D.—No. 6H.

FURTHER PAPERS

RELATING TO THE

CONSTRUCTION OF RAILWAYS.

(SOUTH ISLAND).

IX.—REPORTS AND ESTIMATES ACCOMPANYING PARLIAMENTARY SURVEYS.

PRESENTED TO BOTH HOUSES OF THE GENERAL ASSEMBLY BY COMMAND OF HIS EXCELLENCY.

WELLINGTON.

1871.

SCHEDULE OF CONTENTS.

FURTHER PAPERS RELATING TO CONSTRUCTION OF RAILWAYS.

INVERCARGILL TO MATAURA.

No. 1.

Mr. BRUNTON to the Hon. W. GISBORNE.

SIR,— Princes Street, Dunedin, 28th February, 1871.

I have the honor to forward, accompanying this, plan, section, and estimate of that section of the Otago Southern Trunk Railway situated between Invercargill and the Mataura River.

It is rarely that the natural features of a country are so favourable to railway construction as this is; and it is with every confidence that I state a good single line, 3 feet 6 inch gauge, with the necessary sidings, &c., can be made and equipped for £2,500 per mile, including a substantial bridge over the Mataura River.

It will be seen that I have crossed the Mataura at the Gore township and not at the Falls. There is no question but that, from the formation of the country between these two places and the Clutha, a line of railway, when brought from the latter place to the Mataura, will have to come to or near this point.

The steepest inclination is 1 in 71; the sharpest curve is 12 chains radius.

I have based my calculations on using in all structures such as bridges and culverts, the best Tasmanian blue gum, as far more durable than our indigenous timber suitable for bridge work. Indeed, the length of its durability, if properly fixed, experience has not yet ascertained. Using stone or brick in these structures would add largely to expense.

Good clean gravel for ballast can be obtained on the whole length of the line. The two heaviest cuttings, at 20 miles 45 chains, and 28 miles 20 chains, respectively, will principally be through such material.

Sleepers will be of totara, sawn, and free from sapwood. Similar sleepers have been in use seven years on the Invercargill and Bluff Railway, and are at present perfectly sound.

I have estimated the prices of rolling stock and permanent way materials from English prices of latest date, adding ample for cost of transit to Invercargill.

The line passes through—

	Miles	chains.
Land reserved for Government purposes	5	33
Purchased by Australian and New Zealand Land Company	22	79
Owned by small settlers	11	68
	40	20

The Australian and New Zealand Land Company, I believe, have notified their intention to Government of giving the land required for this railway without charge, leaving land for making 11 miles 68 chains of railway to be negotiated for (commencing at 1 mile 4 chains and terminating at 10 miles 46 chains, and again at 36 miles 48 chains and terminating at 38 miles 74 chains)—about 94 acres—very little of which is otherwise than in its original state. I have placed £1,000 on the estimates for this purpose, but have confidence that this amount will exceed that required when arrangements with landholders shall have been made.

Until negotiations are concluded with owners of land, it is impossible to state accurately the amount of accommodation required by them in respect to level crossings. On the Australian and New Zealand Land Company's property, a distance of 22 miles 79 chains, I have estimated for nine, exclusive of public roads, and have the honor to attach copy of letter received from their representatives in this Province in respect to the same; and I am of opinion that the number over the whole line that are provided will be found to be adequate for the requirements, and satisfactory to the owners of property through which the line passes.

I have, &c.,

The Hon. the Colonial Secretary, Wellington. WM. BRUNTON, C.E.

Enclosure 1 in No. 1.

Messrs. GRAY, RUSSELL, and Co. to Mr. BRUNTON.

New Zealand and Australian Land Company (Limited),

SIR,— Dunedin, 7th March, 1871.

We are favoured with your letter of this date, and have to reply that we will be quite satisfied with the nine occupation level crossings provided by you on the proposed Invercargill and Mataura Railway for the Company's use, as approved of by Mr. Brydone—it being understood that, in the event of the Company desiring to alter the position of any of the crossings, it will be acceded to.

Yours, &c.,

GEORGE GRAY, RUSSELL, AND CO.,

W. Brunton, Esq., C.E. Agents.

Enclosure 2 in No. 1.

APPROXIMATE ESTIMATE—Otago Southern Trunk Railway.

Invercargill and Mataura Section—length, 40 miles 20 chains; single line of railway, 3 feet 6 inch gauge; weight of rails, 36 lbs. to the yard.

				£	s.	d.
Earthwork—						
Main Line	... 232,478 cub. yds.					
Deviations and Approaches	... 21,412 „					
Stations and Sidings ...	... 14,000 „					
	267,890,	at 1s. 1d. per cubic yard	...	14,510	14	2
Ballast—						
Main Line	... 88,550 cub. yds.					
Stations and Sidings ...	... 4,400 „					
	92,950,	at 1s. 8d. per cubic yard	...	7,745	16	8
Rails—						
Main Line	... 2,295 tons					
Stations and Sidings ...	... 114 „					
	2,409,	at £9 per ton	... ...	22,885	10	0
Dog-spikes, Fish-plates, and Bolts—						
Main Line	... 91 tons					
Stations and Sidings ...	... 4½ „					
	95½	at £10 per ton	... ...	955	0	0
Sleepers—						
Main Line	... 85,008 sleepers					
Stations and Sidings ...	... 4,224 „					
	89,232,	at 2s. each	... ...	8,923	4	0
Mls. chs.						
Bridges at 0 16, superstructure to be renewed			... ...	200	0	0
„ 1 34, one 25 feet span	... ...			150	0	0
„ 5 70, three 25 feet span	... ...			450	0	0
„ 9 7, one 25 feet span	... ...			150	0	0
„ 25 51, two 25 feet span	... ...			300	0	0
„ 31 56, three 30 feet span	... ...			540	0	0
„ 36 49, one 15 feet span	... ...			90	0	0
„ 40 11, twenty 30 feet span	... ...			4,000	0	0
Culverts, seventeen 3-feet openings at £28 each	... ...			476	0	0
„ four 4-feet openings at £30 each	... ...			120	0	0
„ one 5-feet opening at £35	... ...			35	0	0
„ eight 6-feet openings at £45 each	... ...			360	0	0
„ two 10-feet openings at £65 each	... ...			130	0	0
Level Crossings, Gates, &c., twenty-five at £20 each	... ...			500	0	0
Fencing Ditch and Bank, eighty miles at £15 per chain	... ...			4,800	0	0
Points, Switches, and one Turntable	... ...			1,500	0	0
Laying Permanent Way, Main Line, 40 miles 20 chains at £50 per mile	... ...			2,012	10	0
Stations and Sidings, 2 miles at £50 per mile	... ...			100	0	0
Rolling Stock—						
Four Locomotives at £1,500 each	... ...			6,000	0	0
Four composite Carriages at £300 each	... ...			1,200	0	0
Forty open Goods Waggons at £85 each	... ...			3,400	0	0
Ten covered Goods Waggons at £110 each	... ...			1,100	0	0
Two Break Waggons at £150 each	... ...			300	0	0
Stations—						
Six Platforms and Sheds at £250 each	... ...			1,500	0	0
Water Tanks	... ...			300	0	0
Land—Purchase of about ninety-four acres	... ...			1,000	0	0
Engineering expenses	... ...			4,250	0	0
Contingencies, 10 per cent.	... ...			8,980	0	0
Total	... ...			£98,963	14	10

MATAURA TO CLUTHA.

No. 2.

Mr. BRUNTON to the Hon. W. GISBORNE.

SIR,— Princes Street, Dunedin, 6th July, 1871.

I have the honor to forward with this plan section and estimate of the "Long Ford" and "Clutha" section of the Otago Southern Trunk Railway.

In a former report on the country over which the Invercargill and Long Ford section of this line runs, I characterized it as one rarely to be met with for favourable features in railway construction. The character of the country now in question is much the reverse; it being difficult from its irregularities, and involving a largely increased amount of earthwork, in order to obtain a line not having by steep grades a permanent bar to its success. This after many trial sections I have been able to obtain, as will be seen from the section and plan, the steepest gradient being 1 in 92, and the

sharpest curve 10 chains radius; the estimated cost of which, including rolling stock, is £3,421 per mile.

I have based my estimates on using the same material in the construction of bridges and culverts, viz., blue gum, as I did on section from Invercargill to Long Ford, excepting the abutments of bridges carrying public roads over railway, which will be of rubble masonry, and constructed for double line of railway.

In order to obtain the best line, I have kept the low ground between the spurs running from ranges of hills. A great portion of the present surface is covered in floods which rise and fall gradually, and without any strong current endangering earthwork; and I have kept the line at such a height as to be well out of the reach of such floods, and made ample provision for the escape of the waters to their natural outlet.

Most of the roads crossed on this section are at present unformed (only reserved on survey plans), and no road is raised or lowered to cross it on a level to a degree to injure its utility. All roads on this section have steep grades in them, as bad as 1 in 12; I estimate all approaches to railway line to be not greater than 1 in 20.

You will see that the price of earthwork is increased 2d. per yard above earthwork on section Invercargill to Long Ford; the extra length of lead from cuttings to the embankments, also the extra height of the embankments where they have to be formed from side-cuttings, necessitate this. The ballast is also increased 4d. per yard. I have every confidence that good gravel ballast can be obtained, but it is not so plainly visible as over the section from Invercargill to Long Ford. The price of sleepers I have also slightly increased, as but little timber suitable is near the line on the section.

I have estimated the same rolling stock for the fifty miles as I did for the Invercargill and Long Ford section of forty miles in length; at first I should not consider it necessary to order this stock, letting that already estimated for do the work, and only ordering additional as it is found the traffic increases. The largest and most expensive work on this section is the crossing of the Clutha, estimated at £7,000. I should strongly recommend that before any crossing is constructed, the present action of this river should be carefully considered. It is yearly encroaching, and I am of opinion that unless some works are constructed above, so as to throw it into its former course, it only requires a flood a little above the ordinary ones to make it take its course through the township, leaving the present bridge high and dry. I am certain it is a matter for serious consideration in constructing a railway crossing over this river, and more especially for those who have property in this township.

The country through which this section runs I consider good agricultural land on the low portions, which will be taken in the construction of the line, but little has been done to improve it; but from 63 miles to the Clutha, the land alongside of the line is principally purchased, and a great portion broken up. From Long Ford to 63 miles, it is still occupied by pastoral tenants.

I have, according to instructions, supplied the Commissioner of Crown Lands with tracing, showing what land, for purposes of this railway, should be reserved from public sale.

I have the honor to enclose lithograph plan, showing course of this line from Invercargill to the Clutha.

I have, &c.,

The Hon. the Minister for Public Works, Wellington. W. Brunton, C.E.

Enclosure in No. 2.

Approximate Estimate—Otago Southern Trunk Railway.

Long Ford and Clutha Section—Length 49 miles 79 chains 24 links; single line of railway, 3 feet 6 inch gauge; weight of rails, 36 lbs. to the yard; works over railway constructed for double line of rails.

			£	s.	d.
Earthwork—					
Main Line	... 736,013 cub. yds.				
Deviations and Approaches	... 95,502 „				
Stations and Sidings ...	... 27,000 „				
	858,515, at 1s. 3d. per cubic yard	...	53,657	3	9
Ballast—					
Main Line	... 110,000 cub. yds.				
Stations and Sidings ...	... 6,600 „				
	116,600, at 2s. per cubic yard	...	11,660	0	0
Rails—					
Main Line	... 2,850 tons				
Stations and Sidings ...	... 171 „				
	3,021, at £9 per ton	... ...	27,189	0	0
Dogs, Fish-plates, and Bolts...	... 113 tons				
Stations and Sidings ...	... 6¾ „				
	119¾, at £10 per ton	... ...	1,197	0	0
Sleepers—					
Main Line	... 105,600 sleepers				
Stations and Sidings ...	... 6,336 „				
	111,936, at 2s. 2d.	... ...	12,126	8	0
Mls. chs.					
Bridges at 43 27, four 30 feet openings under railway		... ...	720	0	0
„ 48 37, two 30 feet openings under railway		... ...	360	0	0
„ 52 25, five 30 feet openings under railway		... ...	900	0	0
„ 56 40, one 20 feet opening under railway		... ...	145	0	0
„ 57 52, one 20 feet opening under railway		... ...	145	0	0
„ 66 16, one 25 feet opening over railway		... ...	280	0	0

	Mls.	chs.	£	s.	d.
Bridges at	66	77, two 25 feet openings under railway	290	0	0
„	70	40, two 30 feet openings under railway	360	0	0
„	73	36, one 25 feet opening over railway	300	0	0
„	75	25, one 30 feet opening under railway	180	0	0
„	77	48, two 30 feet openings under railway	360	0	0
„	82	14, one 15 feet opening under railway	90	0	0
„	87	61, one 25 feet opening under railway	150	0	0
„	90	10, thirty-three 30 feet openings under railway	7,000	0	0
Culverts, five 2-feet openings at £22 10 each			112	10	0
„ twelve 3-feet openings at £28			336	0	0
„ four 4-feet openings at £30			120	0	0
„ one 5-feet opening at £35			35	0	0
„ four 6-feet openings at £45			180	0	0
„ one 8-feet opening at £55			55	0	0
„ four 10-feet openings at £65			260	0	0
Level Crossings, Gates, &c., twenty-eight					
Estimated accommodation, No. 20=48 at £20			960	0	0
Fencing, Ditch and Bank, 100 miles at £60 per mile			6,000	0	0
Points, Switches, Signals, and one Turntable			1,800	0	0
Laying Permanent Way, 50 miles; Stations and Sidings, 3=53 miles at £50 per mile...			2,650	0	0
Station, Goods and Engine Shed at Clutha			2,500	0	0
Five Platforms and Sheds on line			1,200	0	0
Water Tanks			300	0	0
Purchase of Land			2,500	0	0
Rolling Stock—					
Four Locomotives at £1,500 each			6,000	0	0
Four composite Carriages at £300 each			1,200	0	0
Forty open Goods Waggons at £85 each			3,400	0	0
Ten covered Goods Waggons at £110 each			1,100	0	0
Two Brake Waggons at £150 each			300	0	0
			£148,118	11	9
Contingencies, 10 per cent.			14,811	0	0
			£162,929	11	9
Engineering expenses, 5 per cent.			8,146	0	0
Total			£171,075	11	9

6th July, 1871. WM. BRUNTON, C.E.

ATHOL TO KINGSTON.

No. 3.

Mr. BRUNTON to the Hon. W. GISBORNE.

SIR,— Princes Street, Dunedin, 7th August, 1871.

I have the honor to submit plan, section, report, and estimate of that portion of the Invercargill and Kingston Railway situated between Athol and Kingston, in length, with branch goods line to shore of Wakatipu Lake, 18 miles 5 chains.

In order to obtain a workable gradient out of Kingston, I have been forced to keep the main passenger station some 60 feet above the level of the lake, and from thence have provided a branch line for goods to its shore, the passenger terminus is in the proper position for continuing the line to Queenstown at some future time if required.

It appears to me, that formerly (not easy to define) the water from this lake had its outlet at Kingston, and ran over the ground which I now recommend the line to take. The bottom of this valley is composed altogether of shingle; the earthwork will not be very expensive, or ballast either, but the soil is not adapted for sod-walls, which in my former estimates I recommended for fencing; I am therefore forced to take a more expensive mode of enclosing the railway line.

The Mataura River being sometimes close under precipitous hills on one side, and again crossing the valley and running close under the same character hills on the other, necessitates me crossing it three times; the present road or track crosses it five.

Over this section there is not a single road formed, and the ground having never been surveyed, no roads are provided for by the authorities. In this case I have made an approximate estimate of the crossings which ultimately will most likely be required.

As this section will be a small portion of main line which on its being constructed will be provided with rolling stock, I have not estimated for any.

I have, &c.,
WM. BRUNTON, M.I.C.E.

The Hon. W. Gisborne, Minister for Works, Wellington.

APPROXIMATE ESTIMATE—Invercargill and Kingston Railway.

Kingston and Athol Section—Length 18 miles 5 chains; single line of railway, 3 feet 6 inch gauge; weight of rails, 36 lbs. to the yard.

		£	s.	d.
Earthwork—				
Main Line	... 177,493 cub. yds.			
Deviations and Approaches	... 19,582 „			
Stations and Sidings ...	... 10,650 „			
	207,725, at 1s. 3d. per cubic yard	12,982	16	3
Ballast—				
Main Line	... 39,654 cub. yds.			
Stations and Sidings ...	... 2,379 „			
	42,033, at 2s. per cubic yard	4,203	6	0
Rails—				
Main Line	... 1,026 tons			
Stations and Sidings ...	... 61½ „			
	1,087½, at £9 per ton	9,787	10	0
Dogs, Fish-plates, and Bolts	... 40½ tons			
Stations and Sidings ...	... 2½ „			
	43, at £10 per ton	430	0	0
Sleepers—				
Main Line	... 38,016 sleepers			
Stations and Sidings ...	... 2,280 „			
	40,296, at 2s. 2d.	4,365	8	0
Mls. chs.				
Bridges at 8 38, five 30 feet openings		900	0	0
„ 11 30, one 30 foot opening		180	0	0
„ 13 63, five 30 feet openings		900	0	0
„ 16 24, five 30 feet openings		900	0	0
Culvert, one, 6 feet opening		45	0	0
Level Crossings, Gates, &c. (approximate) 18 at £20		360	0	0
Fencing, Post and Rail, 36 miles, at £120 per mile		4,320	0	0
Points, Switches, Signals, and one Turn-table		800	0	0
Laying Permanent Way, 18 miles; Stations and Sidings, 1½=19½ miles, at £50 per mile		975	0	0
Passenger Station, Goods and Engine Shed at Kingston		2,500	0	0
One Platform and Shed on line		250	0	0
Water Tanks		300	0	0
Purchase of Land, 10 acres, at £10 per acre		100	0	0
		£44,299	0	3
Contingencies, 10 per cent.		4,430	0	0
		£48,729	0	3
Engineering expenses, 5 per cent.		2,436	10	0
Total ...		£51,165	10	3

Average Cost per Mile, £2,832.

7th August, 1871. WM. BRUNTON, M.I.C.E.