant, engineering, has been debited with the cost of tools, etc., handed over from Plant construction which has been credited with half cost only, and generally this latter head has been credited with 20 per cent by sales, etc. The estimates for locomotive and carriage and waggon plant are believed to be sufficient. Figures for station and office furniture have been taken from actual standard equipment and prices as they obtain on the Uganda Railway.

Stations.

The type of station proposed is the double loop type with the goods shed opposite the station building. The platforms are at rail level, 600 feet long. The length of train which can be accommodated on the 2nd. loop is 850 feet.

The run from Nairobi to the Engine Changing Station at Tana is 82¼ miles, calculated on the length of the existing Thika Railway from Nairobi to Mile 25 thereon. The distance, Tana to the terminus is 23 miles by the Valley Route and 17.71 miles to Karatina on the Ridge Route.

The sites, distances apart and particulars of stations and station sites are shown in the Tabulated Details attached, on which also appear remarks on the water supply.

Buildings, Quarters & Station Machinery.

Provision is made to equip the Railway with buildings, quarters and station machinery to the designs and scale adopted on the Uasin Gishu Railway.

Rolling Stock.

No provision is made for the supply of rolling stock.

Construction.

Labour. From the facts that shortly after the commencement of construction of the Uasin Gishu Railway, ample unskilled labour was available, and that the route of the proposed railway passes through the Kikuyu Native Reserve, it may be assumed that ample unskilled local labour will be available for the construction of this Railway.

It is considered that, owing to the proximity of the proposed railway to Nairobi, no difficulty will be experienced in obtaining sufficient skilled labour.

Earthwork. In the course of the alignment of the proposed Railway there are several heavy cuttings.

These can economically be taken out by hand and the spoil run to embankment by Decauville trucks running on narrow portable railway track.

Masonry. Excellent stone is procurable throughout the whole length of the railway. The stone is easy to work and dress. Owing, however, to the high cost of skilled labour the most economical bridge masonry will probably be found to consist of rubble concrete with a facing of masonry, thus avoiding the necessity of costly timber forms and framing for the concrete.

Water. There is an ample supply of water throughout the length of the line.

Sand. Sand, as usual in this Colony, will be difficult to obtain. There are small deposits in the Mathioya and Tana Rivers. The main supply, however, must be obtained from the Athi River Station on the Uganda Railway, a distance of 55 miles from Thika by railway.

Timber. Supplies of local timber of soft wood and hard wood and cedar are available.

General and Miscellaneous.

The estimates are based on the entertainment of a staff of sufficient strength to construct a railway 80 miles in length within a period of three years. For shorter lengths an amount pro ratio has been adopted.

The most convenient site for the Headquarters of construction is at Thika, where the Store Depot would be also. On the above basis the following staff would be required :-

Engineering.	1 Executive Engineer in Charge, construction
	4 Senior Assistant Engineers.
	6 Junior Assistant Engineers.
	8 Surveyors.
	5 Supervisors of work.
	1 Office Superintendent.
	6 Clerks.
	2 Typists.
	1 Head Draughtsman.
	2 Tracers.
	40 Chainmen.
Store.	1 Deputy Storekeeper, construction.
	4 Clerks.
	2 Tally clerks.
	1 Yard Foreman.
Audit & Accounts.	1 Deputy Chief Accountant, construction
	1 Assistant Deputy C. A. do.
	1 Head Cashier.
	4 Accounts Clerks.
	3 Travelling Paymasters.
	6 Messengers.

Medical & Sanitation.	1 Medical Officer.
	3 Sub-assistant Surgeons.
	3 Compounders.
	1 Clerk.
	1 Storekeeper.
	3 Sanitary Inspectors.
	4 Messengers.
Native Administration.	1 Railway Magistrate1
	1 Labour Inspector.
	1 European Police Officer.
	3 Clerks.
	12 Askaris.

XIV. TRAFFIC REPORT.

In pursuance of the request of the Secretary of State a Committee was appointed by His Excellency the Governor in 1921, to make an Economic Survey of the country traversed by and adjacent to the route of the Proposed Railway and to submit an estimate of the probable traffic which would be carried by the Railway three years after its completion and permanently.

The Committee, however, found that it was impracticable to furnish an estimate as required under the terms of His Excellency's remission, but submitted an estimate of the probable traffic and earnings at periods of 3 and 10 years after the completion of the Railway.

The members of the Committee were :-

The Director of Agriculture (Chairman)
The General Manager, Uganda Railway.
The Commissioner of Lands.
The Conservator of Forests.

The Committee visited the districts to be served by the proposed Railway, collected evidence and submitted their report on the 28th, April, 1921, copy of which is appended, Appendix No.A.

The districts from which traffic will originate are Thika, Donya Sabuk, Nyeri, Northern and Western Kenya and the Kikuyu and Embu Native Reserves. All are agricultural with the exception of Northern and Western Kenya, which are essentially pastoral and forestal. The European population within these districts is estimated at 2000.

The following table shows the areas within these districts, cultivable, and the areas which it is estimated will be under cultivation at periods of 3 years and 10 years after the completion of the Railway :-

TABLE I

District	Total area acres	Agricultural area acres.	Area estimated cultivable after 3 years acres	Area estimated cultivable after 10 years. acres
Thika-Donya Sabuk) Fort Hall)	350,000	120,000	21,500	32,500
Nyeri	47,000	20,000	4,000	7,000
Northern & Western Kenya	770,000 excluding forests	10,000 (irrigable)	1,000	2,000
Native Reserve	800,000	-------	Unknown	-------

On the slopes of Mt. Kenya the area of forest excluding bamboo, is estimated at 300,000 acres, only one quarter of which, i.e. 62,500 acres, is considered accessible to the Railway. The timber available for felling in this area is estimated at 500 cu.feet per acre or a total of 31,250,000 cu.ft., equivalent to the annual putput of 1,000,000 cu.ft., or 20,000 tons.

The annual traffic delivered to rail at periods of 3 years and 10 years after the completion of the Railway is estimated at 10,000 tons and 20,000 tons respectively. The timber consists chiefly of cedar and camphor woods.

The Native population of the Reserve through which the Railway passes, is large and it is anticipated that a substantial amount of revenue will be derived from Native passenger traffic, which it is estimated will increase five-fold after 3 years and ten-fold after 10 years from the completion of the Railway.

The following table shows the principal articles of produce from the districts, the estimated production, less local requirements, 3 years and 10 years after completion of the Railway, and the estimated earnings accruing therefrom to the Railway and the estimated increased earnings at similar periods accruing to the existing railway.

TABLE II

Articles of Production	Estimated Production. Tons.		Estimated Earnings on New Railway.		Estimated Increased Traffic on existing Railway.	
	After 3 years	After 10 years	After 3 years £	After 10 years	After 3 years	After 10 years
Sisal Tons.	4400	6000	591	806	2903	5080
Coffee	2500	4100	1028	1660	4449	12208
Flax	400	800	175	349	363	726
Maize & Beans	12786	15702	1763	2200	2611	3012
Wheat	1786	4464	1020	2550	270	720
General Crops	5024	8429	810	1573	2770	5515
Timber	10000	20000	5712	11424	22848	45696
Cattle. No.	1000	2000	349	698	155	310
Sheep	10000	20000	558	1116	248	496
Pigs	3000	3000	67	67	--	--
Bacon & Products. tons	500	813	378	756	2442	3968
Butter	223	446	127	255	510	1020
Cheese	558	1116	319	637	1275	2550
Wool	111	222	68	135	758	1548
Inward Traffic			2777	9257	9943	46921
European Personel			5400	7100	8820	13230
Native do.			36375	72750	14550	32738
	Total	£	57517	113333	74915	175738

The estimated amount of Gross Revenue accruing from each of the four districts traversed by the Railway is shown in the following table :-

TABLE III

418

DISTRICT	Estimated Earnings on New Railway		Increased Earnings on Existing Railway	
	After 3 years £	After 10 years £	After 3 years £	After 10 years £
Thika & Donya Sabuk	1403	2089	8298	17747
Nyeri	542	895	1223	2292
N. & W. Kenya	3377	7501	6659	14539
Timber	5712	11424	22848	45696
Native Reserve	1930	2317	2574	2575
Total	12964	24226	41602	82849
Inward Traffic	2777	9257	9943	46921
European Personel	5400	7100	8820	13230
Native do.	36375	72750	14550	32738
Total £	57516	113333	74915	175738

From the above table it appears that the gross earnings from the proposed Railway 3 years and 10 years after completion are £132,432 and £289,031 respectively.

From Table III it will be observed that the estimated Revenue includes amounts of £28,560 and £57,120 as the revenue estimated to accrue from the transport of timber on the new and existing Railways. This estimate is based upon an anticipated export trade being established. It is problematical if such a trade will be established, and in the event of it not being established, the gross revenue at periods of 3 years and 10 years after the completion of the Railway would be £103,871 and £231,951 respectively.

Turning now to a consideration of the probable gross revenue which will accrue to a Railway with its terminus at Fort Hall or Tana River, 58 miles long, it will be observed that the districts affected are Nyeri and North West Kenya only.

It is assumed that the loss of gross revenue from the districts would amount to 25% on stock and 100% on timber. No loss is anticipated on Passenger and Inwards Traffic. The following Table IV shows the estimated gross revenue accruing to a Railway terminating at Mile 58.

TABLE IV

DISTRICT	Estimated Earnings on New Railway		Estimated Earnings on Existing Railway	
	After 3 years £	After 10 years £	After 3 years £	After 10 years £
ika & Donya Sabuk	1403	2089	8298	17747
eri	407	671	917	1719
& W. Kenya	2533	5626	4994	10904
tive Reserve	1930	2317	2574	2575
Total	6273	10703	16783	32945
ard Traffic	2777	9257	9943	46921
opean Per-sonel	5400	7100	8820	13230
ive do.	36375	72750	14550	32738
Total £	50825	99810	50096	125834

The estimated gross revenue 3 years and 10 years after completion of the Railway is therefore £100,921 and £225,644 respectively.

Turning now to a consideration of the probable gross revenue which will accrue to a Railway with its terminus at Fort Hall or Tana River, 58 miles long, it will be observed that the districts affected are Nyeri and North West Kenya only.

It is assumed that the loss of gross revenue from the districts would amount to 25% on stock and 100% on timber. No loss is anticipated on Passenger and Inwards Traffic. The following Table IV shows the estimated gross revenue accruing to a Railway terminating at Mile 58.

TABLE IV

DISTRICT	Estimated Earnings on New Railway		Estimated Earnings on Existing Railway	
	After 3 years £	After 10 years £	After 3 years £	After 10 years £
Thika & Donya Sabuk	1403	2089	8298	17747
yeri	407	671	917	1719
.& W. Kenya	2533	5626	4994	10904
ative Reserve	1930	2317	2574	2575
Total	6273	10703	16783	32945
ward Traffic	2777	9257	9943	46921
ropean Personel	5400	7100	8820	13230
tive do.	36375	72750	14550	32738
Total £	50825	99810	50096	125834

The estimated gross revenue 3 years and 10 years after completion of the Railway is therefore £100,921 and £225,644 Respectively.

Turning now to a consideration of the probable gross revenue which will accrue to a Railway with its terminus at Fort Hall or Tana River, 58 miles long, it will be observed that the districts affected are Nyeri and North West Kenya only.

It is assumed that the loss of gross revenue from the districts would amount to 25% on stock and 100% on timber. No loss is anticipated on Passenger and Inwards Traffic. The following Table IV shows the estimated gross revenue accruing to a Railway terminating at Mile 58.

TABLE IV

DISTRICT	Estimated Earnings on New Railway		Estimated Earnings on Existing Railway	
	After 3 years £	After 10 years £	After 3 years £	After 10 years £
Thika & Donya Sabuk	1403	2089	8298	17747
Nyeri	407	671	917	1719
N.& W. Kenya	2533	5626	4994	10904
Native Reserve	1930	2317	2574	2975
Total	6273	10703	16783	32945
nward Traffic	2777	9257	9943	46921
uropean Personel	5400	7100	8820	13230
ative do.	36375	72750	14550	32738
Total £	50825	99810	50096	125834

The estimated gross revenue 3 years and 10 years after completion of the Railway is therefore £100,921 and £225,644 Respectively.

The following Table V shows the estimated gross revenue as above in comparative form.

TABLE V

Source of Revenue	Estimated Revenue New Railway		Increased Earnings Existing Railway	
	After 3 years £	After 10 years £	After 3 years £	After 10 years £
Thika-Nyeri Railway	57516	113333	74915	175738
do. No timber	51804	101909	52067	130042
Thika-Fort Hall Railway	50825	99810	50096	125834

Assuming Working Expenses to be 75% of the gross revenue, the Net Revenue at the third and tenth years from the completion of the Railway would be :-

TABLE VI.

Source of Revenue	Net Revenue 3 years after completion £	Net Revenue 10 years after completion £
Thika-Nyeri Rly.	33108	72268
do. do. Without timber	25968	57990
Thika-Fort Hall Railway	25230	56411

The following Table V shows the estimated gross revenue as above in comparative form.

TABLE V

Source of Revenue	Estimated Revenue New Railway		Increased Earnings Existing Railway	
	After 3 years £	After 10 years £	After 3 years £	After 10 years £
Thika-Nyeri Railway	57516	113333	74915	175738
do. No timber	51804	101909	52067	130042
Thika-Fort Hall Railway	50825	99810	50096	125834

Assuming Working Expenses to be 75% of the gross revenue, the Net Revenue at the third and tenth years from the completion of the Railway would be :-

TABLE VI.

Source of Revenue	Net Revenue 3 years after completion £	Net Revenue 10 years after completion £
Thika-Nyeri Rly.	33108	72268
do. do. Without timber	25968	57990
Thika-Fort Hall Railway	25230	56411

XV. FINANCIAL PROSPECTS.

The Traffic Report shows that the estimated annual net revenue on a Railway commencing at Thika and terminating at the Tana River, a distance of 58 miles, is £25,230 three years and £56,411 ten years after completion of the Railway.

The estimated cost of the Ndrugu - Tana Section is £541,664. Assuming the Interest and Sinking Fund Charges amount to 7 per cent per annum, the annual charges under these heads would be £37,910.

At periods of 3 years and 10 years after completion, the estimated net revenue would be sufficient to pay 4.6 per cent and 10.4 per cent respectively on the estimated cost of the first section.

The estimated cost of a railway on the Valley Route is £886,564 and the estimated net revenue 3 years and 10 years after completion is £33,108 and £72,268 respectively, if an export trade in timber is established and £25,968 and £57,990 if the export timber trade is not established. This revenue is sufficient to pay 3.6 and 8.2 per cent and 2.9 and 6.5 per cent respectively on the estimated capital cost.

The estimated cost of a Railway from Ndrugu to Karatina on the Ridge Route is :-

First Section	£541,664
18 miles @ £9,000	162,000
Total	£ 703,664

421

XV. FINANCIAL PROSPECTS.

The Traffic Report shows that the estimated annual net revenue on a Railway commencing at Thika and terminating at the Tana River, a distance of 58 miles, is £25,230 three years and £56,411 ten years after completion of the Railway.

The estimated cost of the Ndrugu - Tana Section is £541,664. Assuming the Interest and Sinking Fund Charges amount to 7 per cent per annum, the annual charges under these heads would be £37,910.

At periods of 3 years and 10 years after completion, the estimated net revenue would be sufficient to pay 4.6 per cent and 10.4 per cent respectively on the estimated cost of the first section.

The estimated cost of a railway on the Valley Route is £886,564 and the estimated net revenue 3 years and 10 years after completion is £33,108 and £72,268 respectively, if an export trade in timber is established and £25,968 and £57,990 if the export timber trade is not established. This revenue is sufficient to pay 3.6 and 8.2 per cent and 2.9 and 6.5 per cent respectively on the estimated capital cost.

The estimated cost of a Railway from Ndrugu to Karatina on the Ridge Route is :-

First Section	£541,664
18 miles @ £9,000	162,000
Total	£ 703,664

FINANCIAL STATEMENT.

Source of Revenue - Route	Capital Cost.	Estimated Net Revenue after 3 & 10 years.	Interest & Sinking Fund Charges 7 per cent.	PROFIT after 3 yrs.	PROFIT after 10 yrs.	LOSS after 3 yrs.	LOSS after 10 yrs.	Per cent Net Revenue to capital after 3 yrs.	Per cent Net Revenue to capital after 10 yrs.
	£	£	£	£	£	£	£		
Kibugu to Tana River	541,664	25,250	37,910	--	18,501	12,660	--	4.6	10.4
		56,411							
Valley Route to Nyeri With Timber Traffic	886,664	33,108	62,060	--	10,268	28,952	--	3.6	8.2
		72,268					4,070		
Valley Route to Nyeri Without Timber Traffic.	do.	25,968	62,060	--	--	36,092		2.9	6.6
		57,990							
Ridge Route to Karatina With Timber Traffic.	703,664	33,108	49,250	--	20,636 ¤	18,524 ¤	--	4.3 ¤	9.9 ¤
		72,268							
Ridge Route to Karatina Without Timber Traffic	do.	25,968	49,250	--	6,358 ¤	25,664 ¤	--	3.3 ¤	7.9 ¤
		57,990							

For calculating amounts marked thus "¤", the sum of £2,382 is added to Interest and Sinking Fund charges as the additional annual charge on the Ridge Route due to operating Banking Section.
For calculating figures marked thus "¤", the sum is deducted from Estimated Revenue.

Assuming that the net revenue with and without an export timber trade to be the same as accruing to a railway following the Valley Route and terminating near Nyeri, the interest earned on the above estimated cost of the Ridge Route to Karatina would be 4.3 per cent and 9.9 per cent and 3.3 per cent and 7.9 per cent respectively as explained below.

The attached table shows the above results in comparative form, from which it appears that the financial prospects of a Railway terminating at Tana River are superior to those of any other route. The route with the next best prospects is the Ridge Route.

To exhibit actuarially the financial effect of operating the Banking Section on the Ridge Route, the sum of £2,382, the estimated annual cost of operating the Banking Section, is added to the annual Interest and Sinking Fund Charges for the purpose of arriving at the probable profit and loss accruing after periods of 3 years and 10 years from the completion of the Railway; and similarly, for calculating the percentage of net revenue to capital the sum of £2,382 is deducted from the estimated revenue after periods of 3 years and 10 years from the completion of the Railway.

The establishment of the large export trade in timber anticipated in the Report of the Departmental Committee responsible for the Economic Survey of the Railway is so very problematical that the amount of assumed revenue accruing therefrom is not considered as a factor influencing the decision as to the route to be adopted.

Assuming that the net revenue with and without an export timber trade to be the same as accruing to a railway following the Valley Route and terminating near Nyeri, the interest earned on the above estimated cost of the Ridge Route to Karatina would be 4.3 per cent and 9.9 per cent and 3.3 per cent and 7.9 per cent respectively as explained below.

The attached table shows the above results in comparative form, from which it appears that the financial prospects of a Railway terminating at Tana River are superior to those of any other route. The route with the next best prospects is the Ridge Route.

To exhibit actuarially the financial effect of operating the Banking Section on the Ridge Route, the sum of £2,382, the estimated annual cost of operating the Banking Section, is added to the annual Interest and Sinking Fund Charges for the purpose of arriving at the probable profit and loss accruing after periods of 3 years and 10 years from the completion of the Railway; and similarly, for calculating the percentage of net revenue to capital the sum of £2,382 is deducted from the estimated revenue after periods of 3 years and 10 years from the completion of the Railway.

The establishment of the large export trade in timber anticipated in the Report of the Departmental Committee responsible for the Economic Survey of the Railway is so very problematical that the amount of assumed revenue accruing therefrom is not considered as a factor influencing the decision as to the route to be adopted.

These figures will require revision in the light of the Detailed Estimate of the cost of the Valley Route and Ridge Route to be made later.

XVI. CONCLUSIONS.

The results of the survey, reviewed in the proceeding sections of this Report, indicate that :-

A. The estimated cost of the construction of a Railway commencing at Ndrugu and terminating at Tana River, a distance of 58 miles, is £541,664 and the profit accruing from the investment of this sum during the eleventh year after completion of the Railway will be £18,501.

B. The estimated cost of the construction of a Railway commencing from Ndrugu and terminating in the vicinity of Nyeri, in the valley of the Tana River, a distance of 81 miles, is £886,664, and the loss accruing from the investment of this sum during the fourth and eleventh year after completion of the Railway will be £36,092 and £4,072 respectively.

C. The estimated cost of the construction of a Railway commencing from Ndrugu and terminating in the vicinity of Nyeri at Karatina on the Sakumi-Tana Ridge, a distance of 76 miles, is £703,664, and the profit accruing from the investment of this sum during the eleventh year after completion of the Railway will be £6,358.

XVII. RECOMMENDATIONS.

Of the above three projects, the adoption of "A", a railway from Ndrugu, terminating at Tana River, is recommended on the grounds that it is a Railway project with reasonable prospects of becoming financially successful in the not distant future.

If, for economic reasons, it is expedient that the proposed Railway be extended to the vicinity of Nyeri and that there is no prospect of the Railway being extended beyond the vicinity of Nyeri, the adoption of the Ndrugu - Nyeri Route, (Ridge Route) terminating at Karatina is recommended.

If the extension of the proposed Railway north of the Nyeri district is contemplated, it is recommended that for the present, the proposed Railway terminate at Tana River and that no decision be taken as to the route to be followed by a Railway northwards from there, pending the completion of a survey of a route from Kampi-wa-Guruwe to the Guaso Nyiro Watershed in continuation of the Ridge Route, the final survey of the Valley Route from Tana River Station site to the proposed terminus in the vicinity of Nyeri and the preparation of detailed estimates of the cost of constructing railways from Tana River to the Guaso Nyiro Watershed by the Valley Route and the Ridge Route, and a Report thereon.

W. H. Beetham

CHIEF ENGINEER.
Construction & Survey of Railways

Entebbe. 11. Aug 23.

XVII. RECOMMENDATIONS.

Of the above three projects, the adoption of "A", a railway from Ndrugu, terminating at Tana River, is recommended on the grounds that it is a Railway project with reasonable prospects of becoming financially successful in the not distant future.

If, for economic reasons, it is expedient that the proposed Railway be extended to the vicinity of Nyeri and that there is no prospect of the Railway being extended beyond the vicinity of Nyeri, the adoption of the Ndrugu - Nyeri Route, (Ridge Route) terminating at Karatina is recommended.

If the extension of the proposed Railway north of the Nyeri district is contemplated, it is recommended that for the present, the proposed Railway terminate at Tana River and that no decision be taken as to the route to be followed by a Railway northwards from there, pending the completion of a survey of a route from Kampi-wa-Guruwe to the Guaso Nyiro Watershed in continuation of the Ridge Route, the final survey of the Valley Route from Tana River Station site to the proposed terminus in the vicinity of Nyeri and the preparation of detailed estimates of the cost of constructing railways from Tana River to the Guaso Nyiro Watershed by the Valley Route and the Ridge Route, and a Report thereon.

W K Bowman

CHIEF ENGINEER.
Construction & Survey of Railways

Nairobi. 11. Aug 23.

TABULATED DETAILS.

THIKA-NYERI EXTENSION.

Metre Gauge.

CURVE ABSTRACT.

DEGREE OF CURVE AND RADIUS.	Kiruga - Tana River 57.78 miles			Valley Route 23 miles			Ridge Route - Kamutina 17.71 miles			Ridge Route - Kamuti Curves. 22.5 miles		
	No. of each	Length in miles.	Total curvature degrees.	No. of each	Length in miles.	Total curvature degrees.	No. of each	Length in miles	Total curvature degrees.	No. of each	Length in miles	Total curvature degrees.
10° radius = 573 ft.	118	7.87	4156.00	108	10.77	5700.00	69	7.52	3969.33	85	9.37	4935.00
9° " 637 "	--	--	--	1	.27	129.70	--	--	--	--	--	--
8°30' " 674 "	--	--	--	--	--	--	1	0.33	147.16	1	0.33	147.16
8° " 716 "	17	1.22	521.00	6	.56	287.43	3	0.11	49.16	3	0.11	49.16
7° " 818 "	2	0.34	125.97	2	.04	19.00	--	--	--	1	0.04	17.00
6° " 955 "	14	2.02	639.61	12	1.00	316.83	9	0.94	297.66	9	0.94	297.66
5° " 1146 "	1	.24	63.61	1	.24	64.00	3	0.45	117.83	3	0.45	117.83
4°30' " 1273 "	--	--	--	--	--	--	1	0.36	86.00	1	0.36	86.00
4° " 1432 "	27	3.01	637.41	9	.59	125.70	6	0.39	82.16	8	0.75	158.16
3° " 1910 "	7	0.97	153.28	1	.05	7.70	--	--	--	--	--	--
2° " 2865 "	5	1.07	112.62	3	.19	20.45	--	--	--	1	0.11	11.50
1° " 5730 "	2	0.43	22.86	2	.12	6.70	--	--	--	--	--	--
TOTAL	193	17.17	6432.36	145	13.83	6627.49	92	10.10	4749.30	112	12.46	5819.47
Ratio of curve to length of line	29.71 per cent			60.1 per cent			56.4 per cent			55.4 per cent		
Average amount of curvature per mile	111.3 degrees			288.15 degrees			268.2 degrees			258.7 degrees.		

THIKA-NYERI EXTENSION.

Metre Gauge.

CURVE ABSTRACT.

DEGREE OF CURVE AND RADIUS.	Nduguti - Tana River 57.78 miles			Valley Route 28 miles			Ridge Route - Kamutina 17.71 miles			Ridge Route - Kamutina Chainage 28.8 miles		
	No. of each	Length in miles.	Total curvature degrees.	No. of each	Length in miles.	Total curvature degrees.	No. of each	Length in miles	Total curvature degrees.	No. of each	Length in miles	Total curvature degrees.
10° radius = 573 ft.	118	7.87	4156.00	108	10.77	5700.00	69	7.52	3969.33	85	9.37	4836.00
9° " 637 "	--	--	--	1	.27	129.70	--	--	--	--	--	--
8°30' " 674 "	--	--	--	--	--	--	1	0.33	147.16	1	0.33	147.16
8° " 716 "	17	1.22	521.00	6	.56	287.43	3	0.11	49.16	3	0.11	49.16
7° " 818 "	2	0.34	125.97	2	.04	19.00	--	--	--	1	0.04	17.00
6° " 955 "	14	2.02	639.61	12	1.00	316.83	9	0.94	297.66	9	0.94	297.66
5° " 1146 "	1	0.24	63.61	1	.24	64.00	3	0.45	117.83	3	0.45	117.83
4°30' " 1273 "	--	--	--	--	--	--	1	0.36	86.00	1	0.36	86.00
4° " 1432 "	27	3.01	637.41	9	.59	125.70	6	0.39	82.16	8	0.75	158.16
3° " 1910 "	7	0.97	153.28	1	.06	7.70	--	--	--	--	--	--
2° " 2865 "	5	1.07	112.62	3	.19	20.43	--	--	--	1	0.11	11.50
1° " 5730 "	2	0.43	22.86	2	.12	6.70	--	--	--	--	--	--
TOTAL	193	17.19	6432.36	145	13.83	6627.49	92	10.10	4749.30	112	12.46	5819.47
Ratio of curve to length of line	29.71 per cent			60.1 per cent			56.4 per cent			55.4 per cent		
Average amount of curvature per mile	111.3 degrees			288.15 degrees			268.2 degrees			258.7 degrees.		

A28

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge.

GRADIENT ABSTRACT.

GRADIENT.	Ndrugu - Tana River 57.78 miles			Valley Route 23 miles			Ridge Route - Karatina 17.71 miles			Ridge Route - Kampi-ya-Chuma. 22.5 miles.		
	No. of each	Length in miles	Percentage of total length.	No. of each	Length in miles.	Percentage of total length	No. of each.	Length in miles	Percentage of total length.	No. of each.	Length in miles	Percentage of total length.
1 in 40 or 2.5% comp:	--	--	--	--	--	--	6	12.42	70.13	6	12.42	55.20
1 in 41 to 1 in 50	--	--	--	--	--	--	1	0.17	.96	1	.17	.76
1 in 66.6 or 1.5% comp:	51	34.36	59.47	18	18.60	81.00	2	2.06	11.63	8	5.42	24.09
1 in 67 to 1 in 100	21	3.82	6.61	6	1.02	4.3	1	0.47	2.66	2	0.48	2.13
1 in 101 to 1 in 200	26	5.12	8.86	6	.95	4.1	3	0.34	1.92	5	0.80	3.55
1 in 201 to 1 in 300	5	1.32	2.28	1	.13	0.6	1	0.24	1.35	2	0.58	2.58
1 in 301 to 1 in 400	4	.97	1.68	--	--	--	-	--	--	-	--	--
1 in 401 to 1 in 500	5	1.22	2.12	--	--	--	-	--	--	-	--	--
1 in 500 & flatter	4	.92	1.59	--	--	--	-	--	--	-	--	--
Level	30	10.05	17.39	12	2.30	10.00	10	2.01	11.35	11	2.63	11.69
	146	57.78	100.00	43	23.00	100.00	24	17.71	100.00	35	22.50	100.00
Steepest Gradient	Fall 1.5% comp:			Rise 1.5% comp:			Rise 2.5% comp:			Rise 2.5% comp:		
Longest continuous length of steepest grade	4.16 miles			8 miles			3.68 miles			3.68 miles		
Followed by	Level			Level			Level			Level		
For	0.11 miles			0.23 miles			0.29 miles			0.29 miles.		

THIKA - NYERI EXTENSION.

Metre Gauge

BRIDGE ABSTRACT.

CLASS OF BRIDGE	SPANS	Kiruga - Tana River 57.78 miles		Valley Route 23 miles		Ridge Route 17.71 miles		Ridge Route to Kamp-wa-Guruwa. 22.5 mls	
		Total No. of spans.	Waterway Lin. ft.	Total No. of spans.	Waterway lin. ft.	Total No. of spans	Waterway lin.ft.	Total No. of spans	Waterway lin.ft.
PIPE DRAINS	18 inches	4	6	--	--	--	--	--	--
	24 "	145	290	60	120	78	156	84	168
	30 "	61	152.5	--	--	--	--	--	--
	36 "	66	198	86	258	4	12	8	24
ARCH CULVERTS	6 feet	3	18	1	6	--	--	--	--
	12 "	1	12	4	48	--	--	--	--
	20 "	4	80	-	--	--	--	--	--
GIRDER BRIDGES	12 feet	9	108	--	--	2	24	2	24
	20 "	19	380	24	480	-	--	-	--
	40 "	21	840	36	1440	-	--	-	--
	60 "	6	360	12	720	-	--	-	--
TOTAL		339	2444.5	223	3072	84	192	94	216
WATERWAYS per mile		42.3 lin.ft.		132.3 lin.ft		10.8 lin.ft.		9.6 lin.ft	
Deducting Viaducts		29.9 "		50.1 "		--		--	

430

UGANDA RAILWAY

THIKA-NYERI EXTENSION

ABSTRACT OF STATIONS AND STATION SITES

Section	Name of Station	Class W - Watering E - Engine Changing C - Crossing S - Site	Mileage from zero	DISTANCE APART: Sites	Crossing	Watering	Engine Changing	REMARKS
Ndrugu to Tana River	Ndrugu	S	3.2	3.2				
	Thika	C.W.	8.00	4.80	8.00	8.00		Water supply continuation of present system
	Site	S	14.30	6.30				
	Site	S	18.37	4.07				
	Site	S	23.48	5.11				
	Punda Milia	C.W.	29186	6.38	21.86	21.86		
	Site	S	33.50	3.64				
	Site	S	37.83	4.33				
	Fort Hall	C	47.28	9.45	17.42			
	Maragua	S	50.37	3.09				
	Tana	C.W.E.	57.57	7.20	10.29	28.71	82.57	From Nairobi
Tana River Route	Site	S	61.94	4.37				Water available
	Site	S	68.25	6.31				Water available
	Site	S	71.14	2.89				Water available
	Karatina	C.W.	75.27	4.13		17.70	17.70	
	Kampi-wa-Gurmwa.	C.W.	80.19	4.92		4.92	22.62	From Tana Station
Valley Route	Minjiri	C	65.90	8.33	8.33			
	Tumi-Tumu	C	75.40	9.50	9.50			Water available at all Station Sites
	Nyeri	C.W.E.	80.80	5.40	5.40	23.00	103.89	From Nairobi

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 57.78 Miles

KIARUGU TO TANA VALLEY

GENERAL ABSTRACT OF COST OF RAILWAY

Head of Account and Sub-Head.	Sub-Head Cost Sh.	Sub-Head Rate Per Mile Sh.	Main Head Cost Sh.	Main Head Rate Per Mile Sh.
I. PRELIMINARY EXPENSES			133128	2316
(a) Survey Expenses	38048	656		
(b) Plant	21576	372		
(c) Establishment	73504	1288		
II. LAND			132060	2289
III. FORMATION			2197132	38026
(a) Earthwork	1942223	33614		
(b) Drains	53669	929		
(c) Maintenance	192098	3325		
(d) Clearing	6000	104		
(e) Road Diversions	3142	54		
IV. BRIDGEWORK			2178597	37705
(a) Major Bridges	1212773	20989		
(b) Minor Bridges	509049	8810		
(c) Culverts	456775	7906		
V. FENCING			24618	426
(a) Fencing	15378	266		
(b) Boundary Posts	2320	40		
(c) Gradient Posts	2960	51		
(d) Mile Posts	1044	18		
(e) Level Crossings	2916	51		
I. ELECTRIC TELEGRAPH			103689	1799
I. BALLAST & PERMANENT WAY			3388684	58648
(a) Main Line				
1. Permanent Way	2932612	50754		
2. Ballast	196888	3408		
(b) Sidings				
1. Permanent Way	183885	3171		
2. Ballast	Nil.			
(c) Points & Crossings	75959	1315		
I. STATIONS & BUILDINGS			767995	13291
(a) Stations & Offices	123280	2133		
(b) Workshops & Stores	Nil.			
(c) Staff Quarters	404668	7004		
(d) Station Machinery	239939	4154		
Carried Forward.....			8925903	154500

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 57.78 Miles

NDARUGU TO TANA VALLEY

GENERAL ABSTRACT OF COST OF RAILWAY

Head of Account and Sub-Head.	Sub-Head Cost Sh.	Sub-Head Rate Per Mile Sh.	Main Head Cost Sh.	Main Head Rate Per Mile Sh.
I. PRELIMINARY EXPENSES			133128	2316
(a) Survey Expenses	38048	656		
(b) Plant	21576	372		
(c) Establishment	73804	1288		
II. LAND			132060	2289
III. FORMATION			2197132	38026
(a) Earthwork	1942223	33614		
(b) Drains	53669	929		
(c) Maintenance	192098	3325		
(d) Clearing	6000	104		
(e) Road Diversions	3142	54		
IV. BRIDGEWORK			2178597	37705
(a) Major Bridges	1212773	20989		
(b) Minor Bridges	509049	8810		
(c) Culverts	456775	7906		
V. FENCING			24618	426
(a) Fencing	15378	266		
(b) Boundary Posts	2320	40		
(c) Gradient Posts	2960	51		
(d) Mile Posts	1044	18		
(e) Level Crossings	2916	51		
VI. ELECTRIC TELEGRAPH			103689	1799
VII. BALLAST & PERMANENT WAY			3388684	58648
(a) Main Line				
1. Permanent Way	2933612	50754		
2. Ballast	196888	3408		
(b) Sidings				
1. Permanent Way	182225	3171		
2. Ballast	Nil.			
(c) Points & Crossings	75959	1315		
VIII. STATIONS & BUILDINGS			767995	13291
(a) Stations & Offices	122290	2153		
(b) Workshops & Stores	Nil.			
(c) Staff Quarters	404688	7004		
(d) Station Machinery	240000	4154		
Carried Forward.....			8925903	154500

UGANDA RAILWAY

433

THIKA-NYERI EXTENSION

KIARUGU TO TANA VALLEY

Metre Gauge
Length 27.78 Miles.

GENERAL ABSTRACT OF COST OF RAILWAY (Continued)

Head of Account and Sub-Head	Sub-Head Cost Sh.	Sub-Head Rate Per Mile Sh.	Main Head Cost Sh.	Main Head Rate Per Mile Sh.
	Brought Forward		8925903	154500
I. PLANT			331997	5746
(a) Engineering	19200	332		
(b) Construction	278797	4825		
(c) Locomotive	5000	87		
(d) Carriage & Wagon	5000	87		
(e) Station & Office Furniture	24000	415		
II. FERRIES			Nil.	
III. ROLLING STOCK			Nil.	
IV. GENERAL CHARGES			1575375	27265
(a) Direction	139250	2410		
(b) Engineering	716185	12395		
(c) Stores	160050	2770		
(d) Audit & Accounts	216965	3755		
(e) Native Administration	118160	2045		
(f) Medical & Sanitation	224765	3890		
GRAND TOTAL	Sh.		10833275	187511
	£.		541,664	9,376

W. H. Watson

CHIEF ENGINEER,
Construction & Survey of Railways.

UGANDA RAILWAY

IHIKA-MBERI EXTENSION

NDAROGU TO TANA VALLEY

Metre Gauge
Length 57.78 Miles.

GENERAL ABSTRACT OF COST OF RAILWAY (Continued)

Head of Account and Sub-Head	Sub-Head Cost Sh.	Sub-Head Rate Per Mile Sh.	Main Head Cost Sh.	Main Head Rate Per Mile Sh.
	Brought Forward		8925903	154500
PLANT			331997	5746
(a) Engineering	19200	332		
(b) Construction	278797	4825		
(c) Locomotive	5000	87		
(d) Carriage & Wagon	5000	87		
(e) Station & Office Furniture	24000	415		
FERRIES			Nil.	
ROLLING STOCK			Nil.	
GENERAL CHARGES			1575375	27265
(a) Direction	139250	2410		
(b) Engineering	716185	12395		
(c) Stores	160050	2770		
(d) Audit & Accounts	216965	3755		
(e) Native Administration	118160	2045		
(f) Medical & Sanitation	224765	3890		
GRAND TOTAL	Sh.		10833275	187511
	£.		541,664	9,376

CHIEF ENGINEER
Construction & Survey of Railways

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

KIANJEGU TO TANA VALLEY — Metre Gauge Length 57.75 Miles.

1. PRELIMINARY EXPENSES.

For details see Appendix "B"

Sub-head	Mileage	Rate Sh. cs.	Cost Sh. cs.
A) Survey Expenses	58	656. 00	38,048. 00
B) Plant	58	372. 00	21,576. 00
C) Establishment.	58	1,288. 00	73,504. 00
	TOTAL.....		133,128. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

KIAMBU TO TANA VALLEY — Metre Gauge Length 57.75 Miles.

1.PRELIMINARY EXPENSES.

For details see Appendix "B"

Sub-head	Mileage	Rate Sh. cs.	Cost Sh. cs.
A) Survey Expenses	58	656. 00	38,048. 00
B) Plant	58	372. 00	21,576. 00
C) Establishment.	58	1,288. 00	73,504. 00
	TOTAL.....		133,128. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION

KIARUGU TO TANA VALLEY

Metre Gauge
Length 57.78 Miles.

II. LAND.

Item	Acres	Rate Sh. cs.	Cost Sh. cs.
ACQUISITION OF LAND			
Thika Station	27	25. 00	675. 00
Punda Milia "	27	160. 00	4,320. 00
Fort Hall "	27	Crown	Land
Tana Valley "	134	"	"
COMPENSATION			
Improved	22	200. 00	4,400. 00
Coffee in bearing	6	1,600. 00	9,600. 00
Sisal (full grown)	75	1,000. 00	75,000. 00
Plantations & Nurseries	11	600. 00	6,600. 00
Native Cultivation	600	20. 00	12,000. 00
Native Huts No.	50	50. 00	2,500. 00
Buildings		Lump sum	1,000; 00
SURVEY OF LAND OFFICE PLANS			
Miles	58	240; 00	13,920. 00
MISCELLANEOUS			2,045. 00
	TOTAL		132,060. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION

NDARUGU TO TANA VALLEY

Metre Gauge
Length 57.78 Miles.

II. LAND.

Item	Acres	Rate Sh. cs.	Cost Sh. cs.
ACQUISITION OF LAND			
Thika Station	27	25. 00	675. 00
Punda Milia "	27	160. 00	4,320. 00
Fort Hall "	27	Crown	Land
Tana Valley "	134	"	"
COMPENSATION			
Improved	22	200. 00	4,400. 00
Coffee in bearing	6	1,600. 00	9,600. 00
Sisal (full grown)	75	1,000. 00	75,000. 00
Plantations & Nurseries	11	600. 00	6,600. 00
Native Cultivation	600	20. 00	12,000. 00
Native Huts No.	50	50. 00	2,500. 00
Buildings		Lump sum	1,000; 00
SURVEY OF LAND OFFICE PLANS			
Miles	58	240; 00	13,920. 00
MISCELLANEOUS			2,045. 00
	TOTAL		132,060. 00

KENYA RAILWAY

THIKA-NYERI EXTENSION.

NDARUGU TO TANA VALLEY — Metre Gauge Length 27.78 Miles.

436

III. FORMATION

Sub-Head	Quantity	Rate Sh. cs.	Unit	Amount. Sh. cs.
(a) EARTHWORK				
Spoils earth	17,117,271	28. 00	%c.f.	479,283. 60
soft rock	12,690,567	50. 00	"	634,528. 50
Cuts earth	8,618,569	28.00	"	241,320. 80
soft rock	2,844,477	50. 00	"	142,223. 90
hard rock	4,236,327	100. 00	"	423,632. 70
Trained Earth	353,892	60. 00	"	21,233. 50
(b) DRAINS				
Side drains				
earth	190,440	40. 00	"	7,617. 60
soft rock	63,480	70. 00	"	4,443. 60
hard rock	63,480	130. 00	"	8,252. 40
Catchwater drains				
earth	398,250	40. 00	"	15,930. 00
soft rock	62,750	70. 00	"	4,392. 50
hard rock	100,250	130. 00	"	13,032. 50
(c) MAINTENANCE & [illegible]				
Allow 10% on to earthworks				192,098. 90
(d) CURBING (Light)	12,000	50. 00	% lin.f.	6,000. 00
(e) ROAD DIVERSIONS				
earth	64,000	28. 00	%c.f.	1,792. 00
soft rock	27,000	50. 00	"	1,350. 00
TOTAL				2,197,132. 20

KAMPALA RAILWAY

TROIKA-MBARARA EXTENSION.

Metre Gauge
KAMPALA TO KAFU VALLEY Length 87.78 Miles.

436

III. FORMATION

Sub-Head	Quantity	Rate Sh. cs.	Unit	Amount. Sh. cs.
(a) EARTHWORK				
Banks earth	17,117,271	28. 00	%c.f.	479,283. 60
soft rock	12,690,567	50. 00	"	634,528. 50
Cuts earth	8,618,589	28.00	"	241,320. 50
soft rock	2,844,477	50. 00	"	142,223. 90
hard rock	4,236,327	100. 00	"	423,632. 70
Trained Earth	353,892	60. 00	"	21,233. 50
(b) DRAINS				
Side drains				
earth	190,440	40. 00	"	7,617. 60
soft rock	63,480	70. 00	"	4,443. 60
hard rock	63,480	130. 00	"	8,252. 40
Catchwater drains				
earth	398,250	40. 00	"	15,930. 00
soft rock	62,750	70. 00	"	4,392. 50
hard rock	100,250	130. 00	"	13,032. 50
(c) MASONRY & [illegible]				
Allow 10% on to earthworks				192,098. 90
(d) CLEARING (Light)	12,000	50. 00	% lin.f.	6,000. 00
(e) ROAD DIVERSIONS				
earth	64,000	28. 00	%c.f.	1,792. 00
soft rock	27,000	50. 00	"	1,350. 00
TOTAL				2,197,132. 20

UGANDA RAILWAY

THIKA - NYERI EXTENSION.

MDARUGU TO TANA VALLEY — Metre Gauge Length 87.75 Miles

IV. BRIDGEWORK

(A) 40' SPAN & OVER

ABSTRACT OF COST

FOR DETAILS SEE APPENDIX "K"

Serial No.	Mileage	Name	Spans		Cost. Shs. cs.
7	1.11	Mdarugu	1 - 60' & 2 - 40'	Girder "	119,037. 00
30	9.78	Thika	2 - 60' & 2 - 40'	Girders "	124,540. 00
54	16.60	Kabuku	3 - 40'	"	69,897. 00
116.	30.62	Thara	3 - 20'	"	37,173. 00
127	33.15	Saba Saba	1 - 40'	Girder	82,037. 00
179	44.15	Marugua	10 - 40' & 10 - 20' & 1 - 60'	Girders " "	592,642. 00
227	50.00	Mathioya	2 - 40' & 2 - 20'	" "	66,557. 00
251	54.20	Tana	2 - 60'	"	94,719. 00
257	57.40	Ragati	2 - 20'	"	18,319. 00

TOTAL	1,204,921. 00
Contingencies.....	7,852. 00
TOTAL	1,212,773. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

MARUGU TO TANA VALLEY — Metre Gauge Length 57.78 Miles

EV. BRIDGEWORK

(A) 40' SPAN & OVER

ABSTRACT OF COST

FOR DETAILS SEE APPENDIX "K"

Serial No.	Mileage	Name	Spans		Cost. Sh. cs.
7	1.11	Marugu	1 - 60' & 2 - 40'	Girder "	119,037. 00
30	9.78	Thika	2 - 60' & 2 - 40'	Girders "	124,540. 00
54	16.60	Kabuku	3 - 40'	"	69,897. 00
116.	30.62	Thara	3 - 20'	"	37,173. 00
127	33.15	Saba Saba	1 - 40'	Girder	82,037. 00
179	44.15	Marugua	10 - 40' & 10 - 20' & 1 - 60'	Girders " "	592,642. 00
227	50.00	Mathieya	2 - 40' & 2 - 20'	" "	66,557. 00
251	54.20	Tana	2 - 60'	"	94,719. 00
257	57.40	Rugati	2 - 20'	"	18,319. 00
			TOTAL		1,204,921. 00
			Contingencies.....		7,852. 00
			TOTAL		1,212,773. 00

UGANDA RAILWAY

THIKA - NYERI EXTENSION.

NDARUGU TO TANA VALLEY

Metre Gauge
Length 27.7 Miles.

438

IV. BRIDGEWORK

(B) MINOR BRIDGES.

UNDER 40 ft. TO 6 ft. SPAN.

ABSTRACT OF COST.

FOR DETAILS SEE APPENDIX "L"

Serial No.	Name	Mileage	Span	Cost. Sh. cs.
6	Karamaini	1. 50	1 - 12' Arch.	44,601. 00
18	Kome	5. 28	1 - 20' "	79,040. 00
33	Lawford's Stream	10. 60	1 - 6' "	29,429. 00
38	Thika Sisal	12. 15	1 - 12' Girder	14,866. 00
42	Samuru	13. 16	1 - 20' Arch.	71,254. 00
67	Kitina	19. 25	1 - 6' "	19,632. 00
72	Genia Valley	20. 34	2 - 12' Girder	15,223. 00
73	do	20. 79	1 - 12' "	13,765. 00
99	Mukuyu	27. 42	do	16,500. 00
111	do	29. 68	do	13,190. 00
131	Little Saba-Saba	33. 76	1 - 20' Arch	44,947. 00
136	Itheru	36. 57	2 - 12' Girder	12,436. 00
139	do	37. 48	1 - 12' "	5,831. 00
143	Kithanji	38. 46	1 - 20' "	20,493. 00
164	do	42. 63	1 - 20' Arch	78,041. 00
191	Fort Hall	45. 96	1 - 6' "	29,801. 00
			TOTAL	509,049. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
NDARUGU TO TANA VALLEY Length 87.0 Miles.

438

IV. BRIDGEWORK

(2) MINOR BRIDGES.

UNDER 40 ft. TO 6 ft. SPAN.

ABSTRACT OF COST.

FOR DETAILS SEE APPENDIX "L"

Serial No.	Name	Mileage	Span	Cost. Sh. cs.
8	Karamaini	1. 50	1 - 12' Arch.	44,601. 00
18	Kome	5. 28	1 - 20' "	79,040. 00
35	Lawford's Stream	10. 60	1 - 6' "	29,429. 00
38	Thika Sisal	12. 15	1 - 12' Girder	14,866. 00
42	Semuru	13. 16	1 - 20' Arch.	71,254. 00
67	Kitina	19. 25	1 - 6' "	19,632. 00
72	Genia Valley	20. 34	2 - 12' Girder	15,223. 00
73	do	20. 79	1 - 12' "	13,765. 00
99	Mukuyu	27. 42	do	16,500. 00
111	do	29. 68	do	13,190. 00
131	Little Saba-Saba	35. 76	1 - 20' Arch	44,947. 00
136	Itheru	36. 57	2 - 12' Girder	12,436. 00
139	do	37. 48	1 - 12' "	5,831. 00
143	Kithanji	38. 46	1 - 20' "	20,493. 00
164	do	42. 63	1 - 20' Arch	78,041. 00
191	Fort Hall	45. 96	1 - 6' "	29,801. 00
			TOTAL	509,049. 00

UGANDA RAIL WAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 87.78 Miles.

NDARUGU TO TANA VALLEY

439

IV. BRIDGEWORK

(c) CULVERTS UNDER 6 FT. SPAN.

Serial No.	Mileage	Span.	Cost Sh. cs.
1	0. 06	1 - 24" Armco Pipe	946. 40
2	0. 44	do " "	1,032. 40
3	0. 51	do " "	903. 60
4	0. 62	do " "	930. 60
5	0. 82	1 - 36" " "	2,408. 60
6	1. 02	2 - 24" " Pipes	1,433. 00
9	1. 76	3 - 24" " "	2,150. 60
10	3. 22	4 - 18" " "	1,037. 25
11	3. 57	1 - 24" " Pipe	896. 40
12	3. 93	do " "	880. 80
13	4. 28	do " "	880. 80
14	4. 49	do " "	953. 20
15	4. 70	do " "	953. 20
16	4. 91	do " "	920. 00
17	5. 05	do " "	906. 80
19	5. 52	1 - 30" " "	1,652. 00
20	5. 73	2 - 24" " Pipes	1,493. 00
21	5. 99	1 - 24" " Pipe	894. 00
22	6. 60	do " "	880. 40
23	6. 95	2 - 24" " Pipes	1,466. 60
24	7. 44	4 - 24" " "	2,638. 20
25	8. 88	3 - 36" " "	4,093. 20
26	8. 04	do " "	4,093. 20
		Carried forward...	34,444. 25

UGANDA RAIL WAY

KAMPALA-MBARARA EXTENSION.

EDARUGU TO TANA VALLEY

Metre Gauge
Length 57.78 Miles.

IV. BRIDGEWORK.

439

(c) CULVERTS UNDER 6 FT. SPAN.

Serial No.	Mileage	Span.			Cost Sh. cs.
1	0. 06	1 - 24"	Armco	Pipe	946. 40
2	0. 44	do	"	"	1,032. 40
3	0. 51	do	"	"	903. 60
4	0. 62	do	"	"	930. 60
5	0. 82	1 - 36"	"	"	2,408. 60
6	1. 02	2 - 24"	"	Pipes	1,433. 00
9	1. 76	3 - 24"	"	"	2,150. 60
10	3. 22	4 - 18"	"	"	1,037. 25
11	3. 57	1 - 24"	"	Pipe	896. 40
12	3. 93	do	"	"	880. 80
13	4. 28	do	"	"	880. 80
14	4. 49	do	"	"	953. 20
15	4. 70	do	"	"	953. 20
16	4. 91	do	"	"	920. 00
17	5. 05	do	"	"	906. 80
18	5. 52	1 - 30"	"	"	1,652. 00
20	5. 73	2 - 24"	"	Pipes	1,493. 00
21	5. 99	1 - 24"	"	Pipe	894. 00
22	6. 60	do	"	"	880. 40
23	6. 95	2 - 24"	"	Pipes	1,466. 60
24	7. 44	4 - 24"	"	"	2,638. 20
25	8. 82	3 - 36"	"	"	4,093. 20
26	8. 04	do	"	"	4,093. 20
		Carried forward...			34,444. 25

(c) CULVERTS UNDER 6 FT. SPAN (Continued)

Serial No	Mileage	Span			cost Sh. cs.
			BRought Forward		34,444. 25
27	8. 89	1 - 24"	Armco	Pipe	897. 60
28	9. 23	do	"	"	946. 40
29	9. 46	do	"	"	1,091. 60
31	10. 03	do	"	"	920. 00
32	10. 24	do	"	"	920. 00
34	10. 81	do	"	"	953. 20
35	11. 19	1 - 36"	"	"	1,715. 60
36	11. 41	2 - 30"	"	"	2,620. 80
37	11. 77	1 - 30"	"	"	1,044. 80
39	12. 19	2 - 36"	"	"	3,670. 20
40	12. 54	1 - 24"	"	"	1,111. 60
41	12. 93	1 - 30"	"	"	1,393. 60
43	13. 35	2 - 36"	"	"	4.053. 00
44	13. 56	1 - 24"	"	"	894. 00
45	13. 80	1 - 36"	"	"	1,715. 60
46	13. 93	1 - 24"	"	"	914. 00
47	14. 00	do	"	"	914. 00
48	14. 67	2 - 24"	"	"	1,485. 80
49	15. 64	2 - 36"	"	"	6,363. 00
50	15. 87	1 - 24"	"	"	940. 00
51	16½ 00	do	"	"	874. 00
52	16. 23	do	"	"	893. 60
53	16. 38	do	"	"	992. 80
54a	16. 55	2 - 36"	"	"	6,317. 40
55	16. 85	1 - 24"	"	"	960. 00
56	17. 04	do	"	"	920. 40
57	17. 27	2 - 36"	"	"	9,099. 00
			Carried Forward....		89,066. 25

XV BRIDGES

(c) CULVERTS UNDER 6 FT. SPAN (Continued)

Serial No	Mileage	Span			cost Sh. cs.
				BRought Forward	34,444. 25
27	8. 89	1 - 24"	Armco	Pipe	897. 60
28	9. 23	do	"	"	946. 40
29	9. 46	do	"	"	1,091. 60
31	10. 03	do	"	"	920. 00
32	10. 24	do	"	"	920. 00
34	10. 81	do	"	"	953. 20
35	11. 19	1 - 36"	"	"	1,715. 60
36	11. 41	2 - 30"	"	"	2,620. 80
37	11. 77	1 - 30"	"	"	1,044. 80
39	12. 19	2 - 36"	"	"	3,670. 20
40	12. 54	1 - 24"	"	"	1,111. 60
41	12. 93	1 - 30"	"	"	1,393. 60
43	13. 35	2 - 36"	"	"	4.053. 00
44	13. 56	1 - 24"	"	"	894. 00
45	13. 80	1 - 36"	"	"	1,715. 60
46	13. 93	1 - 24"	"	"	914. 00
47	14. 00	do	"	"	914. 00
48	14. 67	2 - 24"	"	"	1,485. 80
49	15. 64	2 - 36"	"	"	6,363. 00
50	15. 87	1 - 24"	"	"	940. 00
51	16. 00	do	"	"	874. 00
52	16. 23	do	"	"	893. 60
53	16. 38	do	"	"	992. 80
53a	16. 55	2 - 36"	"	"	6,517. 40
55	16. 85	1 - 24"	"	"	960. 00
56	17. 04	do	"	"	920. 40
57	17. 27	2 - 36"	"	"	9,099. 00
				Carried Forward....	89,066. 25

Serial No.	Mileage	Span			Cost Sh. cs.
				Brought Forward	89,066. 25
58	17. 38	1 - 24"	Armco	Pipe	940. 00
59	17. 50	do	"	"	920. 40
60	17. 61	do	"	"	920. 40
61	17. 70	do	"	"	920. 40
62	17. 80	do	"	"	980. 40
63	17. 89	1 - 24	"	"	1,038. 80
64	18. 02	2 - 36"	"	"	2,765. 40
65	18. 61	1 - 24"	"	"	880. 80
66	18. 93	2 - 24"	"	"	1,465. 80
68	19. 41	1 - 24"	"	"	933. 60
69	19. 75	2 - 24"	"	"	1,505. 80
70	19. 96	1 - 24"	"	"	940. 00
71	20. 17	do	"	"	900. 40
74	21. 19	do	"	"	913. 60
75	21. 30	3 - 24"	"	"	2,210. 00
76	21. 53	1 - 24"	"	"	913. 60
77	21. 78	do	"	"	874. 00
78	22. 12	do	"	"	874. 00
79	22. 31	do	"	"	874. 00
80	22. 78	do	"	"	900. 40
81	23. 04	2 - 36"	"	"	3,160. 60
82	23. 44	1 - 24"	"	"	860. 80
83	23. 61	do	"	"	860. 80
84	23. 99	do	"	"	874. 00
85	24. 22	1 - 36"	"	"	2,981. 00
86	24. 43	2 - 36"	"	"	9,759. 00
				Carried Forward.	130,214. 25

(c) CULVERTS UNDER 6 FT. SPAN (Continued)

441

Serial No.	Mileage	Span			Cost Sh. cs.
				Brought Forward	89,066. 25
58	17. 38	1 - 24"	Armco	Pipe	940. 00
59	17. 50	do	"	"	920. 40
60	17. 61	do	"	"	920. 40
61	17. 70	do	"	"	920. 40
62	17. 80	do	"	"	980. 40
63	17. 89	1 - 24	"	"	1,038. 80
64	18. 02	2 - 36"	"	"	2,765. 40
65	18. 61	1 - 24"	"	"	880. 80
66	18. 93	2 - 24"	"	"	1,465. 80
68	19. 41	1 - 24"	"	"	933. 60
69	19. 75	2 - 24"	"	"	1,505. 80
70	19. 96	1 - 24"	"	"	940. 00
71	20. 17	do	"	"	900. 40
74	21. 19	do	"	"	913. 60
75	21. 30	3 - 24"	"	"	2,210. 00
76	21. 53	1 - 24"	"	"	913. 60
77	21. 78	do	"	"	874. 00
78	22. 12	do	"	"	874. 00
79	22. 31	do	"	"	874. 00
80	22. 78	do	"	"	900. 40
81	23. 04	2 - 36"	"	"	3,160. 60
82	23. 44	1 - 24"	"	"	860. 80
83	23. 61	do	"	"	860. 80
84	23. 99	do	"	"	874. 00
85	24. 22	1 - 36"	"	"	2,961. 00
86	24. 43	2 - 36"	"	"	9,759. 00
				Carried Forward.	130,214. 25

Serial No	Mileage	Span	Cost Sh. cs.
		Brought forward	130,214. 25
87	24. 68	2 - 36" Armco Pipe	6,362. 00
88	24. 93	do " "	5,096. 60
89	25. 06	1 - 36" " "	2,355. 00
90	25. 32	do " "	1,755. 60
91	25. 59	do " "	3,516. 20
92	25. 91	do " "	3,227. 60
93	26. 13	do " "	1,777. 80
94	26. 27	1 - 24" " "	1,131. 60
95	26. 49	1 - 30" " "	1,598. 00
96	26. 74	do " "	1,447. 60
97	26. 98	1 - 24" " "	894. 00
98	27. 14	do " "	894. 00
00	27. 45	1 - 36" " "	2,290. 60
01	27. 75	1 - 24" " "	979. 60
02	27. 83	do " "	953. 20
03	28. 03	do " "	920. 40
04	28. 16	do " "	920. 40
05	28. 31	1 - 24" " "	940. 40
06	28. 54	1 - 36" " "	2,750. 20
07	28. 74	1 - 24" " "	940. 40
08	28. 82	do " "	914. 00
09	28. 92	do " "	1,072. 00
10	29. 05	do " "	874. 00
11	29. 75	do " "	874. 00
12	29. 96	2 - 24" " "	1,453. 00
13	30. 13	do " "	1,901. 80
14	30. 43	do " "	1,465. 80
		Carried Forward...	179,520. 05

(c) CULVERTS UNDER 6 FT. SPAN (Continued)

Serial No	Mileage	Span		Cost Sh. cs.
		Brought forward		130,214. 25
87	24. 68	2 - 36"	Armco Pipe	6,362. 00
88	24. 93	do	" "	5,096. 60
89	25. 06	1 - 36"	" "	2,355. 00
90	25. 32	do	" "	1,755. 60
91	25. 59	do	" "	3,516. 20
92	25. 91	do	" "	3,227. 60
93	26. 13	do	" "	1,777. 80
94	26. 27	1 - 24"	" "	1,131. 60
95	26. 49	1 - 30"	" "	1,598. 00
96	26. 74	do	" "	1,447. 60
97	26. 98	1 - 24"	" "	894. 00
98	27. 14	do	" "	894. 00
99	27. 45	1 - 36"	" "	2,290. 60
100	27. 75	1 - 24"	" "	979. 60
101	27. 83	do	" "	953. 20
102	28. 03	do	" "	920. 40
	28. 16	do	" "	920. 40
	28. 31	1 - 24"	" "	940. 40
	28. 54	1 - 36"	" "	2,750. 20
	28. 74	1 - 24"	" "	940. 40
	28. 82	do	" "	914. 00
	28. 92	do	" "	1,072. 00
	29. 05	do	" "	874. 00
	29. 75	do	" "	874. 00
	29. 96	2 - 24"	" "	1,453. 00
	30. 13	do	" "	1,901. 80
	30. 43	do	" "	1,465. 80
		Carried Forward...		179,520. 05

Serial No	Mileage	Span	Cost Sh. cs.
		Brought Forward.	179,520. 05
117	30. 90	1 - 24" Armco Pipe	874. 00
118	31. 22	2 - 24" " "	1,453. 00
119	31. 47	do " "	1,505. 80
120	31. 98	do " "	1,690. 60
121	32. 17	1 - 24" " "	920. 40
122	32. 37	2 - 36" " "	6,650. 60
123	32. 55	1 - 36" " "	2,113. 00
124	32. 72	1 - 24" " "	900. 40
125	32. 82	do " "	893. 60
126	32. 95	do " "	893. 60
128	33. 31	do " "	1,111. 60
129	33. 50	do " "	1,111. 60
130	33. 67	do " "	893. 60
132	33. 88	do " "	953. 20
133	34. 25	1 - 36" " "	1,851. 00
134	34. 84	2 - 24" " "	1,386. 60
135	35. 58	1 - 24" " "	874. 00
136	35. 88	do " "	894. 00
137	36. 13	do " "	860. 80
140	37. 66	do " "	880. 80
141	37. 85	do " "	880. 80
142	38. 17	do " "	874. 00
144	38. 61	do " "	940. 00
145	38. 76	1 - 36" " "	1,711. 20
146	38. 97	1 - 24" " "	1,296. 40
147	39. 15	do " "	975. 20
148	39. 28	do " "	920. 40
		Carried Forward...	215,828. 25

Serial No	Mileage	Span			Cost Sh. cs.
				Brought Forward.	179,520. 05
117	30. 90	1 - 24"	Armco	Pipe	874. 00
118	31. 22	2 - 24"	"	"	1,453. 00
119	31. 47	do	"	"	1,505. 80
120	31. 98	do	"	"	1,690. 60
121	32. 17	1 - 24"	"	"	920. 40
122	32. 37	2 - 36"	"	"	6,650. 60
123	32. 55	1 - 36"	"	"	2,113. 00
124	32. 72	1 - 24"	"	"	900. 40
125	32. 82	do	"	"	893. 60
126	32. 95	do	"	"	893. 60
128	33. 31	do	"	"	1,111. 60
129	33. 50	do	"	"	1,111. 60
130	33. 67	do	"	"	893. 60
132	33. 88	do	"	"	953. 20
133	34. 25	1 - 36"	"	"	1,851. 00
134	34. 84	2 - 24"	"	"	1,386. 60
135	35. 58	1 - 24"	"	"	874. 00
136	35. 88	do	"	"	894. 00
137	36. 13	do	"	"	860. 80
140	37. 66	do	"	"	880. 80
141	37. 85	do	"	"	880. 80
142	38. 17	do	"	"	874. 00
144	38. 61	do	"	"	940. 00
145	38. 76	1 - 36"	"	"	1,711. 20
146	38. 97	1 - 24"	"	"	1,296. 40
147	39. 15	do	"	"	973. 20
148	39. 28	do	"	"	920. 40
				Carried Forward...	215,828. 25

Serial No.	Mileage	Span	Cost Sh. cs.
		Brought Forward.	215,828. 25
149	39. 48	1 - 24" Armco Pipe	966. 40
150	39. 75	do " "	992. 80
151	39. 86	1 - 36" " "	2,490. 40
152	40. 07	1 - 24" " "	1,138. 00
153	40. 25	1 - 30" " "	2,066. 80
154	40. 37	1 - 24" " "	992. 80
155	40. 51	do " "	992. 80
156	40. 92	1 - 30" " "	1,408 . 80
157	41. 19	do " "	1,391. 20
158	41. 36	do " "	1,841. 20
159	41. 55	do " "	1,446. 40
160	41. 80	do " "	1,634. 40
161	42. 07	do " "	2,048. 00
162	42. 16	1 - 24" " "	1,309. 20
163	42. 39	1 - 30" " "	1,877. 60
165	42. 75	do " "	2,153. 60
166	42. 87	do " "	2,855. 20
167	42. 92	do " "	2,191. 20
168	42. 97	do " "	3,400. 40
169	43. 04	1 - 24" " "	854. 00
170	43. 22	1 - 30" " "	1,520. 40
171	43. 40	1 - 36" " "	2,983. 20
172	43. 47	do " "	3,826. 80
173	43. 55	1 - 24" " "	1,046. 40
174	43. 64	do " "	1,383. 60
175	43. 76	do " "	1,978. 00
176	43. 79	do " "	1,619. 60
177	43. 89	do " "	1,157. 60
		Carried Forward.	265,895. 05

Serial No.	Mileage	Span		Cost Sh. cs.
		Brought Forward.		215,828. 25
149	39. 48	1 - 24"	Armco Pipe	966. 40
150	39. 75	do	" "	992. 80
151	39. 86	1 - 36"	" "	2,490. 40
152	40. 07	1 - 24"	" "	1,138. 00
153	40. 25	1 - 30"	" "	2,066. 80
154	40. 37	1 - 24"	" "	992. 80
155	40. 51	do	" "	992. 80
156	40. 92	1 - 30"	" "	1,408 . 80
157	41. 19	do	" "	1,391. 20
158	41. 36	do	" "	1,841. 20
159	41. 55	do	" "	1,446. 40
160	41. 80	do	" "	1,634. 40
161	42. 07	do	" "	2,048. 00
162	42. 16	1 - 24"	" "	1,309. 20
163	42. 39	1 - 30"	" "	1,877. 60
165	42. 75	do	" "	2,153. 60
166	42. 87	do	" "	2,855. 20
167	42. 92	do	" "	2,191. 20
168	42. 97	do	" "	3,400. 40
169	43. 04	1 - 24"	" "	854. 00
170	43. 22	1 - 30"	" "	1,520. 40
171	43. 40	1 - 36"	" "	2,983. 20
172	43. 47	do	" "	3,826. 80
173	43. 55	1 - 24"	" "	1,046. 40
174	43. 64	do	" "	1,883. 60
175	43. 76	do	" "	1,978. 00
176	43. 79	do	" "	1,619. 60
177	43. 89	do	" "	1,189. 60
		Carried Forward.		265,895. 05

IV. BRIDGEWORK

(c) CULVERTS UNDER 6 FT. SPAN (Continued)

Serial No	Mileage	Span			Cost Sh. cs.
			Brought Forward		265,895. 05
178	43. 96	1 - 24"	Armco Pipe		1,225. 60
180	44. 28	1 - 30"	"	"	2,716. 80
181	44. 43	1 - 36"	"	"	2,028. 80
182	44. 66	1 - 30"	"	"	3,024. 40
183	44. 80	1 - 24"	"	"	930. 40
184	45. 04	2 - 36"	"	"	5,662. 60
185	45. 11	1 - 30"	"	"	1,784. 80
186	45. 17	do	"	"	1,446. 40
187	45. 23	do	"	"	1,446. 40
188	45. 39	do	"	"	1,784. 80
189	45. 44	2 - 30"	"	"	3,871. 20
190	45. 46	1 - 30"	"	"	1,897. 60
192	46. 08	do	"	"	1,332. 40
193	46. 39	2 - 36"	"	"	7,161. 40
194	46. 54	1 - 30"	"	"	1,672. 00
195	46. 61	do	"	"	1,897. 60
196	46. 64	do	"	"	1,897. 60
197	46. 72	do	"	"	1,484. 00
198	46. 76	do	"	"	2,104. 40
199	46. 89	do	"	"	1,672. 00
200	46. 97	do	"	"	2,236. 00
201	47. 12	do	"	"	1,784. 80
202	47. 20	do	"	"	1,672. 00
203	47. 23	1 - 24"	"	"	979. 60
204	47. 29	1 - 30"	"	"	1,784. 80
205	47. 37	1 - 24"	"	"	1,164. 40
206	47. 42	1 - 30"	"	"	2,046. 80
			Carried Forward.		324,604. 45

IV. [illegible]

(c) CULVERTS UNDER 6 FT. SPAN (Continued)

Serial No	Mileage	Span			Cost Sh. cs.
		Brought Forward			265,895. 05
178	43. 96	1 - 24"	Armco	Pipe	1,225. 60
180	44. 28	1 -m30"	"	"	2,716. 80
181	44. 43	1 - 36"	"	"	2,028. 60
182	44. 66	1 - 30"	"	"	3,024. 40
183	44. 80	1 - 24"	"	"	930. 40
184	45. 04	2 - 36"	"	"	5,662. 60
185	45. 11	1 - 30"	"	"	1,784. 80
186	45. 17	do	"	"	1,446. 40
187	45. 23	do	"	"	1,446. 40
188	45. 39	do	"	"	1,784. 80
189	45. 44	2 - 30"	"	"	3,871. 20
190	45. 46	1 - 30"	"	"	1,897. 60
192	46. 08	do	"	"	1,332. 40
193	46. 39	2 - 36"	"	"	7,161. 40
194	46. 54	1 - 30"	"	"	1,672. 00
195	46. 61	do	"	"	1,897. 60
196	46. 64	do	"	"	1,897. 60
197	46. 72	do	"	"	1,484. 00
198	46. 76	do	"	"	2,104. 40
199	46. 89	do	"	"	1,672. 00
00	46. 97	do	"	"	2,236. 00
01	47. 12	do	"	"	1,784. 80
02	47. 20	do	"	"	1,672. 00
03	47. 23	1 - 24"	"	"	979. 60
04	47. 29	1 - 30"	"	"	1,784. 80
05	47. 37	1 - 24"	"	"	1,164. 40
06	47. 42	1 - 30"	"	"	2,046. 80
		Carried Forward.			324,604. 45

Serial No	Mileage	Span			Cost Sh. cs.
		Brought Forward			324,604. 45
207	47. 55	1 - 30"	Armco	Pipe	1,695. 60
208	47. 78	do	"	"	2,197. 20
209	47. 86	do	"	"	1,464. 00
210	47. 98	do	"	"	2,554. 40
211	48. 01	1 - 24"	"	"	2,216. 00
212	48. 22	do	"	"	893. 60
213	48. 38	1 - 30"	"	"	4,227. 60
214	48. 54	1 - 24"	"	"	1,461. 20
215	48. 66	1 - 30"	"	"	3,287. 60
216	48. 91	do	"	"	1,896. 40
217	48 . 98	1 - 24"	"	"	1,144. 40
218	49. 01	do	"	"	1,144. 40
219	49. 11	1 - 30"	"	"	1,670. 80
220	49. 31	do	"	"	2,629. 60
221	49. 34	do	"	"	2,629. 60
222	49. 41	do	"	"	2,216. 00
223	49. 48	do	"	"	2,817. 60
224	49. 58	do	"	"	2,968. 00
225	49. 73	do	"	"	2,234. 80
226	49. 88	1 - 24"	"	"	840. 80
228	50. 15	2 - 36"	"	"	5,469. 40
229	50. 25	1 - 30"	"	"	1,860. 00
230	50. 45	1 - 30"	"	"	1,840. 40
231	50. 62	2 - 36"	"	"	3,338. 20
232	50. 81	1 - 30"	"	"	2,518. 00
	50. 94	1 - 36"	"	"	3,980. 00
	51. 20	1 - 30"	"	"	2,689. 60
		Carried Forward.			388,129. 65

Serial No	Mileage	Span			Cost Sh. cs.
			Brought Forward		324,604. 45
207	47. 55	1 - 30"	Armco	Pipe	1,695. 60
208	47. 78	do	"	"	2,197. 20
209	47. 86	do	"	"	1,464. 00
210	47. 98	do	"	"	2,554. 40
211	48. 01	1 - 24"	"	"	2,216. 00
212	48. 22	do	"	"	893. 60
213	48. 38	1 - 30"	"	"	4,227. 60
214	48. 54	1 - 24"	"	"	1,461. 20
215	48. 66	1 - 30"	"	"	3,287. 60
216	48. 91	do	"	"	1,896. 40
217	48 . 98	1 - 24"	"	"	1,144. 40
218	49. 01	do	"	"	1,144. 40
219	49. 11	1 - 30"	"	"	1,670. 80
220	49. 31	do	"	"	2,629. 60
221	49. 34	do	"	"	2,629. 60
222	49. 41	do	"	"	2,216. 00
223	49. 48	do	"	"	2,617. 60
224	49. 58	do	"	"	2,968. 00
225	49. 73	do	"	"	2,234. 80
226	49. 88	1 - 24"	"	"	840. 80
228	50. 15	2 - 36"	"	"	5,469. 40
229	50. 25	1 - 30"	"	"	1,860. 00
230	50. 45	1 - 30"	"	"	1,840. 40
231	50. 62	2 - 36"	"	"	3,338. 20
232	50. 81	1 - 30"	"	"	2,818. 00
233	50. 94	1 - 36"	"	"	3,980. 00
234	51. 20	1 - 30"	"	"	2,629. 60
			Carried Forward.		388,129. 65

Serial No.	Mileage	Span			Cost Sh. cs.
			Brought Forward		388,129. 65
235	51. 29	1 - 30"	Armco	Pipe	1,952. 80
236	51. 41	1 - 36"	"	"	4,071. 00
237	51. 51	do	"	"	2,228. 40
238	51. 56	2 - 36"	"	"	6,062. 20
239	51. 60	1 - 36"	"	"	2,339. 40
240	51. 78	2 - 36"	"	"	4,403. 80
241	51. 93	1 - 24"	"	"	953. 20
242	52. 18	1 - 36"	"	"	3,380. 60
243	52. 40	do	"	"	2,092. 00
244	52. 56	1 - 24"	"	"	992. 80
245	52. 78	1 - 30"	"	"	1,492. 80
246	52. 84	1 - 36"	"	"	2,284. 00
247	53. 05	1 - 24"	"	"	940. 00
248	53. 31	do	"	"	940. 00
249	53. 61	2 - 24"	"	"	1,585. 00
250	53. 96	1 - 36"	"	"	2,226. 20
252	54. 75	1 - 24"	"	"	900. 80
253	55. 40	2 - 36"	"	"	2,699. 00
254	56. 72	1 - 24"	"	"	940. 40
255	56. 81	do	"	"	900. 40
256	56. 97	do	"	"	860. 80
258	57. 40	1 - 36"	"	"	1,549. 00
		TOTAL			435,824. 25
		Contingencies 5%			21,751. 21
		GRAND TOTAL			456,775. 46

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 87. 78 Miles

KIKUYU TO TANA VALLEY

V. FENCING. LEVEL CROSSINGS. GRADE POSTS &c.

For details see Appendix "C".

Sub-Head	Quantity	Rate Sh.cs.	Unit	Amount. Sh.cs.
(a) FENCING	4 Miles	3,844. 42	Mile	15,377. 68
(b) BOUNDARY POSTS	928	2. 50	each	2,320. 00
(c) GRADIENT POSTS	148	20. 00	each	2,960. 00
(d) MILE POSTS	58	18. 00	each	1,044. 00
(e) LEVEL CROSSINGS				
2nd. Class	6	233. 40	each	1,400. 40
3rd. Class	10	151. 60	each	1,516. 00
		TOTAL		24,618. 08

UGANDA RAILWAY

TEITA-MYERU EXTENSION.

Metre Gauge

BRANCH TO TANA VALLEY Length 4 M. 70 Miles.

V. FENCING, LEVEL CROSSINGS, GRADE POSTS &c.

For details see Appendix "C".

Sub-Head	Quantity	Rate Sh.cs.	Unit	Amount. Sh.cs.
(a) FENCING	4 Miles	3,844. 42	Mile	15,377. 68
(b) BOUNDARY POSTS	928	2. 50	each	2,320. 00
(c) GRADIENT POSTS	148	20. 00	each	2,960. 00
(d) MILE POSTS	58	18. 00	each	1,044. 00
(e) LEVEL CROSSINGS				
2nd.Class	6	233. 40	each	1,400. 40
3rd.Class	10	181. 60	each	1,816. 00
		TOTAL		24,618. 08

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge

NDARUGU TO TANA VALLEY Length 57.78 Miles.

VI. TELEGRAPH

For details see Appendix "P".

	Item	Quantity	Rate Sh. cs.	Unit	Amount. Sh. cs.
3	Wires on Cedar poles complete with instruments.				
	Materials.	57. 8	1532. 42	Mile	88,573. 87
	Labour	"	220. 00	"	12,716. 00
	Tools	"	6. 90	"	398. 82
	Instruments				
	Intermediate Stations	3	305. 00	each	915. 00
	Terminal Station	1	409. 00	"	409. 00
				TOTAL	103,012. 69
			Contingencies		676. 31
			GRAND TOTAL		103,689. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 87.75 Miles.

NDARUGU TO TANA VALLEY

VI. TELEGRAPH

For details see Appendix "F".

	Item	Quantity	Rate Sh. cs.	Unit	Amount. Sh. cs.
3	Wires on Cedar poles complete with instruments.				
	Materials.	87. 8	1532. 42	Mile	88,573. 87
	Labour	"	220. 00	"	12,716. 00
	Tools	"	6. 90	"	398. 82
	Instruments				
	Intermediate Stations	3	305. 00	each	915. 00
	Terminal Station	1	409. 00	"	409. 00
				TOTAL	103,012. 69
			Contingencies		676. 31
			GRAND TOTAL		103,689. 00

KENYA RAILWAY

THIKA-NYERI EXTENSION. 450

Mains Gauge
Length 37.77 Miles.

BRANCH TO TANA VALLEY

VII. PERMANENT WAY & BALLAST

For details see Appendix "G".

Description	Quantity	Rate Sh. cs.	Unit	Amount. Sh. cs.
(a) MAIN LINE				
1. Permanent Way 80 lb.rails.	37.78	80,754. 79	Mile	2,932,611. 77
2. Ballast Cuttings only	24.04	8,190. 00	Mile	196,887. 60
(b) SIDINGS				
1. Permanent Way. 80 lb.rails	3.61	80,754. 79	Mile	183,224. 79
(c) POINTS & CROSSINGS				
1 in 12 complete	12	2,509. 48	Set	30,113. 76
1 in 8½ complete	39	1,175. 54	Set	45,846. 06
		TOTAL		3,388,683. 98

KENYA RAILWAY

THIKA-NYERI EXTENSION. 450

BRANCH TO TANA VALLEY Main Line Length 97.78 Miles.

XXI. PERMANENT WAY & BALLAST

For details see Appendix "GG".

Description	Quantity	Rate Sh. cs.	Unit	Amount. Sh. cs.
a) MAIN LINE				
1. Permanent Way 80 lb.rails.	97.78	30,754. 79	Mile	2,932,611. 77
2. Ballast Cuttings only	24.04	8,190. 00	Mile	196,887. 60
b) SIDINGS				
1. Permanent Way. 80 lb.rails	3.61	30,754. 79	Mile	183,224. 79
c) POINTS & CROSSINGS				
1 in 12 complete	12	2,509. 48	Set	30,113. 76
1 in 8½ complete	30	1,275. 54	Set	45,946. 06
		TOTAL		3,388,683. 98

UGANDA RAILWAY

THIKA - NYERI EXTENSION.

VIII. STATIONS & BUILDINGS.

(A) STATIONS & OFFICES.

	STATION BUILDINGS CLASS			RESTHOUSE	PASS. [illegible]	GOODS SHED	LATRINES. NATIVE	LATRINES. EUROPEAN	GOODS SHED	MAIN BOARD.	PALISADES.	PLATFORM PASS	LAMPS GOODS	DRINKING HYDRANTS.	STATION GARDENS.	APPROACH ROADS	LAMP [illegible]	STORE SHEDS & YARDS	THERMO-METER
	1st.	2nd.	3rd.																
	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.
8.00	---	---	6,800	Nil.	800	6,000.	800	300	4,000	320	Nil	200	200	Nil	600	300	Nil	Nil	Nil
29.75	---	---	6,800	Nil.	800	6,000.	800	300	4,000	320	Nil	200	200	Nil	600	1,000	Nil	Nil	Nil
37.30	---	---	6,800	Nil.	800	6,000	800	300	4,000	320	Nil	200	200	Nil	600	2,000	Nil	Nil	Nil
97.60	---	---	6,800	12,000.	4,000	6,000	1,000	300	4,000	320	Nil	400	400	Nil	600	300	800	Nil	800

METRE GAUGE

LENGTH 87.78 MILES.

[illegible]	APPROACH ROAD	LAMP [illegible]	STORE SHEDS & YARDS	[illegible] -ATORS	DAK BUNGALOWS	OFFICES	COST PER STATION
	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.	Sh.
	800	Nil	Nil	Nil	Nil	Nil	20,020.00
	1,000	Nil	Nil	Nil	Nil	Nil	20,720.00
	2,000	Nil	Nil	Nil	Nil	Nil	21,720.00
	800	800	Nil	800	12,000	12,000	60,820.00

TOTAL COST..... 123,280.00

UGANDA RAILWAY

452

THIKA - NYERI EXTENSION

KIGANJO TO TANA VALLEY

Metre Gauge
Length 17.78 Miles

XXIX. STATIONS & BUILDINGS

(c) STAFF QUARTERS.

ABSTRACT OF COST

FOR DETAILS SEE APPENDIX "F"

Name of Station	Cost Sh.cts.
THIKA	63,420.00
PUNDA MILIA	33,075.00
FORT HALL	29,190.00
TANA VALLEY (CHANGE STATION)	175,050.00
GANG HUTS	103,950.00
TOTAL	404,685.00

UGANDA RAILWAY

TSAVO-NYANZA EXTENSION

REVISED 1929

TSAVO VALLEY

Metre Gauge
Length 87.78 Miles

VIII. STATIONS AND BUILDINGS

(2) STATION MACHINERY

STATION	ASH PITS Sh.	WATER TANKS Sh.	WATER CRANES Sh.	WATER PIPING AND SUPPLY Sh. 6"	4"	Sh. 3"	HAND PUMPS Sh.	HYDRANTS. Sh.	SIGNAL-ING Sh.	TYER TABLETS Sh.	ENGINE SHEDS Sh.	LOCO EXAM PITS Sh.	LOCO ASH PITS Sh.	FUEL STAGES Sh.	CRANES Sh.	BUFFER STOPS Sh.	TOTAL Sh.
[illegible]KA	7,400	7,000	5,400	3,800	-		20,800	-	2,500	5,000	-	-	-	3,400	6,600	400	62300
[illegible]NDA [illegible]IA	7,400	7,000	5,400	3,800	-		24,000	-	2,500	5,000	-	-	-	3,400	6,600	400	65500
[illegible]Y [illegible]	-	-	-	-	-		-	-	2,500	5,000	-	-	-	-	6,600	400	14500
[illegible]A [illegible]KY	-	10,000	2,700	1,000	-		20,500	1,000	2,500	2,500	30,000	-	7,000	1,700	6,600	800	86300
																	228600
															Contingencies 5%		11430
															TOTAL		240030

UGANDA RAILWAY

THIKA - NYERI EXTENSION.

Main Line Length 96.7 Miles.

NDAKINI TO TANA VALLEY

IX. PLANT

For details see Appendix "E".

		Sh. cs.
(A)	Engineering	19,200. 00
(B)	Construction	278,797. 00
(C)	Locomotive	5,000. 00
(D)	Carriage & Wagon	5,000. 00
(E)	Station & Office Furniture	24,000. 00
	TOTAL....	331,997. 00

UGANDA RAILWAY

455

THIKA-NYERI EXTENSION

Metre Gauge
Length [illegible] Miles

KIARUGU TO TANA VALLEY

XII. GENERAL CHARGES

For details see Appendix "V".

Item.	Rate per Mile.	Amount.
DIRECTION	£.120. 10	£.6,962. 10
ENGINEERING	619. 15	35,809. 05
STORES	138. 10	8,002. 10
AUDIT & ACCOUNTS	187. 15	10,848. 05
NATIVE ADMINISTRATION	102. 05	5,908. 00
MEDICAL & SANITATION	194. 10	11,238. 05
TOTAL		£ 78,768. 15
		Shs.1,575,375. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION

Metre Gauge
Length 87.78 Miles

NDARUGU TO TANA VALLEY

XII. GENERAL CHARGES

For details see Appendix "Y".

Item.	Rate per Mile.	Amount.
DIRECTION	£.120. 10	£.6,962. 10
ENGINEERING	619. 15	35,809. 05
STORES	138. 10	8,002. 10
AUDIT & ACCOUNTS	187. 15	10,848. 05
NATIVE ADMINISTRATION	102. 05	5,908. 00
MEDICAL & SANITATION	194. 10	11,238. 05
TOTAL		£ 78,768. 15
		Shs.1,575,375. 00

APPENDIXES
TO
ESTIMATES.

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 80 Miles.

NDARUGU TO NYERI

I. PRELIMINARY EXPENSES.

		Sh. cs.
ESTIMATED COST OF SURVEY		
(a) Survey Expenses		45,483. 00
(b) Plant	Sh.27,916. 00	
Less credit	2,271. 00	25,645. 00
(c) Establishment		88,872. 00
	TOTAL TO DATE	160,000. 00
AMOUNT REQUIRED TO COMPLETE FINAL SURVEYS		
(a) Survey Expenses	Sh. 8,425. 00	
(b) Plant	4,225. 00	
(c) Establishment	12,650. 00	25,300. 00
	TOTAL COST...	185,300. 00

RATE PER MILE

(a) Survey Expenses	656. 00
(b) Plant	372. 00
(c) Establishment	1,288. 00
TOTAL	Sh. 2,316. 00

APPENDIX "E"

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 80 Miles.

MARUGU TO NYERI

I. PRELIMINARY EXPENSES.

ESTIMATED COST OF SURVEY		Sh. cs.
(a) Survey Expenses		45,483. 00
(b) Plant	Sh.27,916. 00	
Less credit	2,271. 00	25,645. 00
(c) Establishment		88,872. 00
	TOTAL TO DATE	160,000. 00
AMOUNT REQUIRED TO COMPLETE FINAL SURVEYS		
(a) Survey Expenses	Sh. 8,425. 00	
(b) Plant	4,225. 00	
(c) Establishment	12,650. 00	25,300. 00
	TOTAL COST...	185,300. 00

RATE PER MILE

(a) Survey Expenses	656. 00
(b) Plant	372. 00
(c) Establishment	1,288. 00
TOTAL	Sh. 2,316. 00

APPENDIX C

458

DETAILS OF COST.

A. Cost of One Mile Wood Posts and Six Wire Fences.

DESCRIPTION	NUMBER	RATE Sh.	AMOUNT Sh.-cs.
Cedar straining posts.....	8	5/- each	40.00
do intermediate posts.....	8	4/- "	32.00
Wood " ".....	337	1/- "	337.00
do braces	18	3/- "	54.00
G.I. wire 600 lbs. per mile... ÷ 2000 lbs. tons.....	1.32	£22.10 ton	319.00
Staples 365 posts G.I. staples 35 lbs...	35	7/- lb.	245.00
W.I eye and Hook bolts ⅜ X 18" @ 2 lbs each.....	200	45/- per 100	86.00
Erection per mile.....			200.00
Freights on Uganda Railway:- Posts 20 - 1 ton 340 say 18 tons x 200 miles @ -/35c per ton mile.....			1125.00
Freight, Insurance & landing on Imported material.....	L.S.		140.00
Freight on Imported material:- 2 tons x 368 miles @ -/35cs per ton per mile.....			258.92
Freight on Construction Train 21 tons @ -/50cs. for 35 miles.....			367.50
TOTAL ..... Sh.			3644.42

APPENDIX C

458

DETAILS OF COST.

A. Cost of One Mile Wood Posts and Six Wire Fences.

DESCRIPTION	NUMBER	RATE Sh.	AMOUNT Sh. cts.
Cedar straining posts.....	8	5/- each	40.00
do intermediate posts.....	8	4/- "	32.00
Wood " ".....	337	1/- "	337.00
do braces	16	3/- "	54.00
G.I. wire 600 lbs. per mile... x 6. tons.....	1.82	£22.10 ton	419.00
Staples 365 posts G.I. staples lbs...	35	7/- lb.	245.00
W.I eye and Hook bolts ⅝ X 18" @ 2 lbs each.....	200	45/- per 100)	90.00
Erection per mile.....			200.00
Freights on Uganda Railway:-			
Posts 20 - 1 ton 342 say 18 tons x 200 miles @ -/35c per ton mile.....			1188.00
Freight, Insurance & landing on Imported material.....	L.S.		140.00
Freight on Imported material:- 2 tons x 348 miles @ -/35cs per ton per mile.....			238.00
Freight on Construction Train 21 tons @ -/50cs. for 35 miles.....			367.50
TOTAL ..... Sh.			3044.50

APPENDIX "G" (Continued)

V. FENCING

DETAILS OF COST.

459

Description	No.	Rate Sh. cs.	Amount Sh. cs.
B) BOUNDARY POSTS			
Concrete posts 7" x 7" x 2'6" supply & erecting	16 per mile	2. 50	40. 00
C) GRADIENT POSTS			
Cost of one gradient post erected complete		Lump sum	20. 00
D) MILE POSTS			
Cost of one mile post erected complete		Lump sum	18. 00
E) LEVEL CROSSINGS			
2nd. Class			
Notice Boards	2	25. 00	50. 00
Guard Rails			114. 00
C.I. Blocks with Bolts	14	2. 10	29. 40
Bending rails, boring & erecting			40. 00
			233. 00
3rd. Class			
Notice Boards	2	25. 00	50. 00
Guard Rails.			57. 00
C.I. Blocks with Bolts.	6	2. 10	12. 60
Bending rails, boring & erecting			32. 00
			151. 60

APPENDIX "C" (Continued)

V. FENCING

DETAILS OF COST.

459

Description	No.	Rate Sh. cs.	Amount Sh. cs.
B) BOUNDARY POSTS			
Concrete posts 7" x 7" x 2'6" supply & erecting	16 per mile	2. 50	40. 00
C) GRADIENT POSTS			
Cost of one gradient post erected complete		Lump sum	20. 00
D) MILE POSTS			
Cost of one mile post erected complete		Lump sum	18. 00
E) LEVEL CROSSINGS			
2nd. Class			
Notice Boards	2	25. 00	50. 00
Guard Rails			114. 00
C.I. Blocks with Bolts	14	2. 10	29. 40
Bending rails, boring & erecting			40. 00
			233. 00
3rd. Class			
Notice Boards	2	25. 00	50. 00
Guard Rails.			57. 00
C.I. Blocks with Bolts.	6	2. 10	12. 60
Bending rails, boring & erecting			32. 00
			151. 60

APPENDIX "P"

VI. ELECTRIC TELEGRAPH. 460

ESTIMATE OF COST PER MILE

Item No.	Description.	Quantity	Rate Sh.	Unit	Amount Sh. cs.
1.	Cedar poles 25' long 4" diam. to 6" diam.	22	8. 00	each.	176. 00
2.	Dressing bottom of pole and applying preservatives, fixing lightening wire and G.I. roof, fixing arms and erecting	22	7. 00	"	154. 00
3.	Meeri arms 18"x3"x3" with holes for insulators &c.	22	. 40	"	8. 80
4.	G.I. roofs 6" x 4"	22	116	"	3. 52
5.	Three iron wires each 400 lbs. per mile F.O.B. London ton.	.536	370. 00	ton	198. 32
6.	Stay wire G.I.4 x 8 strand F.O.B. London "	. 4	430. 00	"	172. 00
7.	Binding wire 23 coils each 3' long F.O.B. London Coils	23	13. 66	100	3. 14
8.	G.I. Jointing wire in 4' lengths No.16 F.O.B. London Coils	8. 6	. 21	100	. 02
9.	G.I. Line wire 150 lbs per mile F.O.B.London				
10.	White Porcelain Insulators U.K. pattern F.O.B. London	66	56. 00	100	36. 96
11.	G. Steel stalks $\frac{3}{4}$" diam. complete with nuts and washers to suit 3" wood cross arms F.O.B.London	66	35. 00	100	23. 10
12.	Creosoted felt washers for use with insulators and stalks F.O.B.London	66	22. 50	1000	1. 49
13.	G.I. Bolts 10" long $\frac{1}{2}$" diam. Screwed 3$\frac{1}{2}$"with nuts and 2 washers F.O.B. London	22	30. 00	100	6. 60
14.	White Porcelain shackle Insulators	1	. 66	each	. 66
	Carried Forward.....			Sh.	784. 61

APPENDIX "F"

VI. [illegible] TELEGRAPH.

460

ESTIMATE OF COST PER MILE

Item No.	Description.	Quantity	Rate Sh.	Unit	Amount Sh. cs.
1.	Cedar poles 25' long 4" diam. to 6" diam.	22	8. 00	each.	176. 00
2.	Dressing bottom of pole and applying preservatives, fixing lightening wire and G.I. roof, fixing arms and erecting	22	7. 00	"	154. 00
3.	Meeri arms 18"x3"x3" with holes for insulators &c.	22	. 40	"	8. 80
4.	G.I. roofs 6" x 4"	22	116	"	3. 52
5.	Three iron wires each 400 lbs. per mile F.O.B. London ton.	.536	370. 00	ton	198. 32
6.	Stay wire G.I.4 x 8 strand F.O.B. London "	. 4	430. 00	"	172. 00
7.	Binding wire 23 coils each 3' long F.O.B. London Coils	23	13. 66	100	3. 14
8.	G.I. Jointing wire in 4' lengths No.16 F.O.B. London Coils	8. 6	. 21	100	. 02
9.	G.I. Line wire 150 lbs per mile F.O.B.London				
10.	White Porcelain Insulators U.R. pattern F.O.B. London	66	56. 00	100	36. 96
11.	G. Steel stalks $\frac{3}{4}$" diam. complete with nuts and washers to suit 3" wood cross arms F.O.B.London	66	35. 00	100	23. 10
12.	Creosoted felt washers for use with insulators and stalks F.O.B.London	66	22. 50	1000	1. 49
13.	G.I. Bolts 10" long $\frac{1}{2}$" diam. screwed 3" with nuts and 2 washers F.O.B. London	22	30. 00	100	6. 60
14.	White Porcelain shackle Insulators	1	. 66	each	. 66
			Carried Forward.....	Sh.	784. 61

Item	Description	Quantity	Rate sh.	Unit	Amount sh.
	Brought Forward				[illegible]
15.	Set of shackle iron work suitable for insulators F.O.B. London 3.5 to 10 Miles.....	.35	.50	ea	.18
16.	G.I.Stay rods with tightners & Anchor plates & thimbles complete F.O.B. London.....	6	4.00	ea	24.00
17.	Wiring 3 lines including jointing & binding complete.....	1	220.00	Mile	220.00
18.	Railway freight on 22 Cedar poles, say 4 to the ton for 200 miles @ -/35s. per ton per mile.....				363.00
19.	Railway freight on 22 cross arms as above 1/25 ton.....				2.64
20.	1/70th. of cost of tools as shown below £ 69/70..				17.14
21.	1/140th. cost of sea freight, Insurance and landing charges as below £ 600/140.....				85.72
22.	1/40th. cost of freight on Uganda Railway for Imports as below [illegible] say...				150.00
23.	Freight on Construction line 6 tons @ -/50 per ton per mile for 35..... miles...				[illegible]
			[illegible]		1,762.38
	Tools				
1.	Salamanding.....	2	65.00	cwt.	130.00
2.	G.P.O. Inspector.....	1	105.00	ea.	105.00
3.	W.I. Spanners.....	6	3.00	"	18.00
4.	Spanner to suit bolts and nuts.....	6	2.50	"	15.00
5.	Hand vice for making Britannia joints.....	4	25.00	"	100.00
6.	Draw tongs P.O. pattern for 400 lb. wire.....	4	10.00	"	40.00
7.	Straining ratchets and keys all for 400 lb. wire. F.O.B. London...	5	45.00	"	225.00
8.	Local tools & ladders...		L.S.		[illegible]
	[illegible] required for 140 miles.....				965.00
	Cost per mile - sh.6.90				
	Total cost, Materials, Labour & tools per mile.....				1,720.38

Item	Description	Quantity	Rate Sh.	Unit	Amount Sh.
	Brought Forward				[illegible]
15.	Set of shackle iron work suitable for insulators F.O.B. London 3.5 to 10 Miles.....	.25	.50	ea	.13
16.	G.I.Stay rods with tightners & Anchor plates & thimbles complete F.O.B. London.....	6	4.00	ea	24.00
17.	Wiring 3 lines including jointing & binding complete.....	1	220.00	Mile	220.00
18.	Railway freight on 22 Cedar poles, say 4 to the ton for 200 miles @ -/35cs. per ton per mile.....				363.00
19.	Railway freight on 22 cross arms as above 1/25 ton.....				2.64
20.	1/70th. of cost of tools as shown below £ 60/70..				17.14
21.	1/140th. cost of sea freight, Insurance and landing charges as below £ 600/140.....				85.72
22.	1/40th. cost of freight on Uganda Railway for Imports as below [illegible] say...				150.00
23.	Freight on Construction line 6 tons @ -/50 per ton per mile for 35..... miles...				[illegible]
	[illegible]		[illegible]		1,782.20
1.	Salamoning.....	2	65.00	cwt.	130.00
2.	G.P.O. Sounder.....	1	100.00	ea.	100.00
3.	W.I. Spanners.....	6	3.00	"	18.00
4.	Spanner to suit bolts and nuts.....	6	2.50	"	15.00
5.	Hand vice for making Britannia joints.....	4	25.00	"	100.00
6.	Draw tongs P.O. pattern for 400 lb. wire.....	4	10.00	"	40.00
7.	Straining ratchets and keys all for 400 lb. wire. F.O.B. London...	6	48.00	"	288.00
8.	Local tools & ladders...	5	45.00 L.S.		225.00 [illegible]
	[illegible] required for 140 miles.....				900.00
	[illegible] per mile - Sh.6.86				
	Total cost, Materials, Labour & tools per mile.....				1,782.20

VI. ELECTRIC TELEGRAPH.

Item No.	Description	Quantity	Rate Sh.	Unit	Amount Sh.
	INSTRUMENTS IN ONE INTERMEDIATE STATION				
(1)	Pony sounders P.O. pattern 40 G.N.M.S.	2	45.50	ea.	91.00
(2)	Galvano Scopes P.O. pattern.	2	24.75	"	49.50
(3)	Lightening arresters double plate.	1	32.50	"	32.50
(4)	10 Cell Leclanche cell battery.	2	12.50	"	25.00
(5)	Leading in wire 7Lbs. All F.O.B. London.	30	1.6.		7.00
				TOTAL	205.00
(6)	Labour in installing apparatus & leading in wire				100.00
				TOTAL	305.00
	INSTRUMENTS FOR LOCAL TERMINAL WORKING.				
(1)	Pony sounder P.O. pattern 40 G.N.M.S.	1	45.50	ea.	45.50
(2)	Galvano scopes P.O. pattern.	1	24.75	"	24.75
(3)	Polarised relay standard P.O. pattern	1	156.75	"	156.75
(4)	Lightening arrester double plates. Siemen pattern	1	32.50	"	32.50
(5)	10 Cell Leclanche Cell battery	3	12.50	"	37.50
(6)	Copper wire No. 1 .064" H.C. wire insulated. 7Lbs. All F.O.B. London	30	1.6.		12.00
				TOTAL	309.00
(7)	Labour in installing apparatus & leading in wire.				100.00
				TOTAL	409.00

VI. ELECTRIC TELEGRAPH.

Item No.	Description	Quantity	Rate Sh.	Unit	Amount Sh.
	INSTRUMENTS IN THE INTERMEDIATE STATION				
(1)	Pony sounders P.O. pattern 40 O.H.M.S.	2	45.50	ea.	91.00
(2)	Galvano Scopes P.O. pattern.	2	24.75	"	49.50
(3)	Lightening arresters double plate.	1	32.50	"	32.50
(4)	10 Cell Leclanche cell battery.	2	12.50	"	25.00
(5)	Leading in wire Yds. All F.O.R. London.	30	1.8.		7.00
				TOTAL	205.00
(6)	Labour in installing apparatus & leading in wire				100.00
				TOTAL	305.00
	INSTRUMENTS FOR LOCAL TERMINAL WORKING.				
(1)	Pony sounder P.O. pattern 40 O.H.M.S.	1	45.50	ea.	45.50
(2)	Galvano scopes P.O. pattern.	1	24.75	"	24.75
(3)	Polarised relay standard P.O. pattern	1	156.75	"	156.75
(4)	Lightening arrester double plates, Siemens pattern	1	32.50	"	32.50
(5)	10 Cell Leclanche Cell battery	3	12.50	"	37.50
(6)	Copper wire No. 1 .044" H.C. wire insulated. Yds. All F.O.R. London	80	1.8.		12.00
				TOTAL	309.00
(7)	Labour in installing apparatus & leading in wire.				100.00
				TOTAL	409.00

APPENDIX E

UGANDA RAILWAY 463

TRIKA-NYERI EXTENSION.

Nairobi-Kampala
KAMPALA TO KIRA VALLEY Kampala-Jinja Sec.

II. PLANT.

ITEM	NO.	RATE Sh.cs.	UNIT.	AMOUNT Sh.cs.
(A) ENGINEERING				
Permanent Way Gangs.	15	400.00	Gang.	6,000.00
Trollies	3	1,400.00	each	4,200.00
Instruments	1	3,000.00	set.	3,000.00
General Tools		6,000.00	set	6,000.00
			TOTAL	19,200.00

APPENDIX E

UGANDA RAILWAY 463

ZEIKA-NYERI EXTENSION.

RAILWAY TO ZEIKA VALLEY Main Range Length 7.0 Miles.

II. PLANT.

ITEM	NO.	RATE Sh.cs.	UNIT.	AMOUNT Sh.cs.
(A) RECURRING				
Permanent Way Gangs.	15	400.00	Gang.	6,000.00
Trollies	3	1,400.00	each	4,200.00
Instruments	1	3,000.00	set.	3,000.00
General Tools		6,000.00	set	6,000.00
			TOTAL	19,200.00

UGANDA RAILWAY

KIJABE-KISUMU EXTENSION.

KISUMU TO KAVIRONDO VALLEY

Main Line
Length [illegible] Miles

EX. YEAR

ITEM	NO.	RATE Rs.as.	UNIT.	AMOUNT Rs. as.
(b) CONSTRUCTION				
Rail Bender	1	650.00	Each	650.00
Decauville Track	10	10000.00	Mile	100000.00
" Points & Cross.	40	250.00	Set	10000.00
" Trucks	120	250.00	Each	30000.00
Steam Crane 5 ton	1	24000.00	Each	24000.00
Sling Chains		Lump	Sum	650.00
Platelayers trucks	4	250.00	Each	1000.00
Motor Tractors	2	7150.00	"	14300.00
Water Carts	5	1200.00	"	6000.00
Tarpaulins	20	100.00	"	2000.00
Electric Batteries	2	800.00	"	1600.00
Survey Motor Trolley	1	10000.00	"	10000.00
Weighing Machines	2	500.00	"	1000.00
Anvils	4	150.00	"	600.00
Grinding Wheels	2	60.00	"	120.00
Rail Saw	2	250.00	"	500.00
Screening Machine	1	1400.00	"	1400.00
Inspectors' Trolleys	4	1400.00	"	5600.00
Tools Assorted	2	80.00	"	160.00
Bridge erecting Plant		Lump	Sum	20000.00
Workshop Tools		"	"	12000.00
Motor Cars	2	10000.00	Each	20000.00
Miscellaneous Tools		Lump	Sum	10000.00
Upkeep and repair of Rolling Stock		Lump	Sum	40000.00
				321880.00
		Contingencies 5%		16094.00
		TOTAL		338,000.00

UGANDA RAILWAY 464

KAMPALA-KIJABE EXTENSION.

KAMPALA TO KIRA VALLEY Extra Over Lumbwa-Kisumu 5 Miles

M. YEAR

ITEM	NO.	RATE Sh. cs.	UNIT.	AMOUNT Sh. cs.
(a) CONSTRUCTION				
Rail Bender	1	600.00	Each	600.00
Eggenville Track	10	10000.00	Mile	100000.00
" Points & Cross.	40	220.00	Set	8800.00
" Brakes	100	200.00	Each	20000.00
Steam Crane 5 ton	1	24000.00	Each	24000.00
Sling Chains		Lump	Sum	600.00
Platelayers trucks	4	300.00	Each	1200.00
30hp Tractors	2	7140.00	"	14280.00
Water Carts	5	1800.00	"	9000.00
Tarpaulins	20	120.00	"	2400.00
Electric Batteries	2	800.00	"	1600.00
Driving Motor Trolley	1	10000.00	"	10000.00
Welding Machines	2	800.00	"	1600.00
Anvils	6	150.00	"	900.00
Grinding Wheels	2	60.00	"	120.00
Rail Saw	2	250.00	"	500.00
Screwing Machine	1	1400.00	"	1400.00
Inspectors' Trolleys	4	1400.00	"	5600.00
Tools Assorted	8	50.00	"	400.00
Bridge erecting Plant		Lump	Sum	20000.00
Workshop Tools		"	"	10000.00
Water Cars	2	10000.00	Each	20000.00
Miscellaneous Tools		Lump	Sum	10000.00
Upkeep and repair of Rolling Stock		Lump	Sum	40000.00
				321880.00
		Contingencies 5%		16076.00
		TOTAL		337,956.00

APPENDIX E. (cont'd)

UGANDA RAILWAY

TESO-KYOGA EXTENSION.

KUMI TO TORA VALLEY

Metre Gauge
Length 27.78 Miles

IX PLANT

ITEM	NO.	RATE Sh.cs.	UNIT	AMOUNT Sh.cs.
(a) LOCOMOTIVE				
Workshop Tools		Lump	Sum	5,000.00
(b) CARRIAGE & WAGON				
Workshop Tools		Lump	Sum	5,000.00
(c) STATION & OFFICE [illegible]				
Standard equipment for Wayside Station and Goods Shed.	4.	6,000.00	each	24,000.00
(f) STEAMERS & BOATS	Nil.			
(g) ELECTRIC	Nil.			

ITEM	No.	SALARIES Years	SALARIES Rate (1) £	SALARIES Amt: £	Duty Passages (2) £	XII Allowances (3) £	(4) £	(5) £	(6) £	(7) £	(8) £	Total £
DIRECTION												
Consulting Engineers	L.S.			£. 1000	-	-						
Crown Agents	L.S.			9000	-	-						
				£ 10000			-	-	-	-	-	£ 10,000
ENGINEERING												
Exec: Engineer	1	3	1000	3000	150	350	250	200	120	-	500	Rate per mil
Senior Asst: "	4	3	700	8400	300	800	600	200	400	-	400	
Junior " "	6	2½	450	6750	450	864	600	-	600	-	200	£ 189. 10s
Surveyors	8	2	360	5760	-	-	400	-	800	-	-	
Supervisors	5	2	350	3500	-	-	250	-	500	-	-	
Clerks	6	3	350	6300	-	-	200	-	-	-	-	
Office Superintendant	1	3	550	1650	150	-	150	-	-	-	-	
Typists	2	3	240	1440	-	-	100	-	-	-	-	
Head Draughtsman	1	3	600	1800	150	-	150	-	-	-	-	
Tracers	2	3	300	1800	-	-	150	-	-	-	-	
Chainmen &c.	40	2½	12	1200	-	25	100	-	-	-	-	
				41800	1200	2039	3000	1200	1920	-	1200	£ 51,439
STORES												
Deputy Storekpr	1	3	600	1800	150	-	150	-	-	-	-	
Clerks	4	3	420	5040	-	-	200	-	-	500	700	Rate per Mil
Tally Clerks	2	2½	350	1750	-	-	200	-	-	-	-	£116. 15s.
Yard Foreman	1	2½	350	875	-	-	100	-	-	-	-	
Messengers	4	2½	12	60	-	-	100	-	-	-	-	
				9525	150	6	750	-	-	500	700	£ 11,496
ACCOUNTS												
Deputy Accountnt:	1	3	800	2400	150	-	200	100	-	-	200	Rate per Mil
Asst: "	1	3	500	1500	-	-	150	-	-	-	-	£138. 10s
Head Cashier	1	3	500	1500	-	-	150	-	-	-	-	
Trav.Paymasters	3	2½	450	3375	-	360	200	-	-	-	-	
Clerks	4	3	400	4800	-	-	200	-	-	-	-	
Messengers	6	3	12	216	-	15	200	-	-	-	-	
				13791	150	375	1200	100	-	-	200	£ 15,896
NATIVE ADMINISTRATION												
City Magistrate	1	3	650	1950	-	250	200	100	-	-	400	Rate per Mile
Labour Inspectors	1	2½	450	1125	-	150	100	-	-	-	100	£187. 15s.
Police "	1	2½	450	1125	-	150	100	-	-	-	-	
Clerks	3	2½	350	1575	-	-	100	-	-	-	-	
Policemen	12	2½	30	900	-	60	100	-	-	-	500	£ 8,495
				6675	-	610	600	100	-	-		
MEDICAL & SANITARY												
Medical Officer	1	2½	700	1750	150	300	500	500	2250	400	400	Rate per Mile
Sub.Asst.Surgeon	3	2½	450	3375	150	-	200	-	-	-	-	£108. 5s
Compounders	3	2½	300	2250	150	-	150	-	-	-	-	
Clerk	1	2½	250	625	-	-	100	-	-	-	-	
Storekeeper	1	2½	250	625	-	-	100	-	-	-	-	
Sanitary Inspect.	3	2½	300	2250	-	-	150	-	-	-	-	
Messengers	4	2½	12	150	-	-	100	-	-	-	-	
			£	10950	£ 450	£ 300	1800	500	2250	400	400	£ 16,325

Rate per Mile £ 108. 10s.

APPENDIX "B"

VII. BALLAST & PERMANENT WAY

(a) Details of cost and weight of 1 mile 50 lb. rails B.S. Section with Steel Sleepers and Ballast.

Item.	Unit	Quantity	Weight tons.	Rate	Amount Sh. cs.	Total Amount Sh.
50 lb. rails 30' long	ton	352	78.57	£8. 0. 0	12571. 20	
Fishplates @ 14.65 lbs per pr	"	704	2.30	8. 0. 0	368. 00	
Fishbolts @ .914 lb. each	"	1408	.574	27.10.0	315. 70	
Steel Sleepers 12 per rail 76 lb. each	"	2112	71.65	13.10.0	19345. 50	
Steel Keys 1.81 per pair	"	4224	1.706	13.10.0	460. 62	
		TOTAL	154.80			33061. 02
Freight	"		154.80	1.15. 0	5418. 00	
Insurance	"		154.80	1.10	287. 93	
Lighterage Dock Charges, Mombasa	"		154.80	10. 5	1609. 92	
Railway Freight Kilindini to Thika	"		154.80	2. 8.10	7558. 88	
						14874. 73
Loading & un-loading at Thika Linking & laying including train charges & first lift & packing with earth	Mile	1		£. 100		2000. 00
						49935. 75
				Contingencies 1½%		719. 04
				5% on laying		100. 00
				TOTAL		50754. 79

Cost of Ballasting:-

Ballast	100 c.f.	40000	Sh. 9.00	3600.00	
Train charges	" "	40000	5.00	2000.00	
Loading	" "	40000	1.50	600.00	
Placing in Line	" "	40000	4.00	1600.00	
					7800. 00
			Contingencies 5%		390. 00
			TOTAL		8190. 00

APPENDIX "S"

VII. BALLAST & PERMANENT WAY

(a) Details of cost and weight of 1 mile 60 lb. rails B.S. Section with Steel Sleepers and Ballast.

Item.	Unit	Quantity	Weight tons.	Rate	Amount Sh. cs.	Total Amount Sh.
60 lb. rails 30' long	ton	352	78.57	£8. 0. 0	12571. 20	
Fishplates @ 14.65 lbs per pr	"	704	2.30	8. 0. 0	368. 00	
Fishbolts @ .914 lb. each	"	1408	.574	27.10.0	315. 70	
Steel Sleepers 12 per rail 76 lb. each	"	2112	71.65	13.10.0	19345. 50	
Steel Keys 1.81 per pair	"	4224	1.706	13.10.0	460. 62	
		TOTAL	154.80			33061. 02
Freight	"		154.80	1.15. 0	5418. 00	
Insurance	"		154.80	1.10	287. 93	
Lighterage Dock Charges, Mombasa	"		154.80	10. 5	1609. 92	
Railway Freight Kilindini to Thika	"		154.80	2. 8.10	7558. 88	
						14874. 73
Loading & un-loading at Thika Linking & laying including train charges & first lift & packing with earth	Mile	1		£. 100		2000. 00
						49935. 75
				Contingencies 1½%		719. 04
				5% on laying		100. 00
				TOTAL		50754. 79

Cost of Ballasting:-

Ballast	100 c.f.	40000	Sh. 9.00	3600.00	
Train charges	" "	40000	5.00	2000.00	
Loading	" "	40000	1.50	600.00	
Placing in Line	" "	40000	4.00	1600.00	
					7800. 00
			Contingencies 5%		390. 00
			TOTAL		8190. 00

APPENDIX H

UGANDA RAILWAY

TEKA-MYERI EXTENSION

KAMPUNU TO TANA VALLEY

VIII. STATIONS & BUILDINGS.

COST OF WATER SUPPLY TO STATIONS.

	Cost Sh.cts.
TEKA STATION	
Existing supply to be extended to new station site by 3" pipe, and new Hydraulic ram installed.	
Estimated supply 20,000 gal per 24 hours	
8,000 ft. of 3" galv. pipe @ Sh.1/75 per ft.	14,000.00
Laying and transport @ Sh.-/10c per ft.	800.00
Additional Hydraulic ram.....	5,000.00
TOTAL	20,000.00
FUNDA MILIA STATION	
Gravity supply from Thara river, available Head 40 ft.	
Estimated supply 20,000 per 24 hours	
12,000 ft. of 3" galv. pipe @ Sh. 1/75 per ft.....	20,800.00
Laying and transport @ Sh. -/10c per ft.....	1,200.00
Headworks at intake.....	2,000.00
TOTAL	24,000.00
FORT HALL STATION	
No water supply.	
TANA VALLEY STATION	
Gravity supply from Sabuni River Falls available Head 60 ft. Head	
Estimated supply 40,000 gal. per 24 hours	
10,000 ft. of 3" galv. pipe @ Sh. 1/75 per ft.....	17,500.00
Laying and transport @ Sh. -/10c per ft....	1,000.00
Head works at intake.....	2,000.00
TOTAL	20,500.00

APPENDIX H

UGANDA RAILWAY

TEIKA-MYERI EXTENSION

KAMPALA TO TANA VALLEY

WALL, STATIONS & BUILDINGS.

COST OF WATER SUPPLY TO STATIONS.

	Cost Shs.cs.
TEIKA STATION	
Existing supply to be extended to new station site by 3" pipe, and new Hydraulic ram installed.	
Estimated supply 20,000 gal per 24 hours	
8,000 ft. of 3" galv. pipe @ Sh.1/75 per ft.	14,000.00
Laying and transport @ Sh.-/10c per ft.	800.00
Additional Hydraulic ram.....	4,000.00
TOTAL	20,800.00
KUNDA MILLA STATION	
Gravity supply from Thawa river, available Head 40 ft.	
Estimated supply 20,000 per 24 hours	
12,000 ft. of 3" galv. pipe @ Sh. 1/75 per ft.....	20,800.00
Laying and transport @ Sh. -/10c per ft.....	1,200.00
Headworks at intake.....	4,000.00
TOTAL	26,000.00
FORT HALL STATION	
No water supply.	
TANA VALLEY STATION	
Gravity supply from Sakumi River Falls available Head 60 ft. Head	
Estimated supply 40,000 gal. per 24 hours	
10,000 ft. of 3" galv. pipe @ Sh. 1/75 per ft.....	17,500.00
Laying and transport @ Sh. -/10c per ft.....	1,000.00
Head works at intake.....	5,000.00
TOTAL	23,500.00

APPENDIX "I"

DETAIL COST OF CONCRETE AND MASONRY

469

COST OF CEMENT PER TON OF 5.8 CASKS.

C.I.F. Mombasa.....	Shs.	107. 60	
Landing.....	"	10. 60	
Railway Freight.....	"	48. 10	
Unloading & Stereing.	"	2. 00	
Carting Average.....	"	10. 00	
Damage and Loss.....	"	1. 00	
	Shs.	178. 70 per.ton =	Sh. cs. 34.40 per cask.

COST OF SAND PER TON OF 25 CUB. FT.

C.I.F. Thika.....	Shs.	12. 00	
Carting Average.....	"	10. 00	
Loss.....	"	1. 00	
		23. 00 per ton =	92/- per 100 cub. ft.

COST OF BROKEN STONE PER 100 CUB.FT.

Labour.....	Shs.	8. 50	
Carting Average.....	"	8. 00	
		16. 50 =	16/50 per 100 cub. ft.

COST OF HAMMERDRESSED MASONRY PER 100 CUB. FT.

Stone measured in Wall Shs.	40. 00	per 100 c.f.
Dressing @ 10 cs. per lin.ft.	20. 00	" " "
Building.....	28. 00	" " "
Mortar 4 to 1. Cement 1¼ casks	51. 40	
Sand 25 cub.ft.	23. 00	
Mixing.....	6. 00	
	168. 40	
Plant and Profit.....	31. 60	
Shs.	200. 00	= 2/- per cub.ft.

COST OF CONCRETE 6 - 3 - 1 PER 100 CUB. FT.

Cement 3.8 Casks @ Shs. 34.40	130. 72	
Sand 50 cub.ft. " " 92/-	46. 00	
Broken stone, 100 cub.ft. " " 16/50	16. 50	
Labour.....	10. 00	
	203. 22	
Plant and Profit.....	46. 78	
Shs.	250. 00	= 2/50 per c. ft.

DETAIL COST OF CONCRETE AND MASONRY

COST OF CONCRETE 4 - 2 - 1 PER 100 CUB.FT.

Cement 5.5 casks @ Sh.34.40	Sh.189.20	470
Sand 50 cub.ft. " " 92.00	46.00	
Broken Stone 100 cub.ft. @ Sh.20.00	20.00	
Labour.....	20.00	
	275.20	
Plant and Profit.....	74.80	
	Sh.350.00	= Sh.3/50 per cub.ft.

COST OF MASONRY WITH CONCRETE HEARTING

Masonry face and back 1 cub.ft @ Sh. 2.00	Sh. 2.00	
Concrete heart 3 cub.ft @ Sh. 2.50	7.50	
Cost of 4 cub.ft. walling	= 9.50	
Cost per 1 cub.ft.	= 2.30	
Allow for Pointing and Cleaning.....	.20	
Total cost per cub. feet.	Sh. 2.50	

NOTE.

Bridges from Thara to Maragua have Concrete and Masonry rates increased by Sh. 0/20 per cub. ft. to allow for extra transport of materials.

DETAIL COST OF CONCRETE AND MASONRY

COST OF CONCRETE 4 - 2 - 1 PER 100 CUB.FT.

Cement 5.5 casks @ Sh.34.40	Sh.189.20	470
Sand 50 cub.ft. " " 92.00	46.00	
Broken Stone 100 cub.ft. @ Sh.20.00	20.00	
Labour.....	20.00	
	275.20	
Plant and Profit.....	74.80	
	Sh.350.00	= Sh.3/50 per cub.ft.

COST OF MASONRY WITH CONCRETE HEARTING

Masonry face and back 1 cub.ft @ Sh. 2.00	Sh. 2.00	
Concrete heart 3 cub.ft @ Sh. 2.50	7.50	
Cost of 4 cub.ft. walling	= 9.50	
Cost per 1 cub.ft.	= 2.38	
Allow for Pointing and Cleaning.....	.20	
Total cost per cub. feet.	Sh. 2.50	

NOTE.

Bridges from Thara to Maragua have Concrete and Masonry rates increased by Sh. 0/20 per cub. ft. to allow for extra transport of materials.

APPENDIX "K" UGANDA RAILWAY 12L

(Continued)

THIKA-NYERI EXTENSION

Metre Gauge

NDARUGU TO TANA VALLEY Length 57.78 Miles

IV. BRIDGEWORK 471

(A) MAJOR BRIDGES 40' SPAN AND OVER.

ITEM NO.	DESCRIPTION OF WORK				Name	NDARUGU
					Serial No.	7
					Mileage	1 - 11
					Height:- Bed of river to Formation	62 feet
					Foundations	2 ft. on rock
					Span	1 - 60' Girder & 2 - 40' Girder.
			Sh. cs.	Unit	Quantity	Sh. cs.
1	Excavation earth		38. 00	%cub.ft.	8	304. 00
2	do soft rock		55. 00	"	4	220. 00
3	Concrete in founds 6-3-1	a.	2. 50	cub.ft.	2280	5700. 00
		b.	2. 70	"	-	-
4	Masonry in Superstructure	a.	2. 50	"	27344	68360. 00
		b.	2. 70	"	-	-
5	Extra to Masonry for height	a.	0. 25	"	5000	1250. 00
		b.	0. 50	"	3500	1750. 00
		c.	0. 75	"	3000	2250. 00
6	Concrete in piers 4-2-1	a.	3. 50	"	-	-
		b.	3. 70	"	-	-
7	Dry stone backing and pitching		48. 00	"	40	1920. 00
8	Pitching (hand set)		1. 33	Sup.ft	-	-
9	Girder blocks 4-2-1	a	3. 50	Cub.ft	84	294. 00
		b.	3. 70	"	-	-
10	Steelwork complete		600. 00	ton	45.04	27024. 00
11	Channel Iron ballast Wall		Lump	sum	L.S.	182. 00
12	Bridge Sleepers		17. 00	each	105	1785. 00
13	Sleeper Bolts		1. 00	"	420	420. 00
	" Plates		1. 00	"	210	210. 00
14	Earthwork to approaches		28. 00	% Cub.ft	-	-
15	Temporary works		Lump	sum	L.S.	500. 00
16	Piling		3. 00	% Cub.ft.	-	-
17	Works Establishment		Lump	sum	L.S.	1200. 00
						113,369. 00
					Contingencies 5%	5,668. 00
					TOTAL	119,037. 00

TAITA-VOI EXTENSION

Metre Gauge
Length 57.78 Miles

NDARUGU TO TANA VALLEY

471

XV. BRIDGEWORK

(A) MAJOR BRIDGES 40' SPAN AND OVER.

ITEM NO.	DESCRIPTION OF WORK		Name / Serial No. / Mileage / Height:- Bed of river to Formation / Foundations / Span		Unit	Quantity	Sh. cs.
			NDARUGU				
			7				
			1 - 11				
			62 feet				
			2 ft. on rock				
			1 - 60' Girder & 2 - 40' Girder.				
1	Excavation earth			38. 00	Cub.ft	8	304. 00
2	do soft rock			55. 00	"	4	220. 00
3	Concrete in founds 6-3-1	a.		2. 50	cubft	2280	5700. 00
		b.		2. 70	"	-	-
4	Masonry in Superstructure	a.		2. 50	"	27344	68360. 00
		b.		2. 70	"	-	-
5	Extra to Masonry for height	a.		0. 25	"	5000	1250. 00
		b.		0. 50	"	3500	1750. 00
		c.		0. 75	"	3000	2250. 00
6	Concrete in piers 4-2-1	a.		3. 50	"	-	-
		b.		3. 70	"	-	-
7	Dry stone backing and pitching			48. 00	"	40	1920. 00
8	Pitching (hand set)			1. 33	Sup.ft	-	-
9	Girder blocks 4-2-1	a		3. 50	Cub.ft	84	294. 00
		b.		3. 70	"	-	-
	Steelwork complete			600. 00	ton	45.04	27024. 00
	Channel Iron ballast Wall			Lump	sum	L.S.	182. 00
	Bridge Sleepers			17. 00	each	105	1785. 00
	Sleeper Bolts			1. 00	"	420	420. 00
	" Plates			1. 00	"	210	210. 00
	Earthwork to approaches			28. 00	% Cub.ft	-	-
	Temporary works			Lump	sum	L.S.	500. 00
	Piling			3. 00	% Cub.ft.	-	-
	Works Establishment			Lump	sum	L.S.	1200. 00
							113,369. 00
					Contingencies 5%		5,668. 00
					TOTAL		119,037. 00

(A) MAJOR BRIDGES 40' SPAN AND OVER (Continued)

	THIKA	KAMUKU	THARA
	No. 30	No. 54	No. 116
	Mile 9. 78	Mile 16. 60	Mile 30. 62
	52 feet	46 feet	13 feet
	5 feet on rock	2 feet on rock	4 feet on 15' Piles
	2 - 60' Girders & 2 - 40' "	3 - 40' Girders	3 - 20' Girders.

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		7	266. 00	8	304. 00	9	342. 00
2		1 - 2	66. 00	8	440. 00	-	-
3	a.	4318	10795. 00	1735	4338. 00	-	-
	b.	-	-	-	-	3046	8224. 00
4	a.	18312	45780. 00	14300	35750. 00	-	-
	b.	-	-	-	-	3688	9958. 00
5	a.	3000	750. 00	2100	525. 00	-	-
	b.	2000	1000. 00	-	-	-	-
6	a.	-	-	-	-	-	-
	b.	-	-	-	-	-	-
7.		30	1440. 00	24	1150. 00	10	480. 00
8.		-	-	-	-	-	-
9	a.	112	392. 00	48	168. 00	-	-
	b.	-	-	-	-	48	178. 00
0		67.48	40488. 00	33.90	20340. 00	11.04	6624. 00
1		L.S.	182. 00	L.S.	182. 00	L.S.	142. 00
2		150	2550. 00	90	1530. 00	45	765. 00
3		600	600. 00	360	360. 00	180	180. 00
4		300	300. 00	180	180. 00	90	90. 00
5		-	-	-	-	-	-
6		L.S.	8000. 00	L.S.	102. 00	L.S.	2000. 00
7		-	-	-	-	1740	5220. 00
		L.S.	6000. 00	L.S.	1200. 00	L.S.	1200. 00
			118609. 00		66369. 00		35403. 00
ntingencies 5%			5931. 00		3328. 00		1770. 00
TOTAL			124540. 00		69897. 00		37173. 00

(A) MAJOR BRIDGES 40' SPAN AND OVER (Continued)

	THIKA	KAMBU	THARA
	No. 30	No. 54	No. 116
	Mile 9. 78	Mile 16. 60	472 Mile 30. 62
	52 feet	46 feet	13 feet
	5 feet on rock	2 feet on rock	4 feet on 15' Piles
	2 - 80' Girders & 2 - 40' "	3 - 40' Girders	3 - 20' Girders.

m.	Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
	7	266. 00	8	304. 00	9	342. 00
	1 - 2	66. 00	8	440. 00	-	-
a.	4318	10795. 00	1735	4338. 00	-	-
b.	-	-	-	-	3046	8224. 00
a.	18312	45780. 00	14300	35750. 00	-	-
b.	-	-	-	-	3688	9958. 00
a.	3000	750. 00	2100	525. 00	-	-
b.	2000	1000. 00	-	-	-	-
a.	-	-	-	-	-	-
b.	-	-	-	-	-	-
	30	1440. 00	24	1150. 00	10	480. 00
	-	-	-	-	-	-
a.	112	392. 00	48	168. 00	-	-
b.	-	-	-	-	48	178. 00
	67.48	40488. 00	33.90	20340. 00	11.04	6624. 00
	L.S.	182. 00	L.S.	182. 00	L.S.	142. 00
	150	2550. 00	90	1530. 00	45	765. 00
	600	600. 00	360	360. 00	180	180. 00
	300	300. 00	180	180. 00	90	90. 00
	-	-	-	-	-	-
	L.S.	8000. 00	L.S.	102. 00	L.S.	2000. 00
	-	-	-	-	1740	5220. 00
	L.S.	6000. 00	L.S.	1200. 00	L.S.	1200. 00
		118609. 00		66369. 00		35403. 00
ngencies 5%		5931. 00		3328. 00		1770. 00
OTAL		124540. 00		69897. 00		37173. 00

	SAKA - KAKA	MPUGUA	MATEMOVA
	No. 127	No. 179	No. 227
	Mile 33.15	Mile 44.15	Mile 50;00
	38 feet	108 feet	37 feet
	3 feet on rock	2 feet on rock	4 feet on rock
	1 - 40' Girder	10 - 40' Girders & 1 - 60' " " 10 - 20' " "	2 - 40' Girders & 2 - 20' " "

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		7	266. 00	10	380. 00	7	266. 00
2		2	110. 00	10	550. 00	10	550. 00
3	a.	-	-	-	-	4003	10008. 00
	b.	3793	10241. 00	6625	17887. 50	-	-
4	a.	-	-	-	-	10700	26750. 00
	b.	20167	54451. 00	4015	10840. 50	-	-
5	a.	3000	750. 00	-	-	4000	1000. 00
	b.	2000	1000. 00	-	-	-	-
6	a.	-	-	-	-	-	-
	b.	-	-	8618	31887. 00	-	-
7		50	2400. 00	7	336. 00	15	720. 00
8		-	-	-	-	500	665. 00
9	a.	-	-	-	-	64	224. 00
	b.	16	60. 00	16	60. 00	-	-
10		11.30	6780. 00	795. 60	477258. 00	29.96	17976. 00
11		L.S.	182. 00	L.S.	182. 00	L.S.	142. 00
12		30	510. 00	480	8160. 00	82	1394. 00
13		120	120. 00	1920	1920. 00	328	328. 00
14		60	60. 00	960	960. 00	164	164. 00
15		-	-	-	-	-	-
16		-	-	L.S.	6000. 00	L.S.	200. 00
17		-	-	-	-	-	-
18		L.S.	1200. 00	L.S.	8000. 00	L.S.	1200. 00
			78130. 00		564421. 00		63387.00
Contingencies 5%			3907. 00		28221. 00		3170.00
TOTAL			82037. 00		592642. 00		66557.00

(A) MAJOR BRIDGES 40' SPAN AND OVER (continued) 473

	BABA - BABA	[illegible]	MATHOYA
	No. 127	No. 179	No. 227
	Mile 33.15	Mile 44.15	Mile 50;00
	38 feet	108 feet	37 feet
	3 feet on rock	2 feet on rock	4 feet on rock
	1 - 40' Girder	18 - 40' Girders & 1 - 60' " " 18 - 20' " "	2 - 40' Girders & 2 - 20' " "

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		7	266.00	10	380.00	7	266.00
2		2	110.00	10	550.00	10	550.00
3	a.	-	-	-	-	4003	10008.00
	b.	3793	10241.00	6625	17887.50	-	-
4	a.	-	-	-		10700	26750.00
	b.	20167	54451.00	4015	10840.50	-	-
5	a.	3000	750.00	-	-	4000	1000.00
	b.	2000	1000.00	-	-	-	-
6	a.	-	-	-	-	-	-
	b.	-	-	8618	31887.00	-	-
7		50	2400.00	7	336.00	15	720.00
8		-	-	-	-	500	665.00
8	a.	-	-	-	-	64	224.00
	b.	16	60.00	16	60.00	-	-
10		11.30	6780.00	795.60	477258.00	29.96	17976.00
11		L.S.	182.00	L.S.	182.00	L.S.	142.00
12		30	510.00	480	8160.00	82	1394.00
13		120	120.00	1920	1920.00	328	328.00
14		60	60.00	960	960.00	164	164.00
15		-	-	-	-	-	-
16		-	-	L.S.	6000.00	L.S.	200.00
17		-	-	-	-	-	-
18		L.S.	1200.00	L.S.	8000.00	L.S.	1200.00
			78130.00		564421.00		63387.00
Contingencies 5%			3907.00		28221.00		3170.00
TOTAL			82037.00		592642.00		66557.00

(A) MAJOR BRIDGES 40' SPAN AND OVER (Continued)

TAR	NAGATI	JAM
No. 241	No. 257	474 Serial No.
Mile 54.20	Mile 57.40	Mileage
26 feet	9 feet	Height:- Bed of river to Formation. Foundations.
5 feet on rock	4 feet on rock	
2 - 60' Girders	2 - 20' Girders	Span.

Item No.		Quantity	Sh. cs.	Quantity	S. cs.	Rate Sh. cs.	Unit.
1		6	228. 00	5	190. 00	38. 00	%cub.ft
2		6	330. 00	-	-	55. 00	"
3	a.	5580	13950. 00	1066	2665. 00	2. 50	cub ft.
	b.	-	-	-	-	2. 70	"
4	a.	15173	37933. 00	2067	5168. 00	2. 50	"
	b.	-	-	-	-	2. 70	"
5	a.	2000	500. 00	-	-	0. 25	"
	b.	-	-	-	-	0. 50	"
	c.	-	-	-	-	0. 75	"
6	a.	-	-	-	-	3. 50	"
	b.	-	-	-	-	3. 70	"
7		40	1920. 00	15	720. 00	48. 00	"
8		500	665. 00	-	-	1. 33	sup.ft
9	a.	32	112. 00	32	112. 00	3. 50	cub.ft
	b.	-	-	-	-	3. 70	"
10		34.88	26928. 00	7.36	4416. 00	600. 00	Ton.
11		L.S.	212. 00	L.S.	142. 00	Lump	sum
12		82	1394. 00	30	510. 00	17. 00	each
13		328	328. 00	120	120. 00	1. 00	"
14		164	164. 00	60	60. 00	1. 00	"
15		L.S.	1335. 00	48	1344. 00	28. 00	%cub.ft
16		L.S.	3000. 00	L.S.	800. 00	Lump	sum
17		-	-	-	-	3. 00	% cub.ft
18		L.S.	1200. 00	L.S.	1200. 00	Lump	sum
			90199. 00		17447. 00		
Contingencies 5%			4520. 00		872. 00		
TOTAL			94719. 00		18319. 00		

(A) MAJOR BRIDGES 40' SPAN AND OVER (Continued)

No. [illegible]	No. 257	474 Serial No.
Mile 54.20	Mile 57.40	Mileage
26 feet	9 feet	Height:- Bed of river to Formation.
5 feet on rock	4 feet on rock	Foundations.
2 - 60' Girders	2 - 20' Girders	Span.

Item No.		Quantity	Sh. cs.	Quantity	S. cs.	Rate Sh. cs.	Unit.
1		6	228. 00	5	190. 00	38. 00	cub.ft
2		6	330. 00	-	-	55. 00	"
3	a.	5580	13950. 00	1066	2665. 00	2. 50	cub ft.
	b.	-	-	-	-	2. 70	"
4	a.	15173	37933. 00	2067	5168. 00	2. 50	"
	b.	-	-	-	-	2. 70	"
5	a.	2000	500. 00	-	-	0. 25	"
	b.	-	-	-	-	0. 50	"
	c.	-	-	-	-	0. 75	"
6	a.	-	-	-	-	3. 50	"
	b.	-	-	-	-	3. 70	"
7		40	1920. 00	15	720. 00	48. 00	"
8		500	665. 00	-	-	1. 33	sup.ft
9	a.	32	112. 00	32	112. 00	3. 50	cub.ft
	b.	-	-	-	-	3. 70	"
10		44.88	26928. 00	7.36	4416. 00	600. 00	Ton.
11		L.S.	212. 00	L.S.	142. 00	Lump	sum
12		82	1394. 00	30	510. 00	17. 00	each
13		328	328. 00	120	120. 00	1. 00	"
14		164	164. 00	60	60. 00	1. 00	"
15		L.S.	1335. 00	48	1344. 00	28. 00	cub.ft
16		L.S.	2000. 00	L.S.	800. 00	Lump	sum
17		-	-	-	-	3. 00	cub.ft
18		L.S.	1200. 00	L.S.	1200. 00	Lump	sum
			90199. 00		17447. 00		
Contingencies 5%			4520. 00		872. 00		
TOTAL			94719. 00		18319. 00		

UGANDA RAILWAY (Continued)

APPENDIX "L"

THIKA-NYERI EXTENSION

Kaiti Survey Length 1.00 Miles

KIARUTH TO TANA VALLEY

IV. BRIDGEWORK

475

(B) MINOR BRIDGES UNDER 40' TO 6' SPAN

ITEM NO.	DESCRIPTION OF WORK				Name	KARAMAINI
					Serial No.	8
					Mileage	1 - 50
					Height:- Bed of river to Formation	39 feet
					Depth of Founds	1 feet rock
					Remarks	1 - 12' Sur. Arch.
			Sh. cs.	Unit	Quantity	Sh. cs.
1	Excavation earth		38. 00	% cub.ft.	-	-
2	do soft rock		55. 00	"	12	66. 00
3	Concrete in founds 6-3-1	a.	2. 50	cubft.	1688	4220. 00
		b.	2. 70	"	-	-
4	Masonry in Superstructure	a.	2. 50	"	6890	17225. 00
		b.	2. 70	"	-	-
5	Concrete in Arches &c.4-2-1	a.	3. 50	"	4400	15400. 00
		b.	3. 70	"	-	-
6	Dry stone backing and pitching		48. 00	"	.50	2880. 00
7	Pitching (hand set)		1. 33	sup.ft	1200	1596. 00
8	Girder Blocks 4-2-1	a.	3. 50	cub.ft.	-	-
		b.	3. 70	"	-	-
9	Steelwork complete		600. 00	ton	-	-
0	Channel Iron ballast Wall		Lump	sum	-	-
1	Bridge Sleepers		17. 00	each	-	-
2	Sleeper Bolts		1. 00	"	-	-
3	Sleeper Plates		1. 00	"	-	-
4	Arch centres and lagging	a.	5. 70	lin.ft.	-	-
		b.	8. 10	"	100	810. 00
		c.	15. 50	"	-	-
	Earthwork to approaches		28. 00	% cub.ft.	10	280. 00
	Temporary works		Lump	sum	-	-
	Extra to Masonry for height	a.	. 25	cub.ft	-	-
		b.	. 50	"	-	-
		c.	. 75	"	-	-
	Works Establishment		Lump	sum	-	-
						42,477. 00
				Contingencies 5%		2,124. 00
				TOTAL		44,601. 00

UGANDA RAILWAY

APPENDIX "L" (Continued)

THIKA - NYERI EXTENSION

Metre Gauge

Length 87.78 Miles

NDARUGU TO TANA VALLEY

IV. BRIDGEWORK

475

(B) MINOR BRIDGES UNDER 40' TO 6' SPAN

ITEM NO.	DESCRIPTION OF WORK			Name	KARAMAINI
				Serial No.	8
				Mileage	1 - 50
				Height:- Bed of river to Formation	39 feet
				Depth of Founds	1 feet rock
				Remarks	1 - 12' Sur. Arch.
			Sh. cs.	Unit	Quantity	Sh. cs.
1	Excavation earth		38. 00	% cub.ft.	-	-
2	do soft rock		55. 00	"	12	66. 00
3	Concrete in founds 6-3-1	a.	2. 50	cub.ft.	1688	4220. 00
		b.	2. 70	"	-	-
4	Masonry in Superstructure	a.	2. 50	"	6890	17225. 00
		b.	2. 70	"	-	-
5	Concrete in Arches &c.4-2-1	a.	3. 50	"	4400	15400. 00
		b.	3. 70	"	-	-
6	Dry stone backing and pitching		48. 00	"	.80	2880. 00
7	Pitching (hand set)		1. 33	sup.ft	1200	1596. 00
8	Girder Blocks 4-2-1	a.	3. 50	cub.ft.	-	-
		b.	3. 70	"	-	-
9	Steelwork complete		600. 00	ton	-	-
0	Channel Iron ballast Wall		Lump	sum	-	-
1	Bridge Sleepers		17. 00	each	-	-
2	Sleeper Bolts		1. 00	"	-	-
3	Sleeper Plates		1. 00	"	-	-
4	Arch centres and lagging	a.	5. 70	lin.ft.	-	-
		b.	8. 10	"	100	810. 00
		c.	15. 50	"	-	-
	Earthwork to approaches		28. 00	% cub.ft.	10	280. 00
	Temporary works		Lump	Sum	-	-
	Extra to Masonry for height	a.	. 25	cub.ft	-	-
		b.	. 50	"	-	-
		c.	. 75	"	-	-
	Works Establishment		Lump	sum	-	-
						42,477. 00
				Contingencies 5%		2,124. 00
				TOTAL		44,601. 00

(B) MINOR BRIDGES UNDER 40' TO 6' SPAN (continued)

	LAWFORD'S STREAM	TEKKA RIVAL TRAVELLER	SANDHU
	No. 33	No. 38	No. 42
	Mile 10.60	Mile 12.15	Mile 13. 16
	46 feet	12 feet	34 feet.
	1 feet on rock	2 feet on Murrum	4 feet on rock.
	1-6' Sur. Arch.	1-12' Girder	1-20' Sur. Arch.

476

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		115	57. 00	12	46. 00	6000	228. 00
2		2	110. 00	-	-	-	-
3.	a.	1350	3375. 00	1504	3760. 00	6804	17010. 00
	b.	-	-	-	-	-	-
4	a.	4000	10000. 00	3306	8265. 00	9630	24075. 00
	b.	-	-	-	-	-	-
5.	a.	2950	10325. 00	-	-	6120	21420. 00
	b.	-	-	-	-	-	-
6		40	1920. 00	12	580. 00	3500	168. 00
7		900	1197. 00	-	-	2000	2660. 00
8	a.	-	-	16	56. 00	-	-
	b.	-	-	-	-	-	-
		-	-	1.88	1128. 00	-	-
		-	-	L.S.	116. 00	-	-
		-	-	9	153. 00	-	-
		-	-	36	36. 00	-	-
		-	-	18	18. 00	-	-
	a.	134	764. 00	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	71	1100. 50
		10	280. 00	-	-	-	-
		-	-	-	-	-	-
	a.	-	-	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	-	-
		-	-	-	-	-	1800. 00
			28028. 00		14158. 00		67861. 50
ntingencies 5%			1401. 00		708. 00		3393. 07
TOTAL			29429. 00		14866. 00		71254. 57

(B) MINOR BRIDGES UNDER 40' TO 6' SPAN (continued)

	LAWFORDIS SUKRAM	TUKA SISAL TRAILER	SANDBU
	No. 33	No. 38	No. 42
	Mile 10.60	Mile 12.15	Mile 13. 16
	46 feet	12 feet	34 feet.
	1 feet on rock	2 feet on Murrum	4 feet on rock.
	1-6' Sur. Arch.	1-12' Girder	1-20' Sur. Arch.

476

Item No.	Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1	115	57. 00	12	46. 00	6000	228. 00
2	2	110. 00	-	-	-	-
3. a.	1350	3375. 00	1504	3760. 00	6804	17010. 00
b.	-	-	-	-	-	-
a.	4000	10000. 00	3306	8265. 00	9630	24075. 00
b.	-	-	-	-	-	-
4. a.	2950	10325. 00	-	-	6120	21420. 00
b.	-	-	-	-	-	-
	40	1920. 00	12	580. 00	3500	168. 00
5	900	1197. 00	-	-	2000	2660. 00
a.	-	-	16	56. 00	-	-
b.	-	-	-	-	-	-
	-	-	1.88	1128. 00	-	-
	-	-	L.S.	116. 00	-	-
	-	-	9	153. 00	-	-
	-	-	36	36. 00	-	-
	-	-	18	18. 00	-	-
a.	124	764. 00	-	-	-	-
b.	-	-	-	-	-	-
c.	-	-	-	-	71	1100. 50
	10	280. 00	-	-	-	-
	-	-	-	-	-	-
a.	-	-	-	-	-	-
b.	-	-	-	-	-	-
c.	-	-	-	-	-	-
	-	-	-	-	-	1200. 00
		29028. 00		14158. 00		67861. 50
Contingencies 5%		1401. 00		708. 00		3393. 07
TOTAL		29429. 00		14866. 00		71254. 57

(B) MINOR BRIDGES UNDER 40' TO 6' SPAN (Continued)

	No. 67	No. 72	No. 73
	Mile 19.25	Mile 20.34	Mile 20.79
	28 feet	5 feet	7 feet
	2 feet on rock	4 feet on rock	4 feet on rock
	1-6' Sur. Arch	2-12' Girders	1-12' Girder.

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		5	190. 00	36	137. 00	30	114. 00
2		-	-	-	-	-	-
3	a.	1442	3605. 00	2960	7400. 00	2720	6800. 00
	b.	-	-	-	-	-	-
4	a.	2410	6025. 00	1368	3420. 00	1600	4000. 00
	b.	-	-	-	-	-	-
5	a.	1320	6600. 00	-	-	-	-
	b.	-	-	-	-	-	-
6		18	870. 00	5	240. 00	6	288. 00
7		500	665. 00	-	-	-	-
8	a.	-	-	32	112. 00	16	56. 00
	b.	-	-	-	-	-	-
9		-	-	3.76	2256. 00	1.88	1128. 00
10		-	-	L.S.	116. 00	L.S.	116. 00
11		-	-	18	306. 00	9	153. 00
12		-	-	72	72. 00	36	36. 00
13		-	-	36	36. 00	18	18. 00
14	a.	60	342. 00	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	-	-
15		-	-	-	-	-	-
16		-	-	-	-	-	-
17		-	-	-	-	-	-
18		L.S.	400. 00	L.S.	400. 00	L.S.	400. 00
			18697. 00		14495. 00		13109. 00
Contingencies 5%			935. 00		728. 00		656. 00
TOTAL			19632. 00		15223. 00		13765. 00

(E) MINOR BRIDGES UNDER 40' TO 6' SPAN (Continued)

	No. 67	No. 72	No. 73
	Mile 19.25	Mile 20.34	477 Mile 20.79
	22 feet	5 feet	7 feet
	2 feet on rock	4 feet on rock	4 feet on rock
	1-6' Sur. Arch	2-12' Girders	1-12' Girder.

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		5	190. 00	36	137. 00	30	114. 00
2		-	-	-	-	-	-
3	a.	1442	3605. 00	2960	7400. 00	2720	6800. 00
	b.	-	-	-	-	-	-
4	a.	2410	6025. 00	1368	3420. 00	1600	4000. 00
	b.	-	-	-	-	-	-
5	a.	1320	6600. 00	-	-	-	-
	b.	-	-	-	-	-	-
6		18	870. 00	5	240. 00	6	288. 00
7		500	665. 00	-	-	-	-
8	a.	-	-	32	112. 00	16	56. 00
	b.	-	-	-	-	-	-
9		-	-	3.76	2256. 00	1.88	1128. 00
10		-	-	L.S.	116. 00	L.S.	116. 00
11		-	-	18	306. 00	9	153. 00
12		-	-	72	72. 00	36	36. 00
13		-	-	36	36. 00	18	18. 00
14	a.	60	342. 00	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	-	-
15		-	-	-	-	-	-
16		-	-	-	-	-	-
17		-	-	-	-	-	-
18		L.S.	400. 00	L.S.	400. 00	L.S.	400. 00
			18697. 00		14485. 00		13109. 00
Contingencies 5%			935. 00		728. 00		656. 00
TOTAL			19632. 00		15223. 00		13765. 00

[illegible]	No. 111	[illegible] - BABA
No. 99	Mile 29.68	No. 131
Mile 27.42	5 feet	Mile 33.76
10 feet	4 feet on Hard Pan	25 feet
4 feet on Murrum	1 - 12' Girder	1 feet on Rock
1 - 12' Girder		1 - 20' Sur. Arch.

Item No.		Quantity	Sh. cs	Quantity	Sh. cs.	Quantity	Sh. cs.
1		3	114. 00	3	114. 00	-	-
2		-	-	-	-	3	165. 00
3.	a.	-	-	-	-	-	-
	b.	2720	7344. 00	2720	7344. 00	1281	3459½ 00
4	a.	-	-	-	-	-	-
	b.	2354	6356. 00	1180	3186. 00	8047	21727. 00
5	a.	-	-	-	-	-	-
	b.	-	-	-	-	3709	13716. 00
6		8	390. 00	5	240. 00	35	1680. 00
7		-	-	-	-	909	1197. 00
8	a.	-	-	-	-	-	-
	b.	16	59. 00	16	59. 00	-	-
9		1.88	1128. 00	1.88	1128. 00	-	-
0		L.S.	116. 00	L.S.	116. 00	-	-
1		9	153. 00	9	153. 00	-	-
2		36	36. 00	36	36. 00	-	-
3		18	18 . 00	18	18. 00	-	-
4	a.	-	-	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	43	667. 00
5		-	-	6	168. 00	7	196. 00
6		-	-	-	-	-	-
7		-	-	-	-	-	-
8		-	-	-	-	-	-
			13714. 00		12562. 00		42807. 00
Contingencies 5%			786. 00		628. 00		2140. 00
			14500. 00		13190. 00		44947. 00

[illegible]	[illegible]	[illegible] - SARA
No. 99	No. 111	No. 121
Mile 27.42	Mile 29.68	Mile 33.76
10 feet	5 feet	25 feet
4 feet on Murrum	4 feet on Hard Pan	1 feet on Rock
1 - 12' Girder	1 - 12' Girder	1 - 20' Sur. Arch.

Item No.		Quantity	Sh. cs	Quantity	Sh. cs.	Quantity	Sh. cs.
1		3	114. 00	3	114. 00	-	-
2		-	-	-	-	3	165. 00
3.	a.	-	-	-	-	-	-
	b.	2720	7344. 00	2720	7344. 00	1281	3459. 00
4	a.	-	-	-	-	-	-
	b.	2354	6356. 00	1180	3186. 00	8047	21727. 00
5	a.	-	-	-	-	-	-
	b.	-	-	-	-	3709	13716. 00
6		8	390. 00	5	240. 00	35	1680. 00
7		-	-	-	-	909	1197. 00
8	a.	-	-	-	-	-	-
	b.	16	59. 00	16	59. 00	-	-
9		1.88	1128. 00	1.88	1128. 00	-	-
0		L.S.	116. 00	L.S.	116. 00	-	-
1		9	153. 00	9	153. 00	-	-
2		36	36. 00	36	36. 00	-	-
3		18	18 . 00	18	18. 00	-	-
4	a.	-	-	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	48	667. 00
5		-	-	6	168. 00	7	196. 00
6		-	-	-	-	-	-
7		-	-	-	-	-	-
8		-	-	-	-	-	-
			15714. 00		12562. 00		48807. 00
Contingencies 5%			786. 00		628. 00		2140. 00
			16500. 00		13190. 00		44947. 00

(B) [illegible] UNDER 40' TO 6' SPAN (Continued)

	[illegible]		[illegible]		[illegible]
	No. 138		No. 139		No. 143
	Mile 36.57		Mile 37.48		Mile 38.46
	8 feet		8 feet		10 feet
	2 feet on rock		Surface rock		4 feet on Hard Pan.
	2-12' Girders		1-12' Girder		1-20) Girder

Item No.		Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
1		5	190. 00	-	-	6	228. 00
2		-	-	1	55. 00	-	-
3	a.	-	-	-	-	-	-
	b.	1480	3896. 00	-	-	3008	8122. 00
4	a.	-	-	-	-	-	-
	b.	1368	3694. 00	1240	3348. 00	2550	6885. 00
5	a.	-	-	-	-	-	-
	b.	-	-	-	-	-	-
6		5	240. 00	5	240. 00	10	480. 00
7		-	-	-	-	-	-
8	a.	-	-	-	-	-	-
	b.	32	118. 00	16	59. 00	16	59. 00
9		3.76	2256. 00	1.88	1128. 00	3.68	2208. 00
0		L.S.	116. 00	L.S.	116. 00	L.S.	142. 00
1		18	306. 00	9	153. 00	15	255. 00
2		72	72. 00	36	36. 00	60	60. 00
3		36	36. 00	18	18. 00	30	30. 00
4	a.	-	-	-	-	-	-
	b.	-	-	-	-	-	-
	c.	-	-	-	-	-	-
5		15	420. 00	-	-	16	448. 00
		-	-	-	-	L.S.	200. 00
		-	-	-	-	-	-
		L.S.	400. 00	L.S.	400. 00	-	400. 00
			11844. 00		5855. 00		19519. 00
[illegible]ingencies 5%			592. 00		278. 00		976. 00
2251			12436. 00		5831. 00		20493. 00

IV. [illegible] APPENDIX "E"

(B) [illegible] 40' TO 6' SPAN (Continued)

[illegible]	[illegible]	[illegible]
No. 138	No. 139	No. 143
Mile 36.57	Mile 37.48	Mile 38.46
5 feet	5 feet	10 feet
2 foot on rock	Surface rock	4 feet on Hard Pan.
2-12' Girders	1-12' Girder	1-20) Girder

[illegible] No.	Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity	Sh. cs.
	5	190. 00	-	-	6	228. 00
	-	-	1	55. 00	-	-
a.	-	-	-	-	-	-
b.	1480	3896. 00	-	-	3006	8122. 00
a.	-	-	-	-	-	-
b.	1368	3694. 00	1240	3348. 00	2550	6885. 00
a.	-	-	-	-	-	-
b.	-	-	-	-	-	-
	5	240. 00	5	240. 00	10	480. 00
	-	-	-	-	-	-
a.	-	-	-	-	-	-
b.	32	118. 00	16	59. 00	16	59. 00
	3.76	2256. 00	1.88	1128. 00	3.68	2208. 00
	L.S.	116. 00	L.S.	116. 00	L.S.	142. 00
	18	306. 00	9	153. 00	15	255. 00
	72	72. 00	36	36. 00	60	60. 00
	36	36. 00	18	18. 00	30	30. 00
a.	-	-	-	-	-	-
b.	-	-	-	-	-	-
c.	-	-	-	-	-	-
	15	480. 00	-	-	16	448. 00
	-	-	-	-	L.S.	200. 00
	-	-	-	-	-	-
	L.S.	400. 00	L.S.	400. 00	-	400. 00
		11844. 00		5555. 00		19817. 00
[illegible] gencies 5%		592. 00		278. 00		976. 00
TOTAL		12436. 00		5831. 00		20493. 00

(B) MINOR BRIDGES UNDER 40' TO 6' SPAN (Continued) 480

	KIVARGO (11)		FORT HALL		KOMO RIVER	
	No. 164		No. 191		No. 18	
	Mile 42.63		Mile 45.96		Mile 5.22	
	40 feet		35 feet		35 feet	
	1 feet on rock		4 feet on clay		4 feet on rock	
	1-20' Sur. Arch		1-6' Sur. Arch.		1-20' Sur. Arch.	
em o.	Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity.	Sh. cs.
	15	57. 00	12	456. 00	8	304. 00
	3	165. 00	-	-	-	-
a.	-	-	-	-	-	-
b.	2090	5643. 00	4084	10210. 00	6944	17360. 00
a.	-	-	-	-	-	-
b.	11098	29965. 00	3054	7635. 00	9800	24500. 00
a.	-	-	-	-	-	-
b.	8360	20928. 00	1980	6930. 00	6380	22330. 00
	80	3840. 0 0	30	1440. 00	85	4080. 00
	-	-	600	798. 00	2000	2660. 00
a.	-	-	-	-	-	-
b.	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
a.	-	-	90	513. 00	-	-
b.	-	-	-	-	-	-
c.	97	1523. 00	-	-	74	1162. 00
	-	-	-	-	60	1680. 00
	L.S.	1000. 00	-	-	-	-
	-	-	-	-	-	-
	L.S.	1200. 00	L.S.	400. 00	L.S.	1200. 00
		74328. 00		28382. 00		78276. 00
ingencies 5%		3714. 80		1419. 10		3764. 00
TOTAL		78041. 80		29801. 10		79040. 00

RAILWAY (11)	FORT HALL	KOMO RIVER
No. 164	No. 191	No. 18
Mile 42.63	Mile 45.96	Mile 5.28
40 feet	35 feet	35 feet
1 feet on rock	4 feet on clay	4 feet on rock
1-80' Sur. Arch	1-6' Sur. Arch.	1-80' Sur. Arch.

	Quantity	Sh. cs.	Quantity	Sh. cs.	Quantity.	Sh. cs.
	15	57. 00	12	456. 00	8	304. 00
	3	165. 00	-	-	-	-
a.	-	-	-	-	-	-
b.	2090	5643. 00	4084	10210. 00	6944	17360. 00
a.	-	-	-	-	-	-
b.	11098	29965. 00	3054	7635. 00	9800	24500. 00
a.	-	-	-	-	-	-
b.	8360	20932. 00	1980	6930. 00	6380	22330. 00
	80	3840. 0 0	30	1440. 00	85	4080. 00
	-	-	600	798. 00	2000	2660. 00
a.	-	-	-	-	-	-
b.	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
	-	-	-	-	-	-
a.	-	-	-	-	-	-
b.	-	-	90	813. 00	-	-
c.	97	1823. 00	-	-	74	1162. 00
	-	-	-	-	60	1680. 00
	L.S.	1000. 00	-	-	-	-
	-	-	-	-	-	-
	L.S.	1200. 00	L.S.	400. 00	L.S.	1200. 00
		74328. 00		33883. 00		78876. 00
gencies 5%		3716. 80		1419. 10		3764. 00
TOTAL		78041. 80		29801. 10		79040. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

Metre Gauge
Length 87.7 Miles.

KIARUGU TO TANA VALLEY

VIII. STATIONS & BUILDINGS.

(c) STAFF QUARTERS.

481

APPENDIX "M"

Name of Station	Quarters	Grade	No.	Cost. Sh. cs.
THIKA	**TRAFFIC**			
	Station Master	European	1	14,000. 00
	Asst: do	African	1	2,400. 00
	Station Menials	"	4	2,200. 00
	Clerks	"	2	4,800. 00
	Sweeper	"	1	600. 00
	LOCO			
	Menials for fuel and water	"	8	4,800. 00
	ENGINEERING			
	Permanent Way Inspector	European	1	16,000. 00
	Trolley Boys	African	4	2,200. 00
	Artisans	"	2	4,800. 00
	Menials	"	2	1,200. 00
	Clerk and Timekeeper	"	1	2,400. 00
	GENERAL			
	Latrines for staff (4 seats)	"	1	800. 00
	Water supply	Allow		300. 00
	Roads	"		100.00
	Fencing	"		200. 00
	Furniture @ Sh.600	European	2	1,200. 00
	" " Sh.400	African	6	2,400. 00
				60,400. 00
	Contingencies 5%.....			3,020. 00
	TOTAL.....			63,420. 00

UGANDA RAILWAY

THIKA-NYERI EXTENSION.

KIAMBU TO TANA VALLEY

Metre Gauge
Length 87.78 Miles.

VIII. STATIONS & BUILDINGS.

(c) STAFF QUARTERS. 481

APPENDIX "M"

Name of Station	Quarters	Grade	No.	Cost. Sh. cs.
THIKA	TRAFFIC			
	Station Master	European	1	14,000. 00
	Asst: do	African	1	2,400. 00
	Station Menials	"	4	2,200. 00
	Clerks	"	2	4,800. 00
	Sweeper	"	1	600. 00
	LOCO			
	Menials for fuel and water	"	8	4,800. 00
	ENGINEERING			
	Permanent Way Inspector	European	1	16,000. 00
	Trolley Boys	African	4	2,200. 00
	Artisans	"	2	4,800. 00
	Menials	"	2	1,200. 00
	Clerk and Timekeeper	"	1	2,400. 00
	GENERAL			
	Latrines for staff (4 seats)	"	1	800. 00
	Water supply	Allow		300. 00
	Roads	"		100.00
	Fencing	"		200. 00
	Furniture @ Sh.600	European	2	1,200. 00
	" Sh.400	African	6	2,400. 00
				60,400. 00
	Contingencies @.....			3,020. 00
	TOTAL.....			63,420. 00

TEITA-HYDRO EXTENSION

KIBWEZI TO TANA VALLEY

VIII. STATIONS & BUILDINGS.

(c) STAFF QUARTERS. 482

Name of Station	Quarters	Grade	No.	Cost Shs.
KIBWA SIDING	TRAFFIC			
	Station Master	European	1	14,000.00
	Assistant Station "	African	1	2,400.00
	Station Menials	"	4	2,200.00
	Clerks	"	2	4,800.00
	Sweeper	"	1	600.00
	LOCO			
	Menials for fuel & water	"	8	4,800.00
	GENERAL			
	Latrines for staff (2 seats)	"		400.00
	Water Supply	Allow		300.00
	Roads	"		100.00
	Fencing	"		100.00
	Furniture at Sh.600	European	1	600.00
	at Sh.400	African	3	1,200.00
				31,900.00
		Contingencies 5%		1,975.00
		TOTAL		33,075.00

APPENDIX "F" KAMPALA RAILWAY (continued)

TORORA-HYOMA EXTENSION

Rating Curves
Lake Victoria Basins.

KAMPALA TO ZANA VALLEY

VIII. STATIONS & BUILDINGS

(c) STAFF QUARTERS. 482

Name of Station	Quarters	Grade	No.	Cost Shs.
PEMBA HILLS	TRAFFIC			
	Station Master	European	1	14,000.00
	Assistant Station "	African	1	2,400.00
	Station Menials	"	4	2,800.00
	Clerks	"	2	4,800.00
	Sweeper	"	1	600.00
	LOCO			
	Menials for fuel & water	"	8	4,800.00
	GENERAL			
	Latrines for staff (2 seats)	"		400.00
	Water Supply	Allow		300.00
	Roads	"		100.00
	Fencing	"		100.00
	Furniture at Sh.600	European	1	600.00
	at Sh.400	African	3	1,200.00
				31,800.00
		Contingencies 5%		1,975.00
		TOTAL		33,075.00

APPENDIX "F" UGANDA RAILWAY (Continued)

TIRIKA - NYERI EXTENSION.

KISUMU TO KANA VALLEY — Metre Gauge — Length 8.6 Miles

VIII. STATIONS & BUILDINGS

(c) STAFF QUARTERS. 483

Name of Station	Quarters	Grade	No.	Cost Sh.cs.
PORT HALL	TRAFFIC			
	Station Master	European	1.	£ 14,000.00
	Assistant Station Master	African	1.	£ 2,400.00
	Station Menials	"	4.	2,200.00
	Clerks	"	2.	4,800.00
	Sweeper	"	1.	600.00
	GENERAL			
	Latrines for Staff (2 seats)	"		400.00
	Water Supply	Allow		200.00
	Roads	"		100.00
	Fencing	"		100.00
	Furniture at Sh.600	European	1.	600.00
	at Sh.400	African	3.	1,200.00
				26,600.00
		Contingencies 5%		1,330.00
		TOTAL		£ 27,930.00

APPENDIX "F" UGANDA RAILWAY (Continued)

THIKA - NYERI EXTENSION.

Metre Gauge
Length 97.78 Miles

KIAMBU TO NAIVASHA VALLEY

VIII. STATIONS & BUILDINGS

(C) STAFF QUARTERS. 483

Name of Station	Quarters	Grade	No.	Cost Sh.cs.
PORT HALL	TRAFFIC			
	Station Master	European	1.	14,000.00
	Assistant Station Master	African	1.	2,400.00
	Station Menials	"	4.	2,200.00
	Clerks	"	2.	4,800.00
	Sweeper	"	1.	600.00
	GENERAL			
	Latrines for Staff (2 seats)	"		400.00
	Water Supply	Allow		200.00
	Roads	"		100.00
	Fencing	"		100.00
	Furniture at Sh.600	European	1.	600.00
	at Sh.400	African	3.	1,200.00
				26,600.00
		Contingencies 5%		1,330.00
		TOTAL		27,930.00

KAMPALA TO KANA VALLEY Metre Gauge
Length 27.78 Miles

VIII. STATIONS & BUILDINGS.

(c) STAFF QUARTERS. 484

Name of Station	QUARTERS		Grade No.	Cost. Sh.cts.
KANA VALLEY (CHANGE STATION)	**TRAFFIC**			
	Station Master	European	1	14,000.00
	Asst: " "	African	1	2,400.00
	Clerks	"	2	4,800.00
	Station Menials	"	8	4,400.00
	Sweeper	"	2	1,200.00
	Signallers	"	2	4,800.00
	Telegraph helpers	"	4.	2,200.00
	Telegraph Menials	"	4	2,200.00
	Telegraph Linesman	"	1	2,400.00
	Telegraph Fitter	"	1	2,400.00
	Running rooms for Guards	European	2	12,000.00
	do do	African	2	2,400.00
	Train Staff	"	6	4,000.00
	Latrines	European	1	300.00
	do (6 Seats)	African		1,200.00
	LOCO			
	Running rooms for Drivers	European	2	12,000.00
	dé de	Indian	1	2,400.00
	Loco shed Staff, cleaners fuel & water menials	African	16	9,600.00
	Clerk & Store-keeper	"	1	2,400.00
	Carriage Examiner	Indian	1	5,000.00
	Fitters	African	2	4,800.00
	Menials	"	4	2,400.00
	ENGINEERING			
	Assistant Permanent Way Inspectors	African	1	2,400.00
	Trolley Boys	"	3	2,000.00
	GENERAL			
	Latrines for Staff	European	2	600.00
	do. (6 seats)	African		1,200.00
	Water Supply	Allow		1,000.00
	Fencing	"		600.00
	Roads	"		600.00
	Furniture @ Sh.600	European	5	3,000.00
	do @ Sh.400	African	15	6,000.00
				116,700.00
		Contingencies 5%		58,350.00
		TOTAL		175,050.00

UGANDA RAILWAY

AZIMUTH OF

TIKA-KIBERI EXTENSION (Continued)

KISUMU TO LAKE VALLEY Metre Gauge

VIII. STATIONS & BUILDINGS. Length 17.78 Miles

(c) STAFF QUARTERS. 484

Name of Station	QUARTERS		Grade No.	Cost. Sh.cts.
LAKE VALLEY	TRAFFIC			
(CHANGE STATION)	Station Master	European	1	14,000.00
	Asst: " "	African	1	2,400.00
	Clerks	"	2	4,800.00
	Station Menials	"	8	4,400.00
	Sweeper	"	2	1,200.00
	Signallers	"	2	4,800.00
	Telegraph helpers	"	4.	2,200.00
	Telegraph Menials	"	4	2,200.00
	Telegraph Linesmen	"	1	2,400.00
	Telegraph Fitter	"	1	2,400.00
	Running rooms for Guards	European	2	12,000.00
	do do	African	2	2,400.00
	Train Staff	"	6	4,000.00
	Latrines	European	1	300.00
	do (6 Seats)	African		1,200.00
	LOCO			
	Running rooms for Drivers	European	2	12,000.00
	do do	Indian	1	2,400.00
	Loco shed Staff, cleaners fuel & water menials	African	16	9,600.00
	Clerk & Store-keeper	"	1	2,400.00
	Carriage Examiner	Indian	1	5,000.00
	Fitters	African	2	4,800.00
	Menials	"	4	2,400.00
	ENGINEERING			
	Assistant Permanent Way Inspectors	African	1	2,400.00
	Trolley Boys	"	3	2,000.00
	GENERAL			
	Latrines for Staff	European	2	600.00
	do. (6 seats)	African		1,200.00
	Water Supply	Allow		1,000.00
	Fencing	"		600.00
	Roads	"		600.00
	Furniture @ Sh.600	European	5	3,000.00
	do @ Sh.400	African	15	6,000.00
				116,700.00
		Contingencies 5%		58,350.00
		TOTAL		175,050.00

UGANDA RAILWAY

THIKA - NYERI EXTENSION.

MARUGU TO TANA VALLEY — Metre Gauge Length 57.75 Miles

VIII. STATIONS & BUILDINGS.

(G) STAFF QUARTERS.

APPENDIX "M" (Continued)

	Cost Sh. cs.
ENGINEERING	
Permanent Way Gang Huts (10) units 15 @ Sh. 6,600.....	99,000. 00
5% Contingencies.....	4,950. 00
TOTAL....	103,950. 00

THE COLONY & PROTECTORATE OF KENYA

REPORT

of the

DEPARTMENTAL COMMITTEE

appointed to make an Economic Survey of the area

covered by the proposed

THIKA - NYERI RAILWAY LINE

together with Supplementary Report on extension

if constructed from

THIKA to KAMBICHO only.

1921

THE COLONY & PROTECTORATE OF KENYA

REPORT

of the

DEPARTMENTAL COMMITTEE

appointed to make an Economic Survey of the area covered by the proposed

THIKA - NYERI RAILWAY LINE

together with Supplementary Report on extension if constructed from

THIKA to KAMBICHO only.

1921

APPENDIX A

141

486

THE COLONY & PROTECTORATE OF KENYA

REPORT

of the

DEPARTMENTAL COMMITTEE

appointed to make an Economic Survey of the area

covered by the proposed

THIKA - NYERI RAILWAY LINE

together with Supplementary Report on extension

if constructed from

THIKA to KAMBICHO only.

1921

DEPARTMENT OF AGRICULTURE

NAIROBI
28th. April 1921.

487

To:-
His Excellency the Governor,
The Colony & Protectorate of Kenya.

Your Excellency,

In pursuance of the request of the Secretary of State, the Committee appointed by your Excellency to make an Economic Survey of the area covered by the proposed Thika-Nyeri Railway Line, have the honour to present their report as follows:-

PREFACE.

Terms of Reference.

2. As instructed, the terms of reference which applied to the Nakuru - Eldoret - Mumias Line have been followed.

Appendices.

3. Submitted with this report are the following appendices:-

Appendix I.
Table 1. Estimates of areas, cultivation, produce and earnings 3 years and 10 years after completion of Railway.

" 2. Estimates of Live Stock, Dairy Produce and earnings 3 years and 10 years after completion of Railway.

" 3. Estimated tonnage and earnings of timber 3 years and 10 years after completion of Railway.

" 4. Summary of Produce, earnings and estimates of goods and passenger traffic 3 years and 10 years after completion of Railway.

Appendix 2. Summaries of Evidence.

Appendix 3. Chemical Research Departmental Report of samples of soils representative of the different areas.

DEPARTMENT OF AGRICULTURE

NAIROBI
28th. April 1921.

487

To:-
His Excellency the Governor,
The Colony & Protectorate of Kenya.

Your Excellency,

In pursuance of the request of the Secretary of State, the Committee appointed by your Excellency to make an Economic Survey of the area covered by the proposed Thika-Nyeri Railway Line, have the honour to present their report as follows:-

PREFACE.

Terms of Reference.

2. As instructed, the terms of reference which applied to the Nakuru - Eldoret - Mumias Line have been followed.

Appendices.

3. Submitted with this report are the following appendices:-

Appendix I.
Table 1. Estimates of areas, cultivation, produce and earnings 3 years and 10 years after completion of Railway.

" 2. Estimates of Live Stock, Dairy Produce and earnings 3 years and 10 years after completion of Railway.

" 3. Estimated tonnage and earnings of timber 3 years and 10 years after completion of Railway.

" 4. Summary of Produce, earnings and estimates of goods and passenger traffic 3 years and 10 years after completion of Railway.

Appendix 2. Summaries of Evidence.

Appendix 3. Chemical Research Departmental Report of samples of soils representative of the different areas.

Appendix 4. Public Works Departmental Report on the results of ganging of certain rivers in North and West Kenya.

Appendix 5. Average monthly rainfall and extremes of annual rainfall at various stations in t he different areas.

Schedules submitted.

4. The schedules referred to above, indicate the manner in which the estimates of production, the tonnage of traffic and the earnings were arrived at.

488

Traffic on new and existing line.

5. Care was exercised to differentiate between the traffic on the new and existing line and to calculate both.

How traffic estimated.

6. It was found impracticable to estimate the "permanent traffic as requested by the Secretary of State, and it was decided to submit figures indicating probable traffic and earnings in 5 and 10 years periods after completion of the new line.

The area served by the projected new railway was divided for the purposes of the estimates into section in which cultural or other conditions are somewhat similar. In arriving at these estimates of production and traffic use has been made of the Agricultural Statistics and the estimates reflect an expression of opinion as to the development which is calculated to follow from the railway under consideration and the nature of the production.

PROCEDURE.

Steps taken to secure information.

7. In order that an opinion might be formed as to their potentialities and predictivity the areas to be served by the proposed new line were personally inspected by members of the Committee. Evidence having a bearing upon local production and development was taken at Thika and Nyeri from the Local Farmers' Associations and Sir Northrup MacMillan was instrumental in obtaining information from a number of settlers in the Donya Sabuk area

Appendix 4. Public Works Departmental Report on the results of ganging of certain rivers in North and West Kenya.

Appendix 5. Average monthly rainfall and extremes of annual rainfall at various stations in t he different areas.

Schedules submitted.

4. The schedules referred to above, indicate the manner in which the estimates of production, the tonnage of traffic and the earnings were arrived at.

Traffic on new and existing line.

5. Care was exercised to differentiate between the traffic on the new and existing line and to calculate both.

How traffic estimated.

6. It was found impracticable to estimate the "permanent traffic as requested by the Secretary of State, and it was decided to submit figures indicating probable traffic and earnings in 5 and 10 years periods after completion of the new line.

The area served by the projected new railway was divided for the purposes of the estimates into section in which cultural or other conditions are somewhat similar. In arriving at these estimates of production and traffic use has been made of the Agricultural Statistics and the estimates reflect an expression of opinion as to the development which is calculated to follow fro the raflway under consideration and the nature of the production.

PROCEDURE.

Steps taken to secure information.

7. In order that an opinion might be formed as to their potentialities and predictivity the areas to be served by the proposed new line were personally inspected by members of the Committee. Evidence having a bearing upon local production and development was taken at Thika and Nyeri from the Local Farmers' Associations and Sir Northrup McMillan was instrumental in obtaining informatio from a number of settlers in the Donya Sabuk area

Information obtained.

8. Information was sought and furnished from the Associations and persons under the following mainheads and summaries of the evidence given and taken are to be found in the Appendices.

Agricultural and General.

1. Kinds of soil and their fertility.
2. Proportion and areas at present cultivated.
3. Proportion cultivable.
4. Proportion likely to be cultivated by present occupiers on advent of railway.
5. Probable rate of influx of new settlers on advent of railway.
6. Kinds of crops grown.
7. Probable main crops.
8. Yield of crops per acre.
9. Suitability for Livestock.
10. Traffic in stock for breeding and slaughter purposes, and in dairy produce.
11. Estimates of traffic in chief kinds of agricultural and dairy produce, livestock and general requirements of community, passenger traffic, (European and Native.)
12. Factors affecting production, climate, soil fertility, capital labour, market prices, etc

Forestal.

Use has been made of the records of the Forest Department dealing with the Mount Kenya Forests.

MAIN REPORT.

Areas as divided.

9. The area to be served by the proposed new Railway line has been sub-divided as follows:-

(1) An area extending between Thika and Fort Hall and including Donya Sabuk as well as the farms recently allotted along the K'Thanga Hills.

Information obtained.

8. Information was sought and furnished from the Associations and persons under the following mainheads and summaries of the evidence given and taken are to be found in the appendices.

Agricultural and General.

1. Kinds of soil and their fertility.
2. Proportion and areas at present cultivated.
3. Proportion cultivable.
4. Proportion likely to be cultivated by present occupiers on advent of railway.
5. Probable rate of influx of new settlers on advent of railway.
6. Kinds of crops grown.
7. Probable main crops.
8. Yield of crops per acre.
9. Suitability for Livestock.
10. Traffic in stock for breeding and slaughter purposes, and in dairy produce.
11. Estimates of traffic in chief kinds of agricultural and dairy produce, livestock and general requirements of community, passenger traffic, (European and Native.)
12. Factors affecting production, climate, soil fertility, capital labour, market prices, etc.

Forestal.

Use has been made of the records of the Forest Department dealing with the Mount Kenya Forests.

MAIN REPORT.

Areas as divided.

9. The area to be served by the proposed new Railway line has been sub-divided as follows:-

(1) An area extending between Thika and Fort Hall and including Donya Sabuk as well as the farms recently allotted along the I'Thanga Hills.

(2) An area approximately between Nyeri and the Amboni River.

(3).An area exending from the slopes of Mount Kenya to those of the Aberdare Mountains and extending beyond the Uaso Nyiro River on the one side and the Nanjuki River on the other.

(4).The Native Reserve between Fort Hall and Nyeri.

Nature of Traffic.

10. The main traffic has been classified under the following heads:- (1) Agricultural, (2) Timber (3) Passenger, (4) Inward.

The Agricultural and Timber traffic has been estimated mainly on the basis of an expert trade, and the inward traffic represents the needs of the community for maintenance and for development purposes. In respect of each, figures of to tonnage and earnings are given for the period:-

(a).3 years after completion of line.

(b).10 years after completion of line.

Discussion of areas & their probable production.

11. It will be realised that considerable difficulty has been experiencedin furnishing estimates indicating what may he the nature and the volume of the production in the future. Particularly in area 3 comparatively little development has yet taken place and its potentialities are not yet well known. Again the progress of settlement and agricultural development of new and extensive areas must depend upon several factors which cannot at present be gauged. It has, for purposes of this report, been assumed that market values of the different export products will show a fair profit on the cost of production. The estimates have been submitted on a conservative basis, and on the information disclosed in the

(2) An area approximately between Nyeri and the Amboni River.

(3).An area exending from the slopes of Mount Kenya to those of the Aberdare Mountains and extending beyond the Uaso Nyiro River on the one side and the Nanjuki River on the other.

(4).The Native Reserve between Fort Hall and Nyeri.

Nature of Traffic.

10. The main traffic has been classified under the following heads:- (1) Agricultural, (2) Timber (3) Passenger, (4) Inward.

The Agricultural and Timber traffic has been estimated mainly on the basis of an export trade, and the inward traffic represents the needs of the community for maintenance and for development purposes. In respect of each, figures of to tonnage and earnings are given for the period:-

(a).5 years after completion of line.

(b).10 years after completion of line.

Discussion of areas & their probable production.

11. It will be realised that considerable difficulty has been experienced in furnishing estimates indicating what may be the nature and the volume of the production in the future. Particularly in area 3 comparatively little development has yet taken place and its potentialities are not yet well known. Again the progress of settlement and agricultural development of new and extensive areas must depend upon several factors which cannot at present be gauged. It has, for purposes of this report, been assumed that market values of the different export products will show a fair profit on the cost of production. The estimates have been submitted on a conservative basis, and on the information disclosed in the

course of evidence, and after personal investigation, it is considered that unless the world's market prices render the Agricultural industry generally unprofitable the results forecasted will be achieved.

The estimates are confined to those branches of the Agricultural industry which are calculated to succeed and those crops, etc., about which there is some doubt as to whether they will be grown, though the conditions may be suitable, have not been included.

Area 1. 12. Thika - Fort Hall, Donya Sabuk - I'Thanga Hills.

For purposes of this report the agricultural area is estimated at 379,000 acres. The number of European Holdings in occupation as at 30th. June, 1920, was 122 and the area under cultivation was 19,800 acres, both of which have been considerably increased since.

The acreage of the chief crops grown was on that date:- Sisal - 8,717; Coffee - 5,052; Cereals - 1,195; Beans and Peas - 97; Flax - 167 Timber - 204; Fruit - 140; Miscellaneous Crops - 121; Sugar Cane - 117; Land prepared but not planted - 3,990 acres.

In order to arrive at the production if the railway is constructed it has been estimated that some 200,000 acres should come under European occupation 3 years after construction of the railway, of which 120,000 is cultivable.

course of evidence, and after personal investigation, it is considered that unless the world's market prices render the Agricultural industry generally unprofitable the results forecasted will be achieved.

The estimates are confined to those branches of the Agricultural industry which are calculated to succeed and those crops, etc., about which there is some doubt as to whether they will be grown, though the conditions may be suitable, have not been included.

Area 1. 12. Thika - Fort Hall. Donya Sabuk - I'Thanga Hills.

For purposes of this report the agricultural area is estimated at 379,000 acres. The number of European Holdings in occupation as at 30th. June, 1920, was 122 and the area under cultivation was 19,800 acres, both of which have been considerably increased since.

The acreage of the chief crops grown was on that date:- Sisal - 8,717; Coffee - 5,052; Cereals - 1,195; Beans and Peas - 97; Flax - 167 Timber - 204; Fruit - 140; Miscellaneous Crops - 121; Sugar Cane - 117; Land prepared but not planted - 3,990 acres.

Inorder to arrive at the production if the railway is constructed it has been estimated that some 200,000 acres should come under European occupation 3 years after construction of the railway, of which 120,000 is cultivable.

A large proportion of the land is highly fertile. Much of it is red loam suitable for coffee growing; the lower land consists, for the most part, of black loam, rather difficult to cultivate, but fertile. Such land would produce good crops of maize. Other areas are not unlikely to be found suitable for sugar cane but a sugar industry is yet too problematical to warrant estimates based thereon being included in this report.

The rainfall is adequate, and ranges from 25 to 48 inches. The whole area is well watered by rivers and streams. European settlement is already well advanced and the climate is agreeable and not unhealthy. The attacks of Malarial Fever experienced in parts of the area are not so serious as to deter European settlement.

This area constitutes the chief centre of the Sisal Industry of the Colony. The Sisal plant grows to perfection and the quality of the fibre is high. The estates are, for the most part, extensive and the sisal industry lends itself to successful operation on a large scale. On the market prices which have obtained for some time past, and on the costs of export and sale the margin of profit is small. The provision of the railway under consideration would have the effect of reducing costs of marketing by 20/- to 30/- per ton, an amount sufficient to encourage further development and production.

A large proportion of the land is highly fertile. Much of it is red loam suitable for coffee growing; the lower land consists, for the most part, of black loam, rather difficult to cultivate, but fertile. Such land would produce good crops of maize. Other areas are not unlikely to be found suitable for sugar cane but a sugar industry is yet too problematical to warrant estimates based thereon being included in this report.

The rainfall is adequate, and ranges from 25 to 48 inches. The whole area is well watered by rivers and streams. European settlement is already well advanced and the climate is agreeable and not unhealthy. The attacks of Malarial Fever experienced in parts of the area are not so serious as to deter European settlement.

This area constitutes the chief centre of the Sisal Industry of the Colony. The Sisal plant grows to perfection and the quality of the fibre is high. The estates are, for the most part, extensive and the sisal industry lends itself to successful operation on a large scale. On the market prices which have obtained for some time past, and on the costs of export and sale the margin of profit is small. The provision of the railway under consideration would have the effect of reducing costs of marketing by 20/- to 30/- per ton, an amount sufficient to encourage further development and production.

considerable areas of sisal have recently been planted and an increased tonnage within the next few years is already in sight. Improved railway facilities are calculated to bring about a subdivision of the larger estates. Land which is now growing sisal will become too valuable for the purpose and on economic grounds if on none other it will be put to other use.

Much of the land now producing sisal is suitable for coffee growing and in all probability the area under coffee will greatly increase. In some cases sisal will, after cutting is completed, not be renewed, but coffee will take its place. It is estimated that the value of land suitable for coffee is 2 - 3 times that for sisal.

Area 2. 13. NYERI - AMBONI.

The area under consideration is, for purposes of this report, taken at 40,000 acres, of which it is calculated that about 20,000 acres are cultivable, much of which consists of red loam soil of high fertility and primarily suitable for coffee growing. The same kind of soil is also adapted for Flax. In the ordinary course of Farming operations it is likely that Maize, Beans, etc., will be grown.

This area enjoys a good rainfall of 36 inches per annum well distributed, and it is remarkably healthy for Europeans.

The number of Holdings under occupation in the Nyeri Amboni and North West Kenya comprising the Nyeri Magisterial District was on 30th. June, 19[illegible] 20 fifty-seven and the area under cultivation was 2,024 acres. In the above connection separate records are not available in respect of areas 2 & 3. The number of Holdings under occupation has

considerable areas of sisal have recently been planted and an increased tonnage within the next few years is already in sight. Improved railway facilities are calculated to bring about a sub-division of the larger estates. Land which is now growing sisal will become too valuable for the purpose and on economic grounds if on none other it will be put to other use.

Much of the land now producing sisal is suitable for coffee growing and in all probability the area under coffee will greatly increase. In some cases sisal will, after cutting is completed, not be renewed, but coffee will take its place. It is estimated that the value of land suitable for coffee is 2 - 3 times that for sisal.

Area 2. 13. NYERI - AMBONI.

The area under consideration is, for purposes of this report, taken at 40,000 acres, of which it is calculated that about 20,000 acres are cultivable, much of which consists of red loam soil of high fertility and primarily suitable for coffee growing. The same kind of soil is also adapted for Flax. In the ordinary course of Farming operations it is likely that Maize, Beans, etc., will be grown.

This area enjoys a good rainfall of 36 inches per annum well distributed, and it is remarkably healthy for Europeans.

The number of Holdings under occupation in the Nyeri Amboni and North West Kenya comprising the Nyeri Magisterial District was on 30th June 1[illegible] fifty-seven and the area under cultivation was 2,024 acres. In the above connection separate records are not available in respect of areas 2 & 3. The number of Holdings under occupation has

considerably increased since the date given due to the arrival of new settlers, particularly those to whom land was allotted under the ex-Soldier Settlement Scheme. Producers are suffering a great handicap in being 70 to 80 miles from the present railhead and undoubtedly considerable development would take place in this fertile area if the present hindrance of costly transport over bad roads was removed.

It is estimated that the acreage under the chief crops will be as follows:-

Crops	3 years after completion of line.	10 years after completion of line.
Coffee	2,000	3,000
Flax	1,000	2,000
Maize & Beans etc.	1,000	2,000

With the production of cheap grain and other foods it is not unlikely that a few of the farmers will rear pigs. Accordingly an output of 500 pigs per annum from this area has been estimated for.

Area 4. 14. Between Mount Kenya and the Aberdares and beyond R.Uaso Nyiro & Nanyuki Rivers.

This extensive area amounting to approximately 800,00 acres may be regarded as essentially a pastoral country. Probably due to its proximity to the snow clad Mount Kenya, it enjoys a pleasant bracing climate most favourable to European occupation. In the region extending between the slopes of Mount Kenya and the Plains the country is well watered by permanent streams or rivers. From the records of the discharge of five rivers within this area (see appendix 8) about 10,000 acres of land could be placed under irrigation.

considerably increased since the date given due to the arrival of new settlers, particularly those to whom land was allotted under the ex-Soldier Settlement Scheme. Producers are suffering a great handicap in being 70 to 80 miles from the present railhead and undoubtedly considerable development would take place in this fertile area if the present hindrance of costly transport over bad roads was removed.

It is estimated that the acreage under the chief crops will be as follows:-

Crops	5 years after completion of line.	10 years after completion of line.
Coffee	2,000	3,000
Flax	1,000	2,000
Maize & Beans etc.	1,000	2,000

With the production of cheap grain and other foods it is not unlikely that a few of the farmers will rear pigs. Accordingly an output of 500 pigs per annum from this area has been estimated for.

Area 4.

14. Between Mount Kenya and the Aberdares and beyond E.Uaso Nyiro & Nanyuki Rivers.

This extensive area amounting to approximately 800,00 acres may be regarded as essentially a pastoral country. Probably due to its proximity to the snow clad Mount Kenya, it enjoys a pleasant bracing climate most favourable to European occupation. In the region extending between the slopes of Mount Kenya and the Plains the country is well watered by permanent streams or rivers. From the records of the discharge of five rivers within this area (see appendix 8) about 10,000 acres of land could be placed under irrigation.

From the contour of the land and the fall of the rivers it is seen that irrigation projects could be developed at comparatively little expense. Much of the land is fertile and with an average rainfall of 34 inches various crops can be grown successfully.

It is worthy to note that wheat of excellent quality has been grown on the Mount Kenya side of the area now under consideration. With the aid of irrigation once or twice only, during the growing period, a heavy yield is obtained.

It is considered that the future of this extensive area lies in pastoral industry. The pasturage is of good quality, cattle maintain themselves in good condition throughout the year and in some parts sheep thrive well if care is exercised in control parasitic diseases.

The pasturage is sufficiently nutritious in most parts to fatten beef cattle but having regard to the value of the land and the conditions favourable to dairying your Committee have, in these estimates, contemplated that this area will, with railway facilities, consist chiefly of dairy farms. Its suitability in this respect lies in (1) its good pasture; (2) its mild climate with no rigourous winter or frost; (3) its good water supply at cool atmosphere; (4) its production of farm foodstuff at low cost when required to supplement pasture for a very short period. (5) cheap labour.

From the contour of the land and the fall of the rivers it is seen that irrigation projects could be developed at comparatively little expense. Much of the land is fertile and with an average rainfall of 34 inches various crops can be grown successfully.

It is worthy to note that wheat of excellent quality has been grown on the Mount Kenya side of the area now under consideration. With the aid of irrigation once or twice only, during the growing period, a heavy yield is obtained.

It is considered that the future of this extensive area lies in pastoral industry. The pasturage is of good quality, cattle maintain themselves in good condition throughout the year and in some parts sheep thrive well if care is exercised to control parasitic diseases.

The pasturage is sufficiently nutritious in most parts to fatten beef cattle but having regard to the value of the land and the conditions favourable to dairying your Committee have, in these estimates, contemplated that this area will, with railway facilities, consist chiefly of dairy farms. Its suitability in this respect lies in (1) its good pasture; (2) its mild climate with no rigourous winter or frost; (3) its good water supply at cool atmosphere; (4) its production of farm foodstuff at low cost when required to supplement pasture for a very short period. (5) cheap labour.

It is doubtful whether in any part of the Empire there is land available for settlement where conditions so favourable for the development of a Dairying industry can be found. At present the land is cheap for that purpose, prices ranging from 20/- to 40/- per acre. Although many estates are to-day too large to be developed fully by the present owners the advent of the railway would hasten their sub-division. It should be stated however, that the dairying industry will require to be built up upon an expert trade. In its train will follow pig keeping and bacon production.

In dairy products, bacon and bacon products it is considered that the conditions in this area are such that these products can be profitably marketed in competition with other countries; but in order to achieve success it is essential that good dairy cows be bred up from the native stock, that the industry be organised, and that butter, cheese and bacon factories be established upon a co-operative basis.

It will be realised that in treating so extensive an area of country in which comparatively little development has yet taken place it is difficult to forecast its Agricultural future.

Conservative estimates have been prepared upon the following basis:-

It is doubtful whether in any part of the Empire there is land available for settlement where conditions so favourable for the development of a Dairying industry can be found. At present the land is cheap for that purpose, prices ranging from 20/- to 40/- per acre. Although many estates are to-day too large to be developed fully by the present owners the advent of the railway would hasten their sub-division. It should be stated however, that the dairying industry will require to be built up upon an export trade. In its train will follow pig keeping and bacon production.

In dairy products, bacon and bacon products it is considered that the conditions in this area are such that these products can be profitably marketed in competition with other countries; but in order to achieve success it is essential that good dairy cows be bred up from the native stock, that the industry be organised, and that butter, cheese and bacon factories be established upon a co-operative basis.

It will be realised that in treating so extensive an area of country in which comparatively little development has yet taken place it is difficult to forecast its Agricultural future.

Conservative estimates have been prepared upon the following basis:-

Area - 800,000 acres

Three years after completion of the Railway.

on basis of 250 Holdings.

Butter and Cheese from 25,000 cows.

Bacon and Bacon products from 5,000 pigs per annum.

Wool from 50,000 sheep, say 250,000 lbs. per annum.

Cattle 1,000 head railed per annum.

Sheep 10,000 head railed per annum.

Wheat 20,000 bags per annum.

Other grain crops 2,000 tons.

Flax 200 tons.

Ten years after completion of Railway

on basis of 400 Holdings.

Butter and Cheese from 50,000 cows.

Bacon and Bacon products from 10,000 pigs per annum.

Wool from 100,000 sheep , say 500,000 lbs. per annum.

Cattle 2,000 head railed per annum.

Sheep 20,000 head railed per annum.

Wheat 50,000 bags per annum.

Other Grain Crops 5,000 tons per annum.

Flax 400 tons per annum.

Area 4. 15. Native Reserve. Fort Hall - Nyeri.

In this area which forms part of the Kikuyu Reserve the land possesses great fertility and various grain and pulse crops are produced in considerable quantities by the Natives who belong to an agricultural race. With a

Area - 800,000 acres

Three years after completion of the Railway.

on basis of 250 Holdings.

Butter and Cheese from 25,000 cows.

Bacon and Bacon products from 5,000 pigs per annum.

Wool from 50,000 sheep, say 250,000 lbs. per annum.

Cattle 1,000 head railed per annum.

Sheep 10,000 head railed per annum.

Wheat 20,000 bags per annum.

Other grain crops 2,000 tons.

Flax 200 tons.

Ten years after completion of Railway

on basis of 400 Holdings.

Butter and Cheese from 50,000 cows.

Bacon and Bacon products from 10,000 pigs per annum.

Wool from 100,000 sheep , say 500,000 lbs. per annum.

Cattle 2,000 head railed per annum.

Sheep 20,000 head railed per annum.

Wheat 50,000 bags per annum.

Other Grain Crops 5,000 tons per annum.

Flax 400 tons per annum.

Area 4. 15. Native Reserve. Fort Hall - Nyeri.

In this area which forms part of the Kikuyu Reserve the land possesses great fertility and various grain and pulse crops are produced in considerable quantities by the Natives who belong to an agricultural race. With a

minimum of effort they are able to produce sufficient for their own livelihood and of late years they have produced increasing quantities of grain, beans, etc., for consumption outside their reserve.

Your Committee are of the opinion that on the advent of the railway the Natives will be stimulated to cultivate more land by the reduction of the distance which they have at present to carry their goods to market.

In estimating the tonnage and earnings from this area the traffic of native produce which is now railed at Thika, has been taken, and a 25% increase has been allowed for in three years after completion of the line, and 50% increase in 10 years after that completion.

Forestal. 16. The plan attached to this report locates the timber and the bamboo areas of Mount Kenya Forests which might be tapped by the projected railway.

It is considered that a 20 mile haul by road would be the utmost limit of distance for timber to be transported from the forests to the railway over easy country such as the West Kenya Plains, but over broken country, such as to the East of the Nairobi River, where there is a series of rivers and streams running at the bottoms of steep valleys, the distance timber could be hauled would be very much less.

minimum of effort they are able to produce sufficient for their own livelihood and of late years they have produced increasing quantities of grain, beans, etc., for consumption outside their reserve.

Your Committee are of the opinion that on the advent of the railway the Natives will be stimulated to cultivate more land by the reduction of the distance which they have at present to carry their goods to market.

In estimating the tonnage and earnings from this area the traffic of native produce which is now railed at Thika, has been taken, and a 25% increase has been allowed for in three years after completion of the line, and 50% increase in 10 years after that completion.

Forestal. 16. The plan attached to this report locates the timber and the bamboo areas of Mount Kenya Forests which might be tapped by the projected railway.

It is considered that a 20 mile haul by road would be the utmost limit of distance for timber to be transported from the forests to the railway over easy country such as the West Kenya Plains, but over broken country, such as to the East of the Nairobi River, where there is a series of rivers and streams running at the bottoms of steep valleys, the distance timber could be hauled would be very much less.

The approximate limit of the bamboo zone is indicated by blue hatched lines and the areas of the best class of forest by red hatched lines; it will be noticed that the best forests are some distance removed from the route of the railway.

Only one quarter of the forest is estimated as being accessible to the railway, viz:-62,500 acres. A conservative estimate of the quantity of timber available for felling would be 500 c.ft. per acre or a total of 31,250,000 c.ft. and when the forest had been worked over the annual increment might be estimated at 20 c.ft. per acre. This would be the equivalent to one million c.ft. or 20,000 tons as the yearly output, if the forests were worked over in 30 years and thereafter the output were regulated by the annual yield.

These figures are a conservative estimate; the total area of forest excluding bamboo is estimated as 300,000 acres. The actual area is taken as 250,000 acres to allow for glades and none productive areas. The quantity of available timber might, and would probably be as much as 2,000 c.ft. per acre in some parts of the forests, but taking the good with the bad the view is expressed that 500 c.ft. is a reasonable estimate.

The development of an export timber trade from this colony is seriously handicapped as compared with other countries with easy access to the sea board and rivers on which logs, etc., can be floated to the sea. The exploitation of the great timber resources of the Mount Kenya Forests

will depend largely upon the freight charges at which the railway is prepared to carry the timber to the port. In any event an exceptionally low rate would be required and if the Uganda Railway should be removed from the control of the Kenya Government it would probably be decided that any loss incurred by the Railway Administration in the carriage of timber traffic would be required to be refunded by the Kenya Government. The Timbers of Mount Kenya Forests which consist largely of "Cedar" and "Camphor" woods are particularly valuable and are in great demand. While it is not likely that a profitable export trade in the cheaper timbers could be established, there would appear to be considerable promise that the higher priced timbers will bear the cost of exportation. In addition to timber which might be carried on the railway there is the possibility of the creation of a paper pulp industry from the manufacture of bamboo. Basing an estimate on the figures already obtained as a result of experiments, the output of pulp from one-fourth of the bamboo forest on the mountain may be reasonably estimated at 1,000 tons per month. The supply of caustic soda is a factor to be considered in relation to a paper pulp industry and having regard to the large soda deposits at Magadi in this Colony it would appear that the local conditions are favourable.

will depend largely upon the freight charges at which the railway is prepared to carry the timber to the port. In any event an exceptionally low rate would be required and if the Uganda Railway should be removed from the control of the Kenya Government it would probably be decided that any loss incurred by the Railway Administration in the carriage of timber traffic would be required to be refunded by the Kenya Government. The Timbers of Mount Kenya Forests which consist largely of "Cedar" and "Camphor" woods are particularly valuable and are in great demand. While it is not likely that a profitable export trade in the cheaper timbers could be established, there would appear to be considerable promise that the higher priced timbers will bear the cost of exportation. In addition to timber which might be carried on the railway there is the possibility of the creation of a paper pulp industry from the manufacture of bamboo. Basing an estimate on the figures already obtained as a result of experiments, the output of pulp from one-fourth of the bamboo forest on the mountain may be reasonably estimated at 1,000 tons per month. The supply of caustic soda is a factor to be considered in relation to a paper pulp industry and having regard to the large soda deposits at Magadi in this colony it would appear that the local conditions are favourable.

The whole matter of the manufacture of paper pulp from the East African Bamboo is now being carefully enquired into and further data is being collected. So far the reports received are promising.

The estimates of tonnage and earnings in respect of timber have been placed at:-

3 years after completion of railway, 10,000 tons.

Total earnings Fls. 285,600

10 years after completion of railway, 20,000 tons.

Total earnings Fls. 571,200.

In the absence of a complete survey of the Mount Kenya Forests, the information of your Committee is necessarily incomplete and it is not practicable to attempt to predict what might be the production in the future beyond the expression of opinion now given.

Passenger traffic.

17. Upon a population basis of about 2,000 Europeans three years after completion of the line and 3,000 ten years after, together with incidental passenger traffic, it is estimated that 8,000 and 12,000 single journeys respectively will be annually undertaken.

A substantial amount of revenue will be derived from Native passenger traffic. The Native population in the Reserve through which the Railway passes is large and the traffic would be augmented from the Embu and Meru districts. It is calculated that the present Native passenger traffic from Thika would be increased five and ten fold in three and ten years after completion of railway.

The whole matter of the manufacture of paper pulp from the East African Bamboo is now being carefully enquired into and further data is being collected. So far the reports received are promising.

The estimates of tonnage and earnings in respect of timber have been placed at:-

3 years after completion of railway, 10,000 tons.

Total earnings Fls. 285,600

10 years after completion of railway, 20,000 tons.

Total earnings Fls. 571,200.

In the absence of a complete survey of the Mount Kenya Forests, the information of your Committee is necessarily incomplete and it is not practicable to attempt to predict what might be the production in the future beyond the expression of opinion now given.

Passenger traffic.

17. Upon a population basis of about 2,000 Europeans three years after completion of the line and 3,000 ten years after, together with incidental passenger traffic, it is estimated that 8,000 and 12,000 single journeys respectively will be annually undertaken.

A substantial amount of revenue will be derived from Native passenger traffic. The Native population in the Reserve through which the Railway passes is large and the traffic would be augmented from the Kabu and Meru districts. It is calculated that the present Native passenger traffic from Thika would be increased five and ten fold in three and ten years after completion of railway.

Traffic.

18. With the influx of new settlers and the development of the areas under consideration there will be a substantial increase in the inward traffic of goods of all kinds to meet their requirements and the needs of a growing population. Expansion of trade generally will take place at the ports and at the distributing centres. It is impracticable to attempt to estimate the increase in traffic and the benefits to be derived from that general trade expansion so that the Inward Traffic has been restricted for purposes of this report to a three fold and ten fold increase over three and ten years respectively on the present annual traffic tonnage and earnings.

Allottment of land.

19. As indicative of the promise of development it may be mentioned that in the areas under review about 470 Holdings have been allotted under the Ex-Soldier Settlement Scheme.

Labour.

20. The areas under consideration are favourably situated in respect of the supply of native labour, and there is no reason to suppose that having regard to the increasing number of natives now prepared to engage themselves, there will be any serious shortage of unskilled labour to carry out the development and the operations contemplated in this report.

New Railway justified.

21. The settlement of Europeans in this Colony can only, in the opinion of your Committee, be permanently successful if railway facilities and other communications are provided to enable the agricultural products raised by them to be placed on overseas markets at a reasonable cost.

Traffic. 18. With the influx of new settlers and the development of the areas under consideration there will be a substantial increase in the inward traffic of goods of all kinds to meet their requirements and the needs of a growing population. Expansion of trade generally will take place at the ports and at the distributing centres. It is impracticable to attempt to estimate the increase in traffic and the benefits to be derived from that general trade expansion so that the Inward Traffic has been restricted for purposes of this report to a three fold and ten fold increase over three and ten years respectively on the present annual traffic tonnage and earnings.

Allotment of land. 19. As indicative of the promise of development it may be mentioned that in the areas under review about 470 Holdings have been allotted under the Ex-Soldier Settlement Scheme.

Labour. 20. The areas under consideration are favourably situated in respect of the supply of native labour, and there is no reason to suppose that having regard to the increasing number of natives now prepared to engage themselves, there will be any serious shortage of unskilled labour to carry out the development and the operations contemplated in this report.

New Railway Justified. 21. The settlement of Europeans in this colony can only, in the opinion of your Committee, be permanently successful if railway facilities and other communications are provided to enable the agricultural products raised by them to be placed on overseas markets at a reasonable cost.

The railway under consideration will serve large areas of fertile land and an extensive area of good pastoral country. The view is expressed that as compared with other parts of the Empire th this Colony possesses many advantages but its settlement cannot progress, nor can its great potentialities be developed, without railway facilities.

Your Committee would urge that the extension of the line to a point about 30 miles from Thika should not be long delayed and further, assuming that no unsurmountable or too costly engineering difficulties are presented, when a more exhaustive survey is made of the projected line beyond, that the latent agricultural wealth of the areas between Fort Hall and Nyeri and Northwards, together with the unexploited timber resources of the Mount Kenya Forests, justify the provision of railway facilities.

Should the railway be constructed as far as a point in the neighbourhood of Nyeri, further extensions, e.g., to Rumuruti and branches along the lower slopes of Mount Kenya, in order to exploit its timber resources, will doubtless receive consideration in due course.

Financial Statement.

22. The following financial statement submitted by the Honourable the General Manager, Uganda Railway, reflects the estimated result of working the railway in the third year as estimated on pre-war freight rates and on the working results for 1918 - 19.

The railway under consideration will serve large areas of fertile land and an extensive area of good pastoral country. The view is expressed that as compared with other parts of the Empire th this Colony possesses many advantages but its settlement cannot progress, nor can its great potentialities be developed, without railway facilities.

Your Committee would urge that the extension of the line to a point about 30 miles from Thika should not be long delayed and further, assuming that no unsurmountable or too costly engineering difficulties are presented, when a more exhaustive survey is made of the projected line beyond, that the latent agricultural wealth of the areas between Fort Hall and Nyeri and Northwards, together with the unexploited timber resources of the Mount Kenya Forests, justify the provision of railway facilities.

Should the railway be constructed as far as a point in the neighbourhood of Nyeri, further extensions, e.g., to Rumuruti and branches along the lower slopes of Mount Kenya, in order to exploit its timber resources, will doubtless receive consideration in due course.

Financial Statement.

22. The following financial statement submitted by the Honourable the General Manager, Uganda Railway, reflects the estimated result of working the railway in the third year as estimated on pre-war freight rates and on the working results for 1918 - 19.

The figures include the revenue and Expenditure incurred on the existing Railway:-

Receipts	£ 132,430
Expenditure	86,688
Profit	£ 45,742

At the tenth year, taking the percentage of Total Expenditure to Gross Receipts at 75%. the result would be:-

Receipts	£ 289,070
Less 75% for working expenses	216,802
Profit	£ 72,268

Approximate estimates have only been prepared for the cost of constructing the line from Thika to Kambicho, leaving a distance of 40 miles through difficult country yet to be surveyed and estimated, but allowing the cost to be £17,000 per mile, the total cost of an extension of 94 miles from Thika, will cost approximately £1,156,000.

Taking Interest and Sinking Fund charges at 8% gives an annual charge of £92,480.

The final result will then be at the third year:-

	£ 92,480
Less Profit	45,742
Net Loss	£ 46,738

At the tenth year:-

	£ 92,480
Less Profit	72,268
Net Loss	£ 20,212

The figures include the revenue and Expenditure incurred on the existing Railway:-

Receipts	£ 132,430
Expenditure	86,688
Profit	£ 45,742

At the tenth year, taking the percentage of Total Expenditure to Gross Receipts at 75%. the result would be:-

Receipts	£ 289,070
Less 75% for working expenses	216,802
Profit	£ 72,268

Approximate estimates have only been prepared for the cost of constructing the line from Thika to Kambicho, leaving a distance of 40 miles through difficult country yet to be surveyed and estimated, but allowing the cost to be £17,000 per mile, the total cost of an extension of 94 miles from Thika, will cost approximately £1,156,000.

Taking Interest and Sinking Fund Charges at 8% gives an annual charge of £92,480.

The final result will then be at the third year:-

Less Profit	£ 92,480
Net Loss	45,742
	£ 46,738

At the tenth year:-

Less Profit	£ 92,480
Net Loss	72,268
	£ 20,212

Estimated Production.

23. The estimated production per annum in the areas served less requirements for local consumption is:-

(a) 5 years after completion of Railway.

Sisal	Tons	4,400
Coffee	"	2,500
Flax	"	400
Maize & Beans	"	12,786
Wheat	"	1,786
General crops	"	5,024
Timber	"	10,000
Cattle	number	1,000
Sheep	"	10,000
Pigs	"	3,000
Bacon & Bacon products.	Tons	500
Butter	Tons	223
Cheese	"	558
Wool	"	111

(b) 10 years after completion of Railway.

Sisal	Tons	6,000
Coffee	"	4,100
Flax	"	800
Maize & Beans	"	15,702
Wheat	"	4,464
General crops	"	8,429
Timber	"	20,000
Cattle	Number	2,000
Sheep	"	20,000
Pigs	"	3,000
Bacon & Bacon products.	Tons	813
Butter	Tons	446
Cheese	"	1,116
Wool	"	222

Estimated Production.

83. The estimated production per annum in the areas served less requirements for local consumption is:-

(a) 5 years after completion of Railway.

Sisal	Tons	4,400
Coffee	"	2,500
Flax	"	400
Maize & Beans	"	12,786
Wheat	"	1,786
General crops	"	5,024
Timber	"	10,000
Cattle	number	1,000
Sheep	"	10,000
Pigs	"	3,000
Bacon & Bacon products.	Tons	500
Butter	Tons	223
Cheese	"	558
Wool	"	111

(b) 10 years after completion of Railway.

Sisal	Tons	6,000
Coffee	"	4,100
Flax	"	800
Maize & Beans	"	15,702
Wheat	"	4,464
General crops	"	8,429
Timber	"	20,000
Cattle	Number	2,000
Sheep	"	20,000
Pigs	"	3,000
Bacon & Bacon products.	Tons	813
Butter	Tons	446
Cheese	"	1,116
Wool	"	222

Other traffic under (a) Inward 11,888 tons.

Passenger Traffic (European)
8,000 journeys.
Passenger traffic (Native)
242,500 journeys.

506

Other traffic under (b) Inward traffic 56,388 tons

passenger traffic (European)
12,000 Journeys.
Passenger traffic (Native)
485,000 Journeys.

Estimated earnings.

24. The following are estimated earnings on new and existing railway lines after deductions have been made covering traffic now loa ding at Thika, also traffic which would result from development and be carried if the new line were not constructed.

Calculations made allow for a proportion of traffic to be consumed or used in the colony and the remainder carried to the coast for export.

(a) Earnings on New Line 5 years after completion.

Sisal	Florins	5,913	
Coffee	"	10,281	
Flax	"	1,746	
Maize & Beans	"	17,634	
Wheat	"	10,200	
General crops	"	8,096	53,870
Timber	"	57,120	57,120
Cattle	"	3,488	
Sheep	"	5,580	
Pigs	"	667	
Bacon & Bacon Products		3,780	
Butter	"	1,275	
Cheese	"	3,188	
Wool	"	675	18,653
Inward traffic	"	27,771	27,771
European personal	"	54,000	54,000
Native personal	"	363,780	363,780
		575,164	575,164

Other traffic under (a) Inward 11,888 tons.

Passenger Traffic (European)
5,000 Journeys.
Passenger traffic (Native)
245,500 Journeys. 506

Other traffic under (b) Inward traffic 56,888 tons

passenger traffic (European)
12,000 Journeys.
Passenger traffic (Native)
485,000 Journeys.

Estimated earnings.

24. The following are estimated earnings on new and existing railway lines after deductions have been made covering traffic now loa ding at Thika, also traffic which would result from development and be carried if the new line were not constructed.

Calculations made allow for a proportion of traffic to be consumed or used in the Colony and the remainder carried to the coast for export.

(a) Earnings on New Line 3 years after completion.

Sisal	Florins	5,913	
Coffee	"	10,281	
Flax	"	1,746	
Maize & Beans	"	17,634	
Wheat	"	10,200	
General crops	"	8,096	53,870
Timber	"	57,120	57,120
Cattle	"	3,488	
Sheep	"	5,580	
Pigs	"	667	
Bacon & Bacon Products	"	3,780	
Butter	"	1,275	
Cheese	"	3,188	
Wool	"	675	18,653
Inward traffic	"	27,771	27,771
European personal	"	54,000	54,000
Native personal	"	363,760	363,760
		575,164	575,164

(b) Earnings of increased traffic on existing line.

Sisal	Florins	29,030	
Coffee	"	44,486	
Flax	"	3,630	
Maize & Beans	"	26,116	
Wheat	"	2,700	
General Crops	"	27,698	133,660
Timber	"	228,480	228,480
Cattle	"	1,550	
Sheep	"	2, 480	
Pigs	"	-	
Bacon & Bacon Products	"	24,416	
Butter	"	5,100	
Cheese	"	12,750	
Wool	"	7,580	53,876
Inward Traffic	"	99,434	99,434
European Personnel	"	88,200	88,200
Native Personnel		146,800	146,800
		749,180	749,180

(c) Earnings on New line 10 years after completion

Sisal	Florins	8,064	
Coffee	"	16,598	
Flax	"	3,492	
Maize & Beans		22,008	
Wheat		25,500	
General Crops		15,732	91,388
Timber	"	114,240	114,240
Cattle		6,975	
Sheep	"	11,160	
Pigs		667	
Bacon & Bacon Products	"	7,560	
Butter	"	2,550	
Cheese	"	6,375	
Wool	"	1,332	36,637

(b) Earnings of increased traffic on existing line.

Sisal	Florins	29,050	
Coffee	"	44,486	
Flax	"	3,630	
Maize & Beans	"	26,116	
Wheat	"	2,700	
General Crops	"	27,698	133,680
Timber	"	228,480	228,480
Cattle	"	1,550	
Sheep	"	2, 480	
Pigs	"	-	
Bacon & Bacon Products	"	24,416	
Butter	"	5,100	
Cheese	"	12,750	
Wool	"	7,580	53,876
Inward Traffic	"	99,434	99,434
European Personal	"	88,200	88,200
Native Personal		145,500	145,500
		749,150	749,150

(c) Earnings on New line 10 years after completion

Sisal	Florins	8,064	
Coffee	"	16,598	
Flax	"	3,492	
Maize & Beans	"	22,002	
Wheat	"	25,500	
General Crops	"	15,732	91,388
Timber	"	114,240	114,240
Cattle	"	6,975	
Sheep	"	11,160	
Pigs	"	667	
Bacon & Bacon Products	"	7,560	
Butter	"	2,550	
Cheese	"	6,375	
Wool	"	1,320	36,627

Brought Forward	Florins	865,265	865,265
Inward Traffic	"	92,871	92,871
European Personal	"	71,000	71,000
Native Personal	"	787,800	787,800
		1133,336	1133,336

(d) Earnings of increased traffic on existing line

Sisal	Florins	50,804	
Coffee	"	122,061	
Flax	"	7,260	
Maize & Beans	"	30,120	
Wheat	"	7,200	
General Crops	"	55,149	272,614
Timber	"	456,960	456,960
Cattle	"	3,100	
Sheep	"	4,960	
Pigs		-	
Bacon & Ba con Products		39,676	
Butter	"	10,200	
Cheese		25,500	
Wool		15,485	98,921
Inward Traffic	"	469,214	469,214
European Personal	"	132,300	132,300
Native Personal		327,375	327,375
		1757,384	1,757,884

Brought Forward	Florins	865,265	865,265
Inward Traffic	"	92,871	92,871
European Personal	"	71,000	71,000
Native Personal	"	787,800	787,800
		1133,336	1133,336

(d) Earnings of increased traffic on existing line

Sisal	Florins	50,804	
Coffee	"	122,081	
Flax	"	7,260	
Maize & Beans	"	30,120	
Wheat	"	7,200	
General Crops	"	55,149	272,614
Timber	"	456,960	456,960
Cattle	"	3,100	
Sheep	"	4,960	
Pigs		-	
Bacon & Ba con Products		39,676	
Butter	"	10,200	
Cheese		25,500	
Wool		15,485	98,921
Inward Traffic	"	469,214	469,214
European Personal	"	132,300	132,300
Native Personal		327,375	327,375
		1787,384	1,787,384

25. Your Committee desire to record their appreciation of the assistance rendered by representatives of the different Associations, and others who gave evidence and furnished information; and to testify to the capable manner in which the Secretary has discharged his duties.

Owing to absence from the Colony on leave the Hon. Commissioner of Lands is not a signatory to this report.

sgd. Alex Holm,
Chairman,
Director of Agriculture.

sgd. S. Cooper,
General Manager,
Uganda Railway.

sgd. S. Battiscombe,
Conservator of Forests.

SIGNED.

Date.2/5....1921

sgd. L. D. Carpenter,
Secretary,
Statistical Officer.

APPENDIX.

Estimate of Area, Cultivation, Produce and Earnings for Districts served by the proposed Thika-Nyeri Railway Extension

Three Years after completion of Railway.

District	Areas under cultivation of :-						Estimated Produce for Rail						Estimated earni	
	Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops	Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops	Sisal	Coffee
	Acres	Acres	Acres	Acres	Acres	Acres	cwts	cwts	cwts	cwts	cwts	cwts	£s.	£s
Thika Donya Sabuk Area 1.	11,000	10,500	-	-	-	-	88,000	42,000	-	-	-	20,000	5,913	7,056
Nyeri Area 2.	-	2,000	1,000	1,000	-	-	-	8,000	4,000	8,929	-	-	-	3,225
N & W Kenya Area 3.	-	-	1,000	-	-	-	-	-	4,000	-	35,714	40,000	-	-
Native Reserve Area 4.	-	-	-	-	-	-	-	-	-	246,785	-	40,480	-	-
Total							88,000	50,000	8,000	255,714	35,714	100,480	5,913	10,281

Ten Years after Completion of Railway

District	Areas under cultivation of :-						Estimated Produce for Rail						Estimated Earnin	
	Sisal	coffee	Flax	Maize and Beans	Wheat	General Crops	Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops	Sisal	Coffee
	Acres	Acres	Acres	Acres	Acres	Acres	cwts	cwts	cwts	cwts	cwts	cwts	£s	£s
Thika Donya Sabuk Area 1.	15,000	17,500	-	-	-	-	120,000	70,000	-	-	-	20,000	8,064	11,760
Nyeri Area 2.	-	3,000	2,000	2,000	-	-	-	12,000	8,000	17,857	-	-	-	4,838
N & W Kenya Area 3.	-	-	2,000	-	-	-	-	-	8,000	-	89,286	10,000	-	-
Native Reserve Area 4.							-	-	-	296,161	-	48,880	-	-
Total							120,000	82,000	16,000	314,018	89,286	168,880	8,064	16,598

APPENDIX.

Estimate of Area Cultivation Produce and Earnings for Districts served by the pro osed Thika-Nyeri Railway Extension

Three Years after completion of Railway.

District	Areas under cultivation of :- Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops
	Acres	Acres	Acres	Acres	Acres	Acres
Thika Donya Sabuk Area 1.	11,000	10,500	-	-	-	-
Nyeri Area 2.	-	2,000	1,000	1,000	-	-
N & W Kenya Area 3.	-	-	1,000	-	-	-
Native Reserve Area 4.	-	-	-	-	-	-
Total						

Estimated Produce for Rail Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops	Estimated earnings Sisal	Coffee
cwts	cwts	cwts	cwts	cwts	cwts	£s.	£s
88,000	42,000	-	-	-	20,000	5,913	7,056
-	8,000	4,000	8,929	-	-	-	3,225
-	-	4,000	-	35,714	40,000	-	-
-	-	-	246,785	-	40,480	-	-
88,000	50,000	8,000	255,714	35,714	100,480	5,913	10,281

Ten Years after Completion of Railway

District	Areas under cultivation of :- Sisal	coffee	Flax	Maize and Beans	Wheat	General Crops
	Acres	Acres	Acres	Acres	Acres	Acres
Thika Donya Sabuk Area 1.	15,000	17,500	-	-	-	-
Nyeri Area 2.	-	3,000	2,000	2,000	-	-
N & W Kenya Area 3.	-	-	2,000	-	-	-
Native Reserve Area 4.						
Total						

Estimated Produce for Rail Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops	Estimated Earnings Sisal	Coffee
cwts	cwts	cwts	cwts	cwts	cwts	£s	£s
120,000	70,000	-		-	20,000	8,064	11,760
-	12,000	8,000	17,857	-	-	-	4,838
-	-	8,000	-	89,286	10,000	-	-
-	-	-	296,161	-	48,880	-	-
120,000	82,000	16,000	314,018	89,286	168,880	8,064	16,598

ew Line.			Earnings of Increased Traffic on Existing Line						TOTAL earnings New Line	TOTAL increased earnings existing line	TOTAL Earnings
Maize and Beans	Wheat	General Crops	Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops			
Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls
-	-	672	29,030	39,603	-	-	-	6,720	13,641	75,353	88,994
1,050	-	-	-	4,883	1,815	4,000	-	-	6,761	10,698	17,459
-	10,800	4,704	-	-	1,815	-	2,700	17,350	15,777	21,865	37,642
16,584	-	2,720	-	-	-	22,116	-	3,628	19,304	25,744	45,048
17,634	10,200	8,096	29,030	44,486	3,630	26,116	2,700	27,698	55,483	133,660	189,143

ew Line			Earnings of Increased Traffic on Existing Railway						TOTAL earnings New Line	TOTAL increased earnings existing line	TOTAL earnings.
Maize and Beans	Wheat	General Crops	Sisal	Coffee	Flax	Maize and Beans	Wheat	General Crops.			
Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls	Fls
-	-	672	50,804	112,314	-	-	-	6,720	20,496	169,838	190,334
2,100	-	-	-	9,767	3,630	8,000	-	-	11,103	21,397	32,500
-	25,500	11,796	-	-	3,630	-	7,200	44,800	39,041	55,630	94,672
19,902	-	[illegible]	-	-	-	22,120	-	3,628	23,166	25,749	48,915
22,002	25,500	15,732	50,804	122,081	7,260	30,120	7,200	55,149	93,807	272,614	366,421

Three years after completion of Railway.

LIVE - STOCK.

District.	Estimated No. on Rail			Earnings on New Line			Earnings of increased traffic on existing line.			Total earnings New Line	Total increased earnings existing line	Total earnings	Estimated produce for Rail
	Cattle	Sheep	Pigs	Cattle	Sheep	Pigs	Cattle	Sheep	Pigs				
	No.	No.	No.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Cwts
Thika Donya Sabuk Area 1.	-	-	2,500	-	-	388	-	-	-	388	-	388	
Nyeri Area 2.	-	-	500	-	-	279	-	-	-	279	-	279	
N & V Kenya Area 3.	1,000	10,000	-	3,488	5,580	-	1,550	2,480	-	9,068	4,030	13,098	6,2
Native Reserve Area 4.	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1,000	10,000	3,000	3,488	5,580	667	1,550	2,480	-	9,735	4,03	13,765	10,0

Ten years after completion of Railway.

District.	Estimated No. on Railw			Earnings on New Line			Earnings of increased traffic on existing line.			Total earnings New Line	Total increased earnings existing line	Total earnings	Estimated produce for Rail
	Cattle	Sheep	Pigs	Cattle	Sheep	Pigs	Cattle	Sheep	Pigs				
	No.	No.	No.	Rs.	Rs.	Rs.	Rs	Rs	Rs	Rs	Rs	Rs.	Cwts
Thika Donya Sabuk Area 1.	-	-	2,500	-	-	388	-	-	-	388	-	388	3,12
Nyeri Area 2.	-	-	500	-	-	279	-	-	-	279	-	279	62
N & V Kenya Area 3.	4,000	30,000	-	6,975	11,160	-	3,100	4,960	-	17,135	9,060	26,195	12,5
Native Reserve Area 4.	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	4,000	30,000	3,000	6,975	11,160	667	3,100	4,960	-	17,802	9,060	26,862	16,25

...te of Live Stock, Dairy Produce, and Earnings for Districts served by the proposed Thika-Nyeri Railway Extension.

Total increased earnings existing line	Total earnings	Maize and Maize Products. Estimated produce for Rail	Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings.	Butter Estimated produce for Rail	Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings
Rs	Rs	Cwts	Rs	Rs	Rs	Cwts	Rs	Rs	Rs
-	388	3,125	-		7,630	-	-	-	-
-	279	625	-		1,526	-	-	-	-
4,030	13,098	6,250	3,780		19,040	4,464	1,275	5,100	6,375
-	-	-	-		-	-	-	-	-
4,030	13,765	10,000	3,780		28,196	4,464	1,275	5,100	6,375

Total increased earnings existing line	Total earnings	Maize and Maize Products. Estimated produce for Rail	Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings	Butter Estimated produce for Railw	Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings
Rs	Rs.	Cwts	Rs	Rs	Rs.	Cwts	Rs	Rs	Rs
-	388	3,125	-		7,630	-	-	-	-
-	279	625	-		1,526	-	-	-	-
4,030	26,196	12,500	7,560		38,080	8,928	2,550	1,200	12,750
-	-	-	-		-	-	-		-
4,030	26,862	16,250	7,560	39,676	47,236	8,928	2,550	1,200	12,750

Total Earnings	Estimated produce for Rail	Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings.	Wool Estimated produce for Rail	Wool Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings.	Total Earnings Stock and Animal on New Line	Total Earnings Stock and Animal increased traffic existing line.
£s.	Cwts.	£s	£s	£s	Cwts	£s	£s	£s	£s	£s
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	388	7,630
6,375	11,161	3,188	12,750	15,938	2,232	675	7,580	8,255	17,986	44,729
-	-	-	-	-	-	-	-	-	-	-
6,375	11,161	3,188	12,750	15,938	2,232	675	7,580	8,255	18,653	53,876

Total Earnings	Estimated produce for Rail	Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings.	Wool Estimated produce for Rail	Wool Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings.	Total Earnings Stock and Animal on New Line	Total Earnings Stock and Animal increased traffic existing line.
£s	Cwts	£s	£s	£s	Cwts	£s	£s	£s	£s	£s
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	388	7,630
12,750	22,322	6,375	25,500	31,875	4,464	1,35	15,485	16,835	36,657	89,763
-	-	-	-	-	-	-	-	-	-	-
12,750	22,322	6,375	25,500	31,875	4,464	1,35	15,485	16,835	36,657	98,921

Total Earnings.	Estimated produce per Rail	Coal Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings	Total Earnings Stock and Animal Produce. on New Line	increased traffic on existing line.	TOTAL EARNINGS.
Rs	Tons	Rs	Rs	Rs	Rs	Rs	Rs
-	-	-	-	-	388	7,630	8,018
-	-	-	-	-	279	1,526	1,805
15,936	2,232	675	7,580	8,255	17,986	44,720	62,706
-	-	-	-	-	-	-	-
15,936	2,232	675	7,580	8,255	18,653	53,876	72,529

Total Earnings.	Estimated produce per Rail	Coal Earnings on New Line	Earnings of increased traffic on existing line	Total Earnings.	Total Earnings Stock and Animal Produce. on New Line	increased traffic on existing line.	TOTAL EARNINGS.
Rs	Tons	Rs	Rs	Rs	Rs	Rs	Rs
-	-	-	-	-	388	7,631	8,018
-	-	-	-	-	279	1,524	1,803
31,872	4,464	1,350	15,485	16,835	35,970	89,765	125,735
-	-	-	-	-	-	-	-
31,872	4,464	1,350	15,485	16,835	36,637	98,921	135,558

Estimated Tonnage and Earnings of Timber over proposed

Thika-Nyeri Railway Extension.

Three years after completion of Line				Ten Years after completion of Line.			
Estimated Tonnage for Rail	Total Earnings on New Line	Total increased earnings on existing Line	Total Earnings	Estimated Tonnage for Rail	Total Earnings on New Line	Total increased Earnings on existing Line	Total Earnings.
Tons	Fls	Fls	Fls	Tons	Fls	Fls	Fls
10,000	57,120	228,480	285,600	20,000	114,240	456,960	571,200

T I M B E R

Estimated Tonnage and Earnings of Timber over proposed Thika-Nyeri Railway Extension.

Three years after completion of Line				Ten Years after completion of Line.			
Estimated Tonnage for Rail	Total Earnings on New Line	Total increased earnings on existing Line	Total Earnings	Estimated Tonnage for Rail	Total Earnings on New Line	Total increased Earnings on existing Line	Total Earnings.
Tons	Fls	Fls	Fls	Tons	Fls	Fls	Fls
10,000	57,120	228,480	285,600	20,000	114,240	456,960	571,200

	Total No. of Passengers 4 trips 2000 x 4	EARNINGS ON NEW LINE			INCREASED EARNINGS ON EXISTING LINE				
		First Class 2000 Tickets average 60 miles	Second Class 6000 Tickets average 60 miles.	Total Earnings	Thika-Nairobi 2000 Tickets First Class 32 miles	Thika-Nairobi 6000 Tickets Second Class 32 miles.	Total	1000 singles First 330 miles	Total increased earnings
3 Years	8000	21600	32400	54000	11520	17280	28800	59400	88200

	Total No. of Passengers 4 trips 3000 x 4	EARNINGS ON NEW LINE			INCREASED EARNINGS ON EXISTING LINE				
					Thika-Nairobi 32 miles				
		First Class 3000 Tickets average 60 miles	Second Class 9000 Tickets average 60 miles	Total Earnings	3000 Tickets First Class	9000 Tickets Second Class	Total	1500 singles First 330 miles	Total increased earnings
10 Years	12000	32400	48600	71000	17280	25920	43200	89100	132300

NATIVE PASSENGER TRAFFIC.

Railway figures show 4,074 in 1 month = { 48,888 in 1 year / 48,500

Providing for 5 fold increase in 3 years

do. 10 do. do. 10 do.

Thika - Nyeri (92 miles)

	New Line		Existing Line		Less	
	No.of singles	Value @ 2½ cts. per mile Average 30 miles	No.of singles	Value @ 2½ cts. per mile Average 30 miles	No.of singles	Value @ 2½ cts. per mile Average 30 miles
3 yrs.	242500	363750	242500 48500 194000	181875 36375 145500	48500	36375
10 yrs.	485000	727500	485000 48500 436500	363750 36375 327375	48500	36375

INWARD TRAFFIC

Extract - Uganda Railway Report 1919 - 1920.

Inward to Thika 6612 tons valued at Rls. 54347

(6500) (54000)

Providing for threefold increase 3 years after

Providing for tenfold increase 10 years after.

Thika - Nyeri 92 miles.

	New Line		Existing Line		Less	
	Quantity	Earnings over 60 miles.	Quantity	Earnings over 362 miles	Quantity	Earnings over 362 miles.
	Tons	Rls.	Tons	Rls.	Tons	Rls.
3 yrs.	19,500 390,000 cwts.	27,771	19,500 7,612 11,888	162,000 62,566 99,434	7,612	62,566
10 yrs.	65,000 1300000 cwts.	92,571	65,000 8,612 56,388	540,000 70,786 469,214	8,612	70,786

Summary of Produce and Earnings on Proposed Thika-Nyeri Railway Extension and Estimate of Goods and Passenger Traffic, three years and ten years after completion of line

PRODUCTS.		THREE YEARS AFTER COMPLETION OF LINE.				TEN YEARS AFTER COMPLETION OF LINE.			
		Total Produce & c. for rail	Estimated Earnings on New Line	Estimated Earnings of increased traffic on existing line	Total Produce & c. Earnings.	Total Produce & c. for rail.	Estimated Earnings on New Line	Estimated Earnings of increased traffic on existing line.	Total Earnings.
					£				
Sisal	cwts	88,000	5,913	29,050	34,963	120,000	8,064	50,804	58,868
Coffee	cwts	50,000	10,262	44,486	54,767	82,000	16,898	122,804	138,679
Flax	cwts	8,000	1,746	5,630	8,376	16,000	3,492	7,260	10,752
Maize & Beans	cwts	255,714	17,654	26,116	43,750	514,818	22,008	30,120	52,128
Wheat	cwts	38,714	10,800	2,700	12,900	89,286	25,500	7,300	32,700
General Crops	cwts	100,480	8,096	27,698	35,794	186,880	15,738	55,149	70,881
Timber	Tons	10,000	57,120	228,480	285,600	20,000	114,240	456,960	571,200
Cattle	No.	2,000	3,488	1,550	5,038	2,000	6,975	3,100	10,075
Sheep	No.	10,800	5,580	2,480	8,060	20,000	11,160	4,960	16,120
Pigs	No.	3,000	667	-	667	3,000	667	-	667
Bacon & Bacon products		10,000	3,780	24,416	28,196	16,250	7,560	39,676	47,236
Butter	cwts.	4,464	1,275	5,100	6,375	8,928	2,550	10,200	12,750
Cheese	cwts	11,161	3,188	12,750	15,938	22,322	6,375	25,500	31,875
Wool	cwts	4,464	675	7,580	8,255	8,928	1,350	15,485	16,835
Inward Traffic	Tons	11,888	27,771	99,434	127,205	56,388	92,871	469,214	561,785
European Traffic	No.	8,000	54,000	88,200	142,200	12,000	71,000	132,300	203,300
Native Traffic	No.	248,500	365,750	145,500	509,250	485,000	787,500	327,375	1054,875
Total Value		Fls.	575,164	949,150	1,524,314		1,183,536	1,757,384	2,890,720

APPENDIX 2.

No. 4.

CHEMICAL RESEARCH DEPARTMENTAL REPORT

of

Samples of Soils representative of the

Districts served by the proposed

Thika- Nyeri Railway.

Chemical Research Dept.
P.O. Box 141,
Nairobi.

23/11/20

517

Report No. S./5/20.

Lab. Samples Nos. 42,43,44,45 and 46/S/20.

Date received. 7/7/20.

From - The Hon. The Director of Agriculture.

Description of sample.

Five samples received in unsealed canvas bags.

Location of sample 1. Makuyu. Fort Hall District. One mile from main road.
do. do. 2. Messrs. Swift & Rutherfoord, Punda Milia, Chania Bridge.
do. do. 3. Ragati Valley, Fort Hall - Nyeri.
do. do. 4. Hon. R.B.Cole, Narro Njore.
do. do. 5. Nanyukie (nr. Township) on Meru Road.

Results of Analysis.

Fine soil contains:-

	SAMPLES				
	1	2	3	4	5
	%	%	%	%	%
Water	5.45	6.00	7.71	8.53	5.80
Organic matter	12.88	13.87	13.81	13.12	12.87
Insoluble matter	41.44	47.70	44.20	72.16	72.94
Iron oxide & Alumina	38.52	30.66	32.37	4.47	6.72
Lime	0.16	0.25	0.52	0.64	0.20
Magnesia	0.24	0.26	0.29	0.30	0.29
Potash	0.11	0.14	0.17	0.19	0.14
Phosphate	0.53	0.16	0.34	0.21	0.18
Not determined (Soda, Chlorine etc.)	0.67	0.96	0.59	0.38	1.16
	100.00	100.00	100.00	100.00	100.00
	%	%	%	%	%
Containing Nitrogen	.10	.11	.11	.07	.08
Available Potash	.11	.14	.16	.19	.14
do. phosphate	.03	.05	.04	.03	.04

Remarks and Conclusion.

The Nitrogen content is comparatively constant in all five samples. The lime present is seen to vary 0.16% in sample No.1, to 0.64% in sample No.4. Potash is present in small quantities varying from 0.1 to 0.2%. The total Phosphate is present in comparatively large quantities.

Signed. G.A.Clark,

Chemical Officer.

APPENDIX 2.

No. 5.

PUBLIC WORKS DEPARTMENT REPORT

on

The Results of Guagings of

Certain Rivers in

NORTH AND WEST KENYA.

Public Works Department,
Head Office,
NAIROBI

5th. April 1921.

Ref. No. 125/117/3/2.

519

The Hon. Director of Agriculture.
Nairobi.

Economic Survey. Thika-Nyeri Railway.

The results of gaugings of the undermentioned rivers are as stated below:-

River.	Date of gauging	Stage	Flow c.ft.sec.	Place where gauging made.
Nare Moru	9.2.21	low	9.00	Near Nyeri-Meru Road bridge.
Buguret	9.2.21	low	14.10	do.
Nanyoke	9.2.21	low	10.80	do.
Liki	9.2.21	low	19.02	do.
Amboni	7.2.21	low	34.40	do.

(signed) H. L. Sikes,
Government Hydraulic Engineer.

Public Works Department,
Head Office,
NAIROBI

8th. April 1921.

Ref. No. 125/117/3/4.

519

The Hon. Director of Agriculture.
Nairobi.

Economic Survey. Thika-Nyeri Railway.

The results of gaugings of the undermentioned rivers are as stated below:-

River.	Date of gauging	Stage	Flow c.ft.sec.	Place where gauging made.
Naro Moru	9.2.21	low	9.00	Near Nyeri-Meru Road bridge.
Buguret	9.2.21	low	14.10	do.
Nanyoke	9.2.21	low	10.80	do.
Liki	9.2.21	low	19.02	do.
Amboni	7.2.21	low	34.40	do.

(signed) H. L. Sikes,
Government Hydraulic Engineer.

APPENDIX 2.

No. 6

AVERAGE MONTHLY RAINFALL & EXTREME ANNUAL

RAINFALLS AT VARIOUS STATIONS WITHIN TH

AREA OF THE PROPOSED THIKA-NYERI

RAILWAY

APPENDIX 2. AVERAGE MONTHLY AND EXTREME ANNUAL RAINFALLS

Reg. No.	Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total average	Over years	Greatest Annual Rainfall	Smallest Annual Rainfall
6	Chania Bridge Muthuri (Cunningham)	1.91	2.61	4.89	11.85	4.39	1.45	1.51	0.48	1.44	4.64	2.78	1.53	39.48	3	46.18 (1917)	29.91 (1918)
7	Chania Chania Bridge (Henderson)	1.59	2.37	4.42	9.42	4.12	1.57	0.90	0.81	0.96	2.78	6.04	2.12	37.10	9	50.71 (1912)	28.19 (1918)
128	Thika Magogini Estate(Oulton)	0.00	1.55	5.96	9.01	1.51	0.12	0.42	1.04	0.40	4.43	6.39	3.53	34.36	2	35.03 (1916)	33.68 (1919)
126	Thika Nanga (Trotter)	2.18	1.69	5.34	8.80	1.49	2.91	0.10	0.73	0.89	3.05	5.70	1.69	35.57	6	42.06 (1914)	28.04 (1919)
125	Thika N'Durugu (Lindsay)	1.46	1.05	4.72	9.68	1.59	1.84	1.42	0.62	1.62	3.66	4.89	1.92	37.47	6	42.60 (1914)	30.12 (1918)
173	Chania Kabuku (Focks)	2.19	1.41	3.95	10.38	1.51	2.22	0.64	0.47	1.04	3.26	4.81	2.26	35.14	4	41.35 (1917)	25.88 (1918)
181	Donyo Sabuk Maindoindeni (Clay)	2.36	0.53	1.83	12.46	1.54	0.57	0.30	0.15	0.71	2.20	7.35	5.41	36.41	2	43.51 (1916)	29.32 (1918)
15	Fort Hall District Office	1.46	2.26	4.88	12.85	6.33	1.70	0.92	0.83	1.03	4.83	7.82	2.86	47.77	19	60.52 (1912)	35.95 (1918)
105	Nyeri District Office	1.31	1.90	2.49	8.14	7.27	1.57	1.37	1.54	1.00	3.09	4.24	2.46	36.38	16	52.04 (1917)	26.88 (1914)
172	Nyeri Muringate	0.91	3.32	1.65	7.77	6.92	2.14	1.06	1.35	2.21	1.89	3.44	2.40	34.67	2	39.14 (1916)	30.21 (1915)
106	Nyeri Tumu Tumu	0.47	2.89	2.58	12.14	6.04	1.24	1.54	0.70	1.50	3.60	4.89	2.76	[illegible]	4	43.90 (1916)	29.80 (1918
142	West Kenya Esparanza Farm	1.74	1.44	3.02	4.32	2.39	1.14	0.79	1.99	1.61	2.42	2.19	2.05	[illegible]	5	[illegible]	[illegible] (1918
145	West Kenya Marro Moru	1.74	2.62	3.94	7.31	1.81	2.23	0.82	1.61	1.04	3.25	3.85	1.59	1.81	4	40.16 (1917)	[illegible] (1918)
142	West Kenya Forest Station	1.94	1.09	3.87	9.18	1.36	3.16	1.84	1.79	2.08	2.72	7.77	3.21	[illegible]	[illegible]	[illegible]	[illegible] (1911)

APPENDIX 2. AVERAGE MONTHLY AND EXTREME ANNUAL RAINFALLS

Reg. No.	Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total average	Over years	Greatest Annual Rainfall	Smallest Annual Rainfall
6	Chania Bridge Muthuri (Cunningham)	1.91	2.61	4.89	11.85	4.39	1.45	1.51	0.48	1.44	4.64	2.78	1.53	39.48	3	46.18 (1917)	29.91 (1918)
7	Chania Chania Bridge (Henderson)	1.59	2.37	4.42	9.42	4.12	1.57	0.90	0.81	0.96	2.78	6.04	2.12	37.10	9	50.71 (1912)	28.19 (1918)
128	Thika Magogini Estate(Oulton)	0.00	1.55	5.96	9.01	1.51	0.12	0.42	1.04	0.40	4.43	6.39	3.53	34.36	2	35.03 (1916)	33.68 (1919)
126	Thika Nanga (Trotter)	2.18	1.69	5.34	8.80	4.49	2.01	0.10	0.73	0.89	3.05	5.70	1.69	35.57	6	42.06 (1914)	28.04 (1919)
125	Thika N'Durugu (Lindsay)	1.46	1.05	4.72	9.68	4.59	1.84	1.42	0.62	1.62	3.66	4.89	1.92	37.47	6	42.60 (1914)	30.12 (1918)
173	Chania Kabuku (Focks)	2.19	1.41	5.95	10.38	4.51	2.22	0.64	0.47	1.04	3.26	4.81	2.26	35.14	4	41.35 (1917)	25.88 (1918)
181	Donyo Sabuk Maindoindeni (Clay)	2.36	0.53	1.83	12.46	4.54	0.57	0.30	0.15	0.71	2.20	7.35	5.41	36.41	2	43.51 (1916)	29.32 (1918)
15	Fort Hall District Office	1.46	2.26	4.88	12.85	6.33	1.70	0.92	0.83	1.03	4.83	7.82	2.86	47.77	19	60.52 (1912)	35.95 (1918)
105	Nyeri District Office	1.31	1.90	2.49	8.14	7.27	1.57	1.37	1.54	1.00	3.09	4.24	2.46	36.38	16	52.04 (1917)	26.88 (1914)
172	Nyeri Muringate	0.91	3.32	1.65	7.77	6.92	2.14	1.06	1.35	2.21	1.89	3.44	2.40	34.67	2	39.14 (1916)	30.21 (1915)
106	Nyeri Tumu Tumu	0.47	2.59	2.58	12.14	6.04	1.24	1.54	0.70	1.50	3.50	4.89	2.76	39.95	4	43.90 (1916)	29.80 (1918)
142	West Kenya Esparanza Farm	1.74	1.44	3.02	4.32	2.39	1.14	0.79	1.99	1.61	2.42	2.19	2.05	29.18	5	39.55 (1917)	19.85 (1918)
145	West Kenya Narro Moru	1.74	2.62	3.94	7.31	1.81	2.23	0.82	1.61	1.04	3.25	3.83	1.59	31.81	4	40.10 (1917)	22.83 (1918)
143	West Kenya Forest Station	1.94	2.09	3.87	9.18	5.36	3.16	1.84	1.79	2.08	2.72	7.77	3.22	45.02	4	54.34 (1912)	35.92 (1911)

APPENDIX 2.

No. 6

AVERAGE MONTHLY RAINFALL & EXTREME ANNUAL

RAINFALLS AT VARIOUS STATIONS WITHIN TH

AREA OF THE PROPOSED THIKA-NYERI

RAILWAY

APPENDIX 2. AVERAGE MONTHLY AND EXTREME ANNUAL RAINFALLS

Reg. No.	Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total average	Over years	Greatest Annual Rainfall	Smallest Annual Rainfall
6	Chania Bridge Muthuri (Cunningham)	1.91	2.61	4.89	11.85	4.39	1.45	1.51	0.48	1.44	4.64	2.78	1.53	39.48	3	46.18 (1917)	29.91 (1918)
7	Chania Chania Bridge (Henderson)	1.59	2.37	4.42	9.42	4.12	1.57	0.90	0.81	0.96	2.78	6.04	2.12	37.10	9	50.71 (1912)	28.19 (1918)
128	Thika Magogini Estate(Oulton)	0.00	1.55	5.96	9.01	1.51	0.12	0.42	1.04	0.40	4.43	6.39	3.53	34.36	2	35.03 (1916)	33.68 (1919)
126	Thika Nanga (Trotter)	2.18	1.69	5.34	8.80	4.49	2.91	0.10	0.73	0.89	3.05	5.70	1.69	35.57	6	42.06 (1914)	28.04 (1919)
125	Thika N'Durugu (Lindsay)	1.46	1.05	4.72	9.68	4.59	1.84	1.42	0.62	1.62	3.66	4.89	1.92	37.47	6	42.60 (1914)	30.12 (1918)
178	Chania Kabuku (Focks)	2.19	1.41	3.95	10.38	4.51	2.22	0.64	0.47	1.04	3.26	4.81	2.26	35.14	4	41.35 (1917)	25.88 (1918)
181	Donyo Sabuk Maindoindeni (Clay)	2.36	0.53	1.83	12.46	4.54	0.57	0.30	0.15	0.71	2.20	7.35	5.41	36.41	2	43.51 (1916)	29.32 (1918)
15	Fort Hall District Office	1.46	2.26	4.88	12.85	6.33	1.70	0.92	0.83	1.03	4.83	7.82	2.86	47.77	19	60.52 (1912)	35.95 (1918)
105	Nyeri District Office	1.31	1.90	2.49	8.14	7.27	1.57	1.37	1.54	1.00	3.09	4.24	2.46	36.38	16	52.04 (1917)	26.88 (1914)
172	Nyeri Muringate	0.91	3.32	1.65	7.77	6.92	2.14	1.06	1.35	2.21	1.89	3.44	2.40	34.67	2	39.14 (1916)	30.21 (1918
106	Nyeri Tumu Tumu	0.47	2.59	2.58	12.14	6.04	1.24	1.54	0.70	1.50	3.50	4.89	2.76	39.95	4	43.90 (1916)	29.80 (1918
142	West Kenya Esparanza Farm	1.74	1.44	3.02	4.32	2.39	1.14	0.79	1.99	1.61	2.42	2.19	2.05	23.18	5	34.75 (1917)	17.81 (1918
145	West Kenya Narro Moru	1.74	2.62	5.94	7.31	4.81	2½23	0.82	1.61	1.04	3.25	3.85	1.59	41.81	4	46.10 (1917)	32.43 (1918
43	West Kenya Forest Station	1.94	2.09	3.87	9.18	4.36	3.16	1.84	1.79	2.08	2.72	7.77	3.23	35.02	8	54.34 (1917)	21.92 (1911

522

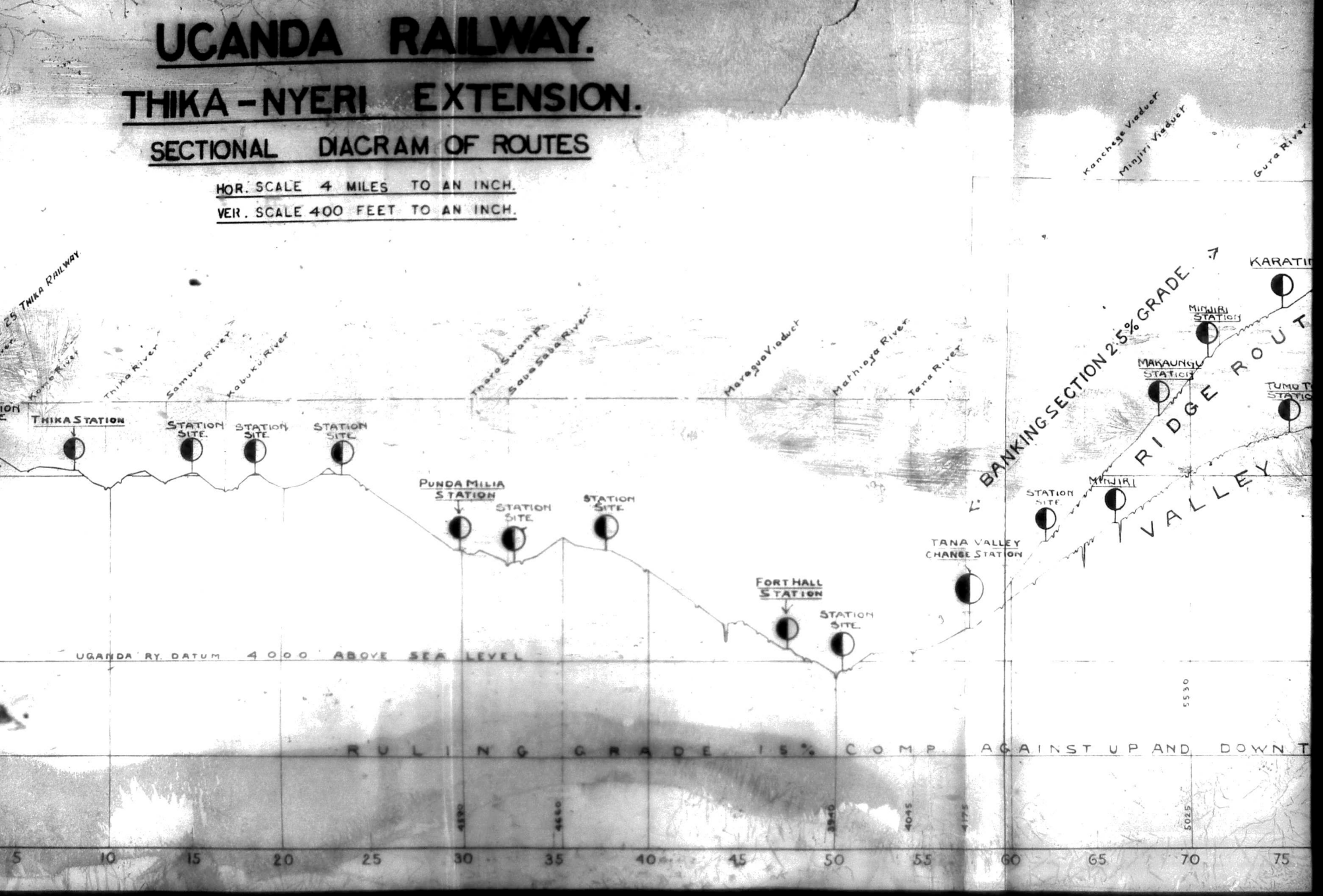
Enclosures of

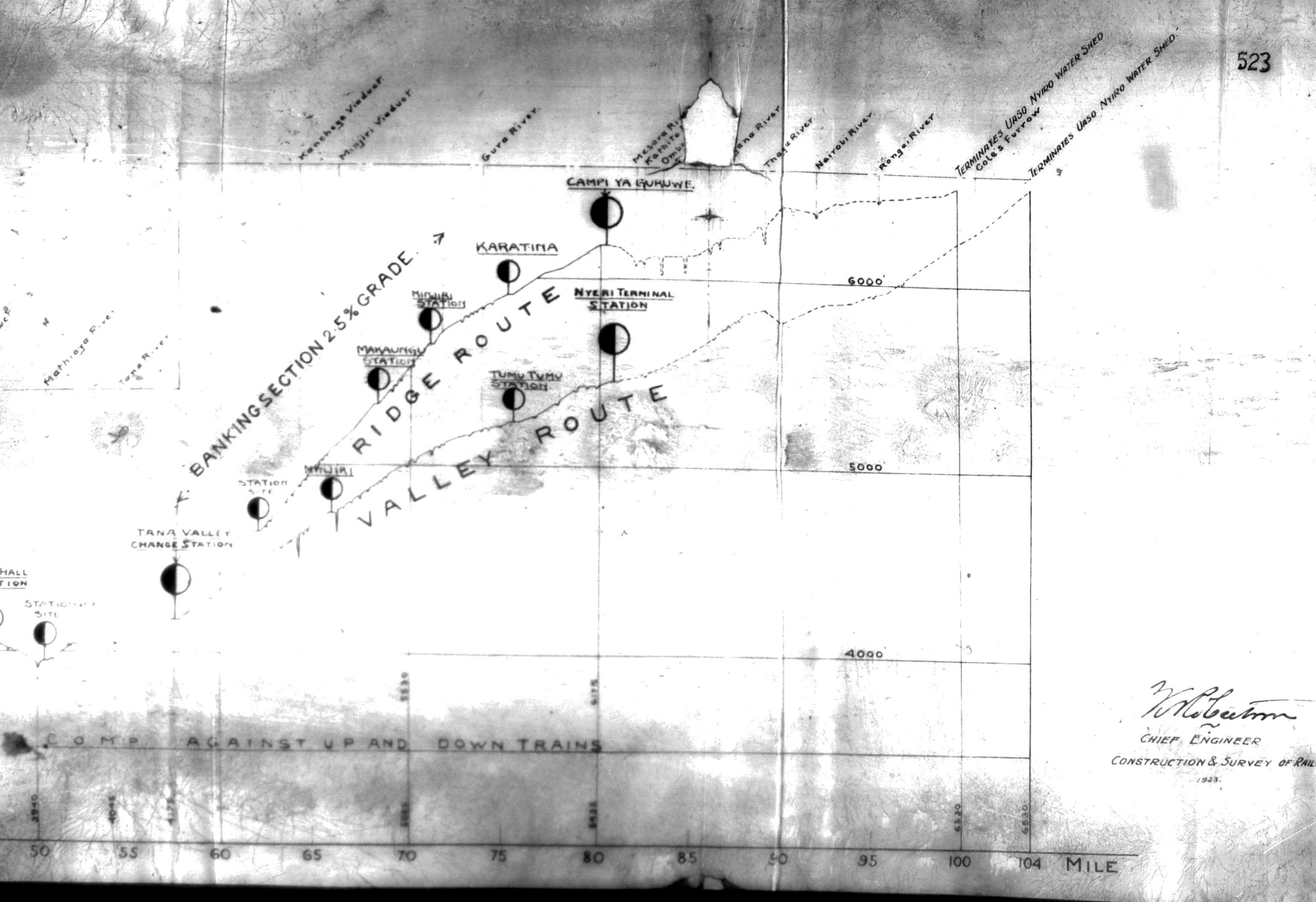
UGANDA RAILWAY.

THIKA - NYERI EXTENSION.

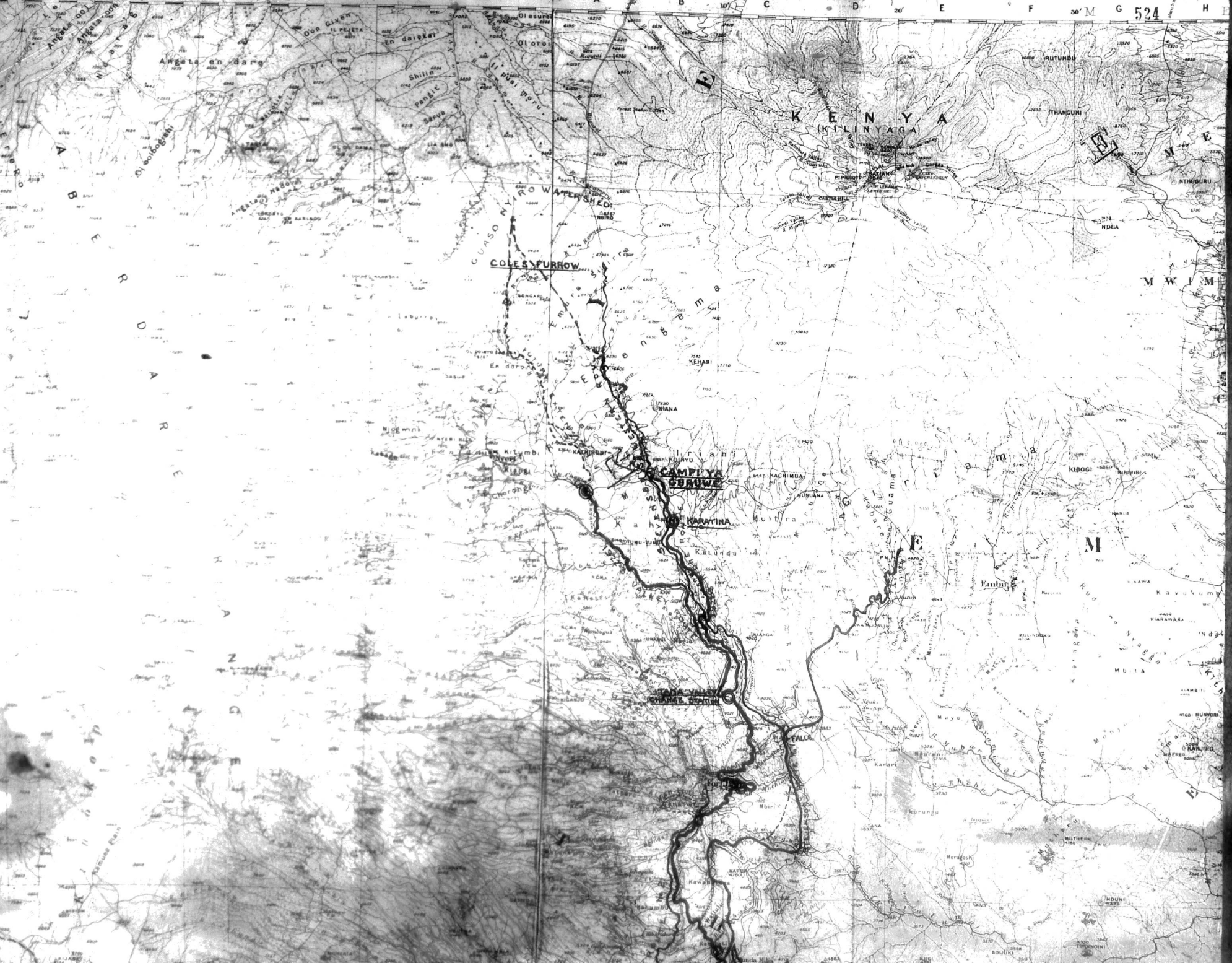
SECTIONAL DIAGRAM OF ROUTES

HOR. SCALE 4 MILES TO AN INCH.
VER. SCALE 400 FEET TO AN INCH.

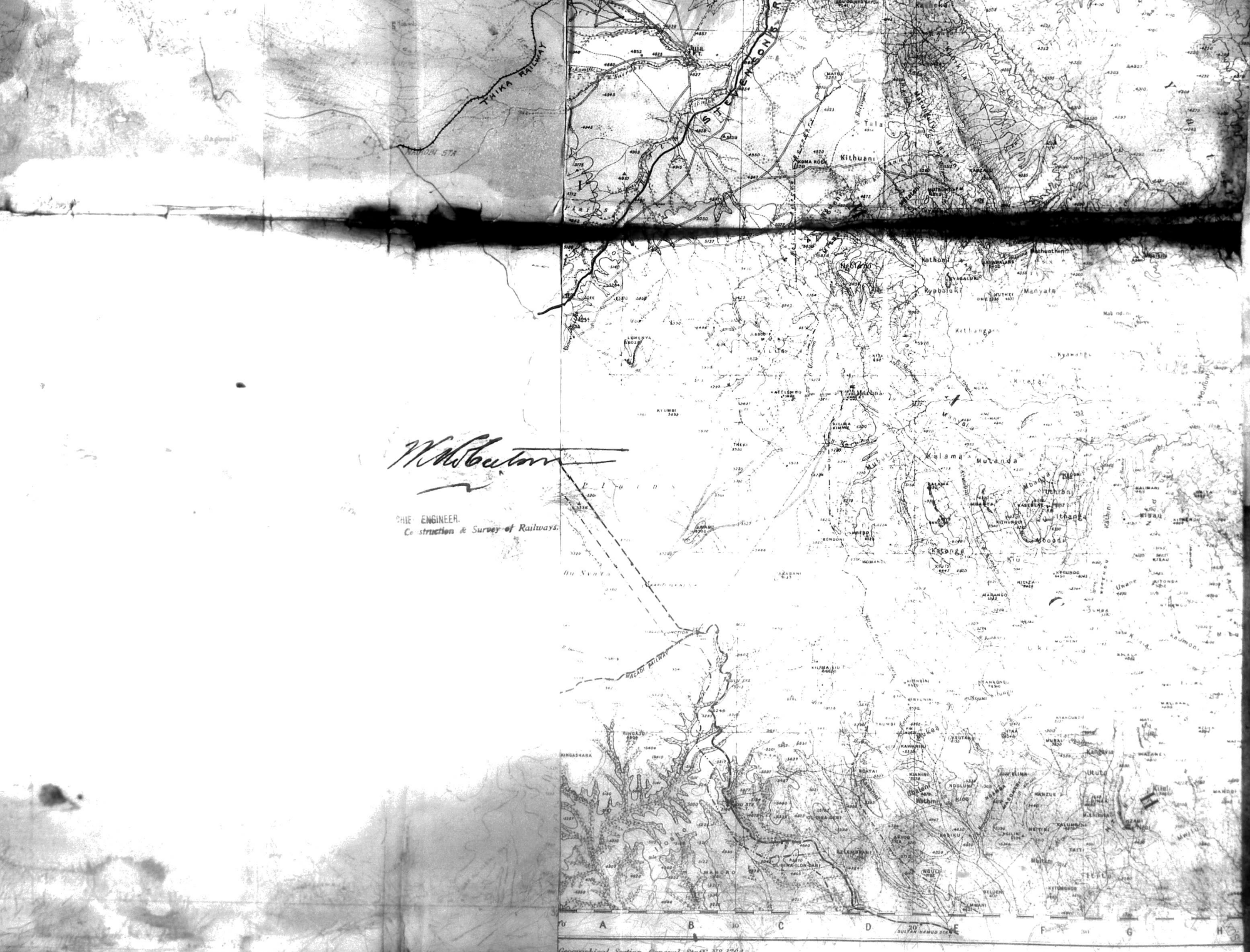




W. R. Beattie
CHIEF ENGINEER
CONSTRUCTION & SURVEY OF RAIL
1923.


KENYA
(KILINYAGA)
COLES FURROW
CAMPI YA
GORUWE
KARATINA
FALLS
Angata en darg
Angata en dare
Oloibogeshi
Ol oroi
En daleka
Shilin
Ol dama
Ol bolossat
Ol doinyo Lengai
En dorora
Kitumbi
Kiboko
Kahuhia
Kaheiti
Kaluadu
Muthara
Kiawa
Embu
Kavukuma
Kiarawara
Mbiria
Kiambiti
Kanjiro
Kiburungu
Mutheru
Ndune
Twinoini
Boulini
Kibogi
Nthuburu
Ndua
Rutundu
Ithanguni
Kehari
Niana
Kahuro
Kahuhia
Kaheiti
Kaluadu
Muthara
Kiawa
Embu
Kavukuma
Kiarawara
Mbiria
Kiambiti
Kanjiro
Kiburungu
Mutheru
Ndune
Twinoini
Boulini
Kibogi
Nthuburu
Ndua
Rutundu
Ithanguni
Kehari
Niana


NEW HAMPS ROUTE
THIKA STATION
MILES 25 FROM NAIROBI
THIKA RAILWAY
STEVENSONS ROUTE
Kidong Valley
Kawa Mbui
Kawa Nguu
Kathekа
Tala
Kilhuani
Kathuni
Nairobi
Kyampiluk
Kalama
Mutanda
Kisau
Kiu
Kitonga
Ou-Nyaya
CHIEF ENGINEER.
Construction & Survey of Railways.



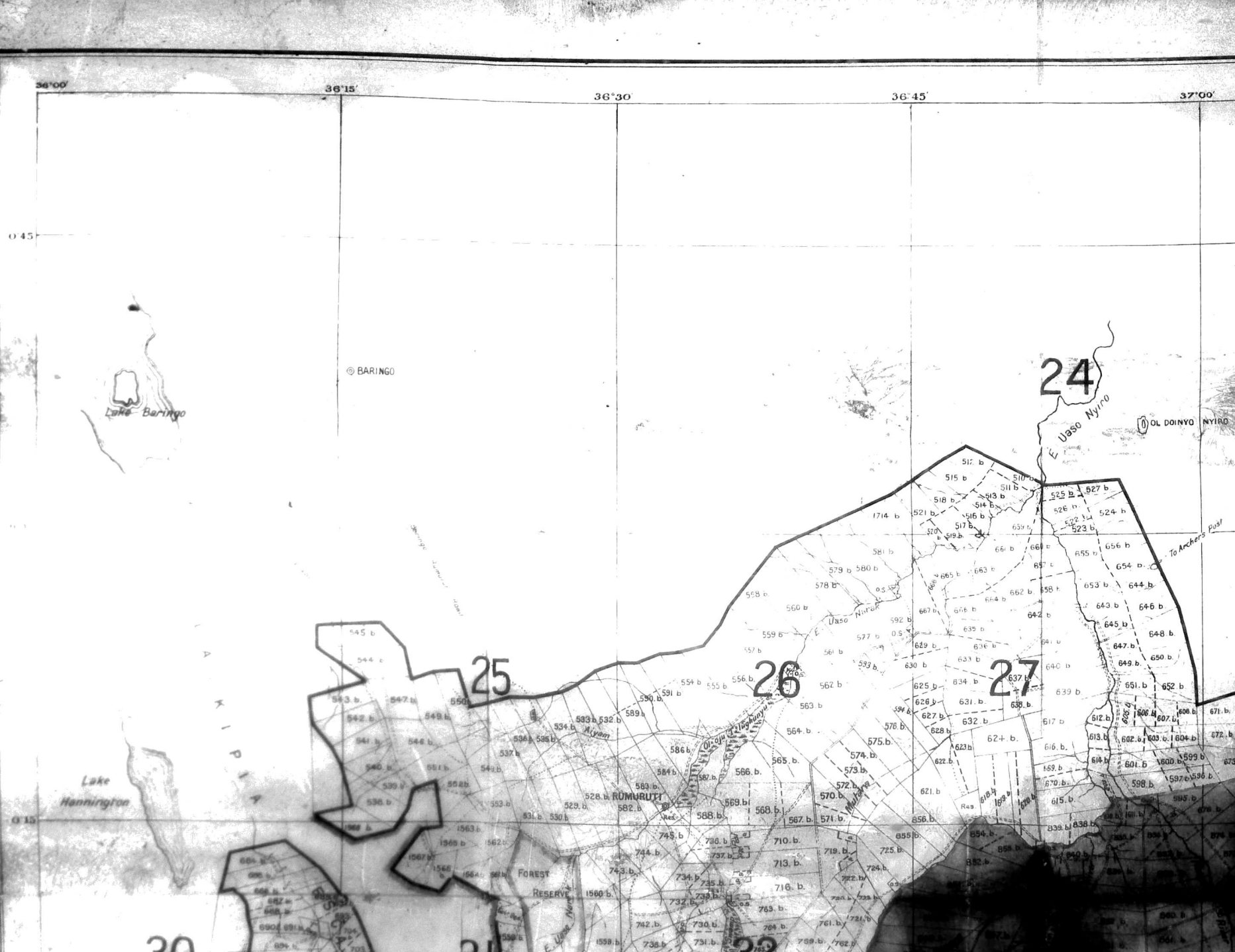
CHIEF ENGINEER.
Construction & Survey of Railways.

Geographical Section, General Staff, N° 1764

Scale 1 Inch to 3·95 Miles
or 1:014 Inches to 4 Miles

Enclosures of .....


36°15'
36°30'
36°45'
37°00'
BARINGO
Lake Baringo
Ol Arabel
E. Uaso Nyiro
OL DOINYO NYIRO
To Archers Post
LAIKIPIA
24
25
26
27
28
30
31
32
34
LAND
K
Showing
Miles 4 2
1. This Plan is i
numbers of
2. The general b
3. The catalogue
(Scale 1: 62.
boundaries.
4. The large num
mentioned l
5. The class "B
6. The class "A
7. Unsurveyed ar


36°00'
36°15'
36°30'
36°45'
37°00'
0°45'
0°15'
BARINGO
Lake Baringo
Lake Hannington
OL DOINYO NYIRO
E. Uaso Nyiro
To Archers Post
RUMURUTI
FOREST RESERVE
24
25
26
27
30

37°00' 37°15' 37°30' 37°45'

0°45'

0°30'

0°15'

EAST AFRICA PROTECTORATE.

LAND SETTLEMENT SCHEME

For Ex-Service Men and Women.

KEY PLAN No. 2

Showing the general locality of blocks available for allotment.

Scale :—1 : 253,440 or 4 Miles to 1 Inch.

0 4 8 12 16 20 24 28 Miles

1. *This Plan is intended to serve as a Key Plan only, and to prevent confusion of outlines the catalogue numbers of the small "a" farms have been omitted.*
2. *The general boundaries of the blocks of land available for allotment have been outlined with heavy lines.*
3. *The catalogue numbers and approximate areas of all farms can be obtained from the large-scale sheets (Scale 1 : 62,500 or 1·014 Inches to 1 Mile), which also show details of the surveyed, or proposed boundaries.*
4. *The large numbers in middle of the 15-minute squares represent the reference numbers of the above-mentioned large-scale sheets.*
5. *The class "B" farms have been numbered thus, 677b., 907b.*
6. *The class "A" farms bear a small letter "a."*
7. *Unsurveyed and proposed farm boundaries shown thus - - - - -*

24

27

28

29

35

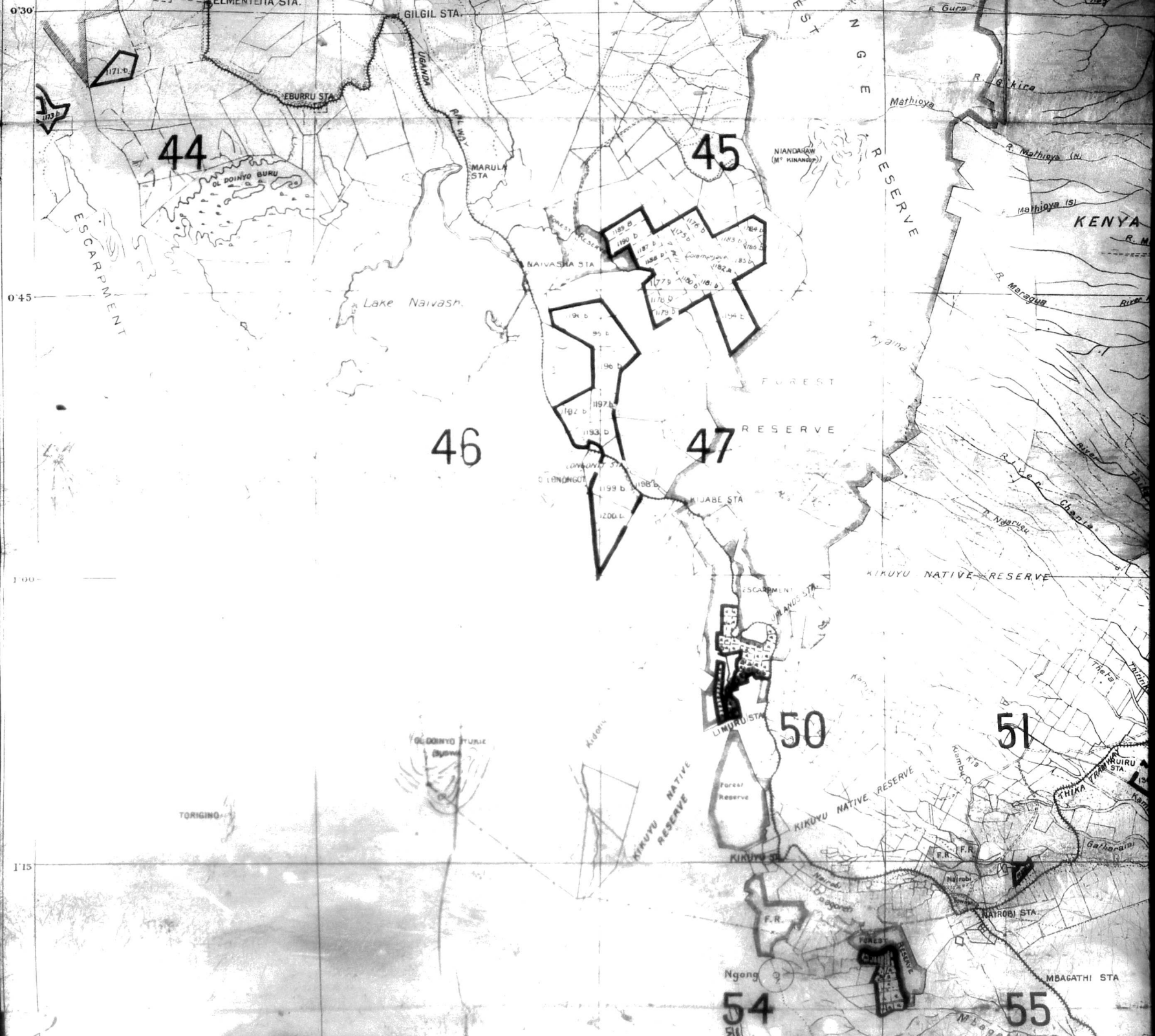
FOREST RESERVE

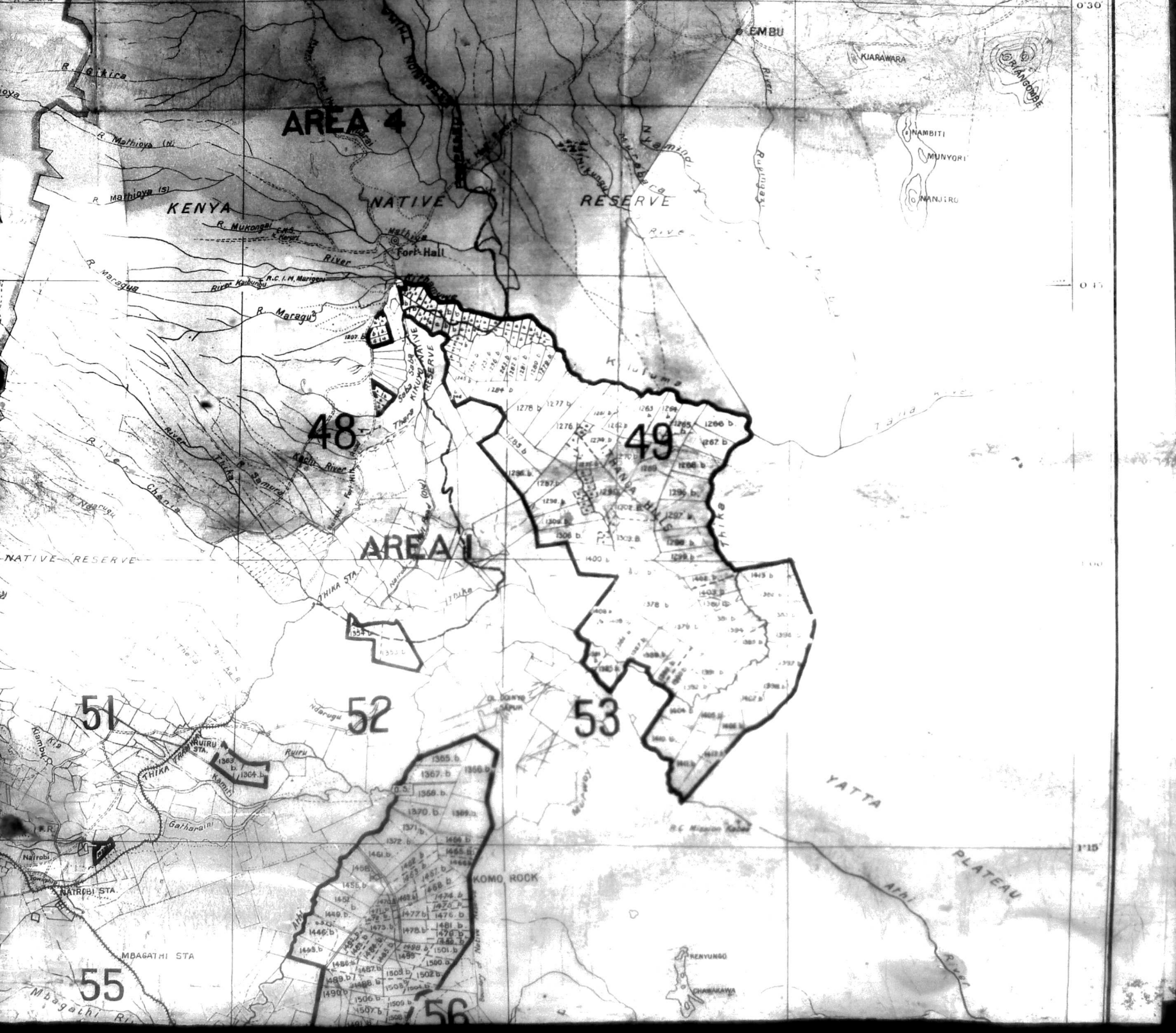
To Archers Post

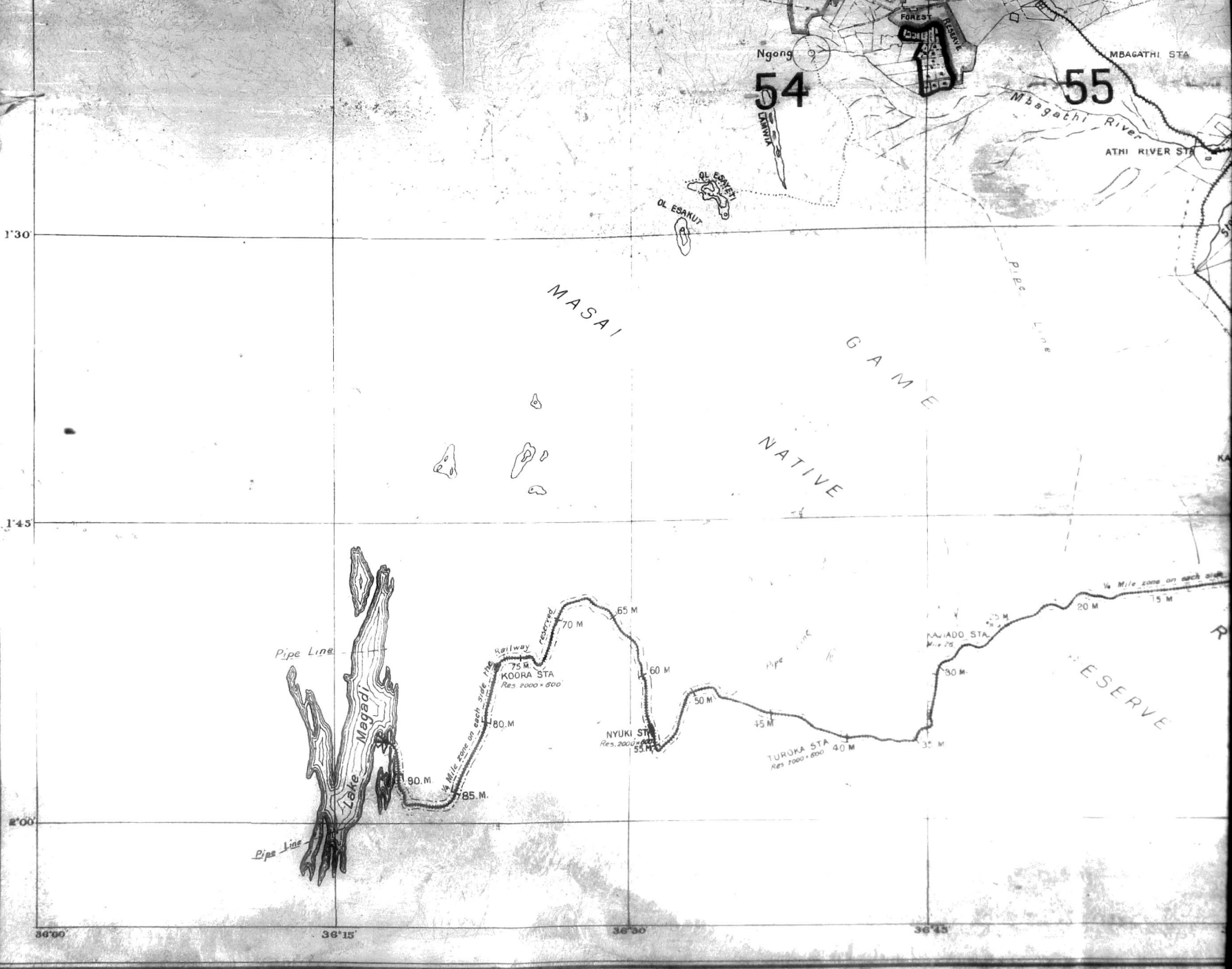
Sirolo


AREA 3
AREA 2
30
31
32
33
36
37
38
39
41
42
44
45
Lake Solai
Hannington
Lake Elmenteita
ELMENTEITA STA
GILGIL STA
EBURRU STA
NYERI
NIANDARAW
(Mt KINANGOP)
MARULA
FOREST RESERVE
ESCARPMENT
Engare Ngobit
River Kegumo
R. Gura
R. Gikira
Mathioya
R. Mathioya (N)

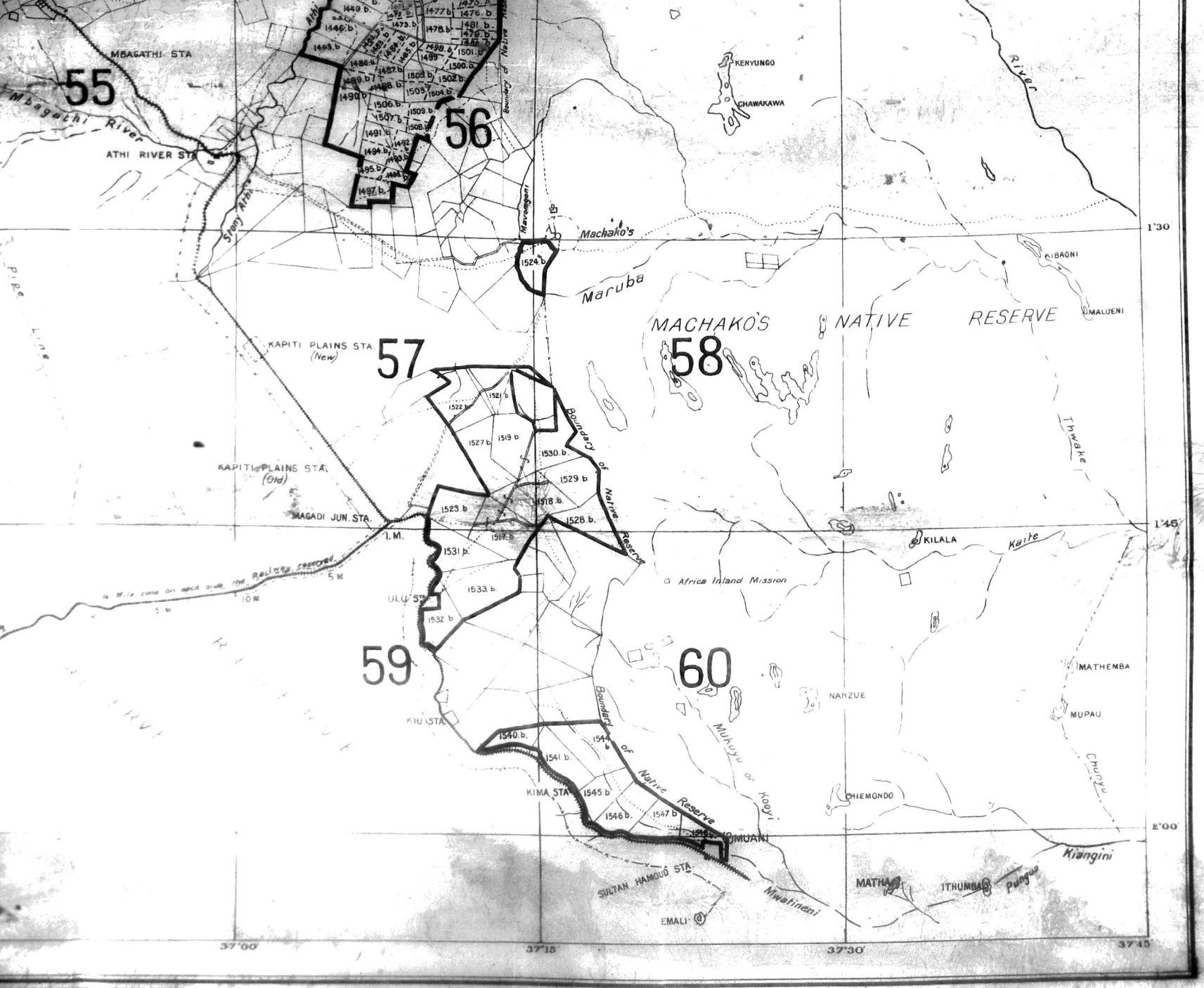

35
40
42
43
AREA 2
AREA 3
FOREST RESERVE
FOREST
MT KENYA
ITHANGUNI
NDUA
MERU
KIKAI
KIANGURU
NYERI
ARUKE
MARANGA
KANYUMBORI
EMBU
KIARAWARA
NAMBITI
Maranja
Siala
R. Kithegu
R. Ungai
R. Ingeru
R. Mutonga
R. Mara (N)
R. Nithi
R. Ena
R. Thiba
R. Gura
R. Mathioya
0°15'
0°00'
0°15'
0°30'


0°30'
0°45
1°00
1°15
GILGIL STA.
ELMENTEITA STA.
EBURRU STA.
UGANDA RAIL WAY
MARULA STA
OL DOINYO BURU
ESCARPMENT
NAIVASHA STA
Lake Naivasha
NIANDARAW (Mt KINANGOP)
R. Gura
R. Gukira
Mathioya
R. Mathioya (N)
Mathioya (S)
KENYA
R. Maragua
River
FOREST
RESERVE
RIJABE STA
R. Ngaruyu
River Chania
KIKUYU NATIVE RESERVE
LIMURU STA
KIKUYU STA
Forest Reserve
KIKUYU NATIVE RESERVE
KIKUYU NATIVE RESERVE
KIHIKA
F.R.
Nairobi
NAIROBI STA
MBAGATHI STA
TORIGINO
44
45
46
47
50
51
54
55


AREA 4
AREA 1
48
49
51
52
53
55
56
KENYA
NATIVE
RESERVE
EMBU
KIARAWARA
NAMBITI
MUNYORI
NANJIRU
Fort Hall
R. Mathioya (N)
R. Mathioya (S)
R. Mukongai
R. Maragua
River Kaburugu
R. Sagana
R. Ndarugu
R. Chania
Thika River
Kamiti River
THIKA STA.
RUIRU STA.
Ruiru
Gatharani
Nairobi
NAIROBI STA.
MBAGATHI STA.
Mbagathi Ri.
KOMO ROCK
YATTA
PLATEAU
Athi River
KENYUNGO
CHANAKAYA
KIRIMUKUYU RESERVE
0°30'
0°45'
1°00'
1°15'



WATERLOW & SONS LIMITED, LONDON WALL, LONDON



LOW & SONS LIMITED LONDON WALL LONDON