

PIPELINE

Archaeological Investigations - Key to the Past

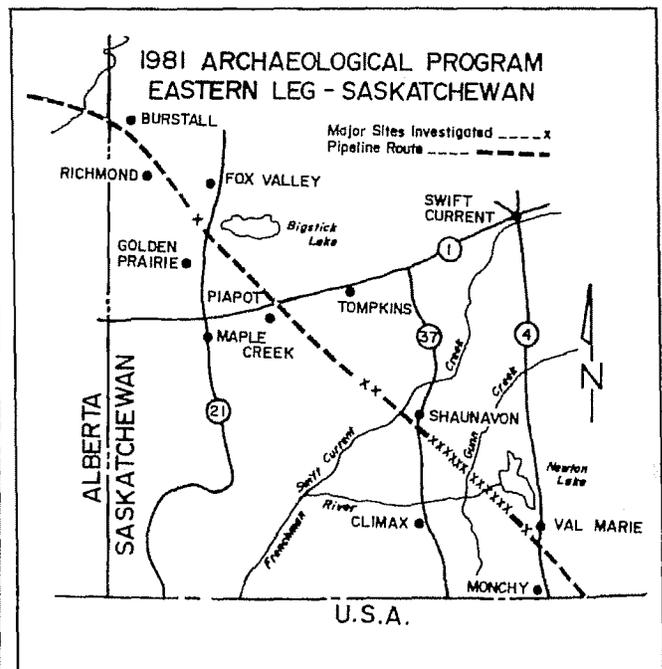
Investigations of 15 major archaeological sites in Saskatchewan along the right-of-way of the Eastern Leg of the Alaska Highway gas pipeline are now complete. This summer's work - the final phase of a program begun by Foothills Pipe Lines (Sask.) Ltd. in May, 1980 - has involved mitigating the impact of pipeline construction activity at certain locations identified as archaeologically significant by both Foothills (Sask.) and the Heritage Conservation Division of the Saskatchewan Department of Culture and Youth.

The Northern Pipeline Agency's environmental terms and conditions require that, prior to the start of construction, the company must conduct a historic resources investigation program in the area through which the pipeline passes and, in consultation with the provincial government, locate the route wherever possible to avoid sites identified as naturally or culturally significant. Foothills (Sask.) conducted an archaeological survey and evaluation and mitigation work in Saskatchewan from spring through the fall of 1980. Following passage of the province's *Heritage Property Act* in November, the company agreed to investigate certain archaeological sites in further detail to determine the possible impacts of construction and how to mitigate them.

Most sites selected for mitigation consist of collections of stones arranged in circles called teepee rings, suggesting encampments occupied as long as 1,200 years ago, says Randall Chappel, Environmental Co-ordinator for the Alaska Project Division of NOVA, An Alberta Corporation, the agent for Foothills (Sask.) and Foothills (Alta.) Teepee rings and other archaeological resources along the right-of-way can be protected by simply flagging and fencing them off, as long as they do not occur where the ditch is going or in the working area of sidebooms and welding equipment, he explains. "The areas are clearly identified on the site drawings which go along with the contract documents. Our field personnel go out in advance of construction to erect fences and flag the sites so that they'll be avoided by vehicles and equipment."

Legislation much like Saskatchewan's *Heritage Property Act* also applies in Alberta, where Foothills (Alta.) has completed a similar archaeological program to protect sites along the Eastern Leg. "A number of significant sites in Alberta have been identified and protected," says Chappel, "but, because the pipeline route in Saskatchewan travels a greater distance through lands with archaeological potential, our work there has been more exhaustive." The route of the Eastern Leg in Alberta already follows an existing NOVA right-of-way, whereas in Saskatchewan the pipeline corridor is new.

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Archaeologists discovered remnants of a stone tool workshop on the pipeline right-of-way near Jones Creek, Saskatchewan. The exposed cobbles represent the various stages of stone tool manufacturing.

Photo courtesy of NOVA, An Alberta Corporation

Eastern Leg Construction Interrupted

Progress was steady on the Eastern Leg of the Alaska Highway gas pipeline in Alberta and Saskatchewan, prior to a strike by welders which began July 26 and has since interrupted construction.

Hydrostatic testing, a process by which water is pumped through a constructed pipeline segment at a specified pressure to check for leaks and faults, began in late July on several completed sections running east of the Saskatchewan River crossing. As of July 17 in Saskatchewan, 153 km (95 mi.) had been graded, 114 km (71 mi.) ditched and strung with pipe, 10 km (6.8 mi.) automatically welded, 97 km (60 mi.) wrapped and lowered-in to the ditch and 82 km (51 mi.) of tie-ins completed.

Pipelaying on the east and west bank approaches to the South Saskatchewan River crossing in eastern Alberta is complete and concrete collars have been placed on the two sections of pipe to be installed in the river to prevent them from floating. Due to high water levels, the crossings of both the South Saskatchewan and Red Deer Rivers in Alberta have been rescheduled for September.

Heavy rain during much of July hampered construction activity in Al-



Pipe is wrapped with protective plastic tape and lowered in to the ditch on the west bank of the South Saskatchewan River in Alberta.

berta on the pipeline section extending 54 km (33.5 mi.) east from James River Junction. As of July 17, 46 km (29 mi.) had been strung with pipe, 33 km (20 mi.) ditched, 25 km (16 mi.) automatically welded and 18 km (11 mi.) wrapped and lowered-in. Grading operations have begun in the badlands area near Brooks, Alberta, where leave-to-proceed with the remaining Eastern Leg sections in Alberta, scheduled for 1981 construction, was granted in July by the

Agency.

As of June 30, of the 868 km (539 mi.) of the U.S. Eastern Leg now under construction 671 km (417 mi.) had been cleared and graded, 314 km (195 mi.) strung with pipe, 324 km (201 mi.) ditched, 184 km (114 mi.) welded and 138 km (86 mi.) wrapped and lowered in. Construction began in early May in Montana, South Dakota, Minnesota and Iowa and is scheduled to start in North Dakota in September.

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"In the case of the 15 sites in Saskatchewan considered sufficiently significant to warrant thorough study, we've concentrated on excavating portions of those sites which would otherwise be destroyed by grading or ditching operations," Chappel continues. "In the archaeological sense, mitigation often refers to unlocking the knowledge that's contained in a site before impact occurs. We've determined from the earlier survey and evaluation phases of our program that these particular sites along the right-of-way give clues to the occupation patterns of the people who used the area some time ago."

Ranging in size from small areas with only several teepee rings to one which is almost 65 hectares (160 acres), encompassing up to 100 rings, the sites under excavation this year are generally spread over the lower sections of the pipeline route in Saskatchewan, south of

Swift Current Creek. Many of these sites are near stream crossings because the choice of habitation was associated with the availability of water and game, notes Brian Spurling, Supervisor of Archaeological Resource Management in the province's Heritage Conservation Division.

Another region considered archaeologically rich is the Great Sand Hills further north, where prehistoric sites are often deeply buried beneath centuries of sand deposits. "Since the pipeline runs along the western edge of the Sand Hills," Spurling explains, "the province also requires that Foothills (Sask.) monitor the trench of the pipeline for any archaeological sites or artifact material which may be uncovered during the course of ditching. So far items typical to the area such as bones and arrowheads have been found." Laboratory analysis of materials uncovered as a re-

sult of Foothills' (Sask.) investigations not yet complete, but Spurling expects the final report this fall.

Both Spurling and Chappel point out that a considerable number of archaeological sites have been disturbed by grazing and cultivation. "In comparison, the impact of pipeline construction is rather minor," remarks Chappel. "It is usually limited to compaction from driving equipment overtop of teepee rings which are already sunk into the ground. Yet a landowner will often plough up the same field without undertaking any kind of archaeological survey work or mitigation." Spurling agrees Chappel's point is valid. "Agriculture has been a major source of impact in Saskatchewan and among the last to be brought within the Heritage Conservation Division's scope. Perhaps in the future, areas being opened up for agricultural use will first be surveyed for archaeological resources."

Policing the Pipeline

Statistics compiled by the R.C.M.P. in Alberta indicate no change or increase in crime patterns during 1980 in the areas of the province where construction of the Western Leg of the Alaska Highway gas pipeline took place.

cial levels of the government and the R.C.M.P., to maintain security on the pipeline and give assistance to enable the police to carry out their law enforcement duties. This means providing the R.C.M.P. with information and access to

are no problems of any consequence. The police detachments along the Saskatchewan segment of the Eastern Leg report the same.

Inspector George Rechner, Officer Commanding of southwestern Saskatchewan, notes the pipeline runs through agricultural country. "We're out in the middle of the prairie. The pipeline crew is out there to get the job done, not to create trouble." Although traffic along the Trans-Canada Highway is usually heavy during the tourist season, Rechner says that the movement of pipeline-related equipment and vehicles has little effect because it occurs early in the morning and late in the evening.

Both Sergeant Bergsma and Inspector Rechner agree successful policing of the pipeline depends on open communication and liaison among all the players involved: R.C.M.P. headquarters, the local detachments, the pipeline company and its contractors, and the Northern Pipeline Agency. "We're continually updating each other," says Bergsma. "It's one of the most fantastic processes I've ever had occasion to work with," he concludes.

"We found the impact to be minimal"

"It's most satisfying that crime did not increase due to the influx of many people into the area," remarks Sergeant Edward Bergsma, head of program evaluation for the Planning Branch of the R.C.M.P. in Alberta. "Although we had anticipated a challenge, we found the impact to be minimal. At times, our local detachments could hardly tell that pipeline crews were around because there were no problems pertaining to either crime in the vicinity of the pipeline or to the security of the pipeline itself."

Bergsma attributes the lack of problems to the co-operation provided to the R.C.M.P. by Foothills Pipe Lines (Alta.) Ltd. and the Northern Pipeline Agency. The Agency's socio-economic terms and conditions require the company, in consultation with the federal and provin-

the pipeline and to construction or operations personnel. Foothills must also ensure that firearms and hunting devices are prohibited on the pipeline right-of-way and on company property, vehicles, aircraft or campsites.

Bergsma explains the R.C.M.P. are keeping all detachments along the route up to maximum strength at all times during construction. "Our job in the planning branch is to look at the pipeline project from the perspective of manpower and how we can best staff the local detachments to reduce crime or keep crime to a minimum in the areas where construction takes place."

Bergsma recently made a trip along the length of the Alberta portion of the Eastern Leg of the pipeline, where construction is underway, and says there

Skills and Interest Inventory to be Conducted Among North B.C. Natives

For the first time two federal government departments are joining forces to undertake an inventory among northern British Columbia status and non-status Indians and Metis people to determine what employment interests and skills exist for major resource developments in the area, including coal, hydro, petrochemicals and construction of the Alaska Highway gas pipeline. The Department of Indian Affairs and Northern Development (DIAND) and the Canada Employment and Immigration Commission (CEIC) are developing the format for the skills and interest inventory, to be conducted at the band level by local native people. The need for information from northern B.C. natives, regarding proposed developments and associated training and job opportunities and impacts on their way of life, was emphasized at workshops co-ordinated by DIAND in late June in Dawson Creek and Prince George.

Funding for the inventory will come from a \$310,000 sum allocated this summer by DIAND and the federal Ministry of State for Economic Development for status and non-status people affected by resource projects in northern B.C. The money will enable native groups to study ways in which they may benefit and participate in resource development and to plan mitigative actions for potential impacts. The estimated 1,050 Indians living in the Treaty 8 area of northern B.C. may be affected.



Blueberry River Reserve, B.C.

Photo by M. Weinstein

South Yukon Geotechnical Drilling Program

by Dick Cowan

Between 1977 and the end of this summer, over 900 geotechnical test holes will have been drilled to obtain soil samples along the route of the Alaska Highway gas pipeline through Yukon.

Foothills Pipe Lines (South Yukon) Ltd. began the geotechnical drilling program to study soil conditions along the proposed right-of-way, particularly permafrost or frozen ground, which would affect pipeline design and pipe-laying procedures. Boreholes were drilled to confirm the location of nearly continuous and discontinuous permafrost, the ice content of frozen soils and the potential for frost heave and thaw settlement. Frost heave occurs when moisture in unfrozen soils freezes and expands, causing the ground to heave upward. Thaw settlement is the tendency for frozen soils to thaw and slump.

Since the gas in the buried pipeline will be below freezing temperature when it enters Yukon from Alaska, pipe designs and installation techniques must be developed to control or minimize frost heave in unfrozen soils within the sections carrying chilled gas. Similarly, in ice-rich permafrost soils further south, where the piped gas will be warmer than ground temperature, designs are required to mitigate thawing and potential loss of pipe support. Soil samples taken help determine the need for stations along the Yukon route to chill the gas, the extent of terrain subject to frost heave or thaw settlement problems and the transitional characteristics between frozen and unfrozen soils. Based on the information collected to date, special construction designs are being developed and tested and realignments of the pipeline route in Yukon have been considered.

Water crossing areas have also been tested to determine whether the approaches contain permafrost and if soils susceptible to frost heave or thaw settlement exist on lake and river bottoms. A further problem is liquefaction, wherein silty sands become like quicksand as a result of ground movement. This condition causes a temporary loss of soil stability, buoyancy and possible slumping. Samples taken from Kluane Lake, the largest proposed lake crossing at a width of six km (four mi.), indicate the sediment on the lake bottom is subject to potential liquefaction which could affect the support and safety of the pipe.

Foothills (South Yukon) geotechnical program has also focussed on designing and locating facilities such as compressor stations, stockpile sites and construction camps according to soil conditions. Compressor stations must be situated on ground sufficiently strong to support a concrete foundation. In this regard, engineers tested the strength of unfrozen soils at non-permafrost sites, the strength of thawed soils at permafrost sites and the potential for thaw settlement in frozen soils. For campsites, soil information is necessary to design shallow foundations and waste

disposal sites and water supply systems.

During this year and next, Foothills (South Yukon) geotechnical work is directed at selecting sand and gravel supply sites for construction of access roads, work pads and foundations and for use as pipe bedding and padding material. Granular resources are also used in the experimental designs to mitigate frost heave and thaw settlement, such as the installation of pipe in above-ground embankments. Testing for granular materials often involves a combination of drilling and backhoe excavation to obtain sufficient data on the depth, extent and quality of the deposits.

Samples taken from the test holes are examined for grain size and moisture content and undergo laboratory analysis to determine strength and susceptibility to form ice pockets or lenses in a freezing situation, or to slump when thawed. Shear tests were also conducted to assess the stability of slopes. Many of the holes have been instrumented with devices called thermistors for obtaining temperature profiles or with piezometers for measuring groundwater levels and pressures. Based on the results, deci-



A hydraulically-powered sonic drill obtains samples from coarse soils at a compressor station site near Destruction Bay.

sions may be made to drill additional holes in a certain area, choose another compressor station site or find a more suitable granular resource site.

Environmental Protection High Priority

Throughout the drilling process, protection of the environment is a high priority. Short-term use of borehole or drill sites are authorized by land-use permits, issued under the *Territorial Land Use Regulations* by Dale Longlitz from the Department of Indian Affairs and Northern Development (DIAND). Longlitz is seconded to the Northern Pipeline Agency to act on DIAND's behalf in matters relating to territorial land tenure and use for the pipeline project. The land-use permits for geotechnical drilling include conditions for environmental protection which are inspected routinely by John Doyle, the Agency's land-use officer based in Whitehorse.

Environmental concerns are general
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Profile - The Hon. H. A. (Bud) Olson, Minister Responsible for the Northern Pipeline Agency



The Hon. H.A. (Bud) Olson, Minister responsible for the Agency

With a project as large and complex as the Alaska Highway Gas Pipeline, there will always be problems to face and overcome, but today none of them seems insurmountable to the Hon. H.A. (Bud) Olson, Minister responsible for the Northern Pipeline Agency. Senator Olson notes that such was not the case in early 1980 when the Canadian Cabinet was examining the possibilities of building the southern segments of the system in advance of construction of the northern sections. "It was clear to me that something had to be done to get the project, which had already been delayed for close to three years, off the ground," says Sen. Olson. In the Minister's view, the government's decision of July, 1980, to proceed with the first phase of construction, created the impetus necessary to move the entire project ahead.

Sen. Olson, 55, was born and raised in southern Alberta. Since 1979 he has operated his own ranch near Brooks, Alberta. Following the federal election of February, 1980, Sen. Olson was appointed to the Cabinet by Prime Minister Trudeau to serve as Minister of State for Economic Development and Minister responsible for the Northern Pipeline Agency. Within Cabinet, the Minister also chairs the committee on Economic Development. While his current duties keep him in Ottawa much of the time, the Minister enjoys returning to his ranch as often as his hectic schedule permits.

First elected to the House of Commons in 1957 as the Social Credit member of Parliament for Medicine Hat, Sen. Olson was re-elected in the general elections of 1962, 1963 and 1965. In 1967, he joined the Liberal party and was elected in the Medicine Hat Riding as the Liberal Member in 1968. From 1968 to 1972, Sen. Olson served as Minister of Agriculture. While holding this post, he oversaw major amendments to the *Canada Grain Act*, as well as passage of the *Farm Products Marketing Agencies Act*.

In April 1977, Sen. Olson was appointed to the Senate. It was here that he first became involved with the Alaska Highway Gas Pipeline Project. Serving as Chairman of the special committee of the Senate on the Northern Gas Pipeline, Sen. Olson played a key role in guiding the *Northern Pipeline Act* through the Committee deliberations in the upper house in early 1978. When the Senate established its special committee in June of that year to oversee the operations of the Agency and the progress of the pipeline project, Sen. Olson was again elected as Chairman.

It was at this point, recalls Sen. Olson, that he became concerned about the methods being used to acquire land for pipeline purposes. Under the expropriation sections of the *Railway Act*, "the landowners' position was untenable." According to Sen. Olson, the *Railway Act* of 1919 was not written with the intention that it would be used to expropriate property for pipeline purposes and "by the time that the law was first applied in this manner in 1959, it was already antiquated and inadequate."

Throughout 1978 and early 1979, the Senate Committee conducted a comprehensive study of expropriation procedures and heard testimony from landowners' associations, farm organizations and representatives of the petroleum industry. Considerable time and effort were also expended in achieving a consensus among all of the political parties on the direction which would be taken in the new legislation.

One of the provisions of Bill S-12, which was subsequently drafted, allowed the landowner a choice of lump sum, annual or periodic payments. Annual or lump sum payments would be subject to review every five years to take into account any increases in the market

value of the land as well as any damages which may have resulted from the construction or operation of the pipeline.

Although S-12 was passed in the Senate and introduced as a private members' bill in the House of Commons, it died on the Order Paper when Parliament was dissolved for the 1979 general election.

The Minister was instrumental in having the government-sponsored bill, C-60, *An Act to Amend the National Energy Board Act*, introduced into Parliament early this year to replace the former S-12. Due to the groundwork done earlier, the bill was dealt with expeditiously the House of Commons and then referred to the Senate. As a result of amendments made to the bill by the Senate, C-60 now requires final approval from the House of Commons before it can be passed into law.

At the time Sen. Olson assumed responsibility for the Northern Pipeline Agency in March, 1980, the pipeline project was at a crucial juncture. If the southern sections of the system were going to be "pre-built", several conditions had to be met before the Canadian government could grant its approval. One of these involved assurances from the United States government that it remained committed to the building of the entire pipeline system.

First Meeting of All Key Players

Following an earlier visit to Washington in May, 1980, Sen. Olson again travelled to the American capital on June 27, 1980 to attend a critical meeting with major Administration officials and Congressional leaders to discuss the assurances which the Canadian government required. As the Minister explains, "The meeting took place at 7:30 in the morning because that was the only time we could get everyone together. As I recall, it was the first occasion when all of the key players had been in the same room. When I explained to them what it was that we required in the way of commitments, they agreed that our requests were reasonable and justifiable. That very afternoon, the United States Senate passed a unanimous resolution stating that the Alaska Highway Gas

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Profile - The Hon. H.A. (Bud) Olson

Pipeline Project 'enjoys the highest level of Congressional support for its expeditious construction and completion'. A few days later the House of Representatives unanimously passed the same resolution. And in July, President Carter sent a letter of formal assurances to the Prime Minister reiterating the Administration's support of the project."

my view, if that support had not come in, the authority to commence the pre-build would also not have happened."

The economic benefits to which Sen. Olson refers include \$17 billion in revenues from the sale of surplus Alberta gas over the life of the export licenses which, in turn, will increase Canada's balance of payments position by approx-

Overwhelming Response From Across Canada

Sen. Olson also worked hard to solicit support directly from Canadian business and labour groups for the "pre-build". "There were members on the opposition benches from Alberta who were questioning whether or not the government should proceed with pre-build", he says. "My Cabinet colleagues were concerned that if the representatives of the people, who are in a position to gain most from the pre-build, are questioning it, then why are we proceeding? It became necessary for me to go past those representatives directly to the people to get an expression of opinion. When I asked for that support, I got an overwhelming response from right across the country in the form of telegrams, letters and phone calls from the gas industry, supporting services and labour groups. They all recognized that there were considerable economic benefits to be gained by starting the construction of the southern sections earlier than the northern segments and did not want to see Canada lose those opportunities. In

imately \$2 billion a year. The net economic benefit to Canada is estimated to be \$4.5 billion. In addition, 90 percent of the goods and services required for the entire pipeline project in Canada are to come from Canadian sources. As the Minister whose primary responsibility is economic development within Canada, Sen. Olson regards this provision as particularly significant as a means of broadening our industrial base and increasing research and development. He is pleased by the fact that Foothills has been successful in meeting this target in its construction activities to date.

The Minister no longer refers to the first-stage construction as pre-build. "I was certain that once we had accepted the commitments made by the United States what we were doing was beginning the building of the whole line. The very significant progress which we have seen in both Canada and the United States these past several months convinces me that this is indeed the case."

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Geotechnical Drilling

ally minor, as the drilling operations cause little or no disturbance to the land. A helicopter-supported drill, for instance, requires only a small, slashed area and no access roads, and introduces no foreign material down the hole. The drill may or may not use water to support the drilling operation. On the other hand, a gravel exploration program, using a backhoe requires access, clearing, backfill and clean-up of excavated test holes and consequently, much on-site supervision.

Biologists also study the drill site areas for possible impact on wildlife and recommend mitigative measures such as "timing windows". A borehole sample may be required near an active eagle nest or sheep lambing area. In such instances, the Agency does not allow drilling activity to proceed until the sensitive or critical period has passed.

Detailed Planning and Analysis

Foothills (South Yukon) geotechnical drilling program is a key aspect of the Alaska Highway gas pipeline project, involving detailed planning and analysis. The ultimate success of the program will not be known until the pipeline has been designed, constructed, and operated safely for several years.

Dr. Dick Cowan is Manager of Environmental Surveillance for the Northern Pipeline Agency and a specialist in terrain analysis.

MINISTERS RESPONSIBLE FOR THE NORTHERN PIPELINE AGENCY SINCE PROCLAMATION OF THE ACT

The Hon. Allan MacEachen	April 27, 1978 to June 4, 1979
The Hon. Walter Baker	June 5, 1979 to October 2, 1979
Sen. the Hon. Robert de Cotret	October 2, 1979 to March 3, 1980
Sen. the Hon. H.A. (Bud) Olson	March 3, 1980 to present

Pipeline

The Northern Pipeline Agency was created by Parliament in April, 1978 to oversee the planning and construction of the Alaska Highway gas pipeline project in Canada. Enquiries or suggestions are welcome and may be directed to:

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