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With the close of the 1971-72 season, the Arctic Circle's long tradition of holding its meetings in one or other of the local militia messes, came to an end. Except for the inaugural meeting and such special occasions as annual dinners and "bicentennial celebrations", meetings of the Circle had been held from 1948 to 1954 in the old R.C.A.S.C. Mess, 278 Sparks Street, a site now occupied by part of the Place de Ville complex, from 1955 to 1958 in the P.L.D.G. Mess, 60 Queen Street, and since December 1958 in the Officers' Mess of the #9 Transport Company, R.C.A.S.C. at the corner of Catherine Street and Bank.

With the consolidation of messing facilities in the Ottawa area, this R.C.A.S.C. mess has been closed and the Arctic Circle forced to make other arrangements. Beginning with the first meeting of the 1972-73 season the Circle meetings will be held, on the second Tuesday of each month at the usual time of 8.30 p.m., at the University Club of Ottawa, 250 Cooper Street. As in previous years, the bar will be open at 8.00 p.m.

The Arctic Circle takes this occasion to express its appreciation to its military hosts of former years for all the courtesies and privileges they have extended to it.

THE ARCTIC CIRCULAR

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197th meeting of the Arctic Circle, Tuesday, 11 January, 1972
This was the occasion of the Annual General Meeting. Mimeographed copies of the Minutes of the 1971 Annual General Meeting were circulated to those present and were moved adopted without discussion.

The Treasurer's Report showed a credit balance of $329.17. This favourable situation resulted from a profit of $103.50 from the very successful Annual Dinner in November (see Arctic Circular XXI (3): 143-149) and the sale of several complete sets of the Arctic Circular, at $100.00 per set, to universities and agencies.

The Auditor's Report stressed the point that the healthy operating profit for 1971 should not lull members into a false sense of security. This profit had only resulted because of the financial success of the Annual Dinner and the sale of sets of the Circular. There was no assurance such windfalls would become annual events. Further, there was the sobering item of $27.00 which had had to be paid out as interest on accounts past due. A vote of thanks to the Auditor, Dan Harris, was moved and seconded. Mr. Harris agreed to act as Auditor for the coming year.

The Annual Dinner, held 17 November, 1971, in the RCAF Officers' Mess, was completely sold out and, as mentioned above, made a profit of $103.50. A continuing problem has been the impossibility of finding a Mess that will undertake to cook Arctic food.

The Editor's Report showed that since the present editor took office at the beginning of 1971, three issues of the Circular had been published and a fourth was about to go to press. Indexes and Table of Contents for back numbers will be circulated as soon as they can be prepared.

The Report of the Publications Secretary showed that since October 1970, orders for complete sets of the Arctic Circular, at $100.00 a set, had been received from

The University of Ottawa
The Defence Research Board
Brock University
The University of Alberta
The University of Manitoba
The University of Winnipeg
The Arctic Research Laboratories (Alaska)

Partial sets had been ordered by The University of Saskatchewan and The Boreal Institute of the University of Alberta.

Tribute was paid to previous editors whose work had enabled the Circular to achieve such wide recognition.

Members who wished to complete their sets were advised that missing numbers of the Circular could be obtained from the Publications Secretary.

The Secretary, Keith Arnold, mentioned that a revision of the mailing system would enable changes of address to be noted more quickly and would, it is hoped, also cut down mailing costs.

The retiring Treasurer, Stewart MacDonald, and the retiring Committee members Arthur Clarke, Geoffrey Hattersley-Smith, Frank Hunt and Patrick McTaggart-Cowan, were thanked by the President for their work and support during their terms of office.

To fill these vacancies the following names were proposed and seconded and adopted unanimously.

Treasurer: Mrs. Mary Craig

Committee Members (3-year term)

Mr. David Gill
Dr. Olav Løken
Dr. Jogmohan Singh Maini

Consideration was given to a Committee suggestion that the membership fee to full-time University or Technical College students should be $3.00 - the same as that for out-of-town members. The suggestion was moved, seconded and adopted.

Following adjournment of the business part of the meeting, the CBC film "The Living Arctic" was shown by Stewart MacDonald who, together with several of his colleagues, had assisted in making it.

198th meeting of the Arctic Circle, Tuesday, 8 February, 1972
The guest speaker was Mr. David R. Gray and the title of his illustrated talk was "A Winter with the Muskox on Bathurst Island".

Mr. Gray is completing his doctoral studies in zoology at the University of Alberta. The subject of his research is the muskox of Bathurst Island, their behaviour patterns, and the extent to which these patterns influence the species' chances of survival under the possibly deteriorating climatic conditions of the area. He has made several field trips to Bathurst Island, spending the summers of 1968 and 1969 and the spring (April-May) of 1970 there. With one companion to assist him, he spent the winter of 1970-71 on the island, counting the muskox, observing the behaviour of individuals and groups, recording the variations in herd size at different periods, and noting the reactions of the animals to different types of disturbance - man, snowmobile, aeroplane, and so forth.

This research is of great interest to zoologists and to all those concerned or responsible for wildlife in the North. Mr. Gray's work is part of a continuing study of the muskox of Bathurst Island and receives federal support from the Canadian Wildlife Service, the National Museum of Natural Sciences, and the Polar Continental Shelf Project. It is also supported by the Boreal Institute of the University of Alberta.

Mr. Gray's interesting address followed fairly closely the text of his paper on Bathurst Island muskox that appeared in the Arctic Circular, Vol. XXI, No. 3, 158-163. It was made even more vivid and personal by his inclusion of an excellent series of slides taken during his overwintering on the island in 1970-71.

The speaker was introduced by Mr. Stewart MacDonald of the National Museum of Natural Sciences, Director of the Bathurst Island Project, and was thanked by the President of the Arctic Circle.

199th meeting of the Arctic Circle, Tuesday, 14th March, 1972
The speaker on this occasion was Mr. Andris Rode, a graduate student with the Department of Environmental Health, School of Hygiene, University of Toronto. The subject of his address, "The Physical Fitness of Eskimos", gave an evaluation of the physical condition of the Eskimos of Igloolik

where he had spent four months in 1970 and an entire year in 1970-71 making measurements and observations.

The following is the speaker's summary of his address.

"It is considered that the sedentary life of the average city dweller has an adverse effect on cardiorespiratory fitness in general, and on endurance fitness in particular. Support for this view is found in deterioration of the physical condition with experimental bed rest and in cases of injuries of the lower extremities. North Americans of today seem less fit than those of 35 years ago. However, rather mediocre figures have also been reported for the maximal oxygen intake of a number of primitive communities.

Two possible reasons advanced for the poor performance of primitive peoples are chronic disease and malnutrition. It was thus considered advisable to make a study of the fitness of an Arctic community where the men still followed the traditional life of hunting and fishing, but where the level of nutrition was good and where the incidence of chronic disease had been dramatically reduced through an aggressive program of public health.

The settlement selected was the Eskimo community of Igloolik at the northern tip of the Melville Peninsula. This is one of three Eskimo villages under investigation by the Human Adaptability Project of the International Biological Program, for which a U.S. team is studying the community of Wainwright in northern Alaska, and a joint Scandinavian and French team is carrying out similar research at Upernavik on the west coast of Greenland.

Igloolik has a population of relatively purebred Eskimos and is still in an early phase of "acculturation". Although permanent housing has now been provided for all villagers, many still spend long periods away from the village, living in tents or snow houses. The Eskimo language and culture are still dominant, and a substantial proportion of the food is derived from the hunt. The influence of the two village churches - Anglican and Roman Catholic - is quite strong, and, to date, many of the problems found in more southerly settlements, such as alcoholism and prostitution, have been avoided.

Two important sources of error in previous Arctic surveys of this nature have been the use of inadequate techniques and a nonrandom sampling of the population under investigation. The methods used in the present study were carefully standardized by an international team and, rather than content ourselves with crude field tests, the entire equipment

of a modern laboratory was flown to the Arctic. As a further check on the absolute accuracy of our data, observations were made on white members of the community and on members of the laboratory staff whose fitness was well documented by previous investigation in Toronto. The data for the white population differed in no respect from that previously reported, and the possibility of technical error can thus be excluded. We were able to test 72% of the male population and 65% of the female over the age of 9 years. Most of the "defaulters" were absent from the village for such reasons as school attendance and summer hunting expeditions. In general, it was the more "traditional" and active Eskimos who were absent at the summer camps, and thus it is unlikely that the unusual fitness of our sample can be attributed to preferential selective sampling of the community.

There can be little question that the Igloolik Eskimos have a higher level of physical fitness than their more sedentary white counterparts in southern cities such as Toronto.

Pulse rates for a given submaximal work load were much lower than would be found in a North American white population. In keeping with this trend, both the directly-measured and the predicted aerobic power were quite large if expressed in absolute terms, and when related to body mass, the average values for Igloolik were at least 50% greater than for Toronto. The boys reached a very high level of aerobic power in the early teens, and the apparent rate of subsequent aging was much slower than in the white community. The large decrease of aerobic power in the oldest Eskimos was based on a rather small sample, but it may reflect the fact that at this age the hunting patterms change. The young Eskimo girls had a very good aerobic power, but there was a sharp drop at puberty - many of the teenage girls received part of their education in the larger and more sophisticated town of Churchill, and, in consequence, learned the lower levels of activity considered appropriate to their sex. The subsequent decline of aerobic power with age was small from 20 to 40 years, probably because the caloric expenditure of an Igloolik housewife is considerably greater than that of her white counterpart running her automated household. As with the men, there was a marked decline in the final age decades; this was more obvious in the relative than in the absolute data and reflected, in part, an increase in the percentage of body fat.

How far is the cardiorespiratory fitness of the Eskimo attributable to a high level of physical activity? Recent ergonomic studies set the daily caloric cost of a hunting expedition at about 3200 Kcal. If we take into account the small stature of the Eskimo, this is quite hard work, perhaps equivalent to the 3500-3600 Kcal of "white" miners and

lumberjacks. But the immediate impression of Eskimo life is one of leisure and long periods of waiting; activity is brief and intense. This is in keeping with current studies of the training process: intensity of activity is more important to the development of cardio-respiratory fitness than frequency or duration.

On the basis of their hunting activity, the men were divided into three categories: hunters, mixed group, and an urban group. The hunters had higher aerobic power than either the mixed group or the urban group; the difference between the hunters and the urban group was significant at the 5% level.

The fitness of the Eskimo men was tested on two occasions, summer 1970 and winter 1971, and it was found that the high level of fitness is maintained on a 12-month basis and is not merely a reflection of summer activity. A comparison of the two tests clearly illustrates the similarity of winter and summer data. There were no significant seasonal changes in the predicted maximum oxygen consumption in any of the age groups tested. There were no marked seasonal changes in strength. All three age groups (20-29, 30-39, 40-49) showed an increase in total skinfold thickness from summer to winter, but only the changes in the 20-29 year-old group were significant. There were no significant seasonal changes in body weight.

When we consider the data according to our previous classification on the basis of hunting activity, we see the same pattern. The gradation from high to lower fitness in hunters compared to urbanized Eskimos still holds and, again, generally there are no significant changes within any group between the summer and winter months. The one exception is a significant increase in the total skinfold thickness of the hunters during the winter months.

The significance of the hunting data is clear - although the Igloolik Eskimos have only recently had any opportunity to accept wage employment on a regular basis, a certain segment of the population (the urban group mentioned earlier) is already showing the effects of adopting the southern patterns of life. Even though the urban group has a high level of fitness relative to a southern white population, they show a significant deficit when compared to the more active members of their own community. The number of Igloolik Eskimos subsisting on hunting is unlikely to increase since an area can only support so many hunters before it becomes exhausted. Economics will, in fact, force a reduction in hunting. The population of Igloolik has doubled in the period 1950-1965 due both to the arrival of migrating Eskimos and to an increase of

surviving births. Inevitably, therefore, more of the people are going to be dependent on wage labour and welfare rather than on the traditional hunting economy.

Although medical care continues to improve and formerly-debilitating diseases are controlled, a continuing decline in cardiorespiratory fitness among the Eskimos can, nevertheless, be expected. Whether poor cardiorespiratory fitness and "the white man's burden" - obesity - will reach the same epidemic proportions they have attained in the rest of North America depends largely on whether measures are taken to prevent the deterioration of the present high levels of fitness in Igloolik and similar areas of the Arctic."

In the course of his talk, Mr. Rode included three very informative and interesting series of slides and films. The slides showed the laboratory and equipment used and some of the physiological tests carried out. The films dealt with walrus and caribou hunting and gave a good idea of the amount of energy expended.

The speaker was introduced and thanked by the President, Brigadier-General Keith R. Greenaway.

200th meeting of the Arctic Circle, Tuesday, 11 April, 1972

This anniversay meeting was held in the RCAF Officers' Mess, Gloucester Street, where the inaugural meeting of the club had been held on Monday, 8 December, 1948. According to the account of the first meeting (Arctic Circular, Vol. I, No. 1), there were about one hundred present on that occasion. Since then the club has grown so that the present total membership of Ottawa members and out-of-town (in some cases, out-of-the country) members stands at approximately 500.

The speaker of the evening was one of the earliest members of the club, Al Copland (known as "Dudley" to most of his northern friends). Others present, whose membership dated from those early days included Frank Davies - who presided at the present meeting - Graham and Diana Rowley, Moira Dunbar, Keith Greenaway, Alex Stevenson and A.H. Tinker who, as F/L Tinker, RCAF, had been the speaker at that first meeting, giving a short description of the establishment of the Joint Weather Stations at Eureka Sound and Resolute Bay by Task Force 68.

It was regretted that, of the charter members still resident in the Ottawa area, two of the most outstanding who have contributed so richly to the interest and development of the Circle - Tom Manning and Erling Porsild -

were prevented by other commitments from attending this meeting.

The speaker was introduced by Frank Davies and chose as title of his address "A Look Back at the Old North". And who better than he to take such a backward glance! He came to the Canadian North aboard S.S. Nascopie in 1923 as an Apprentice Fur Trader with the Hudson's Bay Company, and in the course of his service travelled extensively in Baffin Island, Ungava and the sprawling St. Lawrence-Labrador District in the East as well as throughout the West where he completed his active field career with the Company as Manager of the Western Arctic District with headquarters in the then-thriving settlement of Aklavik.

His career with the Hudson's Bay Company came to an end with the amalgamation of the Western Arctic and Mackenzie River Districts and his transfer to Winnipeg to the desk job as "Arctic Specialist". This inactivity was not to his taste and he joined the RCAF where, during World War II he servied as O/C Northern bases in Newfoundland and Labrador. Later he was seconded to the Defence Research Board,following which he was for several years with the Engineering Branch of the RCAF, specializing in environmental protection.

Since his retirement in 1969 he has turned to writing, mainly about the Arctic as he has known it. He has contributed to many CBC programs including a 13-program series on the Maritime history of the Eastern Arctic, Arctic travelogues, documentaries, and "Northern Assignment" broadcasts, and has done research and writing for the program "North by Sea". He has completed more than fifty "Ookpik" programs which are acted by young professionals from the Montreal School of Drama and are beamed on the north.

In addition to his writing activity, he also acts as military and government liaison officer for a group of European companies specializing in life support equipment.

The following summary outlines briefly his remarks at the 200th meeting of the Circle.

The speaker began his talk by remarking, "Had I not had the good fortune to be born in the old whaling town of Peterhead, I might never have seen the Arctic". He then told of some of the associations of Peterhead with the Canadian North, particularly the whaling industry, and recalled some of the city's well-known Arctic figures: Captain Penny, whaling master and explorer; Captain Gray, for many years Master of the HBC vessel Pelican; Captains John and Alex Murray, whaling masters. Con-

trary to what most histories record, he claimed that Admiral Van Tromp, immortalized in song, probably apocrophally, as having a broom at the masthead to show he swept the seas, was born on a small island that is now part of Peterhead but which, at one time, was leased to the Dutch. The speaker recalled that when he was a child the ketches Vera and Albert sailed regularly for Baffin Island. It was not uncommon to have Eskimos winter in Peterhead, and several are buried there.

"Dudley" Copland entered the service of the Hudson's Bay Company Fur Department in 1923 as a fur-trader apprentice at a salary of $240 per annum. He sailed from Cardiff on the 1100-ton S.S. Nascopie, the first port of call being Bay Roberts, Newfoundland. The voyage north always started officially from Montreal, and as the Nascopie was the only Arctic-bound vessel sailing from that port, she always had a good send-off. Bergs in the Strait of Belle Isle, freight discharge at Port Burwell where the packages had to be carried from ship to shore over the ice by the apprentices, stops at Stupart's Bay and Wolstenholme (established 1909 by the late Chief Factor Ralph Parsons) and at Chesterfield, remain vivid memories. An idea of the complexity of apprentice duties in the old HBC posts was given by the remark that Parsons had entered that service as a Clerk-tutor, part of his duties being the education of District Manager Swaffield's children!

At Chesterfield Inlet the ship was met by half-a-gale wind and the news that there were a number of surgical cases ashore - one of these was Peter Freuchen who had to have his big toe amputated. For days the HBC house reeked of ether!

Trading in those days was a simple matter of exchanging furs for squared wooden pegs. Each peg was valued at fifty cents, twenty pegs given for one white fox skin. The Eskimos at that time were entirely self-supporting and excelled as hunters and travellers.

In those days, the extent of territory covered by the three trading posts of Chesterfield, Repulse Bay, and Baker Lake was enormous, particularly the territory of Baker Lake which relied largely on Eskimo traders to cover the remote areas. The most famous of these traders was Ee-lat-nak who dealt with the then-primitive people living north-west of Baker Lake and south of King William Island. Furs came to the Baker Lake post from as far south as Yathked Lake. Repulse Bay handled the trade from Igloolik in the east to Pelly Bay in the west. Chester-field was a sub-district office for the whole area.

In 1924, when Southampton Island Eskimos crossed over in whale boats and arrived at the floe edge on the Chesterfield Inlet side, it was decided to establish a Southampton Island post. Joe Curley, who was present in the audience at this Circle meeting, was one of the young Southampton Island hunters who had made that crossing to Chesterfield.

A trading outfit was hastily got together, the only lumber available to build the new post being what was gathered from a torn-down building of the defunct Lamson Hubbard Trading Company. Captain George Cleveland, an American who had lived for many years in the Arctic after being shanghaied from a whaling seaport, was in charge of the party that set out in the motor schooner Fort Chesterfield. Southampton Island took a bit of finding but eventually the party arrived at Coral Harbour. There were no Eskimos there, so the two men who were to operate the post set about building their house themselves. Much to their relief, the Eskimos saw the schooner pass on her way back to Chesterfield and arrived at the post within the next few days.

The Coats' Island Post had just been closed down, and the Coral Harbour building was almost completed when the HBC vessel Bay Eskimo arrived bringing Baffin Island Eskimos from Coats Island to what they thought was an uninhabited island! Administrative wires between the two fur trading districts had apparently got crossed. It was quickly arranged that Copland should remain at Coral Harbour as clerk, with the late Sam Ford as manager. That was amicable enough but, initially, there was a little stiffness between the two Eskimo populations.

The first winter passed off quite well. Returns were good and included 250 polar bear skins, most of which had been taken in the vicinity of a stranded whale carcass. In those days, bears were killed for food as well as for the pelts which were only worth $15 each.

The following summer the Bay Eskimo foundered in Ungava Bay. The Nascopie rescued the survivors from an ice floe, but the Southampton Island supplies were lost. The islanders were assured supplies would arrive on the autumn trip of the Nascopie, but this proved impossible. Copland in the meantime had been transferred to Repulse Bay as Manager and it was here he received a message from radio station KDKA in Pittsburgh, urgently requesting relief supplies for the people on Southampton Island. As he remarked in the course of his talk, the NORTHERN MESSENGER SERVICE, which had been made possible by the efforts of Mr. George Wendt of Canadian Westinghouse and which up to then had been more or less an emotional experience for the listeners, now showed it had developed into something practical.

Eskimo Point by canoes up the Maguse River and another outpost was run in on the river leading to Neultin Lake.

In 1928 Sam Ford was taken ill and Copland, who had expected to proceed on home leave, was sent to relieve him at the Southampton Island Post he had helped to found. By this time the two Eskimo peoples on the island had drawn much closer together although each group continued to maintain its own way of life. The Baffin Islanders were still more oriented to the sea and the use of kayaks.

Following leave in Scotland, Copland returned to the Arctic as Manager of the South Baffin Island Section comprising the Cape Dorset, Amadjuak, Frobisher Bay and Lake Harbour posts. This involved considerable travelling, both winter and summer, and during his two years there he covered the entire southern coast of the island by dogteam and boat. In the early twenties, the Company had chosen Amadjuak as the site for a reindeer experiment. The animals had been brought from Lapland aboard the Nascopie but, as they did not get a very good start in Baffin, there was no increase in the first year and the experiment finally failed.

During Copland's second year in South Baffin, the Captain of the schooner Watts died during the Atlantic crossing and the ship, with the four surviving members of her crew, was wrecked close to Cape Haven. The wreck drifted off at high tide, leaving the men stranded without food or adequate clothing. They found an old meat cache left by an Eskimo and managed to survive until some three months later when he came to collect his meat. They were taken to Frobisher Bay and then transferred by RCMP patrol to Lake Harbour where they could get passage home the following summer.

Copland was next appointed Manager of the Ungava Section with headquarters at Fort Chimo. His responsibilities included Port Burwell, George River, Whale River, Leaf River, Payne Bay and Fort Mackenzie, and each post of this large territory had to be visited twice a year, once by boat and once by dogteam. After one experience by dog sled, the new manager found it easier to walk the route to Fort Mackenzie on snowshoes.

The spring of his second year at Fort Chimo was a memorable one. It was the occasion of the first visit of a Governor of the Hudson's Bay Company to the Canadian Arctic. Copland was requested, through NORTHERN MESSENGER SERVICE, to meet the Governor at Port Burwell. The names of some of those present at tonight's meeting appeared on the Nascopie's passenger list that year.

Appointments now followed fast. Copland was first transferred to the Montreal office where he gained some experience in "line" posts, notably Seeneterre which was then a busy mining area. The next summer he shipped north as Assistant to the District Manager, and found his duties also included those of the Purser who was taken ill. On his return he was transferred to Winnipeg as manager of the new Ungava District, and within the year was moved, in 1936, to Aklavik as Manager of the Western Arctic, "the number one headache of the fur trade". Headquarters at Aklavik proved unsatisfactory so he was moved to Edmonton although still required to carry out District inspection by boat and dogteam. On one occasion he was stranded at Baillie Island and, in October, had to travel the 360 miles back to Aklavik by dogteam.

It was during Copland's appointment that the HBC Western Arctic vessel Fort James was damaged by ice and sank, leaving him to make the arrangements to charter a trapper-owned converted submarine chaser, the Audrey B, to carry on the work. The Canalaska Trading Company, under Captain C.T. Pedersen, discontinued its service round Alaska at this time and for one year used HBC transport. The next year it was bought out by the Company. The Mackenzie River Transport system had been extended to Tuktoyaktuk and in 1937 the stern-wheeler Distributor delivered freight there, some for transshipment. In 1937 also, authority was given to attempt to use the North West Passage route. Scotty Gall, in the Aklavik, succeeded, and made contact with the Nascopie at the eastern end of Bellot Strait, his vessel thus becoming the first ship to pass through the strait. The Aklavik returned with supplies for western Arctic posts, the first successful commercial use of the passage in a single summer.

With the closing of a number of western Arctic posts, including Letty Harbour, Fort Collinson and Kugaryouak, and the opening of the Holman Island Post, the reduced Western Arctic District was amalgamated with the Mackenzie River District. Copland was transferred to the Head Office at Winnipeg, but after his years of activity in the North the new work did not suit him. He joined the RCAF as Pilot Officer, was posted to Eastern Air Command to supervise a chain of northern bases along the Labrador coast. This and two later Arctic safaris - to Baker Lake and to the Aleutians on field exercises - rounded out his Arctic experience, although he continued with the Department of National Defence working on environmental protection until his retirement in 1969.

His years in the Arctic are among the best he has ever experienced and he would gladly relive them all over again.

Frank Davies thanked the speaker on behalf of the appreciative audience.

THE CANADIAN ESKIMO IN 1971

by
C.W. Rowley *

(This manuscript has been released simultaneously to the Polar Record and to the Arctic Circular)

There has been no time since the end of the Second World War when it could not have been said that the Canadian Eskimos were at a critical point in their history. The north has become a part of the world as a whole, and the Eskimos, caught in the course of world events, have become subject to changes that affect every aspect of their lives. This is inevitable and all concerned recognize it as an inescapable fact. Some writers have simplified the current situation among the Canadian Eskimos as a struggle between the old and the new. They have pointed to the privation that was so often an unavoidable accompaniment to primitive life, and have argued from this that there can be no return to such conditions. This approach does not lead anywhere, for nobody has seriously suggested a return to the primitive. It is true that the Eskimos may not be any happier now than they were in former times; in outward appearance they seem in fact to be markedly less happy. A return to the old days might therefore be appealing. Nobody, and least of all the Eskimos themselves, considers it to be either possible or desirable - to suggest the contrary is to set up snow men only in order to knock them down.

A determined government could, of course, build a cultural dam to protect a people. This would hold back outside influences, the good as well as the bad, but it would burst sooner or later and the final result on an unprepared and unsophisticated people, if not completely disastrous, would likely be more disruptive than if they had been left to the vicissitudes of continuous contact. The Eskimos living along the northern coast of Alaska provide an interesting contrast with those in the Mackenzie Delta. The two groups are closely related, most of the Delta Eskimos having migrated there from Alaska within the past century. In Canada government policies have until recently cushioned the Eskimos from some of the shock of contact with the south. In Alaska the Eskimos have had to rely on their own capacity to meet violent change and survive. It was as if the Canadian Eskimos were kept waiting to get into the swim in the belief that the water was too cold for them, while the Alaskans were pushed into the contemporary world at the deep end on a "sink or swim" basis. As it turned out the water has become progressively colder

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* See also the comprehensive discussion entitled The Eskimos by G.W. Rowley, Arctic Circular Vol. XI, No. 2, 15-24.

for the Canadians, while the Alaskans have learned to swim quite strongly. Politically most Alaskan Eskimos are now appreciably more advanced than their Canadian cousins.

This does not necessarily mean that the best measures are no measures, and that the best government is no government, with the Eskimos left fully exposed to the winds of change. Nor does it mean that the only attitude a government can adopt is a defensive conservatism, inducing a calm, which in all probability will be followed by a storm. Development of the north is taking place in many ways, - politically, economically, and socially. In all these spheres government can influence the rate of change. It can act like a governor on an engine to modify violent fluctuations by reducing the rate of change when rapid development is leading to over-heating, and by accelerating it when conditions are becoming static. In this way it can keep the rates of political, economic, and social development in phase.

In the Canadian north little was happening between the world wars, and one year was almost indistinguishable from another. This was a time when health, education, and other services should have been introduced and gradually improved to standards comparable with those elsewhere in the country. Measures could have been taken concurrently to encourage economic development. The Eskimos might then have adapted their way of life to absorb these changes while retaining a continuity of evolution and some degree of control over events. The past few years, on the other hand, when no Eskimo could fail to become bewildered by the changes taking place around him, were not the most opportune time for the government to force the pace. It is of course easy to point out what should have been done. It is much harder to achieve orderly change because the measures the government should take are contrary to the general political or economic climate that prevails. Parliament and the country as a whole are much less willing to approve increased expenditures in the north when little is happening there than they are when northern events are frequently in the public eye.

The Canadian Eskimos are still passing through very difficult times. In this air of continuing crisis it is easy to ignore long-term policies, which should be based on careful and thorough study, on the grounds that, while it is regrettable that such work was not initiated several years ago, it is now too late and the situation has become too fluid for anything but comparatively short-term expedients. There is however every indication that the same situation will prevail several years hence and, unless a basis for long-term planning is laid now, the same regrets will then be expressed, and the same excuses made.

There are a number of factors that should act as determinants in the formulation of long-term policies affecting the Eskimos. These are listed below. They do not themselves constitute a policy, but form a set of criteria against which policies can be tested. They are not of course of equal significance and their relative importance will depend on the nature of the proposed policy, and on the location. They are not therefore given in any order of priority.

1. The composition of the northern population is very different in different parts of the north. In the Yukon Territory the Indians form a minority with little more than 15% of the population; there are no Eskimos. In the Northwest Territories as a whole the Indians and Eskimos together number rather more than the white population, but those of voting age are probably in a minority. In the Mackenzie District alone the white population is considerably larger than the total native population. In the Eastern Arctic, in contrast, the population is predominantly Eskimo, with a white minority forming less than a fifth.

2. The Eskimo population is increasing at a very rapid rate, the birth rate being nearly three times the Canadian average. As it is also a very young population, with over half not having yet reached the age of seventeen, the rate of increase can be expected to grow. The introduction of family planning would modify this trend, as it has in parts of both Alaska and Greenland, but the rate is nevertheless likely to remain at a higher level than the Canadian average.

3. The resources on which the Eskimos formerly depended cannot be expected to support significantly larger numbers. In the past starvation was the control that limited the size of the population, keeping it in balance with productivity. The consequences of civilization have been to make the exploitation of traditional resources more difficult. Examples are depletion of wildlife owing to the introduction of more efficient means of killing such as the rifle, the over-exploitation for export of some resources such as the whale, the disturbances of the environment from mineral exploration and from increased fires in the winter range of the caribou, and the concentration of the Eskimo population into fewer settlements. Low fur prices, the introduction of cheaper artificial furs, and higher costs have made trapping less rewarding, with little prospect of any improvement commensurate with the needs of the increasing population. No more than a useful supplement can be expected from carving, handicrafts, and similar activities. The productivity of the land might be increased somewhat by the introduction of

reindeer herding, fur farming, and wildlife conservation measures, but not to the extent required to keep pace with the increase in population.

4. Urbanization is proceeding rapidly, with families deserting their old hunting camps and moving into a small number of larger settlements where there are schools, stores, and nursing stations. This trend has been accentuated recently by the government housing program, which has meant in effect that an Eskimo who wants a house for his family has no alternative to moving into one of these settlements. Practically the whole Eskimo population will soon be concentrated in about thirty settlements. A second stage of urbanization, with movement towards fewer, larger centres, may then set in.

5. Many settlements in the north have very grave inter-related social problems in drunkenness, juvenile delinquency, prostitution, unemployment and underemployment, and abject poverty. These problems and the resulting crime and illegitimacy rates are worst at such places as Frobisher and Inuvik, where it is easy to buy alcohol and where the white population is of significant size. On the other hand, the more isolated settlements have little to attract the young, and few occupations to absorb their energies and imagination. Juvenile delinquency or juvenile despondency is sure to follow as long as there are no satisfying outlets.

6. With greater knowledge of conditions both elsewhere in Canada and in Alaska and Greenland, the Eskimos are realizing that they have been less fortunate than most of the country, and will demand higher standards of living. Utilities, education, and health are examples of services that will have to approach the standards now almost universal in the south. The means to obtain better food, better clothes, etc., will have to be provided.

7. Relations between the native Eskimo and the white immigrant to the north are deteriorating. In the past the few white men were traders, missionaries, or police; they were cut off from all they had known in the south and in many ways were dependant on the Eskimos. They soon became interested in the north, even if for no better reason than that there was no alternative. They got to know, and to be known by, all the local population, and they usually spent many years in the north, often in one area. All this has changed. The white man now brings a wife with him and is surrounded by his family, he is in frequent communication with the south, lives much the same sort of

life he would have lived there, can leave the north any time he wants, and rarely stays more than a year or two. The settlements have much larger white populations, who share common interests and form a social group separate from the Eskimos. The white man never really leaves his southern environment; he no longer travels with the Eskimos and does not require their help. There is no common meeting ground. As a result the mutual understanding that used to mark relations between individuals of the two races has been lost. The social distance now separating them is leading to an assumption of superiority on the part of the whites, and a growing hostility among the Eskimos.

8. The Eskimos and the Indians, as the original possessors and users of the land, have similar moral claims on the state. Legislation and administration of matters concerning the two races have however diverged in the past, resulting in quite wide disparities. This is an unstable situation. Future policies affecting the Eskimos should be similar to, or consonant with, Indian policies, and vice versa.

9. The Eskimos, while appreciating many of the advantages of education, health, and welfare services, resent some of the consequences, even though these may be clearly unavoidable. They include the separation from children sent away to school and from relatives sent away to hospital, the inability of many children to readjust after returning to their homes from school, and the substitution of the authority of the teacher for that of the parent.

10. Industrial development in the north, a high cost area, will probably take the form of large-scale,highly-automated operations, requiring employees with considerable educational background and advanced technical training. Employers will favour importing skilled workers rather than using local manpower resources. Already several places in northern Canada have a pronounced shortage of skilled and semi-skilled labour, accompanied by severe unemployment and underemployment among the native people at the same places. In Alaska and Greenland a similar situation prevails even though the level of formal education reached by the Eskimos is considerably higher. Industrial development does not necessarily carry with it significant improvement to the economic position of the native people, still less to their social position.

11. Eskimos are capable of carrying out the duties of many positions in federal and territorial government departments now filled from southern Canada. Industry cannot be expected to employ Eskimos unless government, by far the largest employer in the north, provides a real lead in employing Eskimos in responsible positions.

12. A few Eskimo individuals and families have moved to southern Canada. This movement, though it may never become large without official encouragement, is likely to continue so long as there is such a wide disparity in living conditions.

13. The way a country treats her minority groups is becoming a matter of major international concern, and it is at the bar of world opinion that Canada's treatment of her Eskimo population will be judged. Policies and administrative actions, therefore, not only must be good but also must appear good, with nothing that could arouse credible, even if unjustified, suspicion of any kind of coercion, either physical or psychological.

14. The Eskimos form a part of four different nations, providing an unusual opportunity for comparisons. Canadian policies towards Eskimos cannot be any less generous than those in Greenland or Alaska, nor would Canadians as a whole want them to be.

15. Any major extraction of wealth from the north will focus increased attention on the povery of the native population.

16. In both Alaska and Greenland the Eskimos are forming active political groups, designed to protect and advance their interests. These are proving surprisingly powerful and effective. It is more difficult for the smaller and more widely dispersed Canadian Eskimo population to organize in this way, but it is a development that can be confidently predicted within the next few years.

17. In both Greenland and Alaska the Eskimos are showing increasing interest in their own culture and language. Since 1890 the only language of instruction in Alaska schools has been English. At the request of the Eskimos some teaching in the Eskimo language is now being introduced there in elementary grades. Canada is following suit. A growing concern for their language and culture can be expected among the Canadian Eskimo, with possibly some pan-Eskimo implications.

18. Measures designed to assist the Eskimos, however sound in theory, and however well meaning, will not be accepted if they appear to the Eskimos to be imposed upon them. Nor will they stand much chance of being effective if they have been drafted without consideration of their full implications for the Eskimos. It is essential, not only that the Eskimos be fully consulted, but also that they take an active part in the formulation and execution of plans and procedures that will appreciably affect their future. This is a sine qua non.

19. The question of whether and to what extent intelligence is affected by the racial gene pool is beyond the scope of this paper. There is, however, little or no evidence that the Eskimos' intellectual potential is in any way different from that of the North American population in general.

The determinants listed above do not contain anything new or controversial. They are generally accepted facts restated in order to give some indication of what policies and programs are likely to be of long-term benefit, and of the directions that research into Eskimo problems should follow.

NORTHERN NATIONAL PARK AREAS

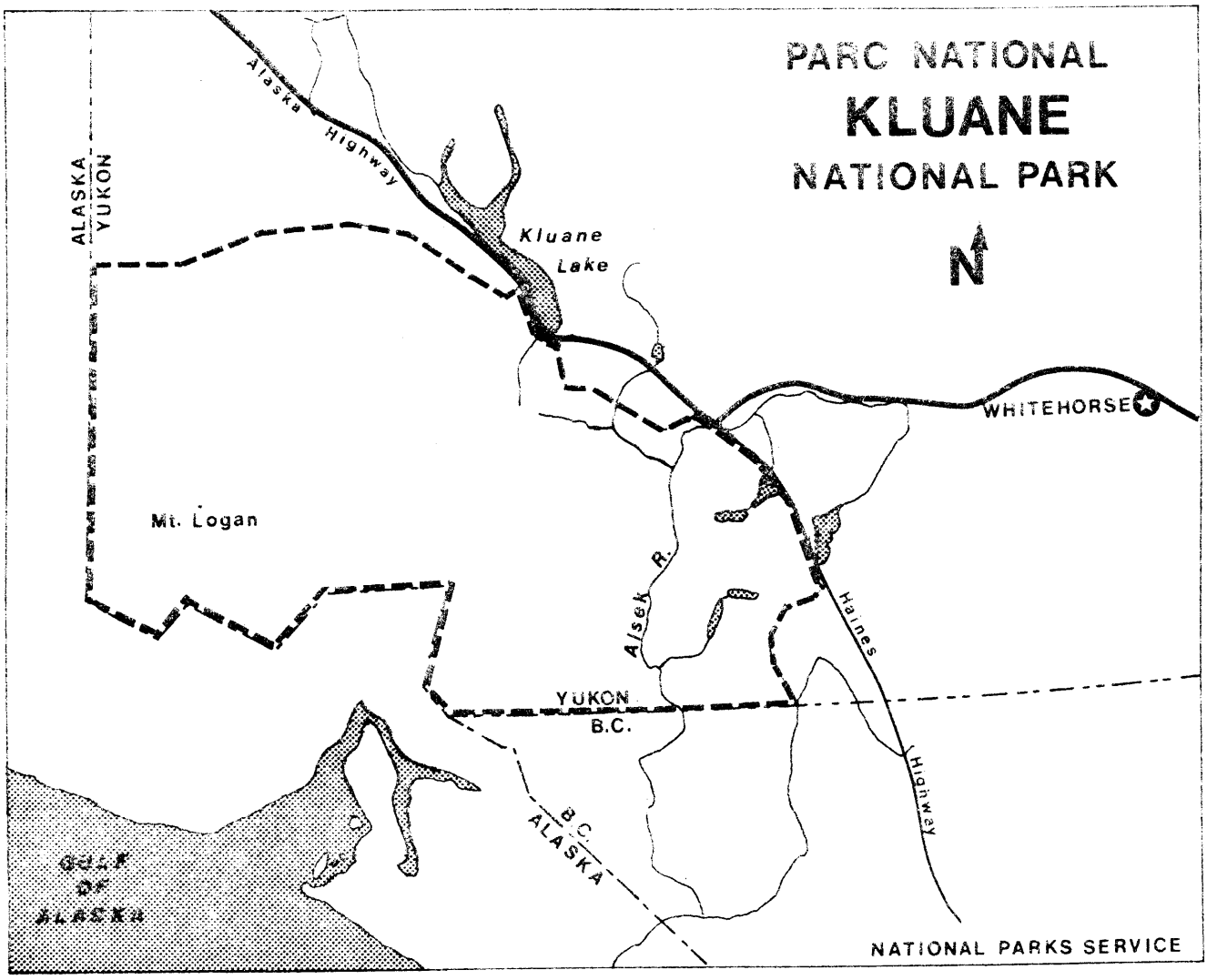
On February 22, 1972, The Honourable Jean Chrétien, Minister of Indian Affairs and Northern Development, announced that more than 18,500 square miles of land in the Yukon and Northwest Territories have been set aside to create three new National Parks: in the Kluane area of the Yukon Territory, along the South Nahanni River, and on the Cumberland Peninsula of Baffin Island in the Northwest Territories. They are Canada's first National Parks above the sixtieth parallel. For the first time, outstanding natural areas in every province and territory of Canada will be represented in Canada's National Parks system. The three northern parks will increase the total area included in Canada's National Parks by more than 50%, from 31,000 square miles to 49,800 square miles. They contain some of the most spectacular scenery in Canada.

Kluane National Park

Located in the southwestern corner of the Yukon Territory, Kluane National Park contains Canada's highest mountains, probably the most spectacular ones, one of the world's largest non-polar icefield systems, and some of North America's finest wildlife populations. The 8500-square-mile area encompasses most of the land set aside as the Kluane Park Reserve in 1942 and the Kluane Game Sanctuary in 1943.

The area lies 100 miles west of Whitehorse and 1400 road miles northwest of Edmonton. The Haines Highway, which runs from the Pacific coast and joins the Alaska Highway at Haines Junction, runs along an 80-mile stretch of the park's proposed northeastern boundary. A commercial airline makes daily flights to nearby Whitehorse from both Vancouver and Edmonton.

During the Klondike Gold Rush in 1898, one of the minor routes for travellers from the Pacific was in the vicinity of the southeastern boundary of the park. Dalton Post, just outside the area, was a stop-over camp. Prospecting occurred in other areas of the Yukon following the Klondike rush and a control post was established by the North-West Mounted Police on the south shore of Kluane Lake in 1904. In 1942 Kluane Lake was the meeting point of American and Canadian crews building the Alaska Highway.



Since the late 1800's the St. Elias Mountains have been popular with mountaineers. Mount Kennedy, named for the late American President, was climbed in 1965. During Canada's centennial year, thirteen peaks were climbed and named for each Canadian province and territory. Prospecting has occurred throughout the years and the area has recently been the site of scientific studies on Dall sheep, grizzlies and glaciers. A continuing study of the high icefields is carried out under the Icefield Ranges Research Project.

The St. Elias Mountains, among the most impressive in North America, run through the park in a NW-SE direction. Mount Logan, 19,850 feet, is Canada's highest peak. The extensive icefields of the St. Elias form one of the world's largest non-polar glacier systems. Dating back to the last Ice Age, these massive fields of snow and ice are maintained by moisture-laden Pacific air that flows over the mountains.

Another dramatic feature is the network of glaciers that, together with the icefields, account for year-round snow and ice cover on more than half the park area. The Steele Glacier is an unusual surging glacier that sporadically moves at a very rapid rate. During a surging period in the late 1960's, this glacier moved downhill 1600 feet in one month. The Kaskawulsh and Lowell glaciers are outstanding examples of the moraine-flanked glaciers typical of the area.

Other features of geological interest include glacier-created sand dunes and dust storms. A large delta is being built in Kluane Lake by wind-blown deposits of material from the Kaskawulsh glacier.

Coniferous species such as white spruce characterize the boreal forest growth of the river valleys. In the southeastern section of the park, the vegetation is more luxuriant as a result of the climatic influence of the Pacific Ocean. Tundra, characterized by lichens, dwarf birch and low shrubs, occurs at altitudes of 5000 to 6000 feet in the northern portion of the park. Colourful Arctic flowers grow from crevices and on rocky ledges of the mountains.

Arctic grayling, lake trout, northern pike and ouananiche (landlocked salmon) are found in most of the lakes and streams.

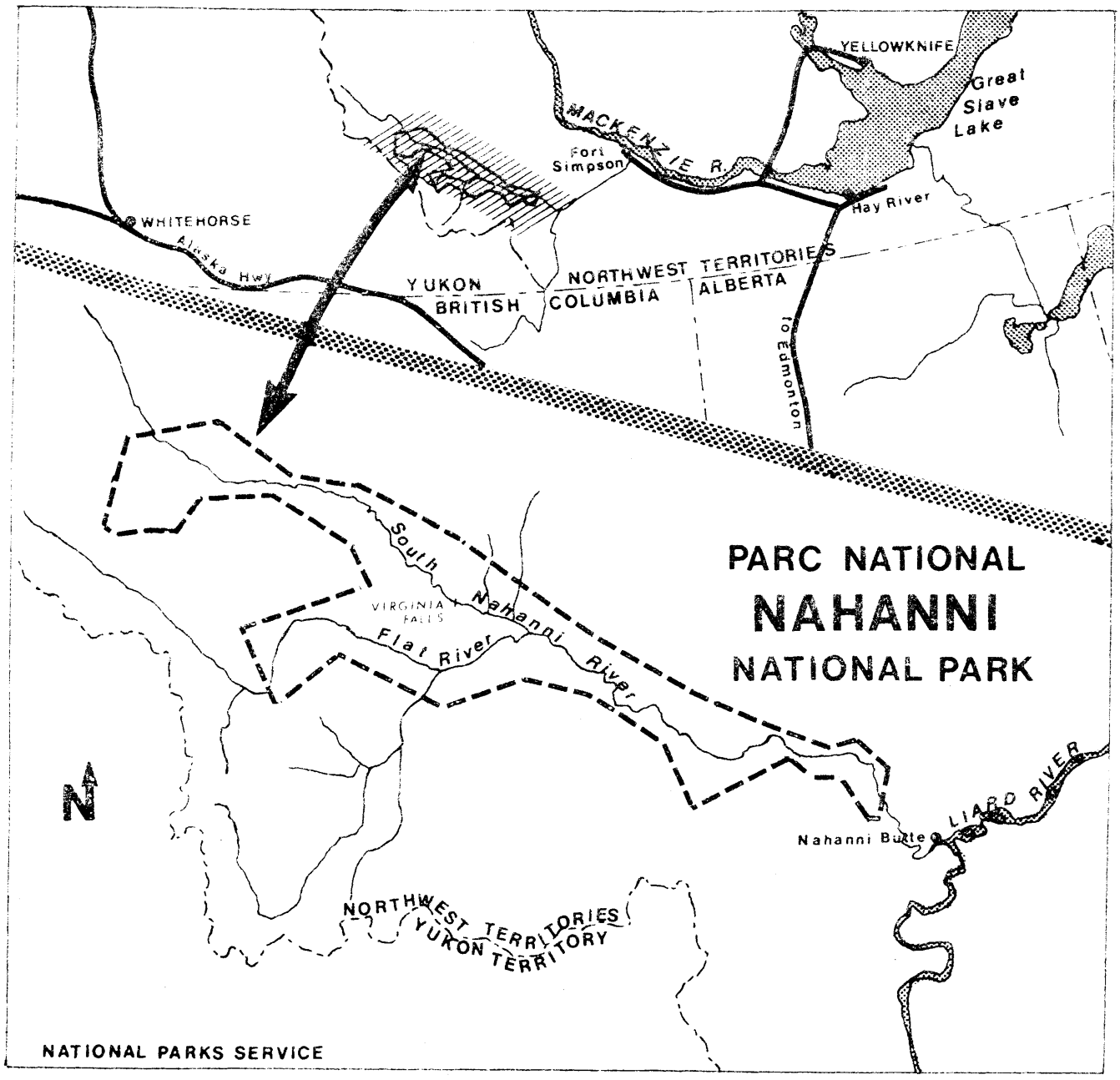
In the Kluane area there are large populations of golden eagle and ptarmigan. The bluebird, once a common resident of southern Canada, nests in the area as well.

The world's last major unhunted bands of Dall sheep are found here. Large numbers of moose inhabit the eastern end of the park and caribou occupy the tundra uplands of the park's northern extremity. The Kluane area lies on the northern edge of mountain goat range.

Wolf and wolverine are also found as well as grizzly. The grizzlies of the Kluane area are smaller than those found elsewhere and they lead a more solitary life and are rarely seen in groups.

Nahanni National Park

The new park located in the southwest corner of the Northwest Territories contains the major portions of the South Nahanni River, covers 1840 square miles - more than double the 870 miles set aside in April 1970.



narrow tortuous constriction known as Hell's Gate. Six miles below Hell's Gate, the Nahanni is joined by the Flat River.

Below this confluence lies Third Canyon, 12 miles long and 3000 to 4000 feet deep. One feature of the canyon is The Gate, a hairpin turn at the botton of 700-foot vertical cliffs, guarded by Pulpit Rock. The South Nahanni then flows only a short distance before it enters the narrow steep-walled Second Canyon. Deadmen Valley, with its wide gravel delta, lies between Second and First Canyons. Untouched by icesheets during the last glaciation, First Canyon has precipitous walls that rise 3500 feet and include many caves, the first to have been discovered north of the 60th parallel. More caves are found in the steep limestone cliffs that border the ridges of tundra north of Deadmen Valley.

At the mouth of First Canyon is a sulphur hotspring. Pools of 98^{o}F water have formed below the spring and the entire area supports a luxurious growth of grasses, balsam, poplar and spruce.

Between Yohin Ridge and Twisted Mountain, the South Nahanni passes near Yohin Lake, a shallow marshy lake providing ideal habitat for large numbers of waterfowl and an unusual growth of plants.

On the slopes of the Liard Range, seven miles southeast of Yohin Lake is an area of spectacular sandstone formations, eroded by wind and water into arches, pedestals and shallow caves. Powderlike sand from these formations covers the ground.

More than 40 plants not previously recorded in the Mackenzie Mountain area have been identified here during recent studies. Several species represent significant range extensions. Wild mint, goldenrod, yellow moneyflower and aster are among the many flowering plants that grow in abundance near mineral springs in the vicinity of Flat River. Large numbers of orchids are found near Virginia Falls. Boreal species characterize the forest growth. Dense growth occurs on the valley bottoms with white spruce and poplar dominating. At higher altitudes and on northern slopes, black spruce becomes more prominent. Alpine tundra characterized by sedges, lichens, grasses and shrubs occurs on the higher mountains of the Tlogotsho, Headless, and Funeral Ranges. These regions as well as the steep cliffs of First Canyon are inhabited by Dall sheep.

The forested river valleys are prime habitat for moose. Grizzly and black bear, wolf, woodland caribou, deer and beaver are among the more than 40 species of mammals in the Nahanni area.

At least thirteen species of fish including Arctic grayling and Dolly Varden trout are found in the streams that flow into the Nahanni and Flat Rivers.

Over 120 species of birds have been recorded in the area, including the golden eagle and Canada goose. American coot, wandering tattler, violet green swallow and song sparrow may represent new nesting range extensions.

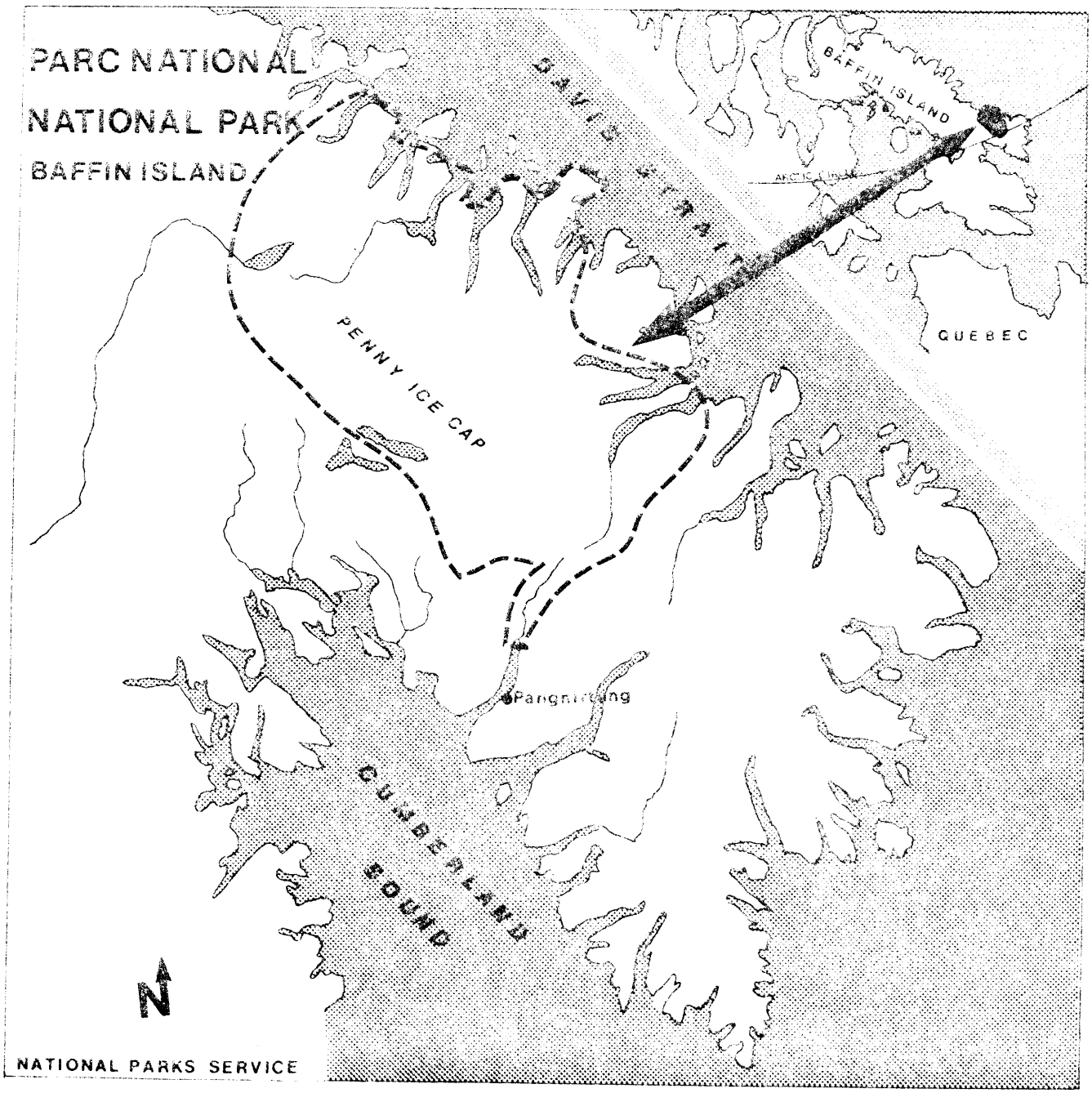
Baffin Island National Park

Baffin Island National Park is located on Cumberland Peninsula 1500 air miles northeast of Montreal and is representative of a part of the vast Arctic regions that constitute well over one-third of the Canadian landscape. The park's 8290-square-mile area, lying along the 60th parallel, mainly north and west of Pangnirtung Pass, is the first National Park above the Arctic Circle. The area is noted for the spectacular Penny Ice Cap, the magnificent fjords and the deeply carved mountains.

The coastline is incised by roughly graded valleys and by fjords up to 30 miles in length with vertical cliffs rising 3000 feet or more above the sea. Inland lie the Penny Highlands. Mountains reaching 6000 to 7000 feet are crossed by long narrow valleys, many filled with glaciers. Pangnirtung Pass, 60 miles long and up to one mile deep, is essentially icefree in summer and supports extensive tundra.

Dominating the highlands is the Penny Ice Cap, rising from 2000 feet in the northwest to over 6000 feet in some areas. With an area of 2200 square miles, it is one of the largest icecaps in the northern hemisphere. The largest of the many long glaciers that extend from the cap is Coronation Glacier, 20 miles long and two miles wide. Bordering the highlands is rolling, hilly terrain covered by boulders and moraine. Isolated icefields exist in a few mountainous areas of the uplands where the peaks rise to 6000 feet.

Baffin Island was one of the areas of the Thule Eskimo Culture which existed in the north a thousand years ago. The ruins of several communities in the vicinity of Cumberland Sound have been discovered by archaeologists. Today there are two Eskimo settlements near the park, one at Pangnirtung at the mouth of the Pangnirtung Fjord and the other on Broughton Island off the northwest coast of the peninsula. A commercial airline operates a daily jet service to Frobisher Bay, 180 miles from the park and also provides regular services to Pangnirtung, 20 miles from the southern boundary.


PARC NATIONAL
NATIONAL PARK
BAFFIN ISLAND
BAFFIN ISLAND
QUEBEC
PENNY ICE CAP
Pangnirtung
CUMBERLAND SOUND
N
NATIONAL PARKS SERVICE

The tundra in the river valleys and Pangnirtung Pass consists of an almost continuous cover of lichen and moss heath with a few dwarf shrubs. Frost polygons caused by the freeze-thaw cycle are found in the marshy lichen areas of the Pangnirtung Pass. The boulders in the rock-strewn barrens of the uplands are often covered with crustaceous lichens and, during the summer, flowering plants such as Arctic poppy and saxifrage bloom in brilliant colours on the rocky slopes.

Whale, narwhal, seal, and walrus frequent the waters of the fjords. Terrestrial mammals include polar bear, Arctic fox and barren-ground caribou. Polar bear, Atlantic walrus and blue, humpback, and right whale are considered endangered species.

Canada goose and snowy owl are among the forty species of birds that nest in the area. Rare species such as gyrfalcon and whistling swan are also found.

OIL DISCOVERED IN THOR AND ROMULUS WELLS, 1972

Panarctic Oils announced two new oil finds during March - one at its Panarctic Tenneco et al Thor P-38 adjacent to its earlier gas discovery on Ellef Ringes Island, and one at its Panarctic Romulus C-42 on Ellesmere Island. At the same time another oil showing was encountered in the Romulus C-42 well following the discovery on February 24 of the first crude oil in the Arctic Islands.

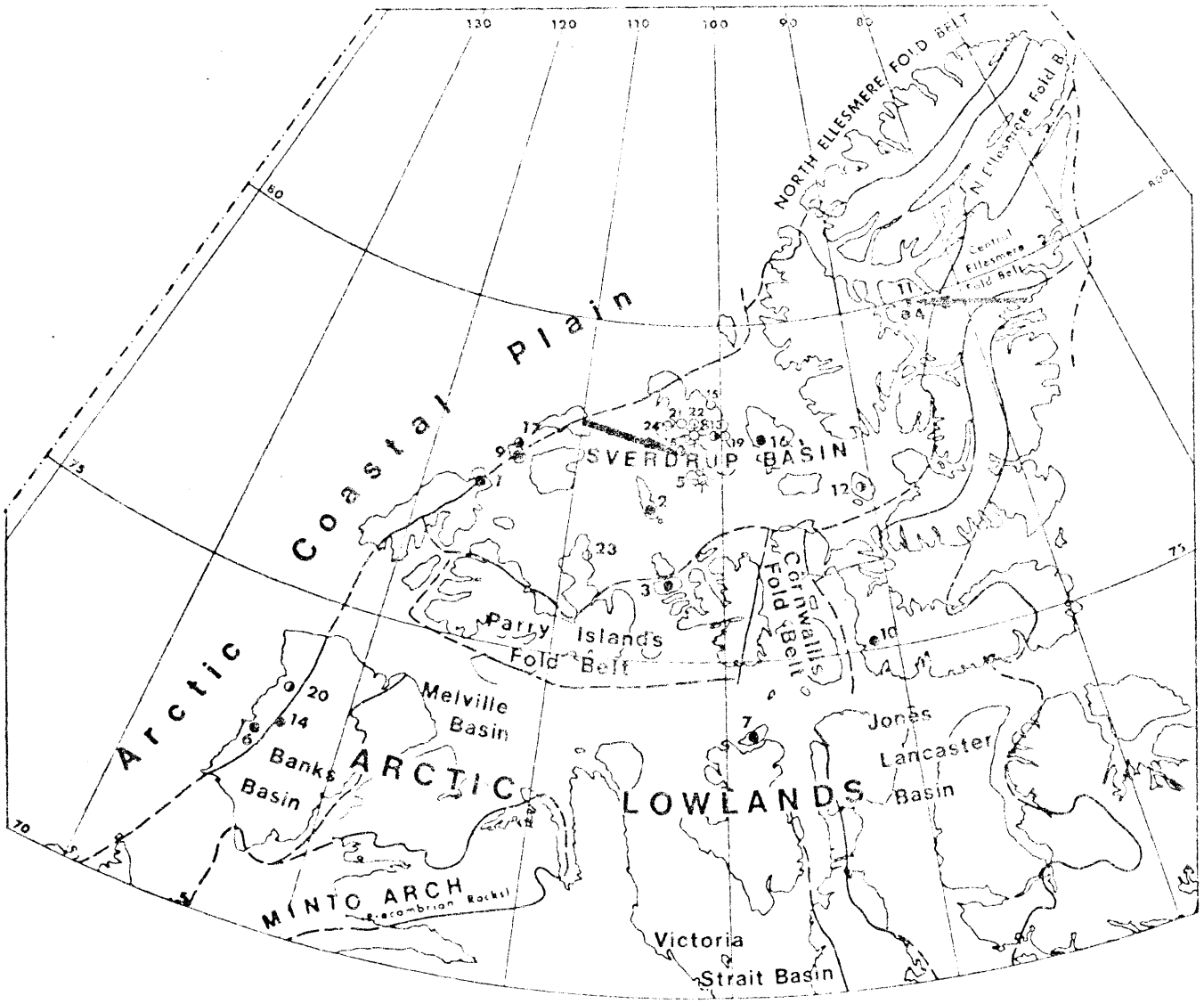
At the Thor well a drill stem test at a depth of 3870 feet flowed sweet oil of 40-degree API gravity to the surface. Continued testing indicated that the pay thickness may not be sufficient to be commercial. The well is located on lands owned 100% by Panarctic.

The Romulus C-42 well, at a depth of 9400 feet, drill stem tested gas to the surface with a recovery of 1325 feet of light oil or condensate of 48-degree API gravity. A second test, at a depth of 10,142 feet in a deeper formation, tested gas to the surface with a recovery of 510 feet of light oil or condensate of 54-degree API gravity. These recoveries of liquid hydrocarbons follow closely on the recent recovery of the first crude oil from the Arctic Islands encountered at the 3425 foot level in the Romulus C-42 well.

In commenting on these recent events Mr. Hetherington said that it is significant that crude oil has now been found near Ellef Ringes Island in the central Sverdrup Basin as well as on Ellesmere Island in the Eastern Arctic.

These two discoveries are separated by some 300 miles, but this undoubtedly will spur the search for oil as well as gas throughout the Sverdrup Basin. Hydrocarbon occurrences in a number of horizons in the Romulus well on the Fosheim Peninsula indicate favourable prospects for large potential areas on Ellesmere Island.

DRILLING SUMMARY ARCTIC ISLANDS



LOCATION

15. Panarctic Gulf Helicopter J-12
19. Imp. Panarctic et al Hoodoo L-41
21. Panarctic et al Dore Bay P-36
22. Panarctic Kristoffer Bay
23. Panarctic Drake P-16
24. Panarctic Noice

DRILLING

11. Panarctic Romulus C-42
12. BP et al Graham C-52
13. Panarctic Gulf Dumbbells D-49
17. Panarctic Brock I-20
18. Panarctic Thor P-38
20. Elf Uminmak B-07

P&A AND ABANDONED

1. BP et al Satellite P-68
2. Sun PR et al Skybattle Bay C-15
3. BP et al Panarctic Hotspur J-20
4. Panarctic Roshore N-27
6. Elf et al Storkerson Bay A-15
7. Sun et al Russell E-82
9. Panarctic et al Brock C-50
10. Imp. IOL et al Devon E-45
14. Elf Naruk B-76
16. Panarctic Gulf West Amund I-44

COMPLETED GAS WELLS

5. Panarctic King Christian N-06
8. Panarctic Tenneco Kristoffer Bay G-0

REPORTS OF ACTIVITIES, 1971

ACTIVITIES OF THE GEOLOGICAL SURVEY OF CANADA IN THE NORTH 1971

In 1971 the Geological Survey had more than 50 projects north of 60°; most were in the Northwest Territories and many were in the Arctic Islands. Preliminary results from these studies were released in January 1972 in Geological Survey Paper 72-1, Part A and this note, based on that report, is designed to make those in other fields of scientific research aware of the nature and scope of the Survey's northern activities.

Environmental and engineering geology studies are of increasing importance as northern development accelerates and several field projects were devoted to such studies.

On Melville Island D.M. Barnett and M. Kuc examined sites of major terrain disturbance associated with oil exploration. Three distinct categories were recognized (1) intensive activity (e.g. well sites or landing strips) (2) extensive systematic activity along seismic lines (3) nonsystematic overland movement. Each category leaves distinctive marks on the terrain and from the data collected it should be possible to list significant geological-geomorphic parameters which can be used elsewhere by those concerned with land use regulations.

Detailed mapping of the surficial geology in and around Tuktoyaktuk was carried out by M. Bouchard and V.N. Rampton; particular emphasis was given to identifying useable sources of aggregate.

Studies on the engineering geology of the Mackenzie Valley Transportation Corridor was carried out by R.M. Isaacs and J.A. Code. These included geological reconnaissance, the evaluation and development of drilling techniques in permafrost for recovery of soil samples, a study of slope and river bank erosional processes, the setting up of a field laboratory and the permanent installation of instrumentation in boreholes.

Terrain sensitivity studies were initiated in the "Corridor" by P.J. Kurfurst and J.A. Heginbottom with the objective of studying the response of various soil and rock material to different types of natural

and man-made disturbances. The effects of forest fires and of man-caused terrain disturbance on permafrost and the active layer were also studied.

In order to provide engineering geological consultation and advice to the Department of Indian Affairs and Northern Development relative to Territorial Land Use Regulations, E.B. Owen carried out field examinations of various operations in Yukon Territory and Northwest Territories. His data were compiled and the resulting reports submitted to the Northern Economic Development Branch.

The mapping of surficial deposits commonly forms the data base on which other studies are based and inventory mapping was continued in several widely separated locations:

- On Melville Island D.M. Barnett carried out studies on the surficial geology and geomorphology east of longitude 112°. Melville Island, one of the last large arctic islands for which such information is not available, has been the scene of considerable petroleum exploration activity and the terrain information obtained will be pertinent to implementation of the Territorial Land Use Regulation.

- J.E. England studied the late-glacial chronology and differential post-glacial uplift in the fiord systems bordering the southern edge of the Lake Hazen Plateau, Ellesmere Island.

- O.L. Hughes and D.A. Hodgson initiated studies in northwestern District of Mackenzie designed to provide inventory surficial geology and permafrost distribution data pertinent to pipeline construction, road building and similar land use activities in the Mackenzie Valley Corridor. Officers of the Canadian Forestry Service and the department of Agriculture were attached to the field party in order to determine the relationship of vegetation to surficial geology, landform and permafrost conditions and soil development.

During August and September C.F.M. Lewis and B.V. Sanford, participated with Aquitaine Company of Canada, Ltd. in a geological study of Hudson Bay. The submersible Pisces III was used in conjunction with a 90-foot-long vessel. Both were equipped with rock drills and sediment samplers; echo sounder, side-scan sonar, and a shallow seismic reflection profiler were also provided. The 2500-mile-long traverse started at Coral Harbour, N.W.T., touched at Rankin Inlet, Eskimo Point, Churchill and the Belcher Islands, and terminated at Povungnituk, Quebec. The main objectives of the geological study were the delineation of Paleozoic rocks as part of the

Geological Survey's Basin Analysis Program for the evaluation of petroleum and natural gas resources and of a study of Quaternary deposits in order to (1) provide data concerning offshore-foundation problems, (2) develop the general inventory and (3) to extend our knowledge of modern sedimentary processes within Hudson Bay.

Quaternary stratigraphy in the vicinity of Eskimo Lakes was studied by V.N. Rampton who also carried out similar studies near Aklavik. Dr. Rampton also spent a short time on Herschel Island and concluded a cooperative study with the Earth Physics Branch to determine whether gravity can be used to determine the thickness of ground ice.

The Quaternary deposits and geomorphology for map-sheets 85E, 95A, H, J and 95 B (south) were mapped at a scale of 1:125,000. The areas include parts of the Mackenzie Mountains, Great Slave Plain and Alberta Plateau. This work, carried out mainly by N.W. Rutter and Gretchen V. Minning, was in support of the Survey's terrain studies in the Mackenzie Valley Transportation Corridor.

Seismic reflection studies carried out in the Mackenzie Bay area by J.M. Shearer have enabled the origin and structure of the Mackenzie Canyon to be deciphered. The work confirmed the existence of a buried canyon wall on the east side of the bay, and other interesting facets of the recent geological history of the area have been described.

Large parts of northern Canada are covered by a mantle of glacial drift which obscures the bedrock and makes conventional prospecting difficult. W.W. Shilts continued studies recently undertaken by the Survey whereby mineral deposits are traced by sampling drift. In 1971, the Kaminak Lake area, District of Keewatin, was studied. Bedrock mapping of the area was done a few years ago. More than 1500 samples were collected from pits dug in frost boils.

J.R. MacKay continued studies of geomorphic processes in the Mackenzie Valley and along the Arctic Coastal Plain in support of the Mackenzie Valley Transportation Corridor study and M.W. Smith studied factors affecting the distribution of permafrost in a small part of the Mackenzie Delta. The results of the latter study will be applicable over a much larger area as the type of terrain underlying the study area is common.

The Survey has been conducting studies on the application of geochemical methods for mineral exploration in permafrost areas. R.J. Allan assisted by other officers, continued these studies in various parts of the Bear and Slave geological provinces which will be the site of an extensive

limnic geochemical survey in 1972. He also studied the surficial dispersion of trace elements near the lead-zinc deposit on Cornwallis Island.

R.G. Garrett completed a regional geochemical census of plutonic rocks in eastern Yukon Territory.

The effectiveness of regional geochemical methods, particularly hydrogeochemistry, in a northern environment, was studied by E.H.W. Hornbrook in the Ennadai-Rankin belt of the District of Keewatin.

T.M. Cordon continued the study of the Daly Bay metamorphic complex (northeastern Hudson Bay). No mineral occurrences of economic interest were found, but the presence of rusty, pyritiferous zones and minor quartz veins in the mylonitic rocks bordering the complex, suggests that this map-unit is the most favourable locality for prospecting.

J.E. Reesor began a petrological study of the Penrhyn Group Metamorphic Complex, southern Melville Peninsula. This study is designed to determine the structural, metamorphic, stratigraphic and age relationships between the "basement" gneisses and the younger Penrhyn Group metasedimentary gneisses and schists.

A. Davidson began a study of the granitic rocks of the Slave geological province in order to determine the types of plutonic rocks present and their lithologic,structural and age relationships. Field work was carried out in parts of map-area 85I (north of Great Slave Lake). Initial results suggest that although the regions of plutonic rocks are highly complex, they can be subdivided into recognizable subunits. J.B. Henderson continued the mapping of the Archean parts of the same area on a scale of 1:250,000. This work is designed to revise and interpret the geology and economic potential of an area previously known only from reconnaissance studies. About 2300 line miles of aerial colour photography were flown in this part of Bear-Slave Province as an experiment in photogeological interpretation.

P.F. Hoffman continued the study of the Coronation Geosyncline between Tree River and Great Bear Lake. The study has shown that in the western part of the area many intrusive plutons (granite to diorite) contain disseminated chalcopyrite and that here, contrary to the common prospecting techniques used in the Canadian Shield, such intrusives should not be ignored in the search for base metal deposits. R.H. Ridler continued a stratigraphic and metalloginic study in the Rankin Inlet-Ennadai belt, southern District of Keewatin.

Basin analysis studies of post-Precambrian rocks were continued in the Interior Plains and Arctic Lowlands. Such studies are of direct assistance to those engaged in exploration, planning, administration and regulation of petroleum and natural gas resources. Preparatory to detailed stratigraphic and structural studies in the central part of Sverdrup Basin. H.R. Balkwill examined selected stratigraphic sections on Amund and Ellef Ringes Islands. T.P. Chamney studied a sequence of Cretaceous rocks west of the Mackenzie Delta and J.A. Jeletzky continued stratigraphical-paleontological studies of Mesozoic and Tertiary rocks in northern Yukon and northwestern District of Mackenzie.

An airborne geological study of eastern Grinell Peninsula directed by J.W. Kerr continued the mapping of this part of the arctic begun in 1967 and designed to extend the geological knowledge of this area as an aid to evaluating its petroleum potential. Air support was also provided to G.D. Mossop who was studying the evaporites of the Baumann Fiord Formation of central Ellesmere Island.

W.W. Nassichuk studied special problems in Carboniferous and Permian stratigraphy in the eastern and northern parts of the Sverdrup Basin. In the course of this work a number of Lower Permian carbonate "hydrozoan" mounds, previously unknown in Sverdrup Basin, were discovered in southwestern Ellesmere Island. Such features are of considerable interest in an area currently being explored for hydrocarbons.

As part of the Basin Analysis Program, K.J. Roy began detailed studies of the Lower Triassic Bjorne Formation in western Ellesmere Island. Six stratigraphic sections were measured between Bjorne Peninsula and Greely Fiord.

The Cretaceous stratigraphy of northern Yukon between Blow and Fish rivers was studied by F.G. Young as part of a basin analysis program designed to study the exposed Mesozoic and Tertiary strata of northern Yukon and their relationship to the subsurface stratigraphy of the Mackenzie Delta-Beaufort Sea area.

The Geological Survey continued its program of aeromagnetic surveys in the North and about 51,500 square miles were mapped including parts of NTS map-sheets 13, 26, 37, 45, 65 and 66.

Experimental airborne gamma-ray spectrometry surveys were made between Ottawa and Yellowknife, from Yellowknife to Coppermine, in the Coppermine and Yellowknife areas, and between Yellowknife-Whitehorse-Dawson and Watson Lake.

R.G. Blackadar

A SUMMARY OF PERMAFROST RESEARCH IN 1971

(Based on the Annual Report of the Division of Building Research, National Research Council, for 1971)

The need for geotechnical information for the national development of the Northern Canada resource potential has continued to be a major factor in the formulation of the Section's research program. Although it was found necessary to reduce the staff support maintained at the field station at Thompson, Manitoba, this was partially compensated by several improvements to the site and facilities.

Pipelines in Permafrost. A quantitative analysis of the thermal, hydraulic and structural aspects of hot pipelines was undertaken in order to identify the geotechnical problems associated with the construction and operation of such facilities in permafrost. Compilation was made of the extent and rate of thaw for two operating temperatures (65°F and 175°F) for a 4-ft diameter pipe in permafrost with a mean annual temperature of 17°F as predicted by a simplified computer program. Major problems requiring immediate attention because of the needs of both prediction and control are: the settlement and rate of settlement that take place during the thawing of ice-rich soil, and the stability of the thawed material, particularly near the zone of thawing. The Section has undertaken investigations to establish some of the information required.

Settlement and stability of thawing permafrost depend on soil type, the rate of release of water, the rate at which water can be removed from the thawing zone, and the conditions of stress. Equipment is being developed for laboratory measurement of settlements, permeability, and pore water pressures for specimens of permafrost thawed under a given imposed load. It is appreciated, however, that the observations made on relatively small samples in the laboratory may not be truly indicative of what occurs during thawing under field conditions.

The Mackenzie Valley Pipeline Research Ltd., a consortium of sixteen oil and pipeline companies, made it possible for the Section to obtain experience concerning the behaviour of permafrost during thawing in situ. Assistance was given by the Section to MVPRL in the design and installation of piezometers for measuring pore water pressures. The piezometers had to be installed in permafrost, be able to withstand the effects of freezing, and to respond to the pore water pressure as soon as the thawing front reached them. This activity and subsequent discussions, provided an appreciation of the importance of rate of thaw and permeability for field

conditions of thawing, and indicated the improvements required in apparatus and in techniques for measuring bore water pressures, settlement, and heat flow.

Experience was also obtained in procuring, shipping and storing permafrost samples. It is necessary during these activities to maintain the temperature of the frozen ground as close as possible to its original level because of the possible effects temperature changes may have on its properties. Sample preparation techniques for thaw-settlement, strength, and thermal-conductivity tests were also developed in the Section's cold room facilities. Some observations were made on the settlement that occurs during uncontrolled thawing of frozen ground specimens about 2½ inches high and 3½ inches in diameter in a standard odometer. The apparatus now being constructed will allow the specimens to be thawed undirectionally at a controlled rate. Consideration is being given to ways of measuring strength for the saturated conditions that exist at the thawing front in ice-rich soils.

Structures in Permafrost. Observations are being made at several structures in the Inuvik, N.W.T., and Thompson, Man., areas to assess their influence on the ground thermal regime. Measurements of temperature and heat flow under the paved airstrip at Inuvik are being analyzed and will be compared to similar measurements made prior to paving. No significant change has been observed under the original pile-supported powerhouse at Inuvik, indicating the success of that design in maintaining permafrost conditions. Bimonthly ground temperature measurements in the duct-ventilated gravel pad on which an addition (insulated flat slab) was constructed in 1967, indicate that the permafrost table has risen to the original ground surface. No movements of the building have been detected by engineering surveys made each year.

Ground and water temperatures and movements are being measured at sand-fill dykes on thawing permafrost at the Kelsey and Kettle Generating Stations on the Nelson River in northern Manitoba, in a cooperative program with the Manitoba Hydroelectric Power Commission. Ground temperatures are also being measured for the Section by resident Department of Public Works staff at selected locations where frozen ground was encountered during construction of a buried water supply line at Churchill, Manitoba.

Strength of Frozen Ground. A study was undertaken to establish the suitability of the "Pressuremeter" for measuring the in situ strength and deformation characteristics of permafrost. The pressuremeter is a cylindrical device for subjecting the walls of a bore hole, over approximately an 18-inch length, to a controlled pressure. This work was

carried out under a cooperative agreement with the Centre d'Ingéniérie Nordique de l'Ecole Polytechnique, Montreal.

Some modifications to the drilling method and equipment, the instrumentation, and the standard test procedure normally used in unfrozen soils were required to

- drill a satisfactory hole with minimum disturbance to the ground thermal regime around the probe in the borehole.

- monitor temperature variations, during the test, at the contact between the probe and the surrounding ground.

- obtain the maximum amount of creep information within the practical limits of probe extension and test duration.

Five tests were performed in June in marine clay at the DBR/NRC site in Ottawa before proceeding in July to Thompson, where 17 tests were conducted in frozen soils, and 3 in unfrozen, varved soils. Although several short-term tests were conducted first at each site, the majority of the tests were of a long-term type in order to evaluate the creep characteristics of the soil. In the latter case three loading programs were used:

- Single stage creep tests
- Multi-stage creep tests
- Equal stage creep tests

Each creep test had to be planned in advance so that the required creep information could be obtained without exceeding the volume capacity of the probe. Analysis of the results of these field tests is presently underway and a report on the work is being prepared.

Anchorages in Permafrost. Analysis of the results of field tests conducted between 1967 and 1970 on grouted rod anchors in permafrost at two sites in northern Manitoba was completed. A paper describing this work was presented at the 24th Canadian Geotechnical Conference in September and submitted for publication in the Canadian Geotechnical Journal. It includes a theoretical analysis, based on engineering creep theory, which shows how the time-dependent behaviour of these anchors (or short piles) can be related to the basic creep parameters of frozen soil. In addition, the use of field creep data for estimating the long-term adfreeze strength of frozen soil for the design of anchors or piles is also described. The results of tests conducted on power installed screw anchors at the same time at the same sites, are being analyzed.

Permafrost Distribution. Investigations continued in three sections of the Canadian permafrost region. In the continuous-discontinuous permafrost boundary region monthly readings were taken by the Department of Geography, University of Alberta, at eight 50-foot-deep thermocouple cables in the various terrain types (bedrock, glacial and beach deposits, peatland) at Yellowknife, N.W.T. Two years of readings have now been obtained and the measurements are being analyzed. Permafrost occurs in the peatlands to depths of 200 feet but there is none in the other types of terrain. Preparations are underway to install similar cables in 1972 at Churchill, Man., Rankin Inlet, N.W.T., and Ennadai Lake, N.W.T.

The Cordillera (mountain) permafrost investigations were increased by the installation of five more 10-foot thermistor cables on mountain summits in southern British Columbia at microwave station sites, making a total of twelve. Monthly readings are being taken by B.C. Hydro and are being forwarded to Ottawa for analysis. Thick snow cover at some of the sites has a significantly moderating influence on the ground temperatures.

In the Arctic Islands, a drilling program was carried out in the summer of 1971 at the Canadian Tundra Biome Site of the International Biological Programme (IBP) near Cape Sparbo on the north coast of Devon Island. Twelve holes of various depths down to 30 feet were drilled in the principal terrain types (bedrock, beach ridges, tundra) and multi-point thermocouple cables were installed in each hole. Monthly readings are being taken by on-site personnel and forwarded to Ottawa for analysis. The active layer varies from 7 feet in granite to 6 inches in tundra. Ground temperatures at $4^{\circ}F$ to $5^{\circ}F$ were recorded in July at the 30-foot depth in several holes.

Permafrost Environmental Studies. A data logging system was installed at the Thompson Terrain Site where observations on the influence of climatic and terrain factors on permafrost have been underway for several years. An energy exchange observation program is being developed and special electronic integrators have been designed and installed to record net radiation on a continuing basis at each of the two permafrost and non-permafrost sites.

Ground Thermal Regime

The Section has had a continuing interest in problems related to ground temperatures in both permafrost and non-permafrost areas. Attention is being given to putting the experience and knowledge gained from these investigations into a form suitable for engineering design needs. The following is one current project contributing to this activity.

Continuous Operation of Skating Rinks. The feasibility of operating a rink beyond the normal winter period in order to provide skating facilities during part of the summer, and possibly for the whole year is under investigation. The rink was constructed on a base course of non-frost-susceptible materials, about 6 feet thick, underlain by a frost-susceptible clay. Thermocouples were installed at several locations to measure temperatures below the rink, and survey markers were placed on the floor to monitor possible heave should the freezing plane rise or fall.

R.J.E. Brown

CANADIAN WILDLIFE SERVICE, EASTERN REGION WILDLIFE RESEARCH IN THE ARCTIC, 1971-72

Northern Mammal Studies

Polar Bear Studies. Dr. C.J. Jonkel continued studies of polar bear productivity in the Owl River-Broad River denning area along the Manitoba coast of Hudson Bay during late February through early April 1971. The work was carried out in cooperation with R. Robertson of the Manitoba Department of Mines, Resources and Environmental Management. The data from 1970 and 1971 indicated that 150 to 200 cubs were born in that area each year. Limited data collected in 1972 gave a similar result. The detailed results will be published shortly in International Union for Conservation for Nature (IUCN), New Series Publication No. 23. Studies of productivity in a denning area on the north part of Devon Island were started in 1971 and continued in 1972. Further data on productivity will be collected in 1973 from Devon Island and also from the Ontario coast of Hudson Bay and from the north coast of Southampton Island.

The Canadian Wildlife Service continued summer studies of the maternity and summer denning area along the Manitoba coast in cooperation with the Manitoba Department of Mines, Resources, and Environmental Management. Those results will also be included in IUCN, New Series Publication No. 23.

Mr. R. Russell, completed the comparative study of food habits of coastal and island polar bears in Hudson and James bays under CWS auspices. He presented the results in his M.Sc. thesis at the University of Alberta.

Mr. S. Knudsen is now writing up the results of behavioural studies of bears on North Twin Island in James Bay which were supported by CWS. He will present the data in an M.Sc. thesis at the University of Montana.

Dr. Jonkel and Drs. N. Oritsland and K. Ronald of the University of Guelph are preparing for cooperative studies of environmental physiology of polar bears in the Owl River-Broad River denning area. A portable field laboratory has been set up for that purpose.

Dr. Jonkel and Dr. I. Stirling continued capture-recapture studies of polar bears in the Beaufort Sea, Lancaster Sound and Hudson Bay areas during 1971 and early 1972, resulting in the marking or recapture of 211 bears. Recaptures and observations of marked bears confirm that bears in many areas form distinct sub-populations with little movement to distant areas.

Dr. Stirling continued studies of the relationship between polar bears, seals, and sea ice conditions, particularly in the Beaufort Sea-Amundsen Gulf region. He examined seals killed by bears and collected samples for age determination and measurements of mercury and other pollutants. Data were collected on the efficiency with which bears capture ringed or bearded seals under different circumstances. Seal lairs broken into by bears were examined to determine what kind of seals had been using them and for what purposes (e.g. parturition, resting, breathing). Underwater-sound recording equipment was used to determine the species of seals present in areas being hunted by bears.

Dr. Stirling collected data on sea ice conditions in an attempt to analyze factors determining polar bear distribution and movements on both a short- and long-term basis.

The Federal-Provincial Polar Bear Technical Committee has made considerable progress in coordinating management measures within Canada. The governments of the Northwest Territories, Yukon, Newfoundland, Ontario, and Quebec all require now that pelts be tagged before they are legal for trade. Quotas are being set within management zones and coordinated between jurisdictions, and preliminary investigations of an international treaty for protection of bears on the High Seas have been undertaken. Cooperative field research programs have been arranged between CWS; Manitoba Department of Mines, Resources and Environmental Management; N.W.T. Game Management Service; and Ontario Wildlife Branch,to study denning area productivity.

Peary Caribou and Muskoxen. In order to provide the Northwest Territories government with a basis on which to decide the advisability of hunting, a study of Peary caribou and muskoxen is being conducted on Melville, Eglinton, and Byam Martin islands. Mr. F.L. Miller is in charge of this project. Mr. R. Urquhart of the Northwest Territories Game Management Service and Mr. R. Russell and Dr. E. Broughton of the Canadian Wildlife Service are participating. The primary objectives are to learn the current numbers, distribution, calf crop, calf mortality and its causes, and seasonal movements both within and between islands.

In 1971 Mr. J. Inglis of Carleton University conducted preliminary surveys of vegetation on sample areas on Devon, Bathurst, and Ellesmere islands, under contract to CWS. He also surveyed the distribution of muskoxen, caribou, and hares in relation to habitat characteristics on sample areas on Ellesmere Island. His report will provide a background for further studies to determine how industrial damage to arctic wildlife populations and their habitats can be avoided.

With CWS support, Mr. B. Hubert, University of Manitoba, is continuing in 1972 a study of the ecology of muskoxen in the Truelove Lowlands of Devon Island. This research, begun in 1971, concerns the productivity of muskoxen in the area and factors influencing it. Techniques used include aerial counts, tracing movements of marked animals, and digestion trials performed with captive muskoxen at the University of Alaska.

In 1971, CWS continued to contribute partial support to a study of muskox behaviour on Bathurst Island conducted by Dr. D.R. Gray. A report of that study recently appeared in the Arctic Circular (Vol. XXI, No. 3, 158-165). That project has since been completed, and the results presented as a Ph.D. dissertation at the University of Alberta.

Forage Stands for Caribou on Southampton Island. Caribou on Southampton Island had been depleted by 1932, probably through overhunting, and became extinct in the 1950's. In 1967 they were reintroduced from Coats Island in an operation financed by the Northwest Territories Game Management Service and conducted by the Canadian Wildlife Service. The animals are now protected on the island. It is intended that hunting be reinstated after the population has reached a secure level but before it exceeds the capacity of the forage stands to support it.

In 1970 Mr. G.R. Parker began a study to document the condition of the forage stands of the island. This is being done to provide a bench mark against which to measure the effects of grazing by caribou as they increase

in numbers. Habitat types were mapped from aerial photos. Cover and standing crop of forage of each plant species were measured on sample plots in all habitat types. Field work has been completed except for a brief sampling to be conducted in August 1972 to develop equations for estimating standing crop of shrubby forage from cover data. The report on the study will be completed in 1972-73.

Effects of Fires on the Capacity of Taiga to Support Caribou in Winter. It has been shown that widespread taiga fires have the potential to adversely affect the welfare of barren-ground caribou by destroying lichens, a major source of their winter food (C.W. Scotter, 1971. "Fire, vegetation, soil and barren-ground caribou relations in northern Canada." Proc. Symp. Tall Timbers Fire Ecology Conf. No. 8. Tall Timbers Res. Sta., Tallahassee, Florida). However, observations in northwestern Manitoba indicate that when snow becomes deep, caribou restrict their foraging activities to forage stands close to lake ice or other treeless areas, including burned areas, where the snow is wind-packed. This behaviour may reduce their vulnerability to wolf predation. Caribou were also observed feeding in winter on non-lichen plants in post-fire seral communities.

D.R. Miller began a study in 1971 in northwestern Manitoba and northeastern Saskatchewan to determine how caribou are affected by fires of the size, frequency, and distribution that currently occur in those areas. The size, frequency, and distribution of fires that have occurred in a known interval are being measured on aerial photographs of sample areas. The relative use of different aged stands on different sites is being determined by tracking caribou in winter on foot and by mapping the distribution of caribou feeding craters on aerial transects. Feeding craters in the various habitats used, are examined to note the plant species that have been browsed, and are marked and re-examined in summer to determine all species present.

The results of this study will provide a basis for formulating fire control recommendations for taiga areas.

D.R. Flook.

Studies of Arctic Geese

Work in 1971. The Canadian Wildlife Service and the Quebec Wildlife Service (QWS) carried out a cooperative study of greater snow geese (Anser caerulescens atlantica) in the High Arctic from June 22 to August 15, 1971. Mr. J.D. Heyland of the QWS undertook aerial surveys and

banding operations on Bylot, northern Baffin, Bathurst, Devon, and southern Ellesmere islands while Kerbes carried out aerial surveys, nesting biology studies and banding operations on Axel Heiberg and northern Ellesmere islands.

Almost 3000 geese were banded over an area approaching 250,000 square miles. Kerbes found seven colonial nesting sites and eight solitary nests on eastern Axel Heiberg and on Ellesmere north of the Raanes Peninsula. A total population of 400 successful breeding adults and 2000 non-breeders was estimated for that region, which is the northernmost area occupied by the subspecies. Peak hatching dates were July 12 to 14. Mean clutch size in early July was 3.2 and mean brood size in early August was 3.7.

Previous aerial surveys have covered much of the area surveyed in 1971, but previous nesting studies and banding operations have been limited to Bylot Island.

Greater snow geese number about 140,000. They are hunted legally only in Quebec. More information from the breeding grounds is needed to understand their population dynamics. The current massive and accelerating amount of human activity in the High Arctic, with the threat of consequent adverse effects on wildlife, has made it imperative to identify the most important goose breeding areas.

Plans for 1972. An inventory of nesting blue and lesser snow geese (Anser c. caerulescens) in the eastern Arctic will be undertaken from about June 10 to July 10, 1972 by means of vertical aerial photography. A large formal aerial camera mounted in a small twin-engined aircraft will be chartered by the CWS from a professional air photo firm. The aircraft will begin the survey at Churchill, Man. The nesting colonies of west Hudson Bay, Southampton Island and Baffin Island will be photographed. Nearly-complete coverage of breeding birds and sample coverage of nonbreeders will be obtained. Analysis of the films will determine the size, colour-phase ratio, nest density, nonbreeding proportion and other data for each colony.

Blue and lesser snow geese that nest in the eastern Arctic are an increasingly important concern to waterfowl managers in Canada and the U.S.A. Factors responsible are (1) an increasing sporthunting kill in the north-central states and in the James Bay area, (2) the threat of adverse effects on migration staging areas by James Bay hydro-electric development, and (3) a suspected cooling of the climate on the nesting grounds, which would lower productivity.

Among the data most needed for management of these geese is an accurate count of their total numbers. Efforts at counting them by visual means with aerial surveys on both the wintering and nesting grounds have proven inadequate. Vertical photography has proven to be a reliable method of counting greater snow geese and, with modifications, it may be able to provide the first complete inventory of the eastern Arctic blue and lesser snow geese.

R.J. Kerbes

Arctic Environmental Studies

Work in 1970 and 1971. During the summer of 1970, the newly-formed Arctic Ecology Unit of the Eastern Region, CWS, carried out a preliminary reconnaissance of resource and other activities in Keewatin and eastern Mackenzie Districts, the Mackenzie lowlands, the High Arctic Islands, Somerset and North Baffin Islands. The purpose was to determine locations, types and levels of activity, effects on wildlife, on their food supply and on the environment on which they depend.

Activity sites are characterized by mile-long airstrips, drill rig pads, camps, mines, tailing and sludge beds. Engineering mistakes resulting in out-of-control wells, mudded-out multiple airstrips and overflowing sumps, greatly increase the total areas of surface damage. Cross-country vehicle travel, especially in summer, for geophysical prospecting or for transporting equipment, supplies and personnel, cause widespread terrain damage in the peat soils of the Mackenzie Peninsula and the fine silty, mud- [illegible] soils. Effects on arctic animals is difficult to assess, and little [illegible] evidence has yet been obtained.

The larger part of the Arctic Ecology Map series was published in 1970. (See review in Arctic Circular, Vol. XVI, No. 1, 60-62). It consisted of a compilation by a contract consultant of all readily available information on areas of Canada north of 60° which were known to be of special importance to wildlife. The maps are available to resource companies and others, to aid them in planning their activities so as to minimize damage to wildlife and the environment. The series was completed in a second instalment published early in 1972.

In 1971 field work was concentrated on the High Arctic Islands plus Somerset Island and northern Baffin Island. Oil activity was identified as the greatest present and foreseeable threat to northern wildlife here. Activity sites were photographed and logged. Gaps in the Arctic Ecology series of maps were completed by reconnaissance mapping and photography.

Plans for 1972. The 1972 field work will be divided between monitoring petroleum activity sites and acquiring additional ecological information for a revision of the Arctic Ecology Maps aimed at early 1973 release. The latter aspect will receive greater emphasis and will be aimed at developing an impact sensitivity forecast for the High Arctic Islands. Range for muskox and caribou will be mapped and referred to a "quality" or "value" scale being developed as a tool for assessing landscape for its importance to wildlife. Possible pipeline routes will be reconnoitred. Areas where resource companies expect to operate over the next couple of years will be examined as a result of requests by the operating companies for ecological information. Sites for inclusion in the IBP system of reserves will be identified and, if possible, check sheets will be completed for some of them. Problems relating to wildlife and its habitat will be identified for possible future research projects.

R.D. Muir

Studies of Waterfowl in Labrador-Ungava

Work in 1970 and 1971. The 1970 cooperative study of waterfowl populations in Labrador-Ungava by the Canadian Wildlife Service and the Newfoundland Wildlife Service (NWS) was continued in 1971. The goals in 1971 were much the same as those of 1970: to assess the effects on waterfowl habitat of the creation, by the Churchill Falls (Labrador) Corporation, of a man-made lake in western Labrador, one third the size of Lake Ontario, and to develop a better method of assessing waterfowl utilization in the more remote sections of Labrador-Ungava. The work has been undertaken by D.I. Gillespie in cooperation with Mr. S. Wetmore of the NWS.

Most of the 1970 findings were supported by those of 1971. The area supported a moderate but well-scattered population of breeding black ducks which were being directly affected by the flooding of potential nesting sites in the Churchill Falls area, and a high population of nonbreeding, moulting Canada geese.

There seems to be reasonably good evidence to support our hypothesis that the density and distribution of waterfowl are directly related to landform. The highest densities encountered in both years have been found on the Lake Plateau, an area covered by moderately deep glacial till. The presence on this area of a peculiar till formation, described as ripple till, appears to have provided optimum waterfowl habitat. The ripple till formulation produces a pothole effect over the area. The density gradients diminish as flight lines move from low rock plateau areas to high rock plateaus to rock massifs.

Plans for 1972. In 1972 CWS and NWS expect to explore further the waterfowl populations of Labrador-Ungava, while testing the density-landform relationship. This work will be carried out in Quebec-Ungava from north of Schefferville to Ungava Bay. As that area contains a diversity of landforms it will be possible to validate or refute our hypothesis.

It is also anticipated that movement of this study from a region generally described as taiga to one predominately forest-tundra will result in encountering different species of waterfowl. Canada geese should continue to be the dominant species but more oldsquaw and fewer black duck should be encountered.

D.I. Gillespie

A SUMMARY OF OIL AND GAS ACTIVITIES NORTH OF 60°

1. Oil industry activities in northern Canada, which increased substantially in 1968 as a result of the impetus provided by the discoveries at Prudhoe Bay, Alaska, continued to increase through 1971.

2. Oil industry expenditures, which had averaged less than $25 million yearly to 1967, increased to $56 million in 1968, $75 million in 1969, $126 million in 1970 and $167 million in 1971.

3. Similarly, acreage under oil and gas permit increased from 190 million at the end of 1967 to 320 million at the end of 1968, and 464 million at the end of 1971.

4. Of the 76 wells drilled in northern Canada in 1971, three were successful in finding substantial quantities of hydrocarbons.

   On the Arctic Islands (Sverdrup Basin), Panarctic brought in its third important natural gas discovery - Panarctic et al, Kristoffer Bay G-06 - located on the southwest side of Ellef Ringes Island. This follows the 1969 discovery at Drake Point on Melville Island, and the 1970 discovery on King Christian Island.

   On the Mackenzie Delta frontier on the Arctic Coast, Imperial brought in an oil and a gas discovery at its Mayogiak J-17 and Taglu C-53 wells respectively. Preliminary results at the two finds in 1971 and the previous Imperial Atkinson H-25 oil discovery indicate a major oil and gas reserve potential in the Mackenzie Delta.

5. In view of the drilling programs, notably in the Arctic Islands, announced by several companies, it is expected that at least 85 wells will be drilled in 1972 and total exploration expenditures will rise substantially above the 1971 level.

Land Activity

The continuing drilling successes on the Arctic Islands by Panarctic Oils Ltd., and in the Mackenzie Delta by Imperial Oil Ltd., have served to maintain the high level of industry interest in oil and gas land in northern Canada (Figs. 1 & 2). New filings since 1969 were concentrated in marine areas, specifically the Sverdrup Basin in the Arctic Islands, and the Davis Strait-Baffin Bay areas. Filing on the mainland and land areas of the southern Arctic Islands was limited by a scarcity of open land. No sales of Crown Reserve land have been held in the past two years and none will be held pending promulgation of the new Canada Oil and Gas Land Regulations. Permits and lease holdings as of December 31, 1971 are summarized in Table 1 and the range of these holdings is shown on Map No. 2.

Table 1

Number of Permits and Leases and Relevant Acreage

31 December, 1971

Permits

Area	No. of Permits	Acreage
N.W.T. Mainland	1886	99,320,100
Y.T. Mainland	591	29,736,657
Arctic Islands *	5392	267,728,745
Arctic Coast Marine **	1513	72,745,539
Total	9382	464,531,041

Leases

Area	No. of Leases	Acreage
N.W.T. Mainland	719	4,436,793
Y.T. Mainland	63	252,222
Arctic Islands *	--	--
Arctic Coast Marine **	--	--
Total	782	4,689,015
Grand Total (permits and leases)	10,164	469,220,056

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* All areas North of 70°, onshore and offshore

** All areas South of 70°, covered by seacoast waters

Exploration Activities - 1971

Oil and gas expenditures exceeded $167 million in 1971, an increase of about $41 million over 1970. Figure 7 illustrates total and final expenditures to 1969 and incomplete and estimated expenditures to 1971, as recorded by the oil and gas industry north of 60°. Most of the exploration was concentrated in three separate areas of the territories, the southern territories, the Mackenzie Delta area and the Arctic Islands, specifically the Sverdrup Basin Islands.

Surface geological and photogeological surveys by the oil industry (measured in geological crew months) was sustained at slightly below the 1970 level (Fig. 2). Most of the surveys can be attributed to the continuing participation programs maintained by V. Zay Smith Associates and Geopluto Services Ltd., on the mainland of the Yukon and Northwest Territories; by J.C. Sproule & Associates, and by Pallister and Associates in carrying out their "Polarquest" program, in the Arctic Archipelago.

Seismic activity in 1971 was also slightly below the previous year, with a total of 235 seismic crew months being recorded, including marine seismic programs in the Mackenzie Delta and Beaufort Sea and Baffin Bay areas. Operations "Polarquest" and "Baffinquest", managed by Pallister and Associates carried out seismic reflection surveys over 350,000 square miles surrounding the Arctic Islands. Over 65 companies subscribed to 20 programs representing expenditures of about $7.6 million for the second year of a four year program. The 1971 programs included 12,315 statute miles of marine seismic reflection profiles. The magnitude of activities in seismic operations indicates a high level of drilling in the future since it takes one to two seasons of seismic exploration to locate suitable drilling sites.

Drilling activity increased substantially in 1971 with 76 wells totalling 469 thousand feet drilled, as opposed to 73 wells totalling 364 thousand feet in 1970. 1971 drilling activity was concentrated on the Arctic Islands, the Mackenzie Delta frontier, and the central territories. Drilling has increased in these areas over the past few years due to the successes of Panarctic Oils Ltd. on the Arctic Islands, and Imperial Oil Ltd. in the Mackenzie Delta.

Panarctic Oils Ltd. drilled one successful gas well on Ellef Ringes Island - Panarctic et al Kristoffer Bay G-06. This brings to three the number of gas discoveries on the Arctic Islands by Panarctic to the end of 1971. To the end of April, 1972, Panarctic has also recovered gas and oil at both its Romulus C-42 well on Ellesmere Island and its Thor P-38 well on Thor Island.

On the Mackenzie Delta in 1971, Imperial Oil Limited brought in gas and crude oil at its Taglu G-33 and Mayogiak J-17 wildcats respectively. In 1972, to the end of April, Imperial has also successfully completed its Taglu West P-03 extension test as a gas well, and discovered gas at its Mallik L-38 wildcat. Gulf Oil Canada Limited discovered gas at the Gulf Mobil Parsons K-09 well located on Parsons Lake 40 miles SE of the Imperial Taglu G-33 well. Preliminary results at the Delta discovery wells indicate a potential for the Mackenzie Delta for major oil and gas reserves.

In 1972 "Wells Drilled" and "Seismic Crew Months" will increase again over the 1971 level. With the discovery of crude oil and continuing gas discoveries in the Arctic Islands, and with continuing gas discoveries in the Mackenzie Delta, substantial drilling programs are expected in 1972 to further evaluate present discoveries and test new prospects. The proposed participation drilling program in the Arctic by Horn River Resources will increase the number of wells drilled to at least 85 in 1972. The continuing "Polarquest" and "Baffinquest" participation programs will continue to contribute substantially to the amount of seismic and geological exploration carried out on the Arctic Islands, and participation programs conducted by V.Zay Smith Associates, and Sigma Geophysical ltd., will continue to maintain a high level of activity on the mainland areas. Drilling activities and seismic programs will increase substantially in all frontier areas and total expenditures may exceed $185 million in 1972.

The tables and diagrams on the following pages give a graphic picture of oil and gas activities north of 60^{o}.

Fig. 1

ACREAGE HELD UNDER OIL & GAS PERMIT

YUKON TERRITORY AND NORTHWEST TERRITORIES

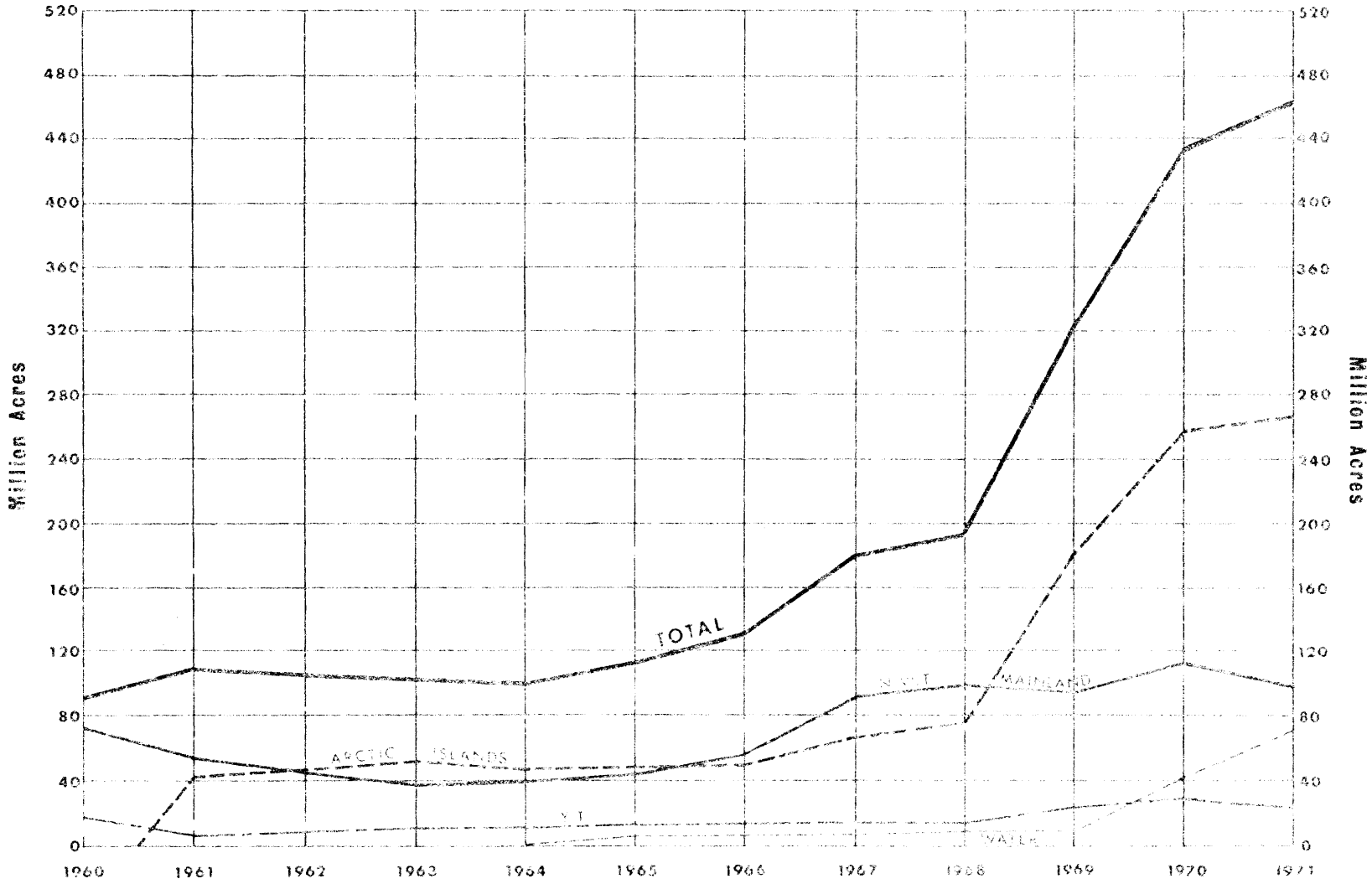
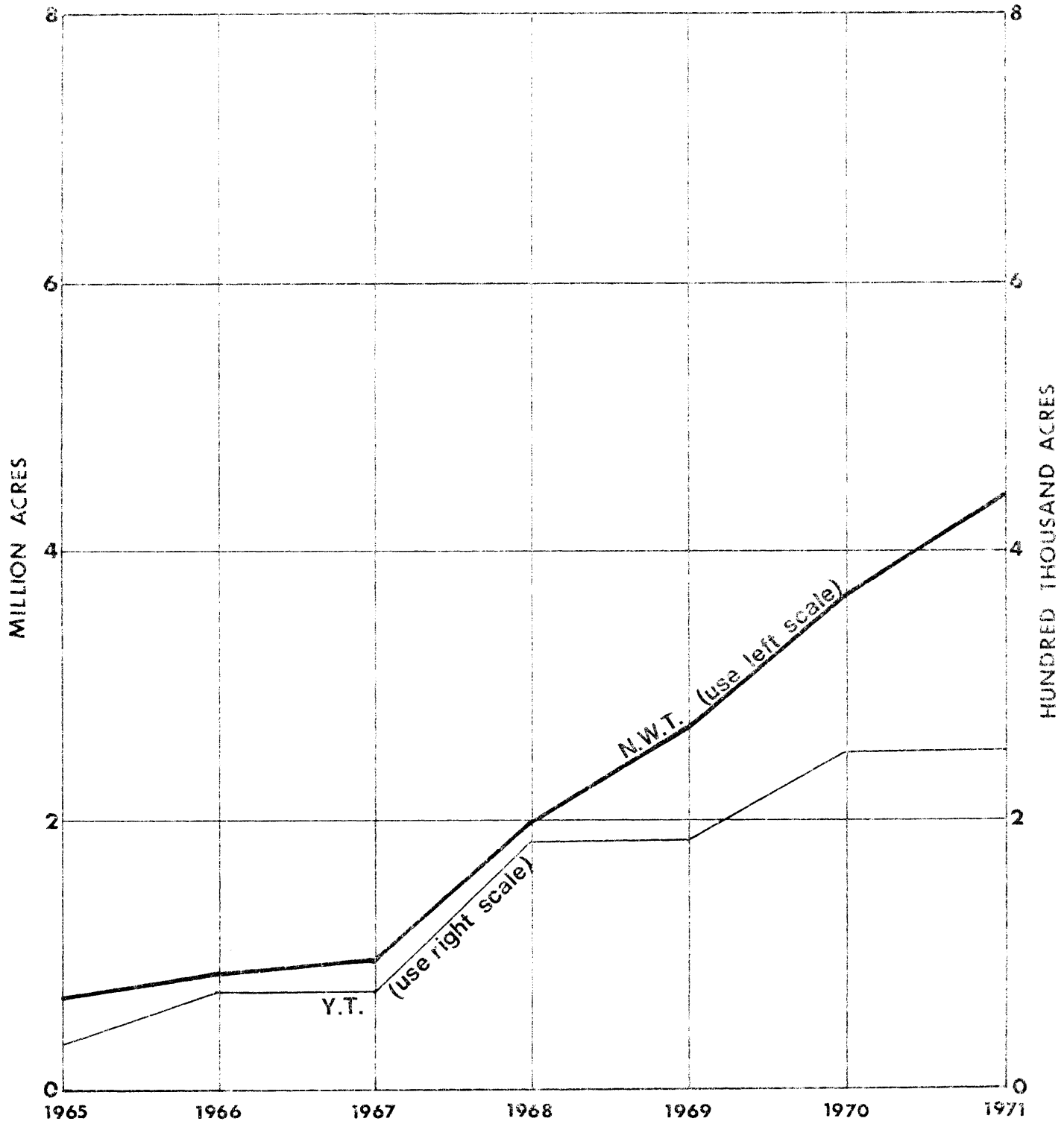


Fig. 2

YUKON TERRITORY – NORTHWEST TERRITORIES

ACREAGE UNDER LEASE

BY YEAR



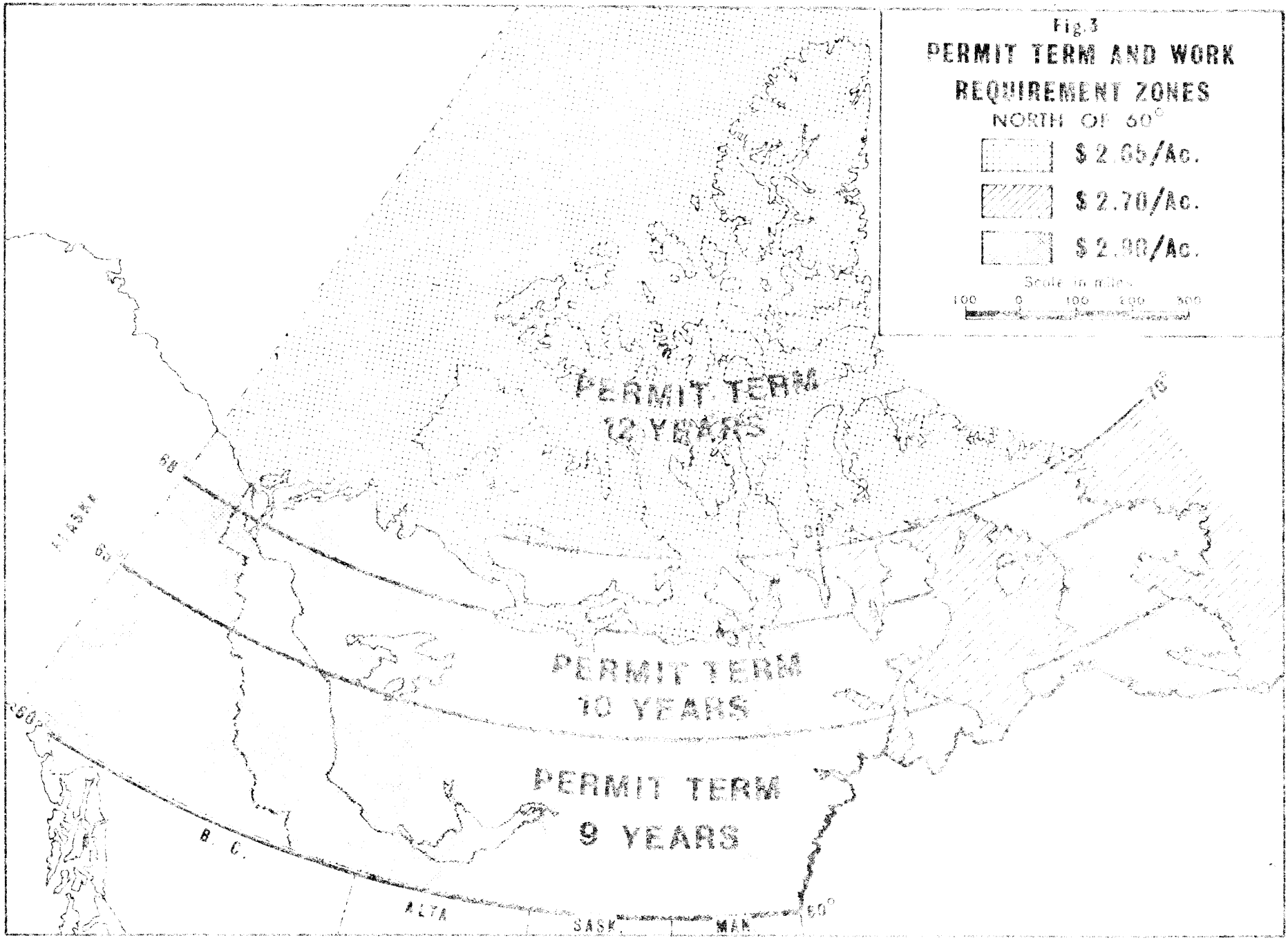
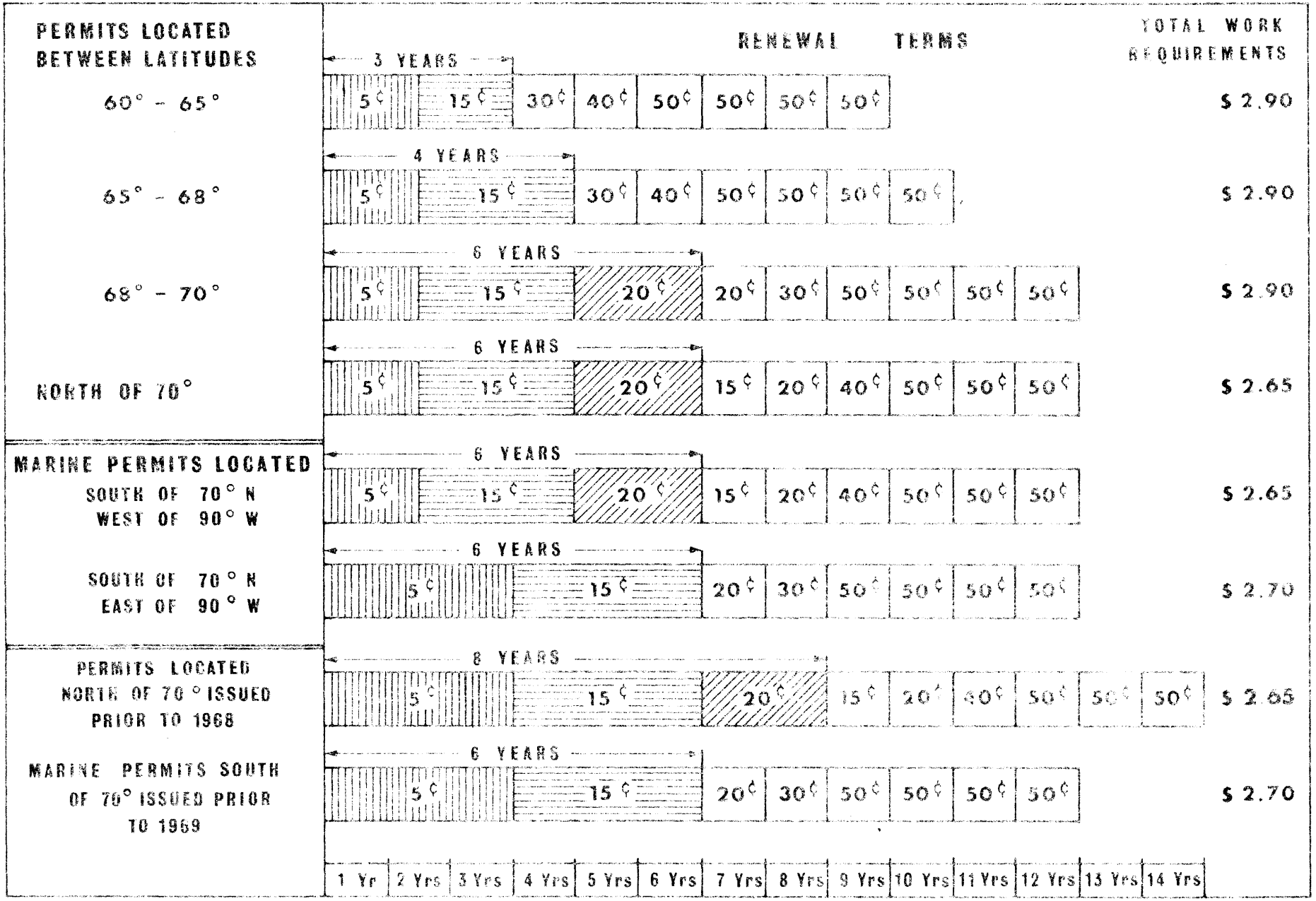


Fig.3
PERMIT TERM AND WORK
REQUIREMENT ZONES
NORTH OF 60°
$ 2.65/Ac.
$ 2.70/Ac.
$ 2.98/Ac.
Scale in miles
100 0 100 200 300
PERMIT TERM
12 YEARS
PERMIT TERM
10 YEARS
PERMIT TERM
9 YEARS
ALASKA
B. C.
ALTA
SASK.
MAN.
60°
60
70

Fig. 4

YUKON TERRITORY – NORTHWEST TERRITORIES

PERMIT TERMS AND DEPOSIT REQUIREMENTS — PER ACRE



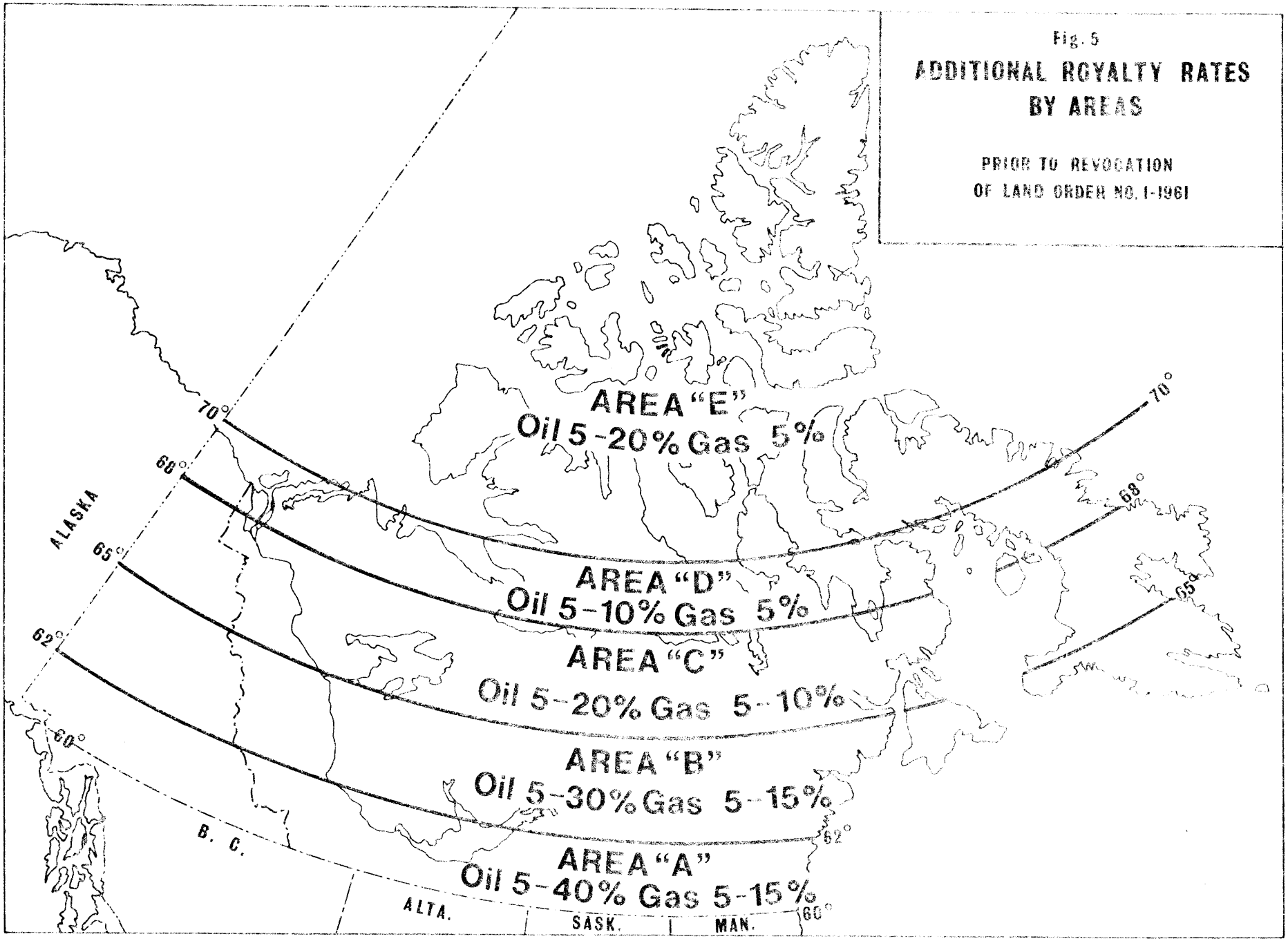


Fig. 5
ADDITIONAL ROYALTY RATES
BY AREAS
PRIOR TO REVOCATION
OF LAND ORDER NO. 1-1961
AREA "E"
Oil 5-20% Gas 5%
AREA "D"
Oil 5-10% Gas 5%
AREA "C"
Oil 5-20% Gas 5-10%
AREA "B"
Oil 5-30% Gas 5-15%
AREA "A"
Oil 5-40% Gas 5-15%
ALASKA
B. C.
ALTA.
SASK.
MAN.
70°
68°
65°
62°
60°

Fig. 6

FLOW DIAGRAM OF DISPOSAL OF OIL AND GAS RIGHTS

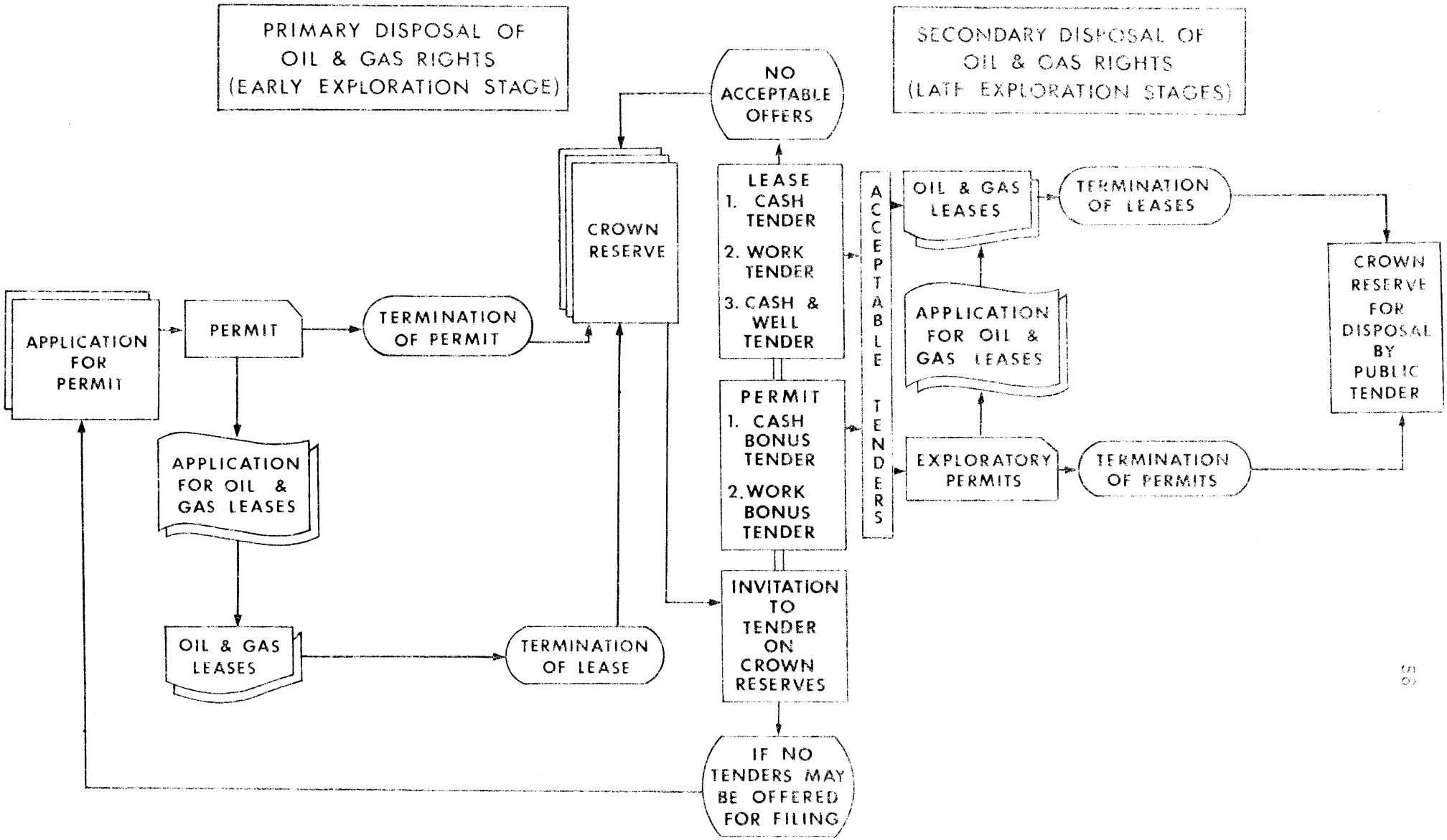


Fig. 7

OIL & GAS EXPLORATION EXPENDITURES

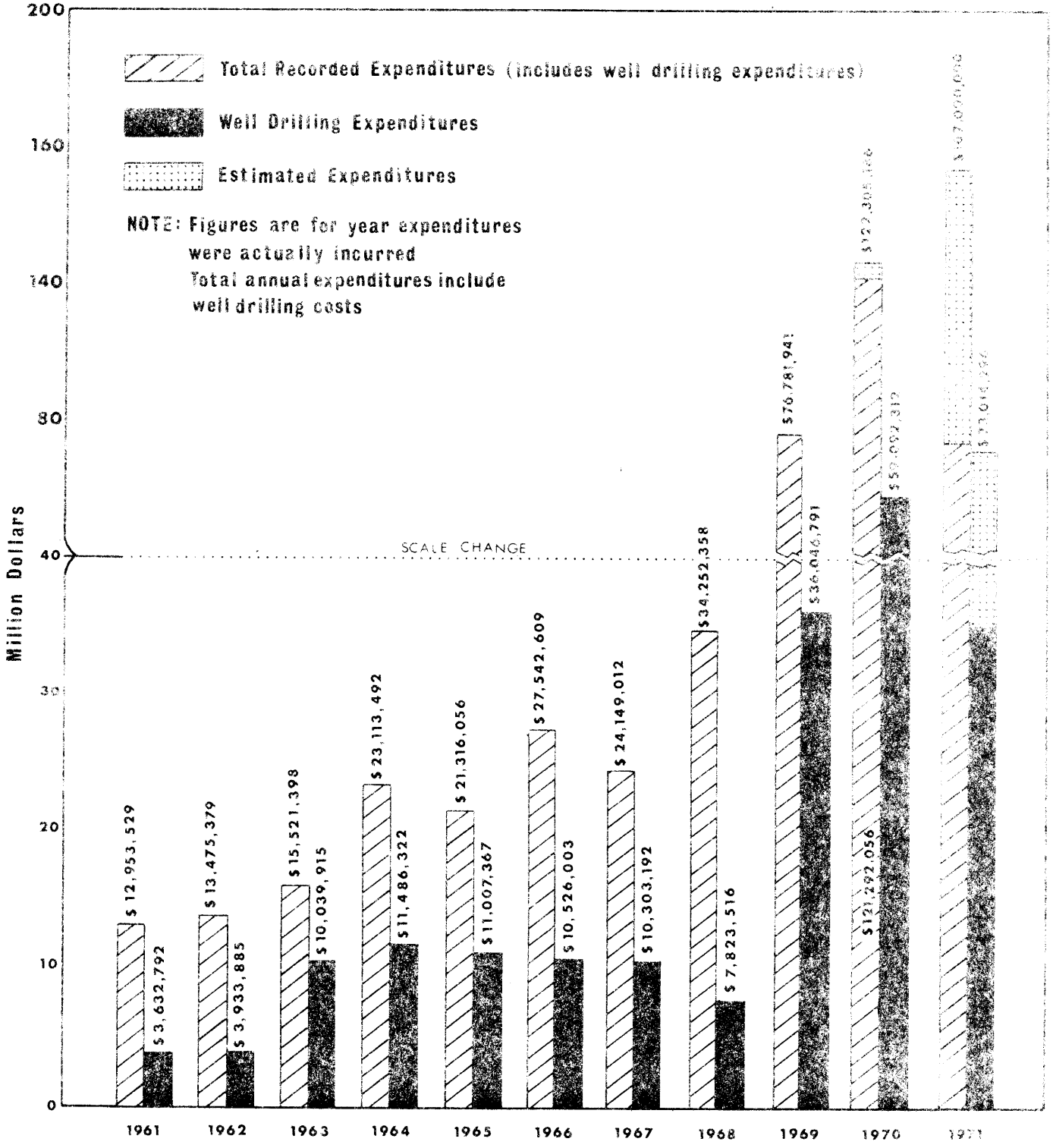
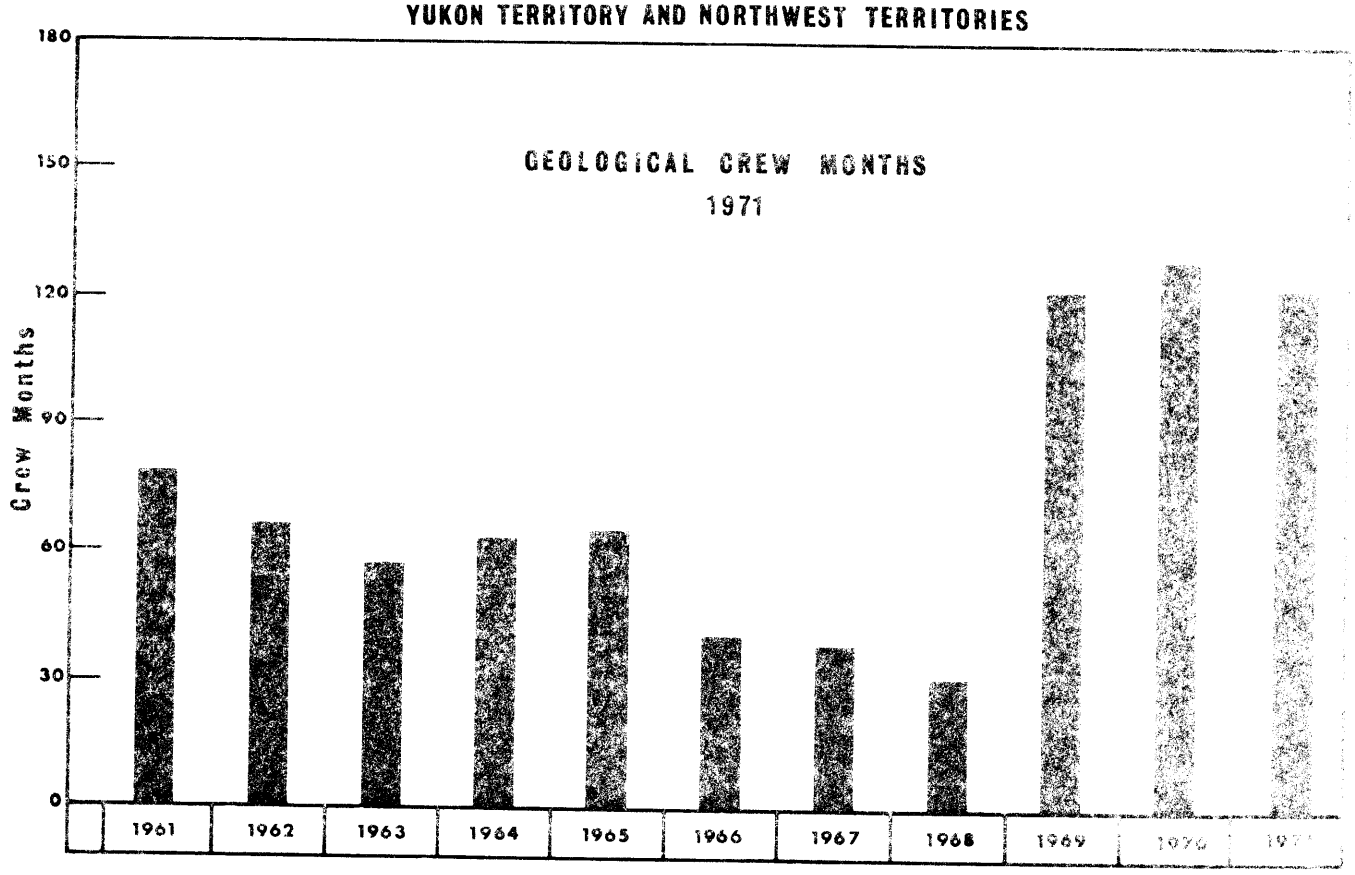


Fig. 8

EXPLORATION ACTIVITY

YUKON TERRITORY AND NORTHWEST TERRITORIES



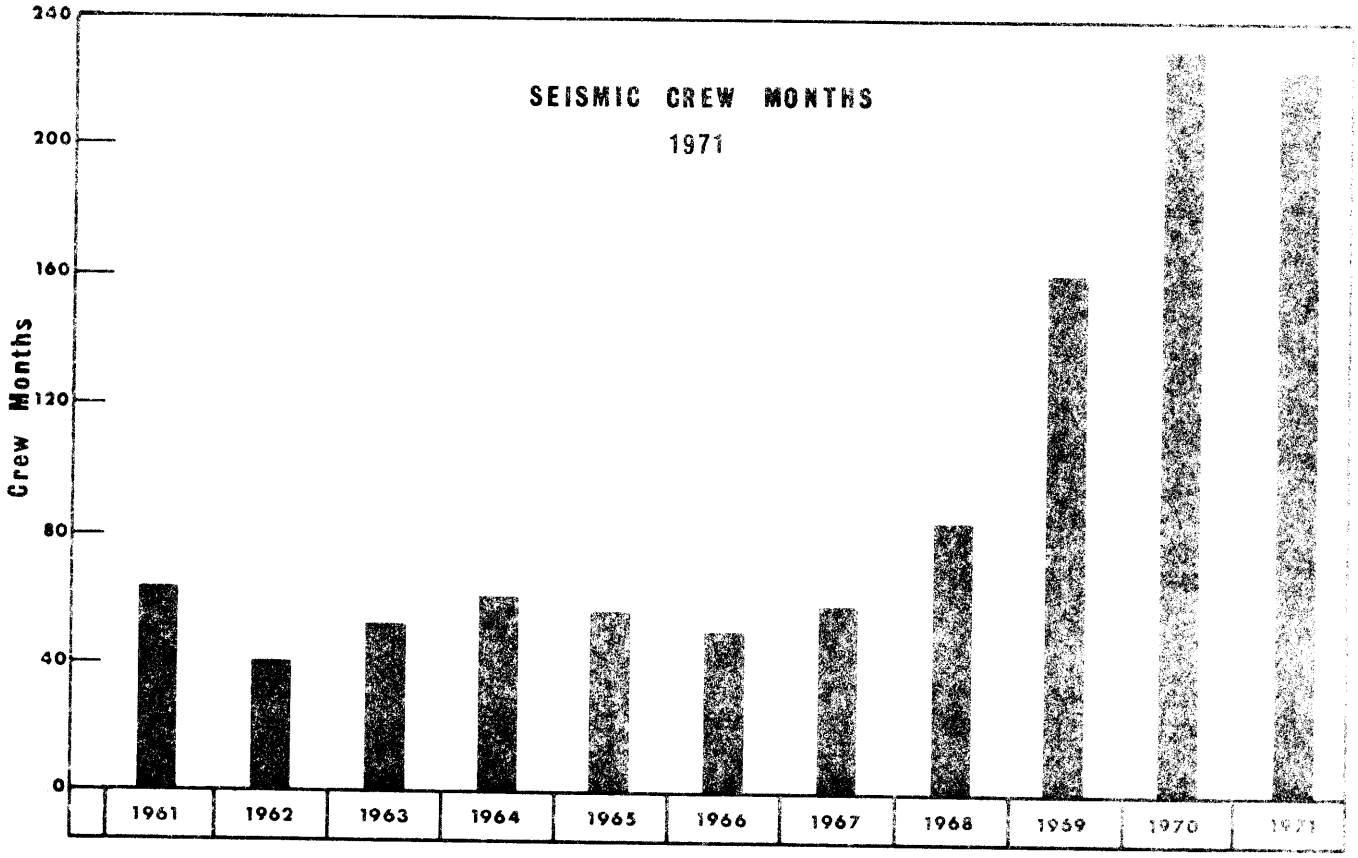


Fig. 9

WELLS DRILLED

YUKON TERRITORY - NORTHWEST TERRITORIES

Number of Wells Drilled to end 1971 ,580

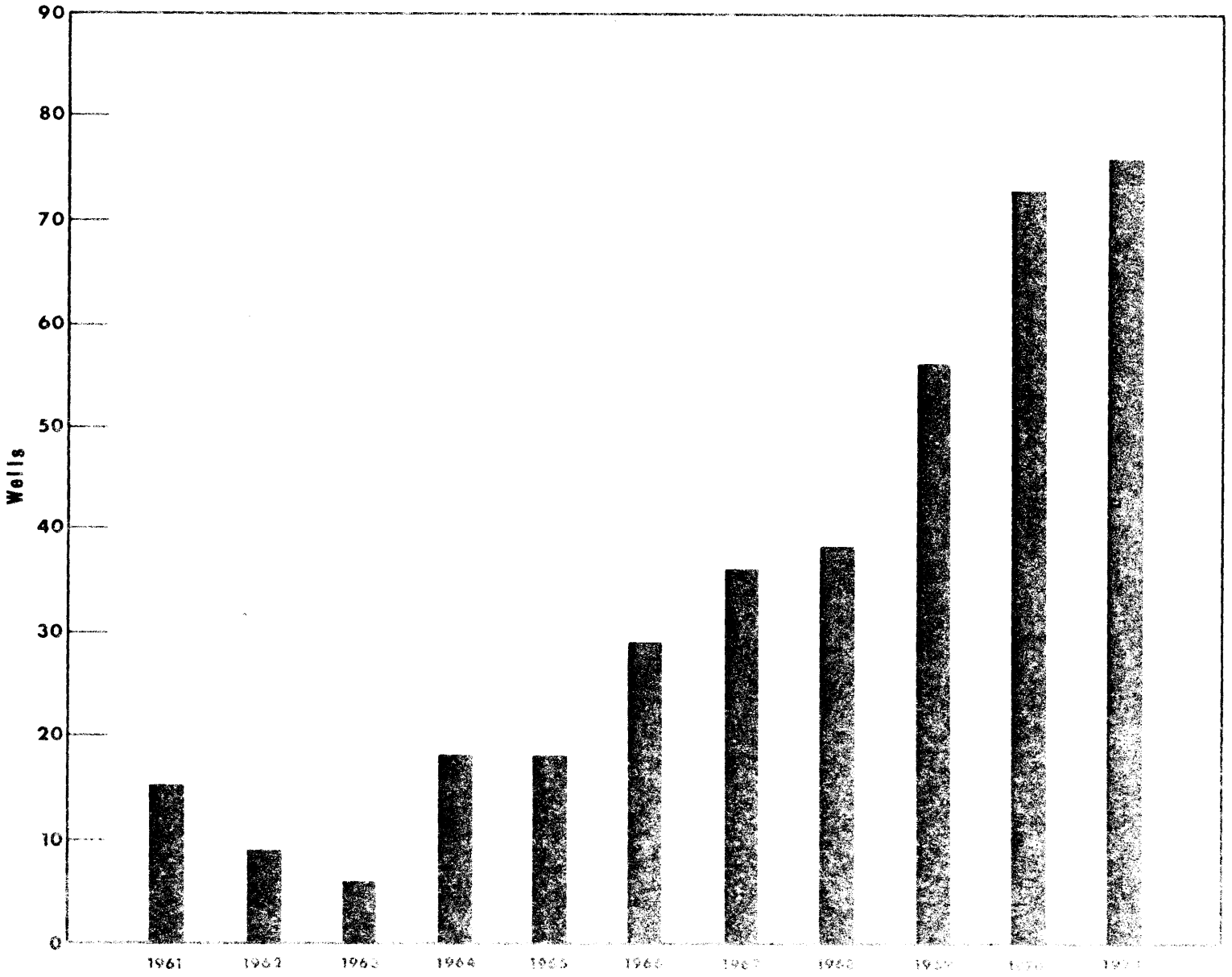


Fig. 10

FOOTAGE DRILLED

YUKON TERRITORY AND NORTHWEST TERRITORIES

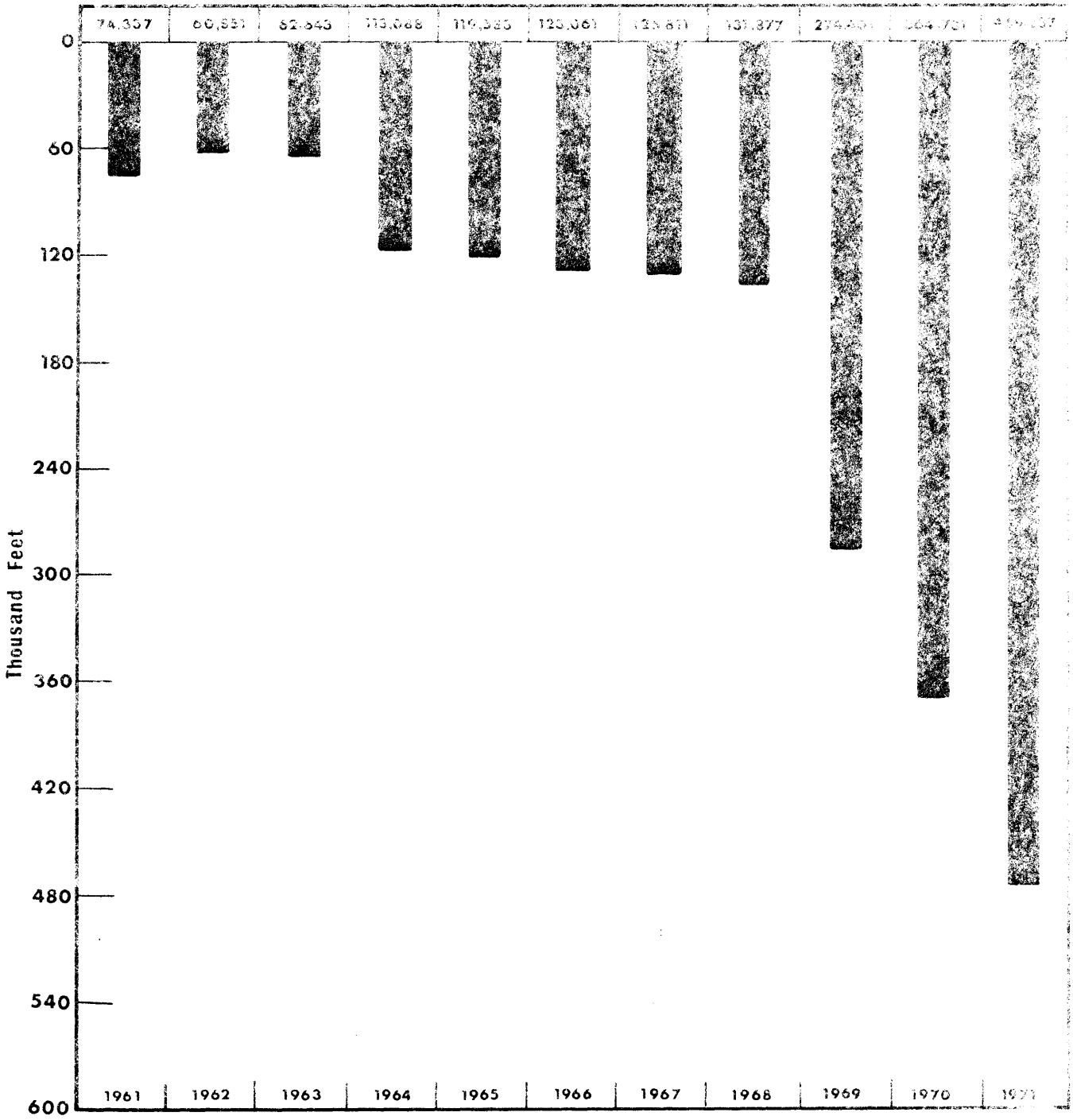


FIG. VI

YUKON TERRITORY–NORTHWEST TERRITORIES

GROSS REVENUE–OIL & GAS FROM CASH BONUS BIDS, FEES, FORFEITURES ROYALTIES, RENTALS & SALE OF MAPS

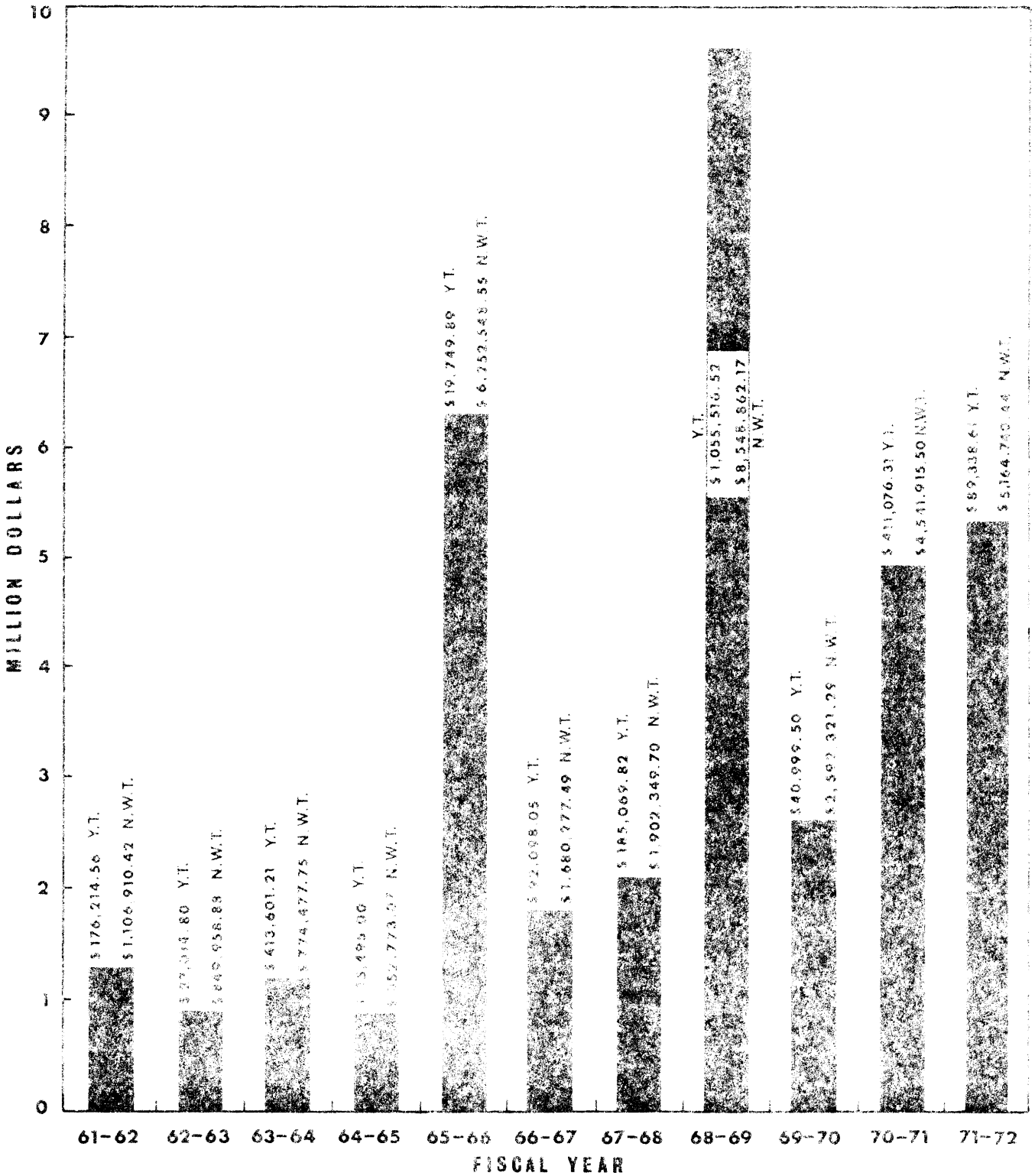
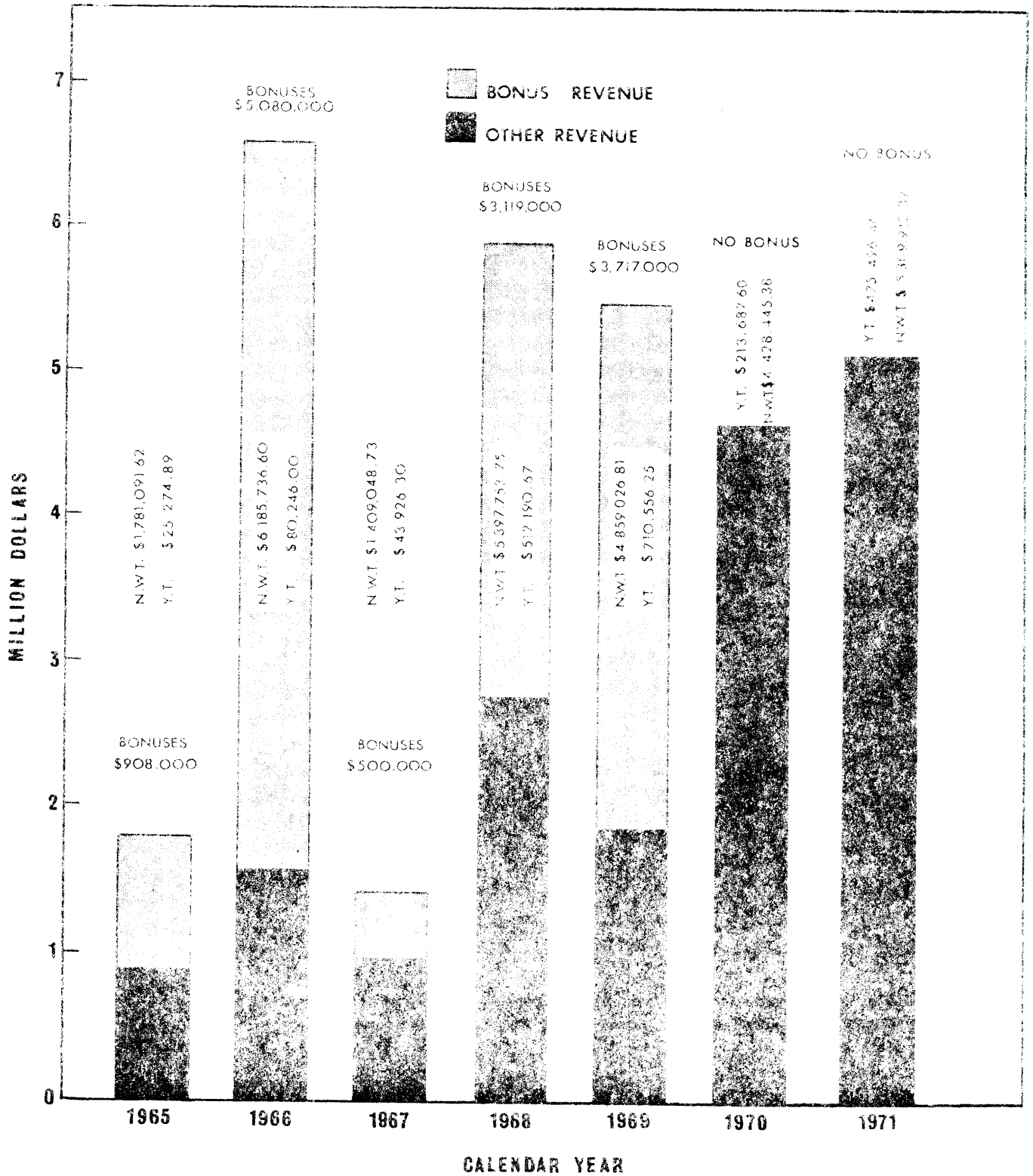


Fig. 12

YUKON TERRITORY - NORTHWEST TERRITORIES

GROSS REVENUE - OIL & GAS FROM CASH BONUS BIDS, FEES, FORFEITURES ROYALTIES, RENTALS & SALE OF MAPS

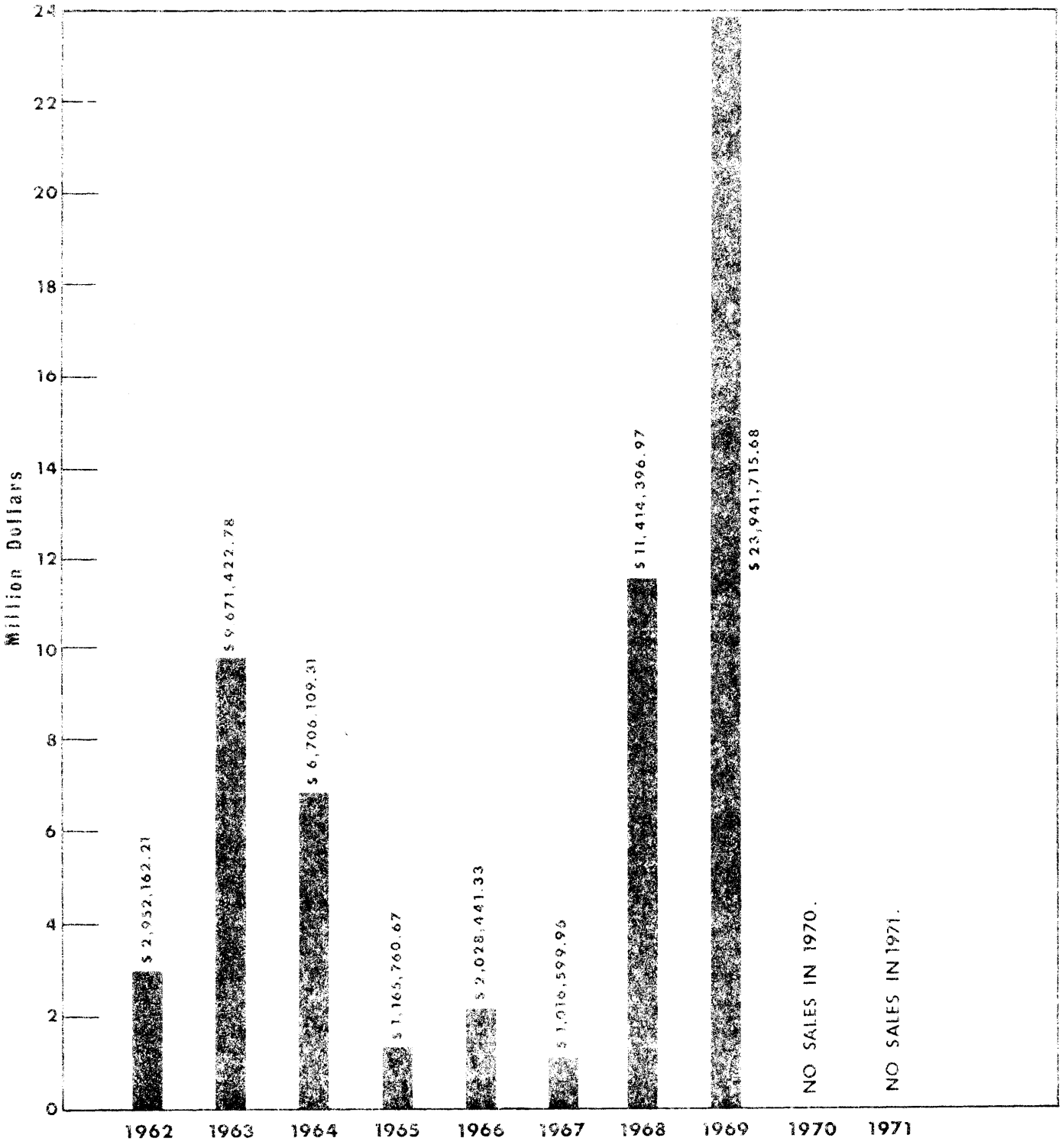


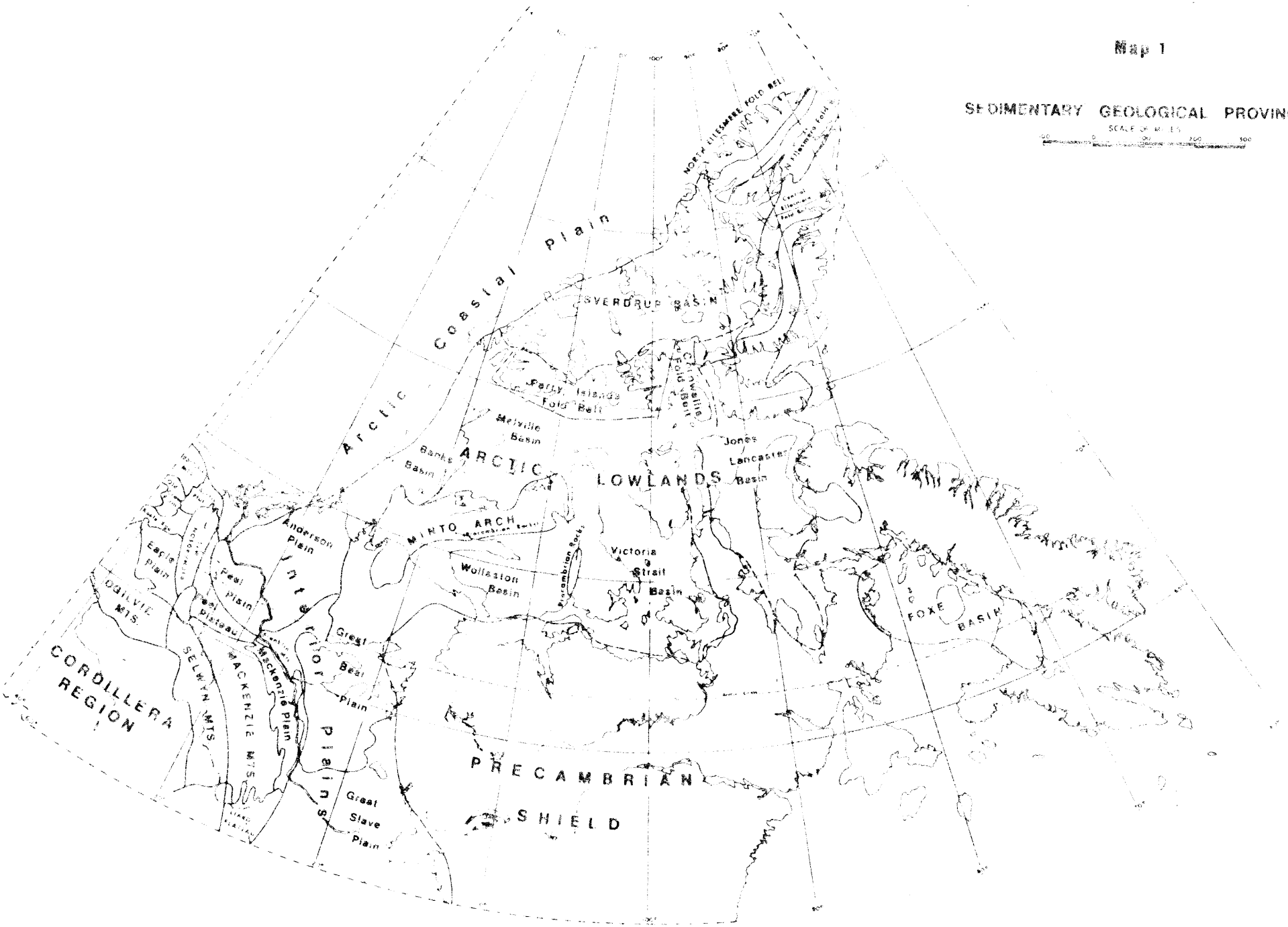
VALUE OF WORK BONUS TENDERS – OIL & GAS

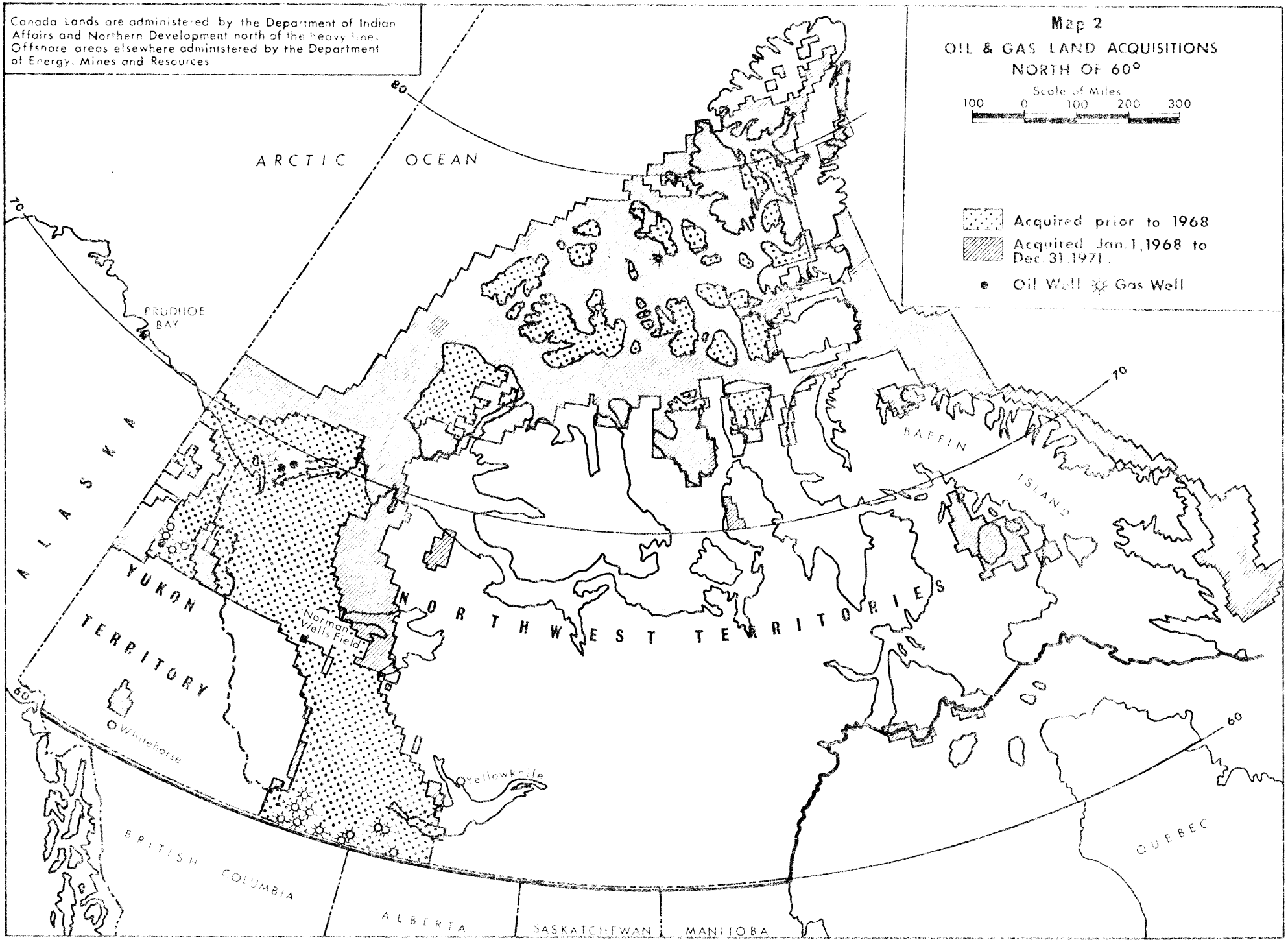
YUKON TERRITORY AND NORTHWEST TERRITORIES

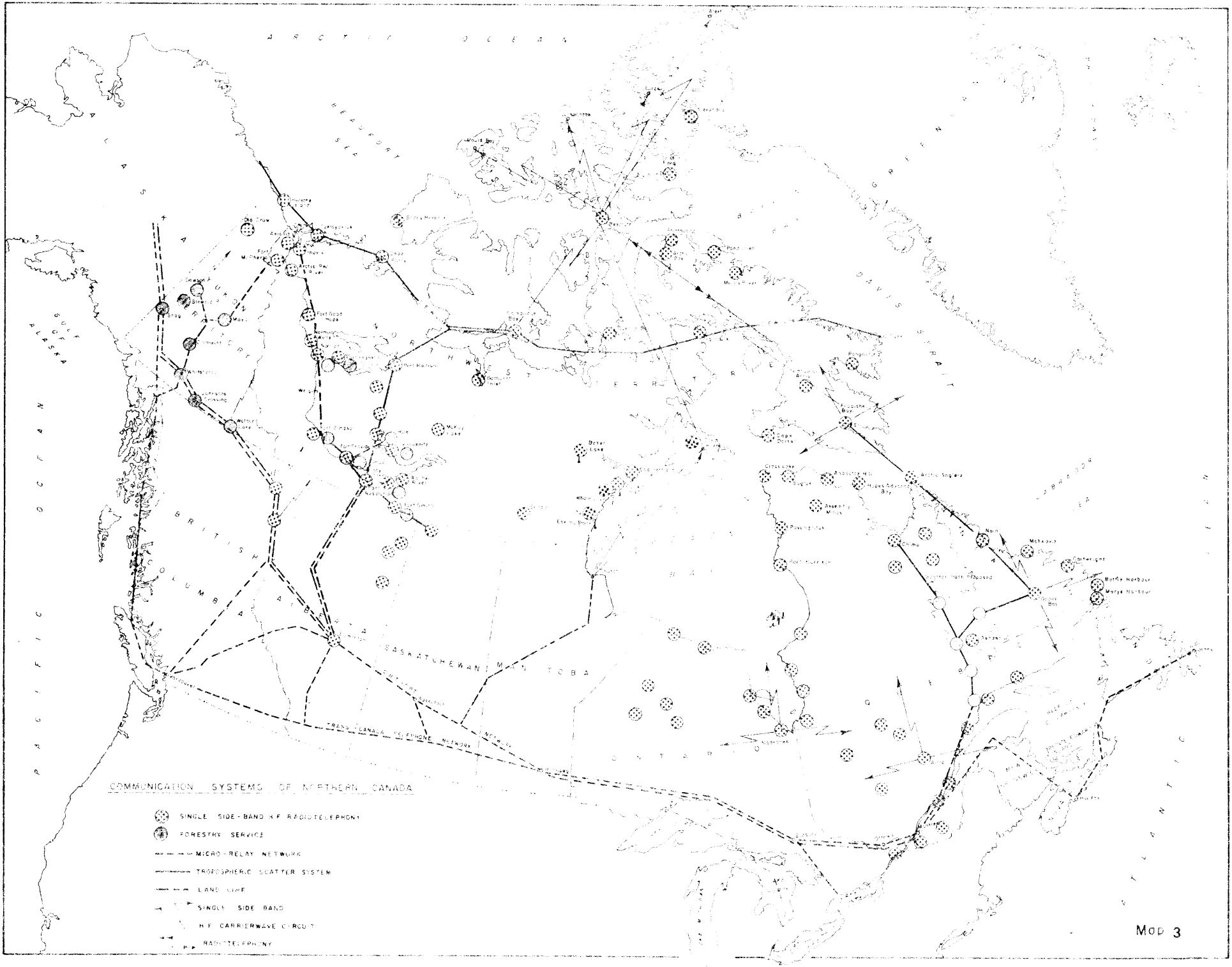
NOTE : Cumulative Value End of Dec.1969

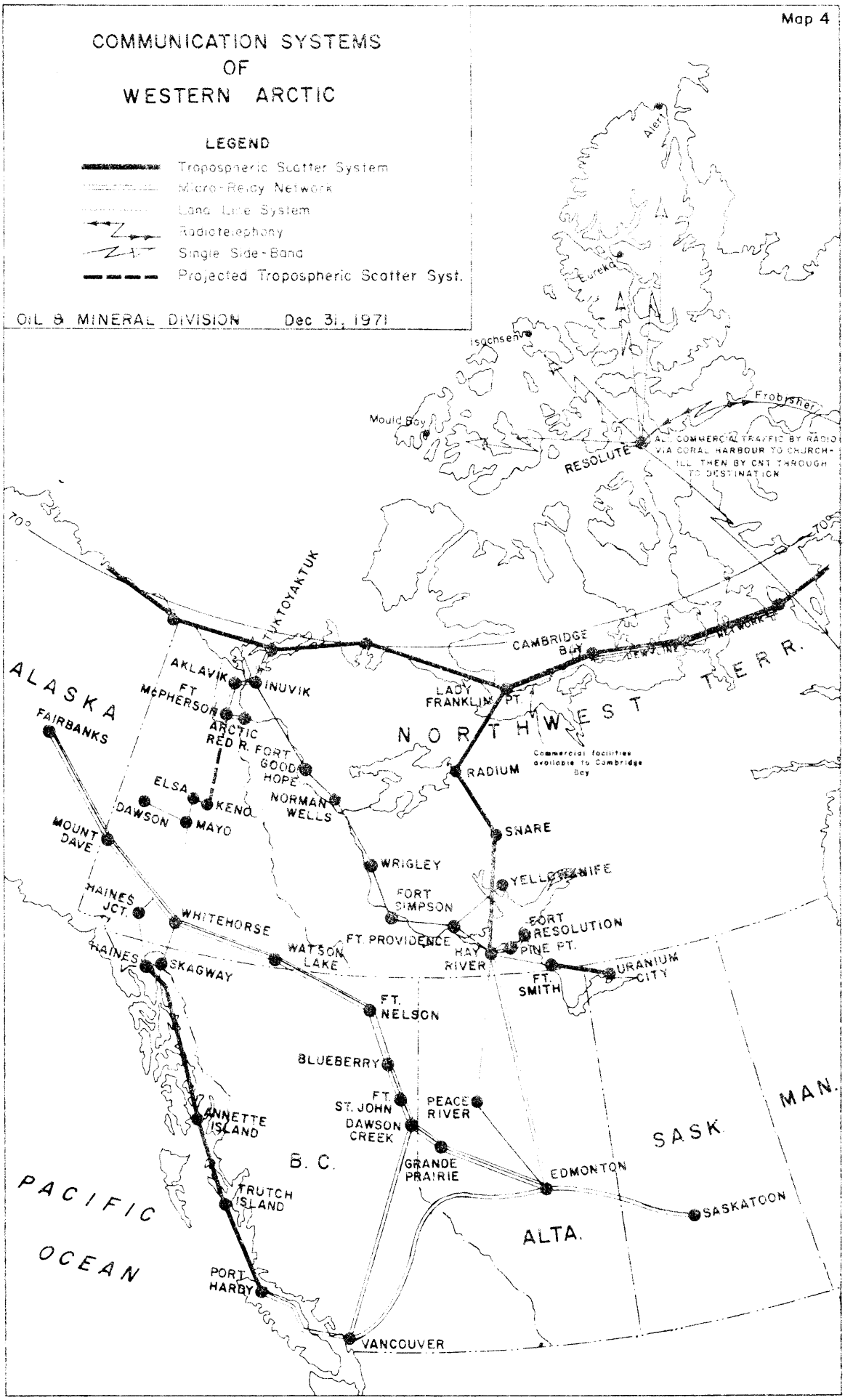
$58,896,608.91

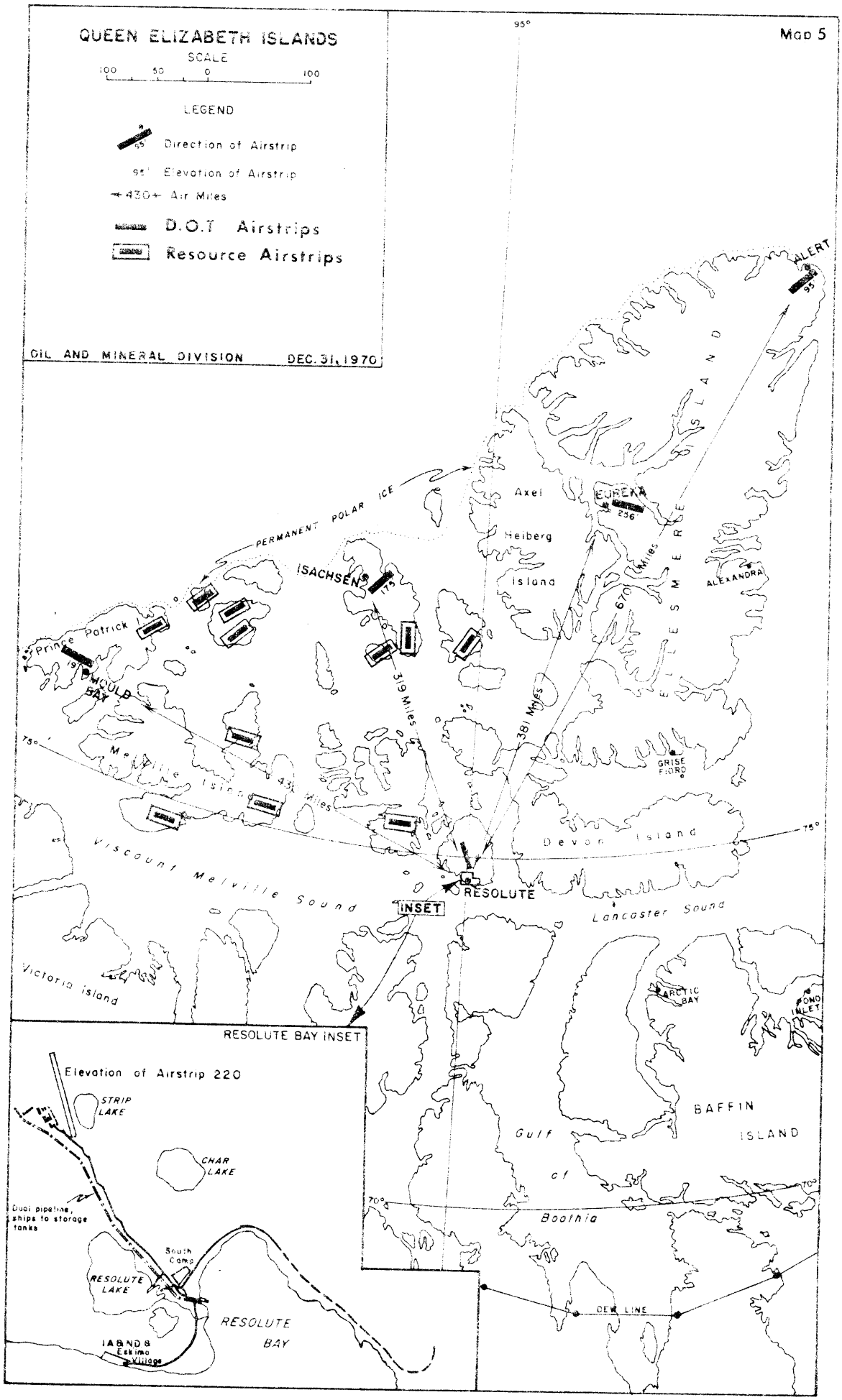



Map 1
SEDIMENTARY GEOLOGICAL PROVINCES
SCALE OF MILES
0 100 200 300
Arctic Coastal Plain
SVERDRUP BASIN
Parry Islands Fold Belt
Melville Basin
Banks Basin
ARCTIC LOWLANDS
Jones Lancaster Basin
MINTO ARCH
Anderson Plain
Eagle plain
Peel Plain
Peel plateau
Wollaston Basin
Victoria Strait Basin
FOXE BASIN
OGILVIE MTS.
CORDILLERA REGION
SELWYN MTS.
MACKENZIE MTS.
Great Bear Plain
Mackenzie Plain
Interior Plains
Great Slave Plain
PRECAMBRIAN SHIELD


Canada Lands are administered by the Department of Indian Affairs and Northern Development north of the heavy line. Offshore areas elsewhere administered by the Department of Energy, Mines and Resources
Map 2
OIL & GAS LAND ACQUISITIONS
NORTH OF 60°
Scale of Miles
100 0 100 200 300
Acquired prior to 1968
Acquired Jan. 1, 1968 to Dec 31 1971
Oil Well
Gas Well
ARCTIC OCEAN
80
70
60
PRUDHOE BAY
ALASKA
YUKON TERRITORY
Whitehorse
Norman Wells Field
NORTHWEST TERRITORIES
Yellowknife
BAFFIN ISLAND
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
QUEBEC


COMMUNICATION SYSTEMS OF NORTHERN CANADA
SINGLE SIDE-BAND H.F. RADIOTELEPHONY
FORESTRY SERVICE
MICRO-RELAY NETWORK
TROPOSPHERIC SCATTER SYSTEM
LAND LINE
SINGLE SIDE BAND
H.F. CARRIERWAVE CIRCUIT
RADIOTELEPHONY
TRANS-CANADA TELEPHONE NETWORK
ARCTIC OCEAN
BEAUFORT SEA
DAVIS STRAIT
PACIFIC OCEAN
GULF OF ALASKA
BRITISH COLUMBIA
SASKATCHEWAN
MANITOBA
ONTARIO
NORTHWEST TERRITORIES
Mod 3


Map 4
COMMUNICATION SYSTEMS
OF
WESTERN ARCTIC
LEGEND
Tropospheric Scatter System
Micro-Relay Network
Land Line System
Radiotelephony
Single Side-Band
Projected Tropospheric Scatter Syst.
OIL & MINERAL DIVISION Dec 31, 1971
Alert
Eureka
Isachsen
Mould Bay
Frobisher
RESOLUTE
ALL COMMERCIAL TRAFFIC BY RADIO VIA CORAL HARBOUR TO CHURCHILL THEN BY CNT THROUGH TO DESTINATION
70°
TUKTOYAKTUK
CAMBRIDGE BAY
YELLOWKNIFE
ALASKA
AKLAVIK
INUVIK
FT. McPHERSON
ARCTIC RED R.
FORT GOOD HOPE
LADY FRANKLIN PT.
NORTHWEST TERR.
FAIRBANKS
RADIUM
Commercial facilities available to Cambridge Bay
ELSA
KENO
NORMAN WELLS
DAWSON
MAYO
SNARE
MOUNT DAVE
WRIGLEY
HAINES JCT.
WHITEHORSE
FORT SIMPSON
FORT RESOLUTION
FT. PROVIDENCE
HAY RIVER
PINE PT.
HAINES
SKAGWAY
WATSON LAKE
FT. SMITH
URANIUM CITY
FT. NELSON
BLUEBERRY
FT. ST. JOHN
PEACE RIVER
ANNETTE ISLAND
DAWSON CREEK
SASK
MAN.
B. C.
GRANDE PRAIRIE
EDMONTON
TRUTCH ISLAND
PACIFIC OCEAN
SASKATOON
ALTA.
PORT HARDY
VANCOUVER


QUEEN ELIZABETH ISLANDS
SCALE
100 50 0 100
LEGEND
Direction of Airstrip
Elevation of Airstrip
430+ Air Miles
D.O.T Airstrips
Resource Airstrips
OIL AND MINERAL DIVISION DEC. 31, 1970
MAP 5
95°
ALERT
95
ELLESMERE ISLAND
PERMANENT POLAR ICE
Axel
Heiberg
Island
EUREKA
236
ISACHSEN
175
670 Miles
ALEXANDRA
Prince Patrick
Island
MOULD BAY
319 Miles
381 Miles
75°
Melville Island
430 Miles
GRISE FIORD
Devon Island
Viscount Melville Sound
RESOLUTE
INSET
Lancaster Sound
Victoria Island
ARCTIC BAY
POND INLET
BAFFIN ISLAND
Gulf of Boothia
70°
DEW LINE
RESOLUTE BAY INSET
Elevation of Airstrip 220
STRIP LAKE
CHAR LAKE
Dual pipeline, ships to storage tanks
South Camp
RESOLUTE LAKE
RESOLUTE BAY
IABND & Eskimo Village

NEWS ITEM

POLAR RESEARCH IN GERMANY

In Germany there has been significant interest in the polar regions over a long period. The names of Boas and Hantszch are particularly well-known in Canada for their work in Baffin Island.

In the nineteen-thirties, several friends of Dr. Wegener, who died on the Greenland ice-cap, established a collection of polar material in his memory and in this way formed "The German Archives of Polar Research" (Deutsches Archives fur Polarforschung). The collection was housed at Kiel under the auspices of the German Society of Polar Research, which also began to publish Polarforschung, a journal of polar research.

About eight years ago, at the instigation of Professor Brockamp, who had worked with Paul-Emile Victor in Greenland, the archives were bought by the University of Münster and moved there from Kiel. The collection was reconstituted as a sub-department of the Department of Geophysics. While remaining a single library it will probably be housed in two places, the natural sciences - much of which is geophysical in view of the nature of Dr. Wegener's work - remaining with the Department of Geophysics, and the human sciences in the Department of Geography. All German scientists active in the polar regions are currently forming a Commission for Polar Research, which will be centred at Münster. It is expected also that other departments of the university will form sub-departments with special polar interests. One of these will certainly be the Department of Geography. Dr. Treude is a member of this department and has recently taken over the editorship of Polarforschung. He says there has been a remarkable revival of interest in polar research not only in Germany but also in Austria and Switzerland, and it is hoped that Münster will form a focus for this interest, something after the pattern that Cambridge has established through the Scott Polar Research Institute. Following this pattern, it will not be the only German university working on polar problems. The University of Würzburg, for instance, has a very active group in geomorphology in Svalbord, and Tübingen is interested in Eskimo archaeology.

Dr. Treude visited Canada late in the summer of 1971 as a member of a German scientific fact-finding delegation, having interrupted his field work in human geography at Gjoa Haven to join the group. After being

Arctic Circle correspondence - Correspondence should be addressed to the officer concerned,

c/o The Arctic Circle,
Box 2068, Postal Station D,
Ottawa, Ontario
K1P 5W3

Arctic Circle Meetings

The regular meetings of the Arctic Circle are held on the second Tuesday of every month at 8.30 p.m. at the University Club of Ottawa, 150 Cooper Street. The bar opens at 8 p.m., giving members half an hour for social and business discussions before the meeting begins and the guest speaker gives his address.

Out-of-town members who wish to receive notices of these meetings and, thereby, be informed in advance regarding the guest speakers and the topics to be discussed, should address their requests to the Secretary, Mr. Keith C. Arnold.

The Arctic Circular

The Arctic Circular is published three times a year - oftener if the amount of material received permits. Correspondence, papers and reports are welcomed from all members, from persons living in the North, or from anyone having information on general northern activities, research or travel, or on technological, industrial or social developments. Contributions and correspondence should be addressed to the Editor, Mrs. Margaret Montgomery Larnder at the Arctic Circle address.

Back issues of the Arctic Circular are available, single copies at $0.50 and complete sets (Volumes I to XX) $100.00. Requests should be addressed to Miss Mary Murphy, Publications Secretary, c/o The Arctic Circle.

THE ARCTIC CIRCULAR

VOL. XXII No. 2 Published by the Arctic Circle 1972
Ottawa

201st meeting of the Arctic Circle, Thursday, 26 October, 1972

In a departure from the pattern of former years, this first meeting of the Fall season was the occasion of the Annual Dinner. It was held at the R.C.A.F. Officers' Mess, Gloucester Street, Ottawa.

The meeting was well attended and, although it again was not possible to serve much Arctic food, the guests were able to enjoy a buffet dinner that included Arctic char. The dinner part of the meeting was brought to a close by the ceremonial blowing of the narwhal tusk by the Secretary, Dr. Keith Arnold. After a few words of welcome by the President and a brief reference to future meetings and business, the meeting moved to the main lounge of the Mess for the address of the evening.

The speaker on this occasion was Mr. W.M. Gilchrist, President of Northern Transportation Company Ltd. He stressed the importance of transportation facilities in view of the ever-growing tonnages of freight to be shipped north. In 1972, about 400,000 tons of freight were moved in the western Arctic. With existing facilities, this took the entire navigation season; in fact, the Angus Sherwood, the last Northern Transportation vessel out of Tuktoyaktuk, had to break ice to reach the open water of Beaufort Sea. With oil exploration increasing, it is expected that freight will increase - Mr. Gilchrist mentioned the figure of 800,000 tons as a realistic possibility for next year just to maintain present settlements and operations, and as much as 1.6 million tons in the near future if provision for new operations is to be handled adequately.

Climate limits the length of the navigation season, but, under present plans, receiving depots will be established at designated points throughout the country; for example, the Hudson's Bay Company in Winnipeg, where freight for the north may be collected throughout the winter, packaged

in crates or pallets and transported by rail, truck or air to Hay River. In this way cargoes will be ready to travel as soon as navigation opens in the spring and no time need be lost in assembling them at the port of departure. Although all-year navigation is not possible, all-year preparation is. By this means it is hoped to move the expected larger tonnages satisfactorily, at least for 1973.

As yet, hovercraft have not been used to any great extent in northern transport although, when it proved impossible to unload freight at Arctic Red River, the cargo was unloaded at Inuvik and delivered to destination by hovercraft.

Oil, gas and minerals - lead and zinc on Cornwallis Island, iron on Baffin - are to be found in varying quantities in the north, and it is only a matter of time and market demand before they will become economically exploitable. Unless thought and planning are given now to the means by which they can be moved to market, transportation may prove to be a bottleneck when the time for development arrives.

Mr. Gilchrist feels that Northern Transportation Company has enough navigation experience and knowledge of the climatic and geographic problems encountered in the western Arctic to handle the demands of tomorrow if provision is made today for the additional vessels, depots and navigation aids that will be required. He admits his estimates of the costs involved have been found rather staggering by the government departments that will have to find the funds, but he feels his figures are realistic and that, unless they are given consideration now, future developments will have to be met in some ad hoc, unorganized manner that may prove even more costly.

As to the eastern Arctic, particularly the northeastern section, there is still so much to learn concerning ice conditions, navigation, and length of season, that sea navigation facilities may seriously lag behind demand. And, he reminded his audience, failure of one ship's cargo to reach its destination cannot be made up "on the next trip". It means a whole year lost.

The speaker was introduced by the President of the Arctic Circle and thanked by Dr. Geoffrey Hattersley-Smith.

202nd meeting of the Arctic Circle, Tuesday, 14 November, 1972
This was the first meeting of the Circle at its new location, the University Club of Ottawa, 251 Cooper Street. The speaker of the evening was Miss Moira Dunbar, a former president of the club and this year's recipient of the Massey Medal (see page 78 of this issue). She was introduced by Brigadier General Keith Greenaway, and the subject of her talk was "Ice and History in Nares Strait*".

Miss Dunbar outlined the history of the North Water, at the entrance to Nares Strait, from its first known discovery, by William Baffin, in 1616. Although Baffin's journals were well known, the map he must undoubtedly have drawn of this voyage appears never to have been printed and seems, subsequently, to have been lost. As a result, Baffin's statements were misquoted and, for many years, were discredited. It was not until the voyage of Sir John Ross in 1818 that the existence of Baffin Bay and the open water at its head was again affirmed and Baffin's findings vindicated.

In Sir John's wake came the whalers: both British and American. Although they found a rich harvest of whales in the area, it was only the British who continued whaling operations there for any length of time. The Americans for the most part confined their efforts to areas farther south, mainly to the southern reaches of Davis Strati and to Hudson Bay and Strait.

Being quite unfamiliar with the pattern of ice movement out of the channels farther to the north in Nares Strait, these early explorers judged the ice cover of the Canadian arctic waters according to their experiences in Europe. Miss Dunbar read extracts from some of their journals indicating that "because of the lateness of the season..." the ships began their homeward journeys in the second or third week of July - sometimes even in June! Thus, in most years, they had come and gone before navigation conditions in the area were at their best.

In addition to maps showing the location of the North Water at the head of Baffin Bay, at the entrance to the channel leading north between Greenland and Ellesmere Island, Miss Dunbar also showed radarscope pictures and photos she had taken - usually from the nose of the Argus plane - on her reconnaissance flights over the area with the Canadian Forces. Most striking was the northward-curving, unbroken sheet of

*The name Nares Strait was approved on 12 February, 1964, by the Canadian Permanent Committee on Geographical Names as the name for the entire passage between the head of Baffin Bay and the Lincoln Sea. The names of the individual bodies of water comprising this passage are still retained: Smith Sound, Kane Basin, Kennedy Channel, Hall Basin, Robeson Channel.

solid ice that marks the northern limit of the North Water in winter. They also showed the coast of Ellesmere Island, with a clear view of Pim Island offshore where the Greely expedition wintered 1883-84 and where all but seven perished. Before the ice bridge formed, the party had no means to cross over to the Greenland side where they could have got supplies; after the bridge formed, they were too weak to walk.

There were also photos of spectacular icebergs, taken at breathtakingly low altitudes from the Argus.

The southern limits of the North Water are considerably less clearly defined than is its northern limit, and they show great variation from month to month and from year to year.

Miss Dunbar subscribes to the view that the persistence of this particular stretch of open water throughout the winter is mainly due to the extreme storminess of the area. The fierce winds keep the surface agitated and break up the ice as it forms along the northern edge. Their strong northerly component drives this broken ice south. Thus, the North Water is in this aspect similar to the lee-shore leads that persist throughout the winter off other coasts in the Canadian Arctic. South-flowing currents in the channel also play a significant part in removing ice floes from the area. In spring, when ice in the northern channels breaks up, the northern boundary becomes lost in the mass of ice drifting south. The North Water as a distinct feature in the landscape then disappears until freeze-up.

Miss Dunbar was thanked for her talk by the club Secretary, Dr. Keith Arnold, who not only complimented her on her interesting presentation of this facet of her ice research, but also on her courage in taking observations and photos in such remote and dangerous areas from the nose of an Argus, at all levels and in all the weather conditions encountered in winter.

Award of the 1972 Massey Medal of the R.C.G.S.

The Arctic Circle is proud to note that, once again, one of its members has been awarded the Massey Medal of the Royal Canadian Geographical Society (R.C.G.S.). On this occasion, the recipient was Miss Isobel Moira Dunbar, a past president of the Arctic Circle and an internationally-recognized authority on conditions, patterns and behaviour of ice in the Canadian Arctic. The Arctic Circle takes this opportunity to congratulate Miss Dunbar both on her outstanding achievements and on the honour they have received.

In reading the citation at the presentation ceremony, Dr. Pierre Camu, president of the R.C.G.S., introduced her, with appropriate whimsy, as Miss "Ice-à-belle Moira Dunbar".

The following is the citation:

CITATION FOR THE PRESENTATION OF
THE MASSEY MEDAL OF THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY
BY HIS EXCELLENCY THE GOVERNOR GENERAL
at Government House, Ottawa, 3 April 1972

ISOBEL MOIRA DUNBAR

Your Excellency:

We have come today to pay tribute to Miss Isobel Moira Dunbar, a Canadian scientist whose special field of study is Arctic ice.

Miss Dunbar was born in Edinburgh, Scotland, and was educated at Oxford University, where she took a master's degree in geography. She then spent several years in the theatre as an actress, playing in London and in various provincial centres and also in presentations to entertain the Armed Forces during World War II.

In 1947 Miss Dunbar came to Canada and joined the professional staff of the Defence Research Board's Arctic Section to study Arctic geography and sea ice. Since then she has travelled widely throughout the Canadian Arctic, by air and on icebreakers, in developing her studies of ice conditions. A letter to the Society from a distinguished Canadian geographer says in part: "Her work has been carefully done, and no one intending to do anything in northern transportation is likely to get very far without making use of her research".

That research has produced important findings on the climatology of ice distribution and the interpretation of ice in photographs, including satellite and infra-red photography. She was joint author, with Brigadier General K.R. Greenaway, of the book "Arctic Canada from the Air". She has written many papers on sea ice and has been published in the Russian journal "Oceanology".

Your Excellency:

I present to you Isobel Moira Dunbar for the award of the Massey Medal of the Royal Canadian Geographical Society for 1972.

Excellence,

Il me fait plaisir de vous présenter Mlle Isobel Moira Dunbar, la première femme à recevoir la médaille Massey de la Société royale canadienne de Géographie et recipiendaire pour l'année 1972.

Recovery of Record of 14 May 1876, left on Ellesmere Island by British Arctic Expedition 1875-76

by

G. Hattersley-Smith
Defence Research Establishment, Ottawa

During the course of a helicopter flight from Disraeli Fiord to Alert, northern Ellesmere Island, on 6 August 1972 we recovered a badly damaged record of the British Arctic Expedition from Hamilton Bluff on the east side of Clements Markham Inlet. The massive cairn in which the record was deposited had fallen down, and so had escaped notice on our previous visits under spring snow conditions. It was built near the edge of the cliff at its highest point which is 500 feet above the sea ice.

The published proceedings of the British Arctic Expedition show that the record was left by Lieutenant G.A, Giffard, R.N. (afterwards Admiral Sir George Giffard) on 14 May 1876 on his return journey from Cape Colan, where he laid a depot for Lieutenant Pelham Aldrich, R.N., at that time exploring to the westward. The following particulars are taken from Giffard's Sledge journal for the period May 7-24, 1876 (Parliamentary Papers, 1877, Vol. 56, No. C-1636, p. 266).

"The cairn was erected on the highest part of the bluff, over Beverley Point; its height was 8 feet, its diameter 5 feet, carried up to a height of 6 feet, and then tapered in. A record was left in a tin, the record being as follows:

'Arctic Expedition
HMS Alert at Floe Berg Beach
Lat. 82.27 N, 61.22 W

This cairn was erected by the crew of H.M. Sledge "Poppie",

Sunday May 14, 1876

Lieut. Giffard, HMS Alert
Thos. Stuckberry "
Robt. Symons "
Wm. Malley "
Geo. Cranstone "
Wm. Ellard "

Belonging to N.W. Survey under Lieut. Aldrich, HMS Alert

All Well.' "

The record, which was unfortunately badly rusted into its canister, has been handed over to the Public Archives for restoratory treatment and safekeeping. We believe this to be the last record of this expedition that will be recovered from the north coast of Ellesmere Island. The other records were recovered by R.E. Peary from Cape Sheridan in 1905, and by Defence Research Board field parties from Crozier Island and Cape Fanshawe Martin in 1953-54. (see Arctic Circular Vol. VIII, p. 8)

Discovery of aircraft lost on Baffin Island, 10 October, 1958

On the morning of 10 August 1972, Wayne Johnson of Midwestern Helicopters sighted the yellow Taylorcraft CF-IKV which had left Frobisher Bay 10 October 1958 for a 4½-hours flight to River Clyde or Cape Christian and which, despite intensive Search and Rescue operations, had never been seen since. Johnson was not searching for the plane but was flying over the area in the course of his regular work. The reported site is 67°31'N, 69°51'W.

Aboard the plane at the time it was last seen were the owner and pilot, Jack W. Rutherford of Yellowknife, and one passenger, Dr. Randolph Hoiles of Toronto, referred to as an "engineer" - presumable a mining engineer.

The day prior to take-off, Rutherford and Hoiles had visited the R.C.M.P. post at Frobisher Bay and advised the officer there of their intention to do prospecting in an area south and west of Cape Christian. They were anxious that it should not be generally known where they were going, but they gave the R.C.M.P. officer a map and description of the exact location of the area and of the campsites they hoped to establish. This practice of leaving a confidential report of intent with someone in authority is fairly common among prospectors. The information is available if search becomes necessary but is usually returned unopened or is destroyed when the parties concerned return safely.

The two prospectors planned to fly to River Clyde or, if that strip were not in good condition, to continue on to Cape Christian, some 12 miles to the northeast. They promised to advise the R.C.M.P. officer by radio of their safe arrival and asked that no search operations be started until 4 or 5 days after their departure. This delay period was requested because the prospectors realized they might have to put down somewhere to wait out bad weather for a day or so. With their plane, they considered such landing and take-off were quite feasible.

The plane was equipped with skis which Rutherford had attached himself at Frobisher Bay while doing a maintenance overhaul. It was understood that, in addition to the two men and an unknown amount of prospecting equipment, it carried sleeping bags, tent, stove, two firearms, and enough food for 10 to 14 days.

CF-IKV took off from Frobisher Bay at 1904Z hours, 10 October 1958. It was never heard from again.

The pilot had filed a VFR direct flight plan. However, he was briefed that weather on both coasts would be below VFR but that conditions were likely to be much better inland. He is then reported to have told the Met forecaster he would fly instead along a route up the centre of the island. This was generally considered to have been a wise and logical decision, given the time of the year, the uncertainty of the weather, and the mountainous terrain along the east coast.

On 12 October, when no message had been received from Rutherford, the R.C.M.P. officer at Frobisher contacted Clyde, Cape Christian, Pangnirtung, and all radar stations in the area. At that time, none could give any news of Rutherford's plane. However, late on 13 October, an officer at Foxe reported to the R.C.M.P. that an unidentified aircraft had crossed the Baffin Island radar network at 2243Z hours on 10 October at 67°35'N, 70°15'W, heading NW. It was assumed, later, that this would have been Rutherford's plane. The radio aboard the aircraft was, apparently, not working - which might account for the "unidentified" - and the fix was not far off the mid-Baffin route he was believed to have finally chosen. Also, it is only about 10 miles from where the plane was to be found 14 years later!

Although the "4 or 5 days" delay period had not yet expired, the R.C.M.P. officer decided early on 13 October to telephone to Air Search and Rescue at Goose Bay; he discovered then that the Department of Transport had already requested a search.

This search lasted for 35 days (14 October-17 November), sometimes with seven planes in the air at one time. In all, at least 15 planes were engaged, Lancasters, Neptunes, Dakotas, a Canso, and a SC54 from the USAF station at Goose Bay. The area covered included most of Baffin Island south of 82°N and east of approximately 79°W. It was divided for search purposes into rectangles of one degree latitude and two degrees longitude. Short-range aircraft were used to search rectangles close to Frobisher Bay, Lancasters and Neptunes searched the more remote ones. In the first two days of the search, the USAF plane made two unsuccessful track surveys.

Over flat terrain, the search was made from altitudes of from 1000 to 1500 feet; over rolling terrain, the altitude was usually about 3000 feet. A certain amount of contour search was carried out, and fiords and valleys were scanned whenever possible. Herds of caribou, wolves, polar bears, and a few Eskimos were sighted, and all tracks were investigated. Over 555 hours were flown, 328½ in actual searching. Approximately 289,000 square miles were searched without finding any trace of the missing aircraft.

Below-freezing temperatures and bitter winds persisted over the area during all this period. Weather conditions were extremely difficult to forecast for reporting stations were few and widely separated, and the open water surrounding the island gave fairly persistent low cloud over much of the search area regardless of the general weather pattern.

When found, the plane was about 260 miles north of Frobisher. It had a broken ski strap, and the tips of its propeller blades were bent, but it was not too badly damaged. There was no one aboard. Inside the plane was a brief note, "Waited week. No aircraft. Walking north."

The R.C.M.P. and the Quebec Regional Office of the Ministry of Transport (Accident Investigation Division) are investigating and will make a report.

Anik I - and its service to CBC

(Summary compiled from papers written for the Arctic Circular by Dixi Lambert, Information Officer with Telesat Canada, and Gillian Godfrey, Information Officer with CBC)

In recent years, Canadians have had the experience of receiving international radio and television broadcasts from abroad via satellite - for example, the Olympic Games and the Moscow segment of the Canada/Soviet hockey series. The world's first geostationary domestic communications satellite, Anik I, was launched for Canada at 20:14 EST, 9 November 1972 from Cape Kennedy under the terms of a contract with the National Aeronautics and Space Administration (NASA). The launch vehicle, a thrust-augmented, three-stage, Thor-Delta was 116 feet high, 8 feet in diameter and had an all-up weight of 204,500 pounds. NASA responsibility ended when the satellite had been placed in transfer orbit - approximately 26 minutes after launch. Control of Anik I then reverted to Telesat Canada.

Anik I coasted in this highly elliptical transfer orbit - apogee 22,000 miles, perigee 115 miles - for about 90 hours until on 13 November the apogee motor on board was fired on command from the Telesat Satellite Control Centre in Ottawa. This inserted the satellite into its circular orbit about 22,300 miles above the equator. Several reorientation and orbit correction manoeuvres were then executed and, on 24 November, Anik I finally achieved its permanent orbital position at 114°W - approximately due south of Calgary. The Telemetry, Tracking and Command (TTC) stations at Allan Park, Ontario and Lake Cowichan on Vancouver Island, B.C. will control and monitor the satellite during its design life of seven years.

"Anik" is Eskimo for "brother", but the Anik satellite systems are intended to serve Canada as a whole, not just the North exclusively.

The satellite belongs to Telesat Canada, a company incorporated by Act of the Canadian Parliament in 1969 to establish and operate a system of domestic communications. It is not a Crown corporation, rather it is a commercial venture that, ultimately, will be owned jointly by three groups of shareholders: the federal government, the approved telecommunications common carriers, and the public. At present, the government and the common carriers each hold $30,000,000 common shares of the initial capitalization of $90,000,000. To fulfil the tripartite concept, shares will be made available to the public once successful operations have been established.

With the satellite successfully positioned, the next step toward making its communications systems commercially operational in early 1973 was to put them through a comprehensive test program to verify that both the space and ground segments were functioning satisfactorily and to demonstrate to the customers that the specifications set out in their contracts were being met.

From its geostationary position, Anik I is able to receive and transmit radio, television, telephone and data signals on microwave frequencies as far north as the southern tip of Ellesmere Island. This will make microwave communications possible between Canadians in practically all parts of Canada, from the United States border to the Arctic and from the Atlantic to the Pacific. Vast distances, difficult terrain and isonospheric disturbances, will no longer be barriers to this type of communications. Canadians in the southern part of the country already enjoy a highly developed, sophisticated telecommunications network. Not only can the satellite serve this area, but it will serve to link the less-accessible, developing areas of mid-Canada and the north to the communications mainstream and provide Canada with one of the world's finest and most efficient national communications systems.

Anik I is just over 11 feet high and 6 feet in diameter. It had a lift-off weight of almost 1250 pounds and its orbiting weight is 550 pounds. Its systems are powered by more than 20,000 solar cells, with on-board batteries to take up the load during eclipse period. The 60-inch optically transparent antenna can "see" the whole of Canada north to roughly the latitude of Jones Sound.

The satellite has 12 channels, each capable of transmitting colour television or up to 960 one-way telephone messages. Ten of the channels can be in operation simultaneously, two will be held in reserve as back-up.

Anik I was designed and constructed by the Hughes Aircraft Co. of California. The major Canadian subcontractors were Northern Electric Co. Ltd. who built the electronic shelf and Spar Aerospace of Toronto who built the structure. Two more satellites, identical to Anik I, have been ordered from the Hughes Aircraft Co. for delivery during 1973. The first of these will be launched in mid-April 1973 and positioned above the equator at 109° W to provide additional communication service and to take over in case of any failure in Anik I. The other satellite will be held on the ground as back-up protection for the system. Like Anik I, each of these satellites will have 12 transmitting/receiving channels, 10 of which can be made available for commercial use, the other two being retained for back-up. The satellites are designed to transmit

on 4 gigahertz and to receive on 6 gigahertz frequency. When completed, the Telesat Canada communications system will comprise two identical satellites in space and a network of earth stations. The present 37 earth stations are but the initial base on which a greatly expanded system of satellite communications will ultimately be developed.

During 1972, Telesat Canada leased 7 of the 10 commercial channels, 3 being contracted in mid-1972 to the Canadian Broadcasting Corporation (CBC). Each of these channels can carry one colour television, one audio, and a cue-and-control signal. In September, the trans-Canada Telephone System and CN/CP Telecommunications jointly leased 2 channels to provide high-density trunk telephone service between Vancouver and Toronto. Together, these two channels can,therefore, carry up to 960 simultaneous two-way voice circuits and will give member telecommunications carriers a reliable alternate telephone route across southern Canada. They can also relay telex, TWX, data and facsimile.

Under a contract signed at Frobisher Bay on 13 October, 2 channels were also leased to Bell Canada for use with its service in the Canadian eastern Arctic. The first Bell channel, to be used as a medium-density trunk line between southern Canada and the Arctic, will initially provide 36 circuits to Frobisher Bay and 12 to Resolute. The second channel, with a capacity of 60 circuits, will provide "thin route", two-circuit service to each of 17 locations in the north. The first two locations will be Pangnirtung on Baffin Island and Igloolik on Melville Peninsula. Fifteen other locations have been selected for this "thin route" service but contracts have not yet been awarded for construction of the stations.

The eighth channel on Anik I will be leased to the Canadian Overseas Telecommunication Corporation on completion of the Cantat II cable in 1974.

On December 5, 1972, Telesat Canada signed agreements with RCA Global Communications/RCA Alaska Communications and the American Satellite Corporation (AMSAT) to lease several channels on the second Anik satellite, scheduled to be launched in mid-April 1973. The agreements are subject to the Canadian Parliament approving wider objectives and powers for Telesat Canada, permitting the Company under special circumstances, to relay communications traffic outside Canada. Under present legislation, the Company is restricted to carrying telecommunications services only "between locations in Canada". The channels will be leased to RCA and AMSAT on an interim basis and will

be subject to interruption should the channels be required for Canadian customers of Telesat.

Anik signals can only be picked up by special receiving stations on the ground from which they are fed out through several "classes" of earth stations to the conventional terrestrial communications network.

The largest and most complex stations are the two heavy route (HR) transmitting/receiving stations at Allan Park and Lake Cowichan which can receive and transmit all forms of telecommunications traffic.

Thin route (TR) stations will provide telephone services to small communities in the north via several two-way telephone message circuits. All TR stations can be expanded or upgraded to meet customer requirements for additional telecommunications services.

The Network Television (NTV) transmitting/receiving stations are located at Edmonton, Regina, Winnipeg, Montreal, Halifax and St. John's. They will serve as distributors to the CBC television stations and network.

Northern Telecommunications (NTC) stations at Frobisher Bay and Resolute will establish a medium-density trunk telephone link with the main networks in southern Canada. The NTC station at Frobisher Bay will also be able to receive CBC network programs.

Remote Television (RTV) receive-only stations at 25 remote, isolated communities, mainly in the north and not presently served by terrestrial microwave facilities, will receive programs for rebroadcast locally.

CBC Uses of Anik I

The satellite system will enable the CBC to distribute live English and French language programs almost anywhere in Canada. Practically all the isolated communities in the north that must rely at present on airlifted videotape packages for limited television service, and other communities that have no television at all, will be able to receive the full CBC service.

Of the three channels on Anik I leased to the CBC for colour television and radio transmission, Channel A will carry the French television network service and Channels B and C, the English service. When the satellite system comes into operation Channel A, the French service, will be transmitted at Eastern Time, the Channel B English service at Atlantic Time and the Channel C English service at Pacific Time.

The network programs received in the Newfoundland, Atlantic and Pacific time zones will be broadcast live, programs from other regions will be recorded for network release at suitable times. Local and regional programs will be added to the network schedule in each region, just as they are added at present.

The north is the only part of Canada where the satellite will provide a telecommunications service that cannot be provided by any other means, except at exorbitant cost. In the rest of Canada, the satellite distribution system will be an addition to the existing microwave system. Programs there will continue to be distributed to the local CBC regional network stations by leased microwave facilities and the viewers will be unaware of the change from microwave to satellite transmission when it takes place. They will continue to receive the same program schedule as before.

In the north where no microwave system exists to distribute regional networks television, the satellite system can and will be used to deliver the programs and services of the CBC national TV networks. The northern CBC television stations will, at last, be able to receive live the full network programming. When the satellite system is fully operative, it will be possible for a master control centre to transmit any program from any one of the three satellite channels to any CBC station in the north at any time. French programs from Channel A can then be broadcast on local English language TV stations, and vice versa. However, during the initial stages of satellite operation, receiving stations in the north will only get broadcasts from Toronto, Montreal or Vancouver.

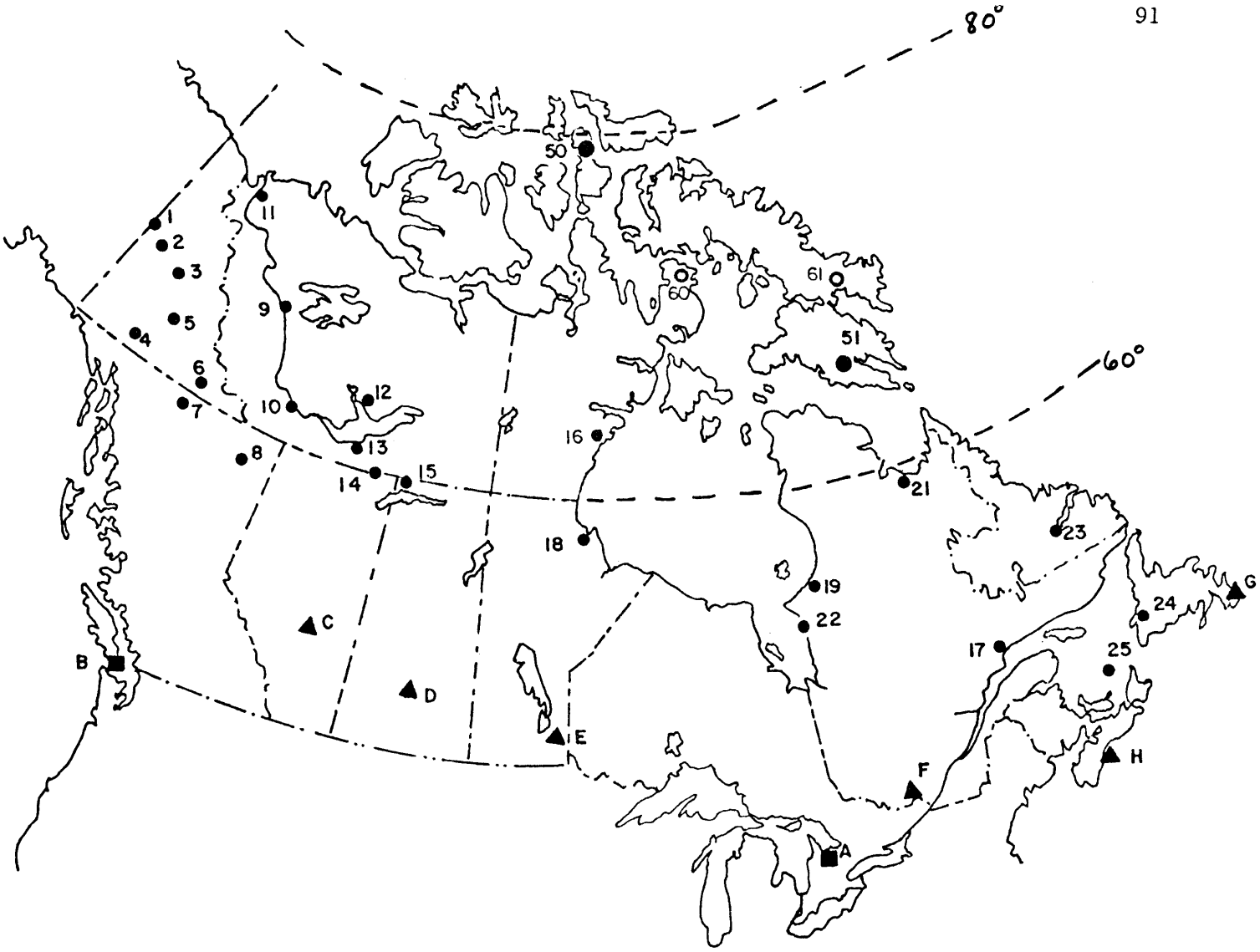
By late summer 1974, all 25 remote, receive-only TV stations in the north will be able to receive either the English or the French network service. Also, northern programs can then be inserted into the local and region periods on the network. The extent and nature of this northern programming will depend on the amount of money provided, the time available for program preparation, and the facilities provided for producing them.

In the north at present, the Northern Service of the CBC has five radio program centres. To provide an adequate TV service for the area, each of these centres should be equipped with basic production facilities and with the capacity to transmit to as well as receive from Anik I. With such facilities, programs by northerners for and about the north could be transmitted, not only throughout that area, but to the outside as well.

It has been the policy for the CBC Northern Service radio broadcasts to devote, whenever possible, most of its production time to programs for the Indians, Eskimos and Métis - who constitute at least half of our northern population. This policy will be continued for television programming. This will be all the more important and necessary as most of the programs received from the "outside" will be produced in the south by non-native people and for southern audiences.

On the matter of radio transmission, there are some areas in the Central and Eastern Arctic that are not provided with a network radio service either by land lines or by microwave. The satellite can provide such service by the TR system, although it will be expensive. At present, the only Canadian radio broadcasts these communities receive are those of the CBC Northern shortwave service produced in Montreal and transmitted from Sackville, N.B. Although this service will be greatly improved and extended when more powerful transmitters and a directional antenna for the north become operational - late 1972, early 1973 - it will still be liable to the blackout hazards due to ionospheric disturbances.

Map of the initial earth stations in the satellite system of Telesat Canada is reproduced on page 91.



HEAVY ROUTE STATIONS ■

A. Allan Park
B. Lake Cowichan

NETWORK TELEVISION STATIONS ▲

C. Edmonton
D. Regina
E. Winnipeg
F. Montreal
G. St. John's
H. Halifax

NORTHERN TELECOMMUNICATIONS STATIONS ●

50. Resolute
51. Frobisher Bay

REMOTE TELEVISION STATIONS ●

1. Clinton Creek
2. Dawson
3. Elsa
4. Whitehorse
5. Faro
6. Watson Lake
7. Cassiar
8. Fort Nelson
9. Norman Wells
10. Fort Simpson
11. Inuvik
12. Yellowknife
13. Pine Point
14. Fort Smith
15. Uranium City
16. Rankin Inlet
17. Sept Iles
18. Churchill
19. Great Whale
21. Fort Chimo
22. Fort George
23. Goose Bay
24. Port-au-Port
25. Magdalen Islands

THIN-ROUTE STATIONS ○

60. Igloolik
61. Pangnirtung

Initial earth stations in the satellite system of Telesat Canada

ARCTIC III Underwater Expedition

Arctic Circular, Vol. XXI, No. 3, 150-157, contains a detailed report of the talk on ARCTIC I and ARCTIC II given by Dr. Joseph B. MacInnis at the Arctic Circle meeting on 13 December, 1971.

The President of the Arctic Circle has received a letter from Dr. MacInnis, dated 27 November 1972, that includes the following list of the participants and their proposed study activity for ARCTIC III. The expedition was just setting out for Resolute at that date and its work is now underway. These projects are being scheduled for the period 22 November to 22 December, 1972.

	Function	Institution Represented
Joseph MacInnis	Expedition Coordinator	MacInnis Foundation
Douglas Elsey	SUBIGLOO Engineer	MacInnis Foundation
Chuck Cantrell	Breathing System (Mk X) Engineer	General Electric Co.
Birger Andersen	Diver Performance Studies	Oceanautics, Inc. (ONR-NOAA)
Brian Gillen	Diver Performance Studies	Oceanautics, Inc. (ONR-NOAA)
William Kcurtsinger	Still Photography	National Geographic Society
George Roy	Still Photography Film Processing	Photo Systems Ltd.
Ches Beachell	Electrical Engineer	National Film Board of Canada
Rick Mason	Motion Photography	MacInnis Foundation
Richard Birch	International Aspects	Bahamian Government
Wally Jenkins	Arctic Diving Factors	USN - Coastal Systems Laboratory
Edward Shank	Equipment Evaluation	USN - Office of Naval Research
Phil Nuytten	Commercial Equipment Evaluation	Can-Dive Services Ltd., (Oceaneering Intn'l)
Timothy Turnbull	Marine Biology	New York University

	Function	Institution Represented
Roger Smith	Marine Geology and Ice Studies	Queen's University
Paul Stang	Cold Water Performance	NOAA - MUST
John Green	Marine Biology	Memorial University
Garfield MacInnis	Surface Structures	MacInnis Foundation G. Adamson Assoc.
Bruce Martin	Equipment Evaluation	Canadian Armed Forces

Study Summary

Diver Performance

A study of the principal factors affecting human performance in the Arctic underwater environment.

Specific tasks such as the laying out of the bottom safety grid, and the construction of the underwater station SUBIGLOO, will be analysed for elements of performance decrement. General diving operations will be assessed throughout the entire mission. Body temperature and heart rate will be studied using thermistor-transmiter pills and hard-wire connectors.

Diving Equipment

SUBIGLOO Manned Station - An operational evaluation of the under-ice operational advantages of a small transparent workshop in support of scientific manned diving.

SEA SHELL Communication Stations - An evaluation of the under-ice operational advantages of 4 portable communication/refuge stations

Thermal Suits - An evaluation of the cold protection afforded by variable volume dry suits with and without supplementary heat.

Breathing Systems - A comparison of open and closed circuit (GE Mk X) breathing systems as they relate to marine science studies and underwater construction.

Miscellaneous Diver Support Systems - An evaluation of diver communication systems (Subcom), diver propulsion systems (Farallon), diver navigation systems (Farallon), and underwater closed circuit television system (General Video).

Geology

A general survey of the marine geological elements at the SUBIGLOO site will be made. Marine sediments, ice thickness and near-shore ice characteristics will be sampled, photographed, and studied. Several "remote site" dives will be made to compare surface and under-ice features of sea ice pressure. A search will be made for evidence of ice-gouged marine sediments.

Biology

A general survey of the marine biological elements at the SUBIGLOO site will be made. Certain aspects of marine symbiosis and fish pathology will be studied. Collections of benthic marine algae will be made for Dr. R. Lee, of the National Museum of Canada. Several "remote site" dives will be made to study the under-ice behaviour of Arctic mammals. Preserved samples and extensive "in-situ" photographs will be taken.

Industrial Diving Study

A study of equipment and diver performance relative to future Arctic industrial diving will be made. Cold protective suits and helmets used for industrial diving in more southerly waters will be assessed.

Surface Support Operations

Structures - A study will be made of the problems of surface support of remote-site, under-ice, diving operations. Human efficiency, structure design and heating, working, and lighting factors will be assessed by a professional architect.

Ice Penetration - A study of ice penetration using explosive techniques will be made. This method will be used for time optimization on the "remote site" dives.

Rapid Film Processing - Underwater investigations are highly dependent on a complete photographic record. In the past it has been necessary to wait until the expedition was over before film could be processed. This study will assess the time/cost relationship of operating a rapid

film processing station for photo dependent expeditions. Colour transparencies from each day's dive will be available for evening review.

Expedition Audio-Visual Documentation

A complete audio record of the expedition will be maintained by C. Beachell, of the National Film Board of Canada. This will include hydrophone recordings of under-ice animal life, and voice recordings of the working divers.

A complete still-photographic record will be maintained by W. Kcurtsinger. of the National Geographic Society. Individual scientists will document their own underwater activities and these photographs will be available for technical and non-technical reports.

A complete motion picture record will be maintained by R. Mason and C. Beachell. It will be shot in 35 mm (with 16 mm back-up) using National Film Board's Arriflex/Mako equipment.

A self-contained underwater television recording system with instant replay underwater will be used for the first half of the expedition. It will be used to record and study diver performance. An assessment will be made of the value of such a system for optimizing learning/ performance curves of future missions.

Postscript

by G.W. Rowley, who visited the expedition while at Resolute

The party arrived safely at Resolute and by mid-December had erected SUBIGLOO successfully under the ice in about 35 ft. of water near the end of the tide gauge jetty in Resolute Bay. The main problem lay in preventing the SUBIGLOO from getting too cold during transit from the base to the sea, as differential contraction between the aluminium rings and the plexiglass globe could have resulted in excessive strain. At the time it was 28° below above, and 28° above below the sea ice, and transfer from the truck, on which it was wrapped up with electric heaters, to immersion in the sea water had to be expeditious. This was done by lowering the two hemispheres by hand through a hole 10 ft. by 8 ft. chipped in the sea ice. When the hemispheres had been put in the water they had to be assembled and secured to a framework anchored to the

bottom by about 17 tons of ballast. SUBIGLOO then had to be filled with air to expel the water inside it. It was like a giant fish bowl, except that it was upside down and the fish were outside thather than inside.

After the hole for SUBIGLOO had been chipped in the ice, it was particularly interesting to lower a light into the sea to attract thousands of shrimps, and a few small fish and jellyfish (it was, of course, dark throughout the day). The effect was just like the thousands of flies that surround a light on a warm June night in the south.

SEMINAR ON GUIDELINES FOR SCIENTIFIC ACTIVITIES IN NORTHERN CANADA

From 15-18 October, 1972, a seminar on guidelines for scientific activities in northern Canada was held at Mont Gabriel, Quebec. The chairman was Dr. O.M. Solandt, former Chairman of the Defence Research Board, former Chancellor of the University of Toronto, and former Chairman of the Science Council of Canada.

The seminar was sponsored by the Sub-Committee on Science and Technology of the Advisory Committee on Northern Development, an interdepartmental committee under the chairmanship of the Deputy Minister, Indian Affairs and Northern Development. Following a review of federally sponsored research in northern Canada planned for 1971-72 that had revealed an apparent imbalance and large differences in the scale of effort in various scientific fields, the Sub-Committee had been given the task of defining guidelines and priorities for such scientific activities. A serious examination was needed to determine whether the extent and pace of activities were in line with the Government's objectives and priorities for northern Canada.

The stated purpose of the seminar was, "To assist with developing guidelines and priorities for scientific activities in northern Canada that would enhance programs related to the people, the environment, renewable resources and non-renewable resources in that order of importance", and it reflected the objectives and priorities for the north as set forth by the Government.

To assist in accomplishing the aims of the seminar, discussions were divided into six major areas with an author invited to prepare a paper for each topic. These were: Northern People, H.B. Hawthorn, University of British Columbia; Natural Environment, F.K. Hare, University of Toronto (now with the Department of Environment); Renewable Resources, M.J. Dunbar, McGill University; Non-Renewable Resources, D.J. McLaren, Director, Institute of Sedimentary and Petroleum Geology, Calgary; Technology, R.F. Legget, former Director, Division of Building Research, NRC; and International Research , J.T. Wilson, Principal, Erindale College, Toronto.

Approximately 90 scientists and specialists from industry, the academic community, and government, and covering a wide range of disciplines and interests, attended the seminar. All had been asked to submit comments on the papers prior to the meeting at Mont Gabriel. The papers and comments provided the background material for the three days of discussion.

According to the organizers, reaction to the seminar was most favourable, and the results should assist greatly in developing guidelines and priorities for research in the north. The papers, amended as a result of the discussions, the summaries of views of the working groups, and related comments, will be published early in 1973 and will be available through Information Canada outlets across the country.

22ND INTERNATIONAL GEOGRAPHICAL CONGRESS

The 22nd International Geographical Congress was held in Canada in August 1972 (see also Arctic Circular, Vol. XXI, No. 1, p.44). The main meetings took place in Montreal from August 10-17 and over 900 registrants participated in 34 geographical excursions or symposia organized before and after this period. Six field activities introduced nearly 130 geographers from 18 countries to Canada's Arctic and Subarctic environments.

A group of 40 geographers took part in an 8-day circuit of northwestern Canada, travelling in an F-27 aircraft chartered from Mackenzie Air Ltd. From Edmonton, the group visited Fort McMurray, Yellowknife, Inuvik, Tuktoyaktuk, Clinton Creek, Dawson and Whitehorse.

From July 31 to August 10, two dozen scientists visited the McGill University Expedition area on Axel Heiberg Island, with brief stops at Resolute, Eureka and Tanquary Fiord.

A small group of those attending the congress spent nine days visiting Pangnirtung, Broughton Island, Lake Harbour and several small Eskimo camps in southern Baffin Island.

Geographers from Sweden, Finland, the USA and Canada participated in a field symposium on the development of the Subarctic from July 28 to August 8. Settlements in northern Manitoba and Saskatchewan were visited, during which time several sessions of papers were organized. Part of the group spent the last three days in the Northwest Territories at Baker Lake, Rankin Inlet and Eskimo Point.

A group representing 14 countries left Montreal immediately after the close of the Congress and travelled by bus up the Ottawa Valley and north to the Clay Belt. A side trip was made to Moosonee and Moose Factory, including a flight over southern James Bay. Return to Montreal was by way of the Quebec part of the Clay Belt and the associated mining communities.

Also, after the Montreal phase of the Congress, a group of geographers were flown north and spent three days in the Resolute area and another three days at the Devon Island camp of the McMaster Arctic Research Group.

Panel discussions at Montreal included one on northern lands (W.C. Wonders and T. Lloyd, Canada; I.P. Gerasimov, USSR; E. Bylund, Sweden; K.H. Stone, USA; J.S. Hansen, Norway; J.W. Watson, UK) and one on the Wisconsin deglaciation of Canada (J.B. Bird, F.K. Hare and J. Terasmae, Canada; J.T. Andrews and R.G. Barry, USA; J.I.S. Sonneveld, Netherlands). Publications include a number of papers on the Arctic in International Geography 1972 and a regional monograph on The North, one of six Studies in Canadian Geography produced on the occasion of the Congress (Both available from University of Toronto Press).

J.K. Fraser

REQUESTS FOR INFORMATION

(As a service to its readers, the Arctic Circular is prepared to carry requests for information, data, and observations that will be of assistance in northern research projects.)

Request for information on the distribution of driftwood in the Arctic Islands

One of the continuing interests of the undersigned is in the distribution of driftwood in the Arctic Islands, both at the modern shore and on raised beaches. Many logs from various localities have been dated by the radiocarbon method, and the present state of our knowledge is shown in Fig. 1. A compilation of data, including observations made during the 1971 field season, was presented at the Symposium on "Climatic changes in Arctic areas during the last 10,000 years", held in Finnish Lapland in October 1971. The Symposium proceedings were published in 1972 by the university of Oulu, Oulu, Finland.

The oldest logs found on raised beaches and post-dating the last glaciation are 8500 to 8000 years old. Logs between 6500 and 4500 years ago are especially abundant, suggesting that more open water may have existed during that interval than is the case today. Most of the logs are either spruce (Picea sp.) or larch (Larix sp.), and many of them may derive from Siberia.

The purpose of this note is to request information and collections from other localities that may be visited, especially from the area south of the Parry Channel and for several of the Queen Elizabeth Islands for which no data is now available. If collections can be made and a saw is handy a complete cross-section is ideal, but a fist-sized piece of wood is sufficient for identification and dating. Observations as to the length, diameter, depth of burial, adhering vegetation, and general condition would be most appreciated, as would photographs. The exact elevation above sea-level is of particular importance, and if possible this should be measured in the field. The wood should be as accurately located as possible on a map or air photograph.

Information and collections should be sent to:

W. Blake, Jr.,
Geological Survey of Canada,
600 Booth Street,
Ottawa K1A 0E8, Ontario

Fig. 1 is reproduced on page 101.

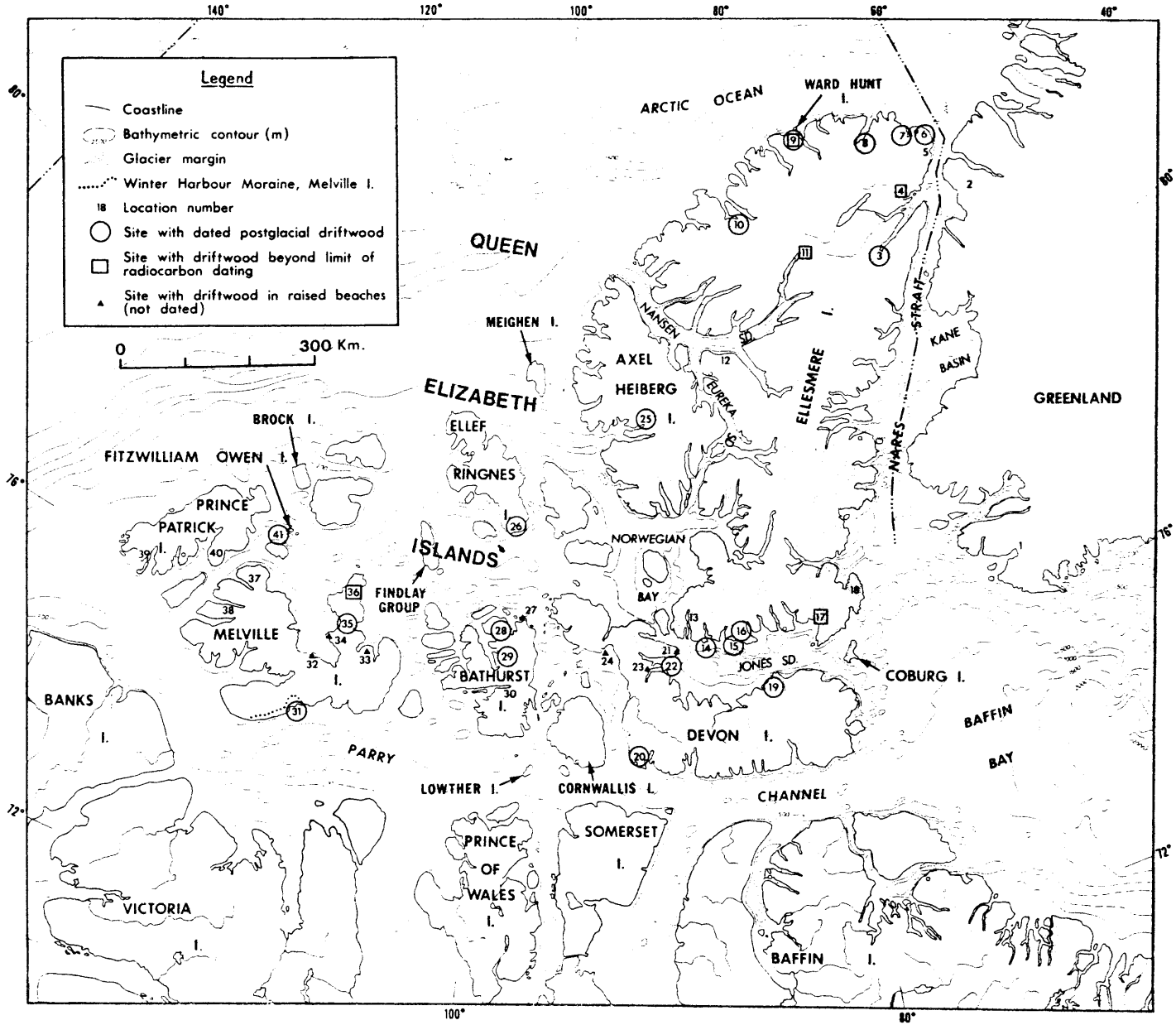


Fig. 1. Location map and driftwood sites, Queen Elizabeth Islands.

W. Blake, Jr.

ARCTIC ANECDOTES

by

Al Copland

NO. 1 Starvation

It would indeed be a rare thing today to have a case of actual starvation in the Arctic, but this was not an uncommon happening during the nineteen twenties. One case that I became involved in had its beginning near Amitoke on the Melville Peninsula, not far to the south of the modern arctic communities of Hall Beach and Igloolik.

A number of Eskimo families were spending the winter on the coast, close to an open water area where walrus could customarily be hunted throughout the entire winter. But weather conditions suddenly changed for the worse to such an extent that there no longer was open water and, consequently, no walrus on which the small group depended for food. Soon the food ran out and the people faced real starvation.

They stayed together for as long as possible, hoping that conditions would somehow change overnight. But when a suggestion was made that they resort to cannibalism, this forced a decision. They gathered together what few possessions they could take with them and moved away, leaving to his fate the elderly person who had made the odious suggestion that they should eat human flesh. The party moved inland to where, during the previous spring, they had killed and cached some caribou. In their emaciated state not all of them made it to the rendezvous. There the survivors of the forced march found that the unusual weather and blowing snow had completely changed the physical features of the land and buried all their markers, so that they were unable to find the meat.

Several by this time had died and there were now only three survivors, SHOOCK-LA-TOOK, a young man, his small daughter, and his mother, a little old woman named OOK-A-SHIT-CHENWAK.

Spring gave place to summer and by eating every living thing they came across, the three survived. But when fall came around they found themselves in no condition to face winter, without food and adequate clothing. By this time they were virtually in rags.

One day in December I was making the round of my traps with my partner Arnungwak along the shores of Repulse Bay. We had spent a comfortable night in a snow house and now, well fed on beans, hardtack and coffee, we had started off across the sea ice toward the Blue Lands. Suddenly our dogs swerved to the right and started to follow fresh footprints. Soon we came across a young man seated on the snow. He was listless and emaciated, and it was with some difficulty that we got him to eat anything and tell us his story.

His mother and daughter, he said, were several days walk inland where he had left them to walk to Repulse Bay Post for help before it was too late. I am sure he would have reached there, but it was still a good two days walk for a person in such a run-down condition.

The following morning I sent off a relief sled with food and clothing, with instructions to bring the old woman and the girl to a place within easy walking distance of the trading post. A snowhouse would be built for them and sufficient food left with them to ensure that they would soon recover lost strength. The young man would then take over our trapping line for himself and in time he would again become self-supporting.

In the meantime, I had to make a journey of several days' duration, so that I would out of touch with SHOOCK-LA-TOOK. However, when I finally did visit him I was told by his mother that he was sick and in bed with back pains. I suggested a few days rest, because he have probably overdone it before he was quite fit again.

The climax to the story was told me by TELERUK-TILUK, another unfortunate whom I had befriended and located close to the other family so that they could visit occasionally. This man had gone to visit SHOOCK-LA-TOOK and, after crawling along the narrow tunnel to the igloo entrance, had stood erect and was amazed to find himself facing the body of OOK-A-SHIT-CHENWAK who had hanged herself from a wooden peg driven into the snow house wall. Underneath and in bed was her son and the young child, both in good health. The body was cut down and buried according to Netchelik custom, covered with a deerskin and laid on a nearby ridge with a few stones to hold the body there.

I had the young man brought in for questioning, since there was not a police detachment within hundreds of miles. His explanation was simply that his mother thought she was going to lose her last son and decided she couldn't live without him. It was her wish that she should die in

this manner, he explained. Perhaps this was true, I thought, but behind the cruel facade of tribal custom there was little doubt about the grief this young man had suffered as one after another of his relatives had died of want.

Fortunately today this would no longer be possible, but we were then dealing with a completely independent people, capable for most of the time of supporting their families by hunting. But when the hunting failed, as it quite often did for one reason or another, there was grim suffering and often death.

ARCTIC PLACE NAMES

by

C.F. Stevenson

(The summaries by Mr. Stevenson were originally written for CBC broadcast and are being printed with permission of G.F. Delaney, Secretary, Canadian Permanent Committee on Geographical Names)

Kluane, Y.T.

Kluane Lake, the largest lake in the Yukon Territory, is located about 150 miles west of Whitehorse and lies at an elevation of 2525 feet. It is approximately 40 miles in length, varies in width between $2\frac{1}{2}$ and 6 miles and has an area of about 184 square miles. It is orientated roughly northwest-southeast, and drains into the Yukon River through the Kluane, Donjek and White rivers. From the Alaska Highway, which follows its SW shore, the snowy summits and glistening glaciers of the St. Elias Mountains are visible to the southwest. Kluane Lake has appeared in the records of the Geographical Board since 10 November 1898.

The entire corner of the Yukon Territory southwest of the lake constituted the Kluane Game Sanctuary which, on 22 February 1972, was included within the wider boundaries of the newly-created Kluane National Park (see Arctic Circular, Vol. XXII, No. 1, 21-23). Northwest of the lake lies one of the best-known, big-game-hunting areas of the Territory. There are a number of gold-bearing creeks in the area.

The name "Kluane" is of Indian origin. It means, according to one authority, "White Fish Town" or "White Fish Place" and is supposed to have been used by the coastal Indians on a journey through the Yukon area while trading with the local Indians. Another authority states that the meaning of the name is "Big Fish" so that Kluane Lake means "Big Fish Lake".

Several other geographic features carry the name Kluane. Besides the lake and river, which were approved in 1898, there are: Kluane Glacier (approved 15 July 1936); Kluane Ranges (approved 2 June 1950); Kluane Hills (approved 17 January 1951); and Kluane Plateau (approved 1 October 1953).

About 1903, Kluane, or Silver City, as it was also known, located on the east shore at the south end of Kluane Lake and at the end of a wagon road from Whitehorse, was a centre of activity. A post office was established 1 October 1904. At first it was called "Bullion Creek"

but the name was altered four months later to "Kluane". The newly-named post office was opened 1 March 1905, by C.A. Munro. It was closed 1 January 1910, re-opened in June 1913 and finally closed 1 January 1921. In addition to the post office there was, at one time, an RCMP station and a Mining Recorder's office.

The Alaska Highway passes near the site of this old mining and lumber camp, now long abandoned, at about Mile 1052.

C.F.S.

Tuktoyaktuk, N.W.T.

This northern settlement lies on a small peninsula on the mainland opposite Tuktoyaktuk Island, which lies in Tuktoyaktuk Harbour. The name has appeared in various forms over the years, approximately 12 variations in spelling are officially recorded, and at one period the name of the settlement was changed to "Port Brabant". The present spelling was approved by the Canadian Board on Geographical Names in 1950, but there are those who like to use a short form or nickname and, consequently, "Tuktuk" and "Tuk" are sometimes heard. Tuktoyaktuk Peninsula is the long, narrow, large peninsula east of the Mackenzie Delta and Richards Island that extends NE along the Beaufort Sea coast and is bounded on the southeast by Liverpool Bay and Eskimo Lakes.

Three origins for the name Tuktoyaktuk, all involving caribou, have been documented:

- Eskimo idiom meaning Rock Caribou Place. Pronounced Took-too-yak-tuk.

- Eskimo word meaning "caribou crossing".

- Derived from Tukto (caribou and Yaktuk (looks like) and means "reindeer that looks like caribou".

A natural feature called "pingo" is found in this region. These are ice-cored hills sometimes several hundred feet in height. Two large ones lie southwest of the settlement and about seven more are strung out to the north reaching almost to Toker Point.

C.F.S.

Editor's Note. The Economic Data Survey maintained by the Department of Idustry and Development of the Government of the Northwest Territories adds the following data:

- The community is located at 69°27'N, 133°02'W, on the Beaufort Sea.

- In 1971, it had a population of 596.

- It is a Hamlet, having a local Council and a representative of the Government of the Northwest Territories.

- By contract, water is delivered to the community each day by truck, and garbage is collected in the same manner.

- Electricity is supplied by transmission line from Inuvik since 1 November 1972. The lines are carried by wooden poles sunk into the permafrost.

- The main re-supply for Tuktoyaktuk, its hinterland, and communities along the Arctic coast, is by ship or barge from Hay River. Tuk is also a trans-shipment point and provides harbour facilities, wharf, and heavy equipment. The general commodity rate from Hay River is $58.00/ton. The shipping is generally from July to mid-September.

- Air transport is available 3 times weekly from Inuvik by Northern Aviation Ltd., a one-way fare costing $20.00, and freight costing 15¢/lb. There is a landing strip, 3522' x 100' (gravel), but no directional beacon and no based aircraft.

- There is a nursing station with 2 nurses, but the nearest hospital is at Inuvik, 77 air miles distant.

- There is no outside contact by road.

- Tuk has three churches: Roman Catholic, Anglican, and Pentecostal.

- There is a community hall accommodating about 200 persons, a library, a post office (mail three times weekly, postal code X0E 1C0), a curling rink, a café, and a flying bank (Canadian Imperial Bank of Commerce, Inuvik).

- There is no public accommodation and no liquor outlet (supplies must be acquired from Inuvik).

- The community has a 10-man fire department with a tracked vehicle, a 2-man R.C.M.P. Detachment, a school for grades 1 to 8, telephone communication via CN Telecommunications, and Radio at R.C.M.P.

- Bulk capacity of available fuels is about 390,000 gals.

- Local transport consists of two 3-ton trucks, two flat deck trucks, a pick-up, and some taxi service (Arctic Coast Services).

- The annual precipitation is about 6.15 inches - 4.02 inches as rain, 21.3 as snow. The mean July high temperature is 58.5°F, the mean January low -25.4°F, and the yearly average 11.7°F.

- The survey adds the following historical note:

"Dr. John Richardson of the Franklin Expedition visited this area in 1826. However, Tuktoyaktuk did not appear as a settlement until 1934 with the transfer of the Hudson's Bay Company supply point from Herschel Island. The present economic base is composed of fur and wage employment at the D.E.W. line site and with the Northern Transpcrtation Co. Ltd. at its transhipping operation from river to ocean vessels in the summer. Tuktoyaktuk is also the location of a research station of the Polar Continental Shelf Project. Extensive oil exploration is presently being carried on in the area."

BOOKS, REPORTS AND REVIEWS

NUNAGA, My Land, My Country

by

Duncan Pryde

Published by M.G. Hurtig, Edmonton $8.95

A review by Al Copland

This book, by a young Scot who entered the service of the Hudson's Bay Company Fur Trade Department some eighteen years ago, is one that many northerners might wish they had written, but with reservations. The accounts of travel, hunting, observations on wild life, all are interesting although at times over-dramatized.

Earlier, such accounts did not somehow appeal to publishers because public interest in the north had not then been stirred enough to make such a book a financial success. The timing of NUNAGA is right. Public interest in the north is now keen and moral standards have changed somewhat so that the author has, therefore, been able to reveal a much closer intimacy between himself and the Eskimo than would have been possible several years ago. His facility with the language no doubt gave him a greater insight into the Eskimo mind, customs and habits, that could have been possible for most northerners with only a "working" knowledge of the language.

Chapter one is an amusing, cleverly-written and authentic description of the day-by-day happenings at Baker Lake during the time he lived there. In case the reader makes the mistake of thinking that the kindly, domestically-oriented Hudson's Bay Company manager is typical, it should be made clear that he was one of a rare and now vanished breed. This reviewer can only recall three or four others who might have fitted this description. Most Post-Managers were young, active and country-wise. They understood the business and managed to keep the people self-supporting, which is no longer possible. Long absences from the trading post, such as the author describes, would not have been wise, nor, generally, would they have been tolerated. The life of the earlier trader revolved around the people and the duty of getting the best efforts from them.

The author then discusses his initial difficulties with the Eskimo language when he discovered what seemed to him conflicting views held by other white men of different linguistic roots. As no effort seems to have been made to reach a common spelling of Eskimo words, the author sets about to correct this systematically. Orthography, or the correct and conventional spelling of words, is possible if a language is pure. But since the Eskimo language is beset with dialectal variations, how can one reconcile the clearly articulated speech of the Baffin Islander and of the people living within that vast area we loosely called UNGAVA (now known as Nouveau Quebec) with the slurred speech of the eastern NETCHELIK, the hacking sounds in the PADLERMIUT, or the low monotone and often slurred sounds of the AIVILICK and IGLOOLIK dialects? It is quite evident the Eskimo think likewise about this, since the official orthography, adopted by the government in 1958, has yet to find favour with them. The old syllabic form of writing is still in general use, although English is gradually displacing it.

Lacking knowledge of many Eskimo groups, the author has concentrated almost exclusively on those he knows best, the people who live inland from and along the shores of the Queen Maud Gulf. Because of their remoteness, they have retained many of the old customs and habits longer. They are not typical of the Canadian Eskimo in general, in case some readers may have formed that impression.

The author shows a great interest in the shaman, more properly the angnacook, and has gone to a lot of trouble to find out how and why their influence appeared to be so strong. To have faith in these men, and to ascribe to them supernatural powers, is wrong. Fifty years ago their influence was on the wane and they were on the way out. Occasionally one might hear, in passing a tent, their "conjuring" babble. The people simply lost faith in them. The only credibility they did achieve was by coincidence - a change in weather they had predicted or, as they insisted, brought about, or the natural recovery from a sickness they claimed to have cured.

The book moves along in an interesting and readable way but there is little doubt but that its current popularity is due to a well-planned publicity campaign and the exploitation of the sexual relationship fad. That wife-swopping did exist amongst the Eskimos is not denied, but it is just one of the many devices by which the Eskimo corrected some of the social problems that even primitive people encounter.

Even some Eskimo and other northern readers regard the author's writing of his philanderings and the naming of his "consenting" partners as an invasion of their privacy. "What do those concerned think of these

revelations?", they ask. With the present trend toward gathering the Eskimo into larger communities, and with consequently more idleness amongst them, the gossips no doubt will be busy!

Be this as it may, the book has several fascinating chapters. The description of a caribou migration is vividly told:-

> "All night long we could smell the strong stench of the animals and hear the clicking of their feet and the whoofing-grunting noise they made as they grazed . . . We had to wait there nine, unbelievable days. All of that time with caribou in every direction as far as we could see. The stench no longer bothered us. Either we had grown immune or smelled like caribou ourselves. Again it would seem to me that if I had to make an estimate I would still put my count at no less than a million. This was the sort of spectacle related by thunderstruck early explorers and fur-traders, speaking in awe of millions of caribou."

The wildlife people probably would not agree with Duncan Pryde's estimate, but it must have been an amazing spectacle. There are also fine descriptive passages about the land in spring and summer, strangely idealistic by comparison with some of the "rougher" passages of the book. Fist and knife fights do not go down well with the old-timers, many of whom are shocked to know that this sort of thing went on. Perhaps the all-too-sudden impact of civilization and its evils is to blame.

The last chapter seems to have some contradictions. There is an almost nostalgic backward look at earlier days, which anyone who has spent eighteen years or more amongst the Eskimo would feel. The author's views on education appear to come from the heart rather than the mind. When one considers the incredible per capita cost to build and maintain schools in each small community, and to provide all the comforts and facilities the modern northerner demands, his proposals for educational facilities do not seem practical. They arise, however, from the author's regrets of the loss of language partly brought about by the long absences of the children from their families as they continue their studies in the larger communities. However, there the author does give his qualified support of the government housing policy - although this reviewer does not go along with his views on the snowhouse as a miserable form of shelter!

The past has gone, swept aside by the tide of "progress". "Need this have come about so suddenly?", one asks, but, to borrow Duncan Pryde's last thoughts, "There will never be another fur-trader in the old tradition, just as there never again will be an Eskimo in the old image".

Taken all-in-all, Duncan Pryde's NUNAGA is a readable book in which he presents his frank views and confessions - if one can call them that. It is likely to be published in other countries, and stands a good chance of being translated into other languages.

Antarctic Record No. 44 (August 1972), containing reports of the Japanese Antarctic Research Expedition has been received by the Editor of the Arctic Circular. The table of contents, the abstracts, and much of the bibliography are in English; the papers themselves are in Japanese. The following is the table of contents:

Persons interested in these papers or their abstracts should write to the

Polar Research Center,
National Science Museum,
Kaga 1-9-10,
Itabashi-ku,
Tokyo, Japan.

We thank the Polar Research Center for bringing this publication to our attention.

1971 Government Activities in the North

Just released is this report which covers the activities of all federal departments and agencies operating in both Territories for the year 1971 and outlines their plans for 1972. The Foreword states, "Much of the material used under the heading "Plans for 1972"... will be 'fait accompli' by the time this document is published; others may have been severely modified or abandoned. It is not practicable to constantly review the status of these plans as the publication of the book proceeds; consequently, they are treated throughout as being in the future." Appendix A gives the results of the 1971 census, showing a total population in the two Territories at that time of 53,195. Appendix B details all the scientific projects supported in the north in all disciplines by the federal government, at a total cost for the year of $23,694,363.00.

The report is unclassified and copies may be obtained in either French or English by writing to the Information Services, Department of Indian Affairs and Northern Development, Ottawa, Ontario K1A OH4.

Arctic Circle correspondence - Correspondence should be addressed to the officer concerned,

c/o The Arctic Circle,
Box 2068, Postal Station D,
Ottawa, Ontario
K1P 5W3

Arctic Circle Meetings

The regular meetings of the Arctic Circle are held on the second Tuesday of every month at 8.30 p.m. at the University Club of Ottawa, 251 Cooper Street.

Out-of-town members who wish to receive notices of these meetings and, thereby, be informed in advance regarding the guest speakers and the topics to be discussed, should address their requests to the Secretary, Mr. Keith C. Arnold.

The Arctic Circular

The Arctic Circular is published three times a year - oftener if the amount of material received permits. Correspondence, papers and reports are welcomed from all members, from persons living in the north, or from anyone having information on general northern activities, research and travel, or on technological, industrial or social developments. Contributions and correspondence should be addressed to the Editor, Mrs. Margaret Montgomery Larnder.

Back issues of the Arctic Circular are available, single copies at $0.50 and complete sets (Volumes I to XX) $100.00. Requests should be addressed to Miss Mary Murphy, Publications Secretary.

Membership dues

Dues are payable as of 1 January. New members joining the Arctic Circle in the Fall or at any time during the period between the last meeting in the Spring and the first meeting in the Fall (usually May-October) will be considered paid-up members for the following year. The dues are:

$7.00 for in-town members and families
$3.00 for out-of-town members and for students
$5.00 for libraries and institutions.

THE ARCTIC CIRCULAR

VOL. XXII No. 3 Published by the Arctic Circle 1972
Ottawa

203rd meeting of the Arctic Circle, Tuesday, 13 December, 1972.
The speaker of the evening, Dr. Robert Legget, is the former Director of the Division of Building Research of the National Research Council, and, among his other writing activities, is the author of "The Rideau Waterway".

Not only has Dr. Legget both carried out northern research himself and directed such research by other scientists, but he has a long personal association and experience with the North, particularly the Western Arctic. The title of his illustrated talk on this occasion was "The Mackenzie Waterway" and, by slides and narrative, he described his eight-day, 1100-mile voyage in June 1972 up the Mackenzie from Inuvik to Yellowknife, comparing the country and settlements of today with what they were when he last visited them 30 years ago.

Dr. Legget had been asked to present a paper on Technology in the North at a seminar scheduled to be held at Mont Gabriel, P.Q., in October 1972 (see p. 138 of this issue.) He was also to act as Chairman of the Working Committee on this topic. As he considered this to be a broad and serious responsibility, he felt it would be wise to have another first-hand look at the area. In spite of his long contact with the region, it was many years since he had actually seen it and much had changed there in the interval.

Arrangements were made for him to fly to Inuvik and there board the Norweeta on her first southbound trip of the season to Yellowknife. In spite of all he was able to see and the amount of material and information he gathered, the trip upstream took only from Tuesday evening to the following Wednesday morning.

The weekend at Inuvik was spent examining externally every building and facility - practically all of which he either knew from previous visits or from recent reports. Using coloured slides, he showed his audience the lay-out and facilities of the town and the degree to which they were measuring up to expectations. He showed the school, the monument, the

modern utilidors that had replaced the old plywood ones that were so easy to bash in, the new housing areas, and the government and business buildings. He noted that the agricultural test plot, so evident in the 1960 photographs, had now disappeared.

With slides and explanatory narrative he took his audience south from the bewildering landscape of the Mackenzie Delta with its myriad lakes and winding streams, making revealing comparisons, as the journey proceeded upstream, between conditions in the areas today and what they had been when he last saw them.

After passing the Caribou Hills, audience and speaker arrived at Aklavik, the town which, it will be remembered, was expected to die when Inuvik was built. It has failed to live up to this gloomy administrative forecast and is still an active community. The hospitals, so evident in photos of 1956, are now gone but have been replaced by a nursing station. There is a new school. The Anglican Cathedral of the Arctic still stands - but is closed. This was the first of several once-active churches the speaker was to find closed. He was, however, able to get into the Cathedral and photograph the altar piece "Madonna of the Snows". This had been painted in Australia by a lady who never saw the North but who worked from postcards and photographs of Indians, Eskimos and R.C.M. Police. She had been inspired to create this picture as a result of a talk that Donald of the Arctic (Bishop Donald Marsh) had given in London, England, when she was visiting there. Dr. Legget was particularly interested in this altar piece as, on his last visit to Australia, he had met relatives of the artist; she herself is now deceased.

There were views taken along the River at various points where strings of barges were encountered being pushed (not towed) downstream. With the modern tugs there is no need to stop along the way and as a result many of the smaller settlements are rarely visited now. One of these is Arctic Red River. Comparing it today with an aerial view taken in 1956, little seems changed. But although the Roman Catholic Church still crowns the hill, its importance seems to have diminished and the priest no longer even bothers to come down to the dock when a ship arrives.

At the Arctic Circle passengers and captain of the Norweeta landed and climbed up to the well-known cairn, toasting the event and the location in Mateus!

Then on to Fort Good Hope, where a stop was made at 11 p.m. Midnight Mass was celebrated, presumably for the community as a whole as well as for communicants aboard the Norweeta and, at 6 a.m., the ship set out again upstream. The Ramparts, shown in aerial views as well as in shots from the ship, provided passengers with a thrilling experience. The country

here in all directions is impressive in its sense of vastness and apparent remoteness from all activity and development.

At Sans Sault Rapids, peaks of over 2,000 feet were visible on the horizon.

Another stop was made at Norman Wells and the speaker showed views of the river, Mr. Olsen's garden, of grounded ice at Fort Norman, and a shot of Great Bear Rock at the confluence of the Mackenzie and Great Bear Rivers. There is a base camp and an air base at Norman Wells. The Anglican Church there is now abandoned - but there is a new community swimming pool.

Then on past Old Fort Wrigley and New Fort Wrigley with views of strings of barges loaded with B.C. lumber for northern construction. At a distance below the junction with the Liard, three canoes were encountered going downstream manned - and womanned - by students using their summer holiday to paddle the explorers' route north. The speaker showed several views around Fort Liard, including a glimpse of the much-discussed new Highway.

Then on to Fort Providence and the commemorative plaque to Mackenzie (see Arctic Circular Vol. XXI, No. 3, p.179) and the monument to the Oblate Mission. At Fort Providence there is new native housing of good quality, a nursing station and a garbage pick-up service. No mention was made by the speaker of the state of the Church there, but he did note that the community had an hotel and a swimming pool.

Along the route Dr. Legget had taken many shots of geologic and geographical features: the geological structure at Point Separation; a large landslide just north of the Arctic Circle; cliffs at The Ramparts and erosion in the vicinity; examples of exfoliation; a frozen waterfall at Sans Sault Rapids, and the burning coal beds at Norman Wells, burning since the days of Mackenzie and Franklin.

Hay River was reached on Wednesday morning. Here the new $15 million dry-dock of the Northern Transportation Company has been built, emphasizing the importance still given to this water route to the North.

In the few hours remaining before take-off for Edmonton, Dr. Legget managed to make a fortunate bus connection that enabled him to visit briefly the installations at Pine Point. The drive both ways was as stimulating as it was hair-raising.

The speaker was introduced by the President of the Arctic Circle, Keith R. Greenaway (who is also Chairman of the Co-ordinating Committee for the Mont Gabriel Seminar). Mr. L.A.C.O. Hunt thanked the speaker on behalf of the club for this Arctic journey south to Yellowknife.

EVIDENCE OF EARLY MAN IN THE OLD CROW BASIN, YUKON TERRITORY

by

C.R. Harington

National Museum of Natural Sciences
National Museums of Canada
Ottawa, Ontario

My interest in the Old Crow area of the Yukon (Fig. 1) as a potential site for collecting ice age vertebrates was stimulated by talks with L.H. Green and Owen Hughes of the Geological Survey of Canada, and by an article by H.S. Bostock (1961). This interest grew following examination of small collections of mammal fossils from Old Crow River made by Vern Rampton and Corporal L.N. Bates, R.C.M. Police, in 1962 and 1965 respectively.

Peter Lord, my field assistant from the settlement of Old Crow, and I started up the winding Old Crow River on July 5, 1966. The water was low, and with a heavy load of fuel, food, camping and collecting equipment in the long river boat, we had a tough time tracking it through the rapids. No fossils were located on the lower part of the stream below the "narrows". But we soon detected fossil bone fragments on the banks farther upstream. On July 7, what appeared to me to be unusual fractures on bone and chert prompted me to remark that we should keep an eye out for human remains.

Five days later I located a small but very productive site, locality 14N, on the right limit of the stream between Schaeffer and Johnson creeks. Evidently many of the bones had been washed out of a thin sandy layer containing vertebrate remains, shells, conifer cones, wood and other organic material, onto the sticky clay of the river bank. I was totally absorbed in cleaning and examining an interesting carnivore mandible when Peter strode over with two darkly stained caribou limb bones, saying with a grin, "I guess this is what you are looking for!" One had a notched end and could have been an artifact (it wasn't) but the other was definitely a tool with a serrated edge. We discussed these discoveries with great excitement, finally managing to return to the more mundane aspects of recording the exact position of the finds, and the type, thickness and relationship of the sediments at the locality. That evening, as rain pattered on the tent roof, we kept talking about the artifact which looked like some kind of a scraper. We did not get to sleep until morning. I even recall speculating as to whether early man

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Ms. received April, 1973

could have ridden the Pleistocene horses, which had been present in large herds according to the abundance of horse bones we were finding! After locating 33 fossil sites and tracing a number of fossils back to their source beds in the sequence of strata, we headed downstream.

Fortunately Bill Irving, then an archaeologist with the National Museums of Canada, was excavating a Kutchin site on Porcupine River just upstream from Old Crow. He and his colleagues displayed great interest in the serrated caribou bone artifact which I showed him at his camp on July 23. He was particularly keen on examining locality 14N when I mentioned that the tool was found with bones of extinct ice age vertebrates such as the woolly mammoth and giant beaver and did not appear to differ from them in degree of mineral staining or preservation. Three days later, Bill, John Joe his assistant, Peter and I started up Old Crow River again and arrived at locality 14N on July 28. We made three test cuts into the fossil-bearing horizon, gathered more bones, and took photographs. No recognizable artifacts were found on that occasion, however.

When we returned from field work that year, Bill and I examined the bones collected from Old Crow River and wrote a preliminary report (Harington and Irving 1967a) on the caribou bone artifact and other items of archaeological interest for the information of our colleagues. Our initial findings were first formally reported at the 1967 meeting of the Society of American Archaeology (Harington and Irving 1967b), and later by Irving (1968). We speculated on the basis of what turned out to be flimsy stratigraphic evidence that the artifacts were over 20,000 years - perhaps even more than 40,000 years old.

Closer examination of the caribou artifact (Fig. 2) showed that someone had applied a few glancing blows to the upper tibial shaft of a small caribou. The edges of the resulting fracture had then been pared down with a sharp stone cutting tool, and the spatulate "blade" was notched to form about 12 tines or teeth, 8 of which are preserved. Interestingly, Manitoba Ojibwa still make similar fleshing tools from moose metapodial bones (Steinbring 1966). They are used to remove excess tissue on the inside of a hide. The serrated edge serves to catch and force stringy residue from the surface.

Bill and I decided we had to try to obtain radiocarbon dates on some of the bone worked by man, despite the fact that it meant sacrificing much or all of the specimens (Irving 1968). Our decision was prompted by the fact that W. Blake Jr. of the Geological Survey of Canada had found that wood samples from the oxidized sand layer which produced the artifacts contained both old (over 40,000 years old) and young wood, suggesting that the deposit itself was relatively recent. Obviously the older wood and bones of extinct animals had been reworked from older horizons upstream. This idea was supported by Tom Hamilton's careful stratigraphic study of

locality 14N in the summer of 1967. He concluded that the fossiliferous sediments there were point bar deposits, formed within the last few thousand years. Therefore, the caribou flesher and two worked fragments of mammoth limb bone were sent to Geochron Laboratories for radiocarbon dating after good casts had been made.

On October 24, 1969, Bill received a radiocarbon date of 27,000(+3000/-2000) years B.P. on the bone apatite fraction of the caribou flesher. Fortunately, the original worked blade of the tool could be saved, and it is now preserved in collections of the National Museum of Man, Ottawa. Dates on a mammoth long bone fragment and the upper end of a mammoth radius, both of which had flakes removed by heavy blows when fresh, were 25,750(+1800/-1500) years B.P. and 29,100(+3000/-2000) years B.P.,respectively. I had previously received radiocarbon dates on the bone collagen fractions from unworked fragments of mammoth femur (22,600 ±600 years B.P.) and bison humerus (33,800 ±2000 years B.P. from locality 14N. In 1970 Bill Irving communicated this information at meetings of the Canadian Archaeological Association in Ottawa during March, the Society for American Archaeology in Mexico during April, and the American Anthropological Association in San Diego during November. The paper on which the last talk was based was revised and published (Irving 1971). I also alluded to the finds (Harington 1970, 1971). These five radiocarbon dates suggest that caribou, mammoth, bison and man lived in the northern Yukon during the period from 22,600 to 33,800 years B.P.

In addition to plant, shell, fish and bird remains, 18 species of mammals have been identified from locality 14N, 10 of which no longer exist in the Yukon Territory. The faunal material consists of: (a) a cold-adapted component including a number of species derived from Eurasia (e.g. woolly mammoth, caribou, bison, moose, and arctic fox), and (b) a warmer-adapted component derived from southern North America (e.g. camel, giant beaver, and mastodon). At present I think that the mammalian faunal evidence indicates a period of transition to a cool climate from a warmer one, but other interpretations are possible. Finally, we (Irving and Harington 1973) presented the radiocarbon and associated information, concluding that man evidently lived in the eastern part of Beringia before the peak of the late Wisconsin glaciation. He had sharp stone tools for working bone and means of breaking large mammoth bones. Probably he hunted mammoth and caribou and prepared caribou skins for use as clothing and perhaps shelter. Furthermore, the advanced nature of bone work on the fleshing tool suggests that in Beringia the transition from Middle Paleolithic to Upper Paleolithic levels of technology occurred at a relatively early date.

Other interesting ice age mammal remains from Old Crow Basin that appear to be artifacts have been collected by National Museums of Canada field parties during the last few years. The front of a male horse mandible bearing several ground or polished facets (Fig. 3) is worth mentioning. All archaeologists who have seen the specimen agree that the facets were

made by man before the bone became mineralized (Irving 1971). Hanjürgen Müller-Beck of the University of Freiburg (personal communication, 1970) remarked that the incisor teeth had been removed and that the sockets had been worked by man. Perhaps the specimen had some ideological value for its maker, as it is difficult to conceive of a practical use for it. In 1971, Charlie Thomas, my assistant from Old Crow, excavated a finely flaked, black obsidian biface (Fig. 4) at locality 20 near the mouth of Black Fox Creek. Many specimens of extinct Pleistocene vertebrates were found in the same sandy gravel deposit - probably similar in nature to the fossil-bearing horizon at locality 14N. The obsidian is reminiscent of that found at Batza Tens in central Alaska. Future analysis of its mineral composition may help to indicate its source. The age of the specimen is unknown. At locality 29, near the mouth of Timber Creek, I found a grayish chert flake which may have been struck from a core, and the lower part of a caribou antler which has four well-defined facets on its base (Fig. 5) which may have been made by man. I speculate that the latter specimen could have been used as a pestle (see, for example, Kitching 1963, p.46).

In 1973 a black chert biface (Fig. 6) was excavated from a depth of one foot in a gravel bar at locality 11A, which is downstream from the mouth of Schaeffer Creek. Its maximum measurements are 80 mm. long, 43 mm. wide and 10 mm. thick. The fact that one edge of the artifact is more heavily flaked than the other may indicate that it was used as a knife. Although many Pleistocene vertebrate species were found in the same gravel deposit, the age of this artifact is unknown.

All these finds have been transferred to the National Museum of Man for more detailed study by archaeologists.

The Old Crow basin appears to be the richest Pleistocene vertebrate locality in Canada. I plan to continue a long range program of collecting there for the National Museums of Canada in order to build up a clearer picture of the kinds of animals and environments that occurred in eastern Beringia (Fig. 1) during the ice age. Who knows, a complete mammoth preserved in permafrost, or remains of early man himself may be awaiting us!

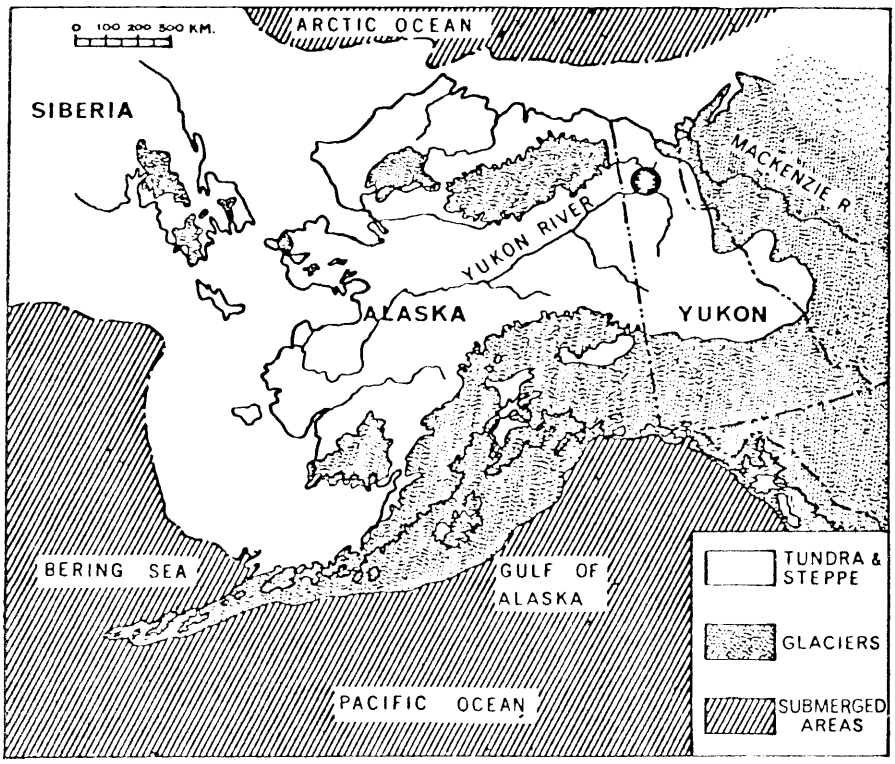


FIG. 1 EASTERN BERINGIA AT PEAK OF LAST GLACIATION — BLACK DOT MARKS OLD CROW AREA

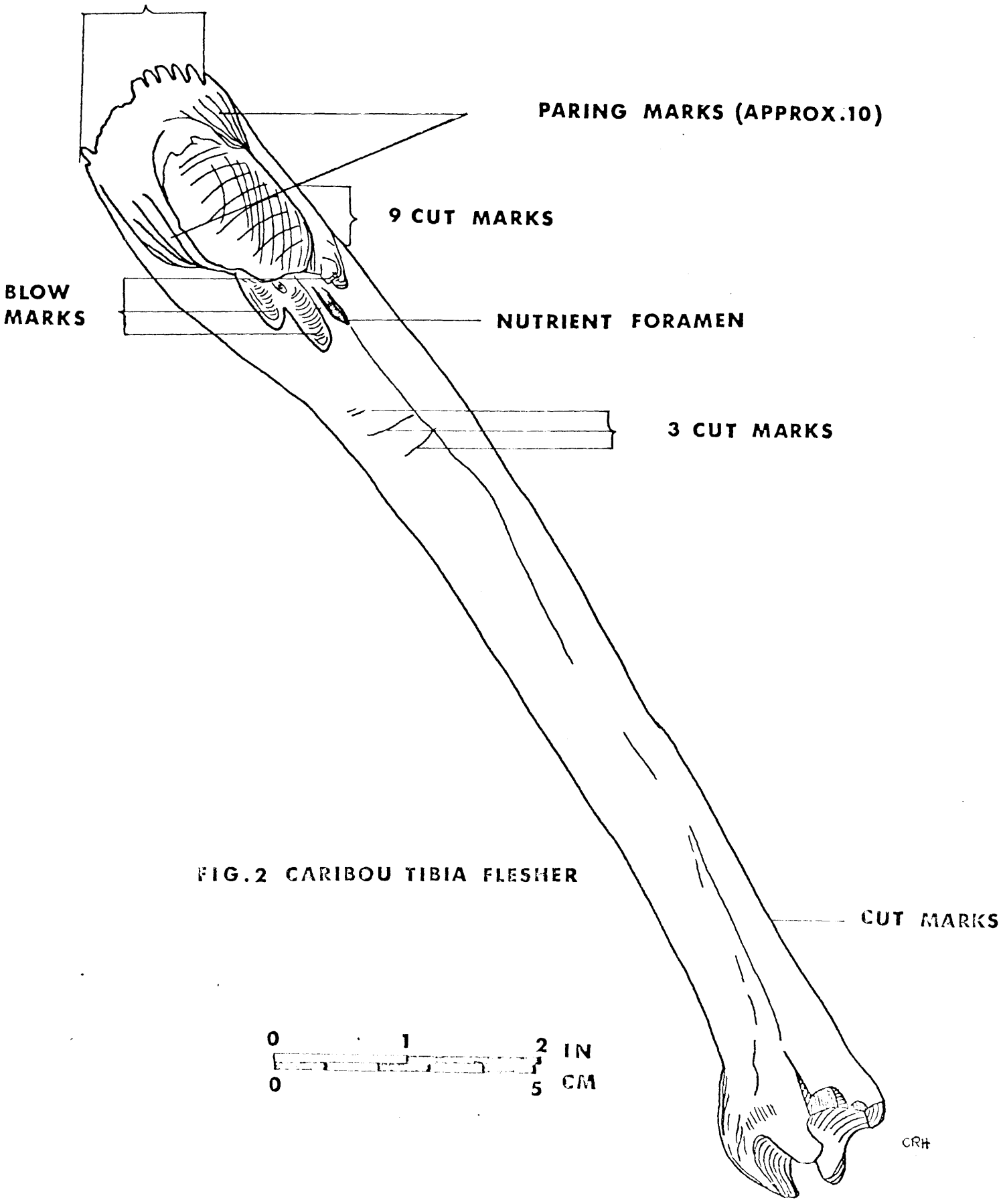


FIG. 2 CARIBOU TIBIA FLESHER

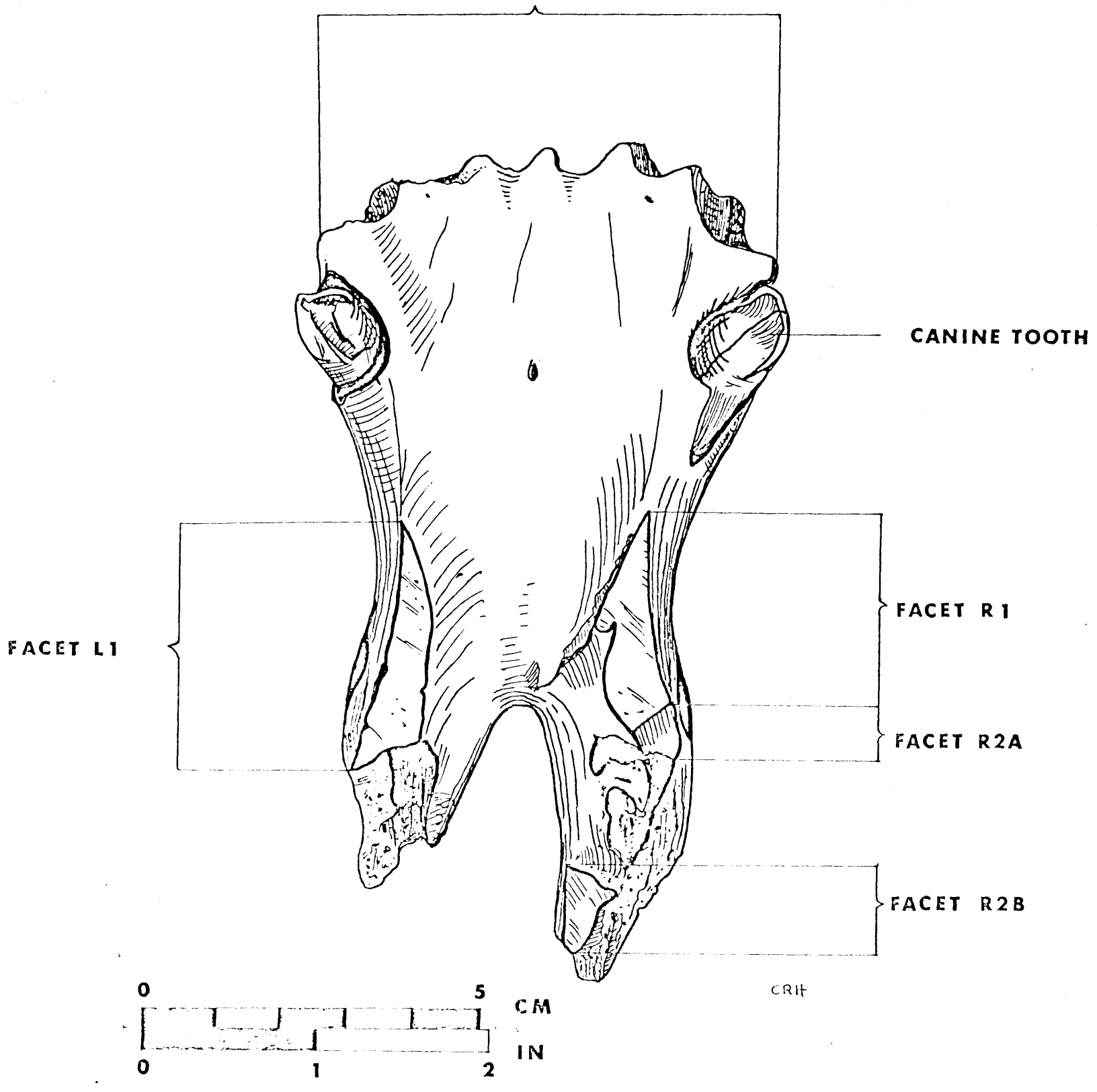


FIG. 3 TOP VIEW OF HORSE MANDIBLE FRAGMENT WITH FACETS

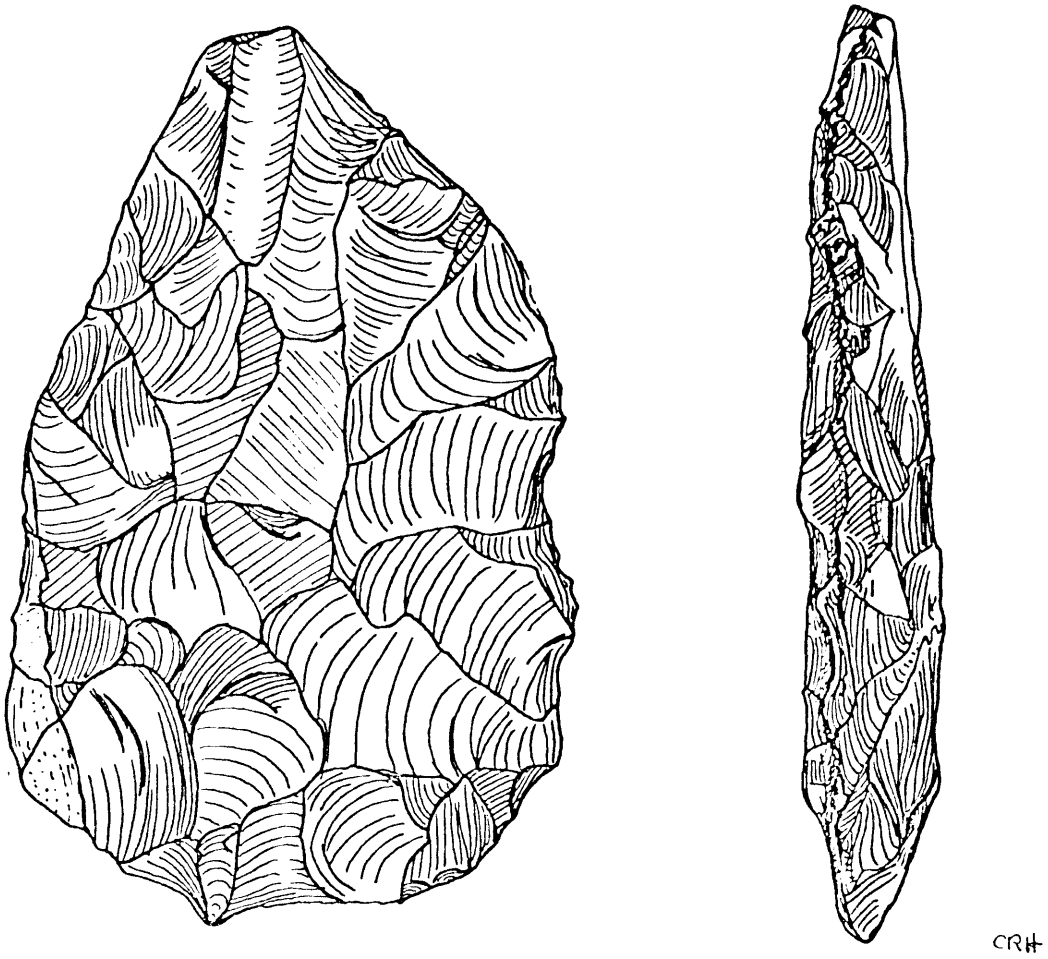


FIG. 4 BLACK OBSIDIAN BIFACE

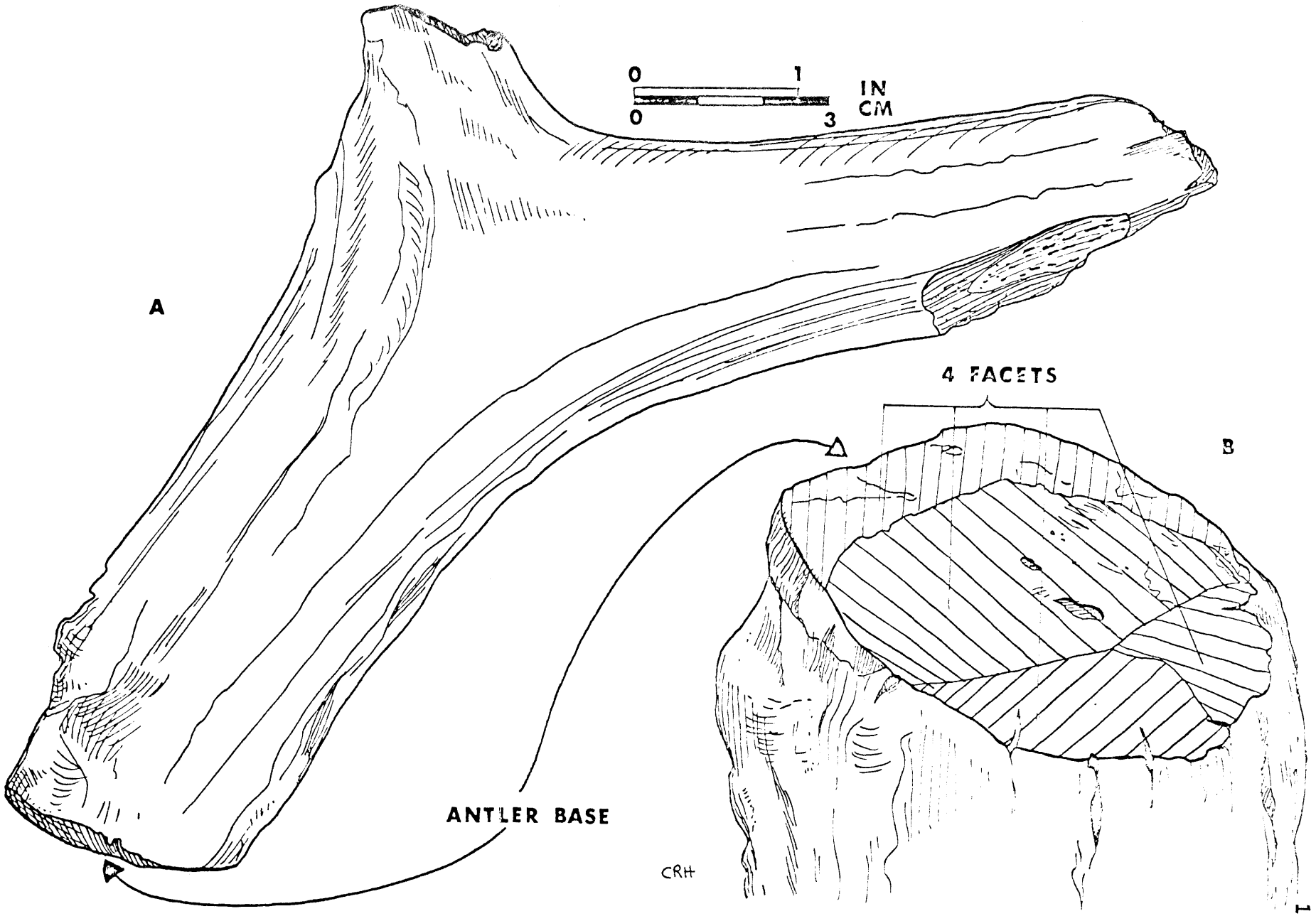
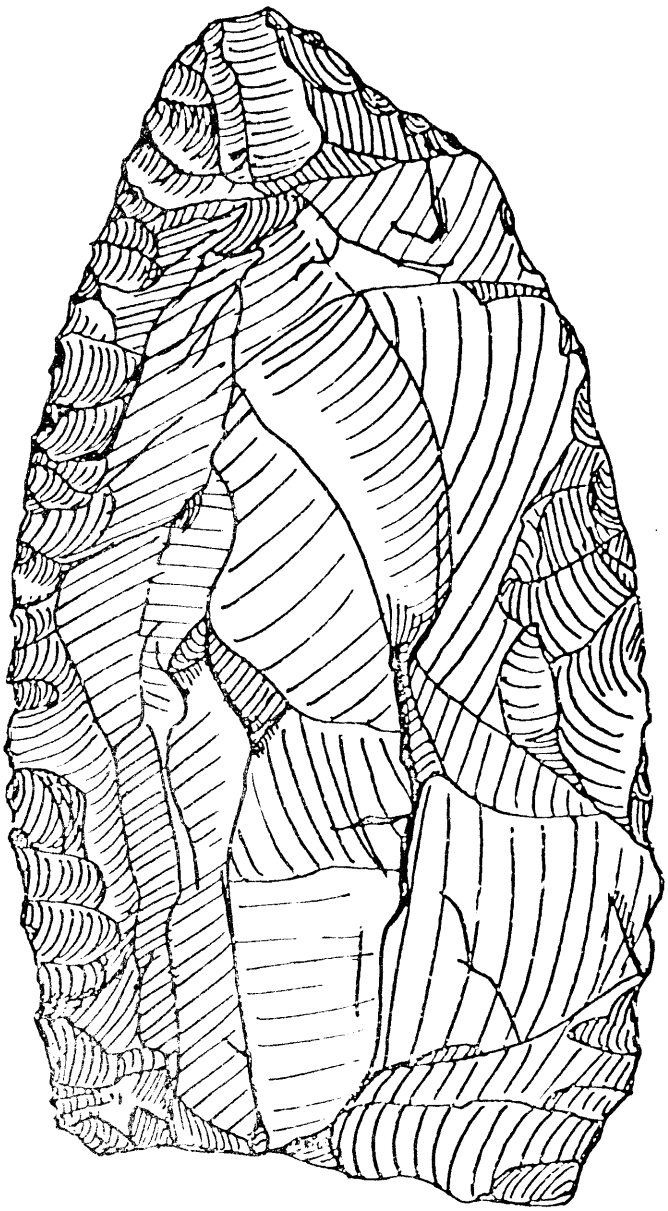


FIG. 5 SIDE VIEW OF CARIBOU ANTLER ARTIFACT (A) — DETAIL OF FACETS ON BASE (B)



CRH

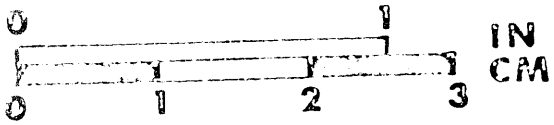


FIG. 6 BLACK CHERT BIFACE

FRONT VIEW

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EXPLORATION ACTIVITIES NORTH OF 60° - 1972

Oils and Minerals Branch
Department of Indian Affairs and Northern Development

Land

Significant applications for oil and gas permits have been received for some 41 million acres in the Wollaston and Victoria Straits Basins and offshore on the Western Arctic Islands and Baffin Bay. On the mainland, applications were received for the area north of Great Bear Lake. Scattered acreages in small lots were filed by several companies and individuals.

Permits were surrendered or cancelled along the periphery of many basins on the mainland and Arctic Islands. Several million acres of permits were also surrendered in the Peel Plateau area. Leases were surrendered in the southern Northwest Territories.

Expenditure

Figures 1, 2, 3, and 4 graphically depict exploration activities North of 60° in 1972. Expenditures on oil and gas exploration in the Northwest Territories and Yukon Territory exceeded $238 million in 1972, an increase of $58 million over the previous year. Exploratory and development drilling increased nearly 60 per cent up to $126 million, while total geological and geophysical expenditures increased 10 per cent to over $100 million. Expenditures for exploration drilling and seismic exploration exceeded similar work in every province, and the combined Atlantic and Pacific offshore areas.

Figure No. 1 indicates that expenditures increased by 35 per cent in 1971 and by 32 per cent in 1972. Indications in early 1972 are that these expenditures will again increase in 1973, best estimates are that they may approximate $250 million. By 1975, expenditures related to oil and gas activities should reach $300 million per year. With the advent of development drilling in the Mackenzie Delta and possible construction of the Mackenzie Valley Gas Pipeline, expenditures in the late 70's may exceed $1 billion a year.

Seismic crew-months, depicted in Figure 2 is an excellent barometer of the magnitude of the drilling activity for the next two years. In 1972, oil companies conducted 240 crew-months of seismic work in land and marine areas, increasing the level of work from the previous year by about 10 per cent. This would indicate a moderate increase in drilling activities in 1973.

Fig. 1

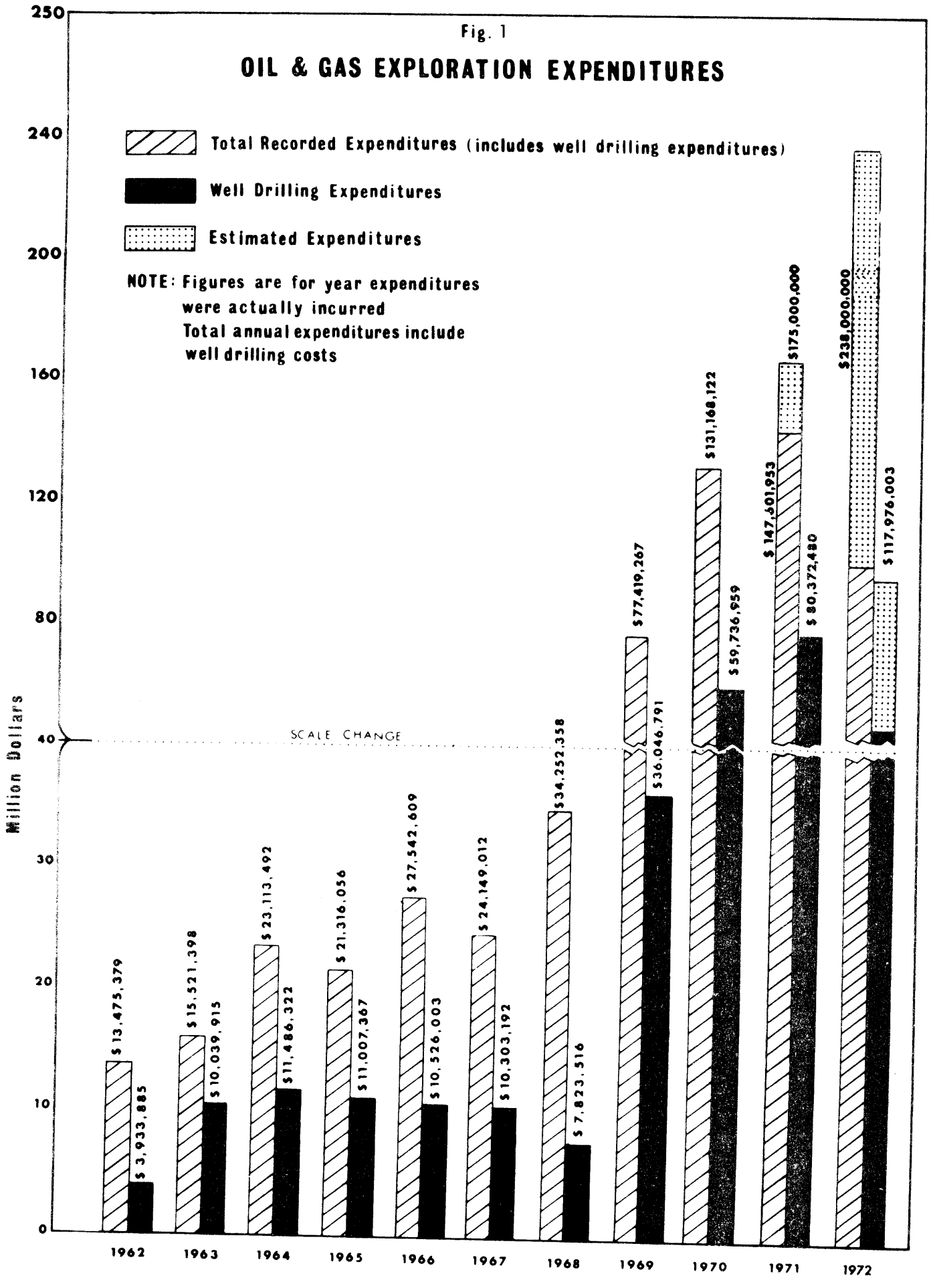
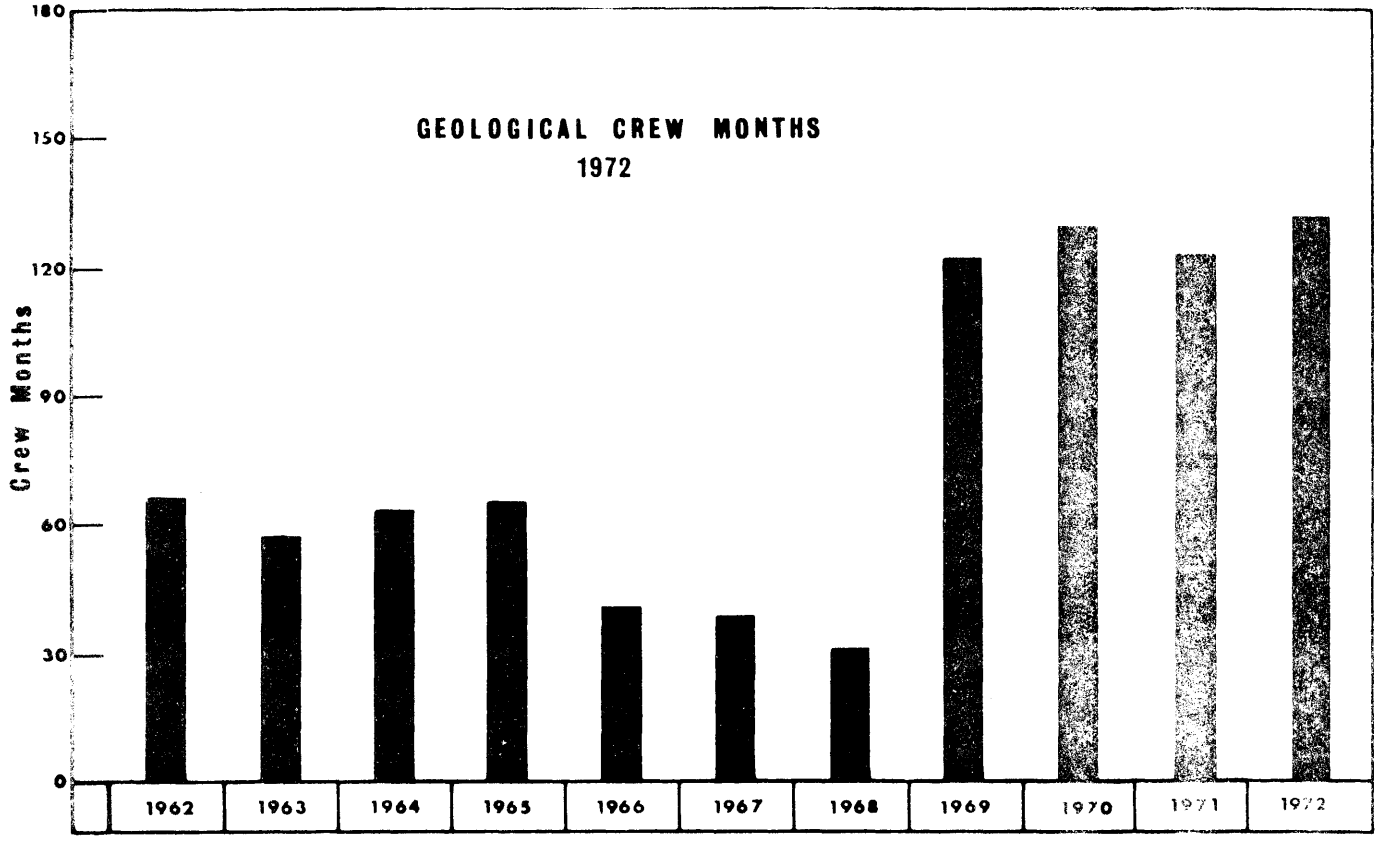

OIL & GAS EXPLORATION EXPENDITURES
Total Recorded Expenditures (includes well drilling expenditures)
Well Drilling Expenditures
Estimated Expenditures
NOTE: Figures are for year expenditures were actually incurred
Total annual expenditures include well drilling costs
Million Dollars
SCALE CHANGE
$13,475,379
$3,933,885
$15,521,398
$10,039,915
$23,113,492
$11,486,322
$21,316,056
$11,007,367
$27,542,609
$10,526,003
$24,149,012
$10,303,192
$34,252,358
$7,823,516
$77,419,267
$36,046,791
$131,168,122
$59,736,959
$147,601,953
$80,372,480
$175,000,000
$238,000,000
$117,976,003
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972

Fig. 2

EXPLORATION ACTIVITY

YUKON TERRITORY AND NORTHWEST TERRITORIES



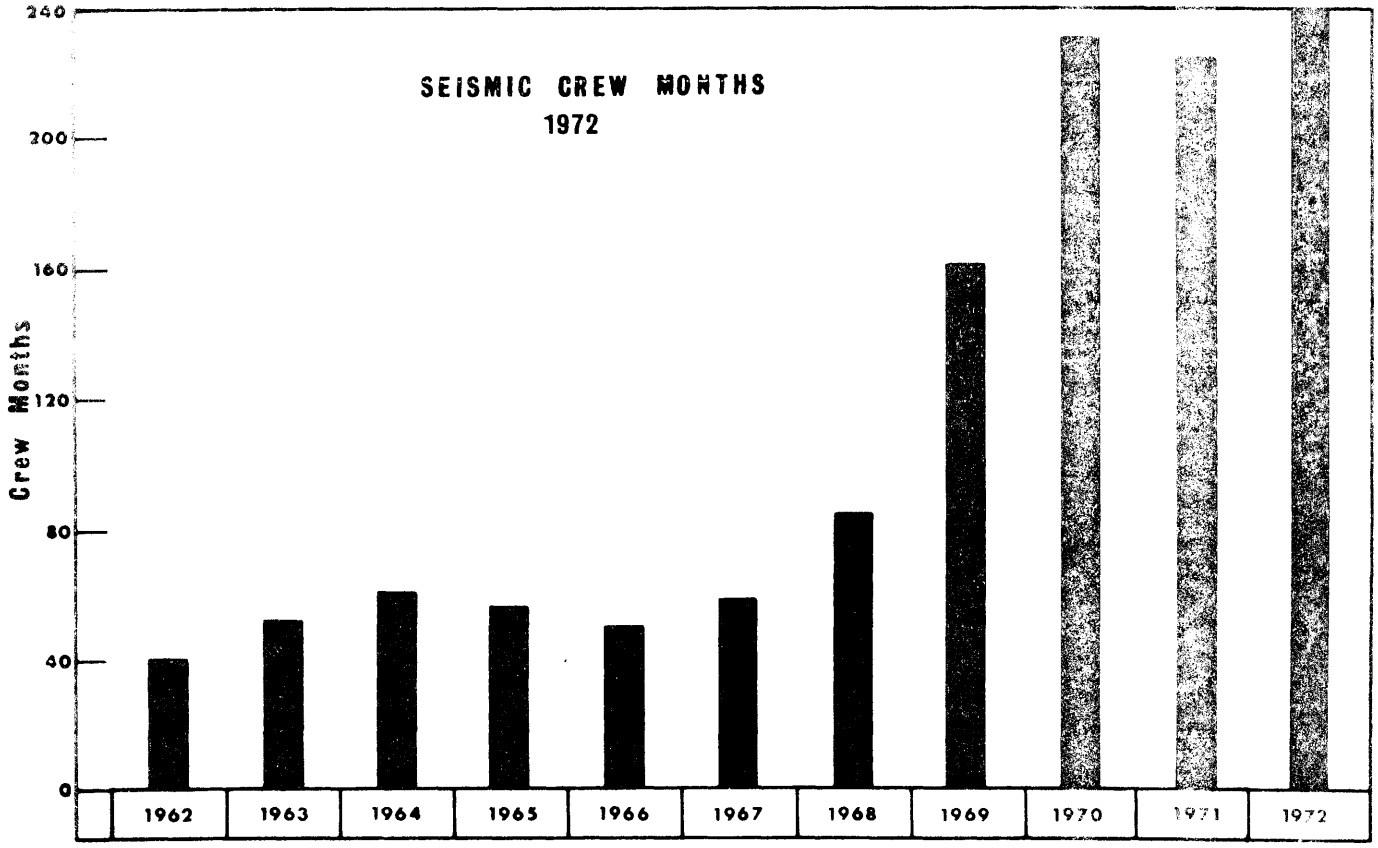


Fig. 3

WELLS DRILLED

YUKON TERRITORY - NORTHWEST TERRITORIES

Number of Wells Drilled to end 1972 ,651

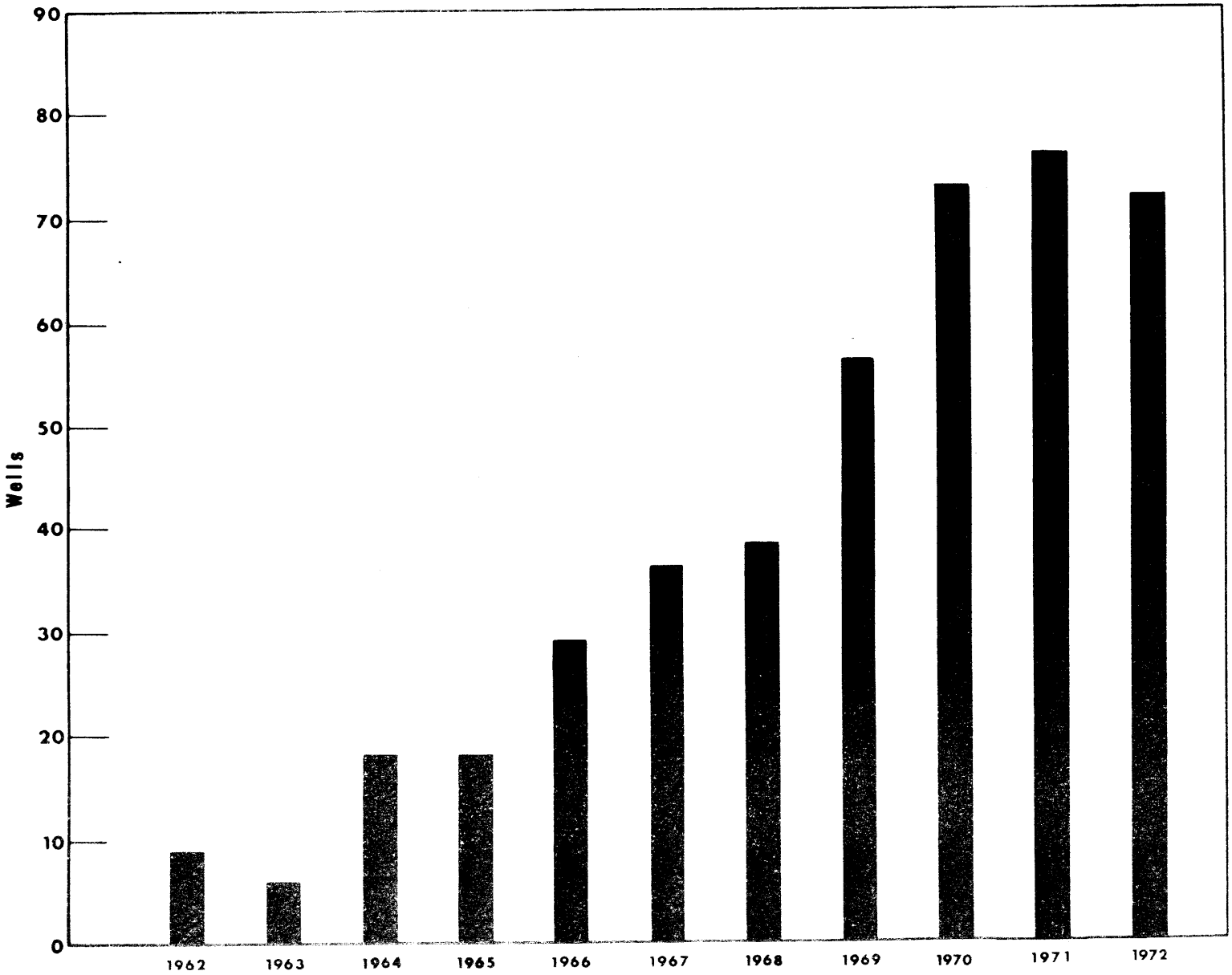
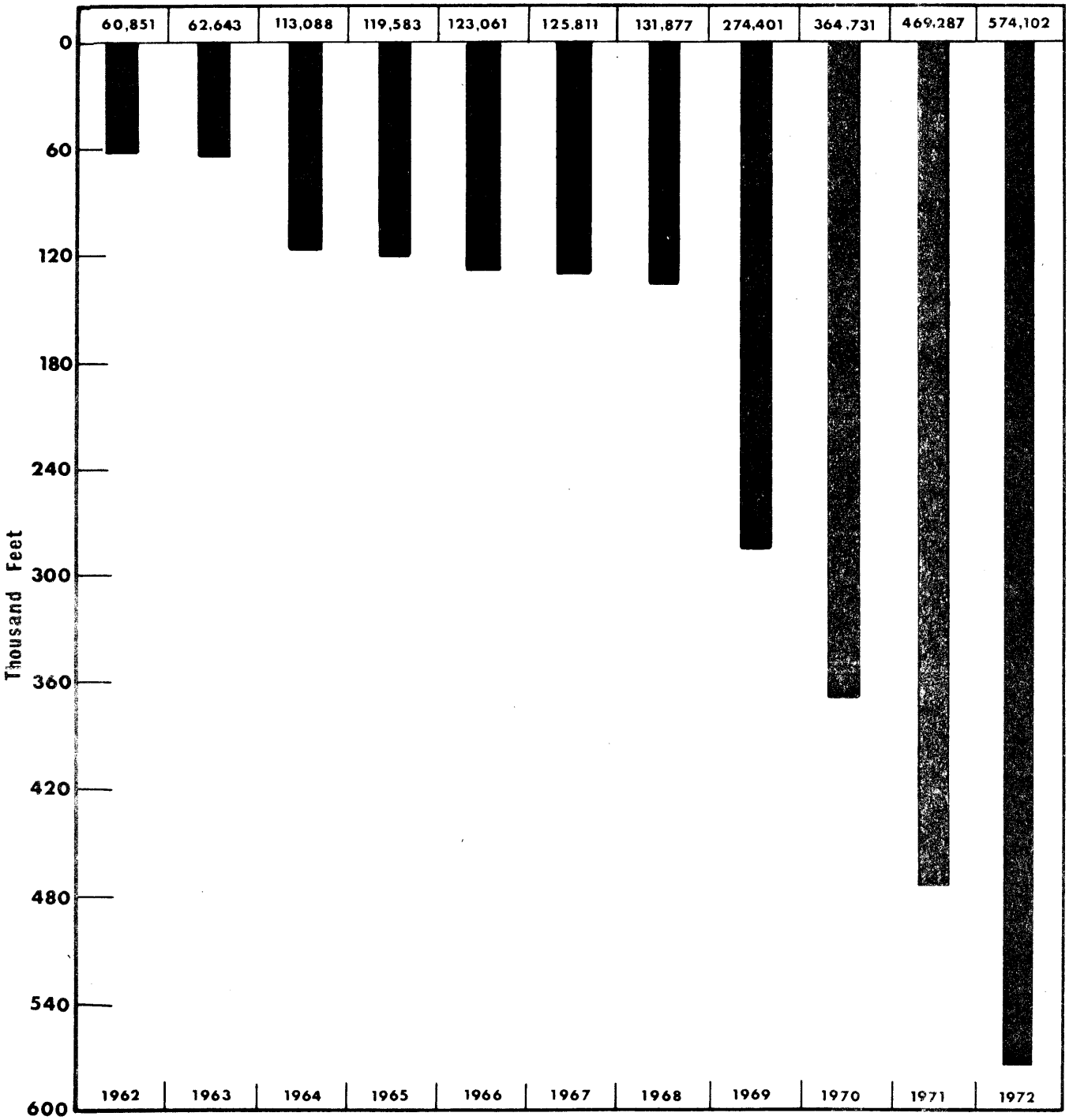


Fig. 4

FOOTAGE DRILLED

YUKON TERRITORY AND NORTHWEST TERRITORIES



Figures 3 and 4 illustrate the number of wells drilled and the amount of footage drilled during the past ten years. Note that footage increased by five times the 1968 total. This is also reflected in the expenditure increase for drilling in that there has been a 16-fold increase in drilling expenditures during the same interval. The large increase in drilling expenditures is attributed to the high cost of drilling wells on the Arctic Islands and in the Mackenzie Delta, and about one-half of the wells drilled were in these frontier areas.

Exploration

Surface geological and photogeological surveys totalling 140 geological crew-months, were carried out on Canada Lands North of 60^{o}. Participation surveys by V. Zay Smith and Associates, Kenquest Exploration Limited and J.C. Sproule and Associates contributed significantly to the total surface exploration program. Imperial Oil Ltd. and Chevron Standard continued surface exploration in the northern Yukon Territory and Northwest Territories, while Panarctic Oils Ltd., ARCO, and Canada Cities Service continued major mapping programs on the Arctic Islands.

Seismic activity was general over many of the geological basins in the North. Detailed seismic work was carried out by many companies in the southern part of the Northwest Territories and in the Eagle Plain area. Imperial Oil Enterprises, Gulf Oil Canada Ltd., Shell Oil Canada and Bow Valley continued to carry out large reflection programs along the Arctic Coastal Plain and in the Mackenzie Delta-Tuktoyaktuk areas. Five reflection seismic participation programs were initiated in the Delta during the current season, participation was received from approximately 30 companies. In the Arctic Islands, major seismic programs were continued by Elf Oil, Canada, on Banks and Prince Patrick Islands while Panarctic Oils Ltd., Sunoco Company, and Imperial Oil Ltd., utilizing approximately 10 seismic crews, continued large scale reflection seismic programs over most of the Arctic Islands.

Drilling activity was highlighted by large and extensive drilling programs in the Tuk-Delta area and Arctic Islands. In the Tuktoyaktuk area, Imperial Oil continued to drill stratigraphic and development tests. In June 1972, Imperial announced that its IOE Taglu C-42 and Mallik A-06 encountered gas in significant volume on tests. Gulf-Mobil made a significant gas discovery in their Parsons F-09 well and in their Kilagmiotak F-48 well. In the Arctic Islands, Panarctic Oils Ltd. drilled successful gas wells on Ellef Ringnes Island, Panarctic et al Kristoffer Bay B-06; on the Sabine Peninsula, a significant gas discovery was made in the Hecla F-62 well, extensions to the Drake Point Gas Field were made by successful completions in their Drake F-16 and B-44 wells. Panarctic also announced that oil flowed to surface from the 3,800 foot level in its Thor F-28 well.

In the Yukon Territory, Chevron Standard drilled and abandoned seven wildcat tests on the Eagle Plain without finding hydrocarbons. Additional wells by Inexco in the Eagle Plain and by Skelly and Pacific on the Peel Plateau failed to recover hydrocarbons.

The number of "wells drilled" and seismic "crew-months" will increase during 1973. Extensive marine seismic programs will be carried out in the Beaufort Sea, in Lancaster Sound, and in the Baffin Bay-Davis Strait areas. Reflection seismic activity will also increase in the Arctic Islands by Panarctic Oils Ltd., Sunoco, and Dome Petroleum Limited, and the wildcat and development drilling in the area by the major companies will increase the number of wells drilled to at least 90 in 1973. Drilling activity and seismic activity will maintain the same level in other areas and total exploration expenditures may exceed $250 million in 1973. With the advent of major pipeline construction in the middle and late 70's, expenditures for oil activities in the North may approximate $1 billion a year.

STUDY GROUPS CONCERNED WITH NORTHERN DEVELOPMENT AND OIL TRANSPORTATION

With the discovery of oil and gas in commercial quantity at Prudhoe Bay, Alaska, it was quickly realized that a new era in northern development was about to open and that the thinking and planning of the last several decades would be inadequate to meet the requirements of tomorrow. It is expected that similar finds of commercial significance will be made in the Canadian Arctic, particularly in the islands of the Archipelago, as a result of the intensive explorations now planned or actually in progress in 1972.

The discovery of large oil fields, so far removed and isolated from the industrial centres of the continent, will pose serious problems of transportation, and the solutions of these problems are likely, in their turn, to give rise to equally serious considerations regarding the effect of all this development on the economic, social and environmental conditions in the North, as well as on the national outlook in general.

Groups are already giving serious consideration to these problems and arriving at proposals, cautionary recommendations or general overviews. The composition of these groups may vary widely and includes, in addition to those with long and practical experience in the North, scientists, technicians, engineers, social workers, environmentalists and even government administrators. Although research is being carried out at present, and although some proposals have been put forward, it cannot be too strongly stressed that, as of now, no truly significant finds of oil have been discovered aside from those on the North Slope of Alaska. There have been encouraging smaller finds in the Mackenzie Delta as well as indications of what may be considerable gas reserves on some of the northern islands. Under these circumstances, therefore, no proposal has been officially accepted, no authorizations have been granted for anything other than exploratory operations, and no request to develop oil fields or construct pipelines has been officially received.

It is, however, of interest to consider some of the various lines of thought and planning that are converging on the problems of northern development. Foremost among the problems to be solved, is that of transportation. For the southward movement of oil and gas from the Alaskan North Slope and the Mackenzie Delta, pipelines are receiving prior consideration and research. Whether this would be an equally satisfactory means of transport should oil be discovered in large quantities in the islands north of Parry Channel, is yet to be evaluated.

In the meantime, the Great Plains Committee has suggested, through its spokesman Captain T.C. Pullen, former captain of the icebreaker HMCS Labrador, an alternative or supplementary proposal. Captain Pullen, it will be remembered, is well acquainted with ice and navigation conditions in Canada's Arctic waters both through his experience aboard the Labrador and as observer aboard the Manhattan on her epic voyages in the Canadian North.

Great Plains Committee proposal

The two main points considered in the proposal of the Great Plains Committee are:

1) the establishment of a northern base for large transport operations,

and

2) the actual means of transport practical for this region.

It is considered that the first requirement would be met by the creation of a new deepwater port - "Northport" - in northern Hudson Bay, that could accommodate the huge icebreaking tankers necessary to transport the crude oil to markets in America and abroad. The site suggested would be centrally located in the Arctic in the vicinity of the present settlement of Chesterfield Inlet. Here the required water depths of 90 feet are to be found and from here advantage could be taken of the stretches of open water or fields of more loosely packed ice in Northern Hudson Bay and Hudson Strait. The more closely packed ice in the Bay itself, the capacity and depth limitations of the harbour at Churchill as well as the ice conditions in its immediate vicinity, combine to make that port unsuitable for consideration in this plan.

The second requirement, the means of transport, could it is felt be economically and successfully met mainly by powerful, icebreaking tankers 1200 feet or so in length and requiring a 90-foot depth of water for berthing. They would be approximately 150,000 tons and would be driven by engines delivering 120,000 shp. Such vessels are considered capable of coping with winter ice conditions - without the aid of icebreakers. In fact they would be their own icebreakers! They would thus be able to assure year-round transport for the area. The port itself could also be used by thin-skinned ships during the summer navigation season.

From areas where it would not be feasible to navigate or load these large tankers and where overland/underwater pipelines to "Northport" would not be practical, the Great Plains Committee proposal envisages the use of huge resource-carrying planes to transport the oil to "Northport". An airport at "Northport" would be necessary in any case, but it is estimated tanker planes of the type considered here would require runways 15,000 feet long and 400 feet wide, the whole airport complex covering about 15,000 acres. It is also expected that, should "Northport" be built, the rail line from Winnipeg to Churchill would be upgraded and extended to "Northport".

The Committee admits the cost of such an undertaking would be enormous but points out that if a provincial government (Quebec) can undertake a $6 billion project for power development, surely the federal government can plan for an undertaking like "Northport" which would have tremendous impact both nationally and on the future of the Arctic.

Canadian Northern Pipeline Research Conference

Another approach to the problems of oil transportation and northern development is illustrated in the Proceedings of the Canadian Northern Pipeline Research Conference held in Ottawa 2-4 February 1972, under the auspices of the National Research Council of Canada, Associate Committee on Geotechnical Research. There were over 500 registrants. As the title indicates, the transportation considerations were limited to pipeline construction, maintenance and effects, mainly in the Western Arctic. The Proceedings, published as Technical Memorandum 104 (NRCC 12498, priced $5.00) are reviewed later in this issue (pp. 149-153).

Science and the North

Yet another look at what is or may be involved as a result of actual or potential oil discoveries and northern development was taken at Mont Gabriel, P.Q., 15-18 October 1972 at a seminar on guidelines for scientific activities in northern Canada, sponsored by the sub-committee on Science and Technology, Advisory Committee on Northern Development. This seminar was organized by its working group on Scientific Guidelines, whose Chairman is Keith R. Greenaway. A report containing background and other relevant material will be published shortly and will be reviewed in a future issue of the Arctic Circular. A general outline of the seminar objectives and of the scientists and other specialists participating appeared in Arctic Circular Vol. XXII, No. 2, 97-98.

Task Force on Northern Oil Development by C.T.W. Hyslop

To tender advice to the Federal Government on all aspects of northern oil development, transportation and marketing, and particularly on the impact of pipeline construction in the Yukon and Northwest Territories, a Task Force on Northern Oil Development was set up in December 1968. Its ultimate objectives were: the economic recovery and exploitation of present and future finds of northern oil and gas; the provision of adequate protection for the northern environment; maximum employment opportunities for northern citizens.

The Chairman of this Task Force is J.C. Austin, Deputy Minister, Energy, Mines and Resources, and the members are: H.B. Robinson, Deputy Minister, Indian Affairs and Northern Development; R.F. Shaw, Deputy Minister, Department of the Environment; O.G. Stoner, Deputy Minister, Ministry of Transport; and R.D. Howland, Chairman of the National Energy Board.

Long-term plans call for the organization and appraisal of studies necessary for optimum development of northern oil resources and for the ensuring of adequate government supervision and control over activities related to such programs. With industry plans under consideration for the building of oil and gas pipelines from the Far North, the Task Force will be carrying on a continuing review and appraisal of activity to ensure that industrial programs are in the national interest.

During 1970, the Task Force drafted the first northern pipeline guidelines. These guidelines, made public by government in August 1970, established requirements ranging from environmental protection and pollution control, to training and employment of residents of the North. They apply to such concepts as common carrier service and contract carrier service for pipelines as well as to corridors in which these lines would be built. They also state that provision must be made to permit Canadians to have an opportunity to participate substantially in the financing, engineering, construction, ownership and management of northern pipelines. The satisfying of these provisions will be an important factor in Canadian government evaluation of proposals for such pipelines.

In June 1972 expanded guidelines for the construction and operation of oil and gas pipelines in the Yukon Territory and the Northwest Territories were tabled in the House of Commons by the Minister of Indian Affairs and Northern Development[1]. They cover environmental, social and corridor concept implications and their tabling gave an

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(1) Expanded Guidelines for Northern Pipelines, Pamphlet No. 72-3, available on request from the Department of Indian Affairs and Northern Development.

opportunity for all interested groups and individuals to make representations before the guidelines themselves are brought into force.

Oil exploration, stimulated by the Prudhoe Bay finds in Alaska and further encouraged by gas discoveries in the Canadian Arctic Islands and some oil discoveries in the Mackenzie Delta, is increasing at a rapid pace. In 1971, about $150 million were spent in the North on exploration alone - more than in any other region of Canada. In 1972, the figure was close to $200 million.

Although all this activity may be successful in discovering commercially significant finds of fossil fuels, it has also created a number of social and environmental problems. The solving of these problems will require considerable effort by all concerned, not by the government alone, if the North is to be developed in a manner that will benefit all. Here is where the major responsibility of the Task Force lies.

To enable its members to advise the government on matters of national interest, the Task Force maintains an on-going appraisal program of the exploration, transportation and market developments and other activities related to northern oil exploitation. Emphasis has been placed on co-ordination of research in the fields covered by the six committees listed below. Various departments and agencies are represented on these committees, and representatives of other interested departments, as well as the governments of the Yukon and the Northwest Territories, participate in some deliberations.

Pipeline Engineering Committee - (chairman: J.R. Jenkins of the National Energy Board) - appraises all engineering matters relative to the proposed oil and gas pipelines in the North. Emphasis is on construction procedures, and on design and operational criteria. Close touch is maintained with gas pipeline study groups in consortiums that have declared themselves as possible applicants to build a gas pipeline from Prudhoe Bay across the Yukon and the Northwest Territories to continental gas markets. Liaison is also maintained with the consortium of oil companies carrying out research for the building of an oil pipeline in the Canadian North, and meetings have been held with the United States oil companies planning to build the trans-Alaska pipeline. The Committee maintains close contact with associations such as the Canadian Standards Association, which determines the specifications for pipeline materials.

Economic Impact Committee - (chairman: H.G.R. Taylor of the Department of Finance) - carries out studies to determine the expected impact on the Canadian economy of building and operating northern pipelines. The cost of building a gas pipeline, for example, from Prudhoe Bay through the Yukon and Northwest Territories to the international boundary has been estimated at more than $3 billion, perhaps as high as $5 billion. Studies carried out by the Committee are concerned with employment benefits, regional impacts, balance-of-payments and exchange-rate effects, investment impacts, and availability of finances. In short, the Committee considers the question of whether or not construction of a northern pipeline would be an asset or a liability to the national and local economy, and determines the nature and scale of the benefit-cost ratio.

Transport Committee - (chairman: M.G. Hagglund, of the Ministry of Transport) - advises the Task Force on matters relating to the transport of oil and gas by means other than pipelines, i.e. rail, road, water, or air, and to the transport support services required. In 1969 and 1970, it focussed most of its attention on the voyages of Manhattan and on the possibilities of using the Northwest Passage for commercial shipping. Currently, it is studying the location and conditions of deepwater harbours in the Arctic. It is also assessing various proposals for transporting oil and gas from the North by means such as rail or specially designed aircraft.

Marketing Committee - (chairman: J.G. Stabback of the National Energy Board) - is responsible for assessing the impact of northern oil and gas on the energy supply-and-demand patterns of North America. It has, for instance, determined the extent to which the Pacific Coast states of the United States could accommodate Prudhoe Bay oil, and the related price effects. It has also estimated and analyzed possible effects of the laid-down cost of northern oil in such major continental markets as Chicago and Toronto.

Industrial Supply Committee - (chairman: R.G. Stead of the Department of Industry, Trade and Commerce) - is responsible for assessing the capability of Canadian industry to supply the goods and services required for the design and construction of northern pipelines. It also attempts to determine attainable levels of content for pipeline construction by Canadian industry sectors that are commensurate with economically sound, stable industrial growth within those sectors.

Environmental-Social Committee - (chairman: A.D. Hunt, Department of Indian Affairs and Northern Development)- is responsible for environmental and social research programs in the Mackenzie Valley and northern Yukon in which the Government of Canada is involved. The programs are multi-disciplinary and include field and laboratory research by sociologists, economists, geologists, geographers, geophysicists, cartographers, biologists, and specialists in forestry, water resources and wildlife.

A full-time project director, A.J. Reeve, was appointed to coordinate the research program of this committee. In late 1970, the program was approved for a three-year term and an expenditure of up to $5 million annually was provided for 1971, 1972, and 1973.

General Comment

Some of the questions currently being dealt with by the Task Force on Northern Oil Development include:

- At what rate should petroleum development take place in the North from the point of view of the people who live there and who are confronted with the tremendous task of adjusting to a new technological culture that is being imported from the south?

- At what rate - and with what precautionary measures - from the point of view of the environment and its ability to recover from the passage of man and the machine, should this development proceed?

- At what rate, from the point of view of the consumption and utilization of the natural resource base of the region, should this development be permitted?

* * * *

To provide further information on which these various committees can base their findings, the N.R.C. Conference and the seminar referred to earlier in this article were held during 1972.

HISTORICAL NOTICE

Herschel Island an Historic Site

A letter to the Editor, Arctic Circular, from Mr. Peter H. Bennett, Secretary of the Historic Sites and Monuments Board of Canada, dated 10 January, 1973, reads as follows ". . . I am glad to advise you that the Minister has now accepted the recommendation of the Historic Sites and Monuments Board of Canada regarding Herschel Island, which reads as follows:

> that the assertion of Canadian sovereignty in the Western Arctic, the whaling industry in the Western Arctic and the intercultural contact at Herschel Island are events of national historic significance and should be commemorated at that location."

THE PULLEN RECORDS

In 1845, the British Admiralty decided to send a naval expedition under Sir John Franklin to attempt the navigation of the Northwest Passage. So much exploration of the coastline had already been completed by this date that it was confidently expected the voyage would end in success. It ended, as later events were to prove, in tragedy.

Prior to his 1845 expedition, Franklin had made two journeys of exploration along these arctic coasts: 1819-1822 he and his party, proceeding overland from York Factory on Hudson Bay had mapped some 550 miles of new coastline in the Bathurst Inlet - Coronation Gulf areas; then in 1826-27, after an overland journey from New York, Franklin and his party had established winter quarters on Great Bear Lake and in the spring had set out to explore the Arctic coast. At Point Separation the party had divided, one group under Franklin had followed the western channel of the Mackenzie to the sea and from there proceeded westward, hampered by fog and heavy ice, to within about 160 miles of Point Barrow. The other group, under Sir John Richardson, followed the eastern channel of the Mackenzie to the sea and explored eastward as far as the mouth of the Coppermine River. Between them, these two groups had charted about 1000 miles of the mainland coast, hitherto unknown. With his knowledge of the country and the fact that the gap between the two Franklin explorations and that of Sir John Ross in 1829-33 had appeared to have been almost closed by the explorations of Sir George Back (1833-35) and of Dease and Simpson (1836-39) it was assumed, at first, when no news was received from Franklin, that the expedition might be found somewhere along this "familiar" coast.

By 1848, when still no news of the expedition had been received, relief expeditions were organized. One of these involved a search of the Bering Sea approaches to the Arctic by crews of the Herald (Captain Henry Kellet) and Plover (Cmdr. Thomas Moore) and of the mainland coast east to the mouth of the Mackenzie.

In command of the boat crews searching eeast from the Bering Sea was Lieutenant (later Vice Admiral) W.J.S. Pullen for whom Pullen Island in the Mackenzie Delta is named. He had had to travel for a year and nearly halfway round the world to join his ship Plover! He kept a journal of his voyage to the Delta and of his trip up the Mackenzie to find winter quarters for his 14 men whom he had to leave in groups of 1, 2, or 3 at various posts and settlements along the River, south to Great Slave Lake. Plans to return to England were brushed aside when orders arrived in the spring that the party was to continue the search east from the Delta if conditions were possible. Both searches were unsuccessful and the parties returned to England.

In 1852 the Admiralty sent out its largest expedition in the Franklin search, under the command of Sir Edward Belcher. The commander of the North Star, Belcher's supply ship, was W.J.S. Pullen, now Commander Pullen, and the Master was T.C. Pullen, his brother. Like his brother on the earlier Franklin search, T.C. Pullen also kept journals of his three winters in the Arctic, journals vivid with accounts of the voyages, the whalers and seamen encountered en route, candid evaluations of officers and men on the expedition, and the effects of the country and climate on the personnel. He also tells of the preparations aboard North Star and her departure for home, crowded with most of the survivors of those ships abandoned in the Arctic when the decision to conclude the search was made.

These fascinating and informative journals, together with a Meteorological Abstract, T.C. Pullen's log of a journey from Madras in 1830 as Master of the Cambria, an Extract from an Admiralty Board of Enquiry, some notes on the life of Vice Admiral Pullen and some extracts from Rae's Arctic Correspondence, are the property of Admiral H.F. Pullen, grandnephew of the two chroniclers. From time to time these have been made available for reading, but not for quoting, to members of the Arctic Circle and other friends by Admiral Pullen and his brother, Captain T.C. Pullen, former Captain of HMCS Labrador.

Admiral Pullen has now graciously decided that, based on the merits of each individual request, permission to quote relevant portions of the records would be given consideration.

ARCTIC PLACE NAMES

(From files of Canadian Permanent Committee on Geographical Names, with permission of C.F. Delaney, Secretary)

Old Crow, Yukon Territory

Located 70 miles north of the Arctic Circle on the north bank of the Porcupine River at its junction with Old Crow River. This Loucheux Indian village was formerly a fur trading centre and had the distinction of being the most northerly settlement in the Yukon. The present day settlement has electric lights and a landing field, through the efforts of the inhabitants.

A post office was opened 25 July, 1959, with Robert Bruce, an Indian resident as the first postmaster. In the early stages of his new duties he was assisted by Rev. George A. Hamilton, the Anglican missionary.

Old Crow Flats, where muskrat are still trapped, Old Crow Mountains where caribou are still hunted, Old Crow Plain, Old Crow Range, and Old Crow River are other designations of this picturesque name.

Edith Josie, a local correspondent to the Whitehorse Star, really brought Old Crow to the world with her column Old Crow News. Her writings were published as received, i.e. - unedited, and are very refreshing reading. A book entitled "The Best of Edith Josie" sold out immediately and an article in Life Magazine deluged her with correspondence and brought many visitors to the town. In July, 1965 she wrote:

> "Old Crow is not very big town. It is sure bad when the rain and sure bad after but after the sunshine sure look good. I sure like to stay here and not going away from here. All we live on meat and fish. There are two store in Old Crow and people are doing fine with grocery at the store. The men are lucky because they are working at camp. After I go to Whitehorse and Dawson and also Inuvik, Old Crow sure small town for me and not much noise. What I really mean is car and bus I see at Whitehorse and Dawson and Inuvik. This is end the news".

BOOKS, REPORTS AND REVIEWS

"Doctor Kane of the Arctic Seas", by George W. Corner. Temple University Press, Philadelphia, 1972. 306 pp.

This book suffers from a rather misleading title, which led at least this reader to expect a sort of Boys' Own Annual or "gee whiz" approach to its hero, who was the leader of one of the first American expeditions to the Arctic, in 1853-55. On the contrary, it is a serious and well-written biography of an interesting and unusual man, and is very well worth adding to any arctic library.

Kane, a medical doctor from Philadelphia, is well described by the author as a man of enquiring mind, rashly daring spirit, and romantic heart. His small stature and physical handicaps (he had a rheumatic heart and suffered throughout his short life from recurring serious illness) far from deterring him, were perhaps largely the spur that drove him to seek personal fame and glory through the undertaking of unusual and dangerous exploits. Before his first visit to the Arctic his adventures included a descent into a volcano that was pronounced impossible by local experts, a journey up the Nile, and an adventure in the Mexican war which would be regarded as outrageously improbable if encountered in a Hollywood movie.

However, his two arctic expeditions, as doctor on the De Haven expedition of 1850-51 and then as leader of his own to Smith Sound and Kane Basin, were undoubtedly his most important achievements, and it is to these that the author devotes the bulk of his book. His treatment, particularly of the second expedition, is of considerable interest, being based on the unpublished parts of Kane's journal as well as on his book, and also on material, published and unpublished, from various other members of the expedition, not all of whom always saw eye to eye with their leader. An eye-opener, too, is the description of the equipping of the De Haven expedition. The ships were bought in the second half of March, the expedition approved by Congress on April 29, and they sailed on May 22. Small wonder there were shortcomings in the equipment, but in these progressive days could even an ill-equipped party with two ships get into the field at such short notice?

The author, like Kane himself, is a doctor, and thus his interpretation of Kane's own health problems and the very considerable medical difficulties that plagued his expedition have particular authority and interest. Unfortunately he seems to be less well informed about arctic exploration in general, and this at times leads him to a misplacing of emphasis and perhaps an overweighting of the importance of Kane in the overall picture. His description of the Franklin search, while containing only minor and not

very significant inaccuracies, misleads by what it leaves unsaid. It is easy (and legitimate) to poke a little gentle fun at the transplanting of rigid British naval tradition to the Arctic, and this he does, while at the same time commending the individual explorers as excellent fellows. But he manages to imply that they accomplished practically nothing, scarcely mentioning the thousands of miles of new coastline mapped by the sledging parties, or the development of techniques of long-range sledge travel which enabled them to do so. At the same time he quotes without comment a claim by Kane to have discovered more than 600 miles of new coast, "more than Penny and Austin together". (Whether or not this was more than Austin and Penny contributed I have not checked, but it is certainly more than Kane in fact discovered, as he misjudged the size of his basin by quite a wide margin, placing Morton's farthest point nearly a degree too far north). On the other hand, the author greatly over-emphasizes the importance of Inglefield: this very minor figure emerges as apparently the leading British explorer of the search up to 1853, presumably because he was a potential rival of Kane's in the Smith Sound area.

I do not however suggest that the author has any intention to mislead or indeed any anti-British bias. He is clearly an honest biographer, and, while obviously enthusiastic about his hero, he is far from being blind to his faults and shortcomings. One rather gets the impression that he has not really studied the work of explorers not directly connected in some way with Kane, and this leads to an imbalance.

The author is perhaps a little uncritical of Kane, a carry-over possibly from his childhood, when he first read and was fascinated by Kane's book, Arctic Explorations. For instance, in the matter of the eight men (nearly half the expedition) who seceded at the end of the first summer and tried to go south on their own by boat, he describes the whole episode only from Kane's point of view. He never points out that, whether or not they were right to split the party by leaving, the seceders were undoubtedly proved right as to the futility of staying, as the following spring left no man fit enough to attempt any further work, and the whole party in fact left in May, long before the ship could possibly be expected to be released from the ice.

Similarly, in assessing Kane's importance as an explorer, the author displays a certain bias. Kane contributed significantly to the unfolding of northwest Greenland and Ellesmere Island, and displayed an astonishing courage and determination in overcoming physical disabilities that make one wonder how he managed to accomplish anything at all. But it seems to be going too far to say, as the author does, that he "set a new pattern for polar exploration". He was indeed one of the pioneers in the application of Eskimo travel methods, but not with any marked success, and it was, after all, the combination with the Eskimo dog-sled of the staging

techniques developed by the British that enabled such travellers as Sverdrup and Peary to perfect the art of sledge travel.

But these are points on which opinions may differ and perhaps merely show a different bias on the reviewer's part. The book remains a well-written biography, very well worth the attention of both the general reader and the specialist. The former will find it a fascinating and readable tale, and the latter will value the hitherto unpublished data and the interesting filling out of the background of Dr. Kane's colourful life, including his mysterious and intriguing love affair - mysterious in that it comes to us only in the presumably one-sided account of the lady in the case, who was a professional medium.

The book is well but unobtrusively documented, well illustrated, and, wonder of wonders, has some highly serviceable maps.

Moira Dunbar

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Proceedings of Canadian Northern
Pipeline Research Conference

The Canadian Northern Pipeline Research Conference was held in Ottawa 2-4 February, 1972. The proceedings, edited by R.F. Legget and I.C. MacFarlane, are available as Technical Memorandum No. 104 of the National Research Council of Canada, Associate Committee on Geotechnical Research. (Price $5.00,NRCC 12498).

This conference resulted from an earlier conference on permafrost problems, held in Calgary in 1969, to discuss the technology required for pipeline construction following the discovery of oil at Prudhoe Bay, Alaska.

There were five formal sessions during the Ottawa Conference and a study of the topics discussed (listed below) gives a good idea of the comprehensive scope on which the program was planned. The Hon. C.M. Drury, President of the Treasury Board, gave the keynote speech at the dinner which opened the Conference.

The Proceedings, which comprise approximately 300 pages, give some idea of the high calibre of scientific and technical competence which is being brought to the planning and research necessary for the orderly development of the varied and various aspects of Arctic resources and way of life. Naturally, not all papers are of equal weight nor, at this stage, could

all topics be dealt with on the same basis of assured research. But the Proceedings give a good picture and valuable record of "what is being done to ensure the acquisition of knowledge necessary if such vast developments are to be successfully undertaken and completed in the Arctic in a manner consistent with man's concern for his environment".

In summing up, Robert Legget, Chairman of the Conference Organizing Committee, stressed that the conference "has been naturally concerned with people - the people of the North who will be directly affected by the construction of the proposed pipelines, and the people from the south who will be responsible for the planning, designing and building the lines with all the assistance that northern citizens can give". He pointed out that it "was the purpose of the conference to bring together those with common interest in the problems that construction of far northern pipelines will inevitably create, and also in the problems that must be solved before designs can be prepared and before construction can be authorized". Although logistics of the meeting limited the numbers that could be admitted to the sessions, those attending included, in addition to many Canadians from the south, citizens from northern Canada, the United States, and a small delegation from the Soviet Union, headed by Deputy Minister Dongaryan. It was interesting to note, however, that all the speakers and discussors were Canadians.

Relating to the future influence of the conference, Dr. Legget stressed that the Proceedings were to be published at as early a date as possible to inform those interested of the fact - not always recognized in the press or journals in this continent - that Canada does possess scientific and technical knowledge and expertize that can contribute to the solution of problems inherent in the building of northern oil and gas pipelines. The participation of both engineers and scientists had been especially gratifying and significant.

An agreed-upon working system of terms for terrain description, in other words, a glossary that could and would be revised and made more precise as work in the field continued, had been shown at the conference to be an immediate need in order to facilitate intelligent communication among the various workers in northern terrains. A similar situation exists with regard to engineering standards, and the "Guide Lines" being developed for northern use show how valuable such Standards can be.

Finally, Dr. Legget stressed that development of pipelines for oil and gas are but one phase of what is expected to become a northern development affecting all aspects of Canadian environment, life, business, and government, and which will demand the utmost co-operation of all, northerners and southerners alike.

The Proceedings are a valuable record of the type of interdisciplinary communication, research, and co-operation required to solve the problems that will undoubtedly face those responsible for development of all aspects of activity in the North as oil and gas is transported south by the pipelines that are envisaged as a future necessity.

The following Table of Contents illustrates the scope of the Conference:

SESSION 1

Co-Chairmen:
C.B. Crawford, National Research Council of Canada
K.L. Hall, Trans Mountain Oil Pipeline Company

1.1 Importance of Pipeline Research.
D.G. Waldon, Interprovincial Pipeline Company, Toronto

1.2 Surficial Geology and Land Classification, Mackenzie Valley Transportation Corridor.
O.L. Hughes, Geological Survey of Canada, Calgary

1.3 Thermal Effects in Permafrost.
L.W. Gold, G.H. Johnston, W.A. Slusarchuk and L.E. Goodrich, National Research Council of Canada, Ottawa

1.4 Offshore Conditions and Problems.
L.M. Narraway, PemCan Services, Calgary; G.W. Walker, The Alberta Gas Trunk Line Co. Ltd., Calgary; and E.M. Lakusta, Gulf Oil Canada Ltd., Calgary

SESSION 2

Co-chairmen:
R.M. Hill, Canada Department of Indian Affairs and Northern Development
R.A. Hemstock, Imperial Oil Limited

2.1 Some Sociological Implications of Pipeline Construction.
A.J. Reeve, Environmental-Social Program, Northern Pipelines, Ottawa

2.2 Ecological Problems Associated with Arctic Oil and Gas Development.
L.C. Bliss and R.W. Wein, University of Alberta, Edmonton

2.3 Potential Effects on Social Values in Wildlife and Fisheries Resources.
A.H. Macpherson and G.H. Watson, Canadian Wildlife Service, Edmonton; J.G. Hunter, Canada Fisheries Service, Ottawa; and C. Hatfield, Canada Fisheries Service, Winnipeg

2.4 Arctic Waste Disposal.
N.A. Lawrence, Associated Engineering Services Ltd., Edmonton

SESSION 3

Co-chairmen:
J.R. Mackay, University of British Columbia
W. Rutherford, National Energy Board

3.1 Airphoto Terrain Classification and Mapping for Northern Feasibility Studies.
J.D. Mollard, J.D. Mollard & Associates Limited, Regina

3.2 Northland Vehicle Considerations.
T.A. Harwood, Defence Research Establishment, Ottawa; and R.N. Yong, McGill University, Montreal

3.3 Problems in Engineering Geology Related to Pipeline Construction.
R.M. Isaacs and J.A. Code, Geological Survey of Canada, Ottawa

3.4 Land and Water Management in the North.
L.V. Brandon, Canada Department of Indian Affairs and Northern Development, Whitehorse

SESSION 4

Co-chairmen:
E.B. Peterson, Canada Department of the Environment
W. Hindle, TransCanada Pipelines Limited

4.1 Principal Requirements for Northern Pipelines.
R.D. Howland, National Energy Board, Ottawa

4.2 Progress Reports on Gas Pipeline Research:

(a) The Northwest Project Study Group.
L.G. Hurd, NPSG, Calgary

(b) Gas Arctic Systems Gas Pipelines Test Facilities.
G.W. Walker, The Alberta Gas Trunk Line Company Limited, Calgary

4.3 Progress Report: Arctic Oil Pipeline Research.
K.L. Hall, T.L. Speer, and R.K. Rowley, Mackenzie Valley Pipeline Research Limited, Calgary

4.4 Construction Problems: Arctic Pipelines.
W. Gant, H.C. Price of Canada Ltd., Calgary; and
R.D. Meeres, Banister Pipelines Ltd., Edmonton

SESSION 5

Co-chairmen:
E.F. Roots, Canada Department of Energy, Mines and Resources
N.W. Radforth, University of New Brunswick

5.1 Permafrost and Ground Ice.
J.R. Mackay, University of British Columbia, Vancouver

5.2 Slope Stability and Drainage Considerations for Arctic Pipelines.
R.M. Hardy and A.H. Morrison, R.M. Hardy & Associates Limited, Edmonton

5.3 Problems of Northern Terrain Classification.
R.A. Hemstock, Imperial Oil Limited, Calgary; and
I.C. MacFarlane, National Research Council of Canada, Ottawa

A SUMMING UP

R.F. Legget, Ottawa

Arctic Circle correspondence - Correspondence shoul be addressed to the office concerned,

c/o The Arctic Circle,
Box 2068, Postal Station D,
Ottawa, Ontario
K1P 5W3

Arctic Circle Meetings

The regular meetings of the Arctic Circle are held on the second Tuesday of every month at 8.30 p.m. at the University Club of Ottawa, ** 251 Cooper Street.

Out-of-town members who wish to receive notices of these meetings and, thereby, be informed in advance regarding the guest speakers and the topics to be discussed, should address their requests to the Secretary, Mr. Keith C. Arnold.

The Arctic Circular

The Arctic Circular is published three times a year - oftener if the amount of material received permits. Correspondence, papers and reports are welcomed from all members, from persons living in the north, or from anyone having information on general northern activities, research and travel, or on technological, industrial or social developments. Contributions and correspondence should be addressed to the Editor, Mrs. Margaret Montgomery Larnder.

Back issues of the Arctic Circular are available, single copies at $0.50 and complete sets (Volumes I to XX) $100.00. Requests should be addressed to Miss Mary Murphy, Publications Secretary.

Membership dues

Dues are payable as of 1 January. New members joining the Arctic Circle in the Fall or at any time during the period between the last meeting in the Spring and the first meeting in the Fall (usually May-October) will be considered paid-up members for the following year. The dues are:

$7.00 for in-town members and families
$3.00 for out-of-town members and for students
$5.00 for libraries and institutions.

** As of October, 1974, meetings of the Arctic Circle are held at 8.30 p.m. at the Faculty Club, Carleton University, Ottawa, on the second Thursday of each month.