# Laying Pipe Along The Montana Northern Border

**by Steve Shuck**

The Alaska Natural Gas Transportation System. This name identifies the largest privately financed construction project in the history of the world. Since oil was discovered on Alaska's North Slope, developers have pondered how to transport the accompanying natural gas to United States markets. The Prudhoe Bay gas field was estimated to contain over 26 trillion cubic feet of saleable natural gas or 13% of the nation's known reserves—our largest reserve.

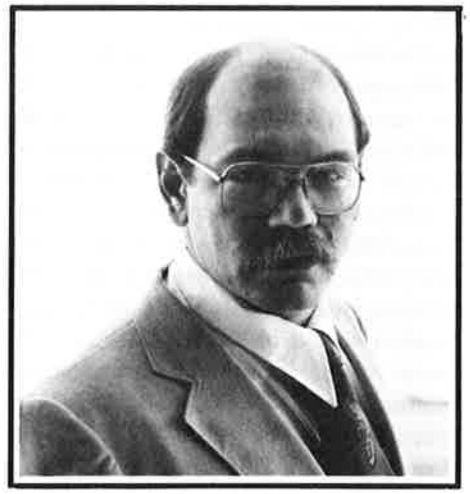
Between 1974 and 1976, three proposals for transporting the natural gas to the lower 48 states were submitted to the Federal Power Commission (FPC). The first proposal, submitted by Arctic Gas, was to deliver the Prudhoe Bas gas as well as natural gas discovered in MacKenzie River Delta in the Yukon Territorry via overland pipeline across Canada. The second proposal was submitted by El Paso Alaska Company. They wished to transport the Prudhoe Bay gas via a pipeline paralleling the Trans Alaska Pipeline System (TAPS) crude oil line to Valdez, Alaska. The gas then would have been liquified and shipped via Liquified Natural Gas tanker to west coast markets. Upon arrival it would have been regassified and put into existing pipeline distribution systems. Alcan Pipeline Company and Northwest Pipeline Company (Alcan) filed the third proposal with the FPC. This plan called for a pipeline following existing utility corridors through Canada to U.S. markets.

Aware of the demand for natural gas in the lower 48 states, the large gas reserves in Alaska, and the potential for delay in the regulatory process authorizing a project of this magnitude, Congress passed the Alaska Natural Gas Transportation Act (ANGTA) in October 1976. This legislation was designed to provide for the expeditious selection of a transportation system, as well as for its construction and initial operation while maintaining construction quality, cost control, safety, and environmental protection. This was done by two provisions of the Act. The Act gave Alaska Natural Gas Transportation System (ANGTS) applications precedence over similar applications, and called for the creation of the Office of the Federal Inspector. The Office of the Federal Inspector (OFI) became the federal government's single contact point. Sponsors and applicants were to work through the OFI, rather than dealing with the maze of federal agencies having enforcement responsibilities.

Another provision of ANGTA directed the President to designate the preferred transportation system. The decision was to be based on recommendations of FPC, land management agencies, environmental impact statements, and the Canadian government, with full consideration given to the economic feasibility of each proposal. On September 22, 1977, President Carter declared that the Alcan proposal would be the Alaska Natural Gas Transportation System.

The Alcan proposal included an Alaskan Segment, a Canadian Segment, a Western Leg, and an Eastern Leg. the Alaskan Segment originates at Prudhoe Bay and parallels the TAPS line to Delta Junction in central Alaska where it turns southeast to the Alaska-Yukon Territory Border. The Canadian Segment starts at that border, travels along southern Yukon Territory, cuts across the northeast corner of British Columbia, and runs along the western edge of Alberta. South of Calgary the line splits into a western pipeline heading southwest to the U.S. boundary near Kingsgate, British Columbia and an eastern line heading southeast to the U.S. border near Monchy, Saskatchewan. The Western Leg begins at the border near Kingsgate, travels through north-

***(see Border, pg. 34)***



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**Border (cont. from pg. 33)**

western Idaho, eastern Washington, Oregon and terminates near San Francisco (see Figure 1).

The Eastern Leg, built during the summer of 1981 by its sponsor Northern Border Pipeline Company, begins near Monchy at the U.S. border and cuts across northeastern Montana, North Dakota, southwestern Minnesota, and Iowa terminating outside Chicago. Its construction provides some interesting insights into how a project of this magnitude is undertaken.

## Northern Border Construction

Northern Border split the line into nine separate construction spreads to be constructed simultaneously. About 20 miles of Spread One (beginning at the Canadian border and continuing southeasterly approximately 90 miles east across Montana) cross public lands administered by the Bureau of Land Management (BLM). The BLM had worked with Northern Border helping them with route selection, landowner contact and other preconstruction activities prior to the arrival of the Office of Federal Inspector's people in the area. When the OFI arrived on site, they established a joint, cooperative effort between the OFI and the BLM. The OFI recognized the BLM's knowledge of the area and redelegated environmental enforcement responsibilities on public land back to the BLM while retaining the responsibility for technical, economic, and administrative matters.

Actual construction on Spread 1 of Northern Border Pipeline began on May 5, 1981 at the Canadian border. The company had been granted a 54 foot permanent right-of-way across public land by the BLM with an extra 46 feet temporary construction width. In places where extensive cutting or more operating space was necessary, up to an additional 100 feet temporary space was granted.

While much of the land along the right-of-way was flat to gently rolling, extensive blading was often necessary to obtain a level work pad. A 42 inch pipeline, weighing about 20,000 pounds must be precisely centered with its weight evenly distributed to prevent rolling. On flat ground, the right-of-way was high-bladed by skimming the surface of the ground to knock off humps, fill in ruts and remove rock to obtain a smooth working area. In all areas which required blading, topsoil was preserved for replacement over the right-of-way after the pipeline was in place and the right-of-way had been recontoured.

Once a level working area was obtained, pipe stringing began. As many as 23 trucks hauled two 80 foot joints per load from the pipe stockpile to the right-of-way. Initially, the stockpiles and right-of-way were about 100 miles apart, leading to only two loads per truck per day. The pipe was strung along the staked centerline in preparation for ditch construction.

As much of the ditching as possible was done by trenching machines. The trenchers were capable of providing a ditch 66 inches wide by 78 inches deep to accommodate the pipe. In places along the route, the trenchers could not operate. Curves, muddy soil, rocky ground and heavy clay soils required that backhoes dig the trench. The backhoes dug an adequate trench but were slower and less efficient. While the trenchers did an admirable job of keeping loose soil and rock out of the trench, further work was still necessary to obtain a usable trench. A small dozer pushed unwanted material into piles on

***A Cleveland Trenching Machine (BLM photo)***

the trench floor to be removed with a bucket. This was followed by a team of people with hand tools who put the finishing touches on the pipe bed.

After the trench was completed, the trench was measured by a surveying crew for angles, bends and sags. This information, measured to ½ degree was written on the pipe alongside the trench. The pipe was bent in a hydraulic bending machine to match the trench configurations. Specifications for pipe allowed for a bend of up to ½ degree every 14 inches. Thus, each 80 foot pipe section could be bent between 20 and 25 degrees.

After the pipe was bent it was welded. A total of 16 welders (working on the top half and bottom half on each side) applied the stringer bead after a line-up clamp inside the pipe aligned the ends of the pipe joints being welded. These were followed by a team of six welders who added a second weld called the first hot pass followed by two more welders who applied the second hot pass. Teams of two welders each then added four more passes (called filler welds) and a final team applied the cap welds.

Each weld was marked to identify each welder's work. In this way the inspectors could determine the quality of each welder's work from the X ray. The pipe section number, weld and welder information, and X rays are kept in a permanent file on the line for future reference during maintenance and operation of the pipeline.

The large number of required welders quickly presented a slight problem. The 75 contract welders each had their own truck which caused significant congestion problems on the right-of-way and excessive off right-of-way travel. Northern Border and the pipeline contractor solved this problem by requiring the welders to put their equipment onto wheeled sleds. The sleds were pulled from one station to another by tractor, eliminating much of the right-of-way traffic.

Northern Border used a method to conserve pipe in case of a blowout. If a blowout would occur the pipe will split laterally along the pipe seams faster than the pipe will depressurize. A break of several thousand feet can develop. Crack arresters designed to reduce a potential split's length were installed on average 3000 foot center and absorb shock rather than allow it to continue along the line. This substantially reduces the risk of pipe ruptures.

The pipe was coated and taped after it had been welded and X rayed. The machine that did this encircled the pipe and moved along it. A series of brushes first cleaned rust and dirt from the pipe. A primer was then applied and covered

***(see Tape, pg. 35)***