

here very steep and broken, I have shown the line descending on the south-east bank on the skew with the river, in sideling of 2 or 3 to 1, principally pumice, and about half a mile further down the river, and then crossing, with two bridges of 60ft. and 100ft. span, at a height of 70ft. above the river, at this site there is an island about eight chains in length, and there is just room for a reverse curve; the line would then rise in cuttings up to the terrace at 95 miles, near the junction of the Wairakei Creek but above it, on its south-west bank. A detailed survey, with cross sections, will be required to fix which of the two modes of crossing would be the cheaper.

At Wairakei there will be some bad ground for working in near the hot springs, but I think the line can be kept above the worst portion, and the creek followed to its head near the crossing of the Main North Road, about 30 chains beyond which is a small watershed near Oruanui, where some heavy cutting will be required in volcanic rock.

In descending to the Ongarahu there is a long dry gully, which may be made use of to assist the cutting; and I think on reaching near the mouth of this the line should bend round sharply to the left (possibly requiring a few chains of tunnel through a rocky spur), and then grade down to the bed of the Ongarahu through some gently-sloping ground. The Ongarahu may be easily followed to near Pukemoremore, the banks being low, and its course being through a tolerably open valley, consisting of shallow swamps and low hillocks of pumice. At 107 miles a low ridge at the foot of Pukemoremore divides the Ongarahu from the Waipapa Creek, and here a choice of two routes can be made. I will first mention the one marked on plans and section as "Deviation." This line would follow down the Waipapa Creek to the Waikato River where an expensive bridge, of probably 200ft. span, would be required; but after crossing the river it may be followed down on its right bank for fourteen miles, without any very heavy work, on terrace flats, which are not intersected by any very bad gullies. From 121 miles to 122 miles, on "deviation," the spurs from Whakamaru rise abruptly over the river but with occasional rock-cuttings there is room to get round them, and the terrace flats open out again for a width of a quarter of a mile, and present no difficulty up to 129 miles on deviation near the Kopokorahi Stream, after which there would be some heavy cutting in sideling. Besides the bridge being probably costly, the objection to the deviation would be that it is three miles longer than the line as laid down on maps.

The line as laid down on plans, instead of branching down the Waipapa at 107½ miles, crosses the Waipapa Creek at the junction of two small streams, and rises with moderate gradients in the direction of the Waipapa Bush, as far as about 112 miles, through some swamps of no great depth, and among hillocks of from 50ft. to 150ft. high covered with poor tussock grass. There are several good patches of bush in this locality growing on high flats and ridges, the position of which is marked upon the plans; they contain a large proportion of totara trees, and there is a noticeable improvement in the soil where the bush is there is less depth of pumice, which has probably been washed down at some period into the lower-lying lands. At 112 miles the line bends sharply to the left, still rising towards the saddle at a break in the hills called Ngatakurua, at about 113 miles. Through this pass the Maori track leads to Kihikihi. The line would then descend quickly to the Potangotango Creek, and down the banks of it to near the Whakakaho, a very prominent hill with broken angular outlines. In following this creek some heavy cuttings would be necessary, principally in pumice, and the line should be kept at about 40ft. above the creek, utilizing occasional terraces. At 121 miles, at a level of about 750ft., the line leaves the creek and slopes with a more gentle descent to the Mangakino Creek, which contains a considerable volume of water, but may be crossed with two spans, of a total length of 120ft., at a height of about 100ft. above the water, and at about 10 chains from the junction of the Waikato River.

On my first journey through this country I kept entirely on the western side of the Waikato, with a view of seeing if a line could be got without crossing and recrossing that river. I found the ground pretty fair as far as the next big creek (also called Waipapa), but beyond this there is a narrow range or ridge rising abruptly some 500ft. above that creek, and called Moetahanga it reaches down to the Waikato, and further on there is a higher range, of which the principal hill is called Wharepuhunga. This whole range is covered with bush, and extends down to the Waikato. On its northern slopes it is intersected by deep ravines, especially one called the Waipare. The difficulties caused by these obstructions would be too great for the location of a line entirely on the western side of the Waikato; so that I propose to follow the Waikato River closely on its right or eastern bank, crossing over to it at about 127 miles, at the spot shown on plans. The river here goes over a fall of about 15ft., and above this again there are several rapids. I think the river can be crossed just above the fall by a bridge of 160ft. in length, and that a pier could be built into the rocky bed of the river in order to divide the bridge into two spans.

The country on the eastern side now consists of high fern downs broken up by volcanic action, and unsuitable for a line; but the watershed on these downs runs nearly parallel with the river and only a few miles back from it, and the water reaches the Waikato, from the eastern side of this ridge, only by running northwards for some miles beyond the Waotu. Consequently there are few stream-channels intersecting the eastern bank of the river, which consists usually of a cliff of volcanic rock about 100ft. high, with a slope of about 2 to 1 of loose rock and pumice below the cliff; or else a terrace-flat, at a height of about 20ft. to 80ft. above the river, is to be found at the foot of the cliff. There are several spurs of volcanic rock which would probably require short tunnels, not exceeding, I think, a total of 40 chains in length. There would be a good deal of heavy rock-cutting in places, but the ground would be all solid and free from slips, and the long stretches of narrow flats would allow the cost of the work on this portion to be reduced to an ordinary average. Near the Waotu the hills rise to a considerable height at a mile from the river, but the flats on the river-bank below are well adapted for a line.

I think the river can be recrossed by one span of 160ft. at a point about a mile and a half above the old pa opposite Mangere Creek. There is a small island on the west side of the river, just above site of bridge. The line would commence to rise after crossing the river, and, cutting into the slopes of the rising ground at the edge of the river-flats, it might be some 80ft. or 90ft. above the river at the