

1921

KENYA

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PER. 23 JUN 1921

GVERNOR NORTHEY

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DATE

23RD MAY 1921

CIRCULATION:—

SUBJECT

UASIN GISHU RAILWAY

Confirms his telegram No.267, Encloses Col. Robertson's final report on surveys with comments of Col. Hammond and Railway Manager. It will be seen both the latter agree line for extension should be by branch from main line at Nakuru.

Mr. Grindle

Sir H. Lambert

Mr H. Road

28/6/21

Sir G. Fiddes

Mr. Wood

Mr. Churchill

Previous Paper

LN

30584

MINUTES

Li H. Road

Good. Boyce is now agreed on the route Nakuru - Molo - Maja Majusi route. Col Robertson is now engaged in getting out a detailed estimate of the cost of construction of a railway by his route so far as Turbo - but not so far as Turbo in account of water. Some of our estimates have been made, such as estimate, etc. have been made.

Subsequent Paper

LN
33053

be allowed at with regard
to the building the railway
know. At Robertsonville,

I understand, submit his
estimate under two heads

A. Estimate of cost if railway
is built according to the same
standard as the Legarda Railway

B. Possible economies if it
is done for financial reasons
to cut down the cost of
construction to the barest
minimum.

At Robertsonville some
of the financial difficulties.

as to present time,

and a few concerns

are being done yesterday

that the other matter is sufficient

has a plan recently sent to him

that if the fact were in
 any difficulty as to finding
 the money at the present
 time, he got to know that
 many she remained open
 I promised that I would
 report what he said —
 lot of course, even though
 the acceptance of the National
 Property for a part solves the
 immediate financial difficulty
 of finding the capital,
 the difficulty of finding the
 interest in future years will
 remain just the same
 And the John Nat. Property
 would be double what he
 for me to say, and would
 probably hedge the loan
 raised with the interest tax

A

he should have first
of any further railway
construction that there may
be some later or some
similar condition

The immediate step
is to have a copy of the
plans, 30534 & 29257
to be for the same for
L.S.

Report (cont)
in orig. in a
out

MS

28 11 27.
I should like to see if all
that is necessary to have received
to the north of the line to
financial assistance

J. J. G.
28 11 27

P. do I
to the present state we must
be careful not to have liabilities
at all small, make the way through
response in comments on 5th July
for 1927. in a fresh step
A. L. G. P. 20/6

30611
20 JUN 21

23rd May, 1921.

Sir,

With reference to my despatch No. 611 of May 4th on the subject of the Uasin Gishu Extension of the Uganda Railway, I have the honour to confirm my telegram No. 267 of May 22nd:

Reference despatch 611 of 4th May, Uasin Gishu Extension. Final Report and recommendations received. Robertson and de Vries will explain plans fully to you.

After most careful surveys and consideration of alternative Routes, he advises adoption of line from Nakuru following the old Survey of 1915 as far as about mile thirty four thence by chord line further West which avoids much of the very heavy work of the old survey rejoining old survey at mile 10. This chord line will cost less than old survey, maintain a maximum gradient of 1.8 per cent and serves more productive country than the old survey alternative. The new route is a station called a Branch Line to the Valley, the construction of present line from Nakuru to the station will have cost about the same to the line now proposed.

RIGHT HONOURABLE

WILSTON CHURCHILL, F.R.S., M.P.,

SECRETARY OF STATE FOR COLONIES,

DOWNING STREET, LONDON, W. C.

" proposed from Makuru will cost to same point. Estimated tonnage of increased traffic by present proposal exceeds Lau Summit scheme, increases Government Land values, will cost less to work, bring larger earnings - the better for supply of wood fuel.

The original survey between miles 55 and 60 proves to be thoroughly bad and too expensive, the Lau Summit scheme was better than that but the new proposal is best of all. Construction will take three years with maintained labour supply of ten thousand. Survey has cost £24,510. Liberal estimate of total cost for proposed line is £2,171,941, but probably less. With unanimous concurrence of the Executive Council I recommend adoption of Robertson's proposals and that so soon as Horton's contract for construction of earth works is signed. Robertson agrees not necessary submit his report to England before commencing preliminary operations, realisation of land etc., and that I shall file your authority to proceed. In fact the work has already begun and will soon begin to give employment to the Colony. With a view to work employment of Europeans in contracts and of local police and to natives to whom they are giving work and employment.

Yours faithfully,
 Sir John Lubbock

1891

" proposed from Makuru will cost to same point. Estimated tonnage of increased traffic by present proposal exceeds Mau Summit scheme, increases Government Land values, will cost less to work, bring larger earnings and be better for supply of wood fuel.

The original survey between miles 55 and 60 proves to be thoroughly bad and too expensive, the Mau Summit scheme was better than that but the new proposal is best of all. Construction will take three years with maintained labour supply of ten thousand. Survey has cost £24,510. Liberal estimate of total cost for proposed line is £2,171,941, but probably less. With unanimous concurrence of my Executive Council I recommend adoption of Robertson's proposals and that so soon as Norton Griffiths signs contract construction of earth works may begin. Robertson agrees not necessary await his report in England before commencing preliminary arrangements, organisation of labour etc., for which I should like your authority by cable. Publication of fact that line is approved and work will soon begin will give great encouragement to whole Colony, with prospect of early employment to Europeans on contracts, sale of local produce etc., and to natives many of whom now crying out for work and cannot find it.

Should there be any fear that loan will not be subscribed -

• subscribed Merton Griffiths is ready to find the capital. The question of this Railway has hung fire for so many years, the slump in markets is having such depressing effect that I trust you will see your way to let me make early announcement that the plans are at last settled and we can get to work without further delay. Colonel Hammond and General Manager Uganda Railway agree."

2. I forward herewith Colonel Robertson's final report on the surveys of the new line together with comments thereon by the General Manager and Colonel Hammond.

3. You will see as I stated in my telegram, that both the latter while questioning some of Colonel Robertson's figures are in complete agreement as to his final recommendation that the line to be selected for the extension shall be the new survey branching from the main line at Nakuru.

I have the honour to be,

Sir,

Your humble, obedient servant,

Edward Mackay

GOVERNOR.

Comments on Report of the Chief Engineer Surveys on the UASIN GISHU RAILWAY EXTENSION.

1. Colonel Robertson has put up a case for the adoption of Nakuru as the starting place of this new Railway, but he cannot get away from the fact that this Route means 25.20 Miles of extra Construction -

Nakuru to Junction	-	53.67 Miles
Mau to Junction	-	10.73 Miles
(Saving	-	42.98 Miles
Less 20.75 Miles from Nakuru to the Molo Valley		
	(-)	20.75 Miles
Net Saving	-	22.20 Miles.

the estimated costs being -

Nakuru to Junction	-	£ 798,091.
53.67 Miles		
Mau to Junction	£203,923	
Nakuru to Molo River.	£245,118.	£ 449,041
Showing a saving of	-	£ 349,050.

2. Against this saving must be put the cost of re-aligning the Main Line, see Pages 6 & 7 of the Report

	-	£ 41,711
Giving a Net Saving of	-	£307,339

Two other items are also referred to as balancing this saving, viz.

- (4) The construction of a Fuel Siding to Mount Blackett
- (5) Track Reconstruction - Nakuru to Mau - 42 Miles.

3. As regards item No. 4, it has been contemplated for a considerable time to put in this Fuel Siding for the requirements of the Main Line, and I, therefore, do not consider it a fair charge against the New Line. The Report does not make it clear that there is no Fuel available at the Junction, 10.73 Miles from Mau or beyond.

4. I cannot follow the reasoning for reconstructing the track between Nakuru and Mau, estimated to cost £274,128. The intention is evidently to provide heavy locomotives on an 80 lb. rail, but as the gradient with the traffic is the same as is found elsewhere on the Extension this proposal seems unnecessary.

5. But it may be necessary to put in extra Stations and thereby increase the carrying capacity of the Section by increasing the number of daily trains.

6. In Pages 13 and 16 the earning power of the Alternative Routes are discussed, and no Timber Traffic is given to the Mau Route, although at present a considerable Traffic in this commodity is handled at Mau Station, and as the Mau Route includes the Branch to the Mole River I think it would be safe to say that Timber would also find its way to this Branch, even if it meant the E.S.M. Company laying their own track. Therefore, the balance as quoted in favour of the Nakuru Route is not justified, and if the amount allowed for Timber be deleted the balance in favour only amounts in the third year to £107.

7. The advantages shown on Page 16 would now read:-

(1) Increased Revenue	£.
(2) Reduction in Train Mile Charges	197
(3) Saving in operating 2% Grades	5,659
(4) Saving in cost of operating Branch Line	3,141
	<u>£ 1,000</u>
Less	£ 8,907

Interest on saving of £807,339 on Capital Cost at 2 1/2%

£ 26,124

Additional for Maintenance Charges

£ 1,108

£ 27,232

Annual Saving in favour of Mau Route - £18,823.

8. The Report does not touch on the increased development and the Traffic to be got from that development if the Mole Valley Railway was continued 10 to 15 Miles further down the Valley, making this Branch 35 Miles from Nakuru; doubtless such a Branch will have to be built, but meanwhile having a Railway some 15 to 20 Miles nearer than at present is some considerable assistance.

9. Now for the other side of the question. By finding a New Route and thereby saving the very heavy work between Miles 48 and 80 the position is very much altered. It was originally expected that the Mau Route would show a saving in the neighbourhood of £225,000, less the cost of the Branch - Nakuru to Mole - estimated now at £245,118, giving a net saving of about £680,000, whereas the saving according to my figures will only be £807,339 in Capital Cost and an Annual Saving of £18,823, but the Annual Saving will lessen year by year and will disappear as the Traffic increases, until eventually the balance will be on the other side.

10. Operating Expenses are one of the most important points to be considered as they continue as long as the Line is kept open, and although the Main-Line has only 2% on the up journey it will increase the cost of operating, and as this Line will in all probability be the Main Route into Uganda or the Sudan and this, in conjunction with the large saving due to the new alignment, makes me in favour of Nakuru as the starting point.

Handwritten signature and scribbles

3
SCA/364/7

Estabbs.

15th May, 1921. 347

Sir,

I have the honour to forward herewith my comments on the Report on the Usain Sishu Extension.

These comments are limited chiefly to the main issues raised by the consideration of the alternative Routes because otherwise I am in complete agreement with the recommendations contained in the able report drawn up by Lieut. Col. Robertson. On this issue, although in general agreement as to the route which should be followed, I cannot agree with certain of the financial conclusions drawn by him.

Traffic
Route.

The first item to which I would draw attention is the probable traffic in timber by the ^{Route} ~~the~~ Map vide pages 11, 13 and 14 of the report. Col. Robertson makes no allowance for any timber traffic by this route whatever on the grounds that it could only be gained to the Map Route by the construction of branch railways and feeder roads which would be a charge on the community and increase the selling price of the products. The distance from the Equator Saw Mills concession is only 10 miles and though I agree that the construction of such a branch would increase the costs of production it is unreasonable to assume that no timber traffic at all would pass. It is difficult to assess in terms of freight exactly what diminution in output would be caused but as an approximation it may be assumed that ^{the} Map route would at 3

Excellency The Governor,
Colony & Protectorate Of Kenya,
Nairobi.

years after completion of the line carry 50% more timber than the Man route and 33% more at 10 years. This is an ample allowance in favour of the former. Taking the amended figures for timber output as quoted on page 40 the Makuru Route after 10 years will carry 33,000 instead of the 30,000 quoted on page 11 and therefore the Man Route would carry 24,750.

ate of
tonnage.

Applying these amended timber figures to the figures for traffic on pages 8 and 11, after 10 years the Makuru-Ravine section of the Makuru Route would carry at the same period a down tonnage of 94,000 \div 3,000 = 97,000 approximately, the Mole Branch 61,900 vide pages 8 and 9, and the Man-Ravine section of the Man Route 24,750 tons.

The down tonnage over the whole Makuru route is estimated, vide page 40, at 124,700 tons per year after 10 years; deducting the 97,000 tons gained from the Makuru-Ravine section gives 27,700 as the down tonnage from the Ravine-Turbo section which is the same for both schemes.

We then get total down tonnage as follows:-

Makuru Route 124,700.
 Man Route (a) Mole Branch 61,900.
 (b) Man-Turbo 27,700 + 24,750
 = 112,450.

ng
ses.

Turning to the question of operating expenses Col. Robertson assumes an average of 2 trains per day over throughout both routes; while this would suffice, assuming one pair of passenger trains a day for the Mole Branch, it would be quite inadequate to handle the traffic over the other branches, as shown above.

In consequence it gives incorrect figures for the train mileage as will be seen below where I have worked out the approximate train mileage from the tonnages shown above. In doing so I have used wherever possible the same factors and unit-costs as Col. Robertson. I would remark, however, as regards up-tonnage that the Committee on the Economic Survey have estimated only 40,000 tons upwards as against 104,700 down; this appears to me a very low figure when it is borne in mind that the up and down traffic on the Uganda Railway are nearly balanced and I prefer to take a proportion of 1 to 3 which would make an up-tonnage of 61,600 on the Nakuru Route 20,600 on the Mole Branch and 24,150 on the Mau Route. As it turns out this does not make any material difference to the train mileage figures as the down tonnage is so much in excess.

Tabulating the tonnage gives the following:-

Nakuru Route

- (a) From Nakuru - Mole section.

Down traffic 1½% grade 61,900 tons mileage 20

Up traffic 1½% grade 20,600 tons mileage 20

- (b) From Mole - Ravine section

Down traffic 1½% grade 122,800 tons mileage 53.67

Up traffic 1½% grade 41,000 tons mileage 53.67

Mau Route.

- (a) From Mole Branch

Same as (a) above.

- (d) From Nakuru - Mau section

Down traffic 1½% grade 112,450 tons mileage 42

Up traffic 2% grade 34,150 tons mileage 42.

(a) From Mani - Ravine section.

Down traffic 1 1/2% grade 112,450 tons mileage 11.

Up traffic 1 1/2% grade 34,150 tons mileage 11.

Allowing average load of 7 tons per 10 ton truck, 5 tons tare for the same and train-loads of 201 tons gross on a 2% grade and 302 tons on 1 1/2% grade, which are the loads of G. class engines, the standard locomotive on the Uganda Railway, we arrive at gross tonnage, and trains per year as follows:-

Nakuru Route.

Nakuru - Hole section.

Down traffic, 106,116 gross tons = 352 trains per year } 352 pairs of
Up traffic, 28,318 " " = 117 " " } trains per year.

Hole - Ravine section.

Down traffic, 210,516 gross tons = 696 trains per year } 700 pairs of
Up " 70,084 " " = 233 " " } trains per year.

Mani Route.

Hole Branch

Same as (a) above. 352 pairs of trains per year

Nakuru-Mani section.

Down traffic, 192,700 gross tons = 639 trains per year } 639 pairs of
Up " 58,548 " " = 202 " " } trains per year.

Mani - Ravine section.

Down traffic, 192,700 gross tons = 639 trains per year } 639 pairs of
Up " 58,548 " " = 202 " " } trains per year.

each of the above must be added one train a day each way for passengers,

Nakuru Route will then have

$$352 \times 20 \times 2 = 14,080 \text{ train miles per year.}$$

$$(700 + 355) \times 53.67 \times 2 = \frac{113,898}{127,978} \text{ train miles per year.}$$

the Mani Route.

$$(352 + 355) \times 20 \text{ miles} \times 2 = 28,080 \text{ train miles per year.}$$

$$(639 + 355) \times 53 \times 2 = \frac{106,424}{135,104}$$

an excess of train mileage per year on the Mani Route of 7,126.

Taking the same cost of 3 florins per train mile as in the report this gives a balance in favour of operating of the Nakuru Route of £ 1,428. I recognise that the train mileage basis is in the same respect not very suitable for calculating costs of this nature but have followed it as that adopted by Col. Robertson.

As regards the other heads of expenditure I am not aware from what figures Col. Robertson has calculated his charge of additional operating expenses due to 2% instead of 1% grades against up traffic for 42 miles, but I am inclined to think it is an underestimate. The train mileage figures above do not reflect this cost properly as the down tonnage is so far in excess of the up. The figure I would prefer would be more in the neighbourhood of £ 3,500.

The same remark applies to the figures of £ 1,108 for extra cost of maintenance due to the extra length of line to be maintained by the Nakuru Route as I do not know from what figure Col. Robertson has arrived at the estimate. Taking the Uganda Railway Report for 1919 - 20 the following would appear fair charges:

(I) 5	Subordinate superintendence	Fls. 198.71	per mile
A II	Maintenance and Renewal of Permanent way	768.87	line open
IV 2	" " " " stations and Buildings (stations only)	43.37	
V 9	Road making and bush clearing	77.66	
		<u>Fls. 1,108.61</u>	

which for 20 miles gives a charge of £ 2,216 per year. The estimate of £1,000 for extra charges incidental to branch line working appears reasonable especially ^{as} the junction stations, Mau and Nakuru, would be required.

On the other hand Col. Robertson makes no allowance for the staff of the extra stations which would be entailed by the extra 20 odd miles of line. Two stations at about £ 350 each give an annual figure of £ 700.

Reconstructing the comparative table of annual operating and maintenance costs given on page 13 on the above lines, the following results would appear.

Head of Charge.	Man Route	Nakuru Route.
Extra running charges for trains.	1,428	
Additional for heavy grades.	3,800	
Additional for extra maintenance.		2,580
Additional for extra cost of branch working.	1,000	
Additional for cost of 2 extra stations.		700
	5,228	3,280

of a balance in favour of the Nakuru Route of £2,678 per year as against the estimate in the report of £ 7,694.

Similarly in his table of comparison of earning power, Col. Robertson, again assumes no timber traffic on the Man Route; assuming the same proportion as I have done earlier, the Man Route would obtain an additional Fls. 67 00 from this source and the balance in favour of the Nakuru Route in earnings, vide page 13, would be reduced to £ 9,276 - 6,780 = £ 2,526 per annum instead of £ 9,276.

As regards the relative capital expenditure I quite agree that the enhanced value of the land which reverts to Government in 37 years should be placed to the credit of the Nakuru scheme as well as the cost of the

fuel siding to Mount Blackett and the realignment of the Uganda Railway between Nan and Nakuru to give 1 1/2% instead of 2% grades against down traffic.

On the other hand I do not consider it fair to charge up the whole of the track reconstruction of that section to take an 80 lb. rail. In considering this question it is important to remember what is likely to be the future of the main line north from Nakuru and of the new extension.

The distance from Turco to Jinja is only about ¹⁵⁰ 200 miles and eventually and probably at no distant date there will be a strong demand to extend to the Nile in that vicinity. In fact that demand may be anticipated as soon as the present extension is finished. It would not therefore be unfair to assume that within 7 to 9 years from date the main Uganda traffic will pass over this extension.

The present rails on the Nan - Nakuru section are estimated to have a further 15 years' life under an average of 4 pairs of trains a day. If the Nakuru Route is not carrying the bulk of the Uganda traffic by that date the Nan - Nakuru section will have to be relaid with heavier rails. If the bulk of that traffic is diverted by that route, it is quite probable that 80 lb. rail will suffice for the traffic originating on the main line between Nakuru and Kisumu and the southern and eastern lake ports. If the Nan Route is adopted, 80 lb. rails will most certainly have to be laid and at a much earlier date than 15 years. I think it is quite fair to credit the Nakuru Route with the saving due to a heavier rail not being required but not with the whole cost of relaying, merely with a certain proportion of the cost because it will delay the necessity for renewal; in other words the

fuel siding to Mount Blackett and the realignment of the Uganda Railway between Nan and Nakuru to give 1 1/2% instead of 2% grades against down traffic.

On the other hand I do not consider it fair to charge up the whole of the track reconstruction of that section to take an 80 lb. rail. In considering this question it is important to remember what is likely to be the future of the main line north from Nakuru and of the new extension.

The distance from Turbo to Jinja is only about ¹⁵⁰ ~~200~~ miles and eventually and probably at no distant date there will be a strong demand to extend to the Nile in that vicinity. In fact that demand may be anticipated as soon as the present extension is finished. It would not therefore be unfair to assume that within 7 to 9 years from date the main Uganda traffic will pass over this extension.

The present rails on the Nan - Nakuru section are estimated to have a further 15 years' life under an average of 4 pairs of trains a day. If the Nakuru Route is not carrying the bulk of the Uganda traffic by that date the Nan - Nakuru section will have to be relaid with heavier rails. If the bulk of that traffic is diverted by that route, it is quite probable that 80 lb. rail will suffice for the traffic originating on the main line between Nakuru and Kisumu and the southern and eastern lake ports. If the Nan Route is adopted, 80 lb. rails will most certainly have to be laid and at a much earlier date than 15 years. I think it is quite fair to credit the Nakuru Route with the saving due to a heavier rail not being required but not with the whole cost of relaying; merely with a certain proportion of the cost because it will delay the necessity for renewal; in other words the

- 3 -

adoption of the Nakuru Route will not do away with the necessity of relaying; it will merely delay it and it may avoid the necessity of using heavier rail on this section when the time comes to relay.

354

To get a fair proportion of the charge of relaying with 80 lb. rail which should be credited to the Nakuru Route let us assume that the bulk of the Uganda traffic passes over the Usain Gishu Plateau after 8 years from the present date. If the Nakuru Route is adopted for these 8 years 4 pairs of trains for the main line between Nakuru and Kisumu and for Uganda traffic will run over this section using up so to speak half the remaining life of the rails. After that an average of 1 train a day each way over this section should suffice and the rails might be assumed to have a further 16 years' life under this reduced traffic or a ^{total} life of 24 years from the present date. If the Mau Route is adopted, for the first 8 years traffic will be 4 pairs of trains to Kisumu plus 2 pairs of trains a day for the branch or six pairs of trains a day which would reduce the life of the rails to 16 years. Thus the relaying would be delayed by 14 years. I recognize that this is a rough and ready method of assuming what the difference will be and by no means accurate; still in a matter where only rough estimates can be made it affords a line to judge the respective merits. It would seem therefore fair to credit the Nakuru route with (a) the difference between the cost of relaying with 80 lb rail and the cost of relaying with 50 lb. and (b) half the cost of relaying with 50 lb. rail.

Taking the figures given in Appendix I assuming that 50 lb. track costs 2/6 of 80 lb.

of rails, sleepers, fish plate, fish bolts, steel keys, freight and insurance amounts to $\frac{1}{2}$ of £ 5,535 - 2 - 0 = £ 2,762 per mile. Adding cost of lifting and relaying at £ 200 each per mile gives a figure of £ 2,962 per mile which with 25% allowance for tools makes a total of £ 4,006 per mile. For a distance of 42 miles half the cost could thus be £ 85,176.

The following would then be the abstract of the difference in cost:-

Cost of relaying 42 miles with 80 lb. track vide Appendix 9.	261,270-0-0
Less half the cost of relaying with 50 lb. rail.	<u>85,176-0-0</u>
Strengthening 9 bridges @ £2,000 each....	18,000-0-0
	<u>204,840-0-0</u>
Contingencies 25%	51,210-0-0
	<u>256,050-0-0</u>
Less 2/3 of original cost of permanent way @ £1,450 per mile....	<u>16,540-0-0</u>
	<u>239,510-0-0</u>

It will be noticed that I have omitted the charge for 2 locomotives @ £ 8,000 as I do not see how it can be allocated as a fair charge against the relaying. The respective capital charges then become

(a) Nan Route

(1) Construction of Nile River Branch	245,118
(2) Realignment of main line	41,211
(3) Construction of Nan Summit to Ravine	203,322
(4) Construction of fuel siding to Mount Blankett.	25,000
(5) Debit for track reconstruction...	173,389
	<u>694,140</u>

(b) Nakuru Route.

Cost of construction from Nakuru to Ravine.	738,034
Less enhanced value of land....	<u>10,044</u>
	<u>728,040</u>

of a greater capital expenditure on the Nakuru route of £ 95,006 which at 5% for interest and sinking fund represents an annual charge of £ 7,511.

Item of Charges

The comparison of annual charges then becomes

(1) Increased Revenue by Nakuru Route	£ 2,526.
(2) Decreased Operating & Maintenance expenses	2,678
	<u>5,204</u>
Less increased interest & sinking fund charges	7,512
Higher annual charges by Nakuru Route	£ 2,308

Of

From this it will be seen that I am not in agreement with Col. Robertson, ^{that} following the line of argument and factors which he has adopted, the Nakuru Route will show a large annual saving over the other, but as to the former route being economically the proper one to choose I am in complete agreement with him. Col. Robertson, by limiting the scope of his review to 10 years after the completion of the extension and by not making adequate allowance for the fact that the extension is bound eventually to form the main line to Uganda and the Congo, has omitted some of the most important considerations which should ~~also~~ weigh in the choice of routes. The Mau-Makara section is probably the worst for up traffic from the point of view of ^{operating} on the Uganda Railway. The Committee for the Economic Survey has estimated a very small figure for the upwards traffic, only allowing 40,000 tons as against 184,700 downwards; this I have already stated I consider a very small proportion and have amended it to 61,000 but even this figure I consider distinctly on the low side. The effect of this has been that the great bulk

of the traffic being assumed as moving in a downwards direction over 1½ grades in both cases, the disadvantages of the 2½ grades upwards on this particular section have not been adequately reflected in the expenditure statistics. That eventually this extension will form the main artery of traffic to Uganda and if properly extended to the rich eastern portions of the Congo cannot be disputed; previously in this memorandum I have estimated that this situation will arise in 8 years from date which may be considered optimistic, but, even if it is delayed for 15 years the argument is the same. If the Main Route is adopted, this badly graded Main-Nakuru section will remain for ever a permanent obstruction to efficient operations; it will be impossible to eradicate it later because the section does not permit of realignment, but would have to be reconstructed throughout. The extra expense of moving the whole of the Uganda traffic over this 2½ section would soon swamp the temporary saving of £ 2,000 a year which it may affect for the first few years. The opportunity has occurred of correcting a mistake originally made in the route of the railway and it should not be allowed to slip by. With the eradication of this section only two sections of 2½ grade against up traffic will remain on the eventual main line of the Uganda Railway, viz. the sections Mombasa-Magera and Nairobi-Kikuyu.

I therefore urge most strongly the adoption of the Nakuru route. It may appear incongruous that although I am a strong advocate of the same route as Col. Robertson, I have disputed his argument, but I have done so because I consider that his figures contain certain weaknesses which leave them open to be controverted by a person opposing the scheme.

ting.
A minor point to which I would draw attention is that while Col. Robertson has allowed in his estimate for ballasting throughout he proposes in his report only to ballast in cuttings. I agree that ballasting throughout to begin with is unnecessary and the saving consequent thereon will amount to £ 70,000 - £ 75,000. 352

Beyond the above I have no further comment to make on this very excellent report.

I have the honour to request that this report may be forwarded to The Right Hon'ble The Secretary of State for The Colonies.

I have the honour to be,

Sir,

Your most obedient humble servant,


Special Commissioner For Railways,
Southern Africa.

$\frac{P_{20}}{30611} \frac{21}{21}$ Kenya

359

52

DRAFT.

Gentlemen, 24 July 1921

our Agents

with ref to the letter

MINUTE.

from this Dept. No 27225 of 7

Mr. Jewell 17/21

the 7th of June & previous

Mr. Battersby 1

corres. I enclose to transmit

Mr.

Mr. Grindle

Sir H. Lambert

Sir H. Bead.

Sir G. Fuller.

Col. Amery.

Mr. Churchill

to you, for the consideration of the

Consulting Engineers, the acc.

copies of airtel & despatches

from this Dept. of Kenya with

10298. 8 June 1921 (29257)

670. 1 May (30584) to

1923 May (50601)

(1st sent in 8/19/21
Return to Messrs)

C.O. 5831 / 201

2/48

CROWN AGENTS
RECEIVED
20 SEP 1922

30611/21 Kenya.

360

CROWN AGENTS,

THE ACCOMPANYING REPORT, WHICH WAS BORROWED FROM YOU ON THE 28TH. JULY LAST (SEE LETTER ATTACHED) IS RETURNED FOR COPYING. WE SHALL BE GLAD IF YOU WILL RETURN THE ORIGINAL IN DUE COURSE. THE MAP WHICH ILLUSTRATED THE REPORT WAS NOT RETURNED BY YOU.

H. S. B.

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Bottomley

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report on the Flamin Gisher Rly
survey, which accompanied C.O. No.
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so far as we know. Could you
have a copy made for us, or
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INCLOSURE

Despatch No. 779 of 13.5.21

362

UGANDA RAILWAY.

REPORT

on the

UASIN GISHU EXTENSION.

1921.

Nairobi,
Colony of Kenya,
April, 1921.

C O N T E N T S

<u>Chapter</u>	<u>Page.</u>
I Preliminary	1
II General Summary	2
III History	2
IV 1920-1921 Survey	3
V Selection of Route	4
VI Fixed Point and Datum	18
VII Gradients	18
VIII Curvature	20
IX Standard Dimensions	21
X Description of Route	21
XI Alternative Routes	29
XII Construction & Engineering	35
XIII Traffic	37
XIV Estimates	43
XV Financial	48
XVI Abstracts	48
XVII Plans	48, 49.

A P P E N D I C E S

- (1) Gradient Abstract, Mau Summit Station to Mau Junction.
- (2) Curve Abstract, Mau Summit Station to Mau Junction
- (3) Curve Abstract
- (4) Gradient Abstract
- (5) Bridge Abstract
- (6) Station Abstract
- (7) Station Buildings Abstract
- (8) Station Machinery Abstract
- (9) U.R. Estimate for 1 Mile Track Reconstruction
- (10) Estimate of alterations to Uganda Railway between Nakuru & Mau to eliminate 2 per cent grade against Down Traffic. (Deviation No.1)
- (11) - do - " " 2A
- (12) - do - " " 2B
- (13) Abstract of Cost of the Railway.
- (14) Report of Department Committee on Economic Survey, 1920.
- (15) Index Plans and Section.

UGANDA RAILWAY.

UASIN GISHU MUMIAS

Gauges: Metre

Length: 148.3 Miles

364

REPORT

I. PRELIMINARY.

- ferences. (I) Report on the Preliminary Survey of the Nakuru Mumias Railway, 1915, by Mr. A. F. Church, Engineer-in-Chief.
- (II) Report of the Departmental Committee appointed to make an Economic Survey of the proposed Nakuru-Eldoret Mumias Railway dated 16th April, 1920.
- (III) Telegram dated 21st February, 1920, from the Secretary of State for the Colonies, deciding upon construction of Railway which will be taken in hand as soon as arrangements settled.
- (IV) Telegram from His Majesty's Crown Agents for the Colonies to His Excellency the Governor, dated the 10th June, 1920, stating the character of the Railway required.
- (V) Agreement dated the 18th June, 1920, between His Majesty's Crown Agents for the Colonies and Messrs. Griffiths & Company Limited, Nairobi, for the execution of the Survey for the Railway.
- (VI) Cablegram No. 369, dated the 17th July, 1920, from His Excellency the Governor, to the Secretary of State for the Colonies, appointing the Honourable the General Manager of the Uganda Railway to act as the Survey Engineer and the Chief Accountant of the Uganda Railway to be the Government Accountant for the purpose of the survey.
- (VII) Agreement dated the 23rd July, 1920, between His

Majesty's Crown Agents for the Colonies and Lt. Colonel J.K. Robertson, R.E., appointing him Survey Engineer.

(VIII) Letter No. 2, dated the 17th July, 1920, from Messrs. Griffiths & Company Limited, Nairobi, to His Excellency the Governor, stating that Major J.H. Gailley, D.S.O., is their Managing Director.

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(IX) Telegram dated the 4th July, 1920, from His Excellency the Governor to the Secretary of State for the Colonies, proposing adoption of the Mau Route and asking authority to proceed with the Survey of same.

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(X) Telegram dated the 8th July, 1920, from the Secretary of State for the Colonies to His Excellency the Governor authorising Survey of the Mau Route.

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(XI) Letter No. Kenya 1207, dated the 19th August, 1920, from the Secretary of State for the Colonies to His Excellency the Governor, forwarding copies of letters from His Majesty's Crown Agents for the Colonies and Messrs. Rendel Palmer & Tritton [Consulting Engineers] advising that no decision on the adoption of the Route be arrived at pending the completion of complete Surveys and Reports on same.

II. GENERAL SUMMARY.

The Uasin Gishu Railway is designed to form an extension of the Uganda Railway (Metre Gauge) to the great uplands of the Uasin Gishu Plateau, and by further extension to form the Main Line into Uganda. It has, therefore, been surveyed for a Metre Gauge Railway.

III. HISTORY.

The history of proposals for the construction of Railways throughout the Uasin Gishu Plateau dates from 1891/92, when Capt. Macdonald, during his reconnaissance to determine the Route of the Uganda Railway, recommended

- 3 -

that the alignment should pass through the Usain Gishu³⁶⁶ Plateau and Northern Kavirondo Districts to Port Victoria on the North-west corner of the Victoria Nyanza.

The Route eventually adopted, on the recommendation of Sir George Whitehouse, did not cross the Plateau, but, keeping to the south of it, follows the Nyanza Valley to the Lake at Kisumu.

The fact, however, that the Railway did not pass over the Plateau did not prevent the development of that great upland district and the fertile and populous districts of Northern Kavirondo.

The development of these areas led from time to time to schemes being put forward for the establishment of better means of communication which eventually resolved themselves into a proposal to construct a Railway from Nakuru to Mumias following a Route through the Plateau via Eldoret.

With the object of constructing a Railway on an alignment following this Route a Survey was carried out in 1914/15. Owing, however, to the outbreak of War shortly after the Survey Operations actually commenced the construction of the Railway was not proceeded with.

The history of the whole project up to the completion of the Survey of 1914/1915 is contained in the Report on this Survey made by Mr. A. F. Church, C.B.E., then Chief Engineer of the Uganda Railway.

IV. 1920/1921 SURVEY.

On the conclusion of hostilities the further development of the Plateau received a considerable impulse through the action of the Government in allocating large areas as Soldier Settlements and to affording other facilities for increasing the development of large areas which were far distant from the Uganda Railway. The question, therefore, of providing Railway connection between the Plateau and the

Uganda Railway, and thereby to the Port of Mombasa, again arose in a form even more urgent than formerly.

As a result of representations made by the Government of the Colony to the Right Honourable the Secretary of State for the Colonies sanction was received in February, 1920, for the final Survey of the Route to be undertaken, the preliminary Survey of which had been completed in 1915, and on the 18th June, 1920, an Agreement was entered into between His Majesty's Crown Agents for the Colonies, on behalf of the Government of Kenya, and Messrs. Griffiths & Company Limited, of Nairobi, for the execution of the final Survey.

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V. SELECTION OF ROUTE.

Alternative Route.

It was recognized by the Chief Engineer of the Uganda Railway, in his Report, that the Survey of 1915 had not exhausted the investigations as to alternative Routes feasible for the proposed Railway, while the changed condition in the economic state of the world's markets and the great enhancement in the cost of Railway construction had altered the economic conditions closely affecting details of construction.

It, therefore, became necessary to review the whole question of the alignment of the proposed Railway, and with that object the proposals contained in the 1915 Survey had to be closely examined in the light of the changed conditions obtaining between April, 1914, and June, 1920.

Mau Route proposed.

The result of these investigations led His Excellency the Governor to submit, on the 4th July, 1920, proposals to the Right Honourable the Secretary of State for the Colonies for the adoption of a Route from Mau Summit Station on the Uganda Railway along the western limit of the Mau Massif to the plateau, where it joined the 1915 Survey Route at Mile 37 thereon, and requested

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authority to proceed with the Survey of this Route.

The reasons advanced in support of this proposal were that it would effect a saving of 30 miles or 25% of the distance, resulting in a saving of £1,000,000, and reduce the period required for construction by two years. It was proposed to utilise £500,000 of this saving for the construction of a Railway from Nakuru to the Molo River Valley following the alignment of the 1915 Survey for part of the length of that Railway. On the 8th July, 1920, the Survey of the Route as proposed was sanctioned by the Right Honourable the Secretary of State for the Colonies and authority to commence the Survey communicated to His Excellency the Governor.

The Survey of the alignment on the Mau Route was commenced by the Contractor on the 1st August, 1920.

The remarkable saving which these proposals aimed at achieving was to be effected by the adoption of a new alignment for the proposed Railway which would avoid the heavy and costly work required between Mile 40 and Mile 80 on the 1915 Survey, and at the time of making these proposals the possibility of the existence of other Routes which would achieve the same object was not considered, and it was not until the arrival of the Survey Engineer that attention was directed to the possibility of the existence of the Route as outlined in Para. 27 of the Chief Engineer's Report referring to the Survey of 1915. This also effected the elimination of the heavy and costly section of the 1915 Route between Mile 40 and Mile 80.

This Route, which diverges from the 1915 Survey Route at Mile 32, follows the northern slopes of Mount Loldiani, whence it gains the western limit of the Mau Escarpment, following along which it eventually joins with the 1915

Existence of
Alternative
Route from
Nakuru.

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Survey Route at about Mile 86 thereon.

After a careful reconnaissance of this Route the Survey Engineer directed the Contractor to complete the Survey along an alignment he had laid down, which joined the Mau Route, commencing from Mau Summit Station, at the controlling point known as Ravine Ridge, at Mile 10.72 thereon.

The proposal for Railway development on the Plateau and in the Holo Valley had, therefore, in February, 1921, been reduced to a consideration of two schemes, each having its point of commencement at Nakuru and each, by divergent Routes, arriving at an important controlling point (Ravine Ridge), distant 53.05 Miles from Nakuru on the Mau Route and 53.67 Miles from Nakuru on the Nakuru Route.

The relative advantages of these Routes will now be considered. The consideration of the Route from Ravine Ridge to Turbe will be considered later when the discussion on the selection of the earlier part of the Route has been completed.

In the discussion the Route proposing Mau as a point of commencement will be referred to as the Mau Route, while the alternative Route ~~with~~ Nakuru as a point of commencement will be referred to as the Nakuru Route.

Mau
Route.

Accepting Nakuru Station on the Uganda Railway as the point of commencement for the two Routes, the works required to be executed under this scheme are:-

- (1) The construction of a Railway from Nakuru to Holo River following the alignment of the 1915 Survey to Mile 20.
- (2) The realignment of three portions of the Uganda Railway between Nakuru Station and Mau Summit Station for the elimination of grades

of 2 per cent against down traffic.

- (3) The construction of a Railway from Mau Summit for a distance of 10.72 Miles to Ravine Ridge, which is a point common to both the Nakuru and Mau Routes.
- (4) The construction of a Fuel Siding to Mount Blackett.
- (5) Track reconstruction, Nakuru to Mau, 42 Miles.

The estimated cost of the execution of these works is shown in the attached Estimates and amounts to:-

- (1) £245,118
- (2) £ 41,711
- (3) £203,923
- (4) £ 25,000
- (5) £274,123

Total:- £789,875

Nakuru Route.

The adoption of this Route necessitates the construction of a Railway from Nakuru to the common point at Ravine Ridge the length of which is 53.67 Miles from Nakuru. The cost of this Railway as shown in the Estimates amounts to £798,091.

The development of the districts served by these alternative Routes and the Traffic accruing therefrom will now be considered.

Mau Route.

The construction of a Railway from Nakuru to Molo River is common to both schemes. This Railway will serve a fairly well-developed area, and in the case of either alignment by the construction of a short extension following a Route midway between the Molo and Rongai Rivers can be extended so as to meet further requirements for Railway Communication as the development of this area extends down the valleys.

The Traffic estimated from this area at periods of three and ten years from the date of the completion of the Railway is:-

Description of Traffic		After 3 Years	After 10 Years
Maise	Tons	27,291	54,582
Flax, Fibre & Tow	"	1,969	3,741
Sundry Crops	"	98	245
Pigs	No.	-	8,000
Bacon & Bacon Products	Tons	-	500
Milk	Galls	-	250,000
Cream	"	-	12,500

Equivalent to Tons 1,600

" " " 1,193

Considering the development of the country along the existing Uganda Railway between Nakuru and Mau Summit Station, throughout which three diversions are required, no increase can be foreshadowed which would not accrue to the existing Railway.

The only other area to be served by the Mau Route is that lying on the western slopes of Mount Loldiani. This area is at present served by the Uganda Railway and will be further served by the construction of either of the proposals under consideration.

So far, notwithstanding its proximity to the Uganda Railway, little or no development has taken place, and any development which might take place in the future would be shared by the existing Railway and either of the proposed schemes. Any Traffic, therefore, which might accrue in the future from this area will not affect the relative earning power of the alternative schemes, as both would participate equally

in it.

The net Traffic, therefore accruing from the adoption of the Mau Route for the Railway would amount to 61,861 Tons ten years after the completion of the Railway.

**Makuru
Route.**

The first 20 Miles of this alignment is common to that of the alternative Mau Route, the Traffic accruing from which is as shown above.

Proceeding to consider the development of the area traversed by this Route from Mile 20.75 to the point at Ravine Ridge (Mile 53.67) at which the alternative Routes meet. This area, though small, is a most important producing one, and one which is now productive of ready Traffic. Further, the enhanced value of the land resulting from the construction of a Railway, which reverts to Government at no very distant date, will eventually be realised by the Government of the Colony and will amount to a very considerable sum.

In order to estimate the profit which will accrue from these enhanced land values for the land reverting to Government after 37 years it is estimated that the value of 60,000 acres will be increased by £3 per acre, realisable after a period of 37 years, the present value of which is £10,440.

To realise the land-locked nature and the disadvantages under which the development of this area has proceeded in the past it is necessary to consider its geographical situation in relation to existing lines of communication, and the nature of the produce of these areas.

The Ravine District is bounded on the south by

Mount Loldiani rising to a height of 9,875 feet above mean sea level. On the north lie the Kamasia Hills; to the west the Mau Escarpment; and to the east Mount Eldolat.

Access in a direct line southwards to the Uganda Railway is blocked by the mass of Mount Loldiani. To the north it is obstructed by the Kamasia Hills. The only other accesses, therefore, run in a general direction, east and west, and connect with the Uganda Railway at Nakuru and Lonfiani Stations, the distance of Ravine Township from these Stations being 40 and 20 Miles respectively.

For the Timber Traffic from the Equator Saw Mills Concession a narrow gauge trolley-line, worked by oxen, runs on the western slopes of Mount Loldiani from Mau Summit Station on the Uganda Railway to the Saw Mills near Ravine, a distance of 16 Miles.

The entire produce of this district has, therefore, to find an outlet along a road which during wet seasons is almost impassable, and along a light trolley-line the capacity of which restricts the development of the specially heavy Traffic which it is required to carry.

The present Timber Traffic from this district which finds its way over the trolley-line amounts to about 325 Tons per mensem, while it is estimated that by the construction of the proposed Railway this amount could increase to 2,500 Tons and 5,000 Tons per mensem at periods of 3 and 10 years respectively after the completion of the Railway.

The following Table summarises the probable Traffic on the through Route, Nakuru to Ravine Ridge (Mile 53.67) at periods of 3 and 10 years after the completion of the Railway:-

Description of Traffic		After 3 Years	After 10 Years
Maize	Tons	28,000	56,218
Flax, Fibre & Tow	"	2,087	4,000
Sundry Crops	"	135	319
Pigs	No.	-	8,500
Bacon & Bacon Products	Tons	-	532
Milk	Galls	-	250,000
Cream	"	-	12,500
Timber	Tons	25,000	30,000

Ø Equivalent to Tons 1,700

* " " " 1,193

Or equal to a Tonnage of 93,962 ten years after the completion of the Railway.

Comparison
of cost of
operation.

The cost of operation of the alternative schemes will now be considered. Basing the estimate on a conservative figure of 2 pair of Trains per day, the annual Train Mileage on the Mau Route would be:-

- | | |
|---|-----------|
| (1) Nakuru to Molo | } 106,653 |
| (2) Nakuru to Mau Summit Station | |
| (3) Mau Summit Station to Ravine Ridge. | |

On the Nakuru Route the Train Mileage will be 78,358.

The average cost of running a Train for 1 Mile, as shown in the General Manager of the Uganda Railway's Report for the period 1919/1920, is Fls.2 per Mile. Taking the future cost at Fls.2 per Train Mile, the ~~sharp~~ ~~cost~~ ~~of~~ ~~the~~ ~~road~~ would be £21,331 and £15,672 per

annum respectively for the Mau and Nakuru routes.

As the gradients to be operated on the Mau route are two per cent against Up Traffic for a distance of 42 Miles, as against a 1.5 per cent on the Nakuru route, there falls a further charge against the Mau route for the reason of additional operating expenses per annum of £2,141.

On the other hand, the length of line to be maintained on the Nakuru route is 20 miles longer, which represents an annual charge of £1,106 on account of wages of gangs and supervision.

The operation of a series of Branch Lines as against one Through Line is invariably effected at a higher rate of expenditure. The reason for this lies in additional Administrative and Staff charges, reduced duty of Stock and additional Engine power, increased consumption of Stores, and the impossibility of enforcing a very high degree of efficiency.

It is difficult to arrive at an exact estimate of what this may amount to, but it is a factor to be considered in any comparison of routes, and in this instance it may be assumed as an annual charge of £1,000.

Summarising these conclusions, the annual estimated difference in charge to be incurred for the operation of the alternative routes is as shown in the following Table:-

Head of Charge	Mau Route	Nakuru Route
Running charges for Trains	£21,331	£15,672
Additional for heavy grades	2,141	
Additional for extra maintenance		1,106
Additional for extra cost in separate from Branch lines	1,000	
TOTAL	£24,472	£16,778

The balance in favour of Nakuru Route is an annual charge of £7,694.

Proceeding now to consider the earning power of the alternative routes in terms of Gross Revenue earned by the New Line only, the following Comparative Table shows estimated receipts from the probable Traffic at periods of 5 years and 10 years after the completion of the Railway on the two Routes.-

Description of Traffic	MAU ROUTE		NAKURU ROUTE	
	5 Years after completion	10 Years after completion	5 Years after completion	10 Years after completion
	£ls.	£ls.	£ls.	£ls.
Wheat	1,051	16,068	8,784	17,815
Flax	1,764	2,552	2,055	3,913
Coffee	-	-	-	-
Sundry Crops	44	110	93	206
Pigs	-	744	-	83
Bacon and Bacon Products	-	7,000	-	7,600
Milk	-	10,000	-	10,000
Creed	-	1,000	-	1,080
Timber	-	-	15,000	90,000
TOTAL	2,859	38,574	82,932	131,334
Balance in favour of Nakuru Route			£7,607	£9,270

It is difficult to establish in how far these figures can be applied, for all the traffic might be gained equally by both routes, but it can certainly be claimed that it could only be gained to the Mau route by the construction of Branch Railways and Feeder Roads which, if not constructed by Government, would have to be constructed by private enterprise if the development of these districts is to continue. The construction, however, of these Railways and Roads would represent a charge against the community and their cost would be reflected in the selling price of the produce from the district.

Again, the construction of a system of Branch Railways and Feeder Roads under a variety of controls, and probably the overlapping of Capital and control, is not the economic solution to the problem of the development of transportation facilities within the district.

Passing now to the consideration of some additional factors which must influence a decision as to the relative merits of the alternative routes which cannot be reduced with accuracy to a common denominator of money, the following are instanced in favour of the Nakuru route.

Fuel. Wood will be the fuel used on the new Railway for long. It will also be required on the Uganda Railway for long. The Uganda Railway have in recent years spent large sums on the construction of Fuel Sidings.

The Nakuru route passes for long lengths through dense and wide forests which will ensure for long a large supply of fuel situated most conveniently for supply both to the Uganda Railway and the new extension, and the

adoption of the Nakuru Route would obviate the necessity for the construction of a Fuel Siding to Mt. Blackett estimated to cost ~~£~~ 25,000, which it is now proposed to construct.

Another factor in the problem which must not be overlooked is the object and character of the proposed Railway. The Railway is designed to form a most important link between Uganda and the Port of Mombasa, which will eventually by the construction of Branch Lines and connection with other Railway Systems become the largest trade artery in a very wide area of Africa.

While it is recognised that the ruling grades on the Uganda Railway which form the first link of this great line are such as will not permit of as economical working as on the proposed Railway still it would be wrong to argue that because of the fact of their existence the inherent disadvantages of steep gradients should not be limited if economically feasible.

It must be accepted that at no very distant date heavy expenditure must be incurred by the Uganda Railway to meet the increased demands for movement of Traffic. This demand will probably be met by the provision of heavier locomotives necessitating a heavier type of permanent way and the strengthening of bridges.

If Mau Summit Station be accepted as the point of commencement as against Nakuru it will entail 42 Miles of track reconstruction and the strengthening of 9 large and long viaducts, representing 4,640 lin. ft. of Viaducts and the provision of a greater number of locomotives. It is difficult to represent this factor in the unit of currency but as it must appear as a credit to the Nakuru Works it is estimated that to effect these improvements will cost 2274,123.

Summarising the relative advantages of the alternative projects, the following facts emerge:-

(A) Capital Expenditure which will be incurred in constructing the Mau Route	£789,875
(B) Capital Expenditure for provision of Nakuru Route	£798,091
Less increased value of Land (present value)	£ 10,440
	£787,651

or a greater Capital Expenditure is required for the Mau Route project of £2,294, which, at 8% represents an annual charge of £189.

Under Revenue, Working and Capital the adoption of the Nakuru Route as against the Mau Route secures the following advantages:-

(1) Increased Revenue gained from the adoption of the Nakuru Route as against the Mau Route	£ 9,276
(2) Reduction in Train Mileage Charges	£ 5,659
(3) Saving in cost of operating 2% Grades	£ 2,141
(4) Saving in cost of operating Branch Lines	£ 1,000
(5) Saving in Interest and Sinking Fund Charges	£ 189
	£18,265
Less additional for Maintenance Charges	£ 1,106
Or an Annual saving of	£17,159

It follows, therefore, that the greater the traffic passing over the new Railway the greater will be the profit accruing from the adoption of the Nakuru Route, and with the development of the Country that the traffic will eventually far exceed the volume as estimated above, is undeniable.

The arguments which led to the decision to abandon a portion of the route of the Nakuru Mumias Railway as surveyed in 1915 and the adoption of the alternative Mau route will now be considered. The chief arguments were:-

That from Mile 36 to Mile 80 on the 1915 Route the work required was very heavy - about 8,000 feet of steel work and heavy earthwork. It was estimated that the cost of construction of this length would amount to £22,000 per Mile.

This is a perfectly reasonable statement. The route is, undoubtedly, a thoroughly bad one.

The preponderating advantages of the Mau route need no elaboration.

There, however, the investigations stopped at that time. No suggestion is made of other routes, nor were any considered.

Later, on the matter being referred to the Consulting Engineers, the Government of the Colony was counselled to adopt a policy of an open mind, and the Crown Agents for the Colonies, in transmitting the advice of the Consulting Engineers, stated that it would "be unwise for the Government to commit themselves to a particular alignment until all necessary Surveys had been completed".

These Surveys have now been completed, and the possibilities of all routes investigated and the advantages and disadvantages of the only two routes which are at all practically feasible have been considered and summed up in this Report; and I am of the opinion the evidence clearly establishes that the Nakuru route is in all respects the better together in

the interests of economic Railway Construction and Operation, Traffic carrying capacity, and as a means to promote and extend the development and productivity of the districts served, both in extent of area and in degree of intensity.

VI. FIXED POINT AND DATUM.

The fixed point from which the mileage is calculated is from the facing points of the new line at the North end of Nakuru station.

The levels for the section Nakuru to Mile 100.25 are referred to the datum of the Uganda Railway.

The levels for the section, Mile 100.25 to the terminus at Turbo (Mile 148.38) are referred to the Government Trigonometrical Survey datum which is 9.13 feet lower than the Uganda Railway datum.

VII. GRADIENTS.

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

The following are the controlling grades:-

Up Journey.

Nakuru to Eldoret 127.2 Miles 1.5% compensated for curvature.

Eldoret to Turbo 21.18 Miles 1%.

Down Journey.

Turbo to Eldoret 21.18 Miles 1.5% compensated for curvature.

Eldoret to Nakuru 127.2 Miles 1.5% compensated for curvature.

The various types of locomotives in use on the Uganda Railway could, therefore, haul the following loads (gross tonnage behind tender):-

From	"A" and "B" Classes	Mallet Class	Tank Class	"C" Class
Nakuru to Eldoret	Tons 264	Tons 428	Tons 241	Tons 302
Eldoret to Turbo	292	608	343	432
Turbo to Eldoret	204	428	241	302
Eldoret to Nakuru	204	428	241	302

Comparing these loads with the haulage capable between Nakuru and Mau Summit, on the Uganda Railway, which is ruled by a 2 per cent uncompensated grade, it appears that the following is the load possible for similar types of locomotives:-

From	"A" and "B" Classes	Mallet Class	Tank Class	"C" Class
Nakuru to Mau Summit	131	296	157	201

The acceptance of a two per cent grade on the proposed Railway would not materially reduce the quantity of earthworks, as the more heavy cuttings are necessitated by the existence of abrupt spurs which cannot be rounded, and cutting through saddles. Similarly the larger banks are due to the existence of Ravines, some of considerable depth, which could not be avoided by an alteration of Ruling grade.

The only capital saving which would be effected by the acceptance of a two per cent grade would be in the length of the line, and even that would not be considerable.

Considering the improvement of grade by the adoption of a ruling grade of one per cent, the result of the survey has shown that on the section Nakuru to Narasha Summit it would not be possible, without the introduction of reversing stations, to get sufficient length to effect a rise of 2,213 feet between Asgeri Station, Mile 32.5, and Narasha Summit, Mile 73.5.

VIII. CURVATURE.

The maximum degree of curvature throughout the Railway is 10 degrees.

This curvature has been freely used to reduce the heavy work throughout the ascent of the Mau Escarpment.

The curvature in degrees in the different sections is as follows:-

Section	Total	Degrees per mile
(1) Nakuru to Molo Mile 20.75	1,795	86.5
(2) Molo to Ravine Ridge Mile 53.67	7,080	215
(3) Ravine Ridge (Mile 53.67) to Narasha Summit Mile 73.5	6,070	370
(4) Narasha Summit Mile 73.5 to Mile 91.27	3,734	511
(5) Mile 91.27 to Turbo Mile 148.38	8,074	142
Total and Average:-	26,752	180

The total length of curved line on the ascent from Molo Mile 20.75 to Narasha Summit Mile 73.5, is 28.39 Miles.

The total degrees of curvature from Nakuru to Turbo,

File 148.38, is 26752, the percentage of curved line being 485.

Compensation for curves has been given the rate of 0.03 feet per degree per chain on all curves.

The length of tangents between reverse curves is sufficient to allow of the introduction of transition curves of length equal to 15 feet per degree of curvature.

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

IX. STANDARD DIMENSIONS.

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

X. DESCRIPTION OF ROUTE.

The description of the Route from Nakuru Station to Eldoret Pass, Mile 31 $\frac{1}{2}$, is thus described in the Report of the 1915 Survey:-

"The commencement of the line is taken from the facing points at the north end of Nakuru Station.
"From there to the Junction Station, Mile 4.75, the present Uganda Railway will be realigned and regraded to a 1.50% grade, which can easily be done.

"The station site is an excellent one for a junction, level for 2,600 feet with a wide flatish staking ground on the lower side and is well fitted as a depot for construction of the new line.

"Leaving the station the line develops up a gully running north on the maximum grade of 1.5 per cent until it reaches the summit of the Menengai Saddle at Mile 9.

"In order to obtain sufficient distance for the grade it is necessary to develop up the gully by crossing and recrossing from side to side, and the earthwork in consequence is fairly heavy. The gully however is a short one and carries only storm water, and pipes under the banks should efficiently deal with the drainage.

"At Mile 10 $\frac{1}{2}$ there is an excellent site for a station when required. From this point the line falls on approximately a 1.5% grade.

"light earthwork to the Bani River at Mile 18 $\frac{1}{2}$,
 "the river being crossed by a 12 ft. girder span;
 "crossing flat country with light earthwork the river
 "hole is reached at Mile 20, the river being cross-
 "ed by a 40 ft. span. Mile Station has been fixed
 "on an excellent site within $\frac{1}{2}$ mile of the river
 "and an excellent water supply is obtainable by
 "gravity. The route then climbs on a 1.50% grade
 "to the Saddle of the Eldolat Pass, Mile 31 $\frac{1}{2}$,
 "crossing the Bisci River with a 40 ft. span girder
 "at Mile 29, the earthwork being comparatively light."

From Eldolat Pass, Mile 31, the alignment continues
 in a north-westerly direction finding support on the
 northern slopes of Mount Loldiani and utilising them to
 effect the rise necessary to gain the Ravine Ridge, an
 important controlling point at Mile 53.67, from which
 point the ascent of the Mau Escarpment commences.

The alignment along the sides of Mount Loldiani lies
 almost continuously in dense forest and is intersected
 by a series of ravines, some light and some of a compar-
 atively formidable character.

The most notable of these ravines are at Mile 38 $\frac{1}{2}$ and
 Mile 50 $\frac{1}{2}$, the crossing of which it is proposed to effect
 by the erection of steel viaducts 880 feet and 450 feet
 in length respectively.

It may be noted that on the alignment of the 1915
 Survey the crossing of the Narosura Ravine was effected
 by the erection of a viaduct 640 feet long and about 70
 feet high. It is crossed on the present alignment by a
 bank 48 feet high at the deepest point of the Ravine in
 which the river flows.

After leaving the Narosura Ravine a Station is pro-
 vided at Mile 41.82 to serve the township of Eldama
 Ravine and the surrounding district.

The alignment, still following the hill slopes,
 curves round an abrupt spur of considerable size and
 reaches Maji Kauri at Mile 44.74.

At Naji Mshak are situated the Saw Mills of the Equator Saw Mills Company Limited and it is anticipated that this will become the centre of a very large Timber industry producing a great volume of Traffic for the Railway.

Still climbing, the alignment follows the hill slopes until it gains the Ravine Ridge at Mile 53.67 at an elevation of 8,111 feet, near which a Station site is provided.

From here the ascent of the Mau Escarpment commences. Ascending continuously for a distance of about 11 Miles the Escarpment culminates at Timberoa Hill at an elevation of 9,496 feet above mean sea level. This point marks the southern limit of the Uasin Gishu Plateau.

The main axis of the Escarpment runs in a north-westerly direction and is of a hogback configuration, falling away very steeply on both sides at right angles to the direction of its main axis. The eastern slopes are scarred by deep and steep ravines which commence close up to the summit of the watershed. Between the ravines run abrupt spurs.

The western slopes are not so broken but are steep and covered with dense forests. Every effort has therefore, been made to keep the alignment on the summit of the ridge forming the main axis.

As, however, the rate of inclination of the slope of the main axis is not in the least uniform the watershed presents the configuration of a series of knolls with saddles between; continuous support for the alignment is, therefore, impossible, and it is only by piercing the higher saddles or by developing round the knolls that

support can be found. Indeed, such development is required that resource has to be made to the introduction of two spirals within this length.

A fair amount of agricultural development has taken place throughout this area. Large cultivated areas on which grow Flax are passed through and one Flax Factory has been erected.

Further up the Escarpment the Saw Mills produce in marketable form the Timber from the adjacent forests.

To serve these industries Stations are provided at Mile 60.34 and Mile 66.

Throughout this length the alignment lies on the watershed and little or no bridging is required. All the ravines which were crossed by the 1915 Survey and which constituted so heavy an item in its estimated cost are headed above their sources.

As the summit is reached at Mile 73.5, 9,130 feet above mean sea level, the side slopes are broken by a series of abrupt spurs between which lie deep ravines.

The problem of carrying the Railway through these spurs requires special attention. There are reasons why cuttings should be avoided and it is probable that a treatment of cut and cover will be more economically effected than tunneling.

At Mile 73.5 the ascent of the Escarpment proper is completed, and the alignment turns through an easy pass into the basin of Lake Narasha, contouring round which on easy sloping ground it reaches the eastern side of the Lake at Mile 75.68, where a Station site is provided in close proximity to the main Londiani Eldoret Road.

Following a northerly direction, the alignment lies in the watershed between the Victoria Nyanza and the Lake Rudolph River systems.

From Mile 78 to Mile 81 the alignment is kept well up the hill sides as here again the slopes at no great distance from the summit of the hill system fall away very steeply and further on are scarred by eight great ravines of most formidable aspect which forbid the possibility of continuous support.

The alignment, therefore, keeping well up, contours round the hill slopes, thereby avoiding the mighty ravines. At Mile 81 the alignment turns abruptly towards the south and develops round an out-lier from the group of hills which lie round Lake Narasha, passes up a flanking ravine which is crossed at Mile 81 by a viaduct 640 feet long and 75 feet high.

The crossing of this ravine places the alignment in a most commanding position to commence the descent from the summit to the Plateau. Crossing the viaduct the alignment immediately regains the ridge forming the watershed between the river systems of Victoria Nyanza and Lake Rudolph.

The watershed here consists of a wide rolling country dropping easily and regularly towards the north with easy side slopes which afford continuous support at a very minimum of expenditure.

The alignment passes down the watershed to Mile 87.25 where crossing the main axis it gains the head waters of a series of streams which form part of the Victoria Nyanza river system and which flow in a westerly direction through the Plateau.

At Mile 91.27, the alignment joins the route of the 1915 Survey, and soon thereafter the descent of the Elgyo Escarpment is commenced, the alignment being developed over a rolling country passes into the valley of the Lolgarini River not far from its source. The river itself is crossed by a 60 ft. girder bridge at Mile 102.5. From the crossing of the Lolgarini River to the veldt at the foot of the Escarpment there is a fall of 548 feet; in order to avoid a heavy approach bank at the foot of the Escarpment the alignment must have a length of seven miles at least. By utilising the right side of the Lolgarini River Valley, then the watershed between the Nondoroto and Lolgarini Rivers, and finally the spur, "Macdonald's Kopje", Mile 110, the necessary length is obtained with only light earthwork.

The upper reach of the Lolgarini River has a very gentle fall, flowing for the most part through a series of shallow marshes; the alignment, therefore, although considerably higher than the stream at the point at which it comes within the influence of the valley, is able to obtain sufficient fall to get on terms with the valley foot at the point at which the stream emerging from the last of the marshes changes its regime and commences to fall rapidly in a deep, narrow, rocky valley.

This abrupt change of topography is caused by the intrusion across the valley of a great mass of rock which provides an excellent site for a bridge over the stream. Crossings above this site, if the alignment could get down, would not be feasible by reason of the wide marshes, while a crossing in the narrow deep valley below would necessitate an expensive viaduct.

Viewed from the veldt the foot slopes of the Elgyo Escarpment are seen to rise abruptly, down which the drainage courses, the latter has cut wide and deep ravines, the nature

of these slopes not only preclude development thereon but makes it compulsory that the alignment should avoid them. Recourse has therefore been had to developing the alignment across the foot of Macdonald's Kopje, thus obtaining sufficient length to find support for the alignment on the more even watershed between the Wondoroto and Lolgarini Rivers.

Macdonald's Kopje being the only spur upon which sufficient width can be obtained for the development of the alignment makes it a very salient feature of the Location for if the development was not obtained immediately the alignment would have to follow the rough and broken lower slopes of the Escarpment necessitating a large expenditure in bridging and earthwork. From the base of this Kopje the alignment turns sharply to the north to obtain a station site.

The survey of routes between this station site and the Township of Eldoret, the next obligatory point, proves that by adopting an alignment along the valley of the Sosiani River a direct route on a 1 per cent grade can be got. Other routes over the veldt while being less direct would necessitate the use of 1.5 per cent grades and be far distant from a water supply.

The location of the crossing of the Sosiani River is controlled by the approach, above it, from the right bank of several tributaries flowing in deep wide valleys. The alignment now contours along the right side of the Sosiani River valley and at Mile 122.77, $4\frac{1}{2}$ miles from Eldoret, a site for a Station is provided to avoid the necessity, should it arise, of passing trains at an Engine Changing Station.

The importance of Eldoret as an obligatory point in the Projected Railway arises from it being

the Administrative and trade centre of the District. Here it is proposed to make an engine Changing Station. The situation is good and healthy for the staff and an ample supply of water is available from the Sosiani River. From Nakuru to Eldoret is an 127.2 mile run and to Turbo, the terminus, the run is 21 miles.

From Eldoret the trace follows down the right side of the Sosiani River being kept well up the valley side so as to pass over the cross drainage near its source and avoid the rough and broken ground along the foot of the valley. At mile 135.5 a wide shallow marsh is crossed, the width directly across is 1,000 feet. On 19th November, 1914, the depth of water was about 3' 6" but in the dry weather the marsh is practically dry. The bed is hard, rock being at no great depth.

After crossing this marsh the alignment rising up a low bluff and passing over a long stretch of flat veldt, covered with grass and scrub, follows close to the watershed between the Sosiani and Sergoit Rivers until at mile 140.5 the descent of the western Escarpment of the Plateau into the Sergoit River valley is commenced. At Mile 140.4 a station is provided close to the Soy - Eldoret Road to serve the Soy and Trans Nzoiia centres.

The valley sides of the Sergoit River eastwards from the point at which it joins the Sosiani River are high and steep, and are everywhere intersected by deep water courses so steep and close are these slopes that the river may be described as flowing through a deep wide gorge. At the point, however, at which the Sergoit River valley slopes merge with those of the Sosiani valley these precipitous slopes bend round towards the south and south east and the valley opening out the River runs for a fairly long reach in a gently falling wide Valley.

Another underfeature of the Topography of this locality which is a most important factor in the location, and makes this crossing of the Sergoit River a controlling point in the alignment of the projected Railway, is the incidence of a long spur projecting from the Plateau, the axis of which, bisecting the angle between the directions of flow of the Sosiani and Sergoit Rivers, forms the watershed between these rivers. The end of this spur runs close up to the junction of the rivers, where, rising, it forms a low hill or knoll, round the southern and western slopes of which the alignment is developed, gaining thereby sufficient fall to cross the Sergoit River while maintaining a 1.5% grade.

Immediately on the right side of the Sosiani River at Mile 148.3 the terminus is reached, the Station there serving an important group of farms which mark the center of gravity of a well developed and prosperous agricultural district.

XI. ALTERNATIVE ROUTES.

The problem of greatest moment arising under this head is that of the selection of the point of commencement of the projected Railway and has been considered under the head of "Selection of Route" and need not, therefore, be further considered here.

During the Survey, however, the possibilities of other alternative Routes have been from time to time considered. These, with one exception, were of minor importance, and the selection of one or the other was a matter of Survey and comparative estimate.

The question, however, of alternative Routes on the ascent of the Mau Escarpment requires careful study and investigation, and it is not suggested that the alignment on which the estimate is based is the best.

333

Very careful and full surveys of all possible Routes have been made. These Surveys present two alignments which may be termed the Western and Eastern respectively from the fact that the former finds support on the western slopes of the Escarpment while the latter lies on the eastern slopes. When, however, the two alignments are able to gain the crest of the Escarpment they traverse similar Routes common to both.

From a study of these two alignments it emerges that probably the best alignment lies in co-ordinating the best features of the two Routes into one.

It has already been explained that the Escarpment consists of a great hagsback ridge running in a south-easterly north westerly direction. The Mau Escarpment is part of the escarpment which forms the western slopes of the Great Rift Valley, and the portion of the Escarpment along which the alternative alignments lie consists of the highest summit of the Lefty Valley side, reaching an elevation of over 9,000 feet above sea level and 4,000 feet above the Valley floor.

Bayine Ridge, Mile 53.67, marks the point at which the alignment of the proposed Railway gets on terms with the crest of the Escarpment, at an elevation of 8,111 feet, and is the point from which the alternative Routes commence. For a distance of 10 Miles, in an air line, the Escarpment may be followed when, at an elevation of over 9,000 feet above sea level, it emerges in the confines of the Usin Gishu Plateau.

The length of the Route, utilising the eastern slopes of the Escarpment, is 19.64 Miles, while the Western Route is 18.67 Miles long. They terminate and unite at Narasha Summit at the entrance to the pass leading to the basin of Lake Narasha, at an elevation of 9,130 feet above sea level. In the estimated cost there is little or no

306

difference in the two Routes, as the extra cost of Permanent Way in the Eastern Route is balanced by the additional cost of earthwork in the Western Route.

On the Eastern Route it can be claimed that better and more convenient Station sites can be obtained and that the alignment lies on more open ground and on more gentle slopes, and for a lesser distance through forest.

The following Table shows the location of Stations on the alternative Routes:-

Station	Eastern Route		Western Route	
	Mileage	Distance Apart	Mileage	Distance Apart
Site	52.5	7.84	52.5	9.00
Mirand	60.34	5.61	61.5	3.75
Ganstaff	65.95	9.13	69.25	7.83
Lake Narasha	75.08		73.08	

The Station sites on the Eastern Route are more suitable and can be obtained with less cost of earthwork, water, etc., than on the Western Route.

The length of the Route evolved from co-ordinating portions of the Eastern and Western Routes, hereafter referred to as the "Middle Route", is 16.74 Miles, being 1.93 Miles shorter than the Western Route and 2.9 Miles shorter than the Eastern Route.

For comparative purposes the study of the relative merits of the Western and Eastern Routes can be made

section by section, the sections being determined as the portions of the alignments lying between lengths common to both, as shown on the attached diagram.

The point at which the alignments diverge is Mile Following
53.67. ~~Separating~~ divergent Routes, they unite at Mile 57½, thereafter continuing on a common alignment to about Mile 58½. Diverging at this point, they follow alternative Routes to Mile 61, when they again unite and continue on one Route to Mile 62½, where, diverging again to west and east, they follow round high ground, uniting again at Mile 67½, at which point they touch, separating again until they gain the Narasha Summit at Mile 73½.

The alternative Routes between Mile 53.67 and Mile 73.5 can, therefore, be considered under four sections lying between the following mileages:-

Section No.	1	Mile 53.67	to	Mile 57.75
"	"	2	"	61.00
"	"	3	"	67.75
"	"	4	"	73.5

the mileages indicated being on the Eastern Route.

The relative advantages of these sections will now be considered and thereafter a selection of a Route established based upon the merits of the relative sections of each Route.

<u>Section No. 1.</u>	Length of Eastern Route	21,600 ft.
"	" Western "	<u>20,210 "</u>
	Western Route shorter by	1,390 "
<u>Barthwork</u>	Western Route	4321376
	Eastern "	<u>3712207</u>
	Balance in favour of	
	Eastern Route	609169
<u>Gridding</u>	Western Route	Nil
	Eastern	6,098

<u>Section No.2.Length of Eastern Route</u>		16,900 ft
" " Western "		<u>12,400 "</u>
Western Route <u>shorter by</u>		4,500 "
<u>Earthwork. Eastern Route</u>	4491385	3713660
Western "	<u>3771306</u>	<u>3097332</u>
Balance in favour Western Route	720079	616328

Bridging Equal.

<u>Section No.3.Length of Eastern Route</u>		27300 ft
" " Western "		<u>16800 "</u>
Western Route <u>shorter by</u>		10500 "
<u>Earthwork. Eastern Route</u>	3504197	3806058
Western "	<u>2104272</u>	<u>2419021</u>
Balance in favour Western Route	399921	2387037

Bridging Equal.

<u>Section No.4.Length of Western Route</u>		40,250 ft
" " Eastern "		<u>29,900 "</u>
Eastern Route <u>shorter by</u>		10,350 "
<u>Earthwork. Western Route</u>	14698638	14664078
Eastern "	<u>13220551</u>	<u>7143792</u>
Balance in favour Eastern Route	1478087	7520286

Bridging. Eastern Route - Fls.42,364.

Result of the additional work on sections of each alignment is shown in the following Table:-

Sub. Head	Section No. 1		Section No. 2		Section No. 3		Section No. 4	
	Eastern Route	Western Route	Eastern Route	Western Route	Eastern Route	Western Route	Eastern Route	Western Route
Permanent Way	11,937		37,580		87,540		251,954	
Earthwork		* 34,728	36,420		78,036		86,656	
Brigging	28,208						42,369	
	40,145		74,000		165,576		338,610	
	34,720						42,364	
Balance Against	5,425		74,000		165,576		296,245	

Note:- All in Florins.

* Since increased owing to work being done Balance of advantage to with Eastern Route

From this analysis of the sections of the alternative Routes it, therefore, emerges that the Middle Route, comprised of sections 1, 2 and 3 of the Western Route and section 4 of the Eastern Route, can be constructed at a less cost than either the Western or Eastern Routes.

The Eastern Route follows next, costing ~~Fls. 22,247~~ ^{Fls. 245} less than the Western Route.

XII. CONSTRUCTION & ENGINEERING.

Labour.

It is proposed that the unskilled Labour required for the construction of the Railway shall be drawn entirely from Kenya and Tanganyika, the greater portion of whom should be of the Wanyanvesi Tribe from Tanganyika Territory.

It is estimated that the construction of the Railway will extend to a period of three years, and that during that period the Labour employed will have to be maintained at a strength of 10,000. To obtain and maintain these numbers it will be essential that the assistance of Government be given. A small Department to administer the Labour will be embodied in the Administration for the construction of the Railway, and this Department will undertake all matters in connection with its discipline, housing, feeding, etc.

Before starting construction this branch of the Administration should be formed and organised and should be in a position when the work actually commences to produce and maintain the requisite supply of Labour. This is a most essential step and a vital factor in determining the net cost of the Railway.

It is considered that skilled Labour will have to be recruited in and supplied from abroad.

It is essential that in order to construct the Railway within the shortest possible period the construction of several portions of the line should be carried on concurrently.

To effect this a temporary branch line should be laid from Ken Summit Station ~~to~~ to get immediate access to the section lying between Mile 53.67 and Mile 73.5 where the earthwork is comparatively heavy, and also to open up the length between Nakuru and Ravine Ridge at both ends.

The plant necessary to push the earthwork through on the Escarpment Section could then be brought up and put into operation at a comparatively early date.

As soon as possible accurate Sections and Plans of viaduct sites will be prepared and sent Home so that designs can be got out and the steel work obtained.

ork. In the course of the alignment of the proposed Railway there are several heavy cuttings and it is suggested that the excavation of these be done by light steam navvies and the spoil run to embankments.

Cuttings not sufficiently heavy to warrant the use of steam navvies would be taken out by hand and run to embankments by Decauville Trolleys, arrangements for the loaded trolleys pulling up the empty ones would be made.

Light earthwork might profitably be loosened by ploughing.

It is advisable to avoid hand labour as much as possible as the Natives of this country are quite unused to work.

ry. Excellent stone is procurable in an unlimited quantity throughout the whole line, but it is for the most part hard trap very suitable for concrete but very difficult to dress for masonry. It will, therefore, be economical to construct all abutments of bridges, culverts, etc., of concrete.

There is an ample supply of water throughout the line.

Sand. Sand, however, will be difficult to obtain.

There are small deposits in the Kongai River and near Eldoret. The main supply, however, must be obtained from Kibes near Kisumu or produced by crushers and pulverisers.

Timber.

During the ascent of the Mau Escarpment the projected line passes through fine forest land, and there should be an unlimited supply of Timber for trestles, etc., for temporary crossings of streams and gullies.

Buildings.

Bricks are burnt widely upon the Plateau by farmers and others, but do not appear to attain to any very high degree of quality; no doubt further experiments will improve this industry and produce a material of a quality and cost to admit of their use building station buildings and staff quarters through the Plateau.

Live Food.

This should be obtainable in sufficient quantities from the settlers on the Molo River, Uasin Gishu Plateau.

XIII. TRAFFIC.

The investigations as to the volume of Traffic likely to accrue to the projected Railway was remitted on the 12th January, 1920, by His Excellency the Governor to a Committee which was instructed to make an Economic Survey of the projected Railway following the route of the 1915 Survey and to submit an estimate of probable Traffic during the first three years and permanently.

The Committee, however, found that it was impracticable to furnish figures respecting Traffic as specified in their instructions but submitted an estimate of the probable Traffic and earnings at various intervals of 3 and 10 years after the completion of the new line.

The Committee consisted of

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

This Committee visited the districts to be served by the proposed Railway, and collected evidence and submitted their Report on the 16th April, 1920, copy of which is appended. Appendix A.

The districts from which Traffic will be served by the new Line are Nakuru, Njoro, Solai, Rengai, Lower Molo Valley, Ravine, Uasin Gishu Plateau, and the Trans Nzoia. Of these all are agricultural, and with the exception of Ravine, which is very largely forestal, are in process of occupation and development by Europeans.

The following table shows these areas and the total area cultivable and the estimated areas which will be under cultivation at periods of 3 years and 10 years after completion of the Railway.

District.	Total Area	Total Area Cultivable	Estimated Area Cultivable	
			at 3 years	at 10 years
Nakuru		126,400	47,400	94,900
Ravine		7,000	2,000	4,000
Uasin Gishu	692,783	457,237	100,000	200,000
Trans Nzoia	670,900	441,338		

The Forestal Area in the Ravine and Plateau districts extends to over 561 square miles, of which about 305 square miles have been conceded to the Equator Saw Mills Limited (E.S.M. Limited) for a period of 37 years.

The available marketable Timber through the

401

Concession is estimated at about 80 tons per acre.

The principle articles of produce from the districts served by the proposed Railway are:-

- Maize
- Flax (Fibre and Tow)
- Coffee
- Wheat
- Barley
- Beans
- Dairy Produce
- Bacon
- Timber

The Makuru district, with the exception of the eastern portion, is reported to be one of the best stock districts in the Colony.

It is doubtful, however, if the Live Stock Industry will advance owing to the fact that the greater portion of the land is of more value to the agriculturalist than to the pastoralist.

In the Ravine district it is reported that owing to the lack of communication to the market centres of the Colony, the Traffic in stock for breeding and slaughter purposes and in Dairy Produce is hopelessly handicapped.

The annual carrying capacity of the Ravine district is estimated at one beast to three acres, with a total of 5,000 head, and already there are about half that number on the land.

The yield of produce per acre is estimated follows:-

- Maize - 11 to 15 tons of 200 lbs.
- Flax - 300 lbs fibre, 100 lbs Tow.
- Coffee - one third of a ton.
- Wheat - 720 lbs to 900 lbs.
- Barley - 900 lbs.
- Beans - 500 lbs.

The proportion of Maize crops required for farm use is estimated at 10% to 15%.

Since the date of the Committee's Report further investigations into the development of the Timber Industry from Ravine have produced evidence which leads to the conclusion that the Traffic estimated from this class of Traffic is less than what may reasonably be anticipated.

The quantity of Timber, therefore, which it is estimated will accrue to the Railway at periods of three and ten years after completion has been increased to 31,000 tons and 33,000 tons, respectively.

Otherwise, based upon the figures of the Economic Survey Committee Report, the estimated production per annum in the areas served, less requirements for local consumption, is:-

(a) 3 years after completion of Railway.

Maize	...	...	66,000 tons
Flax (Fibre and Tow)	...	...	6,750 tons.
Coffee	...	...	1,200 tons.
Sundry Crops	...	...	1,800 tons.
Timber	...	...	31,000 tons.
Inwards	...	...	21,000 tons.

(b) 10 years after completion of Railway.

Maize	...	...	131,250 tons.
Flax (Fibre and Tow)	...	...	12,900 tons.
Coffee	...	...	2,200 tons.
Sundry Crops	...	...	3,900 tons.
Timber	...	...	33,000 tons.
Pigs - number 18,500, converted into 1,200			
Tons Bacon and Bacon Products, Milk - 1,000,000			
gallons of which 350,000 gallons Milk and 55,000			
gallons Cream; also 180 tons Cheese and 112 tons			
Butter Railed.			
Cattle - 5,000 head railed inwards 42,000.			

The Committee estimated that the earnings on the new and existing Railroads three years after completion will amount to Florins 443,000 and Florins 1,362,000 respectively, and similarly after 10 years Florins 853,000 and 2,583,500 respectively.

In framing the Estimate the Committee have deducted the amount of Traffic now loaded at Nakuru and Lendiani and have not included the amount resulting to the existing Railway from Traffic which will be the result of the normal development of the country.

Again, with the exception of the sum of Rs.75,000 and Rs.150,000 included for Native personnel at periods of three and ten years, no amount appears in the Estimate for "Coaching Returns".

To cover this last item of Revenue the figure has been increased to 81,000 and ~~289,000~~ respectively. Otherwise the figures as estimated by the Committee are accepted.

The revised estimated earnings on the new and existing Railway three years and ten years after completion of the new Railway are, therefore, as follows:-

(a) 3 years after completion of the Railway.

Kaize	...	...	...	Rupees	120,000
Flax	...	...	...	"	20,000
Coffee	...	...	...	"	12,000
Sundry Crops	...	...	...	"	8,000
Timber	...	...	...	"	120,000
Inward Traffic	...	...	...	"	80,000
Coaching	...	...	...	"	81,000
Total:-				"	<u>470,000</u>

(b) Earnings of increased Traffic on existing lines.

Kaize	...	...	...	Rupees	365,000
Flax	...	...	...	"	106,000
Coffee	...	...	...	"	26,000
Sundry Crops	...	...	...	"	20,000
Timber	...	...	...	"	500,000
Inward Traffic	...	...	...	"	400,000
Coaching	...	...	...	"	27,000
Total:-				"	<u>1,444,000</u>

(c) 10 years after completion of the Railway.

Maize	...	...	...	...	Rupees	238,000
Flax	...	...	...	...	"	80,000
Coffee	...	...	...	...	"	25,000
Sundry Crops.	...	...	...	...	"	17,000
Timber	...	...	...	...	"	138,000
Inwards Traffic	...	...	...	...	"	162,000
Coaching	...	...	...	...	"	289,000
Pigs	...	...	...	...	"	10,000
Bacon & Bacon Products...	...	...	...	...	"	16,000
Milk, Cream, Butter and Cheese	...	...	...	...	"	18,000
Cattle	...	...	...	...	"	20,000
Total:- "						<u>1,013,000</u>

(d) Earnings of increased Traffic on the existing line.

Maize	...	...	...	...	Rupees	815,000
Flax	...	...	...	...	"	226,000
Coffee	...	...	...	...	"	53,000
Sundry Crops.	...	...	...	...	"	39,000
Timber	...	...	...	...	"	606,000
Inward Traffic	...	...	...	...	"	810,000
Coaching	...	...	...	...	"	96,000
Bacon & Bacon Products...	...	...	...	...	"	48,000
Butter & Cheese	...	...	...	...	"	7,500
Cattle	...	...	...	...	"	20,000
Total:- "						<u>2,921,000</u>

These calculations are based upon present Railway Rates as stated in the Uganda Railway Tariff Book, and are calculated on estimated proportional mileage allowing for a proportion of the Traffic consumed or used in the Colony and the remainder carried to the Coast for Export.

It will be observed from the Report attached that these Estimates are based on calculated areas of about 150,000 acres, reached in three years, and about 300,000 acres, reached in ten years, after completion of the proposed Railway, and there remains a balance of about 800,000 acres of good cultivable land for future development, chiefly in the Usin Gishu Plateau and in the Trans Nzoia districts.

43

404

XIV. ESTIMATES

The Estimates have been prepared by Messrs. Griffiths and Company Limited, under the terms of the Survey Agreement and in consultation with the Survey Engineer.

The cost of materials and freight have recently shown a decrease, and should this movement continue the cost of work would be materially reduced.

In framing the Estimates, however, it is not possible to make any assumption as to what rates will rule at the date the materials are purchased. Current prices have, therefore, been accepted.

It will also probably be possible to effect economy during construction, as for example, by running spoil from cuttings to banks, and in accepting the alternative Route on the ascent of the Mau Escarpment, etc.

With the great uncertainty as to the cost of material and the supply of skilled Labour, it is an impossible task to frame an Estimate with certainty that it will represent the actual cost of the Railway. The Estimate, therefore, is an earnest attempt to forecast the cost of the Railway, avoiding on the one hand inflation and on the other undue optimism. In the light of further information the Estimate will be revised later in London.

Preliminary Expenses.

The Estimate is based upon the total amount expended to date on the 1920/21 Survey. Provision is also made for completing the staking-out and the preparation of working plans, which it is anticipated will be completed by the 31st July, 1921.

It is estimated that the cost of the Survey, including the preparation of working plans, will be Rs. 245,000 or Rs. 1,658.6 per Mile.

Land.

Under the Crown Lands Ordinance, 1915, Section 89, Government is entitled to resume land for the construction of Railways unless the holding is 200 acres or less in extent. Under Section 91 Government may enter upon and construct Railway Stations, Sites, etc., paying compensation for the land.

On the proposed Railway there are 25 Stations and Station Sites for which compensation will be payable.

The area of land reserved for these Stations and Sites extends to 150 acres.

By Order No. 8538, dated the 15th March, 1921, The Commissioner of Lands estimates that the value of land to be resumed will cost from Fls. 25 to Fls. 60 per acre.

For compensation for buildings to be purchased Fls. 10,000 is provided, and for compensation for crops, woods, etc., Fls. 7,500 is included in the Estimates.

Formation. The quantities have been calculated for banks 20 feet wide and cuttings 16 feet wide, the slope of the banks being $1\frac{1}{2}$ to 1 and cuttings

allowance has been made for excavation from the spoil being tipped to embankments. In the section from Mile 33 to Mile 81, where earthwork is heavy, it is proposed to utilise the spoil from cuttings for forming embankments. If this is done, it is estimated that a saving of Fls. 471,330 will be effected.

Having regard to the cost of Labour, Fls. 16

per month, and the cost of ordinary earthwork tools, a flat rate of Fls.28 per 1,000 cubic feet has been estimated for.

There is little recent experience in the country upon which to estimate the rate at which rock excavation can be done.

For this class of work rates run high and as the Labour in the country is quite inexperienced in rock work, progress in it must be necessarily slow, especially if it is recollected that Labour will never remain on the work sufficiently long to gain experience, also it is not a class of work which the Native takes to; therefore, the output will be small.

For this reason the cost of rock excavation has been estimated for at Fls.55 to Fls.100 per 1,000 cubic feet, depending upon the degree of hardness of the rock.

Provision is made for ample side and catchwater drains.

From Mile 30 to Mile 31 much of the alignment of the Route of the proposed Railway lies through dense forest which it is estimated will have to be cleared for a width of 100 feet on either side of the centre line. To clear the site for works the sum of Fls.29,112 is provided.

The provision of a reasonable service road is estimated for so as to permit the construction of small bridges in advance of earthwork, and generally to give access to works and camps.

In view of the cost of cement and sand the rate for concrete runs high, being Fls.123 per 100 cubic

feet, the concrete estimated for being a 1 - 3 - 6 mixture. This rate includes all charges.

**Major
Bridges.**

The Estimate for steelwork is based upon present prices, freight, insurance and erection, and amounts to Fls.440 per Ton.

**Minor
Bridges**

These have been estimated for at the rates for this class of work as at present ruling. It is hoped that by standardisation of design and manufacture of pipes and culverts in sections at yards to reduce the cost to a minimum.

Fencing.

The amount provided in the Estimate allows for fencing only at Eldoret Station Yard and the approach to several bridges.

**Electric
Telegraphs.**

The Estimate is based upon the provision of a three wire line carried on G.I. poles similar to the Uganda Railway type.

The Estimate has been furnished by the Chief Telegraph Engineer, the estimated cost per Mile being Fls.1,922.

It would, however, be possible to reduce the expenditure under this head by substituting wood poles for carrying the wires. It is estimated that the cost of a Telegraph Line of this description would be *Fls 1052 per mile*

**Permanent
Way and
Ballast.**

It is proposed to lay the line with 50 lb. British Standard F.F. Rails and Steel Sleepers of the Uganda Railway type.

The Estimate of cost of a Mile of Permanent Way is shown in Appendix C, and amounts to Fls.44,212, including 5% for contingencies.

In the Estimate for the construction of the Rail-

way prepared in 1915 the Permanent Way is estimated to cost Fls.15,000 per Mile, then equivalent to £1,000, but at the present currency value equivalent to £1,500. The material to be used, however, was to consist of secondhand material, etc., to be supplied at a very low charge by the Uganda Railway.

Although it is not proposed to ballast the track, except in cuttings, provision is made for ballasting the whole line to the full section of 40,000 cubic feet per Mile.

Suitable stone exists along the entire length of the Railway. To convert it to ballast and place and pack in the track is estimated to cost Fls.6,400 per Mile, thus:-

Breaking	Fls.8.50	per 100 cubic feet
Train Charges	" 3.50	" " " "
Loading, etc.	" 1.50	" " " "
Placing in line	" 2.50	" " " "

Total:-Fls.16

Stations and Buildings

The standard type of Stations and Buildings on the Uganda Railway has been adopted.

The Estimate provides for the construction of stone or brick Buildings in cement mortar, but does not provide for tile roofs.

Staff Quarters are estimated to be built in stone or brick of a similar type to the latest designs on the Uganda Railway.

All Stations are equipped to a standard not less than that of the Uganda Railway. In the case of watering arrangements and goods sheds an improved standard is followed.

Plant.

In the absence of any information as to the rating

prices for Machinery it is difficult to frame an Estimate for the Plant required for construction. The whole question will be further considered in London, but it is believed that the provision made is reasonable.

Ferries.

There are no Ferries or Harbour Works.

Rolling Stock.

Under this Estimate no provision is made for Rolling Stock.

General Charges.

These are high, as the Estimate provides for the Engineering and Accounts Staff required by the Government and the Contractors.

Provision is made for the employment of Staff for ten years, declining as the work is completed. The charges under this head include Salaries, Allowances, Passages, Accommodation and Office Contingencies.

XV. FINANCIAL.

The total estimated cost of the proposed Railway is 22,171,941. *without Rolling Stock Exp*

The estimated ~~gross~~ ^{are} Traffic earnings on the new line and increased Traffic on the existing line are 2373,400 ten years after completion. Allowing for 70% for working expenses the net Revenue is 2112,000, which is sufficient to pay 5.25% Interest on the Capital Cost.

XVIG. ABSTRACTS.

The Abstracts showing the incidence of Curvature, Gradients and Bridges, and Stations and Equipment provided are attached.

XVIL. PLANS.

These are being prepared by Messrs. Griffiths and

Company Limited, under the Survey Agreement and in consultation with the Survey Engineer.

Copies of the Plans and Sections accompany this Report, numbered 1 to 72 inclusive, also Plans and Sections of the Mau Route and the alternative Route on the ascent of the Mau Escarpment. For ready reference an Index Plan and Section are attached.



Nairobi,
April, 1921.

Chief Engineer Surveys,
Uasin Gishu Extension.

JKR/AGH

Mau Summit, Uganda Railway Main Line, to Mau Junction,
Mile 53.67.

411

Length 10.72 Miles.

GRADIENT ABSTRACT.

Gradient	Number of Each	Length in Miles.	Percentage of Total Length of Line.
1 in 66 $\frac{2}{3}$ or 1.5 per cent	5	1.12	10.44
1 in 66 $\frac{2}{3}$ Compensated	9	2.50	23.32
1 in 67 to 1 in 100	3	1.97	18.39
1 in 101 to 1 in 150	3	.74	6.90
1 in 151 to 1 in 200	1	.95	8.86
1 in 201 to 1 in 300			
1 in 301 to 1 in 500			
Level	11	3.44	32.09
	32	10.72	100.00

Steepest Grade Rise ¹~~3x~~ in 66 $\frac{2}{3}$
 Longest continuous length of
 steepest grade .57 Miles
 Followed by Rise 1 in 100
 For .66 Miles

Nau Summit, Uganda Railway Main Line, to Nau Junction,
Mile 53. 67: 2

Length 10.72 Miles.

412

CURVE ABSTRACT.

Degree of Curvature & Radius.		Number of Each	Length in Miles.	Total Curvature Degrees
10°	Radius 573 feet	15	2.01	1059.5
8°	" 716 "	15	2.007	853.0
7½°	" 764 "	1	.163	64.5
6°	" 955 "	1	.14	44.3
5°	" 1146 "	3	.47	128.5
4°	" 1432 "	4	.36	75.5
		39	5.15	2235.3

Ratio of Curve to total length of line 48.04 per cent
Average amount of Curvature per Mile 212.09 degrees.

New Summit, Uganda Railway Main Line, to Mau Junction,
Mile 33.67.

Length 10.72 Miles.

CURVE ABSTRACT.

Degree of Curvature & Radius.		Number of Each	Length in Miles.	Total Curvature Degrees
10°	Radius 573 feet	15	2.01	1059.5
8°	" 716 "	15	2.007	853.0
7½°	" 764 "	1	.163	64.5
6°	" 955 "	1	.14	44.3
5°	" 1146 "	3	.47	128.5
4°	" 1432 "	4	.36	75.5
		39	5.15	2235.3

Ratio of Curves to total length of line 48.04 per cent

Average amount of Curvature per Mile 432.09 degrees.

Curve Abstract

148.3 Miles
413

Colo Line 148.3 Miles

20.75
Huber & Mill
Mill 0.5 to Mill 20.75

32.92
Mill to Mass Junction
Mill 20.75 to Mill 53.67

49.758
Mass Junction to Summit
Mill 53.67 to Mill 79.428

77.845
Summit to 2nd 86 1/2 (1915 Survey)
Mill 79.428 to Mill 91.273

57.03
2nd 86 1/2 (1915 Survey) to Turf
Mill 91.273 to Mill 148.3

Station	20.75			32.92			49.758			77.845			57.03		
	No. of Sacs	Length in Miles	Total Curvature in Degrees	No. of Sacs	Length in Miles	Total Curvature in Degrees	No. of Sacs	Length in Miles	Total Curvature in Degrees	No. of Sacs	Length in Miles	Total Curvature in Degrees	No. of Sacs	Length in Miles	Total Curvature in Degrees
573 feet	222	29.470	15557.77				84	10.384	5482.65	57	9.606	5072.46	63	6.540	3853.16
037	1	.346	164.50				1	0.346	164.50						
074	1	.380	177.00							1	.380	177.00			
716	31	3.211	1353.88				16	1.581	667.77	6	.905	382.41	6	3.05	213.20
818	41	9.886	3653.66	9	3.163	1169.3				2	.433	160.16		30	6.29
955	18	2.989	949.57	1	0.218	69.0	3	0.839	265.77	4	.432	137.05		5	1.50
1042	1	.220	65.00											1	0.22
1140	57	10.773	2756.12	3	0.890	103.0				3	.477	126.00	3	2.06	67.50
1432	14	2.604	549.81	3	0.521	110.0	8	1.303	275.06					48	9.03
1637	4	1.040	193.00											3	0.78
1910	22	4.593	728.40	6	1.422	226.3	5	1.181	167.10					4	4.04
2292	4	1.500	197.25				1	0.180	23.75					11	1.99
2865	10	1.977	209.01	2	0.417	44.0	1	0.127	13.40	1	.063	6.66		3	1.32
3131	1	.910	88.75											6	1.37
5730	6	2.063	109.26	4	1.390	73.366				1	.153	8.16		1	0.91
	435	71.962	26752.246	28	7.591	1794.966	126	15.941	7080.00	75	12.45	6669.90	72	7.30	3733.86
to Total Length of Line	0	0	0												
Percent of		48.5	per cent		26.25	per cent		48.42	per cent		6.6	per cent		40.9	per cent
per mile		180.4	degrees		86.5	degrees		211	degrees		207	degrees		514	degrees

UGANDA RAILWAY.

Uasin Gishu Extension.

Gradient Abstract

Metre Gauge

148.3 Miles

414

Whole Line 148.3 Miles			Nakuru to Molo 20.75 Miles			Molo to Mau Junct. 32.92 Miles			Mau Junct. to Summit 19.75 Miles			Summit to Mile 91.273 17.84 Miles			Mile 91.273 to Turbo Miles 57.03			
Gradient	No. of Loads	Length in Miles	Percentage of Total Length of Line	No. of Loads	Length in Miles	Percentage of Total Length of Line	No. of Loads	Length in Miles	Percentage of Total Length of Line	No. of Loads	Length in Miles	Percentage of Total Length of Line	No. of Loads	Length in Miles	Percentage of Total Length of Line	No. of Loads	Length in Miles	Percentage of Total Length of Line
1 in 66 2/3 or 1.5 per cent	159	37.415	25.23	22	6.421	30.93	50	9.61	29.12	14	2.234	11.32	36	6.07	34.2	37	13.03	22.94
1 in 66 2/3 compensated	180	46.977	31.67	21	5.430	26.13	60	18.03	54.73	20.	11.167	56.55	45	5.85	32.80	34	6.50	11.36
1 in 77 to 1 in 100	80	32.301	21.78	11	3.617	17.44	4	0.58	1.77	10	2.434	12.34	7	1.10	6.18	48	24.57	43.08
1 in 101 to 150	19	5.413	3.65	2	0.209	1.01	3	0.75	2.28	3	1.244	6.21	1	0.20	1.14	10	3.01	5.28
1 in 111 to 200	14	3.248	2.19	2	1.212	5.85				3	0.426	2.17				9	1.61	2.82
1 in 101 to 300	7	0.790	0.53	1	0.170	0.82	1	0.28	0.85				1	0.19	1.13	2	0.15	0.26
1 in 101 to 500	8	1.250	0.84	1	0.530	2.56										7.	0.72	1.26
Level	100	20.922	14.11	9	3.161	15.26	14	3.67	11.15	12	2.251	11.41	18	4.45	24.72	47	7.41	13.00
Total:-	565	148.3	100.00	69	20.75	100.00	132	32.92	100.00	62	19.75	100.00	108	17.84	100.00	194	57.03	100.00

Deepest Grade. Rise 1 in 66 2/3 compensated 1 in 66 2/3 compensated Rise 1 in 110 Rise 1 in 100 Rise 1 in 66 2/3 compensated

Length of longest haul (over by) 4.46 Miles 1.47 Miles 1.17 Miles 1.17 Miles 1.17 Miles

Length of longest haul (over by) 2.24 Miles 1.10 Miles 1.17 Miles 1.17 Miles 1.17 Miles

BRIDGE ABSTRACT.

Type of Bridge		Total No. of Spans	Lineal Waterway in Feet.
Class	Span		
12" N W Pipes	1'0" Feet	39	39
18" N W Carriage, Deck Deck	1.5	162	243
2' X 2' Slab Tops	2.0	2	8
3' X 3' " "	3.0	4	12
3' Moulded Concrete	3.0	36	108
4' X 3' Elliptical Pipes	3.0	27	81
Burcharged Arch Culverts	6	12	72
	8	6	48
	12	2	24
	40	1	40
	60	6	360
Girders Bridges	1 Combined Span of 15/40 14/20	29	880
	1 " Span of 6/40 2/35 7/20	15	450
	1 " Span of 1/20 2/30	3	80
	1 " Span of 1/20 2/55	3	130
	1 " Span of 11/40 10/20	21	640
	1 " Span of 1/60 2/40	3	140
Total for whole line:-		371	3,355
Average per Mile 22.6			
Deducting Viaducts & Spiral Bridges 7.9			

UGANDA RAILWAY ESTIMATE OF 1 MILE TRACK RECONSTRUCTION. 416

Rails, 80lbs, 36ft. long, 210 to the Mile		2269 . 0 . 0
126 Tons @ £18 per Ton.		
Sleepers, Steel, 71 Tons @ £25 per Ton		1775 . 0 . 0
Fishplates, 210 pairs @ 30lbs per pair		
- 3 Tons @ £23 per Ton		69 . 0 . 0
Fishbolts, 2lb, 640 - 75 Tons @ £50 per Ton		37 . 10 . 0
Steel Keys 1.5 Tons @ £25 per Ton		37 . 10 . 0
Freight, Carriage, Deck Dues	- 202.25 Tons @ Fls. 66 per Ton	
Loading & Unloading of above		1334 . 17 . 0
Insurance 7/9 per £ sterling - £16.25		16 . 5 . 0
Lifting present Track per Mile		200 . 0 . 0
Relaying new Track per Mile		<u>200 . 0 . 0</u>
		4395 . 2 . 0
Allowance for Tools etc. 5%		<u>219 . 0 . 0</u>
Cost per Mile		<u>6235 . 0 . 0</u>

APPENDIX.

Track 42 miles @ £6,235		261,370 . 0 . 0
2 Locomotives @ £8,000		16,000 . 0 . 0
Strengthening 3 Bridges @ £2,000		18,000 . 0 . 0
Contingencies 5%		<u>14,793 . 0 . 0</u>
	Total	310,663 . 0 . 0
Credit 3/5% of original cost of Permanent Way @ £1,450 per mile		<u>36,540 . 0 . 0</u>
	Balance	274,123 . 0 . 0

417

**ESTIMATES OF ALTERATIONS ON UGANDA RAILWAY BETWEEN NAKURU
AND MAU TO ELIMINATE 2% GRADE AGAINST DOWN TRAFFIC.**

Deviation No. 1.

From M.476i approx. to M.47B. Turi Station.

Earthwork.

Cuttings	1,356,000	Cu. Ft.	@ 28/-	o/oo	Fls.	
Banks	1,217,000	"	"	@ 28/-	o/oo	"
						37,968
						34,076

Drains.

Side	8,000	Cu. Ft.	@ 28/-	o/oo	"	
C.W.D.	24,000	"	"	@ 28/-	o/oo	"
						224
						672

Bridges.

18' Arch	119'	long	"			
518" Pipes	228'	long (Total)	"			8,850
						3,110

Ballast & Permanent Way.

Permanent Way @ Fls. 44011 - 2,15 M	"	94,624
Ballast @ 40,000 Cu. Ft. per M 16%	"	13,760

Points & Crossings.

6 @ Fls. 787	"	4,722
--------------	---	-------

Removing Station

L S	"	2,000
-----	---	-------

Contingencies 5%

10,000

Total

210,006

Credit.

7,700' old Track @ Fls. 8700 per M	12,180	
11,312 Cu. Ft. Ballast on present F.W.	679	12,859

Total Amount

Fls. 197,147

Deviation No. 74.

From Viaduct M 478 to Viaduct M 480.

Earthworks.

Cuttings.	4,522,000	Fls.	126,616
Banks.	72,000	"	2,016

Trains.

Side	9,000	"	252
C.W.D.	56,000	"	1,568

Bridges.

2 - 12" Pipes 50' long Total			332
------------------------------	--	--	-----

Permanent Way & Ballast.

Permanent Way - 1 1/2 M			77,019
Ballast @ 40,000 C/F per M			11,200
Contingencies. @ 5%			10,950
Total			229,953

Credit.

8,200' of old Permanent Way	13,050		
" Ballast @ 20,000			
@ Fls. 6/- per 100	1,800		14,850
Total Amount		Fls.	215,107

Deviation 2 B.

419

From Viaduct M 478 to Viaduct M 480.

Earthworks.

Cuttings	1,021,000	28,588
Banks	1,504,000	42,112

Drains.

Side.	11,000	308
C.W.D.	47,000	1,316

Bridges.

3 - 12" Pipes	90' long (Total)	2,764
3 - 4' x 3' Elliptical Pipes	280' long.	
	(Total)	7,395

Permanent Way & Ballast.

Permanent Way	- 2.8 M	123,231
Ballast @ 40,000	- 2.8 M	17,920
Contingencies. 5%		<u>11,182</u>
Total.		234,816

Credit.

8,200 old Permanent Way	13,050	
" " Ballast @ 20,000		
Cu. Ft. per M.	<u>1,800</u>	<u>14,850</u>
Total Amount	<u>Fls.</u>	<u>219,966</u>

ANNUAL COST OF RAILWAY

Uganda Railway Uasin-Gishetti Extension.
Metre Gauge 148.3 Miles.

ACCOUNT	Whole Line		148.3 Miles		Nakuru - Mile		0-80.75	
	Sub-Head		Main Road		Sub-Road		Main Road	
	Total Cost	per Mile	Total Cost	Rate	Total Cost	Rate	Total Cost	Rate
PRELIMINARY EXPENSES								
(a) Survey Expenses (including striking)	41886.22	282.5	251220.7	1696.72	5860.2	282.5	35248	1696.72
(b) Plant	29721.49	199.7			2972.29	199.7		
(c) Establishment	189312.99	1276.5			2468.51	1276.5		
FORMATION								
(a) Earthwork	5090658	34326.75	5391461	36354.4	344306	16396.9	374732	18059.3
(b) Tunnels								
(c) Clearing Demarcation etc	7227	207.2			6931	354.1		
(d) Side Drains	225588	1521.15			23412	1128.3		
BRIDGEWORK								
(a) Major Bridges	1121047	2811	1613945	10662	23512	1133	55284	2664
(b) Minor Bridges	422898	2852			21772	1531		
FENCING								
(a) Fencing	21821.70	147.5	64228.7	432.1	2952.27	147.15	8987	432.1
(b) Road Crossings	29600	199.59			2141.60	199.59		
(c) Mile & Gradient Posts	12807	86.36			1982.95	86.36		
WIRE TELEGRAPHS								
			285083	2322.3			39889	1922.3
BALLAST & PERMANENT WAY								
(a) Main Line			8651295	58336.4			1210481	58336.4
1. Permanent Way	6851172	46211.5			2567.9	46211.5		
2. Ballast	996776	6720			15507.1	6720		
(b) Sidings								
1. Permanent Way	544537	3739.3			7742	3739.3		
2. Ballast	89740	544.44			11317	544.44		
(c) Points & Crossings	106450	721.17			14244	721.17		
(d) Maintenance	59320	400			4300	400		
STATIONS & BUILDINGS								
(a) Stations & Offices	364300	2456.5	2297507	14817.9	56270	2721.8	269870	13006
(b) Workshops & Stores								
Building								
(c) Staff Quarters	1358950	9163.6			279660	7130.6		
(d) Station Machinery	474257	3197.95			45640	3183.38		

18913492

2002613

Deviation 2 B.

419

From Viaduct M 478 to Viaduct M 480.

Earthworks.

Cuttings	1,021,000	28,588
Banks	1,504,000	42,112

Drains.

Side.	11,000	308
C.W.D.	47,000	1,316

Bridges.

3 - 12" Pipes	90' long (Total)	2,764
3 - 4' x 3' Elliptical Pipes	280' long.	
	(Total)	7,395

Permanent Way & Ballast.

Permanent Way	- 2.8 M	123,231
Ballast @ 40,000	- 2.8 M	17,920
Contingencies. 5%		<u>11,182</u>
Total.		234,816

Credit.

8,200 old Permanent Way	13,050	
" " Ballast @ 20,000		
Cu. Ft. per M.	<u>1,800</u>	<u>14,850</u>
Total Amount	<u>Fls.</u>	<u>219,966</u>

ANNEXURE COST OF RAILWAY

Uganda Railway Uasin-Gisham Extension.
Metre Gauge 148.3 Miles.

ACCOUNT	Whole Line 148.3 Miles				Kakura - Mile 0-20.75			
	Sub-Head		Main Head		Sub-Head		Main Head	
	Total Cost	per Mile	Total Cost	Rate	Total Cost	Rate	Total Cost	Rate
PRELIMINARY EXPENSES								
(a) Survey Expenses (including staking)	41886.22	282.5	251920.7	1698.72			35248	1698.72
(b) Plant	20721.49	139.7			5860.2	282.5		
(c) Establishment	109312.99	1276.5			2099.29	139.7		
					2488.51	1276.5		
FORMATION			58053	391.45			8123	391.45
(a) Earthwork	50906.58	34326.75	539346.1	36355.			374732	18059.3
(b) Tunnels					344386	26596.9		
(c) Clearing Demarcation etc	7327	507.2						
(d) Side Drains	22588	1522.15			6933	334.1		
					23412	1128.3		
BRIDGEWORK			161394.5	1088.			55284	2664
(a) Major Bridges	1181047	8011						
(b) Minor Bridges	422098	2852			21512	1133		
					11772	1531		
FENCING			64228.7	433.2			8987	433.2
(a) Fencing	51821.70	147.5						
(b) Road Crossings	29600	199.59			2053.27	147.15		
(c) Mile & Gradient Posts	12807	86.36			441.60	199.59		
					1481.95	86.36		
TELEGRAPHIC TRUNKS			205063	1382.3			39889	1922.3
BALLAST & PERMANENT WAY			8651295	58334.4			12210481	58334.4
(a) Main Line								
1. Permanent Way	6851172	46211.5			9583.9	46211.5		
2. Ballast	996576	6720.			12244.1	6720		
(b) Sidings								
1. Permanent Way	554537	3739.3			774.8	3739.3		
2. Ballast	89740	6044.			111.7	6044.4		
(c) Points & Crossings	106950	721.17			1424	721.17		
(d) Maintenance	59320	400			2300	400		
STATIONS & BUILDINGS			2197507	14817.9			269870	13006
(a) Stations & Offices	364300	2456.5			56270	2711.6		
(b) Workshop & Staff Building								
(c) Staff Quarters	111							
(d) Station Machinery	1358950	9163.6			647960	7130.6		
	474257	197.95			45640	1163.38		

20513492

2002613

M. 20.75 to M. 53.67 = 32.92M.				M. 53.67 to M. 91.42 = 37.75M.				M. 91.42 to M. 148.3 = 56.88M.			
Sub-Head		Main Head		Sub-Head		Main Head		Sub-Head		Main Head	
Total Cost	Rate	Total Cost	Rate	Total Cost	Rate	Total Cost	Rate	Total Cost	Rate	Total Cost	Rate
		55922	1698.72			64127	1698.72			96623.3	1698.72
9288 4598 3282	282.5 119.7 1278.5			16661 5274.73 48196.3	282.5 139.7 1276.5			16066 7947.59 72609.7	282.5 139.7 1276.5		
		12887	391.45			14777	391.45			22265	391.45
1947025		1622148		220182	58305.2	2266486	60039.3	998165	17548.6	1128096	19832.8
32175 42948	977.3 1304.8			16680 48424	449.8 1284.3			19129 3888 110882	336.3 1947.9		
570019 190138	28553 5778	860157	26129	399724 80016	10321 2112	477640	12653.	107892 112972	1897 1968	220864	3883
4844.03 6970.60	147.15 199.59	14258	433.1	5554.76 7534.80	147.15 199.59	16349	433.1	8369.64 11353.	147.15 199.59	24634.7	433.1
2842.93	86.36			3260.03	86.36			4912.09	86.36		
		63283	1922.3			72568	1922.3			109343.	1922.3
		1920436	58336.4			2292201	58336.4			3318177	58336.4
1521284 221222	46211.5 6720			1744486 293680	46211.5 6720			2628513 382234	46211.5 6720		
123098 17923 23741 13168	3739.3 544.44 721.17 400			141158 28952 27284 15100	3739.3 544.44 721.17 400			212691 30968 41820 22752	3739.3 544.44 721.17 400		
64820	2122.72	268979	8170.7	73835	1995.84	375615	9950	164315	2888.8	1283043	22550
139640 59459	4241.8 1806.16			224640 804649 77140	5800 2043.24			846710 272018	14885.9 4782.31		
		4818070				5489763				6203046	

Y. UASIN-GISHU EXTENSION
 Metro Gauge
 Length 148.3 miles

421

(2)

20.75 to M. 511.67 = 12.92 Miles
 Sub - Road Main Road

Rate	Total Cost	Rate
107.23	4818070 128313	3897.8
4537 5140.7 1988.3 2807.4 1191.2 435.4 674.6 256.26 668.92	583342	17720
5529725		167974.6

M. 511.67 to M. 91.42 = 17.75 Miles
 Sub - Road Main Road

M. 91.42 to M. 148.3 = 56.88 Miles
 Sub - Road Main Road

Total Cost	Rate	Total Cost	Rate	Total Cost	Rate	Total Cost	Rate
4140	309.67	588983 147143	3897.8	8900	156.47	588984 221707	3897.8
171879 1988.3 2807.4 1191.2 435.4 674.6 256.26 668.92	4537 5140.7 1988.3 2807.4 1191.2 435.4 674.6 256.26 668.92	568930	17720	2 88 1 2 84 1 1 30 1 1 30 1 6 77 1 1 37 1 1 37 1 1 37 1 1 37 1	5.7 140.7 1988.3 2807.4 1191.2 135.4 674.6 256.26 668.92	480913	17720
		6395837	167041.97			743266	13067.1

EAST AFRICA PROTECTORATE.

REPORT
OF THE

INDEPENDENT COMMITTEE

APPOINTED TO MAKE AN ECONOMIC SURVEY

OF THE PROPOSED NAKURU-ELDORET-

WOMBEI RAILWAY.

1920.

DEPARTMENT OF AGRICULTURE

Nairobi,

British East Africa.

16th April, 1920.

TO
 His Excellency,
 The Acting Governor,
 East Africa Protectorate,
NAIROBI.

Your Excellency,
 The Committee appointed by Your
 Excellency in terms of your Minute dated the
 12th January, 1920, have the honour to submit
 their report.

Preface.

2. In pursuance of a request from the
 Secretary of State for the Colonies we were
 instructed to make an Economic Survey of the
 projected railway line taking the following
 route Nakuru - Eldoret - Mumias, and to
 submit "estimates of probable traffic during
 the first three years and permanently".

3. A summary of our conclusions was
 prepared and submitted as requested in the
 form of a telegram which was despatched to the
 Secretary of State on the 11th March, 1920
 (Appendix No.2).

4. It now remains for that summarized
 report to be amplified and, submitted with
 this report are the following appendices:-

Terms of
 Reference.

Summary of
 conclusions
 telegraphed.

Appendices.

1. Minute of appointment of Committee.
2. Copy of summary of report transmitted by telegraph.
3. Schedules 1 to 5 giving details of areas, production and traffic.
4. Rainfall records.
5. Summary of evidence taken.

Schedules submitted.

5. 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.

6. Care was exercised to differentiate between the traffic on the new and on the existing railway and to calculate both.

How traffic estimated.

7. It was found impracticable to attempt to estimate the permanent traffic, and it was decided to submit figures indicating probable traffic and earnings in 3 and 10 year periods after completion of the new line.

Procedure.

Steps taken to secure information.

8. In order that an opinion might be formed as to their potentialities and productivity the areas which would 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 from Farmers' and other Associations, from representatives of Companies and from individuals at Nairobi, Nakuru, Ravine and Eldoret.

9. Information was brought from and furnished by those bodies under the following main heads.

Agricultural & General:

1. Kinds of Soil and their fertility.
2. Proportion and area 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.

To be in stock for breeding and purposes, and in dairy

in chief kinds of dairy produce, livestock requirements of community additional to that of Sakuru & Landiani.

production, climate, labour, market

12. The areas within reach of the line and their approximate position

13. The estimated quantity, in tons, of round timber from each area within three years after the opening of the line and thereafter

14. The estimated quantity, in tons, of round timber which will be railed from the area annually for the first three years and thereafter

15. The approximate position of logging areas from which round timber will be obtained as distinct from saw mills.

Main Report.

Areas and their character.

The main areas covered by the enquiry are Sakuru, Njoro, Solai, Rangai and the Muli Valleys, Ravine, Uasin Gishu Plateau, and North Kavirondo.

4.
Of these Kavine is mainly a forestal area and a Native Reserve, North Kavirondo is entirely populated by natives, while the other areas are settled by Europeans.

Nature of traffic.

11. The main traffic may be classified under the following heads: (1) Agricultural, (2) Timber, (3) Native (personal), (4) Inward, to supply the needs of the community for maintenance and for development purposes.

Difficulty of estimating production.

It is somewhat difficult to estimate the degree of accuracy of records of the lines along which development will take place and the impact of that development.

Greater accuracy of forestal production.

12. The case of forestal production in the area is affected, therefore, by the output of the forest and the timber supply can be accurately determined.

Character of estimated production.

14. The estimated production has been determined on the basis of the following considerations:

It is considered that unless the world's market prices render the agricultural industry generally unprofitable the results forecasted will be achieved.

Head of New
Railway.

15. The proposed line will serve areas urgently in need of railway communication. At present agricultural development is seriously hampered particularly in the Uasin Gishu Plateau and the Trans Nzoia by the impediment of a distance of 40 to 120 miles from rail head.

Climate, soil
and fertility.

16. The climatic and other cultural conditions are highly favourable for the production of a number of farm crops, some of them highly valuable. The paucity of geological information prevents a classification of the soils according to their origin being made. They consist chiefly of ^{red} loams in good physical condition for cultivation. Judged by their appearance, the character of the natural vegetation and the yield of crops grown upon them, the soils are undoubtedly for the most part highly fertile. The proportion of cultivable land is high, no poor land is seen among that included in the cultivable area and all that land possesses fertility much above the average.

It is regretted that analyses of samples of soil representative of the types found have not been completed in time for submission with this report.

Suitability for
European
occupation.

17. The climate is well suited to occupation by Europeans.

Results to be
obtained.

18. With railway communication more intensive development will take place, land at present unoccupied will become productive, large

holdings at present only partially in beneficial occupation will be subdivided. A large and an increasing European population will be settled on the land, more capital will be introduced into the country, production will be substantially increased and a natural expansion of trade arising out of the increased needs of the community will be brought about.

Other benefits.

19. As the population increases so provision can be made for the amenities of life of a civilised community and state services which would not be permissible with a sparse population can be rendered.

Other development not estimated.

20. Apart from the increased traffic directly due to the construction of the new line under consideration there will be concomitant development with increased trade and expansion of trade generally will take place at the ports and at distributing centres. It was found to be impracticable to represent these factors by figures but they should be taken into consideration when the merits of the scheme are under review.

Unstable land values.

21. Land values in the main areas dealt with are at present unstable. The prices realised for farming propositions similar in character vary greatly and are dependant largely upon the conditions bringing about the sale and the views of the purchaser.

Satisfactory development.

22. Your Committee was impressed with the amount of development which had already taken place in the absence of railway communication. It is clear that land

has been secured, developed, and held in anticipation of the provision of railway facilities.

Effect of failure to construct.

23. Apart from the disappointment which will be experienced if construction does not begin at no far distant date, development will be checked, land values will either remain stationary or decline, and the effect will be seen in a general arrestment of progress throughout the country.

Need of Trans-Nzoia area.

24. Attention is drawn to the pressing need for bringing the Trans Nzoia into closer railway communication. There, no less than 259 holdings have been allotted under the Ex Soldier Settlement Scheme, and success is only likely to be achieved provided reasonable railway facilities are afforded and it is difficult to see how failure can be prevented unless conditions for marketing the products of the holdings are improved.

Labour supply and conditions.

25. Some apprehension regarding the sufficiency of the labour supply for the development contemplated exists, but it is hoped and expected that the difficulties in respect of labour supply will be overcome. Some economy in the available

supply is also likely to be brought through the saving which can be effected from an extended use of modern agricultural machinery, implements and appliances, and from a better knowledge of the management of the labour itself.

Labour for construction.

26. It is to be assumed that the labour supply needed on the farms will not be disorganised through the demand which will exist for labour for the railway construction, and that the requirements will be met by the importation of unskilled labour from neighbouring territories.

Fair supply of Labour.

27. Granted these premises it is considered that a fair supply of labour is likely to be forthcoming to meet the needs of development at a steady and continuous rate.

Kind of occupiers of land and provision of capital.

28. As far as circumstances allowed an opinion to be formed it would appear that the land now occupied in the areas under consideration is in the hands of progressive men who will take advantage of improved railway facilities and that either they possess sufficient capital for development or they furnish security for raising it.

Crops grown.

29. The staple crops of the areas under review are at present maize, wheat and coffee, each of which has passed the experimental stage and their success

growth and suitability for the soil and climatic conditions have been proved. With the advent of the railway a substantial export trade in the products of these crops is expected. In certain areas wheat is likely to be grown successfully and it may reasonably be expected that within a reasonable time sufficient wheat will be grown to serve local needs, provided always that the wheat is obtained from growing this crop is appreciably less than that to be obtained from other crops. It is not expected that wheat can or will be grown for purchase if cotton is competition with other countries where conditions are more favourable.

Cotton is about to be grown in certain parts and it is not unlikely that it will be found suitable and that so long as comparatively high prices are obtained it will be found that though under pre-war conditions it was considered to be a crop suitable only for production for natives it will under the changed conditions be found a profitable one of the future of the area.

Dairy, and Pigs.

Persons with limited capital who require a quick and steady return it is likely that

dairying and pig farming will become important activities. The conditions are favourable for the success of these pursuits and with the establishment of Butter, Cheese and Bacon Factories already contemplated it is believed that in the course of a few years a substantial export trade in these products will be developed.

Beef production.

31. It is doubtful whether cattle rearing for beef production on a ranching scale is likely to be pursued. While the grazing conditions on some of the areas under consideration are suitable difficulty will exist for some time to come in establishing an export trade in beef, and some time must elapse before the present menace of stock disease is removed.

Sheep.

32. None of the land under consideration is suitable for successful sheep farming, at least with wool bearing sheep.

Export Trade.

33. It will be understood that the development and prosperity of the agricultural industry of this Protectorate will be largely dependent upon the export trade and the rate of progress made will be greatly influenced by the market prices obtained for export products.

Ability to compete with other countries.

34. The view is held that in respect of the staple crops mentioned, also of dairying products and bacon, this Protectorate can successfully compete

against

11.

against other countries provided that in railway and shipping rates and in the economical handling of produce at the port it is not seriously handicapped.

Kind of timber.

35. The forests traversed by, or within reach of the proposed railway line are rich in soft woods, e.g. Podo and Cedar, and hard woods, which are in large demand locally and for which there is every indication that a considerable export trade will be established in the near future.

Local timber requirements.

36. As the development of the country progresses and as more intensive cultivation is undertaken, which may be said to be synonymous with closer settlement so the demand for timber by the building and allied trades will increase; more saw mills will be established to meet the demand and more economical handling of timber will be practiced, which will reduce waste and at the same time tend to conserve the supplies in the forests.

Output of timber.

37. The estimated output of timber as shown in the schedule submitted is based upon the evidence furnished and also on the result of other saw mills now working in similar forests; with the exception of the forest subject to a concession the estimated output of timber is based on the estimated yield of the forest having regard to conservative management. The

estimated output from the mills in the concession forests is based on figures supplied by the Agents and have reference to the number of mills which it is proposed to establish.

Estimates of
production &c.

38. The figures which follow represent a summary of the production, railway traffic and earnings which your Committee estimates, after as careful calculations as can be made, on the information available and obtainable.

Production
Soy to Muiias
negative:

39. It should be noted that on the section between Soy and Muiias passing through the native reserve of North Kavirondo it is considered that the traffic will, for all practical purposes, be confined to Native "personal" and that there will be no appreciable production of crops to be carried by rail.

40. The estimated production per annum in the areas served less requirements for local consumption is:

(a) 3 years after completion of the railway.

Maize	...	66,000 tons
Flax, Fibre & Tow	...	6,700 tons
Coffee	...	1,100 tons
Sundry crops	...	3,900 tons
Timber	...	26,000 tons

(b) 10 years after completion of the railway.

Maize	...	131,250 tons
Flax, Fibre & Tow	...	12,900 tons
Coffee	...	2,200 tons
Sundry crops	...	3,900 tons
Timber	...	26,000 tons

Pigs number 18,500
converted into 1300 tons bacon and
bacon products.

Milk 1,000,000 gallons of which
350,000 gallons milk and 55,000

gallons cream also 180 tons cheese
and 112 tons Butter railed
Cattle 5,000 head railed.

- (c) Other traffic under (a) Inward 21,000
tons Native Personal 50,000 single
journeys under (b) Inward 42,000 tons
"Native Personal" 100,000 single
journeys.

41. The following are estimated earnings
on new and existing railway lines after
deductions have been made covering traffic
now loaded at Makuru and Londiani, also
traffic which would result from develop-
ment and be carried if the new line was
not constructed. Calculations made
allow for a proportion of traffic
consumed or used in Protectorate and the
remainder carried to the Coast for export.

- (a). Three years after completion of new line.

		Rupees.
Maise	...	120,000
Flax	...	40,000
Coffee	...	12,000
Sundry	...	5,000
Timber	...	100,000
Inward Traffic	...	80,000
Native Personal	...	75,000

Total: 442,000

- (b) Earnings of increased traffic on
existing line.

		Rupees.
Maise	...	365,000
Flax	...	106,000
Coffee	...	26,000
Sundry	...	20,000
Timber	...	420,000
Traffic	...	800,000
Personal	...	25,000

Total: 1,602,000

Interest and sinking fund on the Capital cost say £1,850,000	...	£ 111,000
	Net Less:	£ 95,300
Deduct profit earned on the Uganda Railway.		£ 34,000
Total Net Less:		£ 81,300

It is impossible to say what the working expenses may be 10 years after the Railway is completed, but taking the percentage of total expenditure to gross receipts at 75% the result would be:

Earnings (Net)	...	£ 86,000
Interest and Sinking Fund on Capital say	...	£ 111,000
Total Net Less:	...	£ <u>25,000</u>

Scope for
further
development.

43. These estimates are based on a cultivated area of about 150,000 acres reached in 3 years and about 300,000 acres reached in 10 years after completion of the proposed new railway.

There remains a balance of about 800,000 acres of good cultivable land for future development chiefly in the Usin Gishu Plateau and in the Trans Nzoia areas. The use which will be made of it and the extent of the development which may take place cannot at present be forecasted, but it will be evident that there exist potentialities for further expansion on an extensive scale.

44. Acting upon your instructions your Committee confined their attention to the route laid down, but before concluding this report it would appear advisable to state that in our opinion it is likely that an examination of the merits of alternate routes and of serving a certain area by the construction of a branch line would probably have resulted in recommendations being made which would be calculated to serve the needs with greater advantage and probably at less cost.

45. Our thanks are tendered to the representatives of the different associations and other parties concerned who rendered valuable assistance in supplying information required also to officials and others for their help in making the necessary arrangements to facilitate the enquiry.

46. We desire to express our appreciation of the capable manner in which the Secretary has discharged the duties allotted to him particularly in the preparation and compilation of the report submitted with this report.

Sd/- ALEXS HOIM,

Chairman,
Director of Agriculture.

Sd/- S. COUPER,
General Manager, Uganda
Railway.

Sd/- H.T. Martin, -
Commissioner of Lands.

Conservator of Forests.

Signed:-

Date 16.4.1920.