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COMMONWEALTH OF AUSTRALIA



C. B. Russell
Clerk of the Senate.
27-9-16.

PARLIAMENTARY STANDING COMMITTEE ON
PUBLIC WORKS.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

AND AN

APPENDIX

IN REGARD TO THE

PROPOSED EXTENSION OF THE PINE CREEK-KATHERINE
RIVER RAILWAY SOUTHWARDS SO FAR AS BITTER
(MATARANKA) SPRINGS.

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

(First Committee.)

EDWARD RILEY, Esquire, M.P., Chairman.

Senate.

Senator the Honorable John Henry Keating,
Senator Patrick Joseph Lynch (Vice-
Chairman),
Senator William Harrison Story.

House of Representatives.

James Edward Fenton, Esquire, M.P.,
William Fyfe Finlayson, Esquire, M.P.,
The Honorable Henry Gregory, M.P.,
Sidney Sampson, Esquire, M.P.,
William Henry Laird Smith, Esquire, M.P.

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC
WORKS.

PROPOSED EXTENSION OF THE PINE CREEK-KATHERINE RIVER
RAILWAY SOUTHWARDS SO FAR AS BITTER SPRINGS.

R E P O R T.

EXTRACT FROM THE VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES.

No. 96 OF 5TH NOVEMBER, 1915.

5. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—KATHERINE RIVER TO BITTER SPRINGS RAILWAY.—
The Order of the Day having been read for the resumption of the debate on the following motion of
Mr. O'Malley, That, in accordance with the provisions of the *Commonwealth Public Works Committee
Act 1913-1914*, the following work be referred to the Parliamentary Standing Committee on Public
Works for their Report, viz. :—

Extension of the Pine Creek-Katherine River Railway southwards so far as Bitter Springs.

Debate resumed.

Mr. Foynton moved an amendment, That the words "and from Oodnadatta to Alice Springs in a
northerly direction" be added to the motion.

Debate continued.

Amendment ruled out of order.

Debate on original question continued.

Original question—put and passed.

THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS, to which
the House of Representatives referred for consideration and report
the question of the proposed extension of the Pine Creek-Katherine
River Railway southwards so far as Bitter Springs, has the honour
to Report as follows :—

INTRODUCTORY.

1. On the 1st October, 1889, the State of South Australia, as custodian of the
Northern Territory, opened for traffic about 145½ miles of railway from Darwin to Pine
Creek as the first section of the line which it was intended should link up the Northern
Territory with South Australia.

2. When the Commonwealth took over the Northern Territory on the 1st
January, 1911, one of the conditions of the transfer was that the Commonwealth
should—

"Construct or cause to be constructed a railway line from Port Darwin
southwards to a point on the northern boundary of South Australia
proper"

and a section of 54½ miles to carry the line southwards from Pine Creek to Katherine
River is being proceeded with. In November, 1913, the field survey work was completed
and the line is now under construction.

PRESENT PROPOSAL.

3. The present proposal is that the line now under construction between Pine
Creek and Katherine River ~~should~~ be continued from the left or southerly bank of the *shally*
Katherine River for a further distance of 63 miles 65 chains in a south-easterly direction
which will carry it to Bitter Springs.

4. It is the intention to use 60-lb. rails and fastenings, and to construct the line
so that the earthworks, bridges, water-ways, and sleepers will be suitable for the
4 ft. 3½ in. gauge, and will permit of the rails, though laid temporarily to a 3 ft. 6 in.
gauge, being widened at any time to the 4 ft. 8½ in. gauge.

5. The proposed line is to be a single track with all stations on the rail level ;
the ruling grade is to be 1 in 100, and the sharpest curve will have a radius of 40 chains.

ESTIMATED COST.

6. The Departmental estimate of the cost of the work is set down at approximately £820,000, including provision for station accommodation, telegraph line, and water supply; and it is stated that the work can be completed in about 18 months from the date of commencement.

ESTIMATED REVENUE.

7. The revenue which the Department estimate will be derived from the construction of the proposed railway amounts to approximately £12,000 per annum; the estimated cost of traffic, locomotive, working, and general supervision would be approximately £8,500 per annum; while the estimated cost of maintenance is set down at approximately £5,300 per annum.

8. The total revenue expenditure including maintenance would thus amount to about £11,800 per annum, so that not taking into consideration interest on capital cost the revenue would approximately balance the expenditure.

ALTERATION OF NAME—"BITTER SPRINGS."

9. On the 12th January, 1916, a notification appeared in the Press to the effect that, on the recommendation of the Administrator of the Northern Territory, the Minister for External Affairs had approved of the alteration of the name "Bitter Springs" to "Mataranka Springs." The reason for the change was stated to be that the Springs were not bitter but fresh, and the name therefore was misleading.

10. As the locality was called "Bitter Springs" in the reference of the proposed work to the Committee, and referred to as such by witnesses throughout the inquiry, the old name has been retained in this Report to avoid confusion.

COMMITTEE'S INVESTIGATIONS.

11. In the course of its inquiries the Committee ascertained that the Royal Commission on Northern Territory Railways and Ports was favorable to the railway taking a westerly swing from the Katherine to the neighbourhood of Willeroo, subsequently returning to the overland telegraph route in the vicinity of Renner Springs.

A further suggestion was made that the railway should follow a "central route" about mid-way between the westerly swing and the so-called easterly swing *via* Bitter Springs.

12. The Committee studied the various reports dealing with the Northern Territory which have been issued from time to time, and took evidence in Melbourne and Adelaide from persons acquainted with the Northern Territory generally, and with that particular section of the country proposed to be traversed by the railway under consideration.

13. As there were still several important matters upon which the Committee had no satisfactory information, a Sectional Committee, comprising three members of the Committee, was constituted for the purpose of visiting the Northern Territory and reached Darwin on 12th July, 1916.

14. Advertisements were inserted in the Darwin Press intimating that the Sectional Committee was desirous of obtaining information in regard to the proposed railway and the country to be traversed, evidence was taken wherever practicable, and in addition the several members of the Sectional Committee by informal inquiry and conversation at all times sought to acquaint themselves with the condition of affairs in the Northern Territory and the nature of the country in the various parts.

15. A journey was undertaken over the whole of the railway open to traffic and continued to the head of the line under construction, and an inspection was subsequently made of the country through which would pass each of the suggested routes for the railway from the Katherine River southwards.

16. The Sectional Committee returned to Sydney on the 20th August, 1916, and on the 21st idem presented its report to the General Committee.

SLEEPERS.

17. In the course of its inquiry the Committee ascertained that when the first section of the line from Darwin to Pine-Creek was constructed by the South Australian Government steel sleepers were used, and, with the exception of some within a short distance of the coast, are still in good condition. It was the intention of the Commonwealth to continue the use of steel sleepers, and portion of the section from Pine Creek to Katherine River was so laid. Owing, however, to the rapid increase in the price of steel sleepers from 10s. to 19s. each, it was decided by the Department to use wooden sleepers for the remainder of the section, and a similar type of sleeper is proposed for the section now under consideration.

18. These sleepers will be 8 ft. 6 in. long x 9 in. x 5 in.—a size sufficient to take a 4 ft. 8½ in. track—and it is intended that they shall be laid in such a manner that the gauge may in future be altered from 3 ft. 6 in. to 4 ft. 8½ in. by moving one line of rails only.

RAILS.

19. From Darwin to Pine Creek the track is laid with 41-lb. steel rails, but it is intended to use 60-lb. rails on the Katherine River-Bitter Springs section.

20. Eventually, when the gauge is altered to 4 ft. 8½ in., it is proposed to have the whole line laid with 60-lb. rails and to utilize the lighter rails for any branch lines which may be built.

BRIDGES.

21. The estimate set down for the construction of bridges and culverts is £13,362. It is stated, however, that there are but few engineering difficulties on the proposed route and that there will be only one bridge of any consequence, namely, that across the King River. This bridge will consist of three 40-ft. spans, and be constructed on concrete piers with steel girders at an estimated cost of £1,920.

22. The balance of the amount estimated is to cover provision for the remaining smaller bridges and concrete box drains.

EMPLOYEES.

23. It was stated in evidence that there are 392 men working on the line to the Katherine River who will be available for work on the extension to Bitter Springs if the construction of that extension be not delayed too long.

24. Of this number the majority are foreigners, consisting principally of Greeks, Italians, Maltese, Patagonians, Russians, and Spaniards.

25. Inquiries were made as to the possibility of these men remaining permanently in the Northern Territory, and the Committee was informed that there is little likelihood of any number of the men employed on the railway becoming permanent settlers.

ROUTES SUGGESTED.

26. Possibly few people realize that this immense Territory, comprising an area of 523,620 square miles, is more than four times the size of the United Kingdom, and greater than the combined areas of the United Kingdom, Belgium, France, Italy, Roumania, and Switzerland. Further, that the total population of this area, exclusive of aborigines, is less than one person per 100 square miles.

27. It should, therefore, be understood in dealing with this proposal that an extension of 60 or 70 miles of railway from the Katherine southwards, whether on the central route or the easterly or westerly swing, will, of itself, contribute little towards the early development of the country, and in addition it is very improbable that such a line will become a payable proposition for many years.

28. The Committee, therefore, considered the matter chiefly from the point of view of the main North-South line, and endeavoured to satisfy itself as to the best route which such a line should follow for the first 60 or 70 miles after leaving the Katherine.

29. Briefly, the class of country along the several routes as observed by the Sectional Committee may be outlined as follows:—

(a) *Westerly Swing*.—Medium to good pastoral country, soils of excellent quality excepting on the quartzite ridges, some stretches of sand and sandy loam merging into basalt country in the vicinity of Willeroo. This district contains a good deal of broken country, and a few miles east of Willeroo can be seen a line of cliffs, often sheer, which stretch in a continuous line along a general north and south direction. The country is dotted with table-topped and conical-shaped hills, probably the outliers of a former extensive tableland.

The westerly route shown on the plan issued by the Royal Commission on Northern Territory Railways and Ports is impracticable, excepting at very heavy cost. By making certain deviations, however, it would be possible to construct a westerly swing for the main line, but this would increase the length of the line owing to the broken nature of the country traversed in certain parts within the first 100 miles. Additional bridging would also be required, so that the construction of this swing would not only be longer but much more costly than on the route of the easterly or overland telegraph line to Mataranka. No permanent surface waters of any extent were found between the Katherine River and Willeroo.

(b) *The Central Route*.—Would traverse country generally limestone and quartzite, medium pastoral land, with patches of black soil, hard and uneven during the dry season, but which would seem to be subject to periodical inundations and be soft and boggy during the wet season. Several deep dry creeks have to be crossed and no large supply of permanent surface water exists.

(c) *The Easterly Swing*.—Would traverse country generally limestone and quartzite, with stretches of open forest and park-like lands, and good pastoral country near Mataranka. The route is fairly well watered; only one bridge of any magnitude would be required, and the country generally appears to be free from engineering difficulties.

PROSPECTIVE REVENUE.

30. The Committee made inquiries as to the class of industry likely to be most successful in developing the Territory, and discussed the bearing such industry might have on the prospective receipts from the railway, and is inclined to the opinion that for many years to come the railway must depend on pastoral holdings and mining for its revenue.

31. It was stated in evidence that under existing conditions a man would require 300 or 400 square miles of the best pastoral land in the Territory to be assured of a reasonable return for his labours, although naturally—with the erection of fences, the granting of railway facilities, and the provision of water supplies—the minimum size of a payable pastoral holding could be substantially reduced. Agriculture will probably develop later as the country becomes more settled and a market is available for the products, as the Committee had ample proofs that with a good supply of water the soil in parts of the country visited is good enough to grow almost anything.

BORES.

32. With the extension of a definite plan of the policy now adopted to some extent of sinking bores much might be done with country which is at the present time precluded from serving any useful purpose by reason of its lack of water during the dry season. South of Mataranka three bores already completed have, at depths of 108, 175, and 190 feet respectively, struck ample supplies of water of excellent quality—discoveries which must materially aid the development of that portion of the country.

MINING.

33. Apart from several mines on which more or less developmental work is being carried out, there is every indication of the existence of good tin-bearing stone over an area of perhaps 20 square miles at Marranboy. Although some of the mines are even now being worked profitably, the cost of transport under present conditions makes it impossible that the field should be developed as it should be.

34. It was stated in evidence that the price of carting (to the railway at Pine Creek) is £12 10s. per ton, while it costs approximately £20 per ton to place material on board at Darwin. It is possible that the rate to the railway may fall to £5 or £6 per ton upon completion of the railway to Katherine, while if the section to Bitter Springs be constructed and come within 12 miles of Marranboy the rate to the railway should be reduced to £2 or £3 per ton.

TIMBER.

35. Inquiries made convinced the Committee that no suitable local timber in any quantity can be economically obtained for sleepers. Plenty of good sand and gravel, however, are available for concrete work.

COMMITTEE'S RECOMMENDATIONS.

SLEEPERS.

36. The Committee is of opinion that no good purpose would be served by laying wooden sleepers 8 ft. 6 in. x 9 in. x 5 in. as now proposed with a view to their being utilized when the gauge is widened to 4 ft. 8½ in.

37. As a number of years will probably elapse before the gauge of the railway is altered from 3 ft. 6 in. to 4 ft. 8½ in., and assuming that the life of a wooden sleeper in this district is about 10 years, it is unlikely that any wooden sleepers now laid would be in a suitable condition to be utilized for the broader gauge.

38. It is therefore recommended that if wooden sleepers be used the size 7 ft. x 9 in. x 4½ in., which is suitable for the 3 ft. 6 in. gauge, be adopted at a saving of approximately £180 per mile.

39. It was stated in evidence that some 50,000 8 ft. 6 in. x 9 in. x 5 in. powdered karri sleepers have been supplied for the construction of the Pine Creek to Katherine River line. As it was ascertained that white ants abound along the route under construction, and it is known that untreated karri is speedily affected by dry rot when used as sleepers, and as the evidence submitted showed that no effective time test had yet been made as to the life of wooden sleepers in the Territory, the Committee considers that, if timber sleepers are used, only the best and most durable hardwood timbers should be utilized.

40. The Committee was, however, greatly impressed with the samples of concrete sleepers which it inspected in the tramway track in Adelaide, the railway track in the vicinity of North Adelaide, and in the railway track in the vicinity of Leichhardt, New South Wales, where they are undergoing tests under working conditions.

41. As it was stated in evidence by the Engineer-in-Chief, Commonwealth Railways, that about six months would elapse from the time this section is authorized until the time when any sleepers are laid, it is recommended that a supply of concrete sleepers be made at once, using sand and gravel obtainable locally, and that experiments be made with these sleepers on the section now under construction, particularly on steep banks and sharp curves, with a view to the adoption of this class of sleeper if suitable on the Katherine River—Bitter Springs section. In conducting these experiments it is suggested that the manufacture be carried out on such a scale as will not only give a good idea of the utility of the sleepers but of the cost of such sleepers with a view to their use on subsequent sections of the main line.

DEFENCE ASPECT.

42. In the event of Australia ever being called upon to resist an enemy attack on her northern coast, it is generally admitted that a railway connecting Darwin with the south, even if it be only a single narrow-gauge track, would be of considerable

advantage from a defence point of view. The greatest safeguard against aggression in that quarter, however, would be the existence of a considerable permanent white population, and for that reason the Committee is of opinion that it is of vital importance that settlement of the country should be, as far as practicable, contemporaneous with the construction of the railway.

EMPLOYEES.

43. The Committee is aware that a number of the foreigners employed on the line at present under construction, by working under what is known as the butty gang system, are carrying out the work more satisfactorily and earning more money than those employed on dry work, and, as the result means better and quicker work and a better class of employee, suggests that it would be an advantage to the Commonwealth and to the men themselves if this system were extended wherever practicable, and the Australian and British workmen encouraged to adopt it.

Further, in order that the construction of the railway might be made to proceed hand in hand with the settlement of the country, it is suggested that an endeavour should be made to arrange with the majority of the men brought to the Northern Territory for work on the railway to bring their wives and families with them, and that they should be encouraged to take up holdings so that their families could remain on such holdings while they are working on the railway—thus forming the beginning of a permanent settlement.

At the present time the vast majority of the men employed are single, and even if they are saving money it is obvious that the money saved is of no use to the Territory. Some men work for six or eight months or a year and then go away and take their savings with them, while it is well known that others are sending large sums of money to foreign countries every month.

As every Australian State is encouraging immigration, it is improbable that the Territory can be settled by an overflow from the south, and in any case it is doubtful policy to encourage the transfer of people from one part of an empty country to another part of an empty country. It is therefore suggested that people from European countries be encouraged to come to the Territory by guaranteeing them work if suitable, by paying their passages in part and making it a debt against them until they are settled in the country, but at the same time holding out hopes that if they settle permanently the debt may be foregone. In the best interests of the Territory, however, and of the men themselves, it is advisable that all assisted immigrants be married and accompanied by their wives and families, or be closely related to those already in the Territory.

CONCLUSION.

44. A study of the evidence given, supplemented by the Sectional Committee's investigations and inspections, led to the conclusion that the central route offered no advantage over either an easterly or westerly swing, and it was consequently abandoned.

45. The line on the westerly swing offers some immediate temporary advantage by reason of the fact that it taps portion of the Victoria River land, which is excellent pastoral country, and at the present time carries the bulk of the stock of the Territory. There are no serious difficulties, however, in droving cattle from the Victoria River country to the railway, and these difficulties will be lessened by the action of the Government in providing a new stock route with sub-artesian and surface-water supplies at regular intervals.

46. On the other hand, the easterly swing commended itself to the Committee for the reasons that it would traverse comparatively well-watered country with fewer engineering difficulties than either of the other suggested routes; it would approach the mining field at Marranboy, and some good pastoral and agricultural land in the vicinity of Mataranka; and would open up possibilities of developing the country to the south, which would not be practicable in the absence of a railway.

47. The Committee is therefore of opinion that, as a section of the main line, any extension of the Pine Creek-Katherine River railway southwards should proceed *via* Bitter Springs.

RESOLUTION PASSED.

48. The decision arrived at by the Committee is shown in the following extract from its Minutes of Proceedings:—

Mr. Finlayson moved—That the proposed extension be approved.

Seconded by Senator Story.

Mr. Sampson moved as an amendment—That all the words after "that" be struck out with a view to the insertion of the words—"the Committee approves of the construction of the line to Bitter Springs as a part of the main line, but considers that as this section does not promise to give any largely increased traffic in the near future or to serve as a feeder to the Darwin Katherine line, its construction on level grounds is not urgent."

Seconded by Mr. Gregory.

The Committee divided on the amendment.

Ayes (3).

Mr. Fenton,
Mr. Gregory,
Mr. Sampson.

Noes (5).

Senator Story,
Senator Lynch,
Mr. Finlayson,
Mr. Riley,
Mr. Laird Smith.

And so it passed in the negative.

The Committee then divided on the motion.

Ayes (5).

Senator Story,
Senator Lynch,
Mr. Finlayson
Mr. Riley,
Mr. Laird Smith.

Noes (3).

Mr. Fenton,
Mr. Gregory,
Mr. Sampson.

And so it was resolved in the affirmative.

Edward Riley

EDWARD RILEY,

Chairman.

Office of the Parliamentary Standing Committee on Public Works,
120 King-street, Melbourne, 30th August, 1916.

MINUTES OF EVIDENCE

(Taken at Melbourne.)

WEDNESDAY, 10TH NOVEMBER, 1916.

Present:

Mr. RILEY, Chairman;
Senator Keating, Mr. Finlayson,
Senator Story, Mr. Laird Smith,
Mr. Fenton,

Norris Garrett Bell, Engineer-in-Chief and Acting Commissioner Commonwealth Railways, sworn and examined.

1. *To the Chairman.*—I produce a tracing showing the general direction of the proposed extension of the railway from Katherine River to Bitter Springs. I have never been in the Northern Territory, and the information I have is obtained from the reports of my officers. These reports show that the proposed extension will be 63 miles 65 chains in length, and the estimated cost, £320,000, or at the rate of, about £5,000 per mile, of which nearly half will be for rails and sleepers. It will be possible to build the line in, say, eighteen months. There are no engineering difficulties, and there will be only one bridge of any consequence over the King River. This bridge, to consist of three 40-foot spans will be concrete piers with steel girders. It will be a permanent structure, and is estimated to cost about £1,920. The extension from Pine Creek to Katherine River is a single line with 60-lb. rails. It is being built in accordance with the provisions of the Act, so that it may readily be converted from the 3-ft. 6-in. gauge to a 4-ft. 3-in. gauge. All earthworks and waterways have been taken out in sufficient width, and the sleepers are sufficiently long to enable the line to be widened to the Commonwealth gauge. The traffic on the existing railway from Darwin to Pine Creek has been unduly inflated of late owing to the carriage of material required for the section now under construction. I estimate the probable earnings of the new section by taking the earnings per mile of the existing line, and making a slight allowance for cattle traffic, which we expect when the most works at Darwin are finished. I went into the matter, and I anticipate that the expenditure will be £11,800 per annum (traffic, locomotive, and maintenance charged), and that the earnings will be about £12,000 per annum, so that revenue and expenditure will just about balance. This does not provide for interest on capital. After the next section is completed, I expect the earning capacity of the railway will improve so that the extension will probably increase the traffic very considerably, as it will open up cattle and mining country. I can't speak about the mining prospects, because I have no knowledge on that subject; but I know mines do exist, and I anticipate that they will be developed as a result of this railway construction. My reports do not show that there is any special scarcity of water, as the country to be traversed is comparatively well watered, compared with the east-west railway, at all events. The material for the railway, rails and sleepers, are procurable in Australia now, rails being manufactured either at

Newcastle or Lithgow. We call public tenders for sleepers, and get them from the different States. All this material is sent to Darwin by steamer. The first section of the railway from Darwin to Pine Creek is laid with steel sleepers, and also portion of the second section, which we are now building, but after war broke out we were prevented from getting any more steel sleepers, because the price has nearly doubled. It is probable, therefore, that we shall be compelled to use wooden sleepers unless we can get the steel sleepers made for us at Newcastle. I do not think the difficulty with regard to white ants will be so serious on this section as on the first, because the rainfall is less. I know that several railway lines have been built in Queensland in country where the white ants are bad, and I understand that, although timber sleepers are used, they have not been destroyed to any extent by the white ants. As I have already said, I have no personal knowledge of the country, and I have to depend on reports from the surveyors, and Mr. Hobler, who went over the ground. We have about 500 men working on the section between Katherine River and Pine Creek, and we desire to keep those men employed, if possible. We do not wish to see any break in the work between the two sections. Except in the case of certain Welshmen and Spaniards, the Department did not pay the fares of the men who are working there, nor was a guarantee given as to the length of time they would be working. I expect that we will finish the earthworks of the section now in hand by the end of the year, and if no further work is authorized perhaps 150 men will be displaced, as we could not put them on work elsewhere, but the balance of the men will be engaged in plate-laying and finishing up the line generally.

2. *To Mr. Finlayson.*—I anticipate that the section of the railway now under construction will be finished by about June, and if we were able to go on with the earthworks for the new section the plate-laying gang would be able to go right ahead. The terminus of the present section is across the Katherine River, because it would not be wise to stop the line on the northern bank of the river, as the people to the south would not have access to the line. This line is on the 3-ft. 6-in. gauge, and it forms a section of the north-south railway being projected to connect South Australia with the Northern Territory. In this proposed section, there is no deviation of the north-south line. The most suitable point for a connexion with the Queensland system will probably be at Daly Waters, 367 miles from Darwin, and 100 miles south of Bitter Springs. Steel sleepers, of course, remove all difficulty with white ants, but they are fairly costly, and since the present section was started they have increased in price from 10s. to 19s. each. We are now laying 50,000 powdered karri sleepers in the road, and in a little while I shall be able to state definitely how far powdering is efficacious as a remedy for the white ant difficulty. I know of no more expeditious way of transporting the materials for this railway than by steamer to Darwin. We have sufficient rolling-stock to handle the existing traffic, but as we come further south with the railway we will have to increase the stock.

As a matter of fact, a number of cattle trucks and ballast trucks are being built in Queensland for this railway, and I think there will then be sufficient to handle all the increased traffic on the extra 60 miles of line. These are the only additions to rolling stock which at present have been arranged for. I am informed that the railway will pass through pasture and mining country chiefly, and that there is little prospect of agricultural development. It appears, therefore, that we will have to depend on the cattle traffic, and the development that may take place in the mining industry. At present, the cattle traffic over the existing line is very small, chiefly for the butchers at Darwin, but Messrs. Vestey Brothers are building meat works at Darwin, and they expect to be killing in March. While they are carrying out freeing operations they expect to truck about 320 head per day, and we are making preparations, as far as possible, to handle that traffic. When I said it would take eighteen months to build the proposed section of the railway, I meant that it would take eighteen months from the time we start work. If I have authority to start this section in the new year it will take eighteen months from that date to finish it. I am relying upon Mr. Hobler's reports in regard to the final route of the line. We have a railway surveyor there, a fully qualified man, and Mr. Hobler, who has been over the survey, is quite satisfied with the route. Mr. Hobler will arrive in Melbourne next day, so that, if the Committee desires, he will be able to give the latest information as to the route and the nature of the country.

3. *To Mr. Laird Smith.*—At the Katherine River, the telegraph line will be about 2½ miles away from the proposed extension. I do not know whether King River is a permanent stream or not, but I imagine it is not. The line from Darwin to Pine Creek was laid down with steel sleepers 30 odd years ago, but the price recently rose too high to enable us to finish the second portion of the Pine Creek to Katherine extension with steel sleepers also. There are several hundreds of miles of steel sleepers in South Australia, and I think about 100 miles also in Queensland. Where steel sleepers are used the line does not "creep" very much. The proposed section from Katherine River to Bitter Springs will be a comparatively straight line, and what curves there are will be easy curves. The anticipated traffic will not warrant the use of heavier rails, as we are satisfied that the 60-lb. rails will carry the traffic for very many years. I might mention that the line to Bourke, in New South Wales, is laid with 60-lb. rails, and that a similar weight of rail is used for a considerable distance on the line between Adelaide and Melbourne.

4. *To Senator Story.*—We have had some difficulty in getting supplies of rails and sleepers landed at Darwin. Freights are very high, and shipping is scarce. I anticipate this difficulty will continue while the war lasts. A steamer runs from Fremantle to Darwin, and we can get a certain quantity of supplies up that way, but there are the Japanese boats trading to Darwin, but it is somewhat difficult nowadays to get a ship with a full cargo. I dare say it would be worth while considering whether we could charter a steamer for this purpose. I am sorry I cannot give the Committee accurate details as to the ruling grade, but Mr. Hobler will be able to supply this information. I know the grade is an easy one. I made inquiries as to whether steel sleepers could be obtained from the Broken Hill Proprietary Works at

Newcastle, and learned that they have more orders than they can cope with for steel rails. I understand the paper bark tree—known as the litree—growing in portions of the Territory is not ant-proof, and therefore it would not be suitable for sleepers. The ironwood tree gives fine timber, only it is very scarce. I have been making inquiries as to whether sleepers could be got from this tree, and the engineer in charge of the line has endeavoured to get people to quote for supplies of these sleepers, but so far has not been successful. I know that the white ants get into the paper bark tree quickly, and that it also becomes affected with dry-rot. I think 60-lb. rails are heavy enough to enable express trains to run over the line, but this will depend entirely on the weight of engine used. Provided that the locomotive is not too heavy, there is nothing to prevent express trains running over a line laid with 60-lb. rails. For several years I have been looking into the question of using reinforced concrete for sleepers, and nearly every engineering periodical published makes some reference to this class of sleeper, but so far, a successful design has not been perfected. It has been suggested that the vibration shatters the sleepers. Italy went in largely for this class of sleeper several years ago, and the other day I read in an engineering periodical that they had been taken out because they had proved unsatisfactory. I understand, however, they are used with success on street tramways, but it seems they will not stand up to fast railway traffic. They are also very heavy. An ordinary maintenance gang of three or four men would not be able to handle them, so a special gang would have to be employed to lift the line and pack it. In the estimate of cost of the section under construction, as well as the proposed extension, there is included a charge of 10s. per ton per mile for the carriage of the material to the site, the further we get away from Darwin the more expensive will the cost of construction become. On the east-west railway we are charging only 3d. per ton per mile, and that just about pays the cost of working. I cannot tell the Committee what is the freight by steamer from Newcastle to Darwin, but I will ascertain and let my members know what we paid for the last coal we obtained from that port. I anticipate that the freight on rails from Newcastle to the head of the road at Pine Creek would be rather heavier than on coal. If you ask me for an opinion as to which would be the cheapest and best way to construct a line, whether from south to north, or from north to south, I would say that it could be constructed more cheaply from the southern end, but I have not gone into the matter. The rate of wages is very high in the north, and, of course, if the line were started from the southern end, wages would increase the farther north we proceeded. At present we are paying 18s. a day in the Northern Territory. We have not had very much sickness up to the present among the men. A few cases of malaria have been reported, but they have not been serious. If we started the line at the southern end we could land material more cheaply at Port Augusta than at Darwin, because vessels call at Iron Knob for ore for the Newcastle Steel Works, and the material would, in a sense, be banked for them. I think, however, that the line constructed from the northern end will earn revenue more quickly than would the line from the southern end, because the meat works are established at Darwin, and, as a result, there should be a big cattle traffic. I have no personal knowledge of the Territory, but I am a victim of Macdonnell Range.

from Oodnadatta northwards to Pine Creek, and I am going to have an inspection of the country made. I hope to be able to go myself.

5. *To Mr. Fenton.*—The rolling-stock employed on the existing railway and that which we are having constructed in Queensland will cope with the increased traffic could not be converted to the 4-ft. 8½-in. gauge, but probably it could be sold to the Queensland Government again, as there is always a demand for that class of rolling-stock. The section under construction is being carried out by day labour, which is proving satisfactory. We have had very little trouble with the men. Recently their wages were increased very considerably. It is proposed to construct the section from Katherine River to Bitter Springs also under the day-labour system. The section under construction includes the cost of a bridge over the Katherine River, so it would not be correct to say that the total of £320,000 which the proposed section is estimated to cost will include nearly £10,000 for a bridge over the Katherine. There is a deviation of the line there, and it is proposed to put in a low-level bridge until the line is converted to the 4-ft. 8½-in. gauge. This low-level bridge will carry the traffic in the meantime, and it will save about £10,000. If the high-level bridge were constructed, it would be on concrete piers with steel girders, because the banks at that point are very steep. By a deviation, however, we can cross the river where the banks are lower, although the bridge will then be subject to occasional floods. It will be a wooden structure. There is provision only for a single line, and though the bridge could readily be duplicated, this will not be required for many years. At the point where the high-level bridge will cross the river the distance is only about 12 chains, and the deviation will increase the distance by about 2 miles. I have not heard that the Katherine River has double banks, and the plans show one high channel with a high level ridge across. The present section of the railway takes a south-easterly direction, as the country directly south is rather poor, the good country lying more in a south-easterly direction.

6. *To Senator Keating.*—The present terminus of the line is at Pine Creek, 146 miles from Darwin. We are building 57 miles extension at present, and the proposed further extension from Katherine River to Bitter Springs is about 64 miles in length. No provision is being made for future duplications. All platforms are on the rail level. There are several sidings and loops for passing trains, and, as I have said, there is provision for widening the gauge to 4-ft. 8½-in. All the necessary loops and sidings will be provided for in the proposed extension. The bridge over the Katherine River will be constructed of concrete pillars with steel-girders. This could be duplicated, if necessary. Where they have been tried, reinforced concrete sleepers have not been successful. I am told that a number have been tried in the Adelaide street tramway system. They have been tried also in America and other countries, including Italy, but have not been a success. I read recently that they had been taken out of the railways in Italy. I do not know of any special conditions in Italy, as compared with Australia, that would make them unsuitable for railway traffic. Steel sleepers have been largely used in South Australia, and, to some extent, in Queensland. The steel sleepers on the line from Darwin to Pine Creek are trough-shaped, and those laid from Pine Creek to Katherine River are H-shaped, almost like a rolled steel joist. In India, cast iron sleepers, known as pot sleepers, are used. There are no grades of any consequence on the proposed

extension, nothing steeper than 1 in 100. It is all even country, and therefore the curves are also very flat. From the information I have received I gather that the country from the present terminus to the end of the proposed extension is chiefly timbered, but the estimated cost is based on the actual cost of the section which we are now constructing, so the figures are quite reliable. I got a monthly statement showing the cost of that work. From Darwin to Pine Creek the line is laid with 41-lb. steel rails. Eventually, when the gauge is altered, it is proposed to have the whole line laid with 60-lb. rails. We are using 60-lb. rails on the section from Pine Creek to Katherine River. When the line from Darwin to Pine Creek is relaid with 60-lb. rails the rails taken out might be used on branch lines, and for the loops and sidings; but the steel sleepers could not be so used, as they were made for the narrow-gauge line.

7. *To Senator Story.*—The estimated cost includes ballasting with gravel. We have allowed for 1,450 yards per mile.

8. *To Mr. Hutcheon.*—The tracing I have exhibited indicates a branch line to the Marranboy tin-fields, but that is not included in the estimate. That branch line has nothing whatever to do with the proposal before the Committee, and it is shown on the tracing only as a possible route for a line to the Marranboy fields, a suggestion being made that there should be a 2 feet line to assist in the development of the fields. There is no proposition before us at present for the construction of that railway.

Atleo Arthur Hunt, C.M.G., Secretary Department of External Affairs, sworn and examined.

9. *To the Chairman.*—I travelled through the Northern Territory recently, but I did not go over the route of the proposed line. I left the railway line at Katherine River, and followed the track to the Marranboy tin-fields, and thence I travelled to Bitter Springs, so I was not far distant from the route of the proposed extension. The impression I formed of the country was that it was good for stock-raising, but, so far as I could judge, not suitable for agriculture under present conditions in the Territory. The country improves very much as one gets down towards Bitter Springs, in the neighbourhood of which there is the Government sheep farm at Mataranka. The Government desired to ascertain whether sheep would do well in that part of the Territory, because no sheep had been raised nearer than Avon Downs, which is away down on the Queensland border, in about latitude 21 south. They purchased 2,000 sheep from Avon Downs, and these were taken in light stages overland to Bitter Springs, where land was resumed for the purpose of an experimental sheep station. The sheep arrived there in March last year, so they have been eighteen months on the property. So far as I could judge, they are likely to do very well, as they were in excellent condition, and the manager reported that, as far as quality of the wool is concerned, the experiment so far has been entirely satisfactory. When I was there they were lambing, and he expected a very fair percentage. It is hardly fair, however, to compare the conditions of that sheep station with the conditions of a properly-organized station in more settled country, because there are no fences, and the sheep have to be shepherded. They are therefore moved about a good deal, and are not left to themselves as they would be on a properly equipped station,

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but when I was there they seemed to be doing very well. In the neighbourhood of the Roper and Waterhouse Rivers I should say that there are admirable opportunities for small stock settlements. I do not know that the country is so much better than agricultural land in other parts of Australia that the settlers could afford to pay the difference in the rates of wages and cost of transport. The country generally from the Katherine River to Bitter Springs is open, and Katherine River to Bitter Springs is a open, and presents no engineering difficulties. Water can be obtained in all wet weather, but in most of them there are holes which provide permanent water. I think there is permanent water in such holes in Maudie's Creek.

10. *To Mr. Laird Smith.*—The King River is not a permanent stream, but like the others it contains waterholes where permanent water may be obtained. We camped for fifteen or eighteen hours at the King River alongside a good big waterhole, probably 50 yards long by 16 or 20 yards wide, and about 4 feet deep.

11. *To Mr. Fenton.*—We were at the King River about five months after last rains had fallen.

12. *To the Chairman.*—The Katherine River was a very tiny stream indeed when I was there, and it could be crossed on half-a-dozen stepping stones at the point where the road crosses it, the water-course then being only 12 to 15 feet wide and a few inches deep.

13. *To Senator Keating.*—The rainy season extends from about the middle of November to the end of March or middle of April.

14. *To Mr. Fenton.*—Judging by its banks, the Katherine River must be an enormous stream in flood-time and at the point where the tracks cross I should say it would be about 90 feet deep, and at least a quarter of a mile wide.

15. *To the Chairman.*—In my opinion the extension of the line from the Katherine River to Bitter Springs would only be worth considering as part of some bigger scheme to connect the Northern Territory with South Australia or with Queensland. The line from Pine Creek to the Katherine River was essential to get stock from all the country south of the river into Darwin, because the country from the Katherine to Pine Creek is difficult for drovers, there being practically no feed. In normal seasons, however, there is good feed for drovers south of the Katherine, so that the bulk of the stock at present pastured in the country to the south of the latitude of the Katherine could be driven to the terminus of the section under construction. During my travels through the Northern Territory I went from Darwin to Herbert's station, on the Adelaide River, from Darwin to Laurie's and Adelaide River, from Darwin to the Adelaide River; Sayle's stations, also on the Adelaide River; from Batchelor to Stapleton, and through the country in that locality; thence I went to the Daly River, and back to Brock's Creek, and on to Mount Bonny. Afterwards I went by sea to the Bathurst and Melville Islands, thence to the East Alligator River to Cahill's station, and then across to Burrundji. The Mataranka country struck me as being the best, the timber there is of a finer type than elsewhere. I inspected several mining fields, particularly that of Marranboy. 60 miles south-east of the Katherine River this is quite an extensive tin-field, so far as I could judge, and the local mining people seemed very well satisfied with its prospects of

permanent. However, it is difficult country, and a good deal of capital will be required to develop it. The Government have erected a battery there for concentration purposes, and are proposed to deal with any quantities of ore that may be brought in.

16. *To Mr. Fenton.*—The miners on the Marranboy field are chiefly Australians, but, generally speaking, they are not a good class of miners, being mostly of the old prospector type—men who discover fields and then start somewhere else.

17. *To Mr. Finlayson.*—There is practically no settlement in the country I traversed except at Marranboy, where there are a good number of miners, and the men connected with the Government battery.

18. *To the Chairman.*—Many of the miners who have holdings at Marranboy are in full working order, and in the meantime they are working in Darwin or on railway construction. Probably there are about 60 holdings, representing from 120 to 150 men. The proposed extension of the railway will assist the mining industry, because it will then be possible to get supplies up there more cheaply, especially if a tramway is constructed from the line to the field.

19. *To Mr. Fenton.*—The distance from the proposed extension of the railway to the mining field is about 12 miles. The cost of transport to Marranboy is one of the difficulties that prevent its development. There is an extensive stretch of sand to cover, and teamsters have the utmost difficulty in getting through it.

20. *To the Chairman.*—I gather from my reports that there is excellent ore at Marranboy, and that it probably goes down to a considerable depth, so I should say that the field will increase in importance in the future. It is not fair to compare the section at present under construction with that proposed to be constructed, because in the latter case the country is very much better in every way. The country improves immediately you get over the Katherine River.

21. *To Mr. Laird Smith.*—I am hoping, of course, that settlement will follow the line of the railway, but that has not been the experience in the Territory, and right from Pine Creek to Darwin—a distance of 160 miles—you will hardly see a dozen houses along the route of the railway.

22. *To the Chairman.*—I think it will be the policy of the Department to extend the sheep farming experiment, though no decision on the point has been given yet. We are going slowly. I think it is desirable that we should have another couple of years' experience to ascertain if there is anything in the soil or the grasses that will interfere with the development of the industry. The leaf of the ironwood tree contains a rather bad poison, and many are afraid to be kept off it. There may be other plants of a similar character, and of which we have no knowledge at present.

23. *To Mr. Laird Smith.*—The health of the men employed on the railway will probably bear very favorable comparison with the health of men employed on railway construction anywhere else in Australia. The bulk of the local community along the line. There are about sixty Maltese, and probably eighty to 100 Russians and Greeks. The majority of them, I should think, are not likely to become permanent settlers. The Australians are merely railway men who follow railway jobs from one place to another. They are mostly

single men who have their family connexions in the south. They work in that hot, uncomfortable country, and they get back south as soon as they have got together a decent cheque. The Greeks and the Russians will probably leave as soon as they have made enough money also, but the Maltese may settle in their wives. Then we have some settlers from South America, including Spaniards and Italians. These people seem to offer the best prospect of becoming permanent settlers. They seem to be keen about getting on the land, and they are working on the railway with the idea of accumulating a little money to enable them to do so. Most of them had very limited capital when they came, and the Department is encouraging them to work in this way so as to get money together, because from experience we know that men who go on the land without capital usually become Government pensioners. Some of these because South America have brought their people from families with them, and at present there are about fourteen married women and sixty children among them. I assume that when the proposed extension is put in hand these people will be transferred from the present work to the new section, as after they have earned sufficient money, probably they will settle on the land. They receive the same rate of wages as other men. They are all members of the union before they leave Darwin. We are not making any provision along the railway line for villages, because the country at present being traversed is too poor. The land improves from the Katherine River to Bitter Springs, but the men who are likely to become settlers have not selected any locally. We propose later on to arrange for a small village discovered in the locality. The Territory has a possibility of a sugar plantation being established over on the Alligator River, because there the transport will be by sea, and, consequently, I am preparing a memorandum for the Minister expressing some general views about the prospects of will have to be shipped to Darwin. A certain amount of work is being carried out with the object of discovering minerals in the Northern Territory, but our mining advisers recommend that we should work on the existing fields, and that we should not develop them to a lower depth than our assist prospectors generally. In the neighbourhood of Pine Creek a lot of gold has been taken out, but the mines have mostly been abandoned at about 200 feet. The Government are now putting down holes, and are sinking shafts, for the purpose of testing whether the lodes continue or not. I am preparing a report for the Minister giving my impressions, and this will probably be available in two or three weeks.

25. *To Senator Storey.*—During my travels in the Northern Territory I saw very little timber that would be suitable for sleepers, as most of it is liable to be affected by white ants as soon as it is cut. Only two timbers—the cypress pine and the ironwood—are not affected by white ants, but they are not found in great quantities. The paper-bark tree, I am sure, is not white-ant-roper, but it is a hard wood, and well suited for buildings, if it is kept off the ground to prevent the ants from getting in. I had no opportunity of seeing the country south-west of the Katherine River, where large numbers of cattle are raised, but from what I could gather from the settlers it is not suitable for clear settlement, owing to the absence of permanent water. However, I saw some idle country for dairying far away to the east, on the Alligator River, but I did not

there is a lot of black soil country over which it is almost impossible to travel. We used almost every known means of locomotion on my trips—train, motor-car, launch, horseback, and on foot. Unless the Territory is different from every other country in the world, I should say that the building of the railway will lead to development. Regarded as a main trunk line bisecting the Territory, or as a main trunk line connecting with some place in Queensland—Carnarvon has been suggested—I should say that the route of the proposed extension is the best; but unless regarded as part of the bigger scheme referred to I would say that the extension to Bitter Springs would not be warranted. As a link in the chain the proposed extension is in its proper place. I do not think that the proposed extension could with advantage be diverted in any other direction. In view of the fact that the country south of the Katherine River is better for droving than the country between Pine Creek and Katherine River, and that stock could travel the distance to Katherine River, the extension of the line to Bitter Springs is unnecessary for the development of the cattle industry to the west. There is land along the route of the proposed extension suitable for settlement, but I do not know if it is available. I know, however, it is occupied on conditions that will allow of re-occupation. The whole of the property at Mataranka, the area of which is about 760 square miles, could be made available. I would not like to say, without looking at the route detailed plan, exactly what land along the route of the railway would be suitable for small pastoral holdings. There does not appear to be much prospect of coal deposits being discovered in the locality. The Territory has been examined by geologists in many directions, but the only coal deposits I have ever heard of were over on the west near Arson Bay. None of the geologists' reports speak of the existence of coal along the railway line or near it, so none of coal along the railway line or near it, so none of coal required for the working of the line will have to be shipped to Darwin. A certain amount of work is being carried out with the object of discovering minerals in the Northern Territory, but our mining advisers recommend that we should work on the existing fields, and that we should not develop them to a lower depth than our assist prospectors generally. In the neighbourhood of Pine Creek a lot of gold has been taken out, but the mines have mostly been abandoned at about 200 feet. The Government are now putting down holes, and are sinking shafts, for the purpose of testing whether the lodes continue or not. I am preparing a report for the Minister giving my impressions, and this will probably be available in two or three weeks.

26. *To Mr. Finlayson.*—I was in the Territory for about two months, from about the middle of August till the middle of October. During that time the weather conditions generally were suitable for travelling. We were blocked by rain once only for a few hours, but the weather was always very hot. From May or June to September the conditions are reasonably good for travel, but it depends where you want to go to. From September to December the water begins to get very scarce, but from about the latter month, there is abundance; and besides

Brothers, and the construction of the Pine Creek-Katherine line. The cost, in my opinion, would be approximately the same to construct the line from the south northwards as from the north southwards. When the line from Oodnadatta reached the Macdonnell Ranges it would be reproductive, but the country between is very poor. To start from the south would develop the Macdonnell Ranges country quicker. Freight for a long sea journey to Darwin or Adelaide would be about the same. If Broken Hill rails were used it would be cheaper to build from the south. I could not say whether the Oodnadatta climate is better to work in than the Katherine, but I know that the climate at Bitter Springs is fairly good, because as you go inland from Darwin you get altitude.

34. *To Mr. Sampson.*—The country is only grazing along the new line. Everything goes to prove that, except for the Marranboy field, there will be practically no new loading for the new line. The cattle will be driven in to the Katherine from the stations, the lowest of which is Wave Hill. I have heard discussion as to the advantages of a line to the cattle country around the Victoria River. It is good cattle country all through there, but it would mean a very wide deviation. The line to the Katherine has not given any impetus that I know of to cattle raising. As soon as it is completed the stations will send the stock to the Katherine, and they will be railled thence to Darwin. I can supply the Committee with figures showing the revenue from the different classes of goods carried over the existing lines for the last three years. We have had to take some concrete sleepers out of the road near the jetty already. They are too unresponsive. These were an imported make.

35. *To Mr. Finlayson.*—There is no urgency for the construction of the new section, except as a means to the completion of the through line, and incidentally to keep men employed. It is not justifiable from a traffic point of view at present, but it is imperative to build it in order to get the through line. Very few interests will be served by the Bitter Springs extension. I doubt if it will cause any increase in the cattle traffic. The miners at Marranboy are all looking forward to the building of the line, which will give some impetus to the mining industry. If steel sleepers could be manufactured in Australia at a satisfactory price they would meet our purpose.

36. *To Mr. Gregory.*—I cannot see where any new settlement is to come from to the south-east of the new line. I do not know that it will open up any further cattle country. That will all depend upon the extent to which the meat works are able to take the cattle. Later on Vestey Brothers may kill 700 head a day. They expect to be killing next March. It may not be generally known that they have bought up all the station properties round about, and it will open else went there to start cattle-growing they would probably buy them up also. Some of the shafts on Marranboy are down 40 feet or 60 feet. The 10-head battery is quite big enough to cope with any probable population that the field will carry. There is not a sufficient quantity of timber to use as fuel on the locomotives. There is not sufficient ironwood available for sleepers. I would not say that ironwood was imperious to white ants, but it is ant-resistant. For a recent contract we had to go 2 or 3 miles away from the railway line to get the quantity. Engineers say the steel sleeper is too rigid for high speeds, but

our speed in the Territory does not give us an opportunity of testing this point. I should say that steel and concrete sleepers were on a par as regards rigidity. Concrete sleepers could be made at certain centres along the track. Forty-eight thousand powdered sleeper sleepers have already been sent to the Territory. They are invoiced as karri, and the engineers have inspected them and declared them to be karri. I was surprised to hear that karri sleepers had been chosen, because I know that jarrah is a better wood to put in the ground. They arrived in February, and those I mentioned have been lying on the ant beds for about eight months, and have been inspected once a month since. We have not tried to treat sleepers locally to make them ant-resistant, but Mr. Gerald Hill is making experiments in the Department now in regard to various timbers.

37. *To Mr. Fenton.*—Practically none of the 57,000 cattle exported in 1913 was carried on the railways. They evidently went into Western Australia from the Territory, and were shipped at Derby or Wyndham. The proposed section will touch some of the buffalo country, but the buffalo are not there in great numbers. There are more of them in the country along the open line. Some parts of the buffalo are fairly good eating, and I believe the proprietors of the meat works contemplate putting some of them through for frozen meat, but they are mostly killed for their hides.

38. *To Mr. Finlayson.*—The grinding of the bezzes on the B 15 engine is considerable where a grade and a curve occur together. Our grades and curves are not very severe, and it is only with that part of the engine that we have had trouble, but it was solely on account of the length of the wheel base.

39. *To the Chairman.*—The country round Mataranka, where the experimental sheep farm has been established, is very good sheep country, and will be tapped by the new line.

(Taken at Melbourne.)

MONDAY, 22ND NOVEMBER, 1916.

Present:

Mr. RILEY, Chairman;	
Senator Keating,	Mr. Finlayson,
Senator Story,	Mr. Gregory,
Mr. Fenton,	

Harry Vivian Francis, Assistant Engineer, Commonwealth Railways, sworn and examined.

40. *To the Chairman.*—I was in the Northern Territory as Superintendent and Resident Engineer of the Darwin to Pine Creek railway for three years. I have been back in Melbourne over twelve months. I travelled over the proposed new section from Katherine River to Bitter Springs; my furthest south is Milner's Lagoon. With reference to the "westerly swing" shown on the map, as recommended by Messrs. Clarke and Lindsay, two members of the Royal Commission for the Northern Territory railways and parts, starting from Katherine River, passing through the fringe of the Victoria River district, and rejoining the telegraph line at Renner Springs, I understood that the majority of the Commission recommended as direct a line as possible, which would branch off from Pine Creek or

Brook's Creek direct south, but the usual impression in the Territory is that the country immediately south of the Katherine telegraph station is of little value, as no one has attempted to take it up. I know of only two blocks taken up; one occupied by a man who calls himself Duggan, but whose real name is Goghlan, and another taken up by a man named Kruger. In 1902, Allan Davidson worked his way out from Barrow's Creek, and found Tanami, and back to Kelly's Well, and he gives anything but a bright description of the country. The route of the telegraph line is the one most nearly adopted by everybody concerned as a railway route, giving some chance of settlement, and along which there would be water for at least the greater part of the way. From Newcastle Waters across to the Victoria River Downs station is a very dry track, with 70 and 80 mile stages without water in a dry year. Some part of the country is spinifex, which is supposed to be good for stock. The Hon. John Lewis has a large place at Newcastle Waters, with good water supply, but this, and places like it, are all on the telegraph line, or east of the line. There is no one settled on the western side until you reach the Victoria Downs. The direct south route, therefore, has never appealed to persons in the Territory. The Commission, which I met out back, prepared a map showing where they had been. According to this, they went to the east, and were never in the western part of the country at all. Neither Messrs. Clarke and Lindsay, who were the majority, nor Mr. Combes, who was the minority, saw that country at all. It is not understood why they recommended that deviation, unless for directness, and certainly the westerly swing, as shown on their map, is by no means direct. A scientific expedition consisting of Dr. Gilruth, Dr. Breinl, Dr. Woolnough, Professor Spencer, and others, some years ago examined the Roper River country lying to the east of Bitter Springs, and made a report on it. Their guide, Mr. Alfred Giles, also wrote a series of articles, but the greater part of that country is still not taken up. It is permanently watered all the way along by the Roper River, and offers an opportunity for the letting of a large number of blocks, all well watered on at least one fringe for a start. It is supposed to be a good class of country, and all who have been over it speak well of it. Bitter Springs, being the source of the Roper, is the head of that country, so that the Katherine to Bitter Springs extension would undoubtedly tap it. Another point in favour of the Bitter Springs line is that it will serve the Marranboy tin-field, which, as soon as the battery is started, will probably be the biggest mining field in the Territory. When I was there the prospects were very promising, and a large number of men were working on the field. The Bitter Springs line goes within about 9 miles of Marranboy, but the swing to the west would put that place right out of court. The Bitter Springs line catches the Roper River country, Hodgson Downs, Nutwood Downs, and good country extending down to Anthony Lagoon. Most of the country south of Anthony Lagoon would send cattle through Camooveal to Charleville and other railway stations, Queensland. If water was available, cattle could be driven from Anthony Lagoon up to Bitter Springs. We ought to draw cattle from country for at least 300 miles south-east of Bitter Springs. I think that trade would make the Bitter Springs railway a better paying proposition than the Katherine River sec-

tion is likely to be. Bitter Springs is also closer to Wave Hill station and the Victoria River district than Katherine is, and Wave Hill is practically the home station of Vestey Brothers, who are putting up the meat freezing works in Darwin. From Bitter Springs to Wave Hill is about 220 miles. At present, cattle are driven from Wave Hill to Wyndham, Western Australia. There is a good deal of inducement for fresh settlement on the Barkly Tablelands, where a large amount of the land is held under permit, while, as I said, the Roper country is practically unsettled. These are points in favour of the more easterly route, whereas the west part of the Victoria River Downs country is let on forty-two-year leases, which have a long while to run, although I presume the Government would have powers of resumption there as elsewhere. The Bitter Springs extension is certainly more reasonable than that from Pine Creek to Katherine, which is a necessary length in the scheme for a north-south railway, but which passes through what is well known as poor country. The Bitter Springs extension takes the railway into country that offers better prospects. After the rains there is a fine growth of grass at Bitter Springs, and it is more like what appears to be good agricultural country further south. We had no wooden sleepers in the Territory when I was there. Steel sleepers were being sent there after I left. The trough-shaped steel sleepers have been in the old Darwin-Pine Creek line for thirty years, and have stood well, except near the coast, where some of them have corroded. It is hard to say whether the ants would destroy untreated wooden sleepers. There is always the chance that the vibration of the trains will keep them from going through the sleepers. In a line running from Cooktown, in Queensland, wooden sleepers have stood very well in similar country, yet I believe only about two or three trains a week run on the line. Ironwood is not absolutely immune to white ants. If there is a pipe in the centre, the ants will start on it there. We used to fill the centre with concrete. The ants do not care about ironwood, but will eat it. If steel sleepers can be obtained at a reasonable price, there is no question which we should use. The Katherine to Bitter Springs section is very easy from an engineering point of view, but just after leaving the Katherine there is a large belt of limestone country consisting of high limestone rocks with sharp pinnacles. This presents considerable difficulty. We had difficulty with this country our survey as far as Bacon Swamp, after which we got into easy country. We got the survey through there before I left the Territory. That limestone would be very suitable for ballast, if blasted out, and will be probably used there.

41. *To Senator Story.*—I know Mr. Pearce, who suggested to the Commission the direct south line from Brook's Creek. He is the owner of Willeroo Station, and the line goes straight through his property. He is an estimable and honest man, but that consideration would undoubtedly influence him, for a man would be foolish to fly in the face of a possible railway through his land. He has lived on Willeroo for a good many years, and I dare say he would not mind getting out well. This may not be a charitable suggestion, but it counts. If the agreement between the Commonwealth and the State of South Australia influences him, as we have always been obliged to understand, we must either follow the telegraph line, or endeavour to find a route which will secure for the Commonwealth one of the two best

as 8 feet at the wharf at Wyndham. This is very much against the big tide, until the men learn to sit the boats on the mud, which does them no harm. A dredging proposition at Darwin would be difficult. I do not know that the better shipping facilities at Darwin would induce stock-owners to drive their cattle further in order to reach that port; but the driving would not be so bad to Bitter Springs as it is to the Katherine or Fountain Head. Cattle can arrive at Bitter Springs in good condition. The Port McArthur railway proposition requires a careful survey of the bottom between the mainland and the Fallow Islands. Mr. Stretton, at one time Chief Inspector of Aborigines, Sub-Collector of Customs, and Harbormaster, knows Port McArthur very well, and he would not say that it was the best port in the Territory. To take the main trunk line from Katherine River to Oodnadatta, via Renner Springs and Alice Springs, would be to follow as nearly direct a route as is consistent with engineering considerations, and would give a length of about 1,020 miles. I would be agreeable to taking the line that way if the country to the west of the telegraph line could be shown to be of any value. The fringe of the Victoria River district touched by Clarke and Lindsay's westerly swing is an expensive country for railway construction, as the heads of a number of rivers have to be crossed. The Pine Creek to Katherine River section will cost, in the long run, a little over £2,000 a mile to construct. It comprises some fairly heavy work and heavy bridging. That estimate will, I think, cover the low-level bridge across the Katherine. I think the line should be taken to the south side of the Katherine for that amount. I told the Commission that if we were building that railway from Katherine to Bitter Springs in the south, in the same class of country, we would build it for £2,000 a mile in the Southern States; but we have to carry all our materials, and at the same time pay 15s. a day in wages. Mr. Combes' estimate of £6,000 a mile was for a 4-ft. 3-in. gauge. The Katherine to Bitter Springs section will be constructed for much less than £3,000 a mile. There is only the King River to cross, requiring about 120 feet of bridging.

44. *To Mr. Finlayson.*—The lower portion of the Victoria River country belongs, geographically, to Wyndham. The Vestays will not let the whole of the Victoria River district trade go to Wyndham if it means impoverishing their freezing works enterprise at Darwin. When the line is built to Bitter Springs, mobs will be held there which cannot be held at the Katherine after June. Much of the trade of the Roper River and Barkly Tableland country has to go at present through Queensland. A line running a little further east than the telegraph line would catch that trade. The suggested swing through Anthony Lagoon would be a little too wide, and would leave a greater portion of the Territory out of the track; while the telegraph route will be too far away from the Barkly Tableland, much of which is good sheep country. The Government experimental sheep station, on the Waterhouse near Bitter Springs, is a little too high in latitude for sheep, and the country round there is not good sheep country. You do not get to good sheep country until you get below Anthony Lagoon. I believe that the leaseholders would surrender portion of their land for railway purposes, as one of them told

the Commission. A large number of men holding very much of the country there have had bad times for many years. Some time ago, in good years, stock was so low in price that it did not pay. I see no objection to the Bitter Springs extension. It is a necessary link in the southern connexion, and the better part of the country that we can tap lies to the south-east. Half the Victoria River country is lost to us already, and the other half does not come back to us for many years. The immediate construction of the Bitter Springs extension is a financial question. If there are good financial reasons for not going on with it, that stops it; but if we stop railway construction at the Katherine, we stop the north-south railway, which we believe must come eventually, and which is quite as justified as an east-west railway. If it has any justification at all, the north-south railway should be built, even if it has to be done a little at a time; but if we stop it at the Katherine, we lose the lot. If it is extended to Bitter Springs it will be a more payable proposition.

45. *To the Chairman.*—If there is no prospect of the gauge being altered for the next fifteen or twenty years, I should advise the use of 3-ft. 6-in. sleepers, that is, if wide sleepers are used. The difference in the length between 4-ft. 8½-in. and 3-ft. 6-in. would probably save £150 a mile. It would be wise to construct the earthworks, bridges, and culverts wide enough to take the wider gauge at the start. This saving in length would probably be from 1s. 6d. to 2s. per sleeper, and we use about 2,040 sleepers to the mile. The life of the Carnegie steel sleeper should be at least from 80 to 100 years inland, but I understand that the price has become almost prohibitive.

46. *To Senator Story.*—The Roper River is navigable for a short distance for boats of small draught. It could be made navigable at great cost. If the through line is completed the traffic from north of the Macdonnell Ranges will probably go to Darwin, and that from the south to Port Augusta, but a considerable area north of the ranges about Barrow Creek is fairly barren. It is hard to say whether the line should be constructed from north to south or from south to north. The development of the Macdonnell Range country from the south would give the Oodnadatta line some mining and pastoral traffic. We anticipate a little mining development in the Davenport country, about 150 miles north of the Macdonnell Ranges, but a large area further north would for some time be a drag until we get in touch with the downs to the south of Anthony Lagoon. Then we might expect a return going to Port Augusta. If we stopped the line at Katherine, we would be repeating the mistake that was made at the South Australian end by stopping at Oodnadatta, which is practically the Sahara of South Australia.

47. *To Mr. Gregory.*—If necessary, we could bring our rates for trucking cattle down to the Queensland rates. On our present rates, it would cost about 30s. and on Queensland rates about 48s. per head for 300 miles of trucking, speaking from memory. The Queensland rates might be a bit less with their big trucks. They carry cattle in that State between 400 and 600 miles. Two or three years ago a beast worth £3 on the station cost about 6s. to put on the boat at Wyndham. The same beast would be worth £9 at the freezing works at Wyndham or Darwin. Owners can therefore afford to pay freight for cattle to be run fast into freezing works.

TUESDAY, 23rd NOVEMBER, 1916

Present:

Mr. RILEY, Chairman;
 Senator Keating, Mr. Finlayson,
 Senator Story, Mr. Gregory,
 Mr. Fenton, Mr. Sampson.

George Alexander Lobler, Construction and Maintenance Engineer, Commonwealth Railways, sworn and examined.

48. *By the Chairman.*—Last Christmas, I was over the country covered by the section of this line. I have not gone into the question of revenue. The country throughout, from Katherine to Bitter Springs, is easy construction country, with no engineering difficulties of any consequence. The earthworks generally are light. The only bridge of any size is over the King River. That is a bridge of three 40-foot spans on concrete piers. There are a few minor bridges, and a few culverts and box drains. The country from Katherine to within a few miles of Bitter Springs is, I should say fairly good pastoral country, improving as it nears Bitter Springs, and around Bitter Springs itself. It also passes within 13 miles of Marranboy tin-field. I went through the Marranboy tin-field, and from what I could hear there appears to be a large extent of tin-bearing country with very good prospects. The Government have there erected a 10-head stamper battery. From conversations I have had with several of the leaseholders of mines, I should be inclined to consider that the prospects of Marranboy are very good. The great complaint was the difficulty and the high price of cartage for supplies, and the consequent high price of cartage of tin from the mines to Katherine River. At that time the Katherine River railway was under construction, and it was known that the line would eventually come to Katherine; but the road from Marranboy to Katherine River is not too good for teams. In the wet weather, for several months in the year, it is practically impassable for teams. During my visit, there was very good feed for horses between the Katherine and Marranboy, but I was there at the best time of the year. I was told that for eight months in the year there is very little feed indeed on the road, and feed is scarce at the time of the year when the road is most fit for team traffic. In my opinion, this section of railway will have to be constructed no matter what variations may take place afterwards. If the line is to connect with South Australia, the section between Katherine River and Bitter Springs is undoubtedly a part of that route. I have seen the map and report by Messrs. Clarke and Lindsay, but, personally, I have not seen the country on that route. I consider that it would be inadvisable to bend the line to the west. The Victoria River and Sturt's Creek district would be far better served with a separate railway system or branch line later on. It would be better to have that than to bend the main line, which would mean only a partial development of the country; it would not develop it so well as would a branch line. The question is still undecided whether Wyndham might not prove to be the natural port of the district. The Department does not propose to follow the alterations as shown on the map to which you have referred. It is proposed to follow the present overland telegraph line to Bitter Springs, and probably to Daly Waters. After Daly Waters, the question will arise whether the route should

bend towards the east from there, or whether it should still continue along the overland telegraph line to Newcastle Waters. At present, from information I have, and from what I have seen, I am inclined to think that, on investigation, it will be found that Daly Waters will probably be the point at which the line should bend to the east, with the idea of keeping closer to the proposed connexion with the Queensland system at Camooswell and also to keep in better country on its way south. I consider it absolutely certain that we are on the right route of the main line so far as Bitter Springs. I have only made one visit to the Territory, and that was last year. I travelled from Pine Creek to Bitter Springs along the proposed railway route and back through the Marranboy district, and thence to Katherine River. I went about 10 miles south of Bitter Springs. As to which part of the Territory should be developed first, the local development of the Territory must necessarily be considered to a certain extent in connexion with the main route south. Still, if one were confined to the local development of the Territory itself by a railway system, it would entail a considerable amount of investigation which, at the present time, I have not personally gone into. I have not the personal knowledge to enable me to express an opinion. On the Katherine to Bitter Springs extension it is proposed to make the earthworks of sufficient width to take a 4-ft. 8½-in. road, and put sleepers in of sufficient length to widen out from the 3-ft. 6-in. gauge later on. So far, we have had no absolute tests of the life of wooden sleepers in the Territory. But if the best class of hardwood is used, and the attacks of white ants are not worse than they are in the white ant-infested country in Queensland, I should consider that wooden sleepers would have an average life of between fifteen and twenty years. I should not like to say, or express an opinion, when the construction of a 4-ft. 8½-in. line would be completed. Under the present circumstances, in view of the war, such a railway might be demanded at a very early date, but, on the other hand, it might not be required for a considerable number of years. The difference in the cost of using the 3-ft. 6-in. sleeper as against the 4-ft. 8½-in. sleeper, would be about £180 per mile. This would make no difference in the rate of construction. The difference means about 1s. 9d. a sleeper. That would mean 7 feet x 9 inches x 4½ inches for the 3-ft. 6-in. gauge as against 8-ft. 6-in. x 9 inches x 5 inches for the 4-ft. 8½-in. gauge, allowing 2,080 sleepers to the mile. I prefer not to express an opinion whether the long one or the short should be used, as that is a matter of policy. As to a branch line to the tin-field, the country from the junction with the main line to Marranboy is exceedingly easy. It has a good sandy formation, and there are practically very few waterways. There is only one bridge over the Roper Creek, and a line could be laid with light rails; it could be easily and cheaply constructed. I think that such a line would be a great help to the development of the field. I have no estimate as to the number of people likely to be employed on the line, or to live in the neighbourhood. I would like to have about six months to build a line from Katherine to Bitter Springs, and that would mean that the men now employed there could be kept steadily on. There is no work that I know of in which 150 men could be engaged between the end of the year, when the section under construction is expected to be

completed, and when the new section would be started. So far as I know, the men there at the present time employed on the railway would be entirely dependent on such work if they are to continue in the Territory. From a railway point of view, it would be advisable to keep these men employed, but I am unable to say whether there is any work other than railway work for them in case of a temporary cessation of the latter. I could not say whether Messrs. Vestey Brothers could absorb some of the men. That depends entirely on whether Vestey Brothers have sufficient men at the present time, or whether they intend to add to the buildings they have in hand. This firm had only just started when I was there, and very little work had been done to the building at the time. Most of the timber used by Vestey Brothers for the buildings was being imported from the south, but I understand they were getting local timber for the fencing.

40. *To Senator Story.*—It is still a question whether powellised sleepers are effective against attacks by white ants. There has been much controversy on this point. We have not had an opportunity of thoroughly testing the powellised sleeper in the white-ant country. We have a good number of such sleepers laid on the east-west line; but they have been there such a short time that it is impossible to express an opinion as to their resistance to white ants or dry-rot. In my opinion, the Northern Territory is infinitely worse for white ants and dry-rot than the country through which the east-west railway goes. The use of these powellised sleepers is really an experiment. We are using about 40,000 powellised karri sleepers on the section between Pine Creek and Katherine River. Steel sleepers are very hard to procure, and the price is about double that of the normal market, presumably on account of the war. The life of the steel sleeper is a great deal longer than that of a timber sleeper, even though it be powellised. For instance, steel sleepers at present used on the Darwin-Pine Creek line have been on the road just about thirty years, and with the exception of about 5 miles of the line from near Darwin and the sea atmosphere, the sleepers are still in an excellent state of preservation. No one could say whether it would be possible to obtain steel sleepers made in Australia within the next twelve months. These sleepers and powellised karri sleepers are being used on the present section from Pine Creek to Katherine River. The first portion of the road is laid with steel sleepers, and after that come the timber sleepers. We procured a certain number of steel sleepers, which were used first, and then the karri sleepers followed. It is my opinion that the section of the line now under investigation is necessary as a part of the transcontinental line, whatever deviations may be made later. It would be advisable to get a report from the Engineer-in-Chief as to the desirability of first constructing a line to the Marranboy tin-fields, and then continuing the main line when steel sleepers are procurable. There are many circumstances to be considered, and I think the answer to the question asked requires some pronouncement. I should be inclined to say myself that the line should not stop short of Bitter Springs. The line now proposed is 12 miles from the Marranboy tin-fields, and this, of course, means 12 miles of cartage, unless a branch line is built. In any case, the necessity for a branch line into Marranboy should be considered in connection with the further development of the

mine after the main line to Bitter Springs is actually built to the point of junction. The building of the line from Katherine towards Bitter Springs will necessarily bring it within 19 miles of Marranboy, whereas with the line finished at Katherine it will be 46 miles from Marranboy. Necessarily the extension of the line from Katherine to Bitter Springs will bring the line so much nearer to Marranboy, and that in itself, without a branch line, will assist very considerably in the development of the tin-fields. The question then arises whether the expenditure on a cheap branch line to the tin-field itself would be warranted. At Bitter Springs there are better facilities for entraining cattle, and there is a good water supply for a township. The surrounding country is better, and the line is brought nearer to the cattle stations south and south-east of Bitter Springs. Further, the line is in a better position to assist in the settlement of Roper River lands. Roper River starts at Port Roper, in the Gulf, runs due west right to Bitter Springs, where it turns round and runs north-west for some distance, following within a few miles of the route of the railway from Katherine to Bitter Springs. I have been on the Marranboy tin-fields, and I can say that they are fairly extensive. From what I could see there was a considerable area of tin-bearing country. I think that if a line were run into the tin-fields it would assist greatly in the development of the field. I am not, however, in a position to say that the extent and value of the tin-field at the present time would be sufficient to justify the construction of a branch railway, when a main line of railway can be constructed within 12 miles, allowing future developments to show whether the construction of a branch line is warranted. I do not consider that any great advantage would be gained by the construction of a section to Marranboy as a terminus. In my opinion, there is land there suitable for agriculture later on. Until the railway is opened right through from either Queensland or South Australia there is no market. As to the class of agriculture, I should think that maize, for one thing, might be grown; but I do not think it is a wheat country, seeing that the rain comes at the wrong time of the year. But tobacco, and other tropical and semi-tropical produce, might be grown. I know nothing personally of the land north of Oodnadatta.

50. *To Mr. Finlayson.*—There is need for this railway extension, for one thing, as a part of the north and south transcontinental line. There has also to be considered the development of the country to the south of Bitter Springs and along the Roper River. As an individual proposition, I think that the extension of the Katherine River to Bitter Springs railway is justifiable, apart from the transcontinental railway. At present the railway stops at an inconvenient place. In my opinion, the country is much better from Bitter Springs southward than it is at Katherine itself, and quite independent of any junction with the north-south railway, this railway ought to be built. We have also to take into consideration the assistance it will prove to the development of the Marranboy tin-field. From Katherine southwards I consider the country fairly good pastoral country, and there is an improvement when we get within a few miles of Bitter Springs. The country at Bitter Springs is better than it is along the route. It will cost considerably more to divert the line via

Marranboy to Bitter Springs than it would to build direct to the latter place, and subsequently build a branch line to the tin-field. The distance would be increased very considerably, and the line constructed would have to be a standard one, thus increasing the cost, while later a cheap branch line could be made to the tin-field. Such a deviation would also bring the line into country requiring very heavy earthworks and expensive bridges. Altogether, the deviation would be exceedingly expensive as compared with the present route. I consider that the country to the south-west of Katherine River could be better served by a branch railway, because that branch could be extended in any direction and to any length that would be desired to serve the country. On the other hand, the bending of the main trunk route would only partially serve the country, and could never be carried any further except by starting from the point reached, a branch railway. I cannot say whether the general view of the Victoria River country is easy or otherwise for constructive purposes, because I have not been there. I should prefer steel sleepers to the B pattern, which we are using in the Northern Territory; I am impressed with that sleeper. I would not say that I prefer them to any class of wooden sleeper, but I am impressed with the fact that it is most suitable for a climate like that of the Northern Territory, where we have to contend with white ants, if they could be got at a reasonable price, until we got further south. I do not think that anything would be gained by putting down a cheaper line with wooden sleepers as a temporary measure until steel sleepers are available. I do not think that the half-round sleepers used in Queensland could be got, practically, any cheaper than those we have already taken into consideration. There is very little difference in the cost of laying such sleepers, but there would be an extra cost of adding in the case of the half-round sleeper. In any case there would be very little difference in the matter of price by using the half-round sleeper. It is very hard to say what that "little difference" might be; we should have to call tenders in order to find out. Personally, I consider that the use of half-round sleepers should not be allowed for any railway in Australia, because it has caused the destruction of millions of feet of very best timber. It has caused the destruction of young trees that would have eventually produced immense quantities of timber. The use of such sleepers means the destruction of the best trees in the timber forests of the States. I estimate the saving on the square sleeper for 3-ft. 6-in. gauge at about 1s. 9d.; but I doubt whether the half-round sleeper would prove to be any cheaper at all. I do not think that any of the States, except Queensland, have used the half-round sleeper. I consider the II steel sleeper an improvement on the trough sleeper. These sleepers are not available just now, except at a very high price, and, so far as I am aware, they could not be manufactured in Australia at the present time. I think it would be impossible to get such sleepers at the present time, especially in this country. A permanent survey has been made for the extension from Katherine to Bitter Springs. A trial survey has been made from Bitter Springs towards Daly Waters for a distance of about 25 miles, and the permanent survey for

about 12 miles. The permanent survey is proceeding on towards Daly Waters. We have approved to go only as far as Daly Waters. It will take nine months from now to complete the permanent survey with the present strength of the party. I should say that the Pine Creek section after the middle of next year, and in this I include the construction of the low-level bridge now to be built over the Katherine River. The idea is that the staff should continue with the work on the extension to Bitter Springs, as the work finishes on the Pine Creek-Katherine section.

51. *To Mr. Gregory.*—In addition to considering the route of the railway, I also got a general idea of the possibilities of traffic and the opening up of the country—as to the possible places of production and the likelihood of making the railway a paying proposition. I have only gone into the question of other ports than Darwin in a general way; I have not had an opportunity to consider the matter to a sufficient extent to enable me to give the Committee any detailed information. So far as I know at the present time, only small craft of light draught go up the Roper with provisions for the settlers. The Victoria with provisions is navigable for boats of from 5 to 10 tons. I think that the building of this line, with a view to opening up new country, would be justifiable. It would depend considerably on the class of country how far we would be justified in carrying railways instead of the purpose of transporting stock to the seaboard. In some cases stock-overs, and might prefer to travel stock in good seasons, and take them by train over poorer parts of the country. I think, however, that it would be quite justifiable to deal with cattle country situated 600 miles from Darwin. It would be opening up a very large question to talk of extending that to 1,000 miles. A great deal depends on local circumstances when you begin to negotiate such long distances. I should say that, in view of the country I have seen as far as Bitter Springs, it would be quite reasonable for the sake of bringing them to market quickly. Approximately, the distance from Barkly Tablelands to Darwin would be 600 or 600 miles, and I take it that stock could be trucked that far. If a high price is given for stock, that is an inducement to carry it a long distance, and I think you would be quite justified in anticipating a cattle traffic of the kind I have indicated. So far as I know there is no possibility of oil or coal for fuel being found locally in the Northern Territory, the only prospects I have heard of are for copper, tin, and gold. We could get a considerable quantity of firewood, but in ordinary railway working it is somewhat doubtful whether it would pay to use firewood as against coal. On the ballast train we are using principally coal and firewood mixed. At the present time I am not able to say whether that mixture is cheaper than coal, but we have the matter under consideration. If it is possible to use the rise and fall of the tides for the purpose of generating electricity, it ought to be applicable at Darwin, because there the rise and fall is considerable. That is a matter for electrical experts. For the purpose of cheap freights and making railways pay, it is essential, in the case of an ordinary railway, that the line should be built as cheaply as possible, but

that is in the case of a line which it is not anticipated will be a main trunk line. As trade warrants, such lines can be built up; and I would adopt that principle to a reasonable extent in a main trunk line, in the way, for instance, of using low-level bridges over big rivers. It may be found economical to use low-level bridges over the big rivers in constructing the main trunk line from north to south. It is a very doubtful point whether, given a life of fifteen to seventeen years for wooden sleepers, it would pay to lay 7-foot sleepers instead of 8-ft. 6-in. sleepers. That is really more a question of policy. The ballast does not come right out to the end of the sleeper and is covered, but the other is uncovered. The widening of the line will eventually be done with one rail only; we shall not shift both rails. The sleepers will not warp, because so much will be covered with ballast. This does not mean much heavier ballasting than for the ordinary 3-ft. 6-in. line, because the ballasting is kept the same width as for that line. 60-lb. rails are being laid. With the present traffic, 45-lb. rails would be ample, but we should have to use more sleepers. We should approximately have to use 2,640 sleepers with a 47-lb. rail—it is not a 45-lb. rail—as against 2,085 sleepers. It would not be advisable to go in for a lighter rail. Using the heavier rails, we decrease the cost of maintenance considerably. I do not consider there will be any saving in using a 41-lb. rail; with a 60-lb. rail we use fewer sleepers, and the maintenance is cheaper. Further, when it became necessary to widen the gauge, you would have to lose a big proportion of the cost of the lighter rails. I think that the weight of the rails used on the Clarence railway, in Queensland, is 42 lbs. On a good many of the lines in Queensland they are using 60-lb. rails, which were considered the best for the Queensland gauge. In fact, when I left Queensland it had been decided not to import any more 42-lb. rails. They were then taking up the 42-lb. rails on the more busy lines and putting down 60-lb. rails, utilizing the former for very light agricultural branch lines where there was no anticipation of their becoming main lines. I have heard of the concrete sleepers used on the Adelaide tramways, but I have not seen them, and so far as I know, no investigation has yet been made by the Commonwealth Railway Department. I have investigated some concrete sleepers that were laid down on the Northern Territory line, and they were an absolute failure. The trouble is that the concrete, no matter what the reinforcement may be, appears to fracture under the running of the trains. I certainly think it would be worth while to investigate the effect of the concrete sleepers laid down by Mr. Fenton in South Australia some eighteen months ago; and we shall probably get reports regarding them. Sleepers on a railway have to stand much greater shock and strain than on a tramway. I very much doubt whether it will be possible to make concrete sleepers more cheaply than wooden sleepers. The reinforcement costs money, and, apart from that, the sleepers are very heavy to handle. Concrete sleepers have been very much discussed of late years in relation to all railway operations, but up to the present there is nothing to show that they have been an absolute success anywhere. We have reduced the size of the sleepers from 9 ft. x 10 in. x 5 in. to 8 ft. 6 in. x 9 in. x 5 in. The

present price of the Powellised sleeper and jarral sleeper runs from 7s. 6d. to 7s. 9d., and up to 8s. 4d.; but I should like to make myself sure as to that, because the prices vary. As to my figures in regard to the two different gauges, I may say they are the result of actual tenders called. The prices alter very much, and of recent years they have gone up. The Powellised sleeper generally runs to 7s. or 7s. 6d. more than the unpowellised. We have some thousands of Powellised sleepers up there, and I take it that Mr. Bell recommended that they should be sent. I remember learning of a report about some untreated karri sleepers being shovelled off the Great Southern line in Western Australia. There has not been sufficient time to show whether the Powellising process will prevent dry rot. The sooner we have some decisive experiments the better, because in the meantime a great deal of controversy exists. Nothing will prove the value of the Powellised sleeper except an actual test. There are already about 40,000 Powellised sleepers up there. When the estimate was made out for this railway we proposed to put either steel sleepers or Powellised karri sleepers in, but what will be recommended is a matter that lies with the Engineer-in-Chief.

62. *To Mr. Fenton.*—The construction of the Pine Creek to Katherine River line, exclusive of rolling-stock, will cost approximately £6,000 per mile. That is slightly less than the original estimate, because we have eliminated high-level bridges over the Cullen and the Edith Rivers, thus effecting a saving of about £20,000. The Katherine River to Bitter Springs extension will cost about £4,938 per mile, or £1,000 per mile less than the Pine Creek to Katherine River extension. The £6,000 per mile which the Pine Creek to Katherine River extension is costing includes the cost of erecting a low-level bridge over the Katherine. The height of this low-level bridge has been fixed at just above the normal flood mark, and when floods exceed that normal height they will go right over the top of the bridge. Low-level propositions of this kind have been used very considerably in Queensland for a great many years, and experience has proved that they have withstood floods very well indeed. We anticipate that the low-level bridge over the Katherine will be equally successful. It is a somewhat more difficult proposition than is the usual low-level bridge, but I have no doubt that it will stand equally well, and that it is well worth the risk. From what I have seen of Mr. Oombes' report, I take it that he looked at this railway rather from the stand-point of the local development of the Northern Territory, and without considering it as a through connexion to South Australia. In paragraph 7 of his report he states—

The railways routes that would best develop the northern portion of the Territory, and also give most promise of (in time) turning out payable propositions, are as under—

Pellico Islands to Anthony Lagoon and Camoowal	400 miles
Collabrian or Anthony Lagoon westward, passing south of Wave Hill to the Western Australian border .. .	470 miles

In saying that, he was confining the railway propositions entirely to the northern part of the Northern Territory, and was regarding only local development, and evidently not looking at the

matter as a through line proposition. I know that he also says—

The proposal to extend the Darwin-Pine Creek railway through the Katherine, Bitter Springs, and Newcastle Waters to Anthony Lagoon (and Camoowal) will not stand investigation.

In doing so he appears to eliminate the idea of a line going to South Australia. It has not been indicated as a route to South Australia. If he had in mind a line from Darwin to Camoowal, with a branch from Anthony Lagoon to the mouth of the McArthur River, his proposition would then fit in fairly well. But if he wished to connect the Darwin line with a line from Anthony Lagoon to Camoowal, he would have to branch off somewhere—if not at Newcastle Waters, probably at Daly Waters, 100 miles north. In my consideration of the Katherine River to Bitter Springs line, I always had in view the fact that a transcontinental railway has to be constructed from north to south, in accordance with the agreement entered into between the Commonwealth and South Australia. I do not say that that line must be from Pine Creek to Oodnadatta, but it must be from Pine Creek to South Australia. I thoroughly believe that the construction of a line from the Katherine River to Bitter Springs will not only be in conformity with that agreement, but will assist development of the Northern Territory. I consider that the Commonwealth will be absolutely on the safe side, so far as the route is concerned, in constructing the line to Bitter Springs.

53. *To Mr. Sampson.*—The country surrounding Bitter Springs, though not of the best, is fairly good pastoral country. Within 4 miles of Bitter Springs an experimental sheep station has been established, under the care of the Administrator, and when I was there had 1,000 sheep on it. About 10 miles south is the Elsey Creek, and towards the western border of Queensland the country has been more or less taken up, and is stocked. The old Elsey station is only a few hundred yards off the route of the proposed railway. Stock could be travelled from Bitter Springs to the Katherine in a good season, but in the dry portion of the year it would not be good business. The feed would be scarce. The best part of the year in which to drive stock covers two or three months immediately succeeding the wet season. As far as I could ascertain from inquiry, the grass lasts for two or three months after the wet season. It commences to grow vigorously with the first rains of the year, which generally take the form of thunderstorms, and set in about November. From that time onward it continues to make rapid progress during the wet season, which ends about the middle of March. For a couple of months subsequently there is good feed. From that time onwards however, the grass begins to dry up. It will be burnt about May. It will be seen, therefore, that stock driving would be practicable for, say, four to six months of the year. From what I have seen of the country near Marrambidgee, there is some good agricultural soil, but it is patchy. Owing to its isolation, however, there has never been any agricultural operations in that locality which would form a guide as to its production. My own idea is that tropical and semi-tropical agriculture could be carried on there if markets were available. The markets which I have in my mind are those of Queensland and South Australia, but the best overseas markets for agricultural and pastoral products would probably be those of China, Japan, and India.

Leaving out of consideration the question of the construction of a main trunk line to South Australia, I consider that the extension of the line from the Katherine River to Bitter Springs is thoroughly justified on its merits. The building of that extension will bring the line closer to the Barkly Tablelands, which, I am told, is the best portion of the Northern Territory, and also to the settled land on the Roper River and on the Elsey Creek. I cannot say off-hand what revenue the proposed extension is likely to earn, but certainly that information could be obtained by ascertaining the number of stock on the different stations in the vicinity and estimating the proportion of that stock which would be attracted to the railway. The line would undoubtedly attract new traffic, as well as assist in new settlement. If I were supplied with details as to the number of stock in that portion of the country, and the area of occupied lands, I could form an estimate of the profitable traffic. This information could be obtained from various officials in the Territory, although its acquisition would take a little time. I have read the report of Messrs. Clarke and Lindsay on the Northern Territory railways and ports, and I am aware that they recommend—

- (1) That the main trunk line be continued from the Katherine River to Oodnadatta, via Renner and Alice Springs, as nearly direct as is consistent with the best engineering and revenue producing considerations, and that the construction be commenced from both ends.
- (2) That the Victoria River district should be served by railway connexion with Darwin as its natural and most convenient port. Preferably the connexion should be made by a westerly swing of the trunk line south-westerly from the Katherine, passing near Willeroo, thence to the telegraph line at about Renner Springs.

I have not seen the country to which they refer, but, judging from the map, and keeping in mind the country to be traversed on the eastern side of the overland telegraph line, I have no hesitation in saying that it would not be a good proposition to bend the line to the west in order to bring it nearer to the Victoria River country. I would prefer to bend the main trunk line to the east of the overland telegraph line, and to serve the country in the neighbourhood of the Victoria River and Sturt Creek by means of a separate or branch railway system. The bending of the line to the west would give only a partial connexion with that country, whereas a branch line could be extended to any distance that might be required to develop it. I consider that an extension of the line from Bitter Springs to pass somewhere in the locality of Anthony Lagoon should be thoroughly investigated, as I believe that the bending of it east to that point, and thence following as nearly as possible a due south line to Oodnadatta, or perhaps to Illegoot Springs, would take it through the greatest area of good land. That route should be thoroughly investigated before the Commonwealth is committed to following the route of the overland telegraph line.

54. *To Mr. Fenton.*—There is a very extensive cypress pine forest in the vicinity of the Marrambidgee mine, so that there would be a fair amount of timber traffic until the forest was cut out. The area embraced by this forest is several square miles.

55. *To Mr. Gregory.*—The line could not be taken further east just there, because the route is on the edge of a very large area of flooded country.

Royal Commission on this point, showing that sheep would do on the Barkly Tablelands, and at the head of the Victoria River, though it is doubtful whether this could be said of country further north. When I was there sheeps and stock were being put up at the Government sheep farms at Bitter Springs, but the sheep had not arrived. I do not see much prospect for sheep doing well there. The Government may be able to keep sheep alive, but, as I say, commercial success is another matter. Dingoes are very plentiful on the Roper. The spear grass in this part of the Territory is very bad for sheep, and the remaining grass is very coarse. In the early seventies, sheep were tried on the Katherine. About 12,000 were sent from South Australia, along with 2,000 head of cattle, to a station formed near where the proposed railway is to cross the Katherine. After three or four years, however, the venture was abandoned, the animals mostly dying or disappearing. It is evident that the people who carried out the experiment knew something about sheep, because, although it was a long time, none were lost on the road from Adelaide. Dr. Brown, of Adelaide, is supposed to have lost about 240,000 in this experiment. Sheep have been tried about 70 miles from Darwin by the present Administration, but I do not think that any are alive now. South of the head of Victoria River, Newcastle Waters, and Anthony Lagoon, there is every possibility of sheep doing well. According to the evidence we heard, Avon Downs Station has been a sheep station for about thirty years. According to the estimate of the owners, Barkly Tablelands can carry about 2,000,000 sheep and 600,000 or 700,000 cattle on 200,000 acres—1 sheep to the acre. There is estimated to be 150 to the square mile. There is sufficient country south of Barkly Tablelands. Cotton grows wild in the north at Port Essington, but whether it could be made commercially successful, I am doubtful. Experiments in this regard have been made at several places in the Territory, and sugar has also been tried. In the eighties, about £20,000 was spent on sugar near Darwin, but when they got 7 tons the first year, and 5 tons the next they gave it up. Coconuts will grow, but I hear that they do not ripen properly. Coffee has been tried, and I think the reason for its non-success is the six months drought every year. I lived on the Malay Peninsula for five years, and I know what a tropical country it is. Rice has been grown in the Northern Territory to some extent, at one time about 3,000 Chinamen were there, and as all Chinese understand rice growing it is likely that it was given a fair trial, but they did very little good, and gave up the business. I saw an attempt near Pine Creek when I was there, but I do not think the soil is suitable, or that the rainfall tends to success. My experience of the Northern Territory does not present a very bright outlook from an agricultural point of view, and I do not think that that view is worth worrying about. On a small scale there may be agriculture, but I regard the Northern Territory as a pastoral, and, possibly, a mining region, or I was never the mining fields at Pine Creek, but everything seems to be going back. There is one good copper show, I believe, about 40 miles east of Pine Creek. There is certainly a good show of copper ore, but there are many difficulties. Nothing can be done without a railway, which would cost £250,000, and there is no wood, not even frowed for mining purposes. There is no flux, and all the ore would have to be taken to the seaboard.

60. To Mr. Sampson.—My idea is that the Territory should be developed from the coast line by railways between the hinterland and the nearest port. I have already said that I regard the proposal before us as so hopeless that the agreement ought to be varied. There are only two routes, one by Bitter Springs, and the other down to the west, and I assume they would cross somewhere south of Newcastle Waters. I would carry the line more directly south than Messrs. Clarke and Lindsay's route, say to Wave Hill head station, and connect somewhere about Renner Springs, or further south. If the line I have spoken of were built, Darwin would get the traffic in the absence of a line to Wyndham, and that, in my opinion, would be in accordance with any scheme of development from the coast line inward. If a line were not built to Wyndham, it only means that the export of sheep and cattle from Wave Hill would be handicapped by 200 miles extra haulage to Darwin. If the route I suggest were taken, it would serve most of the Victoria River country, but it would not avoid a railway to Wyndham when the country became more settled. As a pastoral proposition the line would serve fairly well. The deviation of the line to Marranboy all depends upon the prospects of the field. The Victoria River country will justify a railway sooner or later on its merits. I should prefer the western line with a branch. The construction of a main line on the best route, and with a view to its being a commercial undertaking, is a matter of course that involves much investigation. It depends on the traffic to Marranboy, and the possibilities of traffic south of the junction. Then we have to consider the relative cost of the different routes, what the grades will be, and the possible traffic from the Victoria River country. My impression now is that the western line is the best.

61. To Senator Keating.—Throughout the Territory, where there are creeks, there is a possibility of conserving water, but when I was speaking a little time ago of the Roper River, I had irrigation in my mind. There we have presented opportunities for the construction of dams for the conservation of water for stock and domestic purposes. On the McArthur River, near Borrooloola, there might be facilities for the conservation of water for irrigation purposes. That is the only place I saw in the Territory where there is a large area of fairly level country suitable for irrigation. I had about ten years' experience of water supply and irrigation work in Victoria and New South Wales, and I think the country about the place I have mentioned would be good for agricultural experiment. It appears to be fairly good soil. There is a lot of limestone country on the McArthur River; it makes the fertile flats lower down. Owing to the presence of limestone this country is better than any I saw elsewhere. It is very hard to say what the soil there is capable of producing, but I think, for one thing, lucerne would grow. There are a few patches of it round about Borrooloola, and it seems to do very well. The line I suggest would go through the country I have just mentioned, but that was too small a consideration to influence me in my preference for this route. There is a pretty fair area of this land, perhaps 40 or 50 square miles, but, apart from that consideration, the route I favour is the shortest from good country to the seaboard. There are patches of country elsewhere in the Territory where conservation and irrigation might be carried on. For instance, there might be some land on the Roper on to

which water could be pumped from a water-hole, but these are only isolated instances. I think the agreement should be varied so that the railway route should be from Oodnadatta to Alice Springs, and the Macdonnell Ranges going north; then south from Pellow Islands to Anthony Lagoon, Alice Downs, and the Frow River. I am doubtful about the Frow River, because according to Mr. Gordon, of South Australia, it is pretty rough country. If the route I have mentioned should prove impracticable, the alternative route from Anthony Lagoon to Tennant's Creek, and thence along the overland telegraph line could be adopted. The line from Port Augusta to Alice Downs, and the Frow River, is 250 miles shorter than the route from Port Augusta to Darwin, and 250 miles in a long haul like this is a big thing. I do not consider that the agreement should be varied to the extent of not connecting Oodnadatta right through the Northern Territory to the sea, but I think that the line should go from Oodnadatta to the Pellow Islands, on the Gulf. I do not think that Darwin has any more strategic value as port than Pellow Islands or Wyndham; an enemy might land at any one of those three places, and even at Port Essington, for that matter, which is about 200 miles from Darwin, and has a better harbor. Admiral Creswell gave evidence before the Commission, and laid stress on the comparative importance of Darwin as port. As a strategic point for Australia in relation to the waterway between the Archipelago and the Pacific, Admiral Creswell considered Darwin most important; but, on the other hand, General Gordon, who then held the post, refused to accept that view. Admiral Creswell stressed the fact that from Darwin it would be easy for Australia to harass a hostile fleet passing from Europe to the Pacific than it would be from any other point. I regard Darwin and Essington as practically of equal value from this point of view. If all the railways that have been mentioned are built, the question of fuel becomes a big one. I think that coal at Darwin now is about £2 10s. a ton, and the working expenses of the Darwin line are 8s. to 10s. per train mile, as against about 3s. 8d. in Queensland. According to a geological report, there is coal in western Queensland, south of the Gulf, for hundreds of miles, and this might be developed and made use of. I do not think, however, that any steps have been taken to develop the deposits I have just seen any of the coal, and I do not know its value. According to Dr. Jensen, there is no oil or coal in the Territory of any commercial value. As I have said, my view is that for a generation at least the Northern Territory is purely a pastoral proposition, and for its development railways must be constructed to the nearest ports to the hinterland. The exports will be cattle, wool, and sheep, and these require to reach the nearest possible ports. I do not entertain any very high hope of tropical production in the Territory, and I think that the non-success in this regard is due to the rainfall—six months in the year, and the question of the real tropics the rainfall is the same all the year round. I have had experience of railway construction in the Malay Peninsula and Siam for five years. My work was that of deciding when, where, and how to build railways. The conditions in the peninsula and Java are not anything like those of the Northern Territory. Nominally, the Northern Territory is in the tropics, but actually it does not appear to be so for the vegetation is altogether different, and the land is much poorer with the six months' drought.

In the real tropics the rainfall is very evenly distributed throughout the year; there is no winter and no summer—no season. The Northern Territory is a tremendous proposition; though apart from that the railway question appears to me simple enough. It is a cattle and sheep proposition. The chief things wanted are water conservation and horses, with the opening up of stock routes. I know that for the last twenty or twenty-five years there has been great railway construction development in Africa—in the Sahara and other places which, some years ago, were regarded as absolutely unproductive. I have not, however, gone into the question more than reading about it in the technical journals. I do not see how any information in regard to this water development elsewhere could help us so far as our railways are concerned. Information of the kind might, however, guide us in making better use of the coastal country.

62. To Mr. Gregory.—I should say that the construction of the proposed strategic railways of the south-eastern Australia is of more importance at the present time than Territory railways. The pastoral development of the country will, I think, come from western Queensland and western New South Wales. The railway which would give the greatest return would be one from Pellow Islands to the Barkly Tablelands. Then there should be a railway from Wyndham into the Victoria River country, and one from Oodnadatta to the Macdonnell Ranges. It would pay people to transport cattle at Queensland rates 600 or 700 miles to a port, but it might not pay at Northern Territory rates. I should say the cattle trade could stand that. Of course, it is a matter of the class of railways. The present line from Darwin to Pine Creek is not capable of carrying any really heavy traffic, it is light, but needs to be rebuilt at a cost of £400,000 or £500,000, with heavier rails and strengthened bridges. Until that is done the line cannot carry proper train loads. I do not think that 41-lb. rails are heavy enough; there ought to be 60-lb. to 70-lb. rails. I have heard that in Western Australia new areas have been opened up by railways with 41-lb. rails, on which heavy loads are carried on easy grades. The grade is 1 in 60 between Darwin and Pine Creek. It all depends, however, on the amount and nature of the traffic, and cattle is a difficult traffic to handle in the Northern Territory. It lasts for only five or six months in the year, and the question of the line to deal with the men afterwards. In the State of Queensland, with a big railway system, the men could be transferred from one place to another, but in the Northern Territory it appears to me that they would have to sit down and wait for the next season. As to light railways for opening up the country, I would point out that at Darwin and Pine Creek we have a region of very heavy rainfall, even at Bitter Springs it is about 35 inches. The saving in the first cost between the heavier and the lighter rails is not very much, and I do not think that we could build railways for £2,500 per mile with the present price of labour in the year. South of the Katherine River you will get grades of 1 in 100. The engineering works established by the Western Australian Government at Wyndham will undoubtedly get most of the cattle. At one time, the great idea was to drive cattle, but railing is coming more and more into favour. Driving is done on a big scale very cheaply, from 1s. to 1s. 6d. per head per 100 miles. Cattle can be driven from McArthur River to Bourke, 1,400 miles, for 21 a head. I have never gone into the question of utilizing

the tides in the north-west in the generation of electricity for power purposes. I believe that some one now is experimenting with the generating of electrical power by means of the sun's rays at the Macdonnell Ranges. I did not see any mining timber in the locality of Marranboy. Along the rivers, and in the water-holes, there is what is called paper-bark, which I take to be a species of t-trees, 2 or 3 feet in diameter, which might be useful. It appears to be sound, but the great percentage of the timber in the Territory is useless, stunted stuff, and nearly all hollow, not fit even for good firewood. As the tin-mining field is developed, and they get deeper down, the expenses will increase, and water will become a very heavy consideration.

63. *To Senator Story.*—I prefer the deviation to the west in order to touch the Victoria Downs country. As a strategic railway, it is necessary to have a line north to a certain point, say, Newcastle Waters, Pollow Islands, Wyndham, or Darwin; possibly it would be advisable to have a railway to three places. I do not think it is correct that, with a line from Darwin to Port Augusta, the trip to England could be shortened very considerably. I think it is practically the same distance from Colombo to Darwin as to Fremantle. If the idea was to go overland through India or Russia, the people would not go to Darwin, but Queensland. I have not been in the Macdonnell Range country, but from evidence given to the Commission, there seems to be considerable mining and pastoral possibilities there. A railway for 300 miles from Oodnadatta to the Macdonnell Ranges would probably cost £2,000,000, and it would be run at a loss, though it would be justifiable. It would open up a lot of country, and there is no question as to that; Port Augusta is the natural outlet for all the rest of Central Australia. Sooner or later a railway will have to be built southward to the South Australian border, but when I reported, I was not looking very far ahead. The building of a line from the Macdonnell Ranges would take four or five years, and to fill up the gap would take about the same time. The only justification for taking the line to Bitter Springs is, in my opinion, that it would develop the Marranboy tin-field. The country traversed is of the poorest possible kind, and not capable of development. The evidence of experienced pastoralists shows that the best of the country would not carry more than four head of cattle to the square mile. The labour of the 150 men or so who might be thrown out of employment if the proposed railway is not proceeded with might be utilized on the Marranboy tin-fields, if they were miners, but I think there is plenty of other work for them in the way of mang roads and tracks, and works for water conservation. In Darwin, there is an L-shape pier capable of handling about 20 tons an hour, and what is required is a new caseway on which the trains can be run alongside the ships. This work would cost probably £300,000 or £100,000. I have heard it said that people are likely to settle about Bitter Springs, but in the last two or three years the Administration has surveyed and thrown open 200,000 or 300,000 acres for agricultural settlement, and there are only ten settlers. Why not put the men there? It is only 70 miles or so from Darwin, while Bitter Springs is 265 miles away from the sea-coast, and the land subdivided is quite as good, and, possibly, better than at Bitter Springs. I certainly do not think there is any necessity to build a railway which would be a losing proposition simply for the sake of keep-

ing 150 men at work; there is plenty of work to be found for them. Some day it would be a good thing to have a line from Darwin to junction with the McArthur River railway for strategic purposes, but that is a long way ahead. If we spend money in that way now, there will be no money to build lines really required for settlement purposes. It is possible, of course, that in the present unsettled state of the world a strategic railway may be needed, say, within the next eight or ten years. Assuming that there are freezing works at Wyndham, there is evidence that there is a good, well-watered stock route to that place from Victoria Downs, and it is quite likely that, in view of the extra distance and freight to Darwin, such a stock route would be used. The same thing, however, would follow if you put the freezing works at Pollow Islands. The difference in the distance to the sea-board is even greater. If the line were continued along the telegraph line, and a spur made to the Victoria Downs country, it would add considerably to the distance; so much so that it would probably kill the traffic to Darwin, and send it to Wyndham. As a railway would go, the Wave Hill country is almost as near Port McArthur as it is to Wyndham. I propose a line right across east to west joining the two. Pollow Island would very likely get the traffic, even if a railway were built to Wyndham. The distance from Wave Hill to Pollow Islands and to Darwin is practically the same. The plan prepared by H. N. L. Brown shows the possibility of coal in the Territory. Bares were put down in Anson Bay two or three years ago, but nothing was found. The land spoken of by Brown towards the Barkly Tablelands has not been bored, but it has been examined by Jensen. I am pessimistic about the prospects of tropical agriculture to the north, but I should think that tobacco is the thing that would grow there. For some reason or other the growth of tobacco seems to have been a failure in spite of the favorable climate. I do not know any of the particulars of the reasons why tobacco culture was abandoned in the Northern Territory, but I still think there are possibilities. For thirty years or more experiments of all kinds have been tried, but none successfully. There is no doubt that maize would grow there in parts.

64. *To Mr. Fenton.*—If the trade were good enough, steamers would go to Pollow Islands. I did not examine that part as much as I should have liked, but Mr. Jensen speaks of mangroves there, and is as well qualified to express a judgment as I am, and he considers that it would carry a railway. There would be no great length of piling required. The chief difficulty is taking the railway out to the islands, and bridging the arms of the sea. Where it is proposed to make a harbor there is a depth of 24 feet at low tide within 100 feet of the shore. Pollow Islands would make quite as good a harbor as would Darwin. The latter has had about £80,000 or £100,000 spent on it, and probably requires another similar expenditure; and if the money were spent on Pollow Islands, we should have a harbor quite as good. A good deep-sea harbor there would not only serve the Barkly Tablelands but also the Normanston districts, Queensland. I do not know the Queensland port, but we had evidence that it is hopeless to get a good harbor on the Queensland side. My contention is that the through route I propose will save 250 miles of hauling from sea to sea, and this, taking the cost of the line at £5,000 per mile, would mean

a saving of £1,500,000. I should say that Wyndham is about 200 miles from the western border of the Territory at Turkey Creek. As to whether, before Wyndham becomes a port for the Victoria River country, it would be necessary to have a line of railway from Wyndham to the border, I should say that Wyndham would still be likely to get the trade without a railway. This would depend on all sorts of things—markets, seasons, and so forth. The evidence is that there is a good stock route right through at every season of the year. I laid out about 400 miles of railway in the Malay Peninsula which would form part of the scheme of an overland route to Great Britain. I think it will be a long time before that comes to pass, but a railway would greatly reduce the mail times, but a lot of railways will have to be built before that is an accomplished fact. I understand that Vestey Brothers have a chain of country from the head of the Victoria River to near the Katherine, and I should say they are bound to send their stock that way. If they sent it to Bitter Springs they would have to cross a patch of absolutely waterless country. The deviation proposed by Clarke and Lindsay would take the line away from the Marranboy tin-fields. I think that oil might be used successfully as fuel in the Northern Territory, but that is a large question. Darwin and the northern parts of Australia is very well situated so far as the supply of oil is concerned, because there is Borneo, and possibly New Guinea to draw on, and, in time, oil may be used in preference to coal. If oil could be obtained in large quantities, it would be a better proposition than taking it from the south. My Commission was recalled before it had finished its investigations, and it will be seen from my report, that I do not recommend a railway straight out to the reason that I have not seen sufficient of the country. The Commission was appointed for two years, but with the change of Government, it ended in thirteen months. Had I had another nine months, I should have seen the southern part of the Macdonnell Range country, and also the Victoria River country. As I have said before, I regard the proposed extension from Katherine to Bitter Springs as a hopeless proposition.

65. *To Mr. Finlayson.*—By profession, I am a civil engineer. I am a native of Tasmania, and at sixteen years of age I joined my father, who was a civil engineer in the Wimmera. I was three years with my father on water supply and irrigation work. I was then some seven years in New South Wales, engaged in water supply and mining works, including copper smelting. In 1898 I joined the Victorian Railways, and for four years was engaged in all sorts of railway work. In 1902 I was appointed by the Colonial Office as Chief Surveyor of the Malay States railways, this included part of Siam. I was there four and a half years, and on my return to Victoria was appointed superintending surveyor in charge of railway surveys in Victoria. This meant investigating and reporting on all railway propositions, making surveys, and so on. In 1913, nearly seven years afterwards, I resigned that position to join the Northern Territory Commission; my last official work was reporting on the proposed strategic railways of south-eastern Australia. Apart from the Northern Territory schemes, I have, in the last fifteen years, investigated and reported on some 225,000,000 worth of proposed railways, and have designed and made surveys for about 1,000 miles of railways, costing £5,000,000 or £6,000,000. I am now occasionally engaged in private practice. I was in the Nor-

thern Territory from June to November, 1913, and my knowledge of the country is confined to that period, with the exception that some years ago I was in Darwin. I have, however, supplemented my experience by a careful study of the question, and have examined witnesses from all over the Territory, so that I think I have now a fairly good general knowledge of its requirements. There is no practical need for the building of a north-south railway as a commercial enterprise, though it might be justified for strategic purposes. Commercially, the line would be better to take the railway in sections. For 300 miles from Oodnadatta to Macdonnell Ranges, there are possibilities, and the line might, in the future, pay working expenses. The next 300 miles to Jonnant's Creek is very poor, excepting in places, as I understand from reading the evidence. The following 400 miles to Pine Creek is also wretched country. Unless for strategic purposes, I would suggest a go-easy policy for railway construction through the centre of Australia. I believe in a line to Macdonnell Ranges, a line to Pollow Islands, and from Anthony Lagoon to Camooweal. If it is decided to follow the telegraph line, then the line from Marranboy tin-field to Bitter Springs is a section. If the Marranboy tin-field is sufficiently good, it is probable that the line should be taken across there instead of missing the field by 12 miles. The only immediate justification for a proposed extension is as a link in the north-south railway. The country proposed to be traversed has been known ever since 1872, and it is still unoccupied. At one time, Bitter Springs formed part of the Elsey cattle station, but it was abandoned. Presuming that the section between Katherine River and Bitter Springs is determined, I do not think that a branch line between Katherine River and Pine Creek would be preferable to a line to Wyndham, which I regard as the natural outlet for most of the Victoria River country. The northern portion would be better served by Darwin, because of the distance only. I would favour some arrangement with the Western Australian Government to connect up the Victoria River district with Wyndham, because to develop that part of the Northern Territory is the proper thing.

66. *To Mr. Sampson.*—I do not know the Daly River, but I know the Katherine, and I have been at the Alligator and the Roper. I think that the soil in the lower reaches of the northern river system is quite unsuitable for irrigation; it is too stiff. In the Malay Peninsula, there is practically nothing else but rice-growing and tin-mining. I should say 90 per cent. of the rice there is grown in swamps in fairly stiff soil, between the hills. North of the Katherine there are a few square miles of nice-looking limestone country, which might be irrigated by pumping water out of the river. No doubt a great amount of water could be conserved on the Katherine, if required, but I know of no large area to justify the building of great reservoirs, and so forth. I am very doubtful if the dairying industry could be carried on in any of the coastal country, because, with insect and other pests, the cattle do not do well. The flies in the wet season are somewhat of a nuisance, but there seem to live, but I am doubtful whether dairying would succeed. Amongst the other products grown in the Malay Peninsula is rubber, which, I think, in some respects, so far as the climate and soil are concerned, might be produced in the Northern Territory. However, as I have said before, the trouble

is the six months' drought. I do not think that the prospects in regard to irrigation colonies are too bright. The only place I thought worth trying was, possibly, on the McArthur River, where the soil is better, because it comes from limestone country higher up. There are also good sites for dams and storage. Along the Adelaide River, there are fairly extensive flats, which are periodically inundated, and ought to be suitable for rice culture. I have had no evidence on that point, though I have heard a good deal about it. I think there might be settlement on a lot of these rivers, but that, of course, means a small-steamers proposition, and not one of railways. I see no chance of closer settlement in the country where there is six months' drought every year. Irrigation is an expensive business, with many drawbacks, and I do not think we need worry about it for a time. A comprehensive report on the subject might be useful, but I do not think the prospects warrant it. I have heard of no areas sufficiently large to justify such a policy. River valleys like the Alligator, the Roper, and so forth, are very much flooded in the wet season, being frequently many feet under water. The salt water in the Roper extends about 80 miles up.

(Taken at Adelaide.)

WEDNESDAY, 2ND FEBRUARY, 1916.

Present:

Mr. Riley, Chairman;
Senator Keating; Mr. Gregory
Senator Story; Mr. Sampson
Mr. Fenton; Mr. Laird Smith.
Mr. Finlayson

The Hon. John Lewis, M.L.C., Director, Bagot, Shakes, and Lewis Ltd., King William-street, Adelaide, sworn and examined.

67. *To the Chairman.*—I have a good knowledge of the Northern Territory. I went overland from Adelaide in 1873, right through to Port Darwin, and, in 1878, through there to Port Essington; so that I have gone across the continent of Australia from one side to the other. I have been over that part of the country involved in the extension of the railway now being considered from Katherine to Bitter Springs. There is no doubt that the railway will have to go very near to Bitter Springs if the intention is to take it through from Katherine to Oodnadatta. The country to the west of the track would probably be drier, and not subject to the inundation that occurs from Katherine to Bitter Springs, where you get into low-lying land. It is one of the sources of the Roper River. I should like to explain that I am interested in a pastoral country in the Northern Territory, and also in South Australia, along the proposed railway from Oodnadatta to Pine Creek; but I wish the Committee to understand that I am not advocating anything for my own special benefit. My evidence is for the benefit of the whole community. A railway along the proposed route would undoubtedly assist in the sending of cattle for treatment at Darwin. The travelling of fat, great stock down to Pine Creek would reduce their condition very considerably, because cattle in that country are not like those farther south. They do not thrive on the feed as they go north. The feed is very long and rank, and not succulent,

so that cattle reduce very rapidly. A railway would assist very much indeed in that direction. Pastoralists would undoubtedly avail themselves of a railway—I refer to a railway from Bitter Springs north to Darwin. A railway is already sanctioned from Pine Creek to Katherine, and the continuation to Bitter Springs would be a very great convenience. The extensive freezing works which have been erected would be able to treat all the cattle that the pastoralists would be able to send from this neighbourhood. It is not all sheep country, but cattle and horse country, and much better for cattle than for horses. The alternative route is a safer route, because there would not be so much inundation. The blue-grass swamp country is very much subject to inundation in wet weather. The alternative route would be a little longer, but a little cheaper—I am referring to the western side. The western deviation is down the Wave Hill district. I would advocate the straight line down to Oodnadatta, though it would be a little farther out of a straight line. From what I remember of the country, it would be much easier to take the western line. There would probably be 25 miles difference between the two lines. The western deviation would just escape Newcastle Waters, and go west of Lake Woods, which, when full, is 150 miles round. I think it would be a great many years before the line would be a paying proposition; but it would help materially in opening the country on either side. The only rich tin-field is below Katherine; but that is quite a recent discovery, and I could not express an opinion about it. A report made about twelve years ago said there was tin there, but the question was whether it could be worked at a profit. Efforts have been made to raise sheep there with very unsatisfactory results. I brought 10,000 from Avon Downs, and took them round to Newcastle Waters. The grass, however, was very rank, and did not do for them at all, and some of them got cancer. There is a great deal of country on either side of the line that might be taken up if there were greater facilities for communication. The cost of rations is very great indeed; it cost me £45 a ton to get supplies there. I do not think there is anything more I could add, beyond a belief that if there was a railway a great many stations would be formed on either side of the line, so the people could get better provisions and material. This, of course, would help to develop the country. We had to send our loading 850 miles by camel; so that you may understand the cost. Barkly Tableland is much better. I have not been on it, but I understand that you can get water at about 350 to 400 feet. That is right across what is known as Barkly Tableland, which is very good country indeed. The extension of the railway will, to a certain extent, go towards Barkly Tableland; but the people there could get to Burketown easier than to Darwin. Their stock nearly all goes into Queensland.

68. *To Senator Story.*—In my opinion, the Bitter Springs route is the better, though more difficult to construct. A short line to Port McArthur would help the Barkly Tableland very much indeed; but I should have thought it better for the people there to send to Burketown. A shorter distance to the seaboard would, of course, save a great deal in carriage, and the Barkly Tableland is the best country we have. The eastern route, following the telegraph line, is the better. It follows John McDouall Stuart's route,

and be discovered nearly all permanent waters. You could easily go right on to the MacDonnell ranges from Oodnadatta. The country in between is so inferior that it is scarcely worth considering a railway, unless you get right on to the ranges. There we have a good rainfall of 12 inches; it increases from 4 inches as you near the ranges. The rainfall in between is too poor to warrant a railway, unless the railway goes right on. At Charlotte the rainfall is only 4 inches a year; but as you go north you get a good rainfall, as at Alice Springs. There is a patch of sandy desert country which is marked as an artesian basin. There is no telling, however, how far it goes. The only proof is a bore about 19 miles from the South Australian border. I should go right through the country with a railway if I wanted to make a success, starting from either end. I would not spend one penny in the Northern Territory unless I could get coloured labour, which, I am sure, could work the Northern Territory profitably. I had six years of hard work there; but if a man has a defect in his constitution, and gets a fever, he has to clear out, or he very soon dies. You cannot get a European to work there like a coloured man.

69. *To the Chairman.*—The Chinamen is as good a man as we can get for mining work there. We had white men from Ballarat for the gold mines, at £4 10s. and found, but they did not stay long before they cleared out. We got a number of Chinamen from Singapore.

70. *To Senator Story.*—I suppose that there is no possibility of that kind of labour coming now; but I think that the Territory is hopeless without coloured labour. I am sorry to say this, because I would sooner have white labour. There are a few aboriginals there, but they are getting fewer every day. They are not good for manual labour; but south of that part they are only good for stock work, which, of course, is all you need for stations. South of that, however, you want to cultivate land as well as raise stock. So far as I know, there are not many minerals south of the Katherine, except at MacDonnell Ranges. There have only been a few specks of gold discovered between the Katherine and the MacDonnell Ranges, but there are gold and precious stones, with wolfram and mica. I recommend that it would be better to follow the suggested route to Bitter Springs.

71. *To Mr. Finlayson.*—I know the Victoria River district by repute. It is excellent country, and a great deal might be utilized if there was water for irrigation in the future. It is rich, dark alluvial soil; but, of course, I speak only from hearsay. I think the country would be better served by connexion with Wyndham. The district covered by the western scheme is, so far as I know, poor, dry country, until you pass the waters. It is from the Katherine River crossing that the divergence of route occurs. I do not think that the extension of the line from Katherine River to Bitter Springs would in any way prejudice the north-south route. The more easterly route that I suggest would, I think, traverse better country and give a better return. There is some good country on the other side of the Roper, to the north of Bitter Springs. The railway to Bitter Springs would tap some good country. The extension to Katherine River is, I think, practically ineffective, unless it be continued to Bitter Springs. There is a strip of bad

country, with one small exception. In order to make the extension worth while, it ought to go on to Oodnadatta. A line built out in a westerly direction would have to depend entirely on pastoral occupation. If the line be continued to Bitter Springs, I think the pastoralists will make use of it for transporting cattle. As I say, the line would have to depend on the pastoral traffic. A good many people from Barkly Tableland would use the line. The country there is very fairly stocked with both sheep and cattle, and there would be more traffic as the line was extended outwards to Newcastle Waters. If the line is to be constructed at all, it is better to go from Katherine River to Bitter Springs.

72. *To Mr. Laird Smith.*—It would, in my opinion, be profitable to send sheep from the Barkly Tableland to the freezing works in the north if the line were constructed. The Bitter Springs country is subject to inundation, but higher up there are only one or two creeks to cross; after that you are practically free from flood country. With freezing works in Darwin, it would be advisable to continue the line from the north for the development of the Territory. As to the rainfall in the MacDonnell Ranges, the Northern Territory is partly tropical and partly sub-tropical; but the rains, as a rule, occur from November to March. I think that this railway will assist very greatly in the defence of Australia. I have never suggested the abandonment of the Territory, but I would not like to take it on unless I could have coloured labour. I am not aware that in South Africa coloured men objected to go below a certain depth. As to the Chinese labour having "picked the eyes" out of the mines, I do not think, as an old miner, that they are very much different from Europeans in that respect. Wherever there was a good patch, I tried to get it, and the Chinamen would do the same. When the railway was first constructed there, Mr. Charles Miller told me that he could never have carried out the work without Chinese labour—he could not get Europeans to do it. That was not owing to the isolation of the country, but because the climate is against Europeans working there. I am not versed in what has been done at the Panama Canal in the way of enabling white labour to be utilized, except from what I have seen in the papers. It is not a matter of wages, because, as I have already said, we paid £4 10s. and keep, but the white men would not work there, simply because the climate was against them. Stock-men have a different life from that of the miner; it is not such a task to ride a horse as to use the pick and shovel. Then, further, the stock-men do not ride much in the heat of the day, but in the early morning, or the cool of the evening. Apart from the coloured labour question, I would, as a matter of development in the Territory, suggest a railway policy similar to that now under consideration—I would follow the telegraph line right through.

73. *To Mr. Fenton.*—It is nearly forty years since I was in the Territory. I know that considerable alterations have been made in regard to the employment of labour in tropical countries. A Britisher in India manages very much better than he did forty years ago; but there all the work and personal services are done by the natives. There are, of course, exceptions to every rule, and a man might work in the Northern Territory for four or five years without harm. I am glad to hear that on the railway construction

but I am not prepared to give an off-hand opinion. I have seen so much damage done by white ants to jerrah that, personally, I would not touch it. Ironbark would, I believe, in many cases last much longer. The little white ants down south are a very different proposition from the Territory white ants, which are nearly as big as bull-ants. As to the proposed deviation to east or west, a new mineral discovery would decidedly affect my recommendations. The fact that there was a tin area 40 miles square and 14 miles from Bitter Springs, would most certainly affect my recommendations. I do not pretend to be able to make a recommendation beyond saying that it would be worth lengthening the line a little to get traffic by tapping the best country. I should hardly think that you could get sufficient traffic merely from the pastoral resources to warrant the construction of the line. But the point is that we do not know what will follow the pastoral development, which is a good thing to start with. There were practically no efforts at closer settlement at Darwin in my time; the most has been done since the Commonwealth took the Territory over. I know of no cases where closer settlement has been successful. I do not think you will ever develop agriculture with white labour—that the 'growing of rice, cotton, and so forth, could be successfully carried on by a white population.

83. *To Mr. Pinlayson.*—I think that the establishment of freezing works at Darwin would lead to a very large stocking up of the country, and this would bring a certain amount of traffic to the line. I do not think the line would be used for stock, except from the Katherine to Darwin, because there is good travelling country to the Katherine. From Darwin to the Katherine the country is very poor, and I do not think you will carry much stock on the railway south of the Katherine. The extension of the line south of the Katherine would not result in any great direct stock traffic; but indirectly it might. The transport of cattle would be the main source of revenue, and the mineral traffic would assist. I am a great believer in the mineral resources of the Territory. It needs the conjunction of all traffic to make a railway pay. Primarily the line should go direct towards the mineral districts and good cattle districts, providing the lengthening of the line is not too great. If the proposed line is to be part of the main line, the lengthening should not be very great. I approve of the idea that the extension of the line merely as a local proposition would not be worth much; but it is the fact that it is a link in the chain of the main line that gives it its value. The extension of the line for local purposes would be difficult of justification, but it is a different matter altogether when it is part of the main line. I regard the Victoria River district as good pastoral country. From what I have heard, I should think that this pastoral country would be better opened out by Wyndham. So far as I know, there are no difficulties in construction. An extension of the line towards Bitter Springs would be worth favorable consideration if there were good pastoral country there which could be developed once railway connection was given.

83. *To Mr. Sampson.*—The present carrying capacity would, I suppose, give an indication of possible future developments; but my opinion is really of very little value on such a matter. I am not in a position to express an opinion as to

whether the Victoria Downs will develop an agricultural population. If I were charged with the duty of developing the Territory, I should go for a through line, and not for lines running from suitable ports inland, as is the case in the various States. My idea is to have a trunk line, because we want a backbone for any system of railways, and not isolated branches. In planning a railway system, I think you want a trunk line with branches to it. The Territory would, to a great extent, be isolated if there were these local lines. The development of the Territory will, I think, depend principally on the export trade. If there were a system of railways running from the coast inland, with freezing works at the various ports, I think you would find it difficult to induce people to go to the Territory. The importance of the ports would depend on the amount of traffic for the trains. But, first of all, you have to get your people there. There are not the same inducements for people to go to the Territory as to other places in the Commonwealth. The great advantage, to my mind, of a trunk line over a system of lines from the coast is the closer communication with the other States it would give to the Territory, and this would tend to induce people to settle there. I think that at first the population to the Territory will come from the south, and not from immigration. I have not prepared a list of reasons for preferring a trunk line, but I have always held the opinion that a main trunk line is essential to the development of the country. I think that, by a system of water conservation, irrigation colonies might be formed in the northern portion of the Territory—that is when you have the labour to make the agricultural settlement. The idea is, I think, practicable. The trouble is, that the rainfall is only for three or four months in the year. Conservation dams could be made; but without the labour that would not be one of the best means of solving the question of settlement. With the necessary labour, it is practicable to store water and establish irrigation settlements, and by that means have closer settlement areas. Many of the rivers are perennial. I have, in a general way, followed the experiments that have been going on in regard to the cultivation of rice, cotton, and so forth. As to dairying areas, there is, of course, the tick trouble anywhere near Darwin. I suppose that the tick is possible of eradication.

84. *To the Chairman.*—It only adds about one-eighth to the cost of the sleepers to lay down a 3-ft. 6-in. gauge on sleepers for a 4-ft. 9-in. gauge, with a view to subsequent alteration, and I would not think it worth while to depart from the present plan. The bridges, I think, are to be built for the broader gauge, for which it is wiser to prepare.

85. *To Mr. Gregory.*—I do not think much has been lost in interest and so forth; but it is a matter of figures and probabilities. There is no danger of the long sleepers breaking if they are properly packed. The packing must be done under the rails, and that is a matter for the engineer. If the longer sleepers crack in the centre, that is a matter of seeing that the packing is properly done.

86. *To Mr. Fenton.*—I think it would be wise to proceed from Oodnadatta north, as well as from the north southwards.

Lawrence Allen Wells, Deputy Commissioner of Federal Taxation, South Australia, sworn and examined.

87. *To the Chairman.*—I have had some experience of the Northern Territory, having spent a good many years there. My first experience was on a survey of the border of Queensland and the Northern Territory from 1883 to 1886, and afterwards I was engaged in exploration work. My last long experience was in the Victoria River district, where I made a survey from 1905 to 1908. Altogether I have seen a great deal of the Territory. I am not in favour of continuing the line right down from Oodnadatta, because I do not think that is the best line, as a paying proposition. I favour parts of the line. The part now being investigated would, I think, form part of the main line down as far as Daly Waters or Newcastle Waters. I should think that the line from Katherine River to Bitter Springs would be continued now. I have no knowledge of the Territory about Bitter Springs, but I have been all about the Katherine. I do not think that the country below Katherine to Bitter Springs is any good. If it were attempted to travel fat stock through that country they would be found to get low in condition. There are not many cattle about that locality. I think that a railway would cause some development, provided there were meat works at Darwin. I think it would benefit the country from Newcastle Waters and south-east of that. I do not think the westerly deviation would be quite justified. I do not see any great benefit to be obtained, because the cattle there now could easily be taken into the Katherine, where they are taken now. They often have to go that way to get to the south, because the other way is not open except in good seasons. I know that part of the country well, as my survey went through it. There is only a small patch of good grazing country at Willeroo. If the railway took a swing over there, it would be only to the benefit of that part, and the benefit would not be much. It would be all right to go on to Bitter Springs. In the Territory the tropical rains are about Christmas, and last about two months, and the cattle build up quickly, but will not stand driving over that class of country. It is scrub country, with long grass that will not feed. There is no sheep country for 150 or 200 miles south of Darwin; but below that there are very good areas in the Ord River country, at Wavo Hill and Victoria River Downs, and Sturt's Creek, and there is a large patch of undeveloped country south-east of Wavo Hill. On the Fitzroy River country sheep stations have been running for years. On Ord River a small flock is kept, and they get the same prices for wool as if down south. From Camoowal to Anthony Lagoon is good sheep country. I do not think there is any possibility of closer settlement or small farming. There was an experiment in farming tried; but there was nothing in wheat, because they do not get the rain at the time it is wanted. The rain starts about Christmas, and is all over after the end of March. That applies down to Wavo Hill. There are white ants, and I brought away a piece of sheet lead in which they had eaten seven or eight holes in order to get at the wood, and they had also done destruction at the superintendent's quarters at the Cable Company's place. The house there is built on concrete blocks. I know that the white

ants will eat green paw-paw. It would be found in the morning that the white ants had made a start on the pack saddles; and they are said to have damaged a set of billiard balls at Port Darwin, after eating through the box—these were composition balls.

88. *To Senator Story.*—I have a knowledge of the Territory from Oodnadatta north, but not much beyond the Charlotte. I know all the western portion. About Musgrave there is sufficient country for a few holdings. About the Charlotte, and right up to Alice Springs, is good pastoral country, and it is all held now. Some of it is good sheep country. I think the line should be extended from the Katherine south, as part of the main line. The other line should be completed in some way or other; but I think it should go from Bitter Springs to Camoowal. There is good country all the way, and most of it is sheep country. The greatest population is on the east coast of Australia, and this would give direct communication. It would be a good scheme if a line were taken from Newcastle Waters west. That would avoid crossing any rivers or creeks, and it would tap all the sheep country; it would be just north of the desert. It would be of some advantage to the Tanami gold-field, and it would be a much shorter distance to Port McArthur than to Darwin. There would not be much chance of getting water between Newcastle Waters and that part, except by well sinking or boring. I favour the east route, because it would benefit the Barkly Tableland. I think that the westerly deviation would be too far away to benefit the Tanami gold-field, and that it would be costly, and subject to washaways and so forth. It is very rough country. When I said before the Commission that there were many miles of good country in the Victoria River district, I meant Wavo Hill and the northern half of the Victoria River Downs, and the belt of country lying south-east of Wavo Hill. The people occupying the land could send their stock to the Katherine; but there are no sheep yet, because there is no railway. I think a line should be surveyed running westward from Daly Waters or Newcastle Waters; it would be an easily-constructed line. When sheep get into the country I think the line will pay; but it will not pay only with cattle, because people would rather drive cattle than put them on the railway. The belt of tin country between the Katherine and Bitter Springs was discovered after I left there; but there is tin all through that country. I think that mineral development added to the pastoral traffic, will go considerably towards paying the cost of the railway—that the mineral development will mean much, particularly in the Macdonnell Ranges. I would continue the Oodnadatta railway to the Macdonnell Ranges, but I would eventually bear off to the east. I would continue the Oodnadatta line to the ranges, and then continue the line north. My only knowledge of minerals in the Macdonnell Ranges, or northern Australia is only from reading. As to the climate, my opinion is that a white man can work where a blackfellow can, if you pay him to do it. I do not say it is nice work. My experience is that I took five men there from Adelaide, and we worked the whole of the first summer. We had to climb mountains and clear large gum trees, and the men could there do as much work as any—as much or more than any coloured men. In

Darwin the climate is a bit different; but I think I could do as much work there as my black man. I think the climate is better down the north part it is very trying. I do not see why the men engaged on the Pine Creek to Katherine railway should not enjoy excellent health if they do not get too much drink.

89. To Senator Keating.—On the eastern side I do not think there are any agricultural possibilities. I would not speak in this connexion with any authority from Darwin as far as Pine Creek. As to agriculture or tropical products, I do not know much about it; but I know there is a lot of stony, rubbishy country, without any good soil. On to Bitter Springs I do not think there is any land in the locality which is capable of agricultural production. I have seen similar country, and it is no good. This line must depend virtually on stock and produce going in, and supplies coming out. They would have to freight the cattle, and they would prefer to travel the cattle if the country were good enough, but this country is not. I think the Barkly Tableland people would make use of the line to send cattle to Darwin. I do not think that the proposition to connect the tableland with Port McArthur is a good one at present; but when the country gets covered with sheep it would pay to have the line. There is no immediate necessity of that, and I do not think the line is necessary. The line connecting with the west would be part of the scheme; but that is an ultimate, rather than an immediate, proposition. I think that line to the west should be made, as well as the line connecting Bitter Springs with Darwin. The Katherine to Bitter Springs railway is the most important and urgent.

90. To Mr. Ferguson.—The line should be extended to Newcastle Waters. In doing a survey, I would not say whether it has proved generally along the line, but I think it would be best; that is a matter for inquiry. If the cost is not too much, it would be profitable to have an easterly deviation, in view of the fact that the line would touch the mineral field, the good pastoral country at the head of the River, and generally would carry all the way south. That cost could be reduced by keeping close to the head waters of the Homer River, in making the line from Darwin go through Barkly Tablelands to Cameroon, I would suggest that the deviation should be about Newcastle Waters, which, I think, ought to be about the central pivot or point with railways running north-south and east-west. My objection to the westerly deviation is largely because it is difficult country from the Katherine to Willeroo; and, secondly, I do not think that railway would be used at all, because the country is suitable for travelling stock. The pastoral country between Bitter Springs and Newcastle Waters is only fair. In any case, I think that the line from Katherine River to Bitter Springs ought to be gone on with, if the pastoral industry is to do anything in the Territory for many years to come.

91. To Mr. Sampson.—I think that the swing over towards the Barkly Tableland should be at Port Newcastle Waters. The construction at that point would depend on the immediate gathering ground. I think that the bulk, or, at all events, half of the traffic to be served would be

to the westward, and would be utilized for sheep. It would be advisable to construct the line to the route to return the most traffic up to the Newcastle Waters point. Presuming that the engineering difficulties are not too great, and I could swing would secure the most traffic, and I could think that, by running the line through the Victoria Downs country you would increase the traffic, and the engineering difficulties are too great for running the line through that country. I base my objection on the fact that that from Victoria Downs will be driven, and that you will lose the traffic of the Barkly Tablelands. Whether the westerly deviation or the easterly one be taken the line has to go to Newcastle Waters, and from that point it could be taken conveniently through the Barkly Tablelands. Wherever you put the line the same number of cattle or sheep will use it, but the westerly deviation will be the more costly. I base my objection on both the engineering and cattle difficulties. The cattle on the Victoria River are improving every year; in 1905 there were 10,000, and last year I am informed there were 17,000 head of calves branded.

92. To Mr. Gregory.—I spoke of the railway running to the Western Australian boundary, and I should say that the average carrying capacity for sheep on the best country with fences and wells would be about fifty sheep to the square mile. I do not think that, in any case, the railway will pay immediately. I should say that when the Barkly Tablelands will improve yearly. As to developing Victoria Downs from the nearest port, you could not run a railway from Wyndham City to the creeks and rivers. I think the country there is all the same, and a great deal worse than between Katherine and Willeroo. The floods there on those rivers. I think the line in the westerly direction would carry some millions of sheep, and the line might pay expenses in years to come. I think there are great possibilities for conserving water for irrigation purposes on the Victoria and Wickham Rivers, and I think that white labour could be successfully utilized for that. There are deep ravines and other facilities for conserving water—the Wickham River in particular—with rich basalt downs in the vicinity. I have not heard of any success in closer settlement near Darwin. There is good country at the Katherine Falls, Flora River, and the cotton I saw there looked well. I think that in the Wickham River country you could irrigate large areas, and there is no reason why there should not be irrigation colonies as along the Murray. As to irrigation along the Katherine and the Daly, you must remember that a tremendous amount of water is required for this purpose. I think that irrigation is possible, as I pointed out in one of my reports. At Kathleen Falls an enormous amount of water passes over whether the season be good or bad. Closer settlement, on a large scale, depends on what is grown and the markets. I think the dairying industry could be established, and should do well. It is a favorable climate for dairy cattle. I would not like to say that it is good for cattle within 200 miles of the north coast, and it would be necessary to clear that country. I cannot speak as to the cultivation of sugar, but I think the land is rich enough for anything on the Victoria River.

93. To Mr. Fenton.—I agree with the statement that there are about 10,000 miles suitable for

production if there is a railway, and the railway I favour would tap good country. I do not think you will ever get the railway to the Longreach in the Victoria River.

94. To Senator Keating.—As to report of Mr. Combes on water conservation I do not think that he went to the Victoria River. There is a big fall from the Wickham down to the Victoria River, and water could be conserved and carried on to good land. You want hilly country for water conservation and irrigation, and I think this would be good holding ground.

95. To Mr. Sampson.—I do not think there are sufficient lagoons adjacent to the rivers which might be used for water conservation.

With the consent of the Committee the following additions are made to Mr. Will's evidence.— Commonwealth of Australia, Deputy Commissioner of Federal Taxation, Adelaide, 9th February, 1916. To the Secretary, Parliamentary Standing Committee on Public Works, 120 King-street, Melbourne.

Dear Sir, Whilst tendering my evidence before the Commission in connexion with railway development in the Northern Territory, I was invited to state the numbers of stock from which produce would be derived for feeding a line if completed from Port Darwin to Newcastle Waters.

As I am familiar with the lands lying to the westward of the proposed line, and am content to express an opinion as to the development which should take place provided a line of railway is also constructed from the proposed terminus in the vicinity of Newcastle Waters to the Western Australian border to enable stocking those lands, as mentioned in my evidence, with sheep. Provided meat works are also constructed at Port Darwin, and a line is not made from Port Darwin to Port McArthur, I am of the opinion it would be safe to estimate that, when properly developed, the western lands, which include a portion of Old River in Western Australia, would carry two million sheep and two hundred thousand head of cattle, the produce of which, together with the traffic necessary in consequence of station supplies and material for development, would be a source of revenue for the railway lines proposed.

Unless the western line is constructed I believe nothing would be delivered at Newcastle Waters, as the lands mentioned would not be occupied by sheep, and a belt of inferior scrubby lands lying immediately to the west of the overhead telegraph line would debar settlers from delivering cattle also. In any case, the Victorian River Downs cattle would be droved to the Katherine. If a line of railway is constructed from near Newcastle Waters to Port McArthur, and meat works are also constructed at that port, the produce from the western sources would find its way there as such port would be the natural outlet for that district as well as the Barkly Tablelands.

What I alluded to was suggested "Western Swing" and "Willeroo." I should have also stated that such a line would, in my opinion, benefit "Willeroo" only, as that property is but a small isolated patch of fair land down country surrounded by inferior to very poor rough and scrubby lands. Delamere, the next run beyond "Willeroo" in the direction of Victoria River Downs, is a very poor property and of little value for depasturing cattle, and no good for sheep.

As I understand the Commission do not require a report as to the carrying capacities of the Barkly Tablelands, and as I am not familiar with the country immediately in the neighbourhood of Newcastle Waters and east thereof, I do not feel at liberty to give an estimate of the stock likely to provide produce for feeding such line, if constructed, from that locality. If the lands near Darwin was not now in existence I would favour a line direct from Port McArthur to the Western Australian border, near Stuart's Creek, and a station on the Barkly Tablelands. Such lines would be much cheaper, and would serve all the pastoral lands of note, except Macdonnell Ranges. Even now it might be worth considering this, and allow the Darwin line to end at Katherine for the present. A line from the Western Australian border to Port McArthur would be about 50 miles in length, and the engineering difficulties from the border to Newcastle Waters.

A line from Katherine to any part of the Victoria River would present enormous difficulties in construction and maintenance if attempted in a direct course. Herewith I forward copies of former reports which may be of some value to the Commission.

Yours faithfully, L. A. WATTS, Deputy Commissioner of Federal Taxation.

20th May, 1913. A. B. Moncrieff, Esq., Commissioner for Railways, Adelaide.

Dear Sir, In response to your request, I have much pleasure in supplying you with any information at my disposal in reference to the development of the Northern Territory and other lands by the construction of railways. Some few years ago, and before it had been definitely decided to extend the "Ouboulatia" line in a northerly direction to eventually connect with Pine Creek, it was considered necessary to give the extent of population direct communication with Port Darwin, and that a line from Hergott Springs, either rid a point east of Bimbawah or via Innesmucka, to connect with the above-mentioned proposed route at Cloncurry or thereabouts would open up a larger extent of fine pastoral lands suitable for sheep and cattle raising. From Hergott Springs to the Queensland border the country may be described as from fair to good pastoral lands, equal to carrying from twenty to fifty sheep per square mile, and from these territories to Cloncurry it would average about ten head of cattle or fifty sheep per square mile.

All the south-western portion of Queensland is from fair to very good pastoral land, capable of carrying several million sheep, from which a railway would reap a benefit.

Herewith is a copy of my report to the Royal Commission appointed to inquire into and report on proposed railways and factors in the Northern Territory. As far as is brief, I am unable to enter into much detail on the subject, but I hope the information as contained herein may be of some service to you.

Yours faithfully, L. A. WATTS, Deputy Federal Commissioner of Land Tax.

[Extract from letter received from Mr. R. Townshend, General Manager of Victoria River Downs, Northern Territory, dated 7th June, 1913.]

A survey party is to be out here shortly to continue your trigonometrical work from Hawk Knob east to Newcastle. No doubts you have seen they in Adelaide. The Government are spending money in the Northern Territory on official salaries, but nothing very good to the country, except the survey to the Katherine. So far the Demonstration Farms are only a sink hole for money, even if tropical produce grows well, labour will kill it, as it is too expensive and unprofitable.

I saw in the papers your evidence before the Railways Commissioners, and quite agree with the development purposes both the district and the tablelands would carry millions of sheep with a railway to them.

As I am not in loco with Bitter Springs as a Capital Site for a long time to come, money would be better spent in other work.

William George Toop Goodman, Chief Engineer and General Manager for the Tramways Trust, Adelaide, sworn and examined.

96. To the Chairman.—The Tramway Trust have constructed 100 miles of tramway in Adelaide, and we have used wooden jarral sleepers throughout the construction until the last two years. We found that jarral resists the ravages of the white ants very well, and in very few instances have we had to renew them. But the price of jarral sleepers has been steadily increasing. When we first started we paid 3s. 11d. each, while the last lot we obtained cost 4s. 7d. for 7 ft. 0 in. x 9 in. x 4 1/2 in., and this difference means £70 per mile, which, of course, is a very serious item when there are many miles. Two years ago a

proposition was submitted to us by Mr. Joseph Timms to use his patent reinforced concrete sleepers. We went very thoroughly into the matter, and laid several miles of track with them. These sleepers cost much more than the jarral sleepers, but owing to their size and bulk, instead of laying them 2 ft. 6 in. apart, as with the jarral sleepers, they put them 3 ft. 3 in. apart. This reduced the number per mile from 2,100 to 1,600. We have laid altogether 6,984 concrete sleepers, and these have been on the track, in some cases, nearly two years. On one route the cars have passed over the track 64,000 times, on another route 77,000 times, and on a third about 18,000 times since the sleepers were laid, and we have had no trouble whatever with them. On no occasion have we had to open up the road and look at the sleepers as we deal with loose koya. The road has been quite rigid, and the maintenance cost is less than with wooden sleepers. We find the concrete sleepers more rigid than wooden sleepers, and another feature speaking, as compared with the more or less defective life of the wooden sleepers. This, of course, is a matter of great importance in railway and tramway construction, though I speak only from a tramway point of view. I may say that there has been a small portion of the railway track in the South Australia laid with concrete sleepers, and also on one of the suburban lines in New South Wales, and I think they have turned out very satisfactory. I shall be glad, if the Committee desire, to open up the track and expose some of the sleepers which have been down two years under the traffic I have mentioned. The concrete sleepers cost about £90 or £100 per mile extra, even allowing for the extra spacing. The cost of the concrete sleeper is about 10s. 6d., and of the wooden sleeper about 8s. 6d., and of course, including adzing and so forth. As to handling, the concrete sleeper weighs on the average 3 cwt., and the jarral sleeper 1 cwt. 1 gr. 2 lbs., and both are the same length, namely, 7 ft. 9 in. The concrete sleeper, however, is 6 inches deep while the jarral is 4½. If I should recommend concrete sleepers, our gauge is 4 ft. 8½ in., and the maintenance cost with concrete is much lower than with wooden sleepers. I have had no personal experience of concrete sleepers on railway work, and I should like to experiment before expressing an opinion, because railway construction is very different from tramway construction, so different that you really cannot make a comparison. The maximum load we can travel at such high rates of speed as on the hour, while on a railway it may be 58 miles an hour, while on the concrete sleepers, but we have arranged with Mr. Timms to take over the plant in order to do so. I do not anticipate, however, that the sleepers will prove much cheaper.

97. *To Senator Story.*—The making of the concrete sleeper is a simple process. Very fine concrete has to be puddled into boxes, and the great thing is to make sure that it is properly puddled without any blow-holes. There would be no difficulty in manufacturing such sleepers in the Northern Territory, provided the material were hard. The labour is unskilled, and all you require is cement, gravel, sand, and the reinforcement wires.

98. *To Mr. Fenton.*—In the case of the concrete sleeper the chair is embedded in the concrete, and attached to the reinforcement, and forms part of the structure. The rail has to sit on the chair, and it is rigid by cast bolts. In railway work the rails would be all exposed to the weather, whereas in the case of tramways they are not. In no case have we found those fastenings work loose. They are long and tapering wedges.

99. *To Mr. Gregory.*—That is the only danger I would fear as an engineer, and it is a matter of trial.

100. *To the Chairman.*—The maintenance men would see that the wedges were kept right.

101. *To Mr. Fenton.*—I should say that the rigidity would make a difference in the resilience. A certain amount of resilience is necessary for comfortable travelling.

102. *To Senator Keating.*—Resilience is more necessary on railways than on tramways, because of the higher speeds and longer and heavier is my opinion. I do not see why concrete sleepers for railway purposes would minimize the resilience beyond what is really safe; of course, I am speaking without actual experience, but that is my opinion. I do not see why concrete sleepers should not be made on the spot in the Northern Territory. It is one of the advantages of the concrete sleeper that, with a good supply of gravel and sand, all you have to obtain from elsewhere is the reinforcing material, chairs, and so forth. It is a practical proposition.

103. *To Mr. Finlayson.*—We give them an average of 20 days to dry, and this should not be reduced in a dry climate. It is a decided advantage not to allow them to dry too quickly. I should strongly recommend that a trial be given of these sleepers, because the question of the wood supply is a very serious one. In a country infested with white ants you want something to resist the pest. No timber is ant-proof, but jarral is the best of the lot.

(Taken at Adelaide.)

FRIDAY, 4TH FEBRUARY, 1916.

Present:

Mr. RILEY, Chairman;
 Senator Keating, Mr. Gregory,
 Senator Story, Mr. Samson,
 Mr. Fenton, Mr. Laird Smith,
 Mr. Finlayson.

Henry Yorke Lyell Brown, sworn and examined.

104. *To the Chairman.*—I am out of business now, having resigned about four years ago from the position of Government geologist, which I had up to the Territory on five or six occasions, and have spent a good deal of time there. I think there are great possibilities in mining, particularly gold, though there are other minerals like lead, copper, and tin. Gold, however, is the chief thing. As yet they have not been deeper, speaking generally, than 200 feet, and I think they are about to go deeper. The most important places from a mining point of view are Pine Creek and Union. There are several other gold-bearing districts, but these are the principal. I have been through that part of the country where it is proposed to build this railway extension, but there are no mining possibilities just there,

Primary rock is favorable to minerals, and this is mostly flat tableland. The nearest mining country is about 15 miles after you leave the Katherine, at Maudslayi Creek; after that it is all plains and tableland. I do not think that the section of railway now before the Committee would do much in the way of mining. I have a knowledge of the mining, but the Murrumbidgee field is a discovery since my time. I think that the route along the telegraph line, in a general direction, would best develop the mining industry of the Territory. A main trunk line would be the best, and the shorter it is the better. The section now proposed will form part of the lead to stations further south, but only second-class, and sheep do not do in that part.

105. *To Senator Story.*—In my opinion the mineral resources of the Territory are well worth developing. I think that mining, together with the pastoral industry, when you get further south, will prove the main sources of revenue. The pastoral industry is not much good in the tropics, and so forth. I do not think that the deviation to the west would go far enough. So far as I know there is no mineral country there, but it is good soil on basalt plain. A line running due west would tap the Wavo Hill station.

106. *To the Chairman.*—The tin-field does not go very far, and is very patchy. In my opinion no minerals will be found immediately south of the Murrumbidgee. I have here a geological map which I prepared and which may be of some use to the Committee.

107. *To Senator Story.*—No valuable minerals have been found near Tennant's Creek, but there are indications of minerals. There are great lodes of very good iron ore there. After that we do not get any minerals until we reach the Macdonnell Ranges. There is nothing very important in regard to minerals at Macdonnell Ranges so far as has been found, but there are a good many gold claims worked there. They fossick about and sink a few feet, but they do not continue, owing to the want of capital. I have reported several times on this mineral country; and as to the possibility of large reefs or lodes being developed, that is a matter of further prospecting. The indications are all right—quartz reefs, and so forth—and they have had 4 or 5 ozs. to the ton. All the working is by private parties. It is very expensive working on account of the cost of stores. They get their stores from Oodnadatta, and it is very costly, and prevents economical prospecting. It is first-class country generally in the Macdonnell Ranges; splendid grass country, and, I think, fit for agriculture. It is fairly well watered, and in the Springs there is abundance at 50 feet, while in the rainy season the creeks are running. It would be possible to conserve water for irrigation, and I should say the country would be suitable for dairying, though it is very good for sheep up to now. The climate is not very hot in the day and cold at night. For three or four months in the year you get ice nearly every night. Alice Springs is about 1,800 feet above sea-level, and there are hills 2,000 to 3,000 feet above. The country south of the Macdonnell Ranges is mostly pastoral, and there are stations there, but I do not know of any sheep. I think that the continuation of the line north from Oodnadatta would be beneficial in

the way of opening up that country, and would have a good effect in reducing the deficit on the line running to Oodnadatta. White men do not work very hard in the Northern Territory, and I do not think they can keep their health. The mosquitoes are so bad that north of the Katherine you have to get into a net, and the mosquito itself is bad enough. I would place the mosquito country north of Ditter Springs, south of which there is a better climate and fewer mosquitoes. The men, after working all day, have to creep into a mosquito net at night, and do not get any sleep until very late, and are not fit next day. Men engaged on the railway work may be all right for a time. The first time I was there for eight months I had no fever, but the next time I was down for a month. The next time when one gets the first time one can stand it, but not as well subsequently. I do not favour the development of the country by short railways running into various parts, as, for instance, Port MacArthur and Wynndrum; a main trunk line is the best, though these short lines would be very useful to the stations. I do not think the Northern Territory will ever be properly developed until we get a main line through from south to north. Such a line will make a tremendous difference in the way of opening the country. At present the journey is such a long way round that few people will go.

108. *To Senator Keating.*—The geological map of which I spoke was prepared in 1898, and does not show the Murrumbidgee tin-field. No systematic and complete geological survey in the Northern Territory has been made for the Government of South Australia, though I made several trips there for special purposes, and to see different parts. On one trip I examined the coast as far as the MacArthur River; that was since the map was published. I have also made a trip to the west. It would not be fair to say that the Territory to regard this map as the result of a systematic survey; it is only the first map, and subject to considerable modifications, though, in a general way, it is all right. Mine have been geological reconnaissance, made as discoveries were reported; nothing anterior to discoveries. The only thing that has been done in the way of systematic prospecting is boring for coal and gold under Government supervision within the last ten years. I recommended Port Keats for boring for coal. The longest time I was in the Territory was about eight months, in connexion with prospecting and discoveries. I went to Darwin and Tanami. When I speak of the Territory as offering possibilities for successful mining enterprise I give an impression consequent on my several visits. As to which railway route would best serve the mineral interests of the country from Pine Creek southwards, I should say the first mineral-bearing country is due south, and down the telegraph line, which, I think, should be followed. To the west there is some very good agricultural country towards Wavo Hill. It is not far from the Katherine, and it extends into Western Australia. There is not such good country on the eastern side.

109. *To Mr. Gregory.*—There is no inter geological map than the one I have here, but there are several reports on various districts, and I believe, in Melbourne. The mineral belt I spoke of is south of Powell Creek; there is only a little gold found there. I do not know how far the area extends north and south. The little gold found is the only indication, but it is a likely mineral country, though I have no idea of an auriferous area. In the north there is not a very

people employed. The universal opinion is that the Commonwealth will honour the agreement made.

119. *To Mr. Gregory.*—Without going over the country I could not give an opinion as to whether it would be profitable to build a railway representing £100,000 in interest, unless there was a reasonable amount of population, but the country is at present useless without the railway. Whether such a railway as I recommend would be profitable without a much larger population in the Territory is a peculiar one; but we have to do something with the Territory, which, without a railway, can never be developed. I should say that, eventually, the line will pay, and much sooner than with the east-west railway. Without a railway there will be no population. It is possible that some big mining development may attract population; otherwise I do not see what is to bring it. There can be no closer settlement in the growing of cotton, rice, and similar products with white labour, and I do not see why these should not be grown with coloured labour; tropical products can be grown only with coloured labour. I have always objected to the leasehold principle. I do not think the clearing and developing of the land would cost much with coloured labour, and without such labour I do not see that there are any possibilities in the tropical portions of the Territory. To settle the Territory you would want an immense population if trouble came, and without a railway I do not see how we are going to defend it. I have heard that there is a large area of country that will grow tropical produce within a reasonable distance of Darwin. I do not think that sugar could ever be grown in the Northern Territory, owing to the want of rainfall. Cotton, rice, and so forth grow remarkably well, but wheat growing is impossible. I do not think that the country has ever been prospected for minerals to any extent—not 20 miles on either side of the line. There are large belts of auriferous country north of the Katherine, but I am doubtful whether they have been sufficiently proved. I have been at Kalbarrie, and I do not look on the Territory, from a mining point of view, as country as good as Western Australia, but the places has never been prospected any distance from a railway line. I do not think there is any possibility of coal. There are areas of tin within 4 or 5 miles of the line. There is an amount of tin-bearing country—there are two or three districts I could mention—and I have seen specimens better than from any other place. In order to develop these propositions the Government would have to subsidize them. It would be as well to have these holders of large areas with money, so long as they complied with certain conditions—if there were those conditions. But I think that ten different persons, owning 1,000 square miles each, would prove a greater source of revenue than one person owning 10,000 square miles. The land was taken up without classification or survey, and those who took it up picked the eyes out of the country. Mr. W. H. Stevens, the manager of several stations, has said that the Victoria River country compares favorably with any in Australia.

120. *To Senator Krating.*—As to the cultivation of tropical products, I know there have been some big failures in sugar growing, but most of it has been experimental. I have seen tropical products growing very well in the botanical gardens. There are some opinions expressed by Mr. Combes. I honestly think that there are better countries than the Northern Territory for tropical agriculture, and that is because of the soil.

Another cause is the heavy downfall of rain for a few months, followed by too long a spell of dry weather. Sugar, when it is coming to maturity, wants rain, of which it does not get sufficient. If the pastoral industry is to be the main thing we cannot look for an extensive population, but mining may cause an increase, and the agricultural question will settle itself automatically. That, I think, will be the evolution of the Territory—pastoral industry first, followed possibly by mining development, and agricultural settlement afterwards. I hold that view irrespective of the question of the use or non-use of coloured labour: The difficulties presented in the way of obtaining a reasonably dense population would be equally the difficulties of any other Power. There are, however, people in some parts of the East so densely packed that they would be glad to take any country. I should hardly like to express an opinion as to whether the fact of our not settling the Territory with a fairly dense population would not afford an opening for some other Power to settle it with a population fairly dense. Any extensive coloured settlement from the East would be a great and serious trouble, but I do not think there is any great danger of it.

121. *To Mr. Fenton.*—I think one of the best possible things would be a line mineral discovery, especially of gold. Gold discoveries have been reported towards the west, but nothing of any value. I have always heard of the western side of the railway as being very much more barren than the eastern side, but I know nothing of the mineral prospects. A lot of money has been made out of the buffalo hide trade, but the animals do not increase very fast. They are hunted at Port Essington principally, and would not contribute to the traffic of the railway to any extent. I would not like to express an opinion whether it would pay to keep herds of buffaloes. Goats thrive very well in Darwin. I do not think that the Territory from a mineral point of view has been tested as it should have been, and the expenditure of a considerable sum of money in this direction would be advisable, as it is the only way in which the country can be proved. There have been considerable alluvial deposits there, and workings. The contention of mining men that where you find alluvial it must be shed from reefs somewhere near has, I think, been burst up in many instances. There has been no real development to any extent in the Territory. I saw the other day that a bore had been sunk several hundred feet and had got 3-oz. stone.

(Taken at Melbourne.)

MONDAY, 7th FEBRUARY, 1916.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Storey,	Mr. Sanson,
Mr. Fenton,	Mr. Laird Smith.

Norris Garrett Bell, Engineer-in-Chief and Acting Commissioner, Commonwealth Railways, recalled and further examined.

122. *To the Chairman.*—I do not know of beds of gravel or sand suitable for the making of concrete for sleepers along the route of the proposed extension to Bitter Springs, but we have had some

difficulty in getting this material along the route from Pine Creek and the Katherine. The officer who surveyed this route is in Melbourne, and he has been told that there is sand and gravel along the existing line, but I do not know personally where this material can be obtained. As to the use of concrete sleepers for railway construction, experiments have been made during a number of years in Russia, Italy, the Argentine, and other countries, and many designs have been tried, but according to the information with which I have been supplied, concrete sleepers have not proved a success.

123. *To Senator Storey.*—The concrete sleepers are reinforced. I read recently in an American journal that so far no efficient concrete sleeper has been designed.

124. *To the Chairman.*—I have seen the Timms patent, and have had letters from Mr. Timms, so that I am acquainted with his design. A recent work on permanent-way construction contains photographs of concrete sleepers taken out of a road in America after they had been for some time in use, and a statement appears in it of the number of sleepers experimented with, and the results of the experiments. The sleepers referred to did not prove a success, and were broken by the load that they had to carry. We have not gone further than the Katherine in the construction of earthworks along the route of the Northern Territory railway, and work has been delayed because most of the men who were engaged in it have been called upon to repair damages caused by floods. It will be a few weeks before constructional work can be resumed. We are not expected to finish the line as far as the Katherine, but have none for any construction beyond that point. At present it takes time to obtain rails. Steel sleepers cannot be obtained at reasonable prices; indeed, I doubt if they can be got at all. Rails cannot be imported just now. They cost about £10 10s. a ton in the Old Country, with another £5 a ton for freight, and sea carriage is very uncertain. I am willing to experiment with concrete sleepers, though I have already tried them. I have not experimented with Mr. Timms' design. The concrete sleepers that I have used were designed to take bolts right through them. The Timms fastening is a better one, and allows the rails to rest on the sleepers. No doubt a concrete sleeper could be designed which would suit both the 3-ft. 6-in. and the 4-ft. 8½-in. gauge. The use of concrete for sleepers is not a new idea; it is one on which experiments have been made for many years. The first cost of concrete sleepers would be greater than that of wooden sleepers, but were they otherwise designed which might be longer life. Concrete sleepers are costly to make and expensive to carry, and, of course, increase the difficulties of maintenance, because they are so heavy. There are 392 men working on the line to the Katherine, and they will be available for the extension to Bitter Springs if the construction of that extension is not delayed too long.

125. *To Mr. Gregory.*—The railway is being made with earthworks and bridges suitable for the 4-ft. 8½-in. gauge. That is being done in compliance with the Act. Moreover, sleepers to carry rails laid on the 4-ft. 8½-in. gauge are being used. It is estimated in Western Australia that a jarrah sleeper there lasts about fifteen years. If the 3-ft. 6-in. gauge is to be used on the proposed extension for 10, 12, or 15 years, it would be cheaper to lay down in the first instance a 7-ft. sleeper in F.19003.—1)

stead of an 8-ft. 6-in. sleeper. The traffic that is to be expected does not warrant expensive construction, the justification for the 4-ft. 8½-in. gauge being the connection with the southern lines. In my opinion, it is a mistake to use rails of less than 60 lbs. in weight. In Queensland, on several occasions, they have used a lighter rail, but they have recently reverted to one which is an old determination not to use any rail lighter than 60 lbs. Such a rail allows the use of heavy engines and large train loads. The revenue from the Northern Territory railway has largely increased during the past few months, an increase due greatly to the traffic caused by the extensions southwards; but we expect considerable cattle traffic when the next yards at Darwin start. The extension of the line to Bitter Springs and the opening of the most works at Darwin should increase the traffic on the line, which I think will then pay working expenses, though not interest on construction. As to the use of sleepers suitable for rails laid on the 3-ft. 6-in. gauge, the Crown Solicitor recently gave the photographs of concrete sleepers taken out of a road in America after they had been for some time in use, and a statement appears in it of the number of sleepers experimented with, and the results of the experiments. The Timms fastening is a better one, and allows the rails to rest on the sleepers. No doubt a concrete sleeper could be designed which would suit both the 3-ft. 6-in. and the 4-ft. 8½-in. gauge. The use of concrete for sleepers is not a new idea; it is one on which experiments have been made for many years. The first cost of concrete sleepers would be greater than that of wooden sleepers, but were they otherwise designed which might be longer life. Concrete sleepers are costly to make and expensive to carry, and, of course, increase the difficulties of maintenance, because they are so heavy. There are 392 men working on the line to the Katherine, and they will be available for the extension to Bitter Springs if the construction of that extension is not delayed too long.

126. *To Mr. Laird Smith.*—The objections to the use of concrete sleepers are these: They sleepers are costly to make and to handle, and are difficult to deal with when in a road. Under heavy traffic they are said to shake to pieces. In big centres, where there are plenty of maintenance men available, the weight of the sleepers is not of much consequence, but it is a serious matter in places where there are only four or five men for the maintenance of perhaps 20 miles of road. It is not clear to me that a saving of ballast can be effected by using concrete sleepers. Ballast is used below sleepers to distribute over the formation the weight of the train, while top ballast is

driving is bad, especially from there to Pine Creek, and there is no doubt that the cattle sent to the freezing works in the north would have to be trucked. In the wet season the country would be too boggy, and in the dry season there is no nourishment, and the cattle would not be fit for killing. As to whether a large quantity of the rolling-stock would have to lie idle at times, or whether there would be a continuous supply of wagons, is a point on which I should not like to express an opinion. I do not think, however, that the supply of cattle would be continuous at the rail head. There would be, say, only six months in the year when cattle would be supplied at the rail head. They do not fatten all the year round. I should say there would be a supply of cattle for the freezers for six months.

137. *To Senator Lynch.*—I favour either the eastern swing or the middle route. On the western swing there is a large area of settlement whereas there is only a small one on the eastern swing, but I suggest the eastern because there is good country that might be taken up. It has not been taken up by now owing to want of water, and people are just realizing the fact that there is water. For years on the Barkly Tablelands there was no stock, and they are just now finding out that a good sub-arctic supply can be got at 300 or 400 feet. I favour the eastern swing on the prospect of water on Barkly Tablelands, and the fact that the country south will eventually be taken up. The country on the western side is taken up by only two or three pastoralists. Bovril Australian Estates Company has, speaking from memory, about 18,000 square miles, and then we have Wave Hill, Gordon Downs, Willeroo, Delamere, and two or three smaller holdings on the borders of Western Australia which really belong to Vestey Brothers. What I mean is that the whole of the land I have mentioned, from Wave Hill inclusive, has been purchased or leased by Vestey Brothers. Then there is Bradshaw's run which has very little cattle on it. In all this territory in the neighbourhood of the western swing the outlet is Wyndham, the natural port, and they could drive the cattle there for most of the year, because the country is the better for driving. I favour the eastern swing because it will eventually serve a much larger area of settlement. As to the size of holdings which would be reasonable I should say about 500 square miles, whereas, as I have said, there is one 12,000 square miles. I have had no experience of white labour in Queensland, and I do not know of men having worked there continuously in the open for a number of years. I can only speak from my own experience, and I know that white men do not do the same work as in the more temperate parts of the Commonwealth. I think that if the development of the top end of the Territory is to take place by means of tropical agriculture there will have to be cheap labour of some kind, or otherwise. If we have to compete with Java, or any other country, we must have some kind of cheap labour. They could find machinery to do the work well and good, but failing that we must have cheap labour. I am speaking purely from an economic point of view. I am a lover of the idea of a white Australia, and was enthusiastic on the subject myself when I went to the Northern Territory, but my four years' experience there convinced me that, under present conditions, another view must be taken. Of course, whether in general terms to come a different acclimatized race of white people spring up, is another matter. I think there would be much better hope from the

importation of some of the southern European races. There are some Maltese there now on the railway, and they are shinning remarkably well. The Territory is in about the same latitude as Mexico, but, in the latter country, there is a mixed race. Another point is that there is trouble to get white women to go to the Territory; and no country can be a white man's country without white women. I think I shall be borne out by any body who has lived in the Territory when I say that white women cannot live there if they have to do their own housework, and that sort of thing. We hear of women who have resided there and have done well in the past, but they had their Chinese cooks and servants, which help cannot be obtained now. I tried to get a Chinese cook for my own wife, and £10 a month was the lowest wage.

138. *To Mr. Fenton.*—The part of the country to which I am referring may be taken as north of the 17th parallel, or you could probably go further north and draw a line from the bottom of the Gulf of Carpentaria. The climate gets better as one goes inland; the coastal country is the worst. There may be fine men at Port McArthur or at Darwin—there are exceptions to every rule. I do not say that I have a preference for it, but I should not favour the eastern route at all. If it were a question of the two swings I should favour the eastern, but I think it possible that a route could be got through the middle which would be as beneficial, perhaps, as the eastern swing. Above the tablelands we are going to get development on the Roper River, and so on. I have not heard through the Marranboy tin-fields. I am not a mining man, but according to geologists and mining people, it is going to be a great place. I know of no one who has reported on the eastern swing, but I suppose the Engineer in Chief has done so. I have made no report on any railway route.

Victor Albert Williams, Surveyor, Commonwealth Railways, sworn and examined.

139. *To the Chairman.*—I have been in the Northern Territory engaged on railway location and survey work. During the last two years I have been travelling backwards and forwards over the route of the proposed extension making surveys. Our instructions were to proceed to Bitter Springs, where I understand, the Administrator proposed to build a township. The Government Experimental Farm is at Bitter Springs, and I understand that that is the reason this point was made for, with a view to a township in the future. We had no discretion whatever on this point; we received our instructions to survey to that place and did so. The country along the route of survey is very poor indeed, with no pastoral settlement. There is the Government farm of which I spoke, and I understand there are there about 2,000 sheep, 60 or 80 cattle, and probably 30 or 40 horses. The railway will terminate at a point about 1½ miles west of Bitter Springs. There is no permanent water on the route; but at King River I think that, by boring, you would strike a very decent supply. That river is about 25½ miles from the Katherine on the survey route. That is the only stream that will have to be bridged over—the only bridge of any size; of course, there are some small culverts, and so forth. It will be very hard to conserve water on the route, but on the upper Katherine it is possible. I am doubtful whether the country is high enough to gravitate water. The Katherine is 350 feet above sea level, and Bitter Springs is

just 450. As to concrete work there is a limited supply of sharp sand in the bed of the Roper creek. There are numerous ironstone ridges running into the Roper, and I think there would be a fair supply of ironstone gravel to be got. There would, however, have to be investigation as to the thickness of the seams, and so forth. I believe that you will be able to locate gravel beds for the purpose of manufacturing concrete sleepers. These tests in the way of trial shafts we have not made on the concrete, however, beyond small cuttings. The earthenways, however, are very small on this section of the line. The white ants were a great trouble to us, and I lost a number of field books. They crawled up the legs of the table and ate right through the books, and we lost a quantity of clothing, boots, and so on. In my opinion, it would be unprofitable to use any timber work on this section of the line. Steel or concrete sleepers will be necessary, unless you can preserve or protect the wood, and I know of no way of doing that. As to mineral development there is the Marranboy tin-field, but, so far, there are surface indications only, with very little developmental work. I understand that a geological report by Dr. Jensen and others. This railway would cheapen the cost of material at Marranboy so that the line will run within a little over 12 miles of the field. I made a trial survey over to Marranboy, and they have the full particulars in the Commonwealth office.

140. *To Mr. Sampson.*—We have proposed no other route except the one we surveyed. From the Katherine to Newcastle Waters the country to the west is very dry—a waterless area. That is the route along the centre. I have explored the country for about 10 or 12 miles from the line, and to the westward it seems to confine dry—poor, miserable, sand country. I know nothing of the Victoria River district. I know the country on the western side is very low and swampy, and subject to inundations from the overflow of the Katherine; that is why we kept slightly to the east. We did not follow the telegraph line, but we were not far from it, crossing it once. There is a small cattle run extending from the Katherine to King River, about 26½ miles, containing some 1,000 head. These could easily be trucked from the Katherine. There is no more cattle raising until we reach Bitter Springs. They come from the stations lower down the Roper—Elsie station. I was there during the muster, and from the report there appeared to be, roughly, 4,000 head. Then, lower down the Roper—about 80 or 100 miles—here is the Hodgson Downs station, where, I understand, they muster over 7,000. They drive their cattle up to Darwin via the Katherine. I have not heard of them shipping them from the Roper. South of the Roper I travelled to just about Daly Waters. The country appears to improve towards the Barkly Tablelands. The general country is smaller, and our horses did better on it than on the grass further back towards the Katherine. A fair number of stock runs on the country further south. Our instructions were to take the best route from the Katherine to Bitter Springs, and to keep as direct a line as possible, avoiding, of course, all engineering difficulties. If there was an extension of the line to the mine would gather very little traffic it would be necessary to carry the line further towards the Barkly Tablelands. I should say it would have to be extended to Anthony Lagoon, over 200 miles from Bitter Springs, before it would secure any amount of traffic. That would increase the distance. If the eastern or western

swing were to terminate at Newcastle Waters, or Powell's Creek the Barkly Tablelands could be served quite well by a branch line.

141. *To Mr. Finlayson.*—I was in the Territory three years, and during that time was on the routes surveyed. I did the first section from Pine Creek to Katherine. I know the country between Darwin and Bitter Springs fairly well. The country between Katherine and Bitter Springs is very much better for pastoral purposes than the country from Katherine to Darwin; it improves as you go south. The prospects of railway traffic, as well as of the development of the country, improve the further south the line is taken. As to the reasons which inspired our instructions to touch Bitter Springs, I think that the water supply was one of the chief. Bitter Springs is the head water of the Roper, and at that point there is a good water supply. At intervals along the Roper Creek, just after the wet season, there are clay-lodes full of water. This is a good road followed by teamsters. You must go towards the tablelands to get traffic of any consequence. I consider that this section is a proper link in the chain connecting Darwin with either the tablelands or South Australia, and I believe the line is probably the best route for a north-south railway. So far as I know the country to the west of the surveyed route is not as good as that to the east. It is badly watered for one thing, and the country is very poor. The battery had not started at Marranboy when I was there. There were engineering difficulties that prevented the line being taken nearer to the tin-fields, it would be a costly line to take from Katherine by Marranboy. That was not exactly the reason the line did not take in the tin-fields. The line survey was authorized there was very little known of Marranboy, which was in its infancy. When I went from Bitter Springs, south to Daly Waters, I was engaged on a trial survey between those two places, roughly, 100 miles. That survey is still going on, and I am going back to the work very soon. There is an inquiry of some sort as to railway construction south of Bitter Springs, towards Daly Waters. We felled trees in clearing work, and found that most of them had been hollowed out by white ants, and were nothing but shells. The timber was practically useless. The ants crawled up outside the legs of the table to which I have referred. They had built a small tunnel of mud and worked their way up through that, always at night time. I say I have had no experience, and would not like to say whether would be the life of a wooden sleeper on a railway line in that country.

142. *To Senator Lynch.*—I prefer the eastern swing, because I consider it will sap much better country, and that the traffic would be much greater with a better water supply. I have not been on the western side further than 10 or 12 miles of the survey line, and I do not know what that side is like from personal experience. I have, however, had conversations with land surveyors who travelled through it recently, and they told me I have got the information. According to the map before me large pastoral areas are taken up on the western swing, while on the east there are only small scattered settlements. The eastern swing contains the better country; but on the western side I understand the pastoralists could ship their cattle from the Victoria River to Darwin and Wyndham. That is one reason I take it why land has been taken up there. I am not aware that the first section of the line from Katherine to Bitter Springs would really determine the route. We shall lose distance certainly

in getting back on the western swing, but not very much. From Bitter Springs we take a westerly swing, tapping Willeroo, and then work south. I realize that my suggestion would mean a zig-zag line, with a sharp angle at Bitter Springs, should it be decided to adopt the westerly swing and go to Victoria River; but still I think it could be done if the success warranted. I have noticed no traffic whatever from Darkly Tablelands district to Darwin. White men cannot live in that country. Cartage rates are excessive. They pay £37 a ton at Daly Waters to cart flour from Pine Creek. Private enterprise cannot stand that. So far as I know, Darkly Tablelands hold out a fair prospect as a pastoral proposition; I have not been there, but have heard reports. My evidence is that, so far as this 65 miles strip, it will not serve any settlement on the route at all; only one station—a Government station—and the Marranboy tin-field will benefit. So far as I can see the prospect of this line carrying any stock are very poor.

(Taken at Melbourne.)

FRIDAY, 10th MARCH, 1916.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Story,	Mr. Sampson.
Mr. Feuton,	

David Lindsay, surveyor, sworn and examined.

143. *To the Chairman.*—I was a member of the Royal Commission for Northern Territory Railways and Ports which inquired into matters connected with the Northern Territory, and in that capacity I have considered the question of the construction of railways in that Territory. I know the section of the railway which it is proposed to construct between the Katherine River and Bitter Springs. I have always opposed the continuation of that line in any particular direction until an examination of the country has been made by experts. The route between the Katherine River and Bitter Springs traverses very poor country most of the way. It follows the valley of the river, and a lot of the country there is subject to inundation. I cannot understand the object of taking a railway there. I have studied this question, not merely as a member of the Commission, but for the past thirty years. I spent twelve years in the Territory, six years on the north coast. The route that I desired the Government to examine before undertaking the construction of the line to the Katherine River, would have traversed country from Pine Creek in a southerly direction, and would have crossed the Daly River, so that it would have served, not only the Roper valley, but the Victoria River valley. It was because the Government had decided to build the line to the Katherine that Mr. Clarke and I recommended a westerly swing from the Katherine, with a view to tapping the Victoria River country, thus making a line which would be only a few miles longer than the direct line, or than the line would be if an easterly swing were adopted. We desired to visit that country as a Commission, in order to ascertain whether it would be better to adopt the westerly

swing or the easterly swing, or to build a straight line. But the Government stopped our work; and, so far, nobody has examined the country which would be traversed by a line with a westerly swing, or by a straight line between the westerly and the easterly swing. I understand that the central line would traverse a level plateau, upon which a railway could be built very quickly. Of course, in a land of heavy rainfall, it is necessary to keep as near to the water-shed as possible. A line with a westerly swing would probably cost more to construct; but it would get into better country sooner—into basalt country. Thus, we were afforded no opportunity of examining the country, and our recommendations were based on sworn evidence, because we were recalled before our labours were finished. The idea underlying the suggested westerly swing was to tap the great western part of the Territory—the Victoria River country. This westerly swing would probably touch Willeroo, and would tap the good country in the Victoria River district. I have visited the Marranboy tin-field; but there are very few tin-mining fields that would justify a deviation from a main trunk line. The westerly swing which I have suggested would take the line much farther away from the Marranboy tin-field. I do not know what has happened to that field since I was there; but, at that time, there was nothing visible to influence any man's judgment as to the route which a railway should follow. Even if the Government erected a plant there to enable the ore to be treated, my opinion in this connexion would be unaffected, because a mining field has a life—shorter or longer, according to the value of its mines—whereas the Commonwealth wishes to construct a railway which will serve the Territory from the stand-point of a permanent settlement. I favour the westerly swing of the line, because I think it would be a more paying proposition, inasmuch as it would tap the country which carries the most cattle. Sixty or 70 miles of the route from the Victoria River to the Katherine River is very poor country to travel stock over. It is true that the pastoralists travel stock over it now; but there is all the difference between travelling a few hundred head of cattle which are intended for local consumption, and travelling thousands of cattle which are intended for export.

144. *To Senator Story.*—Theoretically, a direct line between the two suggested swings would prove a benefit to the Victoria River country. There are two belts—the eastern and western—both of which are capable of settlement and development; and if it be possible to run a line direct between the two, that would be very much better than swinging a line to either, and neglecting the other. I have no personal knowledge of the country that is included in the loop between the two swings, but I believe it is a level plateau upon which a railway could be built very cheaply. It was practically unexplored country until twelve months ago. It is country with a rainfall of from 28 to 30 inches annually, and I have not seen any country which that rainfall in which water could not be obtained at a greater or less depth. A main depot for cattle might be found to enable cattle to travel from Bitter Springs on the east and Victoria River on the west; that would be a necessity. I do not think it is advisable to deviate from the direct line for the sake of developing a mining field, unless it is a very extensive one; and I am of opinion that the Marranboy field is not an extensive one. I would rather run a

2-ft. line from the main line to the tin-fields. I have no knowledge of the country immediately south of the Victoria River district. I do not agree with the suggestion that a spur line should be run due west from about Newcastle Waters, with a view to opening up that country. It is too far from a port for dairying purposes, and I would regard such a line, in the absence of any knowledge upon which to base a conclusion, as merely a theoretical one. If there were a large number of sheep in that country, that fact would be a justification for the construction of the line. But, until the trunk line has been built, a branch line such as that suggested is scarcely worthy of consideration. I think that a railway into Port McArthur is probably the most important developmental railway that it is possible to construct in the Territory. That port is the natural outlet for 200,000 square miles of country, and has no other port to compete with it. It is distant, in a direct line from Port Darwin, about 650 miles. The next nearest port capable of being utilized as a place of shipment for frozen cattle is Townsville, on the east coast of Queensland. There is no other port in the Gulf of Carpentaria which can be made fit for shipping cattle or frozen meat. The main purpose which will be served by a trunk line to Darwin is, that through communication will be established with the other States, and, as a result, it will be possible to conduct business more expeditiously and cheaply; and as a strategic railway it is very difficult to say whether it is more important to continue the existing line south from the Katherine River, or north from Oodnadatta, assuming that both projects cannot be undertaken simultaneously. The southern line would tap the southern half of the Territory; and, in the absence of that line, that portion of the Territory cannot be profitably occupied, although it is capable of profitable occupation. The northern portion of the Territory, even after a railway has been constructed to the Katherine, will be capable of occupation only to a limited extent. But it is absolutely necessary to have the railway at both ends, in order to obtain the full advantage of the country. In other words, both railways are vital to the development of the Territory. I certainly think that a straight line between the suggested easterly and westerly swings is preferable to either of these swings, assuming that the country is suitable, and that there are no engineering difficulties. The difference between the mileage would be very small. If we desired to serve two villages with a railway, obviously, a line that was equally distant from both would be preferable to a line running into either one of them.

145. *To Senator Lynch.*—When Mr. Clarke and I suggested the westerly swing, we were aware there was a suitable place at Willeroo where cattle could be shipped; we were aware that powerful influence was being exerted to get the line constructed to Bitter Springs, and consequently we had to make some recommendation. That recommendation we carefully safeguarded by pointing out that we had not been afforded an opportunity to examine the country. I do not think that the Government would assist to develop the northern river country. But if the McArthur River line were built, that would develop the best pastoral country in the Territory. There is a deep sea port available at Follow Islands. It is a natural port. If such a line were constructed first, its cost would be saved in the less expenditure that would be involved in carrying material for the remainder of the transcontinental line. When the Pine Creek

to Katherine River railway was projected, I wanted expert examination made of the country, to enable us to form an opinion as to whether the line should trend in a westerly direction. There is a lot of good country on the Daly and Flora Rivers, and such a line would bring that country into the closest possible connexion with Darwin. I think that an expert examination of it is practicable within a reasonable time. An expert could get over it at the rate of 20 miles a day. He could travel on horseback. The tributaries of the Victoria River have their rise in the country of basaltic formation, which is coloured yellow on the map. The Territory to the eastward of the telegraph line is sandstone and lime. Much of the country around Bitter Springs is of a poor character; and I do not know what purpose a railway there will serve, except as part of the main trunk line. Of late years, Bitter Springs has been brought into prominence by the Administrator, who, I think, has formed an absolutely erroneous idea of it. Bitter Springs has no qualifications as a main centre upon that trunk line. The western swing of the railway would suffice to develop the Victoria River downs country for many years. If a railway were constructed to Port McArthur, the produce from the Roper River country would go to that port, and the necessity for building a line to tap the Roper River country would thus be obviated. The westerly swing of the line would inflict no injury on the Darkly Tableland, because it would touch that tableland about Newcastle Waters, just as near as would the easterly swing. The Victoria River country is too far from a port of shipment to be practicable for dairying. On the Flora River, however, it would be practicable. It still remains to be seen what opinion would be expressed in favour of the westerly swing of the line.

146. *To Mr. Sampson.*—I favour the construction of a line from the McArthur River to the Darkly Tableland, to the neighbourhood of Anthony Lagoon. I have been over that particular country, and, as a matter of fact, I surveyed all the boundaries of the runs on the Darkly Tableland in 1886. If a line were constructed from the Katherine River to pick up the overland telegraph line at Powell's Creek or Newcastle Waters, it would be perfectly practicable to run a branch line out to tap the Darkly Tableland. The country that would be traversed is absolutely level. The country between Port McArthur and the Darkly Tableland is capable of great development, and that fact in itself would be a partial justification for the construction of a line of railway there. I may mention that, on the McArthur River, a very big irrigation scheme could be carried out. If the westerly swing of the main line were adopted, and the railway were continued south from Newcastle Waters towards Oodnadatta, whether it would serve any considerable portion of the Darkly Tableland would resolve itself into a question of the freights to be paid on the stock, and of Townsville competing against it. Assuming that the freights to be paid on the railway were on the Queensland basis, it would be possible to take stock from a great portion of the Darkly Tableland. The distance is not too great to enable stock to be driven, but the route passes over too much poor country. In regard to the westerly swing of the line which I advocate, I base my opinion chiefly on the evidence which the Commission elicited from those who were settled within the Victoria River and Willeroo country. That evidence indicated that the country would be developed, and

stock to market, would be about 25 square miles. The tableland would do well with horses, but you would get a quicker return from sheep. It is good, healthy stock country right through, but there are patches in which the minimum would have to be raised. At the present time under existing conditions, I would not attempt to start on the tableland without 300 or 400 square miles.

168. *To Senator Story.*—There are no natural waters along the direct route; bores must be sunk. When I spoke of running to Willeroo, I was speaking from a pastoral point of view and was disregarding the possibilities of the Marranboy Tin Field. There are also big possibilities near the head of the Roper, while the country to the east and north-east of Daly Waters carries 10,000 to 12,000 cattle. Another station carries 6,000 or 7,000. All that country will carry stock, and it has big possibilities with the flats for agriculture when they can find somebody to consume their produce at a reasonable rate. The Victoria River district is carrying four or five times as much stock as the country to the east of the telegraph line, therefore a line swinging to the west would earn a bigger present revenue if they drove their stock to the railway. On the other hand, the country to the east is capable of carrying large bodies of stock, but they are not there yet. If the western swing were adopted, there would be greater engineering difficulties, I should say, in the vicinity of Katherine and in the vicinity of Renner Springs, than on the eastern route, and, in my opinion, would cost half as much again as the easterly route. If the railway is intended as a trunk line, the shortest route should be followed, and adjoining districts that are worth developing tapped by branch lines. If you want the biggest revenue from cattle, carry the line towards Willeroo, but if you want a general development from other industries, follow approximately the telegraph line. If the Government were to put down a line of bores from about Battle Creek to Katherine, that stock route would serve the Victoria River district very well, and the eastern swing would be preferable from a developmental point of view. We have iron-wood in the Territory suitable for sleepers, but the cost of obtaining them would probably be too great. We have some belts of timber, but I believe it is nearly all pined by white ants. I do not think there is any possibility of getting local timber suitable for sleepers, and, even so, it would have to be treated with some arsenical preparation to make it capable of resisting white ants. If it is considered probable that concrete sleepers may be adopted, there is plenty of sand available in the Katherine River, and there are sand hills and sand ridges, but it may have to be screened. There are lots of ironstone outcrops that would provide good material for concrete also.

(Taken by Sectional Committee at Marranboy.)

MONDAY, 24th JULY, 1916.

Present:

Senator STORV, in the Chair;

Mr. Sampson, | Mr. Laird Smith.

William Thomas Pearce, Miner, and Manager for Walker Bell and Co., sworn and examined.

150. *To Senator Story.*—The Marranboy Tin Field, in my opinion, is an extensive one, and a permanent one. As far as is known, it is 8

miles in length by about 2 miles wide, but I believe the same class of mineral-bearing country extends for a distance of perhaps 9 or 10 miles and crosses the King River. In regard to the production likely to be expected from the field, I may mention that I know of one property where a shaft 8 feet by 5 feet has been sunk in the lode, and at a depth of 70 feet there are no walls in sight—either foot wall or hanging wall. We know by prospecting that at the bottom of the shaft the lode is at least 10 feet wide, but how much wider it is we do not know. We were going to put in levels at 70 feet, but the stone became so hard that we consider it needs machinery to break it. The stone at the bottom of the shaft at the present time carries about 8 per cent. tin. We have a No. 2 shaft, 8 feet by 5 feet, on the same property. It is down 50 feet, and we are working on the foot wall side of the lode, but we do not yet know the extent of it. There are other claims adjoining that are producing good ore for a distance of about a mile and three-quarters. I think they are on the same line of lode and should prove equally as good as the one being developed. I cannot say that the lode of which I have seen a 10 feet width extends for a mile and three-quarters. I cannot be said that it extends farther than we can see it, but it is the same lode apparently, as it runs right through the same kind of stone that we have. The centre of the field has yet to be prospected. The lode dips under the flats and comes up on to ridges again. I believe there is one claim in the centre of the field that has produced some good stone. At the north end there are several claims, but being some distance from the battery, they do not seem to receive the same attention as those at the south end. On this field there are two parallel lodes about half-a-mile apart, which are producing ore. One claim is on a lode apparently about 4 feet wide. I believe that if we can get some capital into the place things will improve considerably. There is no question of the grade of the stone, but we are handicapped by the cost of transport. The rate for carting concentrates from Marranboy to Darwin is £20 a ton, while from Marranboy to the railway costs £12 10s. per ton. Assuming that the proposed railway came within 12 miles of Marranboy, cartage would be reduced to approximately £3 per ton. There is no question but that this field could support a fairly large population if we could get capital. We have several miners only too willing to bring up their wives and families, but they cannot see their way far enough ahead. If the railway came within 12 miles of Marranboy it would induce population to come here, as we would then have cheaper transport. This is a good district in which to settle, as there is some good country on the Beswick especially, not more than three or three-quarter miles from the battery to its nearest point.

160. *To Mr. Laird Smith.*—It is good agricultural country, and would grow almost anything; English potatoes grow there at the present time.

161. *To Senator Story.*—The climate is excellent, and until just recently it has had the reputation of being a very healthy place. Men work here quite as well as in other places, and even the hottest part of the year produces no excessive fatigue. Rates of wages are abnormal; miners get £5 per week, but the field is rich enough to pay that rate if we got cheaper transport. At the present time there are just a few claims that show a profit, but some others barely pay £5 per week. The majority of the claims would be payable propositions if the railway came within 10 or 12

miles, provided they worked them by other means than the present drill and hammer; and for that we want capital.

162. *To Mr. Laird Smith.*—The agricultural country I spoke of lies east of the battery and would be within 18 miles of the proposed railway. The railway would be the only outlet for that property. If the railway be constructed on the route proposed, it will tend to induce capital to be invested in this field. I think the field may be considered as being beyond the prospecting stage, although there are still parts to be prospected. The lodes in my shafts are continuous; there are two lodes, running parallel to each other, and although I have not had an opinion from anyone of experience, I am inclined to believe that they come together at a lower depth. The richest stone at our 70 feet level carries about 8 per cent. tin, and our smallest percentage was obtained from a bulk crushing from the two shafts, when, from a parcel of 306 tons, we got a percentage of 4.5. I estimate we could send to the battery about 60 tons of stone per week from one property, and about 20 tons per week from the other. Calculating from what we have in sight, I should say we could reasonably expect to carry on for six months in the year. That is, we could send 30 tons of stone per week, carrying a minimum of 3 per cent. tin, for a period of six months. Under present conditions, with cartage at £20 per ton, our shaft, after paying all charges, showed 60 per cent. profit. It cost us £5 a foot to sink the shaft, excluding explosives, and it was payable from the beginning, is still payable, and is getting us good ore down. There is a claim going on on this field as far as I am aware. In the event of a railway being constructed on the proposed route, a branch line to Marranboy would be costly, as it would have to cross a lot of bad country. There are certain flats where, after a heavy storm, you would get a foot or 18 inches of water—sufficient to wash away the earthworks of a light line. I think the mining is sufficiently developed, however, to warrant the Government taking into consideration the question of railway communication; then there is also that agricultural land I mentioned. We have had no trouble so far in getting rid of our concentrates, but we may find trouble in the wet season. For four months in the year we cannot get anything away from here, but a railway would overcome all that.

163. *To Mr. Sampson.*—The £20 per ton cartage to Darwin means free on board. The £12 10s. per ton is for cartage to the railway at Pine Creek. There are three members in my party, and our claims are taken up individually and comprise the "Star of the East," the "Osman," and the "Montana," the total area being thirty acres. I cannot tell you the quantity of stone in sight, but we value our holding at £20,000 to £30,000, basing our calculations on 4 per cent. stone. I am of opinion that the investigations we have made justify us in assuming that the field is a permanent one.

164. *To Mr. Laird Smith.*—The battery erected has proved of great assistance in the development of the field, and in my opinion, we could not have done anything without it. It would be hard to find a better battery anywhere, and the treatment of the ore has been perfectly satisfactory.

165. *To Senator Story.*—In my opinion, the tin bearing stone may go down 1,000 feet, and a mine of that extent would almost keep the battery going itself. We are prepared, at any time, to guarantee to keep the battery going one shift from our own mine.

Louis Norman Stutterell, Mining Engineer and Battery Manager, Marranboy, sworn and examined.

166. *To Senator Story.*—I have been on the Marranboy field two years, and I have over most of that time been of opinion that the tin-bearing country comprises an area about 4 miles by 3 miles. I could not tell you the exact number of claims from which I have crushed stone, but we are on the 20th parcel now. The line of lode across Pearceo and party are on is on the extreme west, and from there the lode runs for about a mile and a half of proved values. The value of stone sent in varies very much. Pearceo and party put through two parcels, one went 16.1 per cent., while the second parcel of 305 tons went 4.35 per cent. I should say the first parcel was picked out of a rich lode. I do not say it was picked out of the lode, but it happened to be a richer lead. Some of the stone on that line of lode has gone less than 4 per cent. Dunn and Ford's went 1.64 per cent., and Sullivan's went a little over 3 per cent., perhaps 3 1/2 per cent. From the parallel line of lode farther south we have received some good values. The Bull Syndicate went, I think, 10 per cent., or 10 1/2 per cent.; the prospectors Schaber and Richardson sent 3 per cent. tin, for a period of six months. There is a distance of about three-quarters of a mile between the two parallel lines of lode, but, as a mining engineer, I think they are too far apart to come together at a depth. As to how deep the lodes extend, there has not been sufficient work done to say, but the indications are good. On the south side of the lode, and on further to the north, there are the claims of Barton and Fischer and of Teece and Elliot. Barton and Fisher sent in seven tons that went over 40 per cent.—that was picked stone. Then they sent in a parcel of 40 1/2 tons of second-grade ore that went about 8 1/2 per cent. They are on what we call the middle lode. I think are down about 20 feet. Teece and Elliot have a parcel of about 85 tons in now awaiting treatment. I should say, by the look of the stone, it should go about 7 or 8 per cent. As a mining engineer, I should say that if railway facilities were provided the indications are good that this field may develop and carry a fairly large population. Of course, the deepest shaft on the field is 70 feet, but it is good at the bottom. Further south Hutchinson's is 60 feet deep, and that went 5 per cent. for 100 tons. As to the lowest percentage that would pay under existing conditions, a lot depends on getting good men and on the cost of breaking the stone. Taking all things into consideration, I should say that 4 per cent. ore would leave a fair profit. But it all depends upon skill and method. Machine drills would have to be used, as the present hammer and drill work is too slow and costly.

167. *To Mr. Laird Smith.*—I have had a wide experience in Tasmania. This field is altogether different from anything I saw over there. We there have big lodes and low-grade materials, but there is nothing different about the treatment. We can get over any difficulty of any metallic iron. We have no need for pumping machinery here, excepting in the wet season; under ordinary conditions baling is sufficient; getting rid of water would not be costly. In regard to the receipt of sufficient material to keep the battery going I may say that we have had one stop. We ran out of stone, and had to stop for ten and a half shifts. We have very great difficulty in obtaining efficient men for the battery. At the present time we are more than keeping pace with

greater portion of the population of Australia is to be found within that area which may be bounded on the north-west by an imaginary line from Rockhampton to Adelaide, the most populous centre being Sydney. It has been already agreed, however, that connexion should be made with the south-western corner of that area. There only remains to be considered therefore the best route to subserve the economic development of the intervening country and the possibility of linking up, by one or more branches from a railway systems to add to its effectiveness from a strategic stand-point. The present section of railway construction is approaching Katherine, from which point it is undecided apparently what exact route shall be followed. Evidently there are under consideration—(1) a direct southerly route, presumably in a bee line to Oodnadatta, or at least Alice Springs; (2) a somewhat indefinite westerly swing *via* Willeroo to meet the telegraph line again at Renner Springs; and (3) that *via* Mataranka, approximately following the overland telegraph line. No. 1 does not seem to have anything to commend it. Between Katherine and Macdonnell Range it would not pass a single permanent water. Until Stuart's Plain, north-west and west of Newcastle Waters, is reached the country on the whole is indifferent pastoral country, even were it well watered. A central line would tap only one corner of good country and have to run through a lot of rough country south of the Katherine.

177. *To Mr. Sanyoun.*—From Wangalla to the south in a straight line you would pass through inferior to medium pastoral country.

178. *To Senator Story.*—South of the 18th or 19th parallel the country generally that would be traversed would be sandy and spinifex (tridion) covered, of comparatively little pastoral value, till the Burr Plain, north of Macdonnell Ranges, is reached. The Burr Plain extends north-easterly to almost the 31st parallel in the vicinity of Davenport Ranges, but there is no permanent water. We might obtain water from wells, but the indications we have gathered from Anthony's Well incline one to the belief that the supply would not be great. No. 2.—The Railways Commission plan No. 4 shows the westerly swing recommended as proceeding direct from Katherine to Willeroo Station in a south-west direction, the distance being estimated at 320 miles as against 316 by the partially surveyed route on the east near the telegraph line. But doubtless a survey would raise the mileage of the Willeroo swing very considerably; that is their estimated mileage owing to the broken country necessitating deviations from the straight line. South and south-west of the Katherine the country is broken and rocky, and of small pastoral value. The King River, one and a half to two chains wide, with high banks and many creeks, would require to be bridged. A line would therefore probably run near and almost parallel to the Katherine River till almost north to Willeroo. It would seem that the time for such a route to be adopted, if at all, was prior to the extension beyond Pine Creek. The even Brock's Creek being commenced. The general trend of the direct railway to Oodnadatta or even Alice Springs would be east of south, and a sudden deviation back to westward from the Katherine crossing would require strong reasons for its adoption. The Willeroo deviation would only supply the northern extremity of the vast Victoria River district, traversing the Willeroo and part of Del-

mero Stations alone. After leaving the last country east of Delamere the line would traverse north and west of Stuart's Plain at least, the class of country I briefly describe later. The map shows that such a swing would not assist very greatly the southern portion of the Victoria line, country, at all events hardly sufficient to encourage sheep-rising instead of cattle raising. From Willeroo southwards the country is poor along the route to the main stations. To avoid that bad country it has recently been decided to provide a new stock route. This will start from the Katherine River at a distance of from five to ten miles from the telegraph station, then run in an irregular manner until it crosses the King, then go to Wangalla; then up the Dry River until it reaches a point about due east of Delamere; thence it will strike the heads of several creeks until it reaches Wake Hill Station. That stock route will be provided with bores and will give a better route for cattle. No. 3.—As to my reasons for advocating construction to Mataranka at present time, which are requested, I think there must be some misunderstanding. I have advocated the construction of a line to Mataranka, but I have never advocated Mataranka as a terminus. I recommended it as a point to which the survey might well proceed, and even construction, pending consideration of the exact line beyond. Up to a few months ago we knew very little of the country between the proposed easterly and westerly swings. The country to the east and west was picked out not because it was any better, but because of the existence of known permanent waters. As a terminus Mataranka would be equally as futile from a profit-earning point of view as for defence for many years to come. My reasons for advocating that the line should go *via* Mataranka and the Warlock Ponds near All Saints' Well are (1) Beyond Katherine Crossing, in the vicinity of Maude Creek, a considerable area of black soil country, which I have very reason to hope may be suitable for agriculture, would be served. (2) The line will be within twelve miles of Marranboy Government Battery, the centre of a very large tin field at least twenty miles in extent, which has every prospect of proving a very valuable asset to the Territory. The battery is forty miles from Katherine by the road, which is very sandy. A railway within reasonable distance will do much to stimulate development, and by reducing cost of transport will enable the lower grade lodes to be worked. (3) Although the country beyond the Maude Creek, and especially beyond the King River, is poor in quality, there is marked alteration noticeable as Mataranka Springs are approached. From about the junction of the Beswick and Roper Creeks onward to the source of the Roper River (Mataranka) there are considerable areas of black and red rich loamy soils near the latter creek, while permanent waters are fairly numerous. At Mataranka is the source of the Roper, which begins in a series of springs whence rushes a large nover-falling and rapidly varying body of beautiful looking clear water slightly above normal temperature of water in that region, very slightly alkaline but quite potable. The statements that this water is unfit for human consumption are, to my mind, unfounded. There have been no complaints from the stop station, and my own experience is that people soon become quite accustomed to the slightly unusual taste. From about twelve miles beyond the junction with the Elsey Creek, about twelve miles beyond in a direct line, the right bank of the winding Roper, is more or less bordered generally by an extensive black soil plain extending back-

ward and more sandy country, well grassed and with many edible shrubs. The same class of country which is excellent for horse-breeding, extends intermittently along the Elsey Creek to the Warlock Ponds. This black soil is very rich. In the wet season surface water lies in places for short periods, but it is rarely really flooded. I have made myself thoroughly acquainted with this country under review by visits and examinations at different periods of the year and under all conditions, and am firmly of opinion it forms the most favorable site for an agricultural settlement, provided it is supplied with railway communication. Further, if any agricultural settlement here, with the proper class of settler, does not prove successful, attempts at agriculture may then be entirely abandoned by white people in the Territory. The situation is high, it is almost as far from the coast as is possible north of the 17th parallel; rainfall is good; water supply good, and inexhaustible. (4) The railway here would also tap the Roper River Valley, which contains the only extent of country so far classified by the Land Board as first-class pastoral country. (5) Again, a glance at the map will show that as the country is developed, Darwin will become more and more unsuitable as the capital on account of its situation; a more central administration point will become necessary. This, in addition to the fact that residence in the tropics should be as far from the seaboard as possible, especially for women and children. Despite other opinions expressed to the contrary, I am convinced that the neighbourhood of the Roper River source (Mataranka) offers the very best site available in the Territory for an inland city, because of altitude, its distance from the sea, central situation, good soil, and beautiful river. Darwin is on the coast, the climate is humid, and the water is not only even now insufficient at times for requirements; there is to supply nearer than fifteen miles; and that supply would require to be pumped. It is understood, of course, that there is no suggestion of immediate change of capital site, but in considering a route for a Transcontinental railway it would seem obvious that the probability of some such central city becoming a necessity in the future should be considered, especially in a country badly watered by nature on the whole. Extension beyond Mataranka—and Daly Waters feature surveys of the unoccupied country along the telegraph line, and on each side show it to be on the whole fair to medium grazing land without (excepting perhaps one or two very small) permanent waters. To the west the unoccupied land is somewhat poorer. Bordering the Birdum Creek there are areas of very rich black soil overlying limestone. The telegraph line follows the course of the Birdum Creek, which runs only after heavy rains. Between the Warlock Ponds (near All Saints' Well) and Daly Waters there are no permanent billabongs. Travellers are supplied by Government wells. Boring for sub-artesian water is now being prosecuted by the Mines Department along this route. The first bore has been sunk to a depth of 120 feet, resulting in a supply of at least 60,000 gallons per day of good potable water. There is no reason to anticipate less favorable results further along the line. Were that route adopted, which, I believe, has been already surveyed nearly as far as Daly Waters (although no official data are apparently available), and runs close to the overland telegraph line, railway construction employees will thus have ample water

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supply by wells and bores. Another point against the central route is that if we leave the river we are less likely to get artesian water. Between Daly Waters and North Newcastle Waters (except one small billabong near Daly Waters) there are again no permanent surface waters. Stuart's Plain, an enormous area of well-grassed unfenced greyish black soil, which is first encountered on the overland route south of the Frews Ironstone Ponds (not numerous) stretches to the westward for about eighteen to twenty miles, and northward irregularly to the vicinity of Milner's Well on the west side of the line. This Stuart's Plain is of much the same nature, though not quite so rich, as the plains of the Barkly Tablelands with which it is continuous. At present, though portion is held on lease, it is unworked because of the absence of surface water. There seems no reason to doubt, however, that, as elsewhere on the Barkly Tablelands, sub-artesian water will be procurable at comparatively shallow depths. North of Milner's Well, which is situated almost on the divide, the drainage of the country is towards the Roper by means of the Birdum. South of Milner's Well drainage is southwards *via* Newcastle Waters (permanent) to Lake Woods (not permanent). The Newcastle Waters country, including Stuart's Plain, marks the extreme western border of the great Barkly Tablelands. It rarely comes as far westward as the overland telegraph route south of South Newcastle Waters, about ten miles below the homestead, although about Renner Springs, which is a small spring, permanent bays, so to speak, of the tableland plains come again within a few miles of the line. Beyond a small plain of grey black soil with tabular characteristics, north of Banka Banka Station, this class of country is not again met with on the telegraph line. To the west of the overland telegraph line, between approximately the 18th and 22nd parallels, the country is poor and sandy, with the exception of scattered patches, although the numerous native wells indicate that water is probably procurable at shallow depth. The line traverses on the whole, till the Burr Plain, near Anthony's Well, is reached, similar country with no permanent waters. Eastward of the telegraph line the country improves. The Davenport Ranges comprise good pastoral country fairly well watered. The tableland does not quite reach to that latitude, however, so far as our surveys indicate. Between the Davenport and Macdonnell Ranges the country is good pastoral land, devoid of permanent waters, but with every indication that water may be found at shallow depths by bores or even wells. It will be noted from the above that a railway following the present telegraph line between the South Newcastle Waters and the Burr Plains above the Macdonnell Ranges would at most only skirt any good, or even fair, pastoral country whatever, i.e., over a distance of about 300 miles by the route partially surveyed. I may remind you at this juncture that the railway systems of two States have at present terminated within a hundred miles of the Territory borders, viz., Selwyn (Duchess Mine) in Queensland, and Oodnadatta in South Australia. Extension of the Queensland line will help to tap the richest pastoral country of the Territory—Barkly Tablelands. This extension is gradually being projected with, I understand. The Barkly Tableland roughly forms a rhomboid with its western boundary at or near the telegraph line between 17th and 19th parallel; its eastern boundary, so far as it lies in the Territory, being the border

between the north of latitude 18 deg. and 21 deg., and irregular but fairly direct lines between the respective northern and southern points. *A priori* it would seem reasonable to anticipate that any transcontinental railway would endeavour to supply and develop this large tract trending south-east and improving as it extends, instead of simply skirting its least valuable border and thereafter for hundreds of miles immediately serving nothing of any great practical value. For these reasons I suggest the railway leave the telegraph line somewhere between Milner's Well and Newcastle Waters, at a point to be determined later, thence *via* Anthony's Lagoon, Brunetto and Alroy stations, or thereabouts. From Alroy Station to Camoowal is but 160 miles. The Townsville western railway is being extended, and will probably reach Camoowal or some other point on the Georgia at no distant date. A junction between the two systems would then probably become imperative. The gap in the coastal railway system of Queensland would doubtless be filled in, even if the proposed linking up of the inland terminus were not completed, and a definite rail connexion between the populous south and the empty and dangerous north established. Between the Barkly Tableland and the Macdonnell Ranges from the evidence available, there is only one length of about sixty to seventy miles of poor sandy country between the better pastoral countries through which the railway would require to cross were it again to turn south-westward to meet the telegraph line about Alice Springs or Anthony's Well. The feature survey of this has not yet, however, been completed, but the maps in the Department of External Affairs, prepared by Chief Surveyor Day, show the class of country below the Davenport Ranges. It will be understood that the points mentioned above are but very approximate; the map is very empty of names, and what is thereon must be utilized. Briefly, what I suggest for serious consideration, whatever northern "swing" may be decided upon, is a deviation of not more than 120 miles to the east of the telegraph line at any point. Such a deviation, it seems obvious, will possess the following advantages.—1. The Katherine-Oodnadatta route would not be materially lengthened, and the swing will present absolutely no engineering problems. I question if one bridge will be required. I believe the only bridge likely to be required from Katherine to Newcastle Waters is that over the King River. 2. It will miss a long tract of poor pastoral country, which the more direct route would traverse. 3. It will help tremendously to develop our best tracts of country nearly equal in extent to half the area of the State of Victoria. 4. Eventually a very short branch will link up with the Queensland railway system. 5. The total amount of railway construction if the branch to Queensland from Alroy be included the already proposed branch to Queensland from Newcastle Waters. In other words, supposing we were to construct a direct line and then put in a branch from Newcastle Waters to Camoowal and compare that with the line I suggest and its branch, my suggested line would be a little shorter, but I contend that even if it were a little longer, it would be justified. 6. A branch from Anthony Lagoon may in the future be made to Port McArthur, where information available indicates it is likely to be found the best situation in the whole Gulf of Carpentaria for a good harbor to accommodate deep sea boats. I believe there

would be no difficulty in constructing a line right on to the island—in fact the natives walk across to the island now at low tide. Given such conditions, Port McArthur would be the natural outlet for much of the north-west of Queensland. 7. The only linking up with the Queensland system and railway connexion with the populous south will be expedited. 8. This scheme will not appreciably retard the extension of the main railway system to the Macdonnell Ranges and Oodnadatta. 9. Assuming the branch to the Gulf later on, then the natural outlet for export produce from north of the Macdonnell Ranges, east of the telegraph line may prove the distance on and not the southern, judging by the distance on the map. If so, this will again assist in peopling the north. In the foregoing I have not attempted to criticize the opinions of others. I am merely endeavouring to set before you what appeals to me as being the best route for the railway to take, bearing in mind the different factors. During the past four years I have seized every opportunity of becoming personally acquainted with the Territory, and I have not confined myself to the periods of the year when travelling is most comfortable, or when the country looks best. I have discussed the difficulties and possibilities with practically every one who has wide and long experience of the country, hence should be in a position to form a fairly just opinion. I do not propose that the swing I suggest should extend farther than about 120 miles east of the overland telegraph. It would lengthen the line by perhaps 160 miles, but as against that it cuts down the length of the branch to connect with Queensland. There is this further to be said that, although the distance is increased by 160 miles, the cost would not be increased proportionately, because the overland line goes through rough country which would require bridges, whereas going further to the east you would avoid the necessity for a single bridge.

179. *To Mr. Sampson.*—Treating the line as purely one for local development I am satisfied that a careful consideration of the stock route would lead to the abandonment of the proposed swing to Willeroo. I do not think that country is associated with a main line proposition. As regards a suggested capital at Matranka, I would mention that most of the capitals of Europe are inland, although it is admitted they are mostly on rivers. I would add, however, that even the Roper could be made navigable for small boats at comparatively little expense. In the future I believe it would be possible to ultimately bring small boats from the mouth of the Roper, by a series of locks, to Matranka. My support of the extension of the present line to Mitter Springs is absolutely associated with a further extension to tap the Barkly Tableland. Connexion with the Barkly Tableland is vital to its development, but a connexion with the Victoria River country is not vital to its development, of course with the qualification that any railway communication with an area vastly improves it. I want, however, to go through the tableland so that it may be developed with sheep. I have also thought of the possibility of growing wheat in some of the sandy loam areas. I ordered some samples of Indian wheat from the Punjab, but they arrived too late for last season. I intend to get fresh samples next year. I have always been of the opinion that the construction of railways might be made to proceed hand in hand with the settlement of the country by insisting that the

majority of the employees should bring their wives and families with them. I would encourage them to take up holdings so that their families could remain there while they were working on the railway, and thus form the beginning of a permanent settlement. At the present time the vast majority of the men employed are single, and even if they are saving money it is obvious the money they save is of no use to the Territory. Some men work for six or eight months or a year, and then go away and take their savings with them. Last year I made inquiries amongst the men and did not find anybody who had any intention of settling in the Territory—that applies to people brought from overseas as well as those from the south. If a railway were connected with the south I do not think there is any possibility of settling this country with the overflow from the south, because they do not want to come so far away from their homes. Every State is bidding against every other State to keep its own people, and in any case I do not think it is good policy to encourage the transfer of people from one part of an empty country to another part of an empty country. I would recommend the system of encouraging people from European countries to come here by guaranteeing them work if suitable—by paying their passages in part and making it a debt against them until they were settled in the country. I would hold out hopes that if they settled permanently the debt might be foregone, but I would insist on either the people being married and bringing their wives and families with them or being closely related to those already here. I find it is not so much the attraction of his country which takes a man away, but the attraction of his friends and relations. In regard to land settlement I think there are certain areas that, with the expenditure of money could in the future be made suitable for irrigation areas, but one should be sure that those areas which can be developed without that expenditure should be developed first. I would apply the same condition to applicants for land, *i.e.*, that they be married.

180. *To Senator Storey.*—I think the proposed extension to Matranka would materially assist in developing Marranby. Then the question arises as to whether Marranby should be connected by a 2-ft. gauge tramway with the railway, but I would favour a rough line of the same gauge as the railway and intended solely for the conveyance of ore and goods; that would save the cost of handling. If the railway be brought within twelve miles of Marranby I think the development of the field of capital for the Territory capable of development without companies. My opinion is that to be a permanent field it will require the expenditure of a considerable amount of capital, particularly when they get down a little further. Labour-saving machinery could be used and should be used to the fullest extent. I think that even if the railway does not give complete connexion to Marranby, the fact that it goes within twelve miles of it will tend to bring people there and add to the possibility of the railway becoming more valuable. There is every indication of Marranby being one of the biggest tin fields in the world. There is no sign of it petering out as greater depths are reached, but of course one cannot speak definitely until the thing is proved. Even the country rock, I am told, shows traces of tin, and there is every reason to believe that other mineral fields may extend beyond the present confines of Marranby.

APPENDIX.

EXTRACTS FROM REPORT BY MR. L. N. SUTHERLAND, MANAGER OF THE MARRANBY BATTERY, DATED 15TH JUNE, 1910, ADDRESSED TO THE DIRECTOR OF MINES.

THE MARRANBY FIELD GENERALLY AND THE PROSPECTS OF THE CLAIMS.

The Marranby field as at present prospected and opened up covers an approximate area of 6 miles by 3. At the end of May there were held about 33 mineral reef claims and ten approved protected leases. The former were held or controlled by about 23 individuals or parties, and the latter eight.

Speaking broadly, the amount of developmental work carried out is practically nil, for only in one or two instances has any attempt been made to open up and prove the lodes in depth and values in anything approaching a workmanlike manner.

Differently situated and endowed with a more energetic and capable class of prospector, this field could be regarded as a so-called "poor man's field," but not under conditions existing. The lodes are hard, but values were picked up on the surface, and in the majority of cases have been proved to continue and improve in value and size with sinking.

If the time spent scratching about the surface for the over elusive leader, flatter, &c., had been spent in sinking on the fine, well-defined lodes, which are on almost all claims in evidence, Marranby would most assuredly have had a more prosperous and brighter record to-day. The almost general method adopted has been to pick up from the surface and scratch from very shallow depths stone, which, in the debited opinion of the owner, would go anything from 20 to 50 per cent tin oxide. The best specimens would be placed nicely on the outside and most conspicuous positions in the heap, which would be pointed out to all comers, either out of ignorance or a desire to mislead, as a heap of stone sampled and proved to go off anything from four to five hundred per cent. In a recent percentage in tin oxide. This practice accounts largely for the number of dis appointing crushings which have been put through, if the prospector who over estimates his ore were naturally disposed, notwithstanding many warnings to the effect that all which glitters is not tin. The result of this system of working on a number of the claims varies from 20 to 27 tons for a period up to three years.

There are two or three progressive parties and individuals on the field who have turned the limited capital at their disposal to good account. For such a proposition as Marranby the scope of these is altogether too limited. Capital—real capital—and confidence are required to push things as they should be pushed.

One party has a shaft down 75 and another 35 feet, both well defined lode carrying good values. Although sufficient has not yet been done to finally determine the width of the lode, it ranges approximately from 7 to 14 feet. A parcel of 315 tons, being the result of sinking, &c., was treated for a yield of 13.3 tons of tin oxide. This, together with a small picked parcel which yielded 1.5 tons of tin, the whole valued at £1,700, returned a net profit of £350. This instance the dividend-paying prospectives of a claim or claims worked on legitimate lines.

There are at present six lode systems proved. The centre area has been opened up at intervals of a few chains for a distance of 2 miles, and is carrying good values throughout. On the same lode a shaft is down about 35 feet, and it has produced to date about 270 tons of ore, which should average over 5 per cent. Close by is a shaft over 35 feet in depth, and from it are now awaiting treatment about 150 tons of very fair grade ore.

The lode next but one in a southerly direction has been opened up for about the same length, though not to the same depth. A shaft 20 feet just off the lode has been sunk, and from this and other sources there have been raised about 300 tons of stone. On the adjoining three blocks the lode has been exposed at intervals, and ranges from 4 to 8 and 10 feet width. On the same lode, and further to the west, there is an open cut for about 150 feet, the width between walls ranging from 4 to 8 feet, the bulk carrying very fair tin.

To sum up, the prospects of most of the claims are distinctly good, that is, worked in an enterprising manner on progressive lines, and in my opinion, this may be expected to be brought about only by the introduction of capital judiciously expended.

THE CLASS OF CLAIM-HOLDERS.

During the past few weeks there has begun what appears to be a gradual displacement of the undesirable type of original claim-holder by a seemingly more capable and energetic class, but they have not yet become established. Five lease applications, and two or three mineral reef claims applications have been received during the past week or so from applicants apparently of this improved type.

The present claim and lease holders may be divided into at least three classes.

1. First of all we have the individuals or parties who are really confident in the prospects of their holdings and the field generally, and who may be reasonably expected to spend a liberal portion of their returns from stone raised in developing their property. This class, from time to time as finances allow, employs labour irrespective of the limited number required to comply with the regulation labour conditions. The work done by most of those included under this head has been briefly dealt with elsewhere.

2. Secondly there are the claim-holders with, for the most part, good holdings, but who, through lack of enterprise and often confidence, and in many cases a keen desire to sell, are merely working their claims with the idea of breaking sufficient stone to return the equivalent of good wages.

Whilst the price of tin remains high, a fair amount of stone may be expected from these; immediately the price begins to drop, however, production will for the most part cease.

3. The third class of claim-holder may be altogether ignored both from a battery-supporting stand-point and a field-developing point of view. The time is not far distant when the convenient and easily obtained surface stone will cease to exist, and when the energy and time expended will not be sufficient to produce enough to satisfy the demands of the most lenient creditor.

THE CLIMATE AND GENERAL LIVING CONDITIONS.

Considering the tropical situation of Marranboy the climatic conditions may be proclaimed excellent. The months of May, June, July, and August could be classed as temperate, the temperature falling as low as 44 degrees during the early morning, rising gradually and reaching the maximum shortly after noon. Of the twelve, the months of February, March, November, and December are the most trying, the temperature ranging from 75 during the night and early morning to about 101 at midday. The months of January, April, September, and October are pleasant.

An occasional shower in November and early part of December heralds the approach of the "wet" season. The heavy rain, falling in frequent showers, falls during the latter part of December, January, and early February, when the heavy showers give place to lighter ones falling occasionally, and often as late as May. The recorded rainfall for the "wet" season 1915-16 was 47 inches.

During the 1914-15 rainy season, owing to transport facilities being inadequate, stores of all kinds were exceedingly scarce. This, coupled with the fact that little or no provision had been made in the way of kitchen gardens, and the consequent lack of vegetables, combined with the absence of fresh beef, gave rise to general ill-health. This state of affairs has, to a great extent, been remedied, and during the last spell of wet

weather locally grown vegetables, such as pumpkins, water melons, and beans, with a more plentiful supply of fresh beef, resulted in a much improved state of general health.

THE CLASS OF LABOUR.

Generally speaking, men of long residence in the Territory employed here during the construction, and subsequently performing physical labour, may be classed as slow and inefficient. This may be due largely to a process of elimination whereby the better class of labour is able to remain amid congenial surroundings, leaving the unfit to satisfy outside requirements. The more recent arrivals from other States are a decided improvement, but very few could be classed as good. Labour of any class is very scarce locally.

THE EFFICIENCY OF THE CONCENTRATING MILL.

Crushing operations at the battery were begun on the 2nd of January of this year after a preliminary run of a few hours during the last day or so of December. Since starting the mill has run one shift continuously, with the exception of ten and a half days lost during May owing to shortage of ore. The production of ore has not at any time warranted the running of more than one shift.

The efficiency of the plant is exceedingly high as regards recoveries, which range from 90 per cent. to 97 per cent. extraction. The capacity has been moderate, owing to the extraordinarily hard and tough nature of most of the ores treated, and the necessity of very fine grinding. The capacity ranges from 0.7 to 20 tons per shift, according to the class of ore treated. If necessary, the capacity could be slightly increased by bringing into regulation the third grinding pan, two only being in use at present.

CONCLUSIONS.

Based on the work done and values proved, there is every reason to believe that the Marranboy field will be permanent. I am not aware of a single instance where, in the main lode channels, the lodes or veins have cut out at depth, although this may not be taken as final until the continuity of the lodes has been proved to a depth of at least two or three hundred feet; also the length of the shoots of tin has yet to be proved, for, so far, no driving has been done underground for a greater length than about 50 feet. To sum up, developmental work has been so far that it is impossible to state definitely the permanency or otherwise of the field, but the indications are very favorable.

The life of the field will depend on the economical working and handling of the lower grade ores, say, from 11 per cent. to 4 per cent. This means capital and efficient labour.

At present the progress of the field depends almost wholly upon class one of the claim-holders; classes two and three are not likely to produce much ore.

I anticipate difficulty in running one shift continuously, as I find that at the present rate of crushing and ore production the mill will catch up to the miners in about three months. During the past five months all ore raised has been treated, together with about 1,100 tons of that which had accumulated prior to the commencement of the crushing operations. I estimate the ore at grass at 900 tons, this including the ore already carted and awaiting treatment.