

Waitara Route.

This route has also been surveyed in a similar manner.

Awakino Route.

From 21 m. 70 ch., where it leaves the Waitara route, to Mokau Station, on the central line, only exploration-work has been done.

GRADES AND CURVES.

Ngairi Route.

The steepest grade is 1 in 50, the sharpest curve $7\frac{1}{2}$ chains (495 ft.) radius, which are the limits now adopted for main lines in New Zealand.

Waitara Route.

Grades and curves similar to Ngairi route.

Awakino Route.

Maximum grade to Mahoenui (62 miles) 1 in 70, possibly 1 in 80; thence 1 in 50 or 1 in 70, according to route adopted. Maximum curvature, $7\frac{1}{2}$ chains radius.

ENGINEERING-WORKS.

Ngairi Route.

The following shows in a tabulated form the comparative degrees of extent and cost of works required to construct the line, with all equipment :—

From	To	Cost under £6,000 per Mile.	Cost under £8,000 per Mile.	Cost under £11,000 per Mile.	Cost under £18,000 per Mile.	Cost under £24,000 per Mile.	Cost under £30,000 per Mile.
M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
0 0	5 26	...	5 25	...	...	...	...
5 26	10 0	...	4 48	...	...	...	...
10 0	16 0	5 74	...	...	...	...	...
16 0	22 77	...	...	6 76	...	...	...
22 77	29 77	7 0	...	...	...	...	...
29 77	31 0	...	...	1 3	...	...	...
31 0	37 0	6 0	...	...	...	...	...
37 0	38 73	...	...	...	1 73	...	...
38 73	47 73	...	9 0	...	...	...	...
47 73	49 5	...	...	...	...	1 10	...
49 5	52 48	...	3 40	...	...	...	...
52 48	55 32	...	...	2 62	...	...	...
55 32	60 59	...	...	5 24	...	...	...
60 59	64 73	...	...	...	3 77	...	...
64 73	68 73	...	...	...	3 74	...	...
68 73	75 63	...	...	6 66	...	...	...
75 63	83 56	7 73	...	...	...	...	...
83 56	88 56	...	5 0	...	...	...	...
88 56	93 54	...	...	4 78	...	...	...
93 54	98 56	...	5 2	...	...	...	...
98 56	103 56	...	...	5 0	...	...	...
		26 67	32 35	32 69	9 64	1 10	...

Numerous watershed-divides are crossed along the route, which, owing to the general character of the country, consist of narrow ridges. Advantage is taken of this feature to provide for tunnelling through them, and so avoid the more expensive grading on the hillsides, and the useless rise and fall thereby occasioned. This accounts for the apparently large number (thirty-one, with an aggregate length of $187\frac{3}{4}$ chains) of tunnels. There are no viaducts, and only two bridges of any magnitude—viz., those over the Tangarakau River, which are estimated to cost an average of £7,400 each.

Briefly the works of construction may be divided into three zones, thus: First zone, moderate works—From Eltham at 0 m. 0 ch. to head of Wangamomona Valley at 47 m. 73 ch., average cost per mile = £6,992. Second zone, heavy works—From 47 m. 73 ch. to Mangaroa Valley at 75 m. 63 ch., average cost per mile = £11,840. Third zone, moderate works—From 75 m. 63 ch. to Kawakawa Junction, average cost per mile = £7,757.

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