THIRD ARCHEOLOGICAL SUPPLEMENT TO THE

BIOLOGICAL REPORT SERIES

Proposal For Archeological Salvage,

Pipeline Corridors, Alaska

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PREFACE

This document constitutes a preliminary proposal for archeological salvage along gas transmission pipeline construction sections in Alaska.

This proposal has been prepared for Alaskan Arctic Gas Study Company based upon information secured to date regarding construction route, methods and schedules, as listed in the body of the following document.

This document has been prepared by Dr. John P. Cook, Chairman, Department of Anthropology, University of Alaska, and Ms. Gloria J. Fedirchuk, M.A. of the Department of Anthropology and Archaeology of the University of Saskatchewan in Saskatoon, with the assistance of Mr. D. Beck of the same department. The general approach to the problem of archeological salvage and most of the details of the salvage project and the methodology have been derived from reports written by Dr. James F.V. Millar, Ph. D. B.A. Sc, P. Eng., Head and Professor of Archaeology of the University of Saskatchewan in Saskatoon, for Canadian Arctic Gas Study Limited.

In summary, this preliminary proposal contains the following information.

1. The objective of this proposal is the presentation of a preventative and salvage archeological program to precede and accompany pipeline construction activities along and adjacent to the proposed route.

2. The purpose of archeological salvage is the minimization of potential damage to and loss of archeological information and the maximization of the potential recovery of information concerning man's heritage in Alaska.

3. Information on the pipeline route, construction design and schedule of which this program is based.

4. Virtually no archeological investigation has been done in the area traversed by the pipeline. Therefore, much of the assessment of

archeological potential, project requirements and costs have been based on surveys carried out in the interior of Alaska. As archeological and paleoenvironmental data is exceedingly fragile, relatively meager and easily lost and destroyed, the conservation and preservation of this information is a responsibility of both industry and the archeological community.

5. The archeological salvage program includes two phases of survey, one of surveillance and two of test and excavation.

(a) Preliminary Survey - aimed at spot-checking or section-checking the most important and most probable sections of activity.

(b) Route Preparation Survey - aimed at further checking during the earliest construction phase.

(c) Surveillance of the Ditching Activity.

(d) Preliminary Excavation - salvage excavation of sites located during the Preliminary Survey or Route Preparation Survey and endangered by construction activities.

(e) Second Excavation Phase - excavation of sites located during the Survey or Ditch Surveillance phases.

6. The Alaska section of the pipeline was divided into six archeological segments based on the construction schedule and archeological strategy.

7. The line has been classified into high, medium and low priority sections and locations. These classifications reflect the probability of site existence and probability of success in locating them by ground survey.

1 INTRODUCTION

1.1 Purpose of Proposal

This proposal summarizes archeological investigations on the significance of that area of Alaska to be traversed by the proposed pipeline with its associated facilities, followed by a research program designed to detect, recover and conserve the archeological resources of that area. This has been prepared for Alaskan Arctic Gas Study Company.

1.2 Basis for Preparation

This proposal was prepared at the request of Dr. J. F. V. Millar and Mr. R. S. Davidson of Batelle, for a preliminary proposal delineating a program and methodology for the determination of archeologically sensitive areas, the location of such areas and their subsequent salvage. A preliminary set of air-photograph strip-mosaics and alignment sheets were provided in addition to a tentative construction schedule.

Related archeological and ethnographic literature was researched to provide information for the derivation of a prehistoric utilization strategy, necessary for predicting archeologically sensitive areas, important for line priority classification and for establishing archeological research strategy and methodology.

1.3 Preparation Procedure

The Guidelines for Archaeological Salvage (Millar 1971) were used as the basis for the design of the program proposed in this document. This report was based on an examination of the available environmental, archeological and ethnographic data on the areas of the proposed line and the air-photograph strip-mosaics. The route was segmented for archeological salvage purposes to conform to the construction schedule and to the gross archeological provinces through which the line passes.

Then the proposed line was classified as to archeological priority by examination of the strip-mosaics, with consideration of the prehistoric utilization strategy and the archeological survey strategy; all of this done with consideration of the terrain, ground cover characteristics and the construction activity contemplated.

Based on the Line Classification and the archeological survey strategy, the archeological schedule was prepared to correlate with the timing limits imposed by the construction schedule.

2 PROPOSED PIPELINE PROJECT

2.1 Basis for Information

This section presents the data on which this proposal has been prepared and the means of calculating any necessary changes related to changes in construction plans. In those areas of pipeline design that remain tentative, the basis used for this proposal will be explained.

Most of the pipeline data were obtained through the co-operation of Mr. R. A. Hemstock, Director of Environmental Studies, Canadian Arctic Gas Study Limited. The archeological program design and schedule reflects the excellent understanding and thoroughness with which this Company has approached the pipeline construction and environmental problems, particularly in their early awareness of the advisability to consider the archeological implications.

2.2 Purpose of the Pipeline Project

The Alaskan Arctic Gas Pipeline is planned as an all-land route to move natural gas from Prudhoe Bay to connect with pipeline facilities in the Yukon Territory in Canada.

2.3 Proposed Pipeline Route

Two alternative routes have been proposed for the region between Prudhoe Bay, Alaska, and the northeastern Mackenzie Basin in Canada. In Alaska, the 'Coastal Route' will follow the Arctic Plain between two and one-half and twenty-seven miles inland from the coast to the Yukon border. The 'Interior Route' traverses interior Alaska, crossing the Brooks Range and striking southeasterly along the Porcupine River drainage crossing the Canadian border just north of the Old Crow Range. This proposal covers only that portion of the pipeline route which lies within the borders of Alaska.

2.4 Pipeline Facilities

Four compressor stations, each with an adjacent 2,400 foot airstrip, will be associated with the 'Coastal Route'. Six compressor stations, most of them with either a 2,400 foot or a 6,000 foot adjacent airstrip, will be associated with the 'Interior Route'.

All stations will be operated by remote control and will be composed of a number of buildings providing operational and maintenance facilities plus temporary living quarters for 12 to 15 persons. Each station will require an area of about 4 acres with an additional 15 to 30 acres needed for an airstrip.

The construction program will require large quantities of gravel for facility bases, roads, berms, etc. Some gravel sources have been determined and have been designated high priority points for archeological salvage.

2.5 Probable Construction Methods

The pipeline will be designed as a conventional buried pipeline with above-ground pipe located only at compressor stations. The buried pipeline will, in most cases, be placed in a six to seven foot wide ditch, with the top of the pipeline a minimum of 30 inches below normal grade.

The right-of-way will be 120 feet wide and will be cleared where necessary. The only permanent roads that will be constructed for the pipeline will be those connecting airstrips and their respective maintenance-stations or material stock-pile sites, and those connecting maintenance-station sites and the primary communications towers. At the repeater communications towers, short permanent pathways will be provided between the tower pads

and the helicopter pads located next to them. All other roads needed for construction of the pipeline will be winter snow or ice roads. The right-of-way will be revegetated. Pipeline construction will be carried out in winter only.

2.6 Construction Facilities and Activities

Construction camps will be constructed, generally as semi-permanent installations at the Compressor Station sites. Some temporary camps may be set up for some areas and special projects: e.g., river crossings.

Construction will inevitably require 'day-to-day' decisions on secondary facilities or temporary sites. To include these in the archeological survey will require close field co-operation between Company, construction crews, land use officers and field archeologists.

The location of supply mobilization points and transportation routes is as yet only approximate, but their very nature makes them of a high priority archeologically.

Construction camps will be required well before the main construction period and will be located at the Compressor Station sites.

Installation of communication systems will be required before actual construction.

Right-of-way flagging will likely be done immediately in advance of the clearing crews.

Actual construction of the line will be done in three phases:

(1) Right-of-way clearing operations accompanied by clearing inspectors.

(2) Preparation of gravel pads for compressor stations, grading of stock pile sites and construction of roads where necessary.

(3) a) grading
b) stringing
c) bending
d) ditching
e) welding
f) coating and wrapping
g) lowering-in
h) tie-in
i) back filling

Where necessary pile and berm construction will also be carried out.

2.7 Pipeline Construction Schedule

The construction schedule used in this proposal is based on that shown in the route map of December, 1973. Both alternatives are scheduled for construction during the third winter. Any displacement of time in this schedule is presumed only to protract the total time rather than alter the construction plans, order or timing.

3 ARCHEOLOGICAL SIGNIFICANCE OF THE AREA

3.1 Archeological Evidence as a Resource

Historic and prehistoric archeology is the study of man and his works in the past. Archeological remains as such are often meager, difficult to find and easily destroyed, and as part of the peoples' heritage should be protected and conserved whenever and wherever possible (Millar 1973: 10-11).

3.2 Archeology of Alaska

Archeological investigations along the route proposed for the pipeline in Alaska, have generally been neglected through lack of competent archeologists and/or adequate funding. On the Arctic Coastal Plain, archeological research has been limited to collections, except at Point Barrow where a great deal of archeological work has been carried out. Recently, the Sagavanirktok River was surveyed by the University of Alaska. Little work has been done on the Interior Route itself. However, surveys have located sites both east and west of the proposed route.

It is largely on the basis of these archeological projects lateral to the route that the following notes and prehistoric utilization strategy were derived.

3.2.1 Past work on proposed route

Coastal Route:
- Collections on Barter Island, 1914: D. Jenness
- Excavations on Barter Island, 1924: N. Sorensen
- Survey of Prudhoe Bay area and Sagavanirktok River, 1970-71: D.E. Derry; E.J. Dixon
- Synthesis of archeological work done at Point Barrow, 1959: J.A. Ford.

Interior Route:
- Cursory survey of Old John Lake area, 1971: J.F.V. Millar

- Survey of Old John Lake, 1973: R. McKennan and E. Hall
- Survey and Excavations at Prudhoe Bay, 1970-71: D.E. Derry
- Survey and Excavations on the Sagavanirktok River, 1970-71: E.J. Dixon
- Survey and Excavations near Murphy Lake, 1970-71: G.H. Bacon
- Survey of Antigun Canyon, 1967: H.E. Alexander
- Excavation of Aniganigurak, Antigun Canyon, 1970-71: J.E. Corbin
- Survey of Antigun Valley, 1968: H.E. Alexander
- Excavation of the Mosquito Lake Site, Galbraith Lake Area, 1970-71: H.E. Alexander; M. Kunz
- Survey of the Upper Koyukuk River, 1970: C.E. Holmes
- Survey Between Livengood and Fish Creek, 1970-71: A.S. Borass
- Survey of Hogan Hill to Livengood, 1971: J.P. Cook.

3.2.2 Prehistory of northwestern North America - From past work by a number of archeological researchers in Alaska, Yukon, Northwest Territories, and in the northern plains, and by using our present speculative glacial geochronology and paleoenvironmental reconstruction, we can weave a tentative picture of the prehistory of northwestern North America.

Early European explorers found that nearly every inhabitable part of both continents and most islands of the hemisphere were occupied by man. Asia and North America may well have been connected by a land bridge supporting a substantial tundra faunal assemblage, over which man, native to the Old World, spread into the New World sometime before 25,000 years ago. Small groups of nomadic hunters, carrying a very simple tool-kit, could have moved south to the plains via an ice-free corridor which separated the Laurentide from the Cordilleran ice-sheets and extended throughout the northern

intermontane region of the Yukon and Alaska, down the Mackenzie Basin onto the Plains. Of these early people, we know very little, having only a few sites and some inferred occupations.

The Mackenzie Basin migration corridor narrowed as the two ice-sheets advanced during the main Wisconsin stadial, about 20,000 years ago, possibly becoming impassable due to closure. As the ice once again melted and the glacial fronts retreated east and west, a new set of influences must have made its way along the same Mackenzie Basin route into the heart of North America. This adaptation to the hunting of mammoth and other cold-adapted megafauna spread widely in the New World. Of these people, we know considerably more; with sites discovered in Alaska, in the southwestern plains and adjacent mountain valleys, in the Mississippi drainage, in the eastern U.S. and in Nova Scotia. Considering their distribution in time and space, it is postulated that they were the earliest successful occupants of much of North America east of the Cordillera.

As the post Pleistocene climate change proceeded, grasslands extended north to the Arctic with characteristic fauna. Men, probably descendents of the earlier megafauna hunters, then occupied most of the central and southern part of the continent. As the fauna spread north, so did man, carrying his characteristic culture with him, reaching the Arctic drainage and possibly the Arctic littoral. During this period, in intermontane Alaska and Yukon, there appeared a unique tool (microblade) technology that may have derived ultimately from Japan. Subsequently, the use of the small delicate tools made from slivers of stone by this technique spread through the intermontane region and east into the Mackenzie Basin.

The forest migration into the north probably occurred before 8,000 years ago and required a new adaptation and additional tools. The

native or indigenous pattern of living found by European explorers in the area likely developed at about this time; forest hunting, fishing and woodworking. To the north, the caribou formed the subsistence basis for the Indians of the interior and a seasonal resource for the Eskimo of the coast. Slightly over 4,000 years ago, the earliest ancestoral Eskimo moved rapidly eastward along the coast from the Bering Strait region as far as Labrador and Greenland. Probably the earliest successful adaptation to the North American Arctic, they combined seasonal caribou-hunting with some exploitation of the marine resources.

3.2.3 Importance of the geographic transect: Coastal Route - In the last decade, evidence for very early man in the New World has been found in northern Alaska and the Yukon territory, i.e. at Onion Portage on the Kobuk River, at Walakpa Bay near Point Barrow, the Gallagher Flint Station on the Sagavanirktok River, a 27,000 year old site at Old Crow, and one in a test drilling site at Prudhoe Bay. Hypotheses concerning the route followed by these early migrants relate to unglaciated portions of the North Slope and a postulated ice-free corridor leading south along the Mackenzie River. Corroboration of this hypothesis could be found along this relatively unexplored archeological area of the coastal alternative of the Alaskan Arctic Gas Pipeline.

Approximately 2,000 B.C., an early Eskimo culture phase spread eastward from Alaska extending as far as Greenland. This, the Arctic Small Tool Culture, has been found in several places in the Brooks Range, at Point Barrow and on the Firth River. One unanswered archeological question relating to this culture is the route along which this diffusion took place. Whether diffusion occurred along the coast as part of a maritime adaptation or through the interior mountains, evidence pertaining to this culture and this question can be expected along the pipeline routes.

Although subsequent evolution of Eskimo culture from the Arctic Small Tool base in both Alaska and Canada appears to have been independent,

a number of cultural traits suggest that continued contact existed between these two areas. Some of these similarities occur in the Canadian Dorset culture and the Alaska Ipiutak and Norton phases, particularly in terms of ground stone artifacts and artistic styles. The archeologically unknown intervening area which may provide information pertinent to this problem is the northeastern coast of Alaska to be traversed by the pipeline.

In 1927, Therkel Mathiassen described the Thule Culture indicating an origin in the Point Barrow area. Since then, archeological work at Point Barrow and in Canada has supported his thesis. About A.D. 1000, the Birnirk Culture gave rise to Thule along the coast between Point Barrow and the Mackenzie River, on the coastal strip on which one alternative of the proposed pipeline route could be constructed. It is on this alternative that sites representative of this transition period, documenting the origin of Thule Culture, may be found. Archeological information related to this problem concerns the present native coastal peoples because the Thule Culture and its distribution is directly ancestral to the present Inyupik-speaking Eskimo.

Related problems concerning the return migration or 'backwash' of Canadian Thule elements strongly affected Eskimo groups as far west as Nome but are poorly documented or dated in archeological contexts. Evidence concerning this problem may be found through archeological survey of the coastal alternative of the Alaskan Arctic Gas Pipeline.

3.2.4 Importance of the geographic transect: Interior Route - Ethnographic studies of the Kutchin and their adaptation to the environment of the eastern Brooks Range require information on the historical development of the existing adaptation which can only be obtained from archeological excavation and which may be provided by archeological work along the interior pipeline route.

Coeval with an environmental shift and introduction of the boreal forest approximately 6,000 years ago in Northern Alaska, a typological shift in tool types occurred in the archeological assemblages. These

new cultural elements, primarily characterized by notched projectile points, were first recognized in Anaktuvuk Pass in 1961 and were probably introduced from the east. However, the specific route of introduction is still uncertain, whether by way of the Yukon drainage or less probably, by the Tanana. This has been a problem of major theoretical concern in Alaskan archeology. Archeological survey and excavations along the interior pipeline route may shed some light on this problem.

The interior pipeline route is also important in view of information which could be obtained relating to problems which are both coastal as well as interior in focus, i.e. interior migration route of early migrants into the New World and the path of Arctic Small Tool cultural dispersion. This interior route is particularly critical in view of the discovery of one of the earliest sites in the Americas at the eastern end of the Alaskan segment at Old Crow. This site was dated at 27,000 years ago.

The Kutchin-speaking Athabaskans have followed a nomadic way of life, band territory boundaries shifting with population pressures, hunting success and incidence of disease. Many theories with little supporting archeological data have been formulated on the origin of these late prehistoric cultures. Two of the major hypotheses concern the southern slope of the eastern Brooks Range. One derives the Kutchin from western Alaska, subsequently moving east; whereas the alternate hypothesis posits the opposite. Data to substantiate one of these hypotheses may be found along the proposed pipeline route.

Although the present boundary between the Kutchin and Eskimo cultures can generally be drawn along the crest of the Brooks Range, research on the Alyeska pipeline indicates that Eskimo cultures may have occupied much of the south slope; in fact, the Arctic Small Tool Culture, as the presumed progenitor of the Eskimo culture, may have originated in this region. Only archeological survey and excavation in this area can positively answer this question.

3.3 Prehistoric Utilization Strategy

To properly assess the archeological priorities and identify the points and sections of high probability, it is necessary to make some estimate of how man used his environment and distributed himself through that environment. We recognize that the post Pleistocene environment changed through a wide spectrum from a periglacial tundra to the present and we can postulate certain correlative changes in the way man used it, acknowledging that clarity dims with antiquity. The notes are presented as a chart using the present-day human biotic zones (Chart 1).

This section does not aim to cover the entire resource utilization by all prehistoric populations, merely to indicate those resources exploited that might help in identifying the high probability areas.

In the non-glaciated sections there is a good chance that evidence of pre-Main Wisconsin migrants or late Wisconsin occupants may be found. Generally, this would be fortuitous and any prediction would be futile. In the glacial area, such traces would have been either obliterated by the glacial advance or obscured by glacial deposits.

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4 ARCHEOLOGICAL SALVAGE PROJECT

4.1 Objectives

(a) The pipeline construction project represents a great potential loss of important archeological evidence and a challenge to both industry and the archeological community. Our main theme should be to maximize the recovery of evidence and information, while minimizing the dangers and losses.

(b) Archeological survey should be carried out by experienced crews well in advance of any construction activities to allow time for minor relocation of the line or excavation of the discovered sites prior to destruction. All phases of survey and surveillance should aim to identify and inventory all sites on the line for immediate or later excavation.

(c) Considering the construction schedule and the advantages of close co-ordination between the construction and archeological organizations, there should be direct communication between the Archeological Co-Ordinator and the Chief Engineer of pipeline construction.

(d) The archeological field parties should be prepared to work with integrated study parties, collecting a variety of environmental data. It may be that some studies might be left to the archeological crews, secondary to the archeological objective.

(e) The archeological organization must be prepared to work with the pressures and time and weather as the effective surveys and excavations must be done with cognizance of the construction schedule and methods. Every effort should be exerted to preclude loss of archeological evidence through inadequate preliminary or right-of-way salvage.

(f) The archeological salvage project should be designed to obviate the need for any possible interruption of pipeline construction due to

archeological salvage. It is inevitable that some sites will be missed during the preliminary surveys due to poor exposure or location in low probability areas. If found during construction, they should be flagged for excavation after the construction program.

All archeological materials recovered should become the property of the Alaskan government.

4.2 Terms of Reference

The Guidelines for Archaeological Salvage (Millar 1971) form the basis for the program contained in this proposal. In summary, these guidelines are as follows:

(a) the owner or operator of the industrial development is responsible for funding, or arranging for funding, archeological salvage operations.

(b) the archeological program will be carried out by an independent institution or organization.

(c) evaluation of the effectivity and adequacy of the archeological survey and excavation will be made by an Advisory Committee made up of senior members of the archeological community in Canada.

(d) all sites located in the endangered area will be excavated before construction if at all possible. If that is not practical, they should be excavated as soon afterward as possible.

(e) the archeological program should be designed to cause a minimum of disruption of the construction operations.

The proposal is based on data derived from the submissions of the Applicant to the Federal Power Commission. Changes in that information could well alter the program described.

4.3 Archeological Line Division

4.3.1 Segmentation rationale - The construction subsegments of the pipeline route were, with some modification, found to be the most practical and manageable units for both supervision and archeological field work.

4.3.2 Segmentation

		Const. Seg.	Arch. Seg.	Mileage
(1)	Coastal Alternative			
	Prudhoe Bay - Canning River	0-65	D	1	65
	Canning River - Canadian border	65-195	A,B	2	130
(2)	Interior Alternative			
	Prudhoe Bay - Kavik River	0-55	D	1	55
	Kavik River - Cane Creek	55-155	C,B	3	100
	Cane Creek - Monument Creek	155-225	A	4	70
	Monument Creek - Canadian border	225-297	E	5	72

4.4 Line Classification

4.4.1 Classification rationale - On the basis of the archeological probability, the extent of ground cover, general environment and the type of construction to be employed, it is possible to make a speculative priority classification of the pipeline route and the facility locations. Based mainly on the prehistoric utilization strategy and the construction character, such places as river banks and river crossings are given a high priority for examination. The priority classification of Segment B of the Coastal Route is somewhat greater than the others, due to the greater effectivity of ground survey in a tundra environment over a boreal environment.

The classification of the pipeline route has been made with only three categories: maximum, medium, low (H, M and L). The maximum category carries with it the inference of high probability, both in

terms of prehistoric utilization strategy and of finding a site under the conditions obtaining. A medium priority is one which the probability is good that man once used the location and there is some possibility that either surface survey or survey of the right-of-way during clearing or preparation might locate that occupation. The low probability sections, by far the greatest in aggregate length, are thought to have quite variable probability, from extremely low to high, but that the possibilities of finding sites during the preliminary or route preparation survey is minimal. Some low priority sections might well be reclassified after the Preliminary Survey phase, to become important localities for survey during the Route Preparation phase.

Generally, river banks, river crossings, borrow pits, compressor stations, airstrips and access roads received high priority classifications.

Analysis of the pipeline routes prior to the first field season will be done from stereo-aerial photographs. Another set of such photographs will be used by the field personnel.

4.4.2 Line Classification Details

Line Classification - Map 6

Coastal Route mp 0-104

Archeological segment 1 and 2

1. Stream area and crossing near Prudhoe Bay. Medium priority.

2. Former oriented lake. Medium priority.

3. Sagavanirktok River crossing; block valve at mp 13.8. Medium priority.

4. Kadlerashilak Pingo translated as "possesses something on top." Medium priority.

5. Kadlerashilak River and meandering stream crossings. High priority.

6. Shaviovik River - Kavik River crossing, particularly point of land formed by confluence. High priority.

7. Stream crossing and facilities. High priority.

8. Canning River (major trade route) crossing. High priority. Winter trail. Medium priority.

9. Creek crossings. High priority.

10. Ridge - possible lookout station. Medium priority.

11. Tamayariak River crossing and facilities. High priority.

12. Katakturuk River crossing; high outwash remnants - good potential for old sites. High priority.

13. Marsh Creek area - outwash remnants and crossing. High priority.

All construction and line facilities such as access road, borrow pits, supply bases, stockpiling areas, communications towers, compressor stations, airstrips and helipads are considered as high priority locations.

Line Classification - Map 7

Coastal Route mp 104-195

Archeological Segment 2

1. Itkilyariak [the route by which the Itkillik (Indians) travel] Creek and Sadlerochit River crossings. High priority.

2. Hulahula River (major trade route) crossing. High priority.

3. Akutuctak River crossing. Medium priority.

4. Okpilak River, Okpirourak River and Jago (tabooed) River crossings. High priority.

5. Okerokovik (translates as 'blubber cache') River crossing. High priority.

6. Sikutaktuvik River crossing. Medium priority.

7. Aichilik River crossing. Borrow resource area in midstream - good potential for paleontological remains. High priority.

8. Egaksrak River and small tributary crossings. High to medium priority.

9. Ekaluakat River, Siksikpalak and tributary crossings. High priority.

10. Kongakut River crossing and facilities. High priority.

11. Turner River crossing. High priority.

12. Clarence River crossing and area to Canadian border. High priority.

All construction and line facilities such as access roads, borrow pits, supply bases, stockpiling areas, communications towers, compressor stations, airstrips and helipads are considered as high priority locations.

Line Classification - Map 6

Interior Route mp 0-145

Archeological Segments 1 and 3

1. Stream area and crossing near Prudhoe Bay. Medium priority.

2. Sagavanirktok River crossing. Borrow resource area in midstream - good potential for paleontological remains. High to medium priority.

3. Fossil flood plain. Medium priority.

4. Sagavanirktok (main channel) crossing - West bank. Medium priority. East bank. High priority.

5. Pingo. High priority.

6. Kadlerashilik River crossing. Borrow resource area. High priority.

7. Shaviovik River crossing. Borrow resource area. High priority.

8. Compressor station facilities to meandering stream. High to medium priority.

9. Kavik River crossing. High lateral ridge. High priority.

10. Ridge area. High priority.

11. Compressor station. High priority.

12. Knoll and ridge and outcroppings. Medium to high priority.

13. Fossil lake shore. High priority.

14. Airstrip and ridge - possible caribou lookout stations. High priority.

15. Canning River area. Bedrock outcroppings and willow thicket areas. High priority.

16. Bedrock outcroppings. Possible caribou lookout stations. High priority.

17. Possible lookout stations. Medium priority.

18. Bedrock outcroppings. Facility locations. High priority.

19. Bedrock outcroppings; old lake shore and Canning River area. High priority.

20. Bedrock outcroppings. Possible lookout sites. High priority.

21. Canning River tributary. Arctic char spawning area. Medium priority.

All construction and line facilities such as access roads, borrow pits, supply bases, stockpiling areas, communications towers, compressor stations, airstrips and helipads are considered as areas of high priority.

Line Classification - Map 9

Interior Route mp 145-297

Archeological Segments 3, 4 and 5

1. Bedrock ridges; Alpine Moraine areas. Facility locations. High priority.

2. Bedrock ridges; etc. High priority.

3. Old Woman Creek area. Bedrock ridges and facilities. High priority.

4. Bedrock ridges; facilities. Possible caribou fences. High priority.

5. Bedrock outcroppings. High priority.

6. Bedrock outcroppings. High priority.

7. Bedrock outcroppings. Medium priority.

8. Bedrock outcroppings. Medium priority.

9. Sheenjek River crossing. High priority.

10. Bedrock outcroppings, creek crossing. Lake area. High priority.

11. Bedrock areas. Facility locations. High to medium priority.

12. Lake outlet. Fossil flood plain. Facilities and area to Colleen River crossings. High priority.

13. Bedrock ridge. High priority.

14. Bedrock ridges. High priority.

All construction and line facilities are considered as areas of high priority.

4.5 Archeological Salvage Methodology

4.5.1 Objectives - The ultimate objective of the archeological salvage program is the conservation and preservation of archeological materials. Therefore, initially, an inventory of archeological finds along the route must be made. Based on this inventory, assisted by evaluation of the sites by testing, as many sites of value as possible considering time, money and practicality should be salvaged by excavating. Very important sites existing directly on the the line or at proposed associated facilities should be avoided if possible. The archeological methodology must appropriately take advantage of the co-operation and co-ordination of construction activities.

4.5.2 General - Three main phases of archeological survey are contemplated; first, a preliminary phase to precede field construction activity; second, a survey to accompany the route preparation; and third, continuous surveillance of the line during ditching and pipe-laying construction activities. A fourth phase, following construction, would survey possibly important areas close to the line but not immediately endangered.

The efficiency of all these phases would be greatly increased by 'exploratory' surveys, which could be carried out during the summer in the year before construction starts, filling in deficiencies in knowledge of areas and testing methodology.

To effect salvage of archeological evidence, two phases of excavation are planned; first, to test and excavate sites discovered during the Preliminary Survey; and second, to test and excavate sites found during the Route Preparation Survey and the ditching activities.

4.5.3 Preliminary survey - Those areas classified as maximum and medium priority should be intensively surveyed well before construction

activities. Relative differences in frequency of maximum priority areas between segments do not necessarily imply gross differences in population density of archeological sites or favorable archeological localities; rather they represent a generally more favorable and productive environment for preliminary survey.

The Preliminary Survey will be concerned with the very close investigation of all high and medium priority sections that are practical to survey prior to construction activities.

In addition to the priority sections along the line, the areas set aside for facilities installations, construction facilities, borrow resources and access roads will likely be high to medium probability localities requiring close survey during Preliminary Survey.

The method of survey should vary with the accessibility and density of sites. Some sub-segments with relatively high densities may require ground traverse throughout most of the route, whereas less dense sections might require helicopter support or transport. In general, the methods of survey will depend on area accessibility, ground cover, prehistoric utilization strategy, terrain, etc. Ideally, it would be best to combine the preliminary archeological survey with the "line-flagging" or "communication installation" phases of the project, both of which precede the construction phase.

Maximum priority areas should be intensively surveyed, test pitting occasionally in areas where probability is high. Those medium priority areas that will be surveyed during route preparation, can be subject to less survey.

All access facilities and camp and compressor stations should be intensively surveyed during this preliminary survey. Mobilization and supply bases and stockpiling areas along the coast are all

considered high priority areas as are access roads along major streams because these areas were generally preferred sites of prehistoric utilization.

4.5.4 Route Preparation survey - Archeological survey should accompany any of the route preparation activities during summer construction and should accompany the final clearing at all times of the year if practical. Areas of maximum and medium priority should receive archeological survey during the summer immediately following the clearing and preferably before grading of the route.

Essentially, the same areas that were maximum priority during the preliminary phase should be considered high in priority during the route preparation phase, with the addition of the remainder of the medium priority sections not surveyed during the preliminary phase. There should be an increase in the lengths of priority sections for the southern parts of the line during this phase as only a minimum amount of preliminary survey is planned for that region. Obviously, the removal of the tree cover and much of the organic layer removes one of the main problems in survey of the Boreal section.

The method of survey will depend to a large extent on what time of year the clearing is carried out. For summer stripping, it would be advisable to have an archeologist accompany the stripping crews, examining the route as the stripping proceeds. For winter stripping, it would be necessary to have the stripped section surveyed during the following summer.

In general, it will be necessary to test any sites discovered and considering the time available between stripping and pipe-laying, any important sites that lie on the ditch-zone itself should be excavated. Other sites might be flagged, or fenced, and excavated at some later date.

Normally, the Route Preparation Survey will be done by an archeologist operating with the construction organization from their camp. When the route preparation is carried out immediately ahead of the ditching operations, the Route Preparation Survey will be carried out by an assistant who will be assigned to work with the archeologist on the ditch surveillance operation.

4.5.5 Ditching/Pipe-Laying survey - All sections of the pipeline should be under archeological surveillance during ditching and pipe-laying operations. Although the entire route is potentially important during this phase, those classified as highest potential should receive greater attention.

During this phase, sites not found during the preliminary survey phases may be discovered. Previous location by standard archeological techniques may have been virtually impossible either through ground cover and other physical limitations or because of situation in areas designated as low priority areas and therefore, receiving less intense survey. However, during ditching operations, archeological remains would be evident in the wall profiles or in the excavated back-dirt. In the event that a site is found, it would be necessary to clearly flag the site, describe the geological context in detail and salvage as much of the archeological materials as possible. If clearly flagged, then salvage excavation during the second phase of excavation program can be carried out.

4.5.6 First Phase excavation - Whenever practical, endangered sites discovered during the Preliminary Survey and the early Route Preparation Survey should be tested and subsequently excavated prior to actual construction activity. Priority of sites for excavation will be determined by imminence of destruction and the importance of the site. In general, excavation could be carried out by special excavation crews working under the Segment Supervisors.

In the permafrost sections of Segments B, C and D, it may be necessary to work on several sites simultaneously, particularly if the sites are reasonably close.

Up to a certain point in the construction program, there is some flexibility in the exact line location; if endangered sites are considered sufficiently important or if the number of sites exceeds the personnel and time available, a slight relocation would be possible.

Salvage excavation of a site might take from 20 to 30 man days for excavation of an average site. A normal excavation crew is designed on a three-man team capable of operating independently. It is assumed that they will be operating from bush camps for about fifty percent of the time.

An allowance is made for a small number of First Phase excavation crews to be available during the year prior to the start of construction to excavate the few known sites on the line and in case important sites are located and must be excavated during the first year.

4.5.7 Second Phase excavation - Those archeological sites found during the late portion of the right-of-way preparation and during the ditching and pipe-laying operations must be excavated during the next season or within several seasons following completion of that section of the line. It will be necessary to allot special excavation crews to these subsequent programs.