

ABSTRACT

"The Alaska Railroad and Its Domain"

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The lineage of The Alaska Railroad is traced back to the Alaska Northern, and further back to the Alaska Central, a private endeavor which filed articles of incorporation in August of 1902.

The Act of Congress of March 12, 1914 empowered President Wilson to locate, construct, and operate a railroad or railroads not to exceed 1,000 miles in total length, and it was this Act which gave The Alaska Railroad dominion over right of way, station grounds, and terminal reserves. This Act established the right of way of one hundred feet on either side of the center line, and twenty-five feet on either side of the center line of any telegraph or telephone lines. Through the years, as the center line of the track has moved, the right of way automatically moved with it.

Industrial development has progressed to meet the demands of a burgeoning new land as it grows and expands, with primary points of development being Anchorage and Fairbanks.

A feasibility study for the extension of the Railroad to the oil-rich Prudhoe Bay area, and to the ore-bearing regions near Bornite and Kobuk has been in progress since 1970. The key to the location of this extension rests primarily on soils conditions along the corridor.

In preparing for this paper, which I had chosen to entitle, "The Alaska Railroad and Its Domain," I went to two source documents for my opening remarks: The Alaska Engineering Commission Report of 1916, and the Bible.

I quickly found what I was looking for in the Commission report. However, it took me a little while to find the particular phrase in the Bible that I remembered from my Sunday school days. I started with the Book of Genesis and finally found what I was looking for in the Book of John in the New Testament.

Some of you may recognize the particular passage which we of The Alaska Railroad are fond of paraphrasing when explaining our exalted place under the sun, "In the beginning was the word, and the word was The Alaska Railroad." If this seems like an haughty and imperious attitude, you're right - it is, but then, who are we to argue with destiny?

We can trace our lineage back in time to the Alaska Northern, and beyond that, to the Alaska Central, a private endeavor which filed its articles of incorporation with the Department of the Interior in August of 1902. At that time, it also filed a map showing the preliminary location of a line from Seward northward to a point on the Tanana River near the present town of Nenana. Right of Way for a portion of this line was acquired under Section 47 of the Act of May 14, 1898 which provided for the grant of a right

of way through lands of the United States in the District of Alaska for any railroad company duly organized under the laws of any State or Territory.

However, the particular "word" which I want to refer to at this time, is the Act of Congress of March 12, 1914, which empowered President Wilson to locate, construct, and operate a railroad or railroads not to exceed 1,000 miles in total length. It is this Act which gave us our present dominion over our right of way, station grounds, and terminal reserves.

It was a well written Act, and required only two ordinary pages of close printing, to establish with clear intent the wishes of Congress concerning the Railroad. The subject of our right of way needed only a part of one sentence to define - and yet that definition is sufficient to legally describe over 500 miles of ^{existing} right of way.

Here is the "word" as written by Congress in the Year of our Lord Nineteen Hundred and Fourteen: "Terminal and station grounds and rights of way through the lands of the United States in the territory of Alaska are hereby granted for the construction of railroads, telegraph and telephone lines authorized by this act, and in all patents for lands hereafter taken up, entered or located in the Territory of Alaska, there shall be expressed that there is reserved to the United States a right of way for the construction of railroads, telegraph and telephone lines to the extent of one

hundred feet on either side of the center line of any such road and twenty-five feet on either side of the center line of any such telegraph or telephone lines, and the President may, in such manner as he deems advisable, make reservation of such lands as are or may be useful for furnishing materials for construction and for stations, terminals, docks, and for such other purposes in connection with the construction and operation of such railroad lines as he may deem necessary and desirable." *in quote*

Right of Way

Quite simply, Congress made the center line of our track a land monument ^{of equal weight} equal to ^{a corner} that of a section line. The center line defined our right of way; if the track moved, the right of way went with it like its shadow. Any property abutting the right of way had to be tied to the track.

The physical location of our right of way has been a source of irritation, vexation, and in some cases - has created a feeling of utter futility to land surveyors who have become involved with it. Here have been some of the reactions that I, personally, have observed: A bright-eyed, eager, surveyor comes into our office and asks for our right of way map showing the alignment and ties to a section corner near a particular piece of property he is surveying. Very gently, we explain to him that the Alaska Engineering Commission made very few ties to section corners, since few existed at that time. If any were made, it was usually at the discretion of the locating engineer. If our surveyor asks about any ties

to the State Plane Coordinate System, we don't even bother to answer - we just look at him.

By this time, he is a little upset and mutters, "Then you don't really know where you are." This gives us the opportunity to reply with the most withering scorn that we can muster, "Of course we know where we are. We are where that center line of track lies."

But our surveyor doesn't give up. Somehow, he has to pin that right of way down. Perhaps he already had a copy of our right of way map and has run a traverse of our center line.

Now, he is in a real lather. "Nothing fits," he screams. "This $3^{\circ}00'$ curve with 200-foot spirals is actually a $3^{\circ}06'30''$ curve and the spirals are 320 feet long. The delta angles of the short reverse curves are both off by 20 minutes, and your tangents are not true. I picked up a ^{engineering} station painted on the rail and it doesn't fit by 10 feet."

Eventually, we get him calmed down to where he is ready to listen to our explanation of this distressing state of affairs, and how best to approach it. We start by telling him of the rehabilitation of the Railroad shortly after World War II. During the rehabilitation, we had quite a number of survey crews running up and down the Railroad, dodging work trains. With this manpower, it would have been an opportune time to reestablish the original

line, and to set permanent markers for the curve points. Unfortunately, the crews were usually put into the field just ahead of the contractor. Stationing had to be established quickly within a few feet for setting blue top stakes, and all curves were run independent of the stationing. In 1948, I can remember racing a contractor the last 10 miles into Curry. I was never more than one-half mile ahead of his track raising gang at any time.

In running curves, we were lengthening spirals to permit higher operating speeds. In order to balance the throws required to bring the track to the new center line, we would slightly increase the degree of curvature; hence the $3^{\circ}06'30''$ curve in place of the original $3^{\circ}00'$ curve. *In throw on spirals balance out on main curve*

Basically, we accomplished what we had set out to do - the rehabilitation of roadbed, track facilities, and equipment. It was also during the rehabilitation of the Railroad that much of the Fairbanks and Anchorage terminal reserves were subdivided for industrial use.

The end of the rehabilitation of The Alaska Railroad as such, came in 1955 with the Seward to Portage division being brought up to our new standards. On this particular stretch, the original alignment and stationing were restored, except for the revision in spiral lengths. *using methods I will describe later on*

An explanation is still required for what has happened to our center line in the ensuing years. We no longer have survey crews. All track work is handled by modern equipment. Tampers raise track automatically to a grade line established by an electric eye at the same time putting in the proper super elevation on spirals and curves. Track liners line tangents and curves, including the proper spiral length, by means of a wire or by an electric eye.

In some cases, the net result has been a small accumulative change in the position of our center line. In other cases, it has been a compensating change. Many of our tangents show swings from a true alignment, but our trains couldn't care less.

However - the question remains for the surveyor: What should be used to define the right of way? The answer is: The original alignment, except in the case of line changes *or other drastic changes in earthquake, slides etc*

Some of you will say that it is impossible to reestablish the original alignment. We say it can be done, with a little effort.

In fact, in some ways, it is analagous to the work required to replace a missing section corner. *Further there is a beautiful clean platform to work on, the tools do all the business to do*

Let's see if I can demonstrate this on the blackboard.

1. Single curve with adequate tangents. *If need be drop back to next curve*
2. Reverse curves with short intermediate tangent. *Do not establish intermediate tangent*
3. Lining curves with curve liners - graphic solution.
4. Some anomalies to watch for.

Townsites

Under the Act of 1914, the President was authorized to...
..."withdraw, locate, and dispose of, under such rules and regulations as he may prescribe, such area or areas of the public domain along the line or lines of such proposed railroad or railroads for townsite purposes as he may from time to time designate."

On June 19, 1915, an Executive Order was issued containing regulations for the survey of townsites and the sale of lots therein.

Of course, the most notable of these townsites was Anchorage. Under the direction of the General Land Office, the original townsite was surveyed out and administered by the Alaska Engineering Commission. Lots were sold, land cleared, streets built, and water service and telephone and lights installed. A school house was built, and other facilities installed to make Anchorage a success as the Government's first attempt at building a town in Alaska.

Terminal reserves and station grounds

We have seen from the Act of 1914, how the President was empowered to withdraw lands for terminal reserves and station grounds. This authority has been used repeatedly by successive Presidents to acquire other public lands for the Railroad's use, such as gravel pits, powder storage, material storage yards, marine ways, and so forth.

Anchorage, of course, is by far the most highly developed of our terminal reserves. In Fairbanks, we acquired the original

station grounds of the old narrow gauge Tanana Valley Railroad. In 1950, we expanded Fairbanks yard and purchased additional land for an industrial area. Since the land at Fairbanks was owned in fee simple prior to 1914, we could not acquire it by eminent domain.

Fairbanks serves as an excellent example of how land use by the Railroad has evolved over the years since original construction. Refer to drawings.

The first industrial spur track in the Fairbanks area was to the F. E. Company on the bank of the Noyes Slough. Coal was hauled for power generation. The layout was simple as you can see.

At the same time, the Suntrana Mining Company wanted an elevated track to its coal bunker, and soon other spur tracks were added for a lumber company; an oil company; the old Alaska Road Commission. Leases were tied to the center line of tracks which was all right, until the particular track was removed. *few roads*

The Ocean Dock area of Anchorage had a similar development, only more so, and more chaotic. There was no master plan; parcels of land were laid out haphazardly for various companies, including fish canneries, a saw mill, the old Sacketts Harbor, and much of the original trackage in the area has since been removed. Although a surveyor's nightmare, it continues to function as a heavy industrial area. *few roads*

The next stage in the development of railroad industrial land is shown in the industrial subdivision at Fairbanks, which was

laid out in 1950. The general arrangement is ^{ideal} good with short curves and a 3-track corridor serving two tiers of lots. This arrangement permitted switching without interrupting other cars that were still being unloaded.

The lot sizes of 50' by 100' were adequate for that day in which all freight came across the Seward Dock. ^{LLL} The 100-foot wide streets permitted ample parking and traffic, even while long semi trucks were being loaded from the warehouse.

The growth at Fairbanks was slow and we had no lessees on the north tier of blocks when the discovery at Prudhoe Bay was announced. Since then, the demand has been for larger lot sizes and we will have to alter this particular subdivision accordingly. Bear in mind too that our rail barge service with carload lots has had its effect on the size of lots on Railroad industrial land.

When the oil boom hit Fairbanks, we went to our third state of industrial development as shown by the Chena Industrial Subdivision. Lot sizes are now a minimum of 100 by 175 ^{min}. Quite frequently, several lots are requested for one lease.

The three-track arrangement is too expensive, ^{at 24/ft} and we have gone to a two track arrangement with cross overs that should be adequate considering the length of track and the number of users. The spacing here for the rail corridor is 8-15-8, for a total of 31 feet.

Cannot force users of RR land



To a certain extent, Anchorage has gone through the same phases of development. However, with an unconfined Ship Creek running through the middle of the Terminal Reserve, we have been limited to subdivisions containing relatively small lots.

The third stage of development which requires large subdivisions of large lots or parcels has begun on private land south of Anchorage, and will continue to develop in that direction. Since the layout of these subdivisions will be handled by local engineering firms, perhaps it may be well to go into some of the geometrics and track arrangements that are involved.

For a rail industrial subdivision, the ideal position of our main line or a drill track is at a 45° angle to the cardinal points of the compass. The best example of this is our main line at Campbell Station, and the spur tracks already in place there. This relation permits spurs in any direction, and cuts down on the total curvature of the track, which is generally unusable to the owner. Refer to drawing.

If we are talking about a large subdivision, then we need a drill track or access track. The drill track cannot be used for loading or unloading; it must be kept clear for switching operations. Therefore, the subdivision should provide for spur tracks from the drill track. The result looks something like a series of wishbones, but is effective and cuts down on the amount of track required.

Each spur track can serve several users in order to minimize the number of switches. Corridor width required here is 8-15-15-8 for a total of 46 feet.

If our main line is normal to, or parallel to, the drill track, then we have problems. Long curves are required to use up the 90° central angles, and much trackage is wasted in the curves. At the current cost of \$24 per track foot, you cannot afford too much unusable track. The maximum curvature that we permit is 16°00'. Turnouts off the main line are either No. 9 or No. 11, and No. 7 turnouts are used for industrial tracks.

Industrial tracks
There will be other changes in rail industrial subdivision in the years to come. Undoubtedly, one of the first of such changes will be the building of huge bonded warehouses requiring extensive trackage and land.

At this point, our right of way in the Anchorage area deserves a comment concerning its future. Ever since I came to the Railroad back in 1947, we have been bombarded with requests for the use of our right of way for roads, power lines, gas lines, leases, and other utilities. I don't blame the people for these requests, since obviously it was much simpler to deal with a single government entity than a multitude of private property owners.

However, if we had acceded to all the requests, very little of our 200 feet would now be left. Now there is talk of a mass rapid transit system that Anchorage will require in the future. Our present

right of way and tracks could form a trunk line for a rail transit system. ~~Possibly~~ ^{probably} north- and southbound freight mains would have to be added to pick up the industry spurs, leaving a main line free for through trains and a rail transit system. Public opinion would seem to support such a system, and the future growth of Anchorage would certainly indicate that a mass rapid transit system ^{could} ~~would~~ be both feasible and desirable.

As most of you probably know, a feasibility study has been under way since 1970 for the extension of the Railroad to the North Slope and west to the ore-bearing regions near Bornite on the Kobuk River.

This study is being conducted with the use of modern techniques that are presently available. Aerial mapping of the route corridors is used exclusively, and soil classifications are determined largely by air photo interpretation, backed by selective drilling at various locations.

The geometrics of the route selection are relatively easy, except for the crossing of the Dietrich Pass, where a tunnel is required. However, as in the case of the proposed Alyeska Pipeline, the key to the location of the railroad alignment is primarily one of soils conditions. A change of 50 feet in the alignment can mean the difference between an extra section crew at \$35,000 a year - or only a nominal maintenance cost.

Answer

In the selection of the final alignment, I envisage a partial return to the old foot-slogging location crew. Several drill rigs will be out ahead as outriders scouting the country for favorable materials.

When one of the rigs sends out word that he has found gravel, the location engineer will turn to his party chief to say, "Sight on that drill rig. We're heading that-a-way!"

So much for modern-day techniques.

Speaking of modern-day techniques....I previously stated that both of our terminal reserves in Fairbanks and Anchorage were laid out in the 1950's and have rarely seen a survey crew since then. Changes have been made in trackage, buildings erected, utilities and roads installed, and so forth. Our station maps are badly in need of being brought up to date.

Recently, we held discussions with local aerial mapping people on the mapping of several of our yards. Right away, we ran into the problem of establishing a common dialogue. They described their capabilities in the jargon of their trade - while we described what we wanted in the simple terms of railroad engineering.

In order to see just what was involved, we decided to map our yard area and station grounds at Healy. We both overlooked the fact that a railroad yard means trains....at the time the aeri^{als} were taken, the southbound freight was making up his train in the yard - effectively concealing the location of several switches which

we wanted to locate. It was necessary to send a field crew out to locate these switches.

But, we haven't given up. I know it's been done for a large railroad in the east - and hopefully, we can work out the problems peculiar to this type of mapping. Of one thing I am sure, what we will be looking for is the simple geometric relationship of the topographic data to our basic yard tracks. It is this relationship which helps us plan alterations or additions in the yard. Coordinate values would only confuse the issue. We'll let the computer worry about what to do with them.