

In addition to the above, my attention has been directed to a line (not shown on plan) straight through the range from the Port Chalmers Railway at Sawyer's Bay to Blueskin Village.

I will first consider those routes that present the least facilities for railway construction, or are otherwise objectionable.

No. 1. The country traversed by this line is a very rough one; with the exception of a few miles at the Taieri Plain and Waikouaiti, the rivers flow in precipitous gorges and ravines. The course of the Silver Stream in particular is remarkably wild, there being scarcely half a mile of open valley in the whole distance, while the banks are broken up by lateral spurs and gullies as close as they can be. The main branch of the Silver Stream terminates in the Silver Peak Mountain, a range 2,000 feet high, but there is a small branch that comes close to the source of the Waikouaiti, with a comparatively narrow range between; its height being 1,450 feet. Independent of the inconvenient distance this route is from Dunedin, the difficulties it presents are sufficient to preclude its adoption.

No. 6. The Coast Route. As there is so little space between the tunnel and the jetty at Port Chalmers, it would probably be necessary to leave the present railway at Mussel Bay, and pass to the north of George Street and the Graving Dock, in which case another tunnel would be required. The line would then skirt the sea for the whole distance to Blueskin, following the most minute indentations of the coast or cliffs. So far as gradients are concerned, it would be first-class, being dead level; but the minimum radius of curves would require to be reduced to about 50 feet in order to avoid heavy tunnelling. There are no serious difficulties from Port Chalmers to the Heads, but beyond this I fear it would be impossible to construct a useful line at anything like a reasonable cost. The cliffs of hard rock are almost perpendicular, and of a great height, and run out into the sea at all the promontories, while the bays consist of drifting sand almost as difficult to deal with. I have put some notes on the plans at this place, which will better enable you to judge of its character. Taken altogether, I do not think that a suitable line can be got in this direction.

Line from Port Chalmers Railway at Sawyer's Bay to Blueskin, being on a low level, would require a tunnel about two miles long, through a basaltic mountain range, so it cannot be considered.

The routes from Dunedin to Blueskin are now reduced to three, and I will consider them together. In examining them, I have worked for gradients of 1 in 50; but it might be an advantage to adopt steeper ones.

Before commencing this survey, I was under the impression that the saddle between the Leith and the Waitati was about 500 or 600 feet high, in which case it would be possible to run up the Leith Valley, as shown by Route No. 3. I find, however, that the saddle is ascertained by the Survey Department to be 1,190 feet above sea level, which height agrees with my own barometrical observation. It would therefore be necessary either to adopt Route No. 2, or to work to a steeper gradient.

To the head of the Kaikorai Valley, a distance of three miles, Line No. 2 runs on very favourable ground; with the exception of two or three stream bridges, there is literally no work. From this point to the Leith Valley, the ground is very rough, and broken up by deep gullies, and a considerable amount of earthwork and bridging would be required. The Leith Valley itself is by no means unfavourable for running up a gradient; there are two or three streams to be crossed at a high level, but the cost of doing so would not be very great.

Assuming that an elevation of 800 or 900 feet were attained, the saddle between the Leith and Waitati could be got through by a tunnel not more than 20 chains long; under this level the valley of the Leith gets flatter, and the length of tunnel would increase rapidly.

Generally, on the south side of the range, No. 2 Line presents no serious obstacle to the construction of a railway; but, unfortunately, the north side is not equally favourable. The objections to it are,—

1. There is not distance to get down from the high level reached at the summit; and
2. The ground on the slope of the range above Blueskin Bay is very irregular, and broken up by deep gullies, entailing heavy works of all kinds.

The above objections induced me to try for a greater length of line on the north side of the range, and finding this could not conveniently be done from the Leith saddle, I examined another between the head of Sawyer's Bay Valley and the east branch of the Waitati. Its height is 1,100 feet, and the distance from sea level on both sides, on Line No. 4, about seven miles. This would make the summit level of railway about 400 feet below the saddle. The length of tunnel required will probably be about 40 chains.

I think that generally this route presents greater facilities for the construction of a railway than the one *via* the Leith, and it has the additional advantage of being a direct continuation of the Clutha line, while the other would leave Dunedin on a branch.

Before proceeding to make a regular survey of a line from Dunedin to Blueskin, I would recommend that sections be made of these two saddles down to a height of say 500 feet above sea level to determine the length of tunnel required, and that borings be taken to ascertain the nature of the materials in them. This will go a long way towards deciding on the relative advantages of the two routes.

Between Blueskin and Waikouaiti the ground generally falls with a uniform slope from the top of the ranges to the coast, terminating in perpendicular clay cliffs of from 100 to 150 feet high. There are numerous hollows and gullies in the slope, but nothing that cannot be got round by sharp curves. The line would keep at a level of from 150 to 200 feet above the sea, and the gradients would be all good. As the highest cliffs are at Brinn's Point, it is possible that the line from thence to the Waikouaiti River may be too steep. There being no detailed survey of the Maori reserve, I could not fix level points on the plan. Should this be the case, it will be necessary to take the route indicated by a dotted line. At the proposed crossing, the Waikouaiti River is about five chains broad, and the ground seems to be suitable for an ordinary pile bridge.

For two-thirds of the distance from Dunedin to Waikouaiti, the route above described runs through dense bush, accessible only at certain points, therefore the line shown on the plans must be taken as indicating merely the general direction intended to be taken. The same remark applies to all the other lines leaving Dunedin, except the one round the coast.