COWICHAN-ALBERNI RAILWAY.

Report on Reconnaissance Survey from the Headwaters of the Nitinat River to Alberni.

Victoria, B. C., March 28, 1903.

The Honourable
the Chief Commissioner of Lands and Works,
Victoria.

Sir,—On the 23rd September, 1902, I was notified by the Deputy Chief Commissioner of Lands and Works, under instructions from you, that I had been appointed to make a survey between the west end of Cowichan Lake and the headwaters of Alberni Inlet, for the purpose of ascertaining whether that section of the country affords a suitable route for the construction of a railway. The instructions further stated:—

"It is not intended that you should make an elaborate instrumental survey, but merely a reconnaissance, taking off-sets from your base-line, and noting carefully the topography on each side of the same, with the barometric heights, in order that you may be able to lay down a projected route that will afford the best possible grades. It is proposed that your route should be from the west end of Cowichan Lake by way of the Nitinat Trail and Roger Creek. You are requested to give your best attention to the professional part of the work under your charge, with a view to furnishing this Department with as accurate and complete returns as possible, showing the route and comparative profile of the section that you find most suitable for railway construction."

In accordance with the above instructions, I proceeded to organise a party, leaving Victoria on the 25th September and Nanaimo on the 29th, arriving on the summit of the Nitinat Pass on the 4th October. Before leaving Nanaimo I set my aneroid barometer to the standard instrument in the Government Agent's office; the readings which were kindly taken by the Agent during the progress of the work at 9 a.m., noon, and 4 p.m. on each and every day (except Sundays), were for the purpose of checking my readings in the field and proved afterwards to be of little value, owing, probably, to the distance of the two instruments apart. It will be of interest to note here the extreme readings in one camp, taken from the journal of the work on Monday, the 17th November, 1902. The reading on that day at noon was 27.55; on the following Thursday, the 20th November, at 8.30 p.m., the barometer reading was 28.55, showing a difference in elevation of the same point of about 865 feet. Now, compare the readings as taken in Nanaimo, and we find at noon of the 20th November, a reading of 30.17, and on the following Thursday, at 4 p.m., a reading of 30.16, showing a very steady barometer, and proving beyond doubt that no reliance can be placed upon barometer heights at this season of the year in connection with the work we are engaged in. The heights being of great importance, as well as correct distances, I deemed it advisable to run a line of levels throughout, thereby establishing the correct heights above sea level of the grade-line heights of the Nitinat, Roger Creek and Waggon Road Passes, being 2,330, 1,440 and 1,200 feet, respectively.

After arriving at the summit of the Nitinat Pass and establishing the variation of the compass at N. 24° 22′ E., a short reconnaissance down the valley of the Nitinat River showed the trail, wherever it left the side-hill, to be completely grown over by heavy underbrush, so much so that in places it was next to impossible to find it, and many of the bridges, as well as those on the north side of the pass, were either washed away or in a decayed condition. The Nitinat River I found falling in a succession of cataracts on an average of 500 feet to the mile for the first three miles, but very much less grade after that, through a valley with steep slopes either side.

Taking into consideration the season of the year, the few men at my disposal, and the condition of the trail, with no food for pack horses other than what was brought into the country, I decided on assuming a datum at the summit of the Nitinat and running a line to begin with on grade both north and south clear of the snow-line. The line to the south along the mountain on the east side of the Nitinat Valley is necessarily on high, steep side-hill, owing to the river falling so rapidly. For the first 4,000 feet the average cross section is 10 to 17 degrees, with an earth formation, and on a grade of .62 per 100 from station 40 to station 156, or 11,600 feet. After this the grade is increased to 1.62 per 100, and may be classed as heavy work or a true mountain road, crossing several canyons in varying depths of 75 to 120 feet—to cross which necessitated a journey to the river, 1,000 feet below the line and up the other side—of narrow width, requiring bridges of spans from 25 to 50 feet, but in each case with good rock foundations. The danger from wash-outs from excessive rainfall is counteracted by the solidity of the straight, clean, rocky walls and precipitous channels to the river below. From station 156 to 172 (1,600 feet) the line is thrown into a basin or amphitheatre, at the entrance to which the stream draining from it falls a vertical distance of close upon 400 feet. This is a difficult and complicated hole, and after plotting it on a large scale in the field, found that in order to ease the curvature it would be more advantageous to raise the grade from station 156, making a level grade to station 172. There are indications of avalanches both of rock and snow, but the construction of wings at certain points above where the permanent line would be would lessen the chances of damage from that quarter. There is a pass to the north-east through this basin, and a traverse line was run to the summit, a distance of 2,400 feet, its elevation (barometer) being 120 feet higher than the Nitinat Pass; but as the water over the summit is drained into the Cameron river and the mountains were particularly abrupt, this did not warrant further examination.

Leaving station 172, the line follows a broken side-hill, the slopes averaging 33 degrees, or a 1 to 1 slope, in places vertical, and if not for the timber and brush, is impassable, necessitating also the men lining up and passing along the instrument from one to another, requiring vertical and horizontal triangulation to obtain the levels, the 300-foot chain being indispensable. The class of work from station 172 to station 270, or 9,800 feet, is mostly solid rock and rock slide, and at prevailing prices, but without taking out the quantities, which can be done at any time, as the cross sections are in evidence, I estimate the cost of construction of this portion of the work to be $43,000 per mile. This is, without doubt, the heaviest and most costly part of the work on the Nitinat, if not of the whole line, as the valley from station 270 now widens considerably, and the river is less rapid.

We now come to the time when it was necessary to abandon this portion of the work, owing to the fact, as reported to you in my progress report of the 13th December, 1902, that the accumulating snow on slopes such as we had to encounter made it unsafe for anyone to attempt to work on them. Up to the 27th October, though the weather had been unsettled, the conditions became suddenly worse, with continued snow on the higher levels. With the trail to cut out, and no food other than that brought from Alberni, or shelter for the horses, which were in bad condition, I decided on abandoning this part of the line, as I did on the 8th November, as it would take 43 fine working days to make Cowichan Lake, and returned to the line on the north side of the Nitinat Pass.

TIMBER, SOUTH SIDE OF NITINAT PASS.

From zero to station 50 (one mile) the timber consists principally of yellow cedar and hemlock. From this on, as far as I went in the valley, on both sides of the river, but below the line, there is a belt of long, straight fir timber, 1,500 feet wide, averaging 18 to 36 inches, which will cut as high as 60 M. to the acre, of good merchantable timber. This belt of fir timber is fringed with a line of sound hemlock of large dimensions.

MINERALS, SOUTH SIDE OF NITINAT PASS.

Several mineral claims have been located at points adjacent to the survey line on both sides, but as no work of any magnitude seems to have been done on these, no reference was made to the survey. In nearly every creek crossed a good deal of "float" existed, and from the precipitous nature of the streams, which are cut deep into the mountain side, gives the hardy miner the best chance of prospecting, and will, I believe, at some future date, speak well for itself, as better means of communication are established.

Waggon Road, South Side of Nitinat Pass.

As reported, the Nitinat River falls for the first three miles on an average of 500 feet to the mile. The trail, which takes the west side at the start, crosses and re-crosses the river in anything but a straight course, and has not the desired effect of easing the grade, being impassable in the wet season and dangerous for animals if used to any extent. In the event of a waggon road being constructed, it would require a qualified engineer to supervise the work. To follow the present trail with a road would not warrant the cost, and to follow the east side, on a 10 per cent. grade, would cost from $2,500 to $3,000 per mile, owing to deep crossings of streams and removal of rock in places.

Line to the North of Nitinat Summit.

Continuing the line from station 96.64, which was carried through on grade to the sea, gives varying grades as follows:—

Zero to 500 (9.47 miles), 2.00 per cent.
500 to 617 (2.21 miles), 1.61 per cent.
617 to 624 (0.13 miles), level.
624 to 1,313 (13.04 miles), 2.00 per cent.

From zero to station 180 the average slopes are 30 degrees, with rock and loose rock formation, crossing a creek with 25-foot span of 140 feet in depth and 600 feet across. From station 180 to station 350 the formation still continues rock and loose rock, and at station 328 another large stream is crossed, with a bridge 60 feet high and 1,000 feet in length. Sage Creek, at station 337, will require a 40-foot bridge, 200 feet in length, and considerable rock cutting. From station 350 to station 409 the formation is rock, loose rock and earth. We now come to the Yellowstone Creek crossing, a stream cutting into the McLaughlan Range in the form of a deep canyon, which will require a bridge of 175 feet in height by 500 feet in length, a span of 50 feet clearing the stream. This crossing was thoroughly cross-sectioned, and everything goes to show good foundations on solid rock.

From station 414 to station 441, on the south side of Roger Creek Pass, requires heavy rock cutting.

The grade at station 441 being too high to avail of Roger Creek Pass being used as a means of getting to the coast, and as distance is required to get down, necessitates continuing the line on down the Cameron River to the Waggon Road Pass, making almost a complete circle round a hill lying between Roger Creek and Waggon Road Passes until it again strikes Roger Creek, 668 feet lower.

The crossing of the Roger Creek Pass, which is in the shape of a saddle, averages about 100 feet in height for a distance of 900 feet in length, as far as station 460.

From station 460 to station 480 is the canyon proper of the Cameron River, though it may be said the river is of that nature for some considerable distance above this point, but the fact of the grade-line being as high as it is materially benefits the work. The rough and rugged nature of the walls for 2,000 feet of this canyon prevented the line being run on grade through it, and a traverse over the top and calculated distance was all the time that could be devoted to it.

From station 480 to station 550, owing to the ground being crossed by low, parallel ridges, entails more thorough cuts from 5 to 15 feet in depth, though the curvature is not excessive.

From station 550 to station 560 entails a thorough cut of an average depth of 10 feet, and to station 575 a side-hill cut. From this point a thorough cut is required of 12 feet through the summit of the Waggon Road Pass, common to all roads coming from the south and east) to station 585, the waters draining to the East and West Coasts, and connection was here made with Mr. Shepherd's reconnaissance from French Creek, in accordance with your instructions.

Passing Summit Lake on the south side, the work is light up to station 612, the easterly end of Loon lake, and continues so on a level grade past its outlet to station 630. We now commence a steady 2 per cent. grade to the crossing of Roger Creek, before mentioned, with varying slopes of from 25 to 30 degrees side-hill work; but before giving details of the Roger Creek crossing it would be as well to call attention to a crown knoll between stations 763 and 793. This affords an opportunity, with a 12-degree curve for about 270 degrees, of returning

to the side-hill down which the Waggon Road passes on its way to Alberni, and from survey made with levels determines the point it would strike—viz., what is known as the Four-Mile Creek on the Alberni Road.

Many things depend upon the adoption of this alternative route, as instanced by, 1st, the selection of a terminus; 2nd, the production of the line still further to the north; and, 3rd, its cost. Though the grade must still continue at 2 per cent., the cost of the line will no doubt be materially reduced from that on the south side of Roger Creek, owing to gravel taking the place of rock.

We now come to the crossing of Roger Creek from station 800 to 807. Owing to the valley being narrow, it requires a 12-degree curve through about 180 degrees of curvature, the height of the bridge being 100 feet, followed by—from station 807 to station 860—heavy side-hill cuts, with slopes from 30 to 35 degrees, of rock formation. From station 862 to station 866 the line crosses Sandstone Creek, with a bed of horizontal strata, overhanging in places, with 25-foot opening approached by a heavy cut. From station 866 the line still continues in side-hill, crossing at station 886 a narrow ravine, with 25-foot fill and 15-foot opening, and from this on to station 907 the formation is mostly rock, with slopes of 25 to 30 degrees. From station 907 to station 985, Roger Creek, and for the remainder of its course to the sea, becomes very crooked, running to all points of the compass. This has the effect of materially increasing the curvature of the line, the formation changing to the extent of two-thirds earth to one-third rock, with slopes of 15 degrees. At station 985 it would be advisable to raise the grade, in order to place the line on more level ground, which would have the effect of making the cutting in gravel in place of rock and considerably ease the curvature. This would continue as far as station 1117, and from there to Alberni I estimate the average excavation to be earth and gravel, of which 15 per cent. will be rock or cement.

After receiving your instructions of December 18th, 1902, directing me to discharge my party, five men left the following day—December 21st—the traverse and levels being carried through along the old China Creek Road to the terminus at new Alberni, whilst waiting for transportation.

TIMBER, NORTH FROM SUMMIT.

For the first mile north from the summit of the Nitinat the timber is principally hemlock, yellow cedar and larch, 12 to 18 inches diameter; from the first to the second mile large hemlock and a few good fir. From the second mile post to the 6½-mile post, hemlock and balsam of from 12 to 28 inches, making from 40 to 60-foot logs, with some scattered fir. Below the line one mile from the summit a body of fir mixed with large hemlock from 24 to 48 inches, making 40 to 80-foot logs, will average 60 M. per acre. This timber follows the creek flowing into the Cameron River, and continues to the 6½-mile post as well as 4 miles up the Cameron River on both sides, as noted in my exploration of 1901, when descending the Cameron River from Indian or Labour Day Lake.

The Cameron River, with high falls on its upper reaches and crooked rocky channels for the most part of its length, would make driving for anything but short logs, and at high water, a difficult proposition. From 6½-mile post to Yellowstone Creek fire has destroyed the timber to the top of the mountain, and as far as Rogers Pass continues small and burnt. From the summit of Roger Pass, following the creek in a westerly direction, there are bunches of large fir extending to Alberni.

Returning to the summit of Roger Pass (8-mile post), along the Cameron River to the Waggon Road Pass (11-mile post), the timber is small and scattered, and from Waggon Road Pass to 13-mile post, following the lakes and creeks, the timber is principally hemlock and fir. Between 13 and 14-mile post is small fir and hemlock, 12 to 18 inches diameter, until the line again strikes Roger Creek, when the timber increases in size from 24 to 48 inches, and will cut up to 80 feet as far as the 20-mile post.

MINERALS.

Though more indications of mineral were apparent on the creeks and streams on the south side of the Nitinat Summit, yet the work accomplished on several claims on the north side through which the line passed gives hopes of their yet turning out remunerative to their owners, as care is taken to still keep them on record.

Estimate of Cost from Summit of Nitinat to Sea.

The average cost from zero to tide water would be $38,190 per mile for a standard gauge road, including bridges. The actual quantities can be taken out at any time from the notes and cross-sections and on completion of the 400-foot scale plan.

Survey Line, Levels and Plans.

The survey line was blazed throughout with scribed bench-marks about every half-mile, and to give the true levels above O. H. W. M. a deduction must be made of 170 feet for each and every elevation. Attached to this report are drawings Nos. 4 and 5, on a scale of 400 feet to the inch, of basin and approaches to it on the Nitinat River and the crossing of Roger and alternative line on north side of said creek. Accompanying it is an index drawing, No. 3, on a scale of 4,000 feet to the inch by latitude and departure, with five blue prints of same. I regret time did not admit of completing the drawing on the 400-foot scale or the section, but this can be accomplished any time should occasion arise.

Cost of Renewing Trail and Bridges

I am of the opinion that one-tenth of the cost of survey should be charged against the appropriation for the District, as the Cowichan Trail is now servicable from the Alberni Waggon Road to within 15 miles of Cowichan Lake, and if cleared out and extended along the north side of the lake its east end would be of great service to prospectors and mining men generally, not omitting the sportsman, who can there find, as regards fishing and shooting, what many men of means travel long distances, at much greater cost, to obtain.

Before closing this report I wish to express my appreciation of the zeal and energy displayed throughout by the men under my charge, very often under trying circumstances; and taking into consideration the fact that out of the total number of 69 days employed on the work only 15 were fine, as the journal of the work shows, I trust, Sir, I may count on your appreciation of the work now before you.

I have the honour to be,
Sir,
Your obedient servant,
D. R. HARRIS,
Engineer in Charge.

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