SESS. II.—1884.
NEW ZEALAND.

EAST AND WEST COAST RAILWAY,

MIDDLE ISLAND, PROPOSED

Presented to both Houses of the General Assembly by Command of His Excellency.

MEMO. for the Hon. the MINISTER for PUBLIC WORKS.

Public Works Office, 29th September, 1884.

HEREWITH I beg to forward for your information a report by the Assistant Engineer-in-Chief on the above subject.

The report is so full, and the facts so clearly summarized, that it will be unnecessary for me to make any additional remarks; it is also illustrated by complete plans and sections, which will assist materially in conveying a clear picture of all the information which has been collected on this difficult problem.

I have, &c.,
J. BLACKETT,
Engineer-in-Chief.

The ASSISTANT ENGINEER-IN-CHIEF to the ENGINEER-IN-CHIEF.

SIR,— Wellington, 12th September, 1884.

In continuation of the remarks in my annual report, I have the honour to submit the following report on the results of the surveys for the Middle Island East and West Coast Railway, undertaken during the past year, and which have just been completed:—

CHARACTER OF SURVEYS AND ESTIMATES.

Surveys.—Although only preliminary surveys, they are more in detail than usual. The lines have been pegged out at short intervals, gradients have been carefully run, and cross-sections taken in rough ground, and a traverse has been made of each line for its entire length. The information is, therefore, very complete, and the estimates based on the surveys may be accepted with considerable confidence.

Gradients and Curves.—The surveys have all been made on the same basis, the steepest gradient for the permanent line being 1 in 50, and the sharpest curve 7½ chains radius.

Alternative Lines.—Alternative lines, with steeper gradients, to be worked by stationary or Fell engines, have also been surveyed at the crossing of the main range on the Hurunui and Arthur's Pass routes. These were intended as a temporary expedient, to save the cost of the long tunnels till the traffic develops; but, as will be seen further on, the first saving is not sufficient to counterbalance the extra cost of working the inclines and the ultimate loss in abandoning them.

Estimates.—The estimates have all been prepared on the same basis, consequently a correct comparison can be made between the relative cost of the lines. Prices have been fixed higher than the rates at present ruling in the colony, and the works can possibly be reduced in the permanent setting-out: still, it is better to allow a considerable margin for large slips and other contingencies that will in all probability arise in constructing a railway through such rough country.

ROUTES.

As stated in the annual report, four main routes have been surveyed, as follows:—

1. *Cannibal Gorge Route.*—From the Red Post, on the Amuri Plains, *viâ* the Waiau Valley, Lewis Saddle, and Cannibal Gorge, to Reefton.

2. *Hurunui Route.*—From Hawarden, near Waikari, *viâ* the Hurunui Saddle, to Bruce's Paddock, in the Teremakau Valley.

3. *Arthur's Pass Route.*—From Springfield, *viâ* the Waimakariri and Arthur's Pass, to Bruce's Paddock, in the Teremakau Valley.

4. *Lake Lyndon Route.*—From Homebush, on the White Cliffs Branch, *viâ* Hororata, the Rakaia and Acheron Valleys, Lake Lyndon, and Craigieburn, to the Cass where it merges into the Arthur's Pass route.

Continuation to Brunnerton.—The continuation of the line from Bruce's Paddock to Brunnerton is common to both the Hurunui and Arthur's Pass routes. It goes by the western side of Lake Brunner and the Arnold Valley.

Amuri Pass.—In addition to the above a reconnaissance survey has been made of the Amuri Pass, to ascertain the length of the tunnel through the main range, and otherwise to determine the general character of the works.

Description of Lines.

Cannibal Gorge Route.—This line commences at a point in the northern extension of the main line, through the Amuri Plain, 2 miles 54 chains from the end of the Balmoral section, now in progress, 71 miles 42 chains from Christchurch, and near to the Red Post. It follows up the valleys of the Waiau, Hope, Boyle, and Lewis to the main range, which is crossed by a long tunnel under the Lewis Pass. The line comes out on the Maruia River, at the upper end of the Cannibal Gorge, then follows down the river to the Maruia Plains. The plain is crossed in a tolerably direct course to the Rahu River, which is followed up to the Grey Saddle. After crossing the saddle the line skirts the foot of the hills above the Mary River for a short distance, and, doubling on itself, ascends to the Rahu Saddle, which is crossed by an open cutting. From this point to Reefton the course is down the valley of the Inangahua River. The present survey of this route has not been carried beyond Reefton, as the remaining portion to Brunnerton had previously been surveyed in connection with the proposal to construct a railway from Nelson to Greymouth.

The Cannibal Gorge line ascends with tolerable regularity from its commencement on the Amuri Plain to the Lewis Saddle, which is tunnelled at an altitude of 2,550 feet. After this comes a descent to 1,430 feet on the Maruia Plains, a rise to 2,200 feet at the Rahu Saddle, and finally a descent to 640 feet at Reefton, which is 20 feet higher than the starting point on the Amuri Plain.

As pointed out by the Royal Commission last year, the greatest difficulty in the way of easy gradients is the ascent from the Maruia Plains to the Rahu Saddle. The saddle is too flat to tunnel to advantage, and there is no suitable ground in the direct course on which to run out a gradient. The railway as surveyed doubles on itself two miles; the distance in a straight line between two points four miles apart by the railway being only about 35 chains. Notwithstanding this highly-objectionable feature, it has been necessary to introduce a 5-chain curve and increase the gradient to 1 in 40 to bring the work within practical limits. It is impossible to get a good line at this place without a large expenditure, unless a zigzag is introduced, and this is anything but a desirable expedient. So far as crossing the main range is concerned, the difficulties on the Cannibal Gorge route are less than on any of the others; but this is balanced by the heavy works on the subsidiary range that forms the watershed between the Maruia and Inangahua Rivers, the country on both sides of the Rahu Saddle being very rough. There is also a considerable extent of heavy work on the eastern side of the main range, more particularly in the vicinity of the Hope and Waiau Junction.

Taking it only to Reefton, the point to which the estimates are made in detail, the total grading on the Cannibal Gorge line is somewhat more than on the other lines right through to Brunnerton, the item earthwork being considerably larger. On the other hand the bridging is very much less—only about one-half.

Altogether there are sixteen tunnels on the line between the Red Post and Reefton, of the aggregate length of 3 miles 64 chains: four on the eastern side of the range, 1 mile 6½ chains; the summit tunnel through the Lewis Saddle, 2 miles 15½ chains; and eleven in the Cannibal Gorge and at other places in the Maruia Valley, 42 chains in total length. Three of the tunnels on the eastern side are respectively 40, 32, and 12½ chains long; all the others on both sides are very small, they are scarcely worth calling tunnels, being only from 2 to 6 chains long.

Including 2 miles 54 chains of the northern line not yet begun, and 1 mile 30 chains partly done at the Brunnerton end the total length of railway to make by the Cannibal Gorge route is 142 miles. The estimated cost, including all charges necessary to complete and equip the line, is £1,875,000—say, £13,200 a mile. This estimate is worked out in detail for the portion between the Red Post and Reefton; but the remainder of the distance to Brunnerton is only taken at an average rate per mile.

Hurunui Route.—This line leaves the main trunk railway near the new Township of Hawarden, on the Horsley Downs, 53 miles 34 chains from Christchurch. It strikes across the open country to the Waitoha Gorge, ascends the Waitoha to the saddle, and by a tunnel reaches the Hurunui Valley, which is followed right up past Lake Sumner to the source of the river in the main range. The pass is pierced by a tunnel, which brings the line into the head-waters of the Teremakau River. The Teramakau Valley is then followed down on the northern side to a point opposite Jackson's, about seven miles below the Otira Junction, where the Arthur's Pass and the Hurunui routes merge into each other.

Commencing at an altitude of 780 feet the line soon begins to rise, reaching an elevation of 1,530 feet at the Waitoha Saddle. It then falls to 1,370 feet at the point where the Hurunui River is struck, after which there is an almost continuous rise, with occasional pieces of level, all the way to the main range, the summit level being 2,360 feet. From the pass the line descends rapidly westward,—the 1-in-50 gradient having scarcely a break for fifteen miles,—till the river-bed is reached at a level of about 800 feet. After this, to the junction with the Arthur's Pass line, at 530 feet, the line follows generally the fall of the river, with occasional rises to get over shingle-fans.

Although no special difficulty is met with on the eastern side of the range on the Hurunui route, there is a large amount of heavy work, more particularly at the Waitoha Saddle and Upper Hurunui Gorge. The summit tunnel is longer than at any of the other passes, and the works on the western incline are very much heavier, the heaviest on any equal length of railway hitherto surveyed in the colony. Practically there is simply an alternation of tunnel and viaduct for a considerable distance. In 12 miles there are nearly 8½ miles of these two works.

Including a small one of 5 chains 20 yards in the Arnold Valley, there are in all thirty-four tunnels on the Hurunui line, of the aggregate length of 9 miles 60½ chains: seven on the eastern side, 1 mile 19 chains 17 yards; the summit tunnel 3 miles 35 chains 7 yards; and twenty-six on the Westland side, 5 miles 5 chains 9 yards. One of the latter is 1 mile 32½ chains, and another 76 chains long; altogether there are eight tunnels on the line 20 chains and upwards.

The item bridging is also a very heavy one. In addition to ordinary stream and river bridges, there are nine iron and thirteen timber viaducts over 50 feet in height, the total length of which is 1 mile 30 chains.

Including the continuation of the line from Bruce's Paddock to Stillwater, and 1 mile 30 chains between Stillwater and Brunnerton, the total length of railway to make by the Hurunui route is 101 miles. The estimated cost, including rolling-stock and all other charges necessary to complete the line, is £1,408,000—say, £14,000 a mile.

Hurunui Route, Alternative Line.—With the view of obviating or postponing the construction of the long tunnel an alternative line has been surveyed over the Hurunui Pass. It is 3 miles 55 chains long. The eastern incline is 2 miles 55 chains, with gradients ranging generally from 1 in 9½ to 1 in 41. There are 25 chains of level on the top, after which comes the western incline of 55 chains, with gradients from 1 in 2 to 1 in 14; the average for the first 30 chains being 1 in 2·3. Although the general direction is tolerably straight, there are a considerable number of 10-chain curves on the summit line, which will increase the difficulty of working.

The line has four tunnels, the total length of which is 38 chains 17 yards, but the other works are comparatively light.

The estimated saving to be effected in making a surface line, instead of a long tunnel, at the Hurunui Pass is £280,000, and the value of the works on it ultimately to be abandoned, £88,000.

From the peculiarity in the alignment and levels of the summit line the cost of working would be very great. There must be a rope traction at the western incline, but this method cannot well be extended to the eastern one, which is better adapted for a Fell locomotive; and to have three systems at work on the one railway is simply out of the question.

Arthur's Pass Route.—As the section onwards from Bruce's Paddock is a direct continuation of the Arthur's Pass Route the two will be considered together as the through line. The plan and sections accompanying this report are also prepared on this basis.

Commencing at Springfield Railway Station, 43 miles 66 chains from Christchurch, the Arthur's Pass line sweeps across the open terrace to the Kowhai Bush, and strikes the Waimakariri River near Paterson's Creek. The Waimakariri is then followed up to the Broken River, which is crossed close to the mouth and followed up to Sloven Creek. The course from thence is by the Sloven Valley, St. Bernard Saddle, and Lake Sarah to the Cass. The Waimakariri is crossed near Goldney's Saddle, and followed up to the Bealey, which in turn brings the line to the main range at Arthur's Pass. The saddle is pierced by a long tunnel coming out in the Otira Gorge, near the foot of the "Zigzag." From this point the line follows the southern slopes of the Otira and Teremakau Valleys to a point near Jackson's accommodation-house, where the Teremakau is crossed. The northern bank of the river is then followed to Bruce's Paddock, after which there is a straight run to the head of Lake Brunner. The line skirts the western side of the lake to the Hohonu Creek, and, sweeping round the spur into the valley of the Arnold, follows it down to the Grey. A junction is made with the authorized Greymouth–Nelson Creek Railway, near Stillwater, 1 mile 30 chains from Brunnerton.

The Arthur's Pass line commences at a level of 1,260 feet at Springfield, and rises, with very few downward gradients, to 2,040 feet at St. Bernard's Saddle. Thence to the Waimakariri there is a fall, with long undulations, to 1,800 feet, the level at the crossing, after which the rise right to the main range is almost without interruption, the level at the summit being 2,530 feet. The descent westward begins at the eastern end of the tunnel, and continues for about seventeen miles, till the Teremakau River-bed is reached, at a level of 690 feet. After this comes a gradual fall to 300 feet along the shores of Lake Brunner, a rise to 480 feet opposite the foot of the lake, and finally a fall to 100 feet at the terminating point in the Grey Valley.

In order to get better places to enter, and a level piece for the commencement of the summit line, the gradient of the long tunnel at Arthur's Pass has been increased to 1 in 44. This, on a straight line, is quite as easy as the 1 in 50 on 7½-chain curves in the open. Still, if considered desirable, the 1 in 44 could be made into 1 in 50 without materially increasing the work.

The rough country on the Arthur's Pass route commences soon after leaving Springfield; but there are no special works in the first five miles except a large viaduct and heavy earthworks at the crossing of the Kowhai. The line strikes the Waimakariri Gorge at the sixth mile, and from thence to the Sloven Valley, at the fourteenth mile, the country is very difficult, and the works exceptionally heavy. From Sloven Creek to the head of the Bealey, a length of thirty miles, the works are very light: there were only two heavy cuttings on the whole distance. The Arthur's Pass summit tunnel is somewhat shorter than the Hurunui one, and, although still exceedingly heavy, the works on the western incline bear no comparison with the corresponding ones on the Hurunui route. The continuation of the line from the Teremakau to Brunnerton, common to both the Hurunui and Arthur's Pass routes, runs through very easy country. With the exception of a few small cuttings

near Lake Brunner, and a short tunnel in the Arnold Valley, there are no works worth mentioning.

Altogether there are twenty-four tunnels on the Arthur's Pass route, of the aggregate length of 5 miles 30 chains 7 yards: eleven on the eastern side, 1 mile 35 chains 20 yards; the summit tunnel, 3 miles 16½ chains; and twelve on the Westland side, 57 chains 20 yards. One of the tunnels on the eastern side is 24 chains long, and there are three between 15 and 20 chains; but all the others on the line are 11 chains and under.

The bridging is very much less than on the Hurunui route, still it forms a considerable item. In addition to ordinary stream and river bridges, there are fourteen iron viaducts over 50 feet in height, the total length of which is 72 chains.

Including the continuation of the line from Bruce's Paddock to Stillwater, and 1 mile 30 chains between Stillwater and Brunnerton, the total length of railway to make by the Arthur's Pass route is ninety-five miles. The estimated cost, including rolling-stock and all other charges necessary to complete the line, is £1,505,000—say, £15,900 a mile.

Arthur's Pass Route, Alternative Line.—As in the case of the Hurunui route, an alternative line, with steep gradients, has been surveyed over Arthur's Pass: it is 3 miles 34 chains long. The eastern incline is 1 mile 36 chains long, with gradients ranging from 1 in 7 to 1 in 50. There are 8 chains of level at the top, after which comes the western incline, 1 mile 70 chains, with gradients from 1 in 5 to 1 in 50. With the exception of a short flat curve at each end, the summit line is straight throughout.

The works on the line are very heavy. They consist of four tunnels, 29 chains long; four trestlework viaducts; a large amount of rock-cutting; and high retaining-walls.

The estimated saving to be effected in making a surface-line, instead of a long tunnel, at Arthur's Pass, is £177,000; and the value of the works on it, to be ultimately abandoned, is £130,000.

So far as the alignment and the arrangement of the inclines are concerned, the surface-line is quite workable, and the one system of rope-traction could be adopted throughout. Furthermore, the machinery to work the inclines might possibly be driven by water-power, of which there is an abundant supply. On the other hand, the saving to be effected in the first instance is scarcely worth considering when compared with the amount to be ultimately thrown away, and the inconvenience and expense of a break in the traffic.

Lake Lyndon Route.—This route commences near Hororata, on the surveyed Canterbury Interior main line, four miles from Homebush and thirty-nine miles from Christchurch. For about eight miles it follows the Canterbury interior line, then strikes up the Rakaia Valley to Windwhistle, and from thence along the slopes of the Big Ben Range, and by the Upper Acheron Valley, to Lake Lyndon. After this it follows generally the course of the Hokitika Road, past Castlehill, Craigieburn, and Lake Pearson to the Cass, where it merges into the more direct Arthur's Pass route by Waimakariri Gorge, already described.

The line commences at Hororata at a level of 630 feet, and, with few interruptions, rises to 2,700 feet at the Lake Lyndon Saddle. Then comes a fall to 2,220 feet near the Broken River, a rise to 2,520 feet at the Craigieburn Saddle, and finally a fall to 1,910 feet at the Cass.

The object in surveying the Lake Lyndon deviation was to avoid the heavy works in the Waimakariri Gorge on the direct route. The anticipations with reference to it have not been realized: the works are much heavier than was expected, and on the direct route they are much lighter; consequently the balance even in cost is in favour of the latter. For this reason it is unnecessary to discuss the Lake Lyndon line in detail. All the works are heavier than on the Waimakariri route, the bridging in particular being very much in excess.

The heaviest bridging occurs at the head-waters of the Selwyn, where there is a break in the range. A better line might possibly be got by following the Selwyn all the way down from this point to the White Cliffs; but, under any circumstances, the balance of advantages will be largely in favour of the direct Waimakariri route.

Taking the Lake Lyndon route and its continuations as a through line from Christchurch to Brunnerton, the total length of railway to make is 126 miles, and the cost completed and fully equipped is estimated at £1,994,000—say, £15,800 a mile.

Amuri Pass Route.—This line, of which a complete survey has not been made, leaves the Cannibal Gorge route at the confluence of the Doubtful and Lewis, follows up the Doubtful to its source in the Amuri Pass, and by a long tunnel reaches the head-waters of the Ahaura. The descent westward is made by the southern slopes of the Ahaura, the river-bed being reached near the Tutaekuri Junction. The Ahaura Valley is then followed down to the Kopara Flats, where the line strikes off to the Kopara Lakes; from thence it reaches the Grey Valley by the Nelson Creek or the Arnold.

The length of the tunnelling through the main range on the Amuri route is much the same as at Arthur's Pass; but the works on the western incline will, in all probability, be considerably lighter, for the slope of the mountains is flatter and more regular. There will, however, be heavy bridging on a long double-back at the Tutaekuri. The portions of the line not already referred to, not included in other routes, pass through very easy country.

Without a complete survey it is impossible to give a decided opinion on the subject; but the probabilities are that this will be found one of the cheapest routes. The distance to make is about 104 miles, and an approximate estimate £1,300,000, or £12,500 per mile.

As will be seen further on, the great objection to the Amuri Pass route is that it does not shorten the distance between any of the principal points that require to be connected.

Comparison of Routes.

As compared with former investigations, the general results of last year's surveys are—that the Cannibal Gorge route is found to be somewhat more difficult than was expected, and the Lake Lyndon one much more difficult; that the Hurunui route is somewhat easier; and the Amuri and Arthur Pass routes very much easier than the previous information led us to expect.

One of the most important considerations in selecting a route for a railway between the East and West Coast is the distance to travel between the principal centres. The following statement enables a comparison to be readily made :—

Table of Distances.

From	By Lewis Pass. Cannibal Gorge Route.		By Hurunui Pass. Hurunui Route.		By Arthur's Pass. Waimakariri Gorge Route.		By Arthur's Pass. Lake Lyndon Route.		By Amuri Pass. Arnold Route.	
	M.	c.	M.	c.	M.	c.	M.	c.	M.	c.
Brunnerton to Christchurch ...	210	56	154	18	138	22	160	30	172	72
Brunnerton to Rolleston ...	221	72	165	34	124	18	146	26	184	08
Reefton to Christchurch ...	171	26	190	68	174	72	197	00	209	42
Reefton to Rolleston	182	42	202	04	160	68	182	76	220	58

The distances by the Amuri Pass from Reefton to Christchurch and Rolleston would be shortened eight miles if the line were taken by Nelson Creek instead of the Arnold; but the latter is the easier route.

Distances are given in the table to Rolleston as well as to Christchurch, because it is the collecting and distributing point for the traffic on the lines that come in south of Christchurch, and a correct comparison cannot be made without giving the distance by all the routes to this place.

The above statement shows that, in the matter of distance between the principal centres, Arthur's Pass route has greatly the advantage; the only exception is between Christchurch and Reefton; and even there the difference in favour of the Cannibal Gorge route is only about three and a half miles.

In my report of 1879 I pointed out the importance of shortening the distance from the West Coast to the populous districts south of Christchurch, and with this object suggested the construction of a direct line from the Arthur's Pass route, near Sheffield, to the main trunk line at the north bank of the Rakaia. This would still further reduce the distance to the southern districts by that route, the amount of the saving being fully twenty miles. This point, and the general superiority of the Arthur's Pass route in respect to length, are more clearly brought out by the following statement :—

	Miles.
From Rakaia to Brunnerton by Cannibal Gorge	243
From Rakaia to Brunnerton by Arthur's Pass	125
Balance in favour of Arthur's Pass	118
From Rakaia to Reefton by Cannibal Gorge	203
From Rakaia to Reefton by Arthur's Pass	162
Balance in favour of Arthur's Pass	41

So far as the districts north of Christchurch are concerned, the line just opened between Oxford and Malvern brings them within easy access of the Arthur's Pass route, the distance from Sheffield to Ashley *viâ* Oxford being somewhat less than that to Christchurch, *viâ* Rolleston.

Another strong argument in favour of the Arthur's Pass route is, that it comes nearer Hokitika and other places south of the Grey than either the Amuri or Cannibal Gorge lines.

The other more important points of comparison between the rival routes are shown by the following table :—

Route.	Length to make.	Estimated Cost.	Greatest Altitude.	Length of Main-range Tunnel.
	Miles.	£	Feet.	M. c.
Cannibal Gorge	142	1,875,000	2,550	2 15½
Hurunui Pass	101	1,408,000	2,360	3 35⅓
Arthur's Pass	95	1,505,000	2,530	3 16½
Lake Lyndon	126	1,994,000	2,700	3 16½
Amuri Pass (figures approximate)	104	1,300,000	2,400	3 0

In the above statement, and otherwise throughout this report, Brunnerton is taken as the western terminus of the proposed railway. If, however, we assume that the connection of Reefton with the East Coast is a condition, the cost of the two lines that come most into competition will stand thus:

Christchurch to Reefton and Brunnerton *viâ* Cannibal Gorge	...	£1,875,000
Christchurch to Brunnerton and Reefton *viâ* Arthur's Pass	...	1,866,000

CONCLUSION.

It is unnecessary in this report to discuss the questions of traffic likely to be developed, or the country to be opened up, by the various routes proposed for the East and West Coast Railway, as the subject has been fully considered in the Royal Commission's report of last year. It is also referred to in my own report of 1879.

The information obtained by the recent surveys, particulars of which are given herein, confirms more strongly than ever the conclusion in my report of 1879, and which is endorsed by the Royal Commission, that "the maximum amount of facilities for transporting the West Coast products to a market is afforded by the Arthur's Pass route."

The line which has been most strongly advocated, as against the Arthur's Pass route, is the one by Cannibal Gorge. In my opinion there is no comparison between them. With the single exception of the amount of tunnelling through the main range, every point is in favour of the former; and, if it is decided to construct a railway between the east and west coast of the Middle Island, I unhesitatingly recommend the Arthur's Pass route.

This report is accompanied by a general map, and a series of sections showing the line and levels of the various routes surveyed during the past year. The Amuri line is not shown, the survey not being in detail like the others.

I have, &c.,
W. N. BLAIR.

By Authority: GEORGE DIDSBURY, Government Printer, Wellington.—1884.

MIDDLE ISLAND

SKETCH PLAN

of the various Routes

for the

EAST AND WEST COAST RAILWAY

SURVEYED IN 1883-1884.

Scale.

5 0 5 10 15 20 25 30 35 MILES.

Reference

- Railways made
- " " in progress
- " " authorized
- Cannibal Gorge Route
- Hurunui " " " "
- Arthurs Pass
- " Waimakariri Gorge Route
- " Lake Lyndon " "

TABLE OF DISTANCES

From	BY LEWIS PASS Cannibal Gorge Route		BY HURUNUI PASS Hurunui Route		BY ARTHURS PASS Waimakariri Gorge Route		BY ARTHURS PASS Lake Lyndon Route	
	M.	C.	M.	C.	M.	C.	M.	C.
Brunnerton to Christchurch	210	56	154	18	138	22	160	30
Brunnerton to Rolleston	221	72	165	34	124	18	146	26
Reefton to Christchurch	171	26	190	68	174	72	197	00
Reefton to Rolleston	182	42	202	04	160	68	182	76

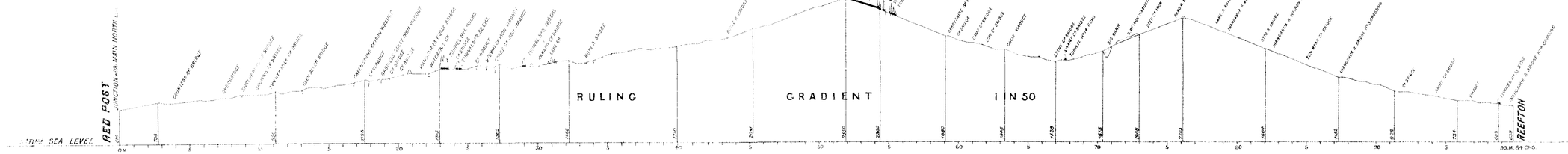
Photolithographed at the General Survey Office, Wellington, N.Z. September, 1884.

MIDDLE ISLAND SECTIONS

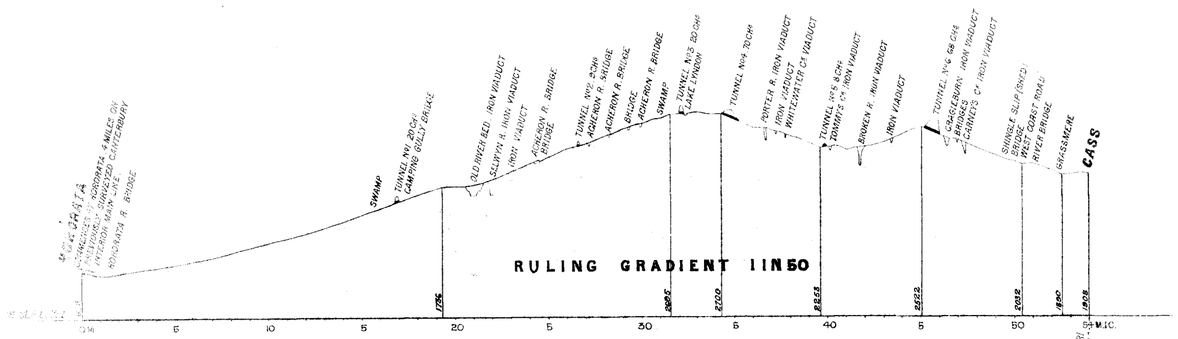
of the various Routes for the

EAST and WEST COAST RAILWAY

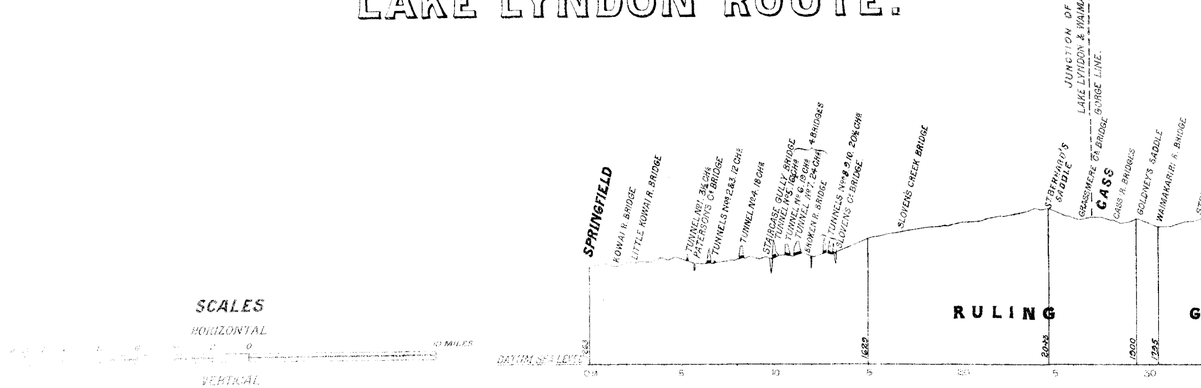
SURVEYED IN 1883-1884.



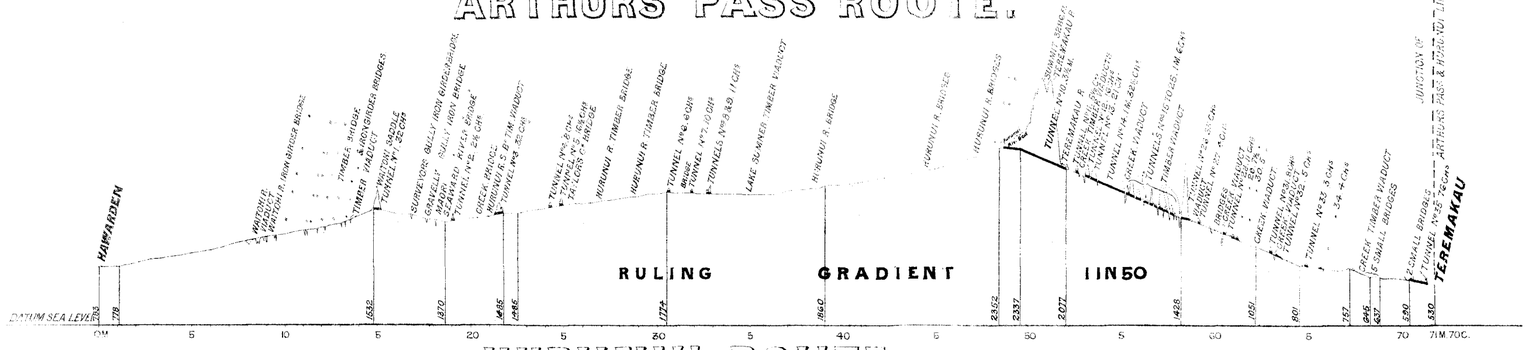
LEWIS PASS ROUTE.



LAKE LYNDON ROUTE.



ARTHUR'S PASS ROUTE.



HURUNUI ROUTE

Photolithographed at the General Survey Office, Wellington N.Z. September 1884.