

THE U. S. GEOLOGICAL SURVEY  
*in* **ALASKA**

1979 PROGRAMS

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GEOLOGICAL SURVEY CIRCULAR 804-A

**UNITED STATES DEPARTMENT OF THE INTERIOR**  
**CECIL D. ANDRUS**, *Secretary*



**GEOLOGICAL SURVEY**  
**H. WILLIAM MENARD**, *Director*

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## PREFACE

Alaska is at once the largest, the least populated, the least explored, and the least developed State in the Nation. More than half of the Nation's 600 million acres of Outer Continental Shelf lies off Alaska's coast, and nearly half of the remaining 762 million acres of Federal land are within its borders. Its resources of all kinds present an opportunity to demonstrate how the needs of both conservation and development can be met for the benefit of the American people.

This circular describes the 1979 programs of the United States Geological Survey in Alaska. The mission of the Geological Survey is to identify the Nation's land, water, energy, and mineral resources; to classify federally owned mineral lands and water-power sites; to resolve the exploration and development of energy and natural resources on Federal and Indian lands; and to explore and appraise the petroleum potential of the National Petroleum Reserve in Alaska.

A companion circular, 804-B, presents summaries of significant accomplishments of the Survey's topical and field investigations in Alaska during 1978. Among the disciplines included are regional geology, economic geology, stratigraphy, paleontology, hydrology, marine geology, and engineering and environmental geology.



# THE U. S. GEOLOGICAL SURVEY *in* ALASKA

## 1979 - THE CENTENNIAL YEAR

In the period of western expansion following the Civil War, the Federal Government came to recognize the vast extent of the Nation's public domain and the need for evaluating it in a systematic manner. Thus, on March 3, 1879, President Rutherford B. Hayes signed an act creating within the Department of the Interior a unique agency: THE UNITED STATES GEOLOGICAL SURVEY.

From the outset, the Survey was an organization of scientist explorers who probed the farthest reaches of the wilderness, piecing together geology, defining landforms, and translating topography into accurate maps. The Survey's men hauled their instruments to the tops of mountains and labored over complex geologic panoramas whose beauty often transcended their documentary purpose.

The Survey's first leaders were men as much at home beside wilderness campfires as in the parlors of Washington. Clarence King, the first director, was a multifaceted scientist, author, raconteur, and administrator who, at the age of 25, had convinced Congress to establish the first geological exploration of the 40th Parallel. He was succeeded by John Wesley Powell, a self-taught naturalist and Union Army Major whose loss of a forearm at Shiloh had not prevented him from carrying out a daring exploration of the Grand Canyon in 1869. Powell, director from 1881 to 1894, was simultaneously the Director of the Smithsonian's Bureau of American Ethnology. Men like King, Powell, and their colleagues established the Survey's traditions: scholarship, integrity, freedom.

The Geological Survey began work in Alaska in 1889 when I. C. Russell explored and surveyed the Alaska-Canada boundary and later described the geology of the St. Elias Mountains. Geologist Frank C. Schrader explored and mapped the Chandalar and Koyukuk Rivers in 1899, and E. de K. Leffingwell first went to Alaska in 1906 to begin mapping the north coast of Alaska. Place names like the Brooks Range, Mount Spurr, the Bagley Ice Field, Lake Schrader, the Philip Smith Mountains, and Russell Fiord were named for these and other Survey explorers.

In its centennial year, the Survey Alaskan programs described in this circular reflect in modern context the 1879 goals of systematically evaluating the natural resources. But now, 100 years later, we as a Nation find ourselves in different circumstances. We have begun to realize the need for environmental concern and the need to preserve our wilderness heritage. At the same time, we face shortages in vital energy and mineral resources. Alaska, more than any State, sharply presents the contrast between the modern constraints posed by environmental conservation and the need to explore and develop the Nation's resources as we did 100 years ago.

Highlights of major accomplishments of the U.S. Geological Survey in Alaska reflect the history of Alaska, as well as the changing needs of our Nation:

- Early Survey exploration by Dall, Russell, Spurr, Muldrow, and others between 1889 and 1915 defined the broad geographic features and the important mountain ranges and drainage areas of Alaska. First determinations have been followed by continuous refinement of the geologic and hydrologic framework and topography in Alaska.

- Formal mineral exploration and study by the Survey in Alaska began in 1895 when Congress appropriated \$5,000 for the study of coal and gold resources. Alaska work increased in intensity after the discovery of gold in the Klondike in 1898. The Division of Alaska Mineral Resources was organized in 1904 under the direction of Alfred H. Brooks with a fulltime staff of 12 people. In that year Brooks published the first of a series of annual bulletins on the mineral resources of Alaska. In recent times the Survey, using the knowledge gained from 85 years of mineral exploration and study in Alaska, has provided information on which to base Alaskan land management decisions by Native, State, and Federal interests.
- The Survey has provided 1:250,000-scale topographic quadrangle maps for all of Alaska and continues to revise and update these and larger scale maps of the State. The first photo-alidade, American trilets aerial mapping camera, and transforming printer were developed before World War I by J. W. Bagley and F. H. Moffit, members of the Survey engaged in Alaskan work.
- The Survey started systematic measurements of the flow of Alaskan streams during the summer of 1906. A report on "The Water Supply of Nome Region" was published by J. C. Hoyt and F. F. Henshaw in that year to aid in providing water for placer mining. Since that time the Geological Survey has continuously collected hydrologic data and, in so doing, has provided increasingly precise hydrologic information on Alaska.
- The Survey has given vital assistance to the exploration for oil, gas, and coal in Alaska. Early Survey studies outlined coal deposits and potential petroleum basins in Alaska; for example, in 1905 G. C. Martin published Bulletin 250, "The Petroleum Fields of the Pacific Coast of Alaska." In the 1920's Survey geologists provided preliminary geologic information for the then newly defined Naval Petroleum Reserve No. 4 in northwest Alaska. In the late 1940's, working with the Navy, the Survey provided detailed framework studies of the geology of the North Slope of Alaska. This information provided a starting point for oil company exploration that eventually led to the discovery of the Nation's largest oil and gas field at Prudhoe Bay. At present, the Survey is actively engaged in exploratory drilling in the Petroleum Reserve. It is also preparing for an oil and gas lease sale in the Beaufort Sea, located north of the Reserve, and for future sales in other areas of the Outer Continental Shelf.
- During World War II the Survey provided, through its Branch of Military Geology, interdisciplinary earth science information for the construction of the Alaska Highway and military bases and in so doing pioneered in the study of permafrost and environmental geology in Alaska. In the late 1960's Arthur H. Lachenbruch, in a landmark analysis of the effects of a hot pipeline laid in permafrost terrain, pointed to the basic engineering problems related to the construction and operation of the trans-Alaska pipeline. As a result, between 1968 and 1975 the Survey provided data and assisted in engineering geology and hydrology studies related to the construction of the Alyeska pipeline. Today it is providing data that will assist in the selection of a route for the proposed natural-gas pipeline through northern Alaska.
- Earthquake studies in Alaska by the Survey have provided information for sound engineering practice and have as a goal the achievement of capability to predict earthquakes. The first Alaskan earthquake study was R. S. Tarr's description of the 1899 earthquake at Yakutat, and George Plafker described the tectonic framework of the Great Alaska Earthquake of 1964. At present the Survey conducts a large earthquake hazards program in Alaska.



## ORGANIZATION OF THE GEOLOGICAL SURVEY

The Director of the U.S. Geological Survey is responsible for the direction and supervision of the activities of the Geological Survey. He is represented in Alaska by an assistant who is responsible for overall coordination of Survey activities in the State. The Office of the Assistant to the Director is in Anchorage.

The operational work of the Survey is accomplished by four divisions and two offices. The function and purpose of each of these is described briefly below. The relation of the operational and supporting divisions, and offices is shown in figure 1.

- THE TOPOGRAPHIC DIVISION is charged with the execution of surveys and the preparation of maps, charts, and bulletins pertaining to the delineation of the physical features of land areas in the United States, its outlying areas, and Antarctica.
- THE GEOLOGIC DIVISION studies include geologic and geophysical mapping to establish the composition and structure of rocks beneath the surface of the land and the outer continental shelves; research into geologic principles and processes to provide guidance for significant geologic interpretations, including specialized research in geochemistry, geophysics, and paleontology; development of new exploration techniques; and collation and synthesis of geologic knowledge of mineral and mineral fuels resources.
- THE WATER RESOURCES DIVISION investigates the occurrence, quantity, quality, distribution, and movement of surface and underground water that comprises the Nation's water resources.
- THE CONSERVATION DIVISION examines and classifies Federal lands in the United States as to their mineral character, water-power and water-storage values, supervises technical operations under oil and gas and other mineral leases on Federal, outer continental shelf, Indian and Naval petroleum reserve lands, and maintains accounts of related production and royalty accruals.
- Within the Director's Office, THE OFFICE OF THE NATIONAL PETROLEUM RESERVE IN ALASKA (ONPRA) has been established to evaluate the resources of the 37,000-square-mile National Petroleum Reserve in Alaska (NPRA) located in northwestern Alaska.
- The OFFICE OF LAND INFORMATION AND ANALYSIS (LIA), also part of the Director's Office, has been organized to develop multidisciplinary land-resources and environmental impact programs of the Survey.

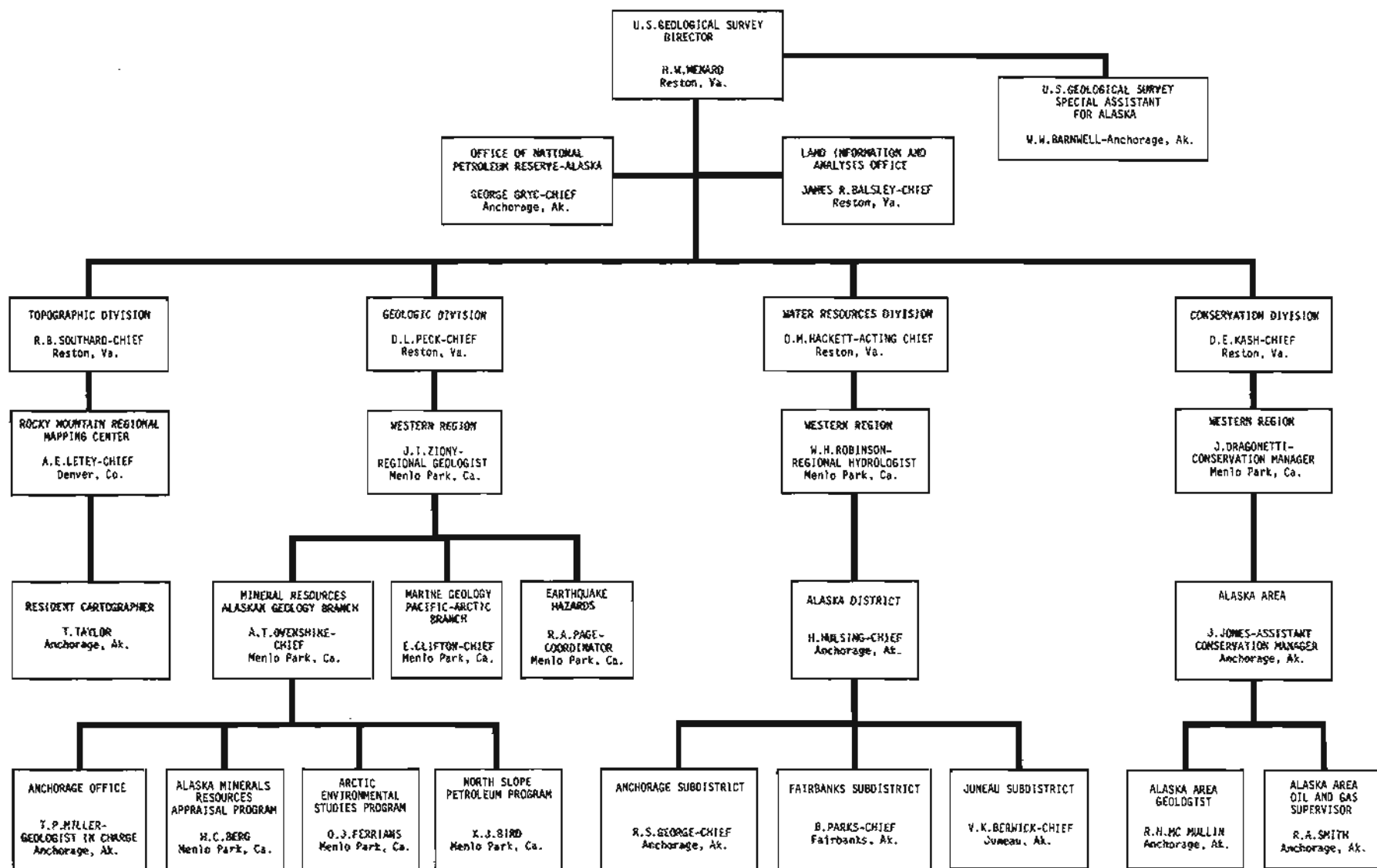


Figure 1.--Organization of the U.S. Geological Survey as it pertains to Alaska.

## OFFICE OF NATIONAL PETROLEUM RESERVE IN ALASKA

On April 5, 1976, the U.S. Congress passed the Naval Petroleum Reserves Production Act. The Naval Petroleum Reserve No. 4 was redesignated in the act as the National Petroleum Reserve in Alaska (NPRA), and jurisdiction was transferred from the Secretary of the Navy to the Secretary of the Interior. The reserve is located in northwestern Alaska and contains about 23 million acres. It is roughly the size of Indiana. (See fig. 2.)

The U.S. Geological Survey through the Office of National Petroleum Reserve in Alaska (ONPRA) assumed management of the exploration program formerly conducted by the Navy on June 1, 1977. Husky Oil NPR Operations, Inc. was selected to continue as the prime contractor for all phases of the exploration program.

At the time of the transfer, the Survey assumed responsibility for the following specific tasks:

- (1) Explore and evaluate the petroleum potential of the NPRA by means of geological and geophysical investigations and by drilling, in order to build an information base to assist Congress in determining the best use of the land within the Reserve.
- (2) Continue to develop and produce natural gas from the South Barrow Gas Field, or other fields as may be necessary, to supply gas at reasonable and equitable rates to the Native village of Barrow and other communities and installations at or near Point Barrow, and to installations of the Federal Government in the vicinity of Barrow.
- (3) Continue environmental rehabilitation in areas of the Reserve disturbed by previous exploration and construction activities.

The first complete year of Survey activities on NPRA was Fiscal Year (FY) 1978. In addition to the work completed in that year (tables 1a and b), preparations were made for FY 1979 activities.

The exploration program in FY 1979 includes continued work on three deep wells (deeper than 14,000 feet) begun in FY 1978. The projected depths of those wells required construction and drilling programs which could not be completed during a single winter season. In mid-May 1979, one of these, the Inigok Test Well No. 1, was plugged and abandoned at a total depth of 20,102 feet. Drilling at a second deep well, Tunalik Test Well No. 1, was at 12,557 feet on May 25, 1979. The third well, the Ikpiukuk Test Well No. 1, was suspended at 14,210 feet. Drilling will be resumed on this well in winter 1979-80.

Three medium-depth wells (3,000 to 14,000 feet) were completed on the coastal plain during the winter of FY 1979. One of these, South Meade, was spudded in 1978, suspended for the summer, and reentered and completed this past winter. Two other wells, Peard and East Simpson, were spudded and completed during the winter drilling season. A fourth medium-depth well, J. W. Dalton, was spudded on May 7 and was drilling ahead at 7,534 feet on May 25, 1979. The well is scheduled for summer drilling and completion prior to the end of the fiscal year.

Two additional FY 1979 deep wells, Lisburne and Seabee, will be located in the foothills region in the southern part of the Reserve. These had not been spudded as of May 1979, but will be drilled as part of the FY 1979 program; completion of the wells is scheduled in FY 1980. These wells are planned for year-round drilling, similar to that at Inigok and Tunalik. At the end of the 1979 program year, 19 exploration wells will have been completed or drilling will be in progress.

Final reports will be made available only through the Environmental Data and Information Service, National Oceanic and Atmospheric Administration, Boulder, Colorado, 80303; (303) 499-1000x6338. Core chips and ditch cuttings are provided by the Department of Natural Resources, Alaska Division of Oil and Gas Conservation, 3001 Porcupine Drive, Anchorage, Alaska 99501.

The NPRA exploration program requires many technical background studies and activities in addition to the drilling and seismic operations carried out by the prime contractor, Husky Oil NPR Operations, Inc. These studies, primarily by the Geologic Division, are described in this circular as part of each operating division's program in the northern region of the State.

For additional information about the ONPRA activities, contact:

George Gryn, Chief, ONPRA; or Max Brewer, Chief, Operation Office, ONPRA  
2525 C Street, Suite 400  
Anchorage, Alaska 99503  
Tel. (907) 276-7422

## PROJECTS OF THE OFFICE OF NATIONAL PETROLEUM RESERVE IN ALASKA

Project Title: Geophysical Exploration of the National Petroleum Reserve in Alaska (NPRA)

Project Chief: John K. Kienzie

Project Objectives: To acquire and interpret common depth point (CDP) seismic and gravity data for use in locating drilling sites for exploratory wells and to aid in assessing the hydrocarbon potential of the National Petroleum Reserve in Alaska.

Project Status: Through Husky Oil NPR Operations, Inc., the contractor to the Office of National Petroleum Reserve in Alaska (ONPRA), and Geophysical Service, Inc. (GSI), a subcontractor to Husky Oil, approximately 1,600 miles of CDP seismic and gravity data will be acquired in NPRA in 1979. The seismic data will be collected by three GSI crews--one dynamite crew in the coastal area and two crews (one dynamite and one vibroseis) in the foothills. The gravity and seismic data will be processed by GSI and interpreted by Tetra Tech, a subcontractor to Husky Oil, and by ONPRA. With the completion of the 1979 fieldwork, approximately 11,000 miles of CDP seismic and gravity data will have been collected in NPRA since 1972.

Project location is shown in figure 2.

\* \* \*

Project Title: National Petroleum Reserve in Alaska (NPRA) Data Open-file

Project Chief: Robert D. Carter

Project Objectives: To inventory, organize, and make available to the public, through the National Oceanic and Atmospheric Administration (NOAA), all geological and geophysical data generated in the petroleum exploration of the NPRA by the U.S. Navy and by the Office of National Petroleum Reserve in Alaska.

Project Status: All well and basic geophysical data generated in NPRA prior to June 1, 1977, have been released and are available through NOAA. An interpretive seismic report on the above data and all the 1978 well information are presently being prepared by NOAA for release in the near future.

Project location is shown in figure 2.

\* \* \*

Project Title: Development and Operation of Gas Fields in the Barrow Area

Project Chiefs: Robert J. Lantz and Robert D. Carter

Project Objectives: To explore the Barrow area by geologic and geophysical methods, including drilling wells, in order to determine the presence of natural gas, to determine the gas reservoirs of known or newly discovered fields, and to develop and maintain such fields. These activities are undertaken in order to continue a supply of gas at reasonable and equitable rates to the people of the Barrow area.

Project Status: One exploratory well (dry) and two development gas wells have been drilled in the east Barrow area. A gas transmission line is being laid to connect the east Barrow area with the present production in the south Barrow field. Geologic and seismic exploration has indicated several additional possible gas-bearing structures.

Project location is shown in figure 2.

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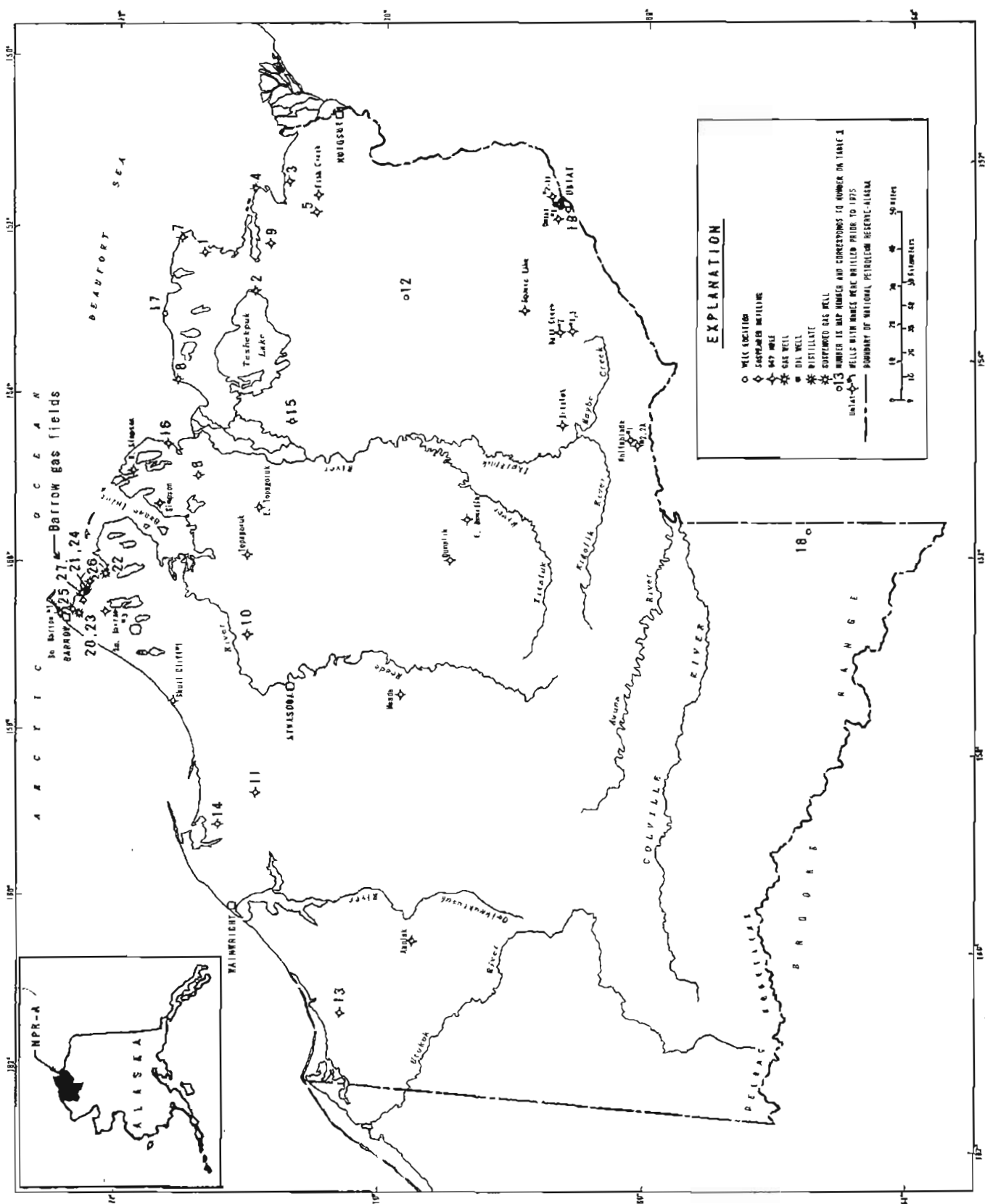


Figure 2.--Exploration wells on National Petroleum Reserve in Alaska.

Table 1a. Exploration wells drilled by the Navy between 1975 and 1977 and wells drilled in Fiscal Year 1978 and planned for Fiscal Year 1979 by the Geological Survey. (See fig. 2.)

Map Number	Name	Location	Date Spudded	Date Completed	Total Depth	Deepest Horizon Attained	Remarks
1	Cape Halkett No. 1	18 mi ESE of Lonely	3/24/75	5/23/75	9,900 ft	Argillite basement (Devonian or older)	Dry; plugged and abandoned
2	East Teshekpuk No. 1	25 mi S of Lonely	3/12/76	5/11/76	10,644 ft	Granite basement	Dry; plugged and abandoned
3	So. Harrison Bay No. 1	50 mi SE of Barrow	11/21/76	1/27/77	11,290 ft	Lisburne Group (Mississippian)	Poor oil shows; plugged and abandoned
4	Atigaru Point No. 1	44 mi SE of Lonely	1/12/77	3/10/77	11,535 ft	Argillite basement (Devonian or older)	Poor oil shows; plugged and abandoned
5	West Fish Creek No. 1	51 mi SE of Lonely	2/14/77	4/21/77	11,427 ft	Kayak Shale (Mississippian)	Poor oil shows; plugged and abandoned
6	So. Simpson No. 1	41 mi WSE of Lonely	3/9/77	4/18/77	8,805 ft	Argillite basement (Devonian or older)	Gas shows; plugged and abandoned
7	W.T. Foran No. 1	23 mi ESE of Lonely	3/7/77	4/16/77	8,864 ft	Argillite basement (Devonian or older)	Oil and gas shows; plugged and abandoned
8	Drew Point Test Well No. 1	14 mi W of Lonely	1/13/78	3/13/78	7,946 ft	Argillite basement (Devonian or older)	Poor oil and gas shows; plugged and abandoned
9	No. Kilikpuk Test Well No. 1	37 mi SE of Lonely	2/27/78	4/14/78	7,395 ft	Kingak Shale (Jurassic)	Poor oil and gas shows; plugged and abandoned
10	So. Meade Test Well No. 1	45 mi S of Barrow	2/8/78 (11/29/78) reentered	1/21/78	9,945 ft	Argillite basement (Devonian or older)	Poor gas shows; plugged and abandoned
11	Kugrua Test Well No. 1	67 mi SW of Barrow	2/13/78	5/30/78	12,588 ft	Lisburne Group (Mississippian)	Poor gas shows; plugged and abandoned
12	Inigok Test Well No. 1	60 mi S of Lonely	6/7/78	5/22/79	20,102 ft	Kekiktuk Formation (Mississippian)	Plugged and abandoned
13	Tunaliik Test Well No. 1	22 mi SE of Icy Cape	11/1/78		21,000 ft (projected)	Argillite basement (projected)	Gas shows; holding at 12,557 ft; running casing, 6/5/79
14	Peard Test Well No. 1	25 mi NE of Wainwright	1/27/79	11/13/79	10,225 ft	Argillite basement (Devonian or older)	Trace of oil and gas shows; plugged and abandoned

Table 1a. Exploration wells--Continued

15	Ikpikpuk Test Well No. 1	42 mi SW of Lonely	11/29/78		15,200 ft (projected)	Argillite basement (projected)	Suspended at 14,210 ft until winter of 1979-80
16	East Simpson Test Well No. 1.	33 mi W of Lonely	2/20/79	4/10/79	7,739 ft	Argillite basement	Poor oil show; plugged and abandoned
17	J.W. Dalton Test Well No. 1	3 mi E of Lonely	5/8/79		8,570 ft (projected)	Argillite basement (projected)	Drilling at 7,555 ft on 6/5/79
18	Lisburne Test Well No. 1	110 mi SW of Umiat	planned 6/10/79		15,000 ft (projected)	Lisburne-Endicott Group (projected)	
19	Seabee Test Well No. 1	1 mi NW of Umiat	planned 6/20/79		15,000 ft (projected)	Basal Cretaceous (projected)	

Table 1b. Barrow gas wells recently drilled by the Navy and the Geological Survey. (See fig. 2.)

20	So. Barrow No. 11	Sec. 14, T22N, R18W	2/10/74	3/6/74	2,350 ft	Argillite basement (Devonian or older)	Completed as gas producer
21	So. Barrow No. 12	Sec. 23, T22N, R17W	3/10/74	3/6/74	2,285 ft	Argillite basement (Devonian or older)	Suspended as marginal gas well
22	Iko Bay*	Sec. 16, T21N, R16W	1/2/75	3/8/75	2,731 ft	Argillite basement (Devonian or older)	Marginal gas well
23	So. Barrow No. 13	Sec. 14, T22N, R18W	12/17/76	1/16/77	2,535 ft	Argillite basement (Devonian or older)	Shows of gas; suspended as marginal gas well
24	So. Barrow No. 14	Sec. 25, T22N, R17W	1/28/77	3/3/77	2,257 ft	Sag River Sand (Triassic)	Suspended; completed as gas well on 3/2/79
25	So. Barrow No. 16	Sec. 1, T22N, R18W	1/28/77	2/18/78	2,400 ft	Argillite basement (Devonian or older)	Dry; plugged and abandoned
26	So. Barrow No. 17	Sec. 30, T22N, R16W	3/2/78	4/13/78	2,382 ft	Argillite basement (Devonian or older)	Suspended; edge well; completed as marginal gas well on 3/25/79
27	So. Barrow No. 19	Sec. 14, T22N, R17W	4/17/78	5/17/78	2,300 ft	Argillite basement (Devonian or older)	Suspended; completed as gas well on 2/16/79.

\*Iko Bay well was drilled approximately 20 miles southeast of Barrow to locate a new gas field to supplement the gas supply for Barrow.





## LAND INFORMATION AND ANALYSIS OFFICE

The Land Information and Analysis (LIA) Office manages interdisciplinary land-resources and environmental impact programs of the Survey. The programs are directly concerned with the technologies and methodologies of collecting, describing, communicating, and applying earth-sciences information to resources management. The principal program elements of the LIA Office include the Earth Resources Observation System (EROS), Geography, Earth Sciences Applications, Resource and Land Investigations, and Environmental Impact Analysis. The Earth Sciences Applications and Resource and Land Investigations programs are not currently active in Alaska.

### EROS PROGRAM

The EROS (Earth Resources Observation Systems) Program was established by the U.S. Department of the Interior in 1977 to assist in realizing the practical benefits in earth-resource and environment inventory and monitoring that can be obtained by use of photography and other remotely sensed data acquired by aircraft and spacecraft, particularly the Landsat satellite. The EROS Data Center in Sioux Falls, South Dakota 57198, is responsible for distributing Landsat imagery, computer compatible tapes, and other forms of remotely sensed data to users throughout the world. The center also develops techniques to assist in applying remote sensing to various kinds of resource problems and helps users apply these programs. Inquiries on specific problems or other matters, including future training opportunities, may be addressed to the Branch of Applications at the Data Center; the telephone number is (605) 594-6511.

Since late November 1974, an EROS Applications Assistance Facility has been in operation in Alaska to improve the availability of technical assistance to Alaskan users. This facility is located at the Geophysical Institute, University of Alaska, Fairbanks 99702. Both manual and digital interpretation equipment, including a color additive viewer and minicomputer enhancer, are available. In addition, files are maintained of selected Landsat images, NASA and other aerial photographs, and other remotely sensed data for Alaska. For information concerning the Fairbanks facility, contact Katherine Martz at (907) 479-7487.

A Landsat browse file is available for public inspection at Public Inquiries Office of the Survey, Room 108, Skyline Building, 508 Second Avenue, Anchorage 99501.

### GEOGRAPHY PROGRAM

The Geography Program links and integrates social science information and techniques of geographic analysis with earth science information and activities of the Geological Survey. Specifically, the program is responsible for: (a) developing and maintaining a data base on current land use and land cover nationwide, with map and statistical output formats; (b) establishing standards and providing technical assistance to users; (c) developing new procedures for acquiring and processing remotely sensed data on land use and land cover; and (d) performing analyses involving these land use data. Efforts are underway to develop techniques for producing land use and land cover maps from Landsat computer-compatible tape digital data; sites of typical land use and cover are identified in the field and then spectrally and geographically related to the Landsat data. The classification system used was developed in conjunction with other Federal and State agencies. (For more information, see U.S. Geological Survey Professional Paper 964.) A Geographical Information Retrieval and Analysis System (GIRAS) has been developed and is being applied to the data taken from the maps produced under the Geography Program. (See U.S. Geological Survey Professional Paper 1059 for an explanation of the process.)

For information on the Geography Program and its application in Alaska, contact:

James R. Anderson, Chief, Geography Program  
U.S. Geological Survey  
12201 Sunrise Drive  
National Center  
Reston, VA 22092  
Tel. (703) 860-6344

## PROJECTS OF THE LAND INFORMATION AND ANALYSIS OFFICE NORTHERN REGION

Project Title: Vegetation Mapping of the National Petroleum Reserve in Alaska Using Landsat Digital Data

Project Chief: Leonard Gaydos  
(Land Information and Analysis Office, Geography Program)

Project Objectives: To map vegetation within the National Petroleum Reserve in Alaska (NPRA) using Landsat multispectral scanner digital data after defining a classification system appropriate to the region and attainable with Landsat data. Fieldwork is designed to define and verify the classes.

Project Status: The mapping phase of the project is now complete. Fieldwork was carried out during the summers of 1977 and 1978 primarily by L.A. Morrissey and R.A. Ennis. Production of the color-coded vegetation map produced from a mosaic of ten Landsat screens is being handled by J.R. Wray in Reston. It will be published in late 1979 or early 1980 with a table of vegetation classes by township and a report of activities.

Project location is shown in figure 2.

\* \* \*

Project Title: Environmental Assessment (Geology) of the National Petroleum Reserve in Alaska

Project Chief: Warren Yeend  
(Land Information and Analysis Office, Environmental Impact Analysis Program)

Project Objectives: To gather data to permit compilation of the geologic sections of the Environmental Impact Assessment [105(b) study] of the National Petroleum Reserve in Alaska (NPRA), with particular emphasis on the effects of petroleum development.

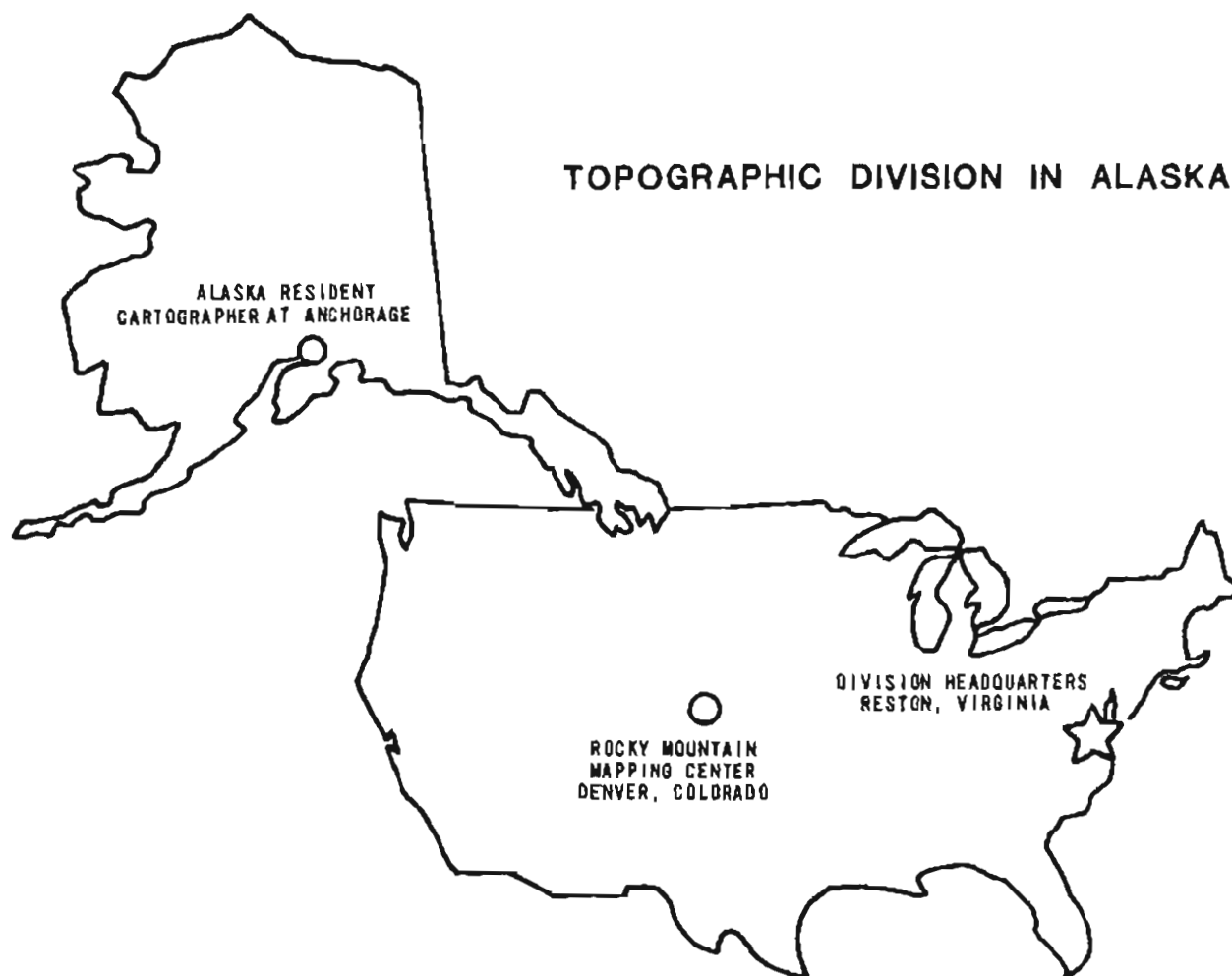
Project Status: The first draft of the report manuscript is being completed.

Project location is shown in figure 2.

\* \* \*



## TOPOGRAPHIC



## TOPOGRAPHIC DIVISION IN ALASKA

For further information, contact the offices listed below.

Anchorage, Alaska  
Thomas E. Taylor

Resident Cartographer Tel. (907) 271-4148  
Topographic Division, Room 210, 218 E Street  
Anchorage, Alaska 99501

Denver, Colorado  
Albert L. Letey

Chief, Rocky Mountain Mapping Center Tel. (303) 234-2351  
Topographic Division, Bldg. 25, Box 25046  
Denver Federal Center, MS 510  
Lakewood, Colorado 80225

Reston, Virginia  
Rupert B. Southard

Chief, Topographic Division Tel. (703) 860-6231  
12201 Sunrise Valley Drive  
National Center, Reston, VA 22092

## TOPOGRAPHIC MAPPING

The preparation of maps for the National Mapping Program is the chief task of the Topographic Division. Photographic and field plotting methods are used to prepare these maps to rigid national standards. Maps are constantly being revised, but the needs of the map users determine the rate of map revision and publication. The maps series of the program include the quadrangle maps and other maps for special purposes. In addition, the National Cartographic Information Center (NCIC) in Reston, Virginia, provides information on maps, charts, and photographs; it can tell a customer what data are available and how to obtain them.

The Alaskan mapping program operations are primarily the responsibility of the Chief, Rocky Mountain Mapping Center, in Denver, Colorado. The resident cartographer in Alaska is the Topographic Division's representative. His office is located in Anchorage. This office gathers and maintains files on cartographic material used in mapping, and maintenance or revision of existing mapping. In addition to assigned responsibilities, assistance in obtaining National Cartographic Information Center (NCIC) cartographic materials, EROS (satellite) photographic products, geodetic control, and base-map material is available to the public through this office.

Topographic mapping at a scale of 1:63,360 (1 inch = 1 mile) has been completed for more than 85 percent of Alaska. The remainder of the State mapping at this scale is in various stages of production, and advance copy is available for some areas. Field operations are scheduled during the summer of 1979 to provide control for completion of map coverage at 1:63,360 and 1:50,000 metric scale.

Alaska is covered by 1:250,000-scale (1 inch = about 4 miles) mapping. This consists of 153 quadrangles, 14 of which are in the provisional Alaska Reconnaissance Series. Three of these, Goodnews [Bay], Bethel, and Russian Mission, will be published early in FY 1980 and will reflect the better source material resulting from new 1:63,360-scale mapping. Many maps of this series are available in shaded relief editions.

Fifty-seven 1:25,000 quadrangles of the new metric scale series for Alaska are in various stages of production. These provide coverage of Cordova, Valdez, Whittier, Seward, and Anchorage. Advance material is available for all of the Anchorage area; these maps should be published in 1980.

The Division also prepares indexes by State showing the topographic maps that have been published. The Alaska index is available free from the Survey's Public Inquiries Office, 108 Skyline Building, 508 Second Avenue, in Anchorage. In addition, a periodic index of publication status is also available free. For detailed information on revisions or current mapping status of specific areas, contact the resident cartographer's office.

The Topographic Division will continue a cooperative agreement with the Bureau of Land Management (BLM) to establish geodetic control in support of the cadastral surveying program for Alaska land selections. During the summer of 1979, field parties will establish approximately 63 positions using Doppler satellite and conventional electronic traverse methods.

The Division also continues its supportive role in the State-Federal 3-year interagency program to obtain uniform high-altitude photography coverage for the entire State. Plans for the establishment of a NCIC terminal affiliate in Alaska are actively being pursued by the Division. A location should be selected by mid-1979.

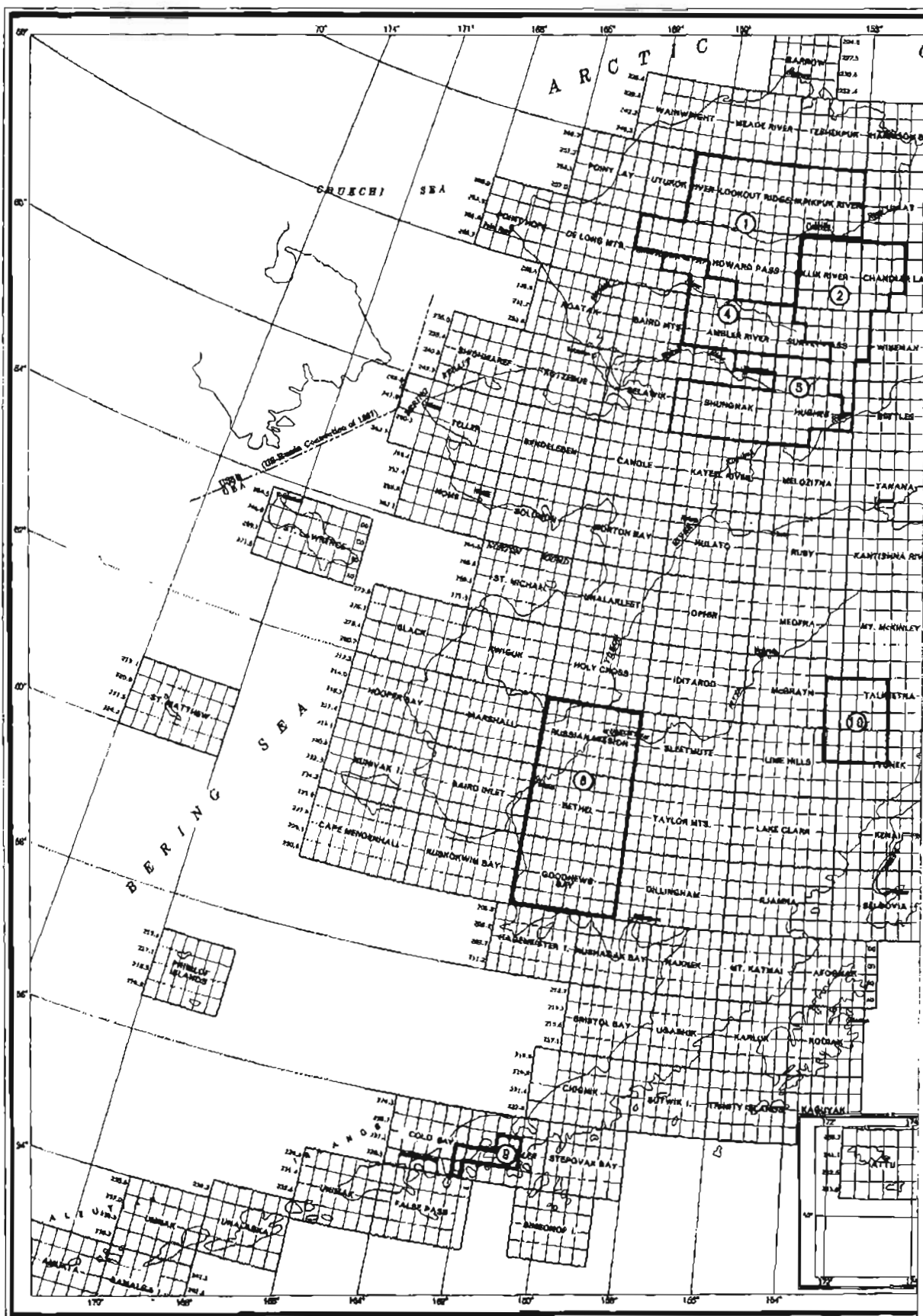
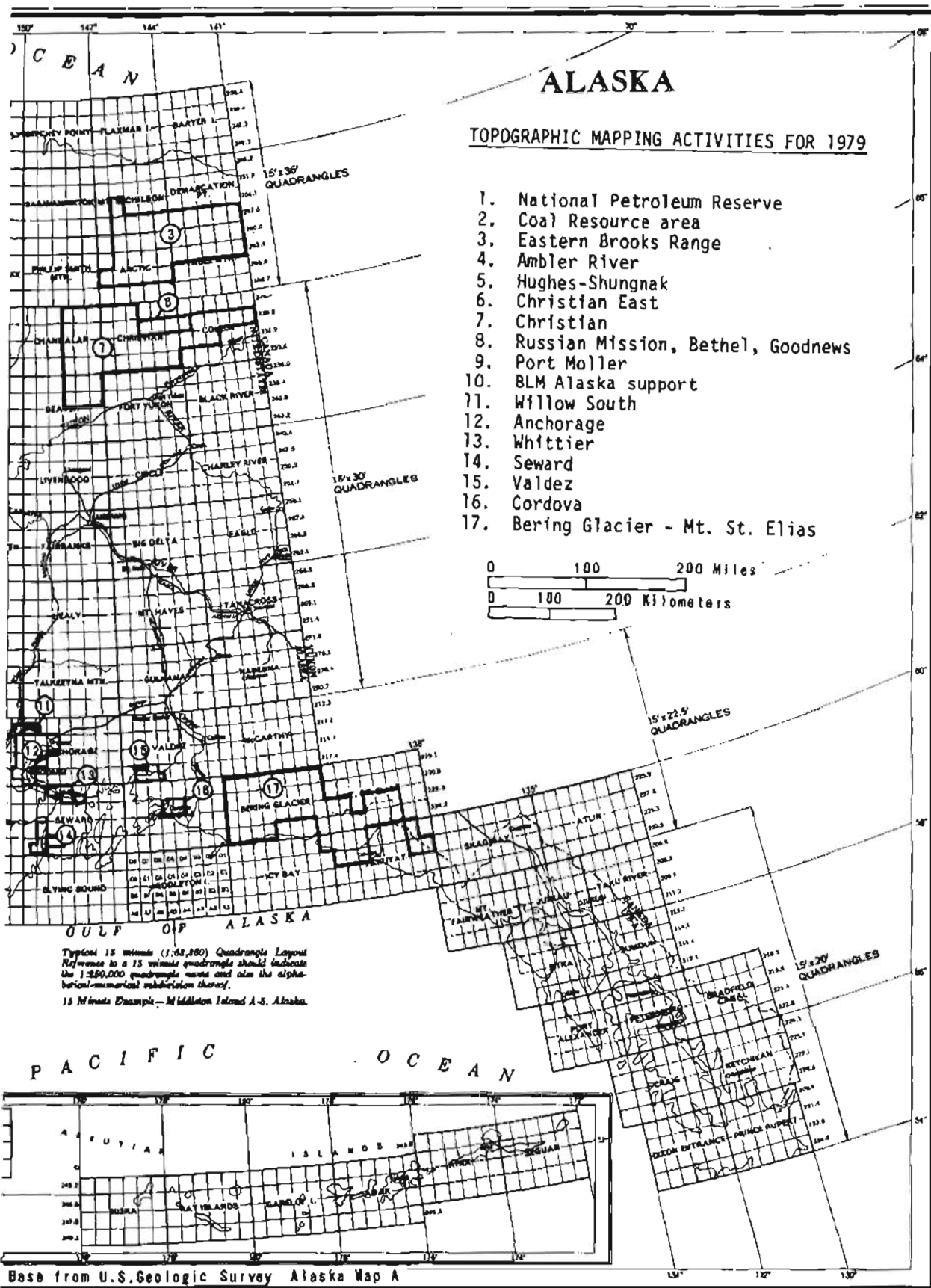


Figure 3.--Topographic mapping activities in Alaska for 1979.



## PROJECTS OF THE TOPOGRAPHIC DIVISION

All Topographic Division projects in Alaska are under the direction of:

Albert E. Letey, Chief  
Rocky Mountain Mapping Center  
Federal Center  
Denver, CO 80225  
Tel. (303) 234-2351

Listed below are the current Division projects. The locations of the projects are shown in figure 3.

### NORTHERN REGION

Project Title: National Petroleum Reserve in Alaska

Project Objective: To provide new 1:50,000-scale topographic maps for that part of the National Petroleum Reserve presently mapped only at the 1:250,000 scale.

Project Status: The project consists of 82 quadrangles being mapped at 1:50,000 scale with metric contours. At the beginning of FY 1979, 48 quadrangles had been compiled with advance manuscript copy available. The remaining 34 quadrangles will be compiled in FY 1979.

\* \* \*

Project Title: Coal Resource Area

Project Objective: To provide 1:50,000-scale topographic maps for an area presently mapped only at the 1:250,000 scale.

Project Status: The project consists of 45 quadrangles to be mapped at 1:50,000 scale with metric contours. Control is being generated using special aerotriangulation techniques. Map compilation is scheduled to begin in FY 1980.

\* \* \*

Project Title: Eastern Brooks Range

Project Objective: To provide new 1:63,360-scale topographic maps in an area previously unmapped at this scale.

Project Status: There are 33 quadrangles remaining to be compiled in this area. This work has been deferred because of higher priority requirements in the National Petroleum Reserve and Coal Resource areas. The present schedule calls for advance manuscript copy to be available for these quadrangles by the end of FY 1980.

\* \* \*

Project Title: Ambler River

Project Objective: To establish geodetic control required for new topographic mapping.

Project Status: The project area is now mapped at 1:250,000 scale. During the summer of 1979, field mapping control will be established to provide mapping coverage at 1:50,000 metric scale.

\* \* \*

### WEST-CENTRAL REGION

Project Title: Hughes-Shungnak Area

Project Objective: To provide new 1:50,000-scale topographic maps in an area presently unmapped at this scale.

Project Status: The area of the project consists of 55 quadrangles at 1:50,000 scale. Field mapping control is approximately 50 percent complete. Because of higher priority requirements for mapping in other areas, such as the National Petroleum Reserve, the present schedule calls for the remaining field control to be obtained in 1980. Advance manuscript copy is to be available in 1981.

\* \* \*



Project Title: Christian East

Project Objective: To provide four new 1:63,360-scale quadrangles in an area previously unmapped at this scale.

Project Status: Advance manuscript copy is presently available for the four quadrangles. They are expected to go to map reproduction facilities for printing by the end of FY 1980.

\* \* \*

Project Title: Christian

Project Objective: To establish geodetic control required for new topographic mapping.

Project Status: Mapping control will be established during the summer of 1979 to provide new 1:63,360-scale mapping. This area is now covered by only 1:250,000-scale mapping.

\* \* \*

#### SOUTHWESTERN REGION

Project Title: Russian Mission, Bethel, Goodnews [Bay]

Project Objective: To prepare three new 1:250,000-scale maps to replace the reconnaissance maps that presently cover this area.

Project Status: The 1:250,000-scale and 24 1:63,360-scale maps of the Goodnews [Bay] quadrangles have been completed and are awaiting publication. The Russian Mission and Bethel 1:250,000-scale maps are scheduled to be completed along with the companion 1:63,360-scale quadrangles in 1979.

\* \* \*

Project Title: Port Moller

Project Objective: To prepare eight new 1:63,360-scale topographic maps of the Port Moller area.

Project Status: Three quadrangles have been compiled, and advance manuscript copy is available. The remaining five 1:63,360-scale quadrangles are scheduled to be compiled during FY 1979.

\* \* \*

#### SOUTHERN REGION

Project Title: Bureau of Land Management, Alaska, Support

Project Objective: To establish horizontal control in support of the public land surveys of the Bureau of Land Management in Alaska.

Project Status: During 1978, the Topographic Division personnel established 19 horizontal geodetic positions by electronic-traverse and Doppler satellite methods. The remaining 31 positions will be completed during the 1979 field season.

\* \* \*

Project Title: Willow South

Project Objective: To provide large-scale topographic maps of the new State capitol site near Willow.

Project Status: The project consists of four 1:25,000-scale maps with metric contours. Field control was obtained in 1978. The schedule calls for advance manuscript copy to be available in FY 1981.

\* \* \*

## TOPOGRAPHIC

Project Title: Anchorage

Project Objective: To provide modern large-scale topographic maps of the greater Anchorage area.

Project Status: The project consists of 31 quadrangles at 1:25,000 scale with metric contours. Advance copy is presently available for these quadrangles. The maps are scheduled to be sent in for printing in late FY 1979.

\* \* \*

Project Title: Whittier

Project Objective: To provide modern large-scale maps of Whittier and vicinity, including Portage and the Turnagain Arm south of Anchorage.

Project Status: The project consists of seven 1:25,000-scale quadrangles with metric contours. The schedule calls for field operations to be conducted in 1979 and advance manuscript copy to be available in 1981.

\* \* \*

Project Title: Seward

Project Objective: To provide modern large-scale topographic maps for Seward and vicinity.

Project Status: The project consists of six 1:25,000-scale maps with metric contours. The schedule calls for field operations to be conducted in 1979 and advance manuscript copy to be available in 1981.

\* \* \*

Project Title: Valdez

Project Objective: To provide modern large-scale topographic maps for this developing area.

Project Status: The project consists of five 1:25,000-scale quadrangles with metric contours. Field control was established during 1977. Advance manuscript copy should be available by the end of FY 1980.

\* \* \*

Project Title: Cordova

Project Objective: To provide modern large-scale topographic maps for Cordova and vicinity.

Project Status: The project consists of four 1:25,000-scale quadrangles with metric contours. Field control was established in 1977. Advance manuscript copy should be available by the end of FY 1980.

\* \* \*

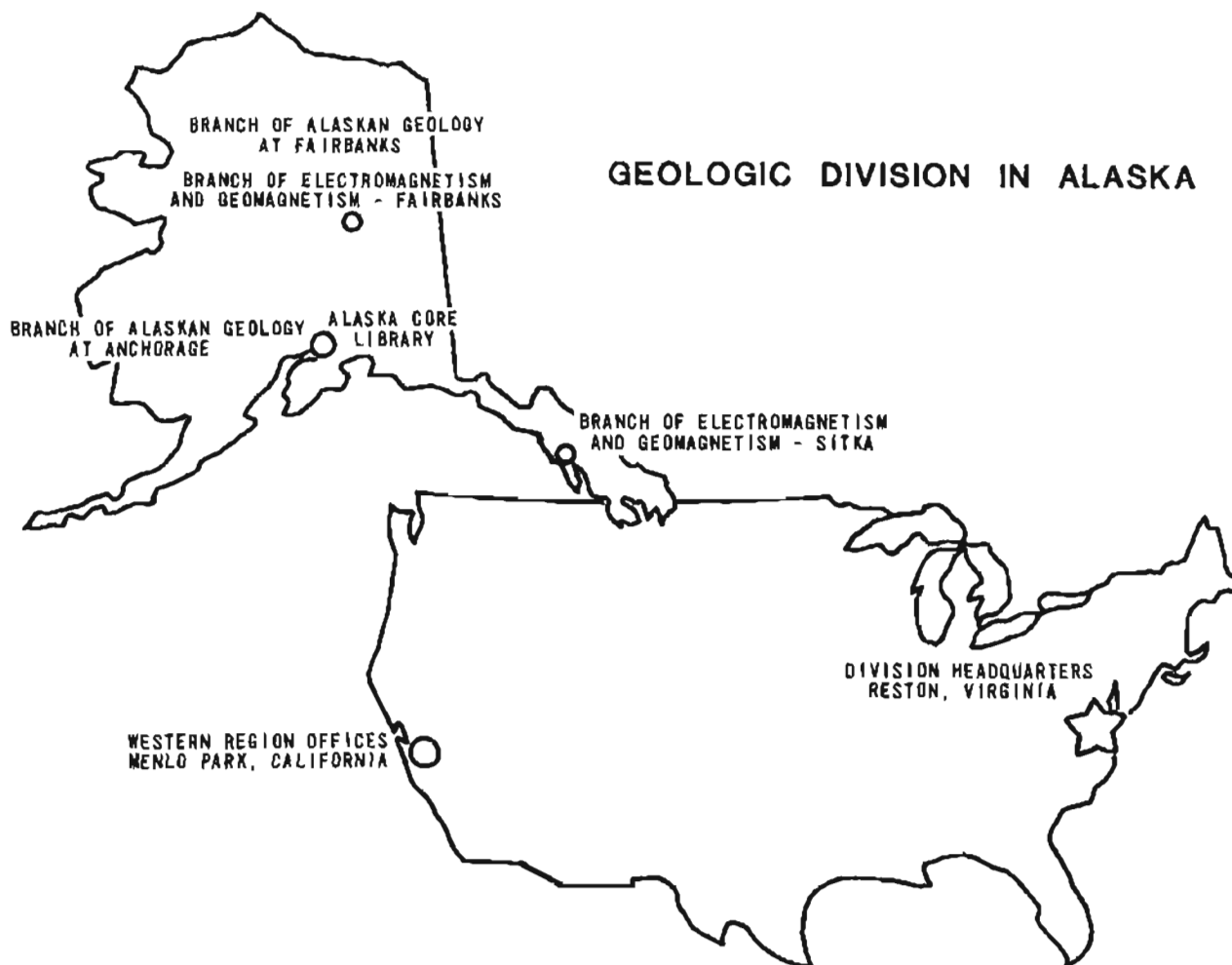
Project Title: Bering Glacier - Mt. St. Elias Area

Project Objective: This project consists of 50 quadrangles at 1:63,360 scale. Five of these have been compiled, and advance manuscript copy is available.

Project Status: Work on the remaining quadrangles has been deferred owing to higher priority mapping requirements in the National Petroleum Reserve and the Coal Resources area.

\* \* \*





For further information, contact the offices listed below.

Anchorage, Alaska  
Thomas P. Miller

Geologist in Charge Tel. (907) 271-4150  
Branch of Alaskan Geology, 1209 Orca Street  
Anchorage, AK 99501

Menlo Park, California  
A. Thomas Owenshine

Chief, Branch of Alaskan Geology Tel. (415) 323-8111x2231  
345 Middlefield Road, Menlo Park, CA 94025

Reston, Virginia  
Dallas L. Peck

Chief Geologist Tel. (703) 860-6531  
12201 Sunrise Valley Drive  
National Center, Reston, VA 22092

Fairbanks, Alaska  
Florence R. Weber

John S. Townshend

Geologist in Charge Tel. (907) 479-7245  
Branch of Alaska Geology, P.O. Box 80586  
Fairbanks, AK 99708  
Chief, College Observatory Tel. (907) 479-6146  
Branch of Electromagnetism and Geomagnetism  
Yukon Drive on West Ridge, Fairbanks, AK 99701

Sitka, Alaska  
Willis I. Osbakken

Chief, Sitka Observatory Tel. (907) 747-3332  
Branch of Electromagnetism and Geomagnetism  
P.O. Box 158, Sitka, AK 99835

Anchorage, Alaska  
W. L. (Doc) Adkison

Geologist Tel. (907) 271-4150  
Alaska Core Library, 132 140 Manor Street  
Anchorage, AK 99501

## ENERGY, MINERALS, GEOLOGIC HAZARDS, AND GEOLOGIC RESEARCH

The current scientific program of the Geologic Division in Alaska is primarily related to mineral and energy resource appraisal, earthquake and geologic hazards, and geologic research conducted in support of these programs. This work includes geologic mapping and mineral-resource evaluation, primarily at scales of 1:250,000 and 1:63,000; mineral district mapping and evaluation; mineral-resource appraisal; geochemical studies and sampling, particularly related to mineral deposits; petroleum-resource surveys; aeromagnetic and gravity surveys and interpretation; engineering geology studies in urban areas and along transportation corridors; earthquake studies; isotope age determination and interpretation; heat-flow studies; and submarine sampling, subbottom profiling, and other geophysical studies of the ocean floor.

Activities in Alaska are the responsibility of several working groups within the Geologic Division: the Branch of Alaskan Geology, the Office of Earthquake Studies, the Office of Energy Resources, and the Office of Marine Geology at the Western Regional Headquarters in Menlo Park, California; the Branches of Regional Geophysics, Electromagnetism and Geomagnetism, Exploration Research, Isotope Geology, and Engineering Geology at the Rocky Mountain Field Center in Denver, Colorado; and the Branch of Paleontology and Stratigraphy at the National Center in Reston, Virginia. Several other branches in the Geologic Division provide services or conduct research in cooperation with these units. The Branch of Alaskan Geology maintains two offices in Alaska: the main office is located at 1209 Orca Street, Anchorage, with Thomas P. Miller as geologist in charge, and a second is located at the University of Alaska with Florence R. Weber in charge. The Branch of Electromagnetism and Geomagnetism maintains observatories at Fairbanks (College), Barrow, Adak, and Sitka. The College and Barrow observatories are under the direction of J. B. Townshend, whose office is in Fairbanks. The Sitka Observatory is directed by Willis Osbakken.

This section on the Geologic Division first describes the major mission-oriented programs in Alaska and then describes the current projects in Alaska by geographic region. Figures 4 through 12 show the locations of current division activities. Projects for other divisions are presented under similar geographic headings for easy cross-referencing or gaining an overview of all Survey activities in a region.

The major program elements of the Geologic Division in Alaska are:

- The Alaska Mineral Resources Appraisal Program (AMRAP) and related projects (23 projects)
- The North Slope Petroleum Program and related Alaska-wide energy studies (16 projects)
- The Marine Geology Program (10 projects)
- The Arctic Environmental Studies Program (5 projects)
- The Earthquake Hazards Reduction Program (6 projects)
- Geologic research in support of the program elements (11 projects)

Most of these programs are interrelated. Several Arctic environmental studies, for example, are designed to determine and mitigate the environmental effects of oil exploration, production, and transportation in the Arctic. The Marine Geology Program, similarly, is designed to determine the petroleum potential in the continental shelf areas off the coast of Alaska and to determine geo-hazards related to placement of oil and mining facilities on the sea floor. Much of the North Slope Petroleum Program is funded by the Office of the National Petroleum Reserve in Alaska.

### ALASKA MINERAL RESOURCES ASSESSMENT PROGRAM

The Alaska Mineral Resources Assessment Program (AMRAP), coordinated by Henry C. Berg, began in 1975. The program was developed to meet the demand by public and private interests for objective and timely information on Alaska's mineral endowment. The AMRAP program has two basic objectives: (1) to assess the State's mineral potential for long-range planning and development by systematic methods carried out by interdisciplinary teams studying the areas of the 1:250,000-scale quadrangles; and (2) to assess in the near term, on a 1:1,000,000-scale base, the State's mineral resources to provide information to Congress and the Department of the Interior for use in their efforts to classify Alaskan lands. The second objective has been realized for most of Alaska; the southeastern part of the State is being investigated in this manner at the present time.

The AMRAP program comprises four levels of study. The objective of Level I is to publish statewide summaries of Alaska's mineral resources. This element is continuing and is based on past and present investigations by the Survey and by other organizations and agencies. Level II works towards identifying mineral resources likely to occur in a given large area of the State by plotting favorable areas on maps, and by presenting some measure of the probable size and grade of undiscovered deposits. Level II reports incorporate summaries of the results of Level III studies, which include geologic mapping, aeromagnetic and geophysical surveys, analysis of geochemical samples, and topical studies of known deposits. Level III addresses specific 1:250,000-scale quadrangles, each containing about 4.5 million acres. Interdisciplinary teams study each quadrangle for about 3 years to acquire more detailed information than that of Level II. Level IV investigations focus on individual mineral deposits or

mining districts to determine their size, nature, and origin. Such Level IV studies are underway on Prince of Wales Island, the Aleutian Peninsula, and in the Alaska and Brooks Ranges.

The total AMRAP project area is nearly 180,000 square miles. Level III studies have been completed for about two-thirds of the area; figure 4 shows the current status of these studies. Fieldwork is scheduled for the following quadrangles and areas in 1979: Bradfield Canal quadrangle, Circle quadrangle, Healy quadrangle, Medfra quadrangle, Mt. Hayes quadrangle, Survey Pass quadrangle (surficial geology), Ugashik-Karluk quadrangles area, and Valdez quadrangle. Fieldwork is completed and laboratory studies are underway or final reports are in preparation for the following projects: Chignik-Sutwik Island quadrangles, Lake Clark quadrangle, and Survey Pass quadrangle (bedrock geology). The following projects are completed and reports have been published or are in press: Ambler River quadrangle, Chandalar quadrangle, Big Delta quadrangle, Goodnews and Hagemister Island quadrangles, Seward and Biyিং Sound quadrangles, Talkeetna quadrangle, Talkeetna Mountains quadrangle, and Tanacross quadrangle.

### ARCTIC ENVIRONMENTAL STUDIES PROGRAM

The Arctic Environmental Studies Program is under the direction of Oscar J. Ferrians, Jr. The program objectives are: (1) to investigate energy-related transportation corridors and other areas of development in Alaska in order to obtain base-line geotechnical data needed to aid in planning, designing, operating, and maintaining engineering structures so that adverse environmental impacts will be minimized; to evaluate feasibility of proposed projects; and to prepare comprehensive Environmental Impact Statements; (2) to collect and synthesize pertinent engineering geologic data made available during construction of the trans-Alaska oil pipeline, particularly emphasizing the character and distribution of surficial deposits and permafrost, Pleistocene and Holocene stratigraphy, glacial chronology, periglacial features, seismic phenomena, and geologic processes that are unique to or especially active in the arctic environment; and (3) to observe and record geotechnical maintenance and environmental problems that arise during the operation of the trans-Alaska oil pipeline in order to determine the location, character, and extent of these problems and their relation to geologic conditions and processes. These observations will allow an evaluation of the adequacy of the technical stipulations in controlling adverse environmental impacts and make it possible to improve stipulations for future engineering projects that would have a significant impact on the environment.

Continuing projects within the Arctic Environmental Studies Program include: Tanana Valley Transportation-Development Corridor Studies, Eastern Arctic Coastal Plain Studies, Surficial Geology of the Central Brooks Range, and Western Arctic Coastal Plain Quaternary Studies. Other major activities during 1978 included: (1) continuing surficial/engineering geologic map compilation of part of the Copper River Basin (item 7, fig. 7); (2) a continuing exchange program with Soviet scientists and engineers concerned with pipelines, permafrost, and environmental protection; and (3) compilation of a 3-year study of the seismicity of northeastern Alaska, demonstrating that this large region is subject to earthquakes although it was previously considered to be essentially aseismic.

### NORTH SLOPE PETROLEUM PROGRAM

The North Slope Petroleum Program, directed by Kenneth J. Bird, consists of a number of projects whose goals are to explore the petroleum potential of the North Slope of Alaska. Specifically, the program's objectives are to determine, map, and describe, on the surface and in the subsurface, by geologic, geophysical, and geochemical methods: (1) the structural framework and regional structural trends in the Brooks Range and North Slope; (2) depositional environments and lateral relations of Paleozoic, Mesozoic, and Cenozoic facies; (3) possible hydrocarbon reservoirs and their regional trends; (4) paleontologic, lithologic, and electric log correlations across the North Slope; (5) the thermal history, hydrocarbon source potential, and relations of extracted hydrocarbons to known North Slope oils; and (6) the geologic history of the area as it relates to potential reservoirs, source and seal rocks, hydrocarbon formation and migration, and present structural trends.

At present there are five active projects within the North Slope Petroleum Program: a reservoir study of the Lisburne Group; a subsurface, seismic, gravity, magnetic, and stratigraphic study of the structural style of the eastern Brooks Range foothills; a comprehensive reservoir study of the Cretaceous Nanushuk Group; a geochemical study of NPRA to assess petroleum source rock potential; and a helium sniffer survey in the NPRA and Prudhoe Bay areas to determine the effectiveness of this technique in the Arctic. The last project is not described in this circular; information can be obtained from Kenneth Bird.

### MARINE GEOLOGY PROGRAM

The Alaskan continental shelf is larger than the combined shelves of the rest of the United States. The energy and mineral potential of this shelf area is and will continue to be a major segment of national resource programs. The primary mission of the Survey's Marine Geology Program is to provide scientifically interpreted information about the (1) resource potential, (2) geo-environmental setting, and (3) overall geologic characteristics of the continental margin and adjacent shallow and deeper coastal areas of Alaska. The program focuses on the investigation of the regional geologic framework

and on geo-environmental problems that typically require the gathering of widely spread and publicly available geophysical and geologic data. In contrast, the Conservation Division's program, described elsewhere in this circular, prepares detailed resource and geo-environmental data analysis for evaluations of specific three-mile-square tracts. The combination of regional geologic synthesis compiled by the Geologic Division and the detailed assessments by the Conservation Division provide a comprehensive understanding of the oil and gas resource potential of an area and the geologic hazards related to exploration and production activities.

Although the bulk of the regional resource studies of continental margins is directed at energy deposits, investigations are also conducted to determine mineral resources, both hard-rock and placer deposits, and the availability of construction materials such as sand and gravel, which may bear on energy resource development. Energy resource investigations are concentrated in areas proposed or that have potential for leasing activity.

The geo-environmental program involves seafloor characterization studies, analyses of processes active on the seabed, and geo-hazard assessments. In Alaskan areas, the studies are designed first to determine the regional relations and then focus on the specific geo-hazards and the processes that form them. Geo-hazards include recent or active faulting, seabed erosion or scour, transportation and deposition, slumping and related mass-sediment movement, gas accumulations in the shallow subsurface, and ice-gouging of the seafloor.

These studies also involve basic or applied research needed to (1) improve our ability to either collect or interpret scientific data or (2) understand processes that shape or modify the seabed and its underlying rocks. The theoretical and technological results of these endeavors bolster our areal resource and geo-environmental programs, as well as enrich the Nation's storehouse of scientific knowledge.

The Marine Geology Program is coordinated by H. Edward Clifton. The projects are described under the regional headings Southwestern and Southern, and Offshore.

### **EARTHQUAKE HAZARDS REDUCTION PROGRAM**

On an annual basis, most of the releases of seismic energy in the United States occur in the Alaska seismic zone. Consequently, earthquakes pose serious hazards to life and property within the State. Severity of the hazard was amply illustrated by the great Alaskan earthquake of 1964. However, Alaska also provides an ideal area to conduct research into the cause of earthquakes. The program in Alaska is part of a national program mandated by the Earthquake Hazards Reduction Act of 1977 (Public Law 95-124). Under the act, the responsibility for research on earthquake hazards is divided between the Survey and the National Science Foundation (NSF). The Survey is responsible for prediction, induced seismicity, and hazards assessment. The NSF is responsible for engineering and research for utilization of mitigating procedures. Much of the national overall program funding goes to universities, private groups, and other government services in addition to the Survey's program. As a result, the Survey closely coordinates its program in Alaska with the Geophysical Institute of the University of Alaska in Fairbanks and with the National Oceanic and Atmospheric Administration (NOAA). Observatories are maintained in Adak, Sitka, and Barrow, in addition to the Fairbanks facilities. The program in Alaska is coordinated by Robert Page. Figure 5 shows the location of current activities of this program.



Figure 4.--Status of Level III Alaska Mineral Resource Assessment Program (AMRAP), January 1, 1979.  
Base from U.S. Geologic Survey Alaska Map A



## PROJECTS OF THE GEOLOGIC DIVISION

## STATEWIDE

Project Title: Mineral Resources of Alaska

Project Chief: Edward H. Cobb  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: As a continuing project, to keep office studies of mineral occurrence data current and to prepare special-purpose maps, reports, and reference lists whenever the need arises. Most data are organized so they are available for entry into computerized storage and retrieval banks.

Project Status: As this is a continuing project, percentage-of-completion data are not applicable; by early in 1979, records should be current as of December 31, 1978.

\* \* \*

Project Title: Alaska Geologic Earthquake Hazards

Project Chief: George Plafker  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To study and evaluate risk in Alaska from tectonic displacement, seismic shaking, and secondary geologic effects. A more general goal is to gain insight into tectonic processes within the seismically active zones of Alaska, with special emphasis on south-central Alaska.

Project Status: The 8-year program has resulted in detailed strip mapping and reconnaissance studies of virtually all known or suspected active faults that are exposed on land in Alaska and evaluation of marine terrace sequences in the Gulf of Alaska region. During 1978 fieldwork included study of the offshore continuations of the Fairweather and Chatham Strait faults using the R/V *Sea Sounder*, completion of work on marine terraces in the Lituya Bay area, and a reconnaissance of the onshore segment of the Chatham Strait fault. Studies of the offset history of the Chatham Strait fault and recent elevation changes along shorelines in southeastern Alaska will be carried out in 1979.

The area of current project activity is shown in figure 5 and in more detail in item 1, figure 11.

\* \* \*

Project Title: Precambrian of Alaska

Project Chiefs: G. Donald Eberlein and Marvin A. Lanphere  
(Office of Mineral Resources, Branch of Alaskan Geology; Office of Geochemistry and Geophysics, Branch of Isotope Geology)

Project Objectives: In response to growing public demand on earth resources and in recognition of the need for closer examination of the largely overlooked mineral resource potential of the world's Precambrian terranes, the Subcommittee on Precambrian Stratigraphy of the International Union of Geological Sciences' Commission on Stratigraphy has established Working Groups in all parts of the world where Precambrian rocks form a significant part of the geology of the region. This program activity, with particular concern for Alaska, is one of seven that constitute the Working Group for the Precambrian of the United States and Mexico. Immediate objectives are: (1) assembly and evaluation of existing pertinent geologic and geochronologic data relevant to Alaskan Precambrian terranes; (2) preparation of a summary geologic report and geochronologic chart for Alaska to be published in a single volume with similar reports for the other regions of the United States and Mexico; (3) formulation of an acceptable time scale for the Precambrian of the United States and Mexico; (4) coordination with the Working Group of Canada in an effort to formulate an acceptable Precambrian time scale for all of North America; (5) identification and designation of reference sections; and (6) revision of the American Commission on Stratigraphic Nomenclature code for the Precambrian.

Project Status: Objectives (1), (2), and (3) have been fulfilled. A review paper on the Precambrian of Alaska has been approved for publication. Efforts are actively going forward in pursuit of objective (4).

\* \* \*

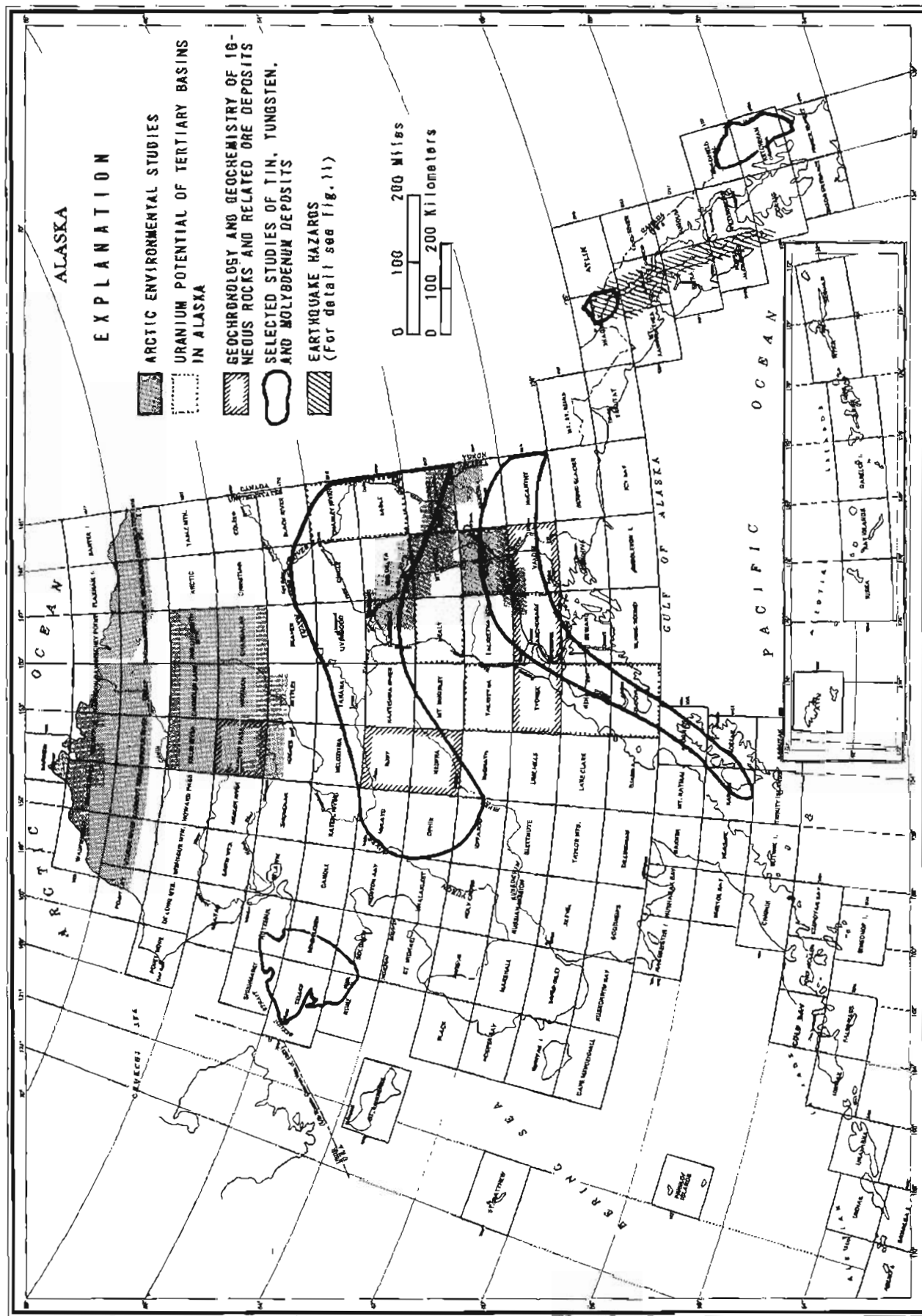


Figure 5.--Statewide geologic activities in Alaska.

Based from U.S. Geologic Survey Alaska Map A

Project Title: Paleozoic Paleontology and Stratigraphy of Alaska

Project Chief: J. Thomas Dutro, Jr.  
(Office of Environmental Geology, Branch of Paleontology and Stratigraphy)

Project Objectives: (1) Field and laboratory studies of Paleozoic biostratigraphy of Alaska, with emphasis on upper Paleozoic rocks of the Brooks Range; (2) systematic description of invertebrate faunas, relating their distribution in space and time to the geologic development of Alaska and the arctic regions; (3) inquiry into the paleotectonic and depositional implications of the faunal assemblages and carbonate petrography, and correlations with other Paleozoic sequences in the Arctic.

Project Status: This is a lifetime project whose direction during any short-term period (2-5 years) is determined, in part, by the nature of cooperative work with other Survey geologists. Current work includes studies of the Carboniferous of Alaska, the Upper Devonian of the central Brooks Range, the Paleozoic of the Medfra quadrangle, Lisburne Group microfacies, carbonate petrography of the Bornite area, biostratigraphy of the Calico Bluff Formation, and the lower Paleozoic sedimentary rocks of the Dilling River in the Alaska Range.

\* \* \*

Project Title: Metamorphic Facies Map of Alaska

Project Chief: David A. Brew  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To compile a 1:2,500,000-scale metamorphic facies map of Alaska showing the facies, facies groups, facies series, selected isograds, and granitic rock bodies in the style of the metamorphic facies map explanation suggested by the International Union of Geological Sciences in 1967. The map is planned as a contribution to a Map of the Metamorphic Belts of the World, which is sponsored by the Commission for the Geological Map of the World (of the International Geological Congress and the International Union of Geological Sciences), and as a joint U.S. Geological Survey-State of Alaska publication.

Project Status: Progress to date includes preliminary compilation and review of regional metamorphic facies maps at a scale of 1:1,000,000 for all of Alaska, coding of background metamorphic mineral locality information, and start of the compilation of the final 1:2,500,000-scale map.

\* \* \*

Project Title: Geochronology and Geochemistry of Igneous Rocks and Related Ore Deposits in Alaska

Project Chief: Miles L. Silberman  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To study both mineralized and unmineralized plutons, stocks, and related volcanic rocks in mining districts and AMRAP project areas to ascertain: (1) the chemical and mineralogic nature of the igneous rocks; (2) the origin of the igneous rocks; (3) the relations in space and time between the igneous rocks and associated ore deposits that bear on the genesis of the ore deposits; and (4) the regional history of Paleozoic, Mesozoic, and Cenozoic magmatism. Accomplishment of these basic objectives will lead to development of criteria for exploration to locate new ore deposits. Recognition of areas favorable for location of new ore deposits and evaluation of mineral potential of areas known to have such deposits are hampered by lack of knowledge of how and why ore deposits form. Spatial association alone suggests an important causative relation that should be evaluated.

Project Status: Isotopic age study is still in progress on igneous rocks and hydrothermal mineralization in the Willow Creek mining district. Preliminary data were reported in Open-file Report 76-191, and the final results, which should be completed in the fall of 1979, will appear as a topical paper and in the AMRAP Talkeetna Mountains report. Additional rubidium-strontium (Rb-Sr) analytical data were determined by the project chief in February and March at the laboratories of University of New Mexico. Initial results of the Rb-Sr study of meta-plutonic rocks in the Brooks Range were reported at the Geological Society of America, Cordilleran Section meeting in April. Additional fieldwork to extend the Brooks Range geochronological study, in collaboration with State of Alaska, Division of Geological and Geophysical Surveys personnel, is planned for summer 1979. Potassium-argon dating of about 25 samples from the Ruby and Medfra quadrangles has been completed; results will be reported in the Medfra AMRAP report. An area which has copper and tin mineralization in the Medfra quadrangle is being studied and evaluated; results of this investigation will appear in an open-file report late in 1979. Additional

fieldwork is planned for the Medfra-Ruby area in 1979. Rb-Sr geochronological study of Precambrian rocks from the Ruby-Medfra area of the Ruby Geanticline will be initiated in 1979.

Project location is indicated in figure 5.

\* \* \*

Project Title: AMRAP Geophysical Studies

Project Chief: James E. Case  
(Office of Geochemistry and Geophysics, Regional Geophysics Branch)

Project Objectives: To provide interpretations of aeromagnetic, gravity, and other geophysical data in support of AMRAP projects.

Project Status: Continuing

\* \* \*

Project Title: Coal Resources of Alaska

Project Chief: Gary D. Stricker  
(Office of Energy Resources, Branch of Coal Resources)

Project Objectives: (1) To evaluate coal resources in the National Petroleum Reserve in Alaska (NPRA) and AMRAP areas of Alaska by geologic mapping, drill core data, and geophysical methods; (2) to prepare cross sections showing coal bed correlations and core distribution in NPRA and AMRAP areas; (3) to provide resource estimates by area and bed for selected parts of these areas; and (4) to assess coal quality by use of Btu values, sulfur and ash content, and major-, minor-, and trace-element concentrations. Coal samples will be collected from drill sites and other acceptable locations and analyzed by USGS laboratories.

Project Status: Twenty-two sections, which include approximately 45,355 feet of strata in the Nanushuk Group, were measured in the 1978 field season, and coal samples were collected. A study of well logs and outcrop data for the coal-bearing Nanushuk Group is underway. Studies in progress include depositional environments and coal resource assessment of NPRA.

\* \* \*

Project Title: Selected Studies of Tin, Tungsten, and Molybdenum Deposits in Alaska

Project Chief: Travis Hudson  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To investigate the origin of intrusive rocks associated with tin, tungsten, and molybdenum deposits in Alaska. Petrology, geochemistry, and geochronology are integrated with regional geology in these studies in order to better understand the genesis of the deposits.

Project Status: Specific field and laboratory studies of the Donatut Granite Complex and associated tin mineralization (Seward Peninsula) and of intrusive rocks associated with the Quartz Hill molybdenum deposit (Ketchikan quadrangle) have been completed. Geochronologic and geochemical studies of Seward Peninsula tin-granite complexes and of intrusive rocks associated with molybdenum deposits in the Coast Range batholithic complex of southeastern Alaska are continuing. A tabulation and geologic summary of tungsten deposits in Alaska are nearing completion, and field and laboratory studies of the Coast Range batholithic complex near Ketchikan and Skagway have begun. Field studies of Jurassic plutonic rocks in the Chugach Mountains will begin in 1979.

The area of project activity is shown in figure 5.

\* \* \*

Project Title: Uranium Potential of Tertiary Basins in Alaska

Project Chief: Kendell A. Dickinson  
(Office of Energy Resources, Branch of Uranium-Thorium Resources)

Project Objectives: (1) To evaluate the uranium potential of selected Tertiary sedimentary basins and coastal regions; (2) to compile data on and locate anomalous radioactivity in Tertiary sedimentary rocks; (3) to determine the environments of sedimentation in each basin and coastal region to delineate nearshore and continental facies most favorable for roll-type uranium deposits; (4) to determine potential granitic and volcanic ash source rocks for uranium near basins and coastal plains; (5) to delineate areas of alteration favorable for uranium deposits and determine hydrology as it relates to movement of uranium-bearing groundwater; (6) to evaluate paleo-geochemical conditions suitable for the preservation of potential host rocks; and (7) to define target areas for physical exploration (drilling).

Project Status: Fieldwork is 70 percent complete, and laboratory and work compilation 50 percent complete. Plans for 1979 field season include 2 weeks in Tintina Valley.

Project location is shown in figure 5.

\* \* \*

Project Title: Arctic Map

Project Chief: Michael Churkin, Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To delineate the major lithospheric plates, past and present. This will provide a regional perspective for other workers making more detailed studies of various parts of Alaska and also assist in the correlation of geology and mineral deposits between Alaska and adjoining areas of Canada and the USSR.

Project Status: A "basement" map of Alaska and adjoining areas, showing oceanic and continental terranes, is nearly ready for technical review. An analysis of this map has outlined the continental backbone of Alaska which has served as a backstop for the accretion of allocthonous terranes of oceanic and microcontinental origin. Results of this study are being prepared for publication.

\* \* \*

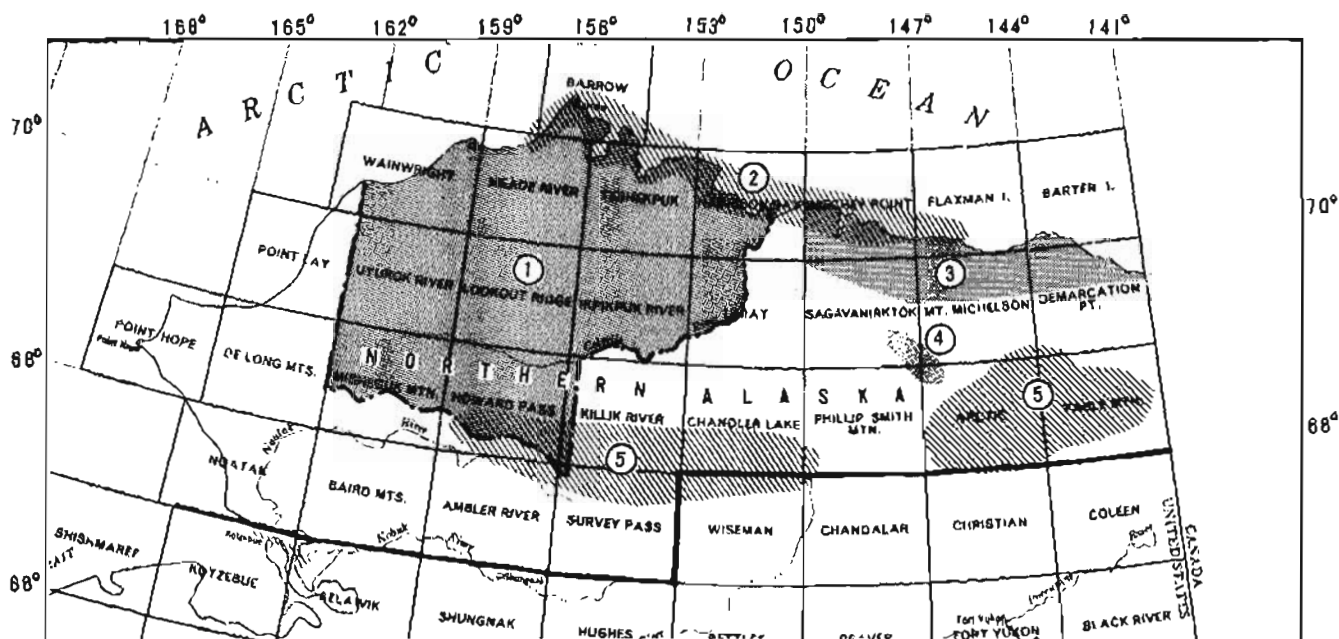
Project Title: Landsat Imagery and Applications in Alaska (AMRAP)

Project Chief: W. Clinton Steele  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: (1) To furnish AMRAP team leaders and principal investigators with state-of-the-art Landsat materials for reconnaissance purposes; (2) to provide unique geologic, structural, and tectonic information relevant to mineral resource assessment for each AMRAP quadrangle; and (3) to develop computer methods to aid in manipulating and analyzing the rapidly increasing volume of data generated in the project.

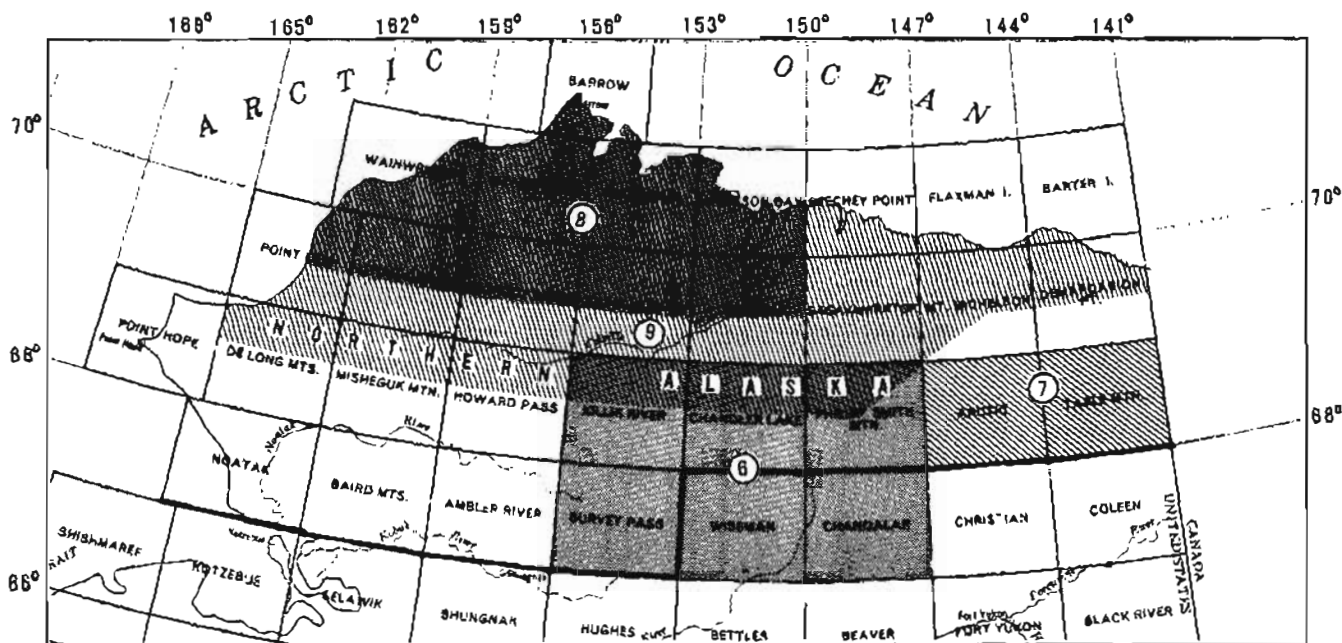
The types of Landsat products used are: (1) black and white, single-band Landsat mosaics; (2) a noncomputer-enhanced, controlled, false-color Landsat mosaic; (3) photographically enhanced false-color images; (4) computer-enhanced first-derivative black and white images; (5) computer-enhanced false-color, color ratio, and simulated natural color images; and (6) interactive computer programs and displays allowing analysis of specific areas.

Project Status: The Landsat data parts of studies of the Nabesna, McCarthy, Tanacross, Talkeetna, Goodnews [Bay], Hagemelster Island, Ketchikan, Prince Rupert, Talkeetna Mountains, Chandalar, Philip Smith Mountains, Ambler River, and Big Delta quadrangles studies have been completed and published. Computer compatible tapes for Ugashik, Karluk, Lime Hills, Medfra, Bradfield Canal, Mount Hayes, Healy, and Circle quadrangles are being processed at the Computer Center Division, Flagstaff, Arizona. Images for the Survey Pass, Seward, Blying Sound, Chignik, Sutwick Island, Lake Clark, and Valdez quadrangles are being analyzed.



#### EXPLANATION

1. NATIONAL PETROLEUM RESERVE
2. NORTHERN ALASKA CENOZOIC
3. EASTERN ARCTIC COASTAL PLAIN
4. GEOLOGIC-GEOPHYSICAL PROFILE ACROSS BROOKS RANGE FRONT
5. BROOKS RANGE DEVONIAN



#### EXPLANATION

6. SURFICIAL GEOLOGY OF CENTRAL BROOKS RANGE
7. SOUTHEAST BROOKS RANGE GEOLOGY
8. WESTERN ARCTIC COASTAL PLAIN QUATERNARY
9. CRETACEOUS NANUSHUK GROUP



Figure 6.--Geologic activities in Northern Alaska.

A noncomputer-enhanced, controlled, 1:1,000,000-scale Lambert conformal false-color Landsat mosaic of Alaska has been constructed. The mosaic includes all of Alaska except St. Lawrence Island and the Aleutian Islands and is available in various formats from the EROS Data Center in Sioux Falls, South Dakota.

Figure 4 shows the location of AMRAP quadrangles.

\* \* \*

Project Title: Strato-Tectonic Terrane Map of Alaska

Project Chiefs: David L. Jones and P.J. Coney  
(Office of Mineral Resources, Branch of Paleontology and Stratigraphy; Department of Geological Sciences)

Project Objectives: To compile a strato-tectonic terrane map of Alaska with accompanying expanded legend and descriptive material. The purpose of this compilation is to portray the major terranes and tectonic elements of Alaska critical to understanding its tectonic evolution.

The project will proceed in two stages:

(1) The first stage is to compile the map in four quadrants at a scale of 1:1,000,000: Northern, Central, Southeast, and Southern. These compilations will be preliminary and placed on open file; the first sheet will be the southern quadrant;

(2) Final compilation will be as single map sheet at 1:2,500,000 with a separate, complete, expanded legend and descriptive material. The final map will include all basement and superjacent terranes and major structures.

Project Status: This new project is scheduled for 4 years. It is being undertaken because it is now apparent that Alaska holds special importance for tectonic studies in North America and particularly in its western Cordillera. It is also critical for understanding tectonic relationships between North America and Asia. This importance is due to the fact that the entire State is made up of a great collage of geologic terranes whose original position and methods of accretion remain enigmatic. Classic plate tectonic signatures are surprisingly absent in many cases. This suggests that the proposed studies will bring important insights to Cordilleran tectonic evolution and to the evolution of classic plate tectonic theory, and make more comprehensible the geologic evolution of Alaska and distribution of its important mineral resources.

\* \* \*

#### NORTHERN REGION

Project Title: National Petroleum Reserve in Alaska Oil and Gas Source Rock Study (North Slope Petroleum Program)

Project Chief: Leslie B. Magoon  
(Office of Energy Resources, Branch of Oil and Gas Resources)

Project Objectives: To provide data and interpretations necessary to assess oil and gas source potential of various possible hydrocarbon source horizons in the National Petroleum Reserve in Alaska. Interim reports will help evaluate the present drilling program and determine the location of new drill sites as required.

Project Status: Analytical data needed for this study will be provided by Geochem Research, Inc., Houston, and Global Geochemistry, Los Angeles. To date, more than 8,000 analyses have been completed. Petroleum Information, Denver, is building and maintaining the data file of these analyses and implementing graphical displays.

Project location is shown in item 1, figure 6.

\* \* \*

Project Title: Engineering Geologic Studies in National Petroleum Reserve in Alaska

Project Chief: Reuben Kachadoorian  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To make engineering geologic investigations to provide geotechnical analyses needed for petroleum exploration of the National Petroleum Reserve in Alaska. Investigations include, but are not limited to, (1) determining sources of construction materials and (2) evaluating site locations of such facilities as airstrips, roads, drill sites, and construction camps. Project personnel consult with participants in the NPRA program on (1) engineering geology and permafrost-related engineering problems and (2) engineering geologic effects of exploration activities in the Reserve.

Project Status: Because the project provides engineering geologic expertise needed to fulfill responsibilities assigned to the Geological Survey through provisions of the Naval Petroleum Reserves Production Act of 1976, it will continue until these responsibilities are fulfilled.

Project location is shown in item 1, figure 6.

\* \* \*

Project Title: National Petroleum Reserve in Alaska (NPRA) 105(c) Land Use Studies

Project Chief: Oscar J. Ferrians, Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To carry out surficial geologic investigations of the Reserve which include the following: (1) determination of the distribution and character of natural construction materials (e.g., gravel deposits, which are limited in extent); (2) investigation of geologic hazards (e.g., thawing of permafrost, unstable bentonitic shales, accelerated erosion, and flooding); (3) determination of distribution of ice-rich permafrost, including ice-wedge polygons, pingos, and other indicators of the presence of permafrost; (4) determination of character and distribution of various types of surficial deposits in terms of their engineering properties; (5) study of unique arctic drainage conditions; (6) study of coastal zone processes and conditions; and (7) preparation of a slope map.

To carry out mineral resource assessment studies which include the following: (1) determine the distribution, character, and stratigraphic and structural relations of rocks which are potentially mineral bearing; (2) systematic sampling of rocks and soils in areas of mineral potential in order to determine their geochemistry; and (3) determination of the types and values of mineral commodities present.

Project Status: After two seasons of fieldwork, the project was officially terminated on April 1, 1979. More than 20 technical reports and maps have been prepared as part of this land use study.

Project location is shown in item 1, figure 6.

\* \* \*

Project Title: National Petroleum Reserve in Alaska Support Paleontology

Project Chief: Charles A. Repenning  
(Office of Environmental Geology, Branch of Paleontology and Stratigraphy)

Project Objectives: To examine Late Cretaceous to Quaternary mega- and microfossils from strata within the National Petroleum Reserve in Alaska and in adjacent regions, with the objectives of estimating age, making stratigraphic correlations, and establishing arctic biochronologies. This information will aid in deciphering the history of structural/tectonic activity within NPRA, which in turn may lead to better understanding of time of hydrocarbon migration and entrapment in possible petroleum reservoirs.

Project Status: Field collection of Tertiary mollusks has been completed, with final sampling of Pleistocene mollusks to occur in summer 1979. Extensive field sampling of Tertiary and Quaternary plants, vertebrates, and microfossils remains to be done, to supplement collecting done in 1978.

Project location is shown in item 1, figure 6.

\* \* \*



Project Title: Northern Alaska Cenozoic

Project Chief: David M. Hopkins  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To determine the state, depth, and extent of offshore permafrost on the Beaufort Sea coast. Core drilling through shorefast ice in Prudhoe Bay has permitted determination of permafrost distribution and the lithology and stratigraphy of subsea sediments. Reconnaissance of the coastline and offshore islands of the Beaufort and Chukchi Sea coasts has given a picture of late Pleistocene and Holocene paleogeography and climatic and depositional history which supports the permafrost studies.

Project Status: This project continues work which was begun in 1976. Data from seven existing boreholes in Prudhoe Bay have been analyzed and reported on to the National Oceanic and Atmospheric Administration in both quarterly and annual reports. Field programs during the summers of 1977 and 1978 have provided information for open-file reports on coastal erosion rates and storm surge limits, as well as furthering studies on ice-wedge development. D.M. Hopkins and R.W. Hartz participated as Outer Continental Shelf Environmental Assessment Program investigators in the Conservation Division's drilling program in the Beaufort Sea during February and March 1979.

Project location is shown in item 2, figure 6.

\* \* \*

Project Title: Eastern Arctic Coastal Plain (Arctic Environmental Studies Program)

Project Chief: Oscar J. Ferrians, Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To complete reconnaissance engineering geologic investigations that will provide base-line geotechnical data needed for planning, designing, operating, and maintaining engineering structures in this region (e.g., the proposed Arctic Gas Pipeline). Planned fieldwork includes engineering geologic mapping at a scale of 1:125,000. Studies of permafrost conditions and geomorphic features and other permafrost-related geologic processes important to arctic engineering will be emphasized. Potential geotechnical problems that require special consideration include: slope stability, drainage conditions, frost action, thawing of permafrost, availability of natural construction materials, swelling soils, earthquake effects, erosion, flooding, and icings.

Project Status: Enough data have been collected during 5 weeks of helicopter-supported fieldwork to prepare preliminary engineering geologic maps of the entire region. After these maps have been prepared, 3-4 weeks of fieldwork will be required for field checking before maps are published.

Project location is shown in item 3, figure 6.

\* \* \*

Project Title: Geologic-geophysical Profile Across the Brooks Range Front, Northeastern Alaska (North Slope Petroleum Program)

Project Chief: Kenneth J. Bird  
(Office of Energy Resources, Branch of Oil and Gas Resources)

Project Objectives: To determine the structural style of the Brooks Range front and its relation to the petroleum potential of this general area by studying a strip about 10 miles wide by 40 miles long extending from the Shaviovik Anticline in the foothills to Wahoo Lake in the range. This area is uniquely suited to a study of this type because of the variety of geologic and geophysical data available and the presence of the Kemik gas field. The data consist of surface geologic maps, four wells, several seismic lines, gravity and magnetic measurements, and rock samples.

Project Status: Gravity and magnetic readings from 50 stations along this profile have been reduced and analyzed by D.M. Giovannetti. Rock samples from wells and outcrop have been measured for their density and magnetic susceptibility. This information is being released in open file. A stratigraphic summary of four wells and numerous outcrop sections along the profile is nearly complete. Geochemical and paleontologic analyses of selected samples have been completed. Synthetic seismograms have been constructed from digitized acoustic logs. Review and updating of the surface geology by means of aerial photographs are in progress.

Project location is shown in item 4, figure 6.

\* \* \*

Project Title: Brooks Range Devonian Rocks

Project Chief: William P. Brosge<sup>1</sup>  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To determine the depositional environments, directions of sediment transport, and present facies trends of the Devonian coarse clastic rocks and the potential of Devonian shale as a hydrocarbon source. To relate directional features in exposed rocks to those in the North Slope subsurface by paleomagnetic studies.

Project Status: Half of the fieldwork has been completed.

Project location is shown in item 5, figure 6.

\* \* \*

Project Title: Surficial Geology of the Central Brooks Range (Arctic Environmental Studies Program)

Project Chief: Thomas D. Hamilton  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To provide data essential for assessment of potential transportation corridors across the central Brooks Range and for other studies involving land-use analysis and land classification. The objective is being accomplished through preparation of 1:250,000-scale surficial geologic maps showing (1) character, age, and genesis of unconsolidated deposits and (2) locations of landslides, debris flows, and other hazards. A general stratigraphic framework, based on measured sections, radiocarbon dates, soil analyses, and geomorphic age criteria, is also being developed for the region. This framework will tie together glacial and nonglacial deposits of the northern and southern Brooks Range, and will provide a basic structure to which other Quaternary events in northern and central Alaska can be related.

Project Status: Surficial geologic maps of the Philip Smith Mountains and Chandalar quadrangles have been published as U.S. Geological Survey Miscellaneous Field Studies Maps MF-878-A and MF-879-A, and maps of the Chandler Lake and Wiseman quadrangles are currently being submitted for publication. Field mapping during the summer of 1979 will be carried out in the Killik River and Survey Pass quadrangles, completing studies in these two map areas.

Project location is shown in item 6, figure 6.

\* \* \*

Project Title: Southeastern Brooks Range Geology

Project Chief: William P. Brosge<sup>1</sup>  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To map the geology of the Arctic and Table Mountain quadrangles at a scale of 1:250,000.

Project Status: About one-third of the geologic mapping has been completed.

Project location is shown in item 7, figure 6.

\* \* \*

Project Title: Western Arctic Coastal Plain Quaternary (Arctic Environmental Studies Program)

Project Chief: L. David Carter  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To determine the Quaternary history of the western Arctic coastal plain (marine transgressions, episodes of eolian activity, fluvial terrace development, paleoclimate, tectonic history, and the like) via stratigraphic and geomorphic studies, and to define relations between modern landscape attributes (topography, thaw lake characteristics, and ground ice distribution, among others) and Quaternary history, in order to predict the effects of natural or man-induced environmental changes.

Project Status: Detailed sampling of key exposures and geomorphic analyses of the terrain will be done over the next three summers. Results will be published in the form of maps and reports, with project completion scheduled for 1982.

Project location is shown in item 8, figure 6.

\* \* \*

Project Title: Cretaceous Nanushuk Group, North Slope, Alaska (North Slope Petroleum Program)

Project Chief: A. Curtis Huffman  
(Office of Energy Resources, Branch of Oil and Gas Resources)

Project Objectives: To assess the petroleum potential of the Cretaceous Nanushuk Group in and adjacent to the National Petroleum Reserve in Alaska (NPRA). Outcrop, subsurface, and paleontologic studies are being integrated to provide a depositional and biostratigraphic framework for such an evaluation.

Project Status: Twelve sections, which include approximately 26,910 feet of strata in the Nanushuk Group, were measured during the 1978 field season, and 1,000 samples were collected for geochemical, paleontologic, and petrographic analyses. A study of well logs and cores from NPRA wells that penetrate the Nanushuk is underway. Studies in progress include: biostratigraphic zonation of the Nanushuk using pollen, dinoflagellates and foraminifers; uranium, thorium, and coal assessments, source rock analysis; and sandstone diagenesis, provenance, and depositional environment studies. Preliminary results of these investigations have been summarized in Circular 772-B.

Project location is shown in item 9, figure 6.

\* \* \*

Project Title: Survey Pass Quadrangle (AMRAP)

Project Chief: Donald Grybeck  
(Office of Mineral Resources, Branch of Alaskan Geology and Branch of Exploration Research)

Project Objectives: To provide the data for a rapid assessment of the mineral resources of the quadrangle by means of reconnaissance geologic, geochemical, geophysical, and telegeologic mapping. Fieldwork included: (1) geologic mapping at 1:63,360 scale, with detailed studies of mineral deposits; (2) geochemical sample survey primarily through use of stream sediments and altered or mineralized rocks, with detailed investigations of selected mineral deposits; (3) sampling mineralized areas for age determinations and for trace-elements and stable-isotope studies; and (4) an aeromagnetic interpretation.

Project Status: All fieldwork was completed in 1978, and the final reports are in preparation. The folio package of the Survey Pass AMRAP project will include a 1:250,000-scale geologic map with supplemental maps of the structure and metamorphic facies, numerous geochemical maps, aeromagnetic and telegeologic interpretations, and a mineral resource assessment of the quadrangle.

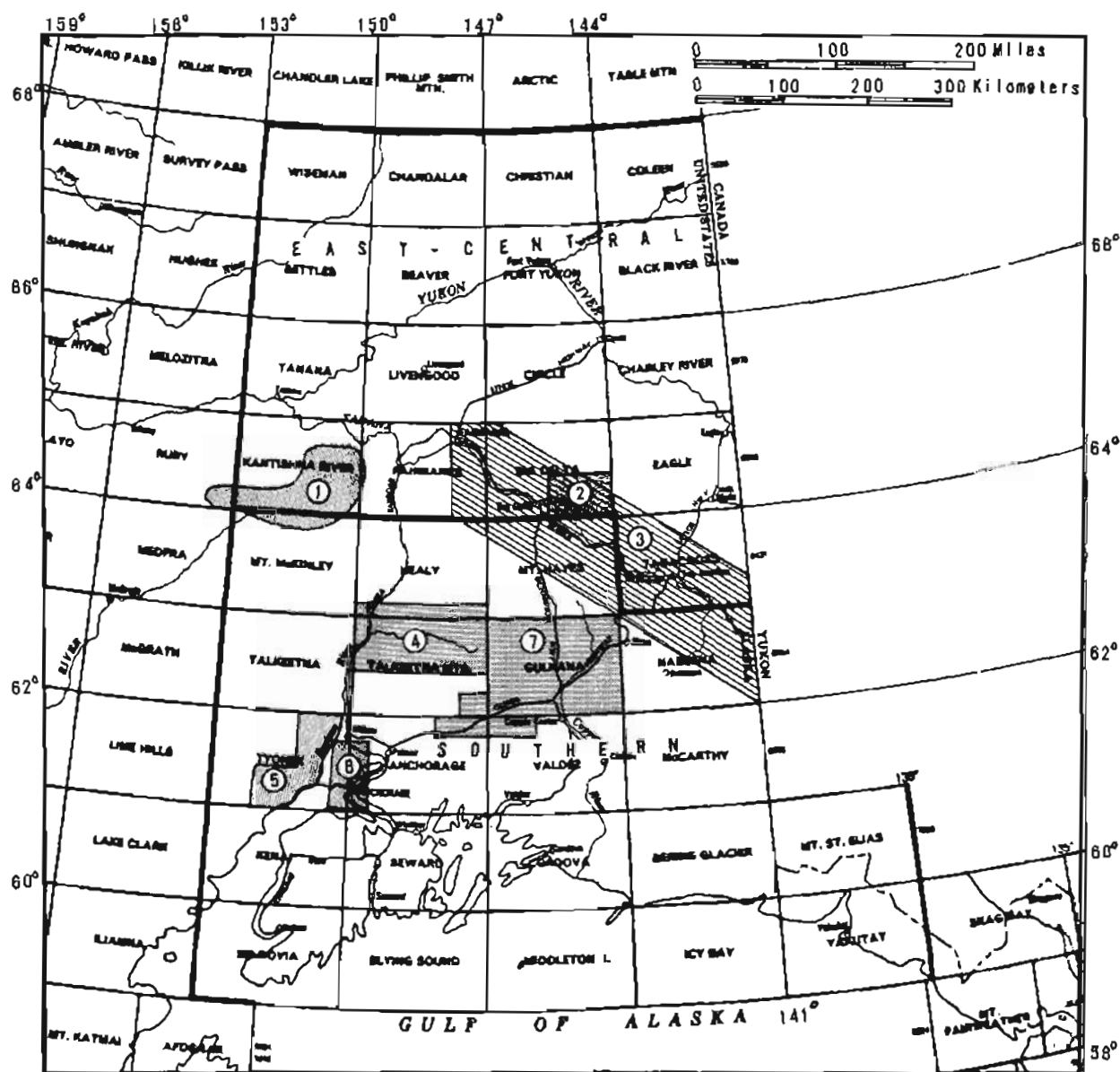
Project location is shown in figures 4 and 6.

\* \* \*

Project Title: Reservoir Study of Lisburne Group (North Slope Petroleum Program)

Project Chief: Kenneth J. Bird  
(Office of Energy Resources, Branch of Oil and Gas Resources)

Project Objectives: To map reservoir trends by determining the relation of reservoir characteristics to lithofacies, and then to construct a series of lithofacies maps. Analysis of Lisburne Group well logs and selective study of well samples and thin sections are designed to determine reservoir characteristics and mappable lithofacies.



## EXPLANATION

1. ARCTIC MINERAL RESOURCES
2. PETROGRAPHIC STUDIES, YUKON-TANANA UPLAND
3. TANANA VALLEY TRANSPORTATION-DEVELOPMENT CORRIDOR
4. WATANA-DEVILS CANYON DAMSITES
5. ENGINEERING GEOLOGY OF COOK INLET COAL LANDS
6. EARTHQUAKE HAZARDS, ANCHORAGE-SUSITNA LOWLANDS
7. COPPER RIVER BASIN ARCTIC ENVIRONMENTAL STUDIES

Figure 7.--Geologic activities in East-Central and Southern Alaska.

Project Status: A comprehensive report on the reservoir properties of the Lisburne Group has been published in the American Association of Petroleum Geologists Bulletin (September 1977). Additional well and outcrop data have allowed extension of the study into the National Petroleum Reserve in Alaska. General location of the project is shown in figure 6.

\* \* \*

#### WEST-CENTRAL REGION

Project Title: Medfra Quadrangle (AMRAP)

Project Chief: William W. Patton, Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To conduct a detailed stratigraphic study and geochemical sampling of Precambrian to Cenozoic rocks of the northern Kuskokwim Mountains. These studies are needed to provide a basic geologic framework for assessing the mineral potential of the Ruby Geanticline and the petroleum possibilities of the Minchumina basin. The Medfra quadrangle was selected for these initial investigations because it provides one of the few areas having good bedrock exposures within the densely vegetated terrain of the Ruby Geanticline.

Project Status: Field stratigraphic studies and reconnaissance mapping are largely completed. Fieldwork in 1979 will be focused primarily on geochemical sampling and mineral-resource investigations.

Location of the project quadrangle is shown in figure 4.

\* \* \*

#### EAST-CENTRAL REGION

Project Title: Arctic Mineral Resources

Project Chief: Robert M. Chapman  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: (1) To compile a geologic map of the unmapped eastern half of Kantishna River quadrangle; (2) to map in detail the Precambrian rocks in the southeast corner of the Ruby quadrangle; (3) to sample selected rock units for radiometric and paleontologic dating; and (4) to recheck several geochemical anomalies. This is part of a regional study that will provide an adequate geologic base for mineral resource assessments, regional geologic correlations, and land-use evaluations throughout the Ruby Geanticline, a major structural feature in central Alaska.

Project Status: During the past several years reconnaissance geologic mapping and geochemical sampling have been largely completed in the Ruby, western Kantishna River, Tanana, and Beaver quadrangles. These studies have been coordinated with similar work in the adjacent Nulato, Medfra, Melozitna, Bettles, and Livengood quadrangles. Fieldwork in 1979 will complete mapping of the Kantishna River quadrangle, and better define the ages and geologic relations of several major rock units in the Ruby and Kantishna River quadrangles.

Project location is shown in item 1, figure 7.

\* \* \*

Project Title: Yukon-Tanana (AMRAP)

Project Chief: Helen L. Foster  
(Office of Mineral Resources)

Project Objectives: To complete geologic mapping and geochemical sampling, assess mineral resource potential, and carry on special geologic studies of the Yukon-Tanana upland. The Tanacross, Big Delta, and Circle quadrangles are AMRAP projects and involve a team approach which includes interpretation of geological, geochemical, geophysical, Landsat, and mineral resource data.

Project Status: The results of geologic mapping of the Eagle quadrangle are published. AMRAP reports for the Tanacross and Big Delta quadrangle have been commenced, and about 50 percent of the geologic mapping and geochemical sampling in these areas will be done during the 1979 field season. Fieldwork will be completed in 1980, and final reports are estimated to be completed in 1982. Continuing are special studies of augen gneiss and other metamorphic granitic and ultramafic rocks.

Location of the project quadrangles is shown in figure 4.

\* \* \*

Project Title: Petrographic Studies - Yukon-Tanana Upland

Project Chief: Cynthia Dusel-Bacon  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To obtain petrographic, petrologic, and geochronologic information about the crystalline rocks of the Yukon-Tanana Upland. The purpose of the study is to determine the age and protolith of a large (approximately 2.6 square miles) body of augen gneiss in the Big Delta quadrangle. Uranium-thorium-lead dating of zircons from the gneiss body will be done by geochronologists from the Branch of Isotope Geology. Examination and quantitative study of the morphology of zircons from the augen gneiss will be one of the tools used to determine the protolith of this body. Knowledge of the history of the augen gneiss will shed light on the as yet poorly understood history of the Yukon Crystalline Terrane.

Project Status: Preliminary reconnaissance mapping on which these studies are based has already been completed under AMRAP by H.L. Foster and others. A week of field study of the Big Delta augen gneiss body and collection of samples for dating purposes is planned for June 1979; studies of this body should be completed in late 1980.

Project location is shown in item 2, figure 7.

\* \* \*

Project Title: Tanana Valley Transportation-Development Corridor: Fairbanks to the Canadian Border (Arctic Environmental Studies Program)

Project Chief: L. David Carter  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To compile a map showing the distribution of unconsolidated surficial deposits within the transportation-development corridor that extends southeastward up the Tanana Valley from Fairbanks to the Canadian border. Tables accompanying the map will include a description of lithology, topography, and geologic hazards in terms of the map units. Fieldwork includes geologic mapping at a scale of 1:125,000 in parts of Fairbanks, Big Delta, Mount Hayes, Tanacross, and Nabesna quadrangles.

Project Status: Existing geologic mapping has been compiled at a scale of 1:125,000. Field checking and additional geologic mapping were undertaken in 1976, 1977, and 1978. A strip map of the surficial deposits along the proposed route of the Alcan (Alaska Highway) gas pipeline from Fairbanks to the Canadian border was published in 1978, and a map of the surficial deposits of the project area will be completed in 1979.

Project location is shown in item 3, figure 7.

\* \* \*

## SOUTHERN REGION

Project Title: Watana-Devils Canyon Damsites, Susitna River, Alaska

Project Chief: Reuben Kachadoorian  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To evaluate geologic and seismic hazards to which the proposed Watana and Devils Canyon dams and reservoirs on the Susitna River will be subjected. To provide to the Corps of Engineers the necessary geotechnical information (1) to evaluate the proposed dam and reservoir sites, and (2) to prepare the geotechnical section of the Environmental Impact Statement.

Project Status: The initial goals of the project are now complete. There is, however, the possibility that additional studies may be made to refine the work done during the summer of 1978.

Project location is shown in item 4, figure 7.

\* \* \*

Project Title: Regional Engineering Geology of Cook Inlet Coal Lands

Project Chiefs: Henry R. Schmoll and Lynn A. Yehle  
(Office of Environmental Geology, Engineering Geology Branch)

Project Objectives: To provide an understanding of the nature, location, and extent of general environmental concerns and potential problems caused by response of geologic materials (surficial deposits and bedrock) to surface and underground coal mining, energy conversion, facility siting, and accompanying land utilization for associated development (including transportation routes and urban development) within the Cook Inlet region.

Project Status: To date, most effort has been devoted to a study of the Capps Glacier-Iyonek area about 65 miles west of Anchorage, where strip mining of coal is anticipated within the next several years. Field investigations, comprising helicopter, fixed-wing aircraft, land vehicle, and foot traverses, are presently in progress within the area of about five 1:63,360-scale quadrangles, and will continue into adjacent quadrangles covering potential transportation corridors. Surficial geology maps are compiled chiefly from aerial photographs and checked in the field. Physical properties of Tertiary sedimentary rocks and Quaternary surficial deposits are being determined in the laboratory from samples collected from outcrops; a limited drilling program is anticipated for collection of additional samples.

Project location is shown in item 5, figure 7.

\* \* \*

Project Title: Earthquake Hazards Mapping, Anchorage-Susitna Lowlands

Project Chief: Oscar J. Ferrians, Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To complete earthquake hazards mapping of the region, with emphasis on assessing the response of surficial materials to earthquakes. The Anchorage-Susitna Lowlands region, which is within an extremely active seismic zone, undoubtedly will experience the greatest development and population growth of any region in Alaska. It occupies a strategic location for land and air transportation and includes the largest city in Alaska (Anchorage), as well as the proposed site for the new State capitol near Willow. As a means of providing the information needed for planning and development, an investigation of this earthquake-prone region is being undertaken to obtain the critical data necessary for earthquake hazards identification and evaluation.

Project Status: A demonstration area has been selected for this investigation and for mapping at a scale of 1:100,000. This area includes all of the Anchorage A-8, B-8, and C-8, Iyonek A-1, B-1, and C-1 quadrangles, and a narrow strip along the southern border of the Anchorage D-8 and Iyonek D-1 quadrangles. This will be a 3-year study and will include: surficial and bedrock geologic mapping, engineering geologic mapping and assessments, Bootlegger Cove Clay study, active faults study, slope

## GEOLOGIC

mapping, seismic study, ground response study, engineering soils study (liquefaction and sensitive clays), collection and syntheses of subsurface soils data, and earthquake hazards mapping.

Project location is shown in item 6, figure 7.

\* \* \*

Project Title: Healy Quadrangle (AMRAP)

Project Chief: Béla Csejtei, Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To assess the mineral potential of the Healy quadrangle through reconnaissance geologic mapping and geochemical investigations, and to collect structural data to help decipher the tectonic history of southern Alaska.

Project Status: This project is being initiated in 1979.

Location of the project quadrangle is shown in figure 4.

\* \* \*

Project Title: Mount Hayes Quadrangle (AMRAP)

Project Chief: Warren J. Nokleberg  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To carry out reconnaissance and detailed geologic mapping and geochemical and geophysical surveys to provide data for a thorough mineral-resource assessment of the quadrangle. Fieldwork will include: (1) geologic mapping at scales of 1:250,000 to 1:1,200; (2) detailed studies and sampling of mineralized areas; (3) geochemical sampling of stream sediments and mineralized areas; (4) isotopic studies of bedrock and mineralized rocks; (5) interpretation of aeromagnetic surveys; (6) mapping and sampling of placer deposits; and (7) surficial geology studies.

Project Status: Two 60-day field seasons are planned for the summers of 1979 and 1980 with a team of seven to seventeen people. All fieldwork will be helicopter supported. Additional follow-up fieldwork is planned for the summer of 1981. Fieldwork in 1979 will include: (1) geologic mapping in the southern part of the quadrangle at a scale of 1:63,360; (2) detailed mapping and sampling of bedrock mineral deposits in the southern part of the quadrangle; (3) study and mapping of surficial deposits in the southern part of the quadrangle; (4) geochemical sampling of stream sediments throughout most of the quadrangle; (5) mapping and sampling of placer deposits; and (6) sampling of igneous and meta-igneous rocks for isotopic studies.

Location of the project quadrangle is shown in figure 4.

\* \* \*

Project Title: Valdez Quadrangle (AMRAP)

Project Chief: Gary R. Winkler  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To evaluate the mineral resources of the Valdez 10 x 30 quadrangle through integrated geologic, geochemical, geophysical, and telegeologic mapping. Fieldwork is to include (1) surficial and bedrock mapping at a scale of 1:250,000; (2) a geochemical survey for metals; (3) detailed geologic and geochemical studies of known and prospective mineral deposits; (4) completion of the regional gravity survey; (5) an aeromagnetic survey; (6) geochronologic, isotopic, and trace-element investigations of volcanic and intrusive rocks; and (7) detailed structural and stratigraphic studies in terranes proximal to the Contact and Border Ranges fault systems.

Project Status: The second, and final, field season in 1979 will emphasize completion of the surficial and bedrock geologic mapping and geochemical sampling, continuation of the paleontologic and geochronologic sampling, and renewed evaluation of known and prospective mineral deposits in the Valdez quadrangle. Aeromagnetic and gravity surveys have largely been completed, as has the stream-sediment



geochemical survey. The completed map of surficial deposits will include discussion of foundation conditions and sources of material for roads, airfields, or other projects that might accompany development of mineral resources in the region. The completed bedrock map will define the structural relations between geologically disparate Paleozoic and Mesozoic terranes for input into regional tectonic studies. Studies of specific mineral deposits will sharpen the overall assessment of the quadrangle's potential resources. The folio of maps is scheduled for completion by mid-1980, with subsequent publications of topical studies of the Port Valdez gold district and structural setting of the northwestern part of the quadrangle.

Location of the project quadrangle is shown in figure 4.

\* \* \*

Project Title: Eastern Gulf of Alaska Seismicity

Project Chief: John C. Lahr  
(Office of Earthquake Studies, Earthquake Hazards Branch)

Project Objectives: To evaluate the hazards associated with earthquake activity in the eastern Gulf of Alaska and adjacent onshore areas that pose a threat to the safety of petroleum exploration and development.

Project Status: A network of seismic stations installed in 1974 and expanded in 1975 is now operating between Prince William Sound and Yakutat Bay. Current emphasis is on the region south of Yakutat Bay. An ocean-bottom seismic experiment is planned for 1979. Quarterly and annual reports are published by the National Oceanic and Atmospheric Administration (NOAA) as "Alaskan OCS Principal Investigators' Reports."

Project location is shown in figure 8.

\* \* \*

Project Title: Alaska Seismic Studies

Project Chief: John C. Lahr  
(Office of Earthquake Studies, Earthquake Hazards Branch)

Project Objectives: To develop an understanding of the current tectonic processes that are generating earthquakes in Alaska in order to evaluate the hazards that pose a threat to the safety of present and future development. Of particular importance is the search for premonitory phenomena and physical conditions prior to moderate and large earthquakes.

Project Status: The Alaska seismic studies project, which began in 1971, currently operates seismic equipment at 50 sites covering the region from Cook Inlet to Yakutat Bay. Topics currently under investigation include seismicity of the Willow - Anchorage region and seismicity of the proposed Susitna Reservoir sites. Open-file reports summarizing the data collected to date are in preparation, with quarterly listings of earthquake parameters and epicenter maps.

Project location is shown in figure 9.

\* \* \*

Project Title: Reconnaissance Engineering Geology of Certain Coastal Communities, Alaska

Project Chief: Lynn A. Yehle  
(Office of Environmental Geology, Engineering Geology Branch)

Project Objectives: To evaluate by reconnaissance field methods the general and engineering geology of certain Alaska tidewater communities for geologic hazards including earthquakes and to present the results of the research on maps and in reports.

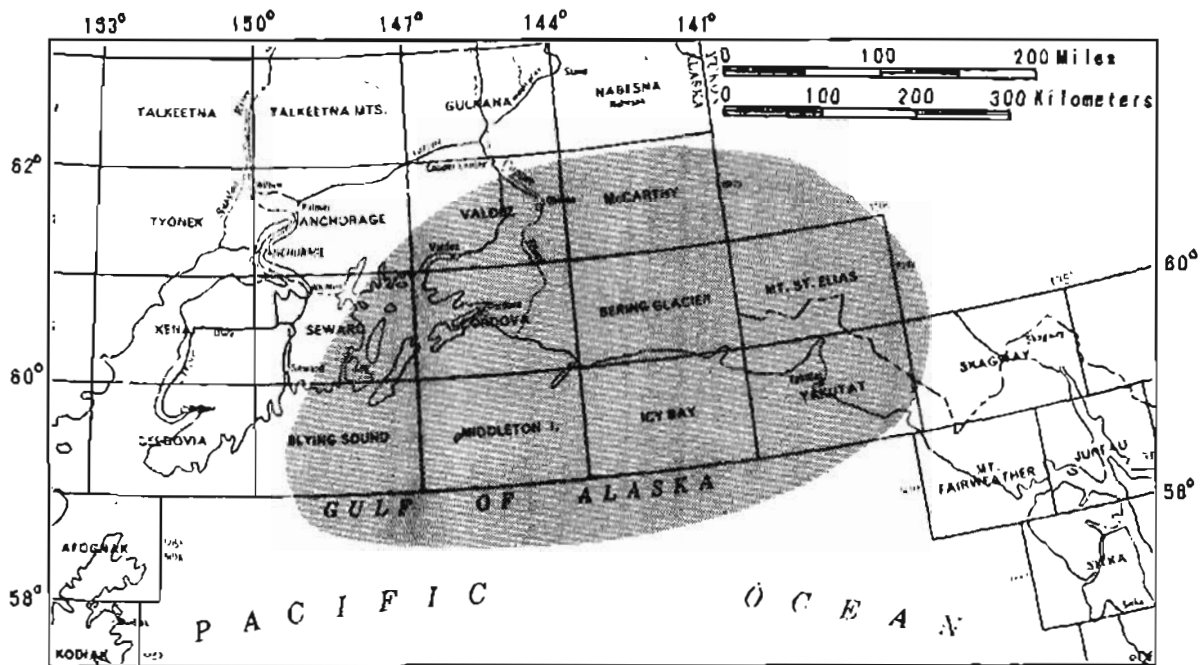


Figure 8.--Eastern Gulf of Alaska seismicity study area.

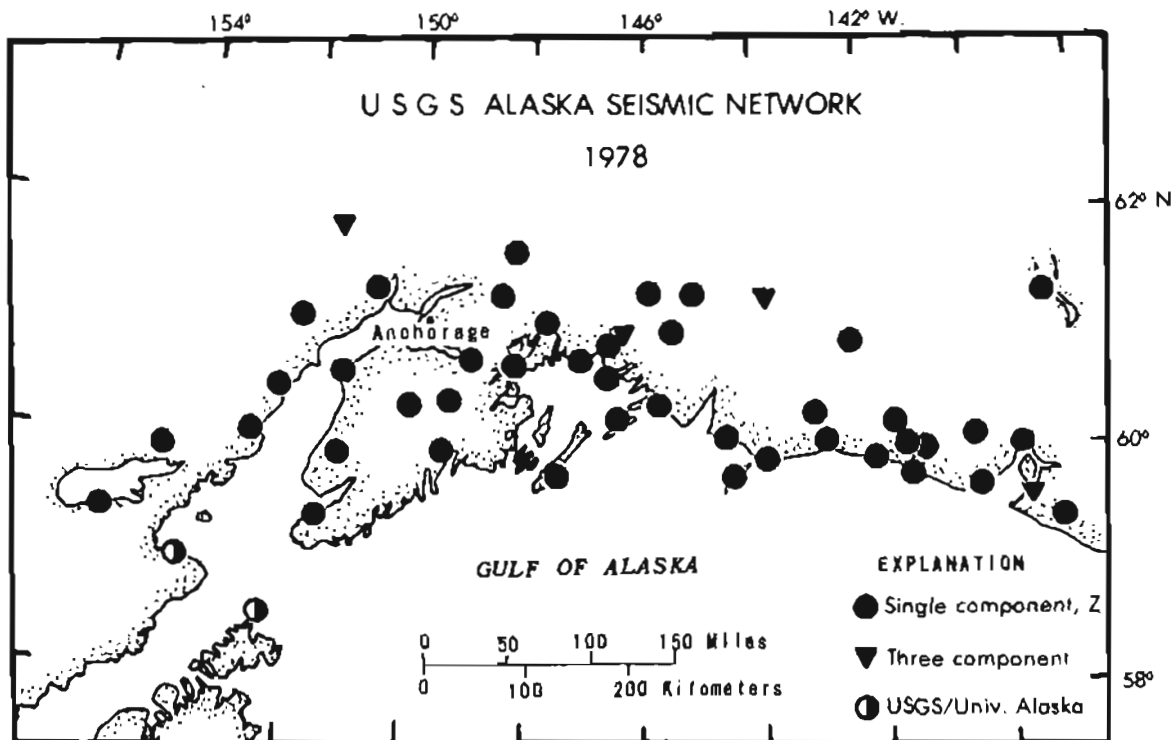


Figure 9.--Location of high-gain seismographs operating in USGS seismic network during 1978.

Project Status: Fieldwork has been completed and open-file reports released to the public for Metlakatla, Sitka, and Yakutat, as well as (under former project chief R.W. Lenke) Haines, Skagway, Ketchikan, and Wrangell. An open-file report on Petersburg was released in 1978. A formal report on Yakutat is in press, and one on Sitka is in preparation. Reports on other communities (several of which are in southwestern, west-central, and northern Alaska) will be prepared when time allows.

The communities of current interest are shown in figure 11.

\* \* \*

#### SOUTHWESTERN REGION

Project Title: Chignik-Sutwik Island Quadrangles (AMRAP)

Project Chief: Robert L. Dettnerman  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To use reconnaissance geologic, geochemical, geophysical, and telegeologic mapping to provide data for rapid assessment of mineral and energy resources. These include geologic mapping at 1:250,000 scale; stream-sediment and pan-concentrate sampling of streams; age determinations of mineralized and altered areas to determine age of mineralization; a regional gravity study; and geothermal investigations of volcanic centers.

Project Status: Field mapping and analysis of geochemical specimens are complete.

Location of the project quadrangle is shown figure 4.

\* \* \*

Project Title: Lake Clark Quadrangle (AMRAP)

Project Chief: Willis H. Nelson  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To provide a rapid evaluation of the mineral resource potential of the area based on reconnaissance geologic, geochemical, geophysical, and telegeologic mapping, and geochronologic studies of intrusive rocks.

Project Status: The fieldwork for this project was completed in the summer of 1978. This included reconnaissance geologic mapping at a scale of 1:250,000, sufficient to delineate the distribution and general relations of the exposed bedrock units of the area, and geochemical sampling of streams and of geologic units to provide background data for evaluating the stream-sediment samples. Gravity and aeromagnetic data have been acquired for this area and, along with multispectral satellite data, are being used to refine the geologic and mineral potential interpretations. The geochemical analyses of the rocks and sediment samples have been completed and are being evaluated. Maps and reports showing the geology and ancillary data, and predictions of the mineral resource potential of the area are planned for release in 1979.

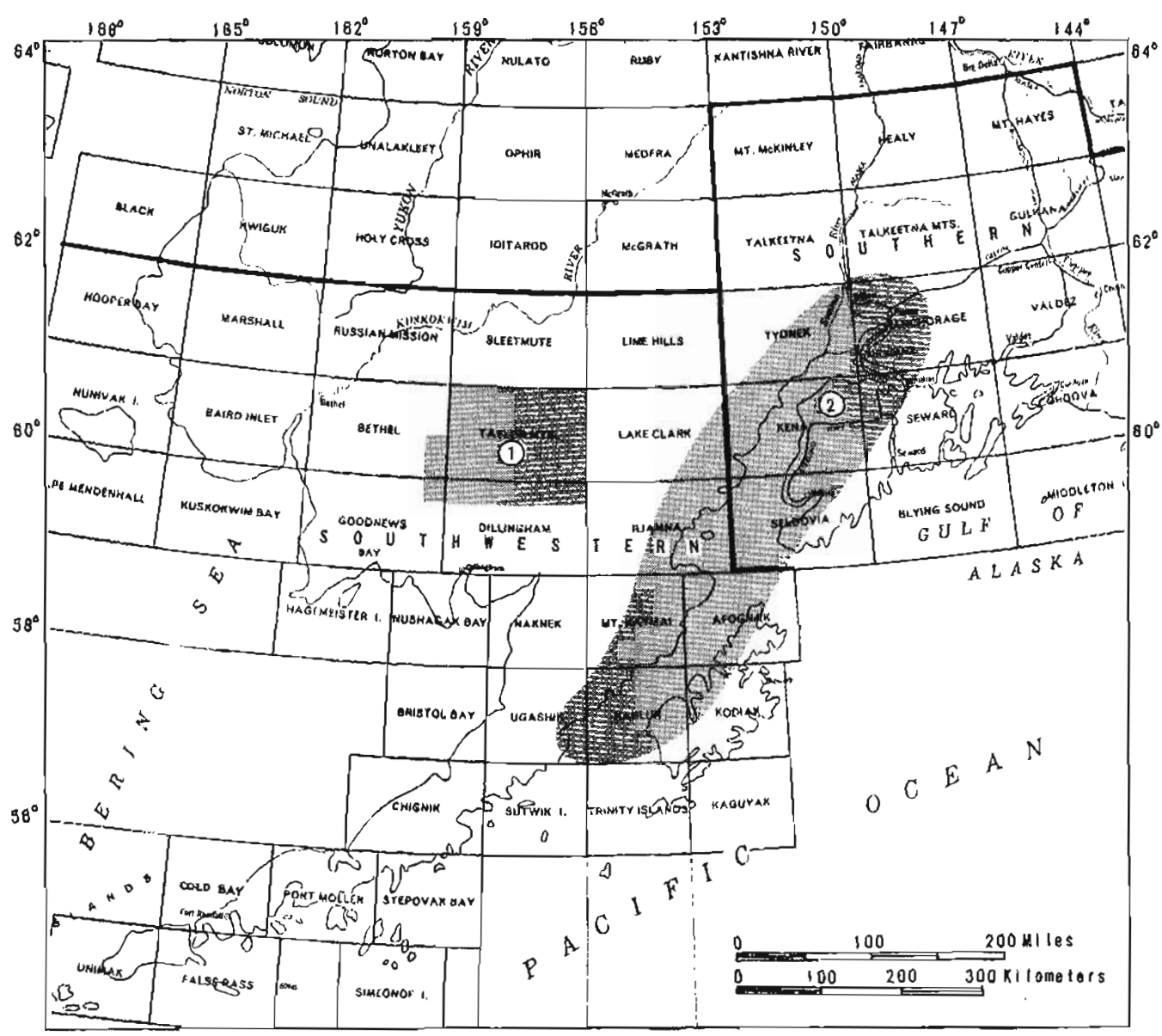
Location of the project quadrangle is shown in figure 4.

\* \* \*

Project Title: Tikchik Lakes - Taylor Mountain Area

Project Chief: Joseph M. Hoare  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: Short-term objective: To sample rocks accessible by boat or foot to determine their age and structure. Long-term objective: To complete reconnaissance geologic mapping begun in 1967 and recessed in 1971. This work should precede mineral resources evaluation in an area already known to have a high potential for mercury.



- EXPLANATION
- 1. TIKHIK LAKES-TAYLOR MOUNTAIN AREA
  - 2. COOK INLET BASIN

Figure 10.--Geologic activities in Southwestern and Southern Alaska.

Project Status: No completion date has been assigned. The project will require at least one helicopter-assisted field season. Fieldwork in 1979 will consist of sampling for microfossils and a paleomagnetic study in rocks accessible from the Tikchik Lakes.

Project location is shown in item 1, figure 10.

\* \* \*

Project Title: Ugashik-Karluk Quadrangles (AMRAP, Geothermal)

Project Chiefs: Robert L. Dettnerman and Thomas P. Miller  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To assess the mineral and geothermal resources using reconnaissance geologic, geochemical, geophysical, and telegeologic mapping. Fieldwork also includes sampling intrusive rocks and mineralized areas for radiometric dating of the age of mineralization and detailed mapping of volcanic centers for geothermal potential.

Project Status: Fieldwork will start in 1979 and will consist of geologic mapping, geochemical sampling and detailed investigations of geothermal and mineralized areas.

Location of the project quadrangles is shown in figure 4.

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#### SOUTHEASTERN REGION

Project Title: Sitka Observatory

Project Chief: Willis E. Osbakken  
(Office of Geochemistry and Geophysics, Branch of Electromagnetism and Geomagnetism)

Project Objectives: To operate seismic instruments for acquiring information on the global occurrence of earthquakes; to telemeter seismic and tidal data to the Alaska Tsunami Warning Center at Palmer; and to record and measure, on a continuous basis, the various elements of the Earth's magnetic field and distribute these data either directly or through the Branch of Electromagnetism and Geomagnetism to domestic and foreign users.

Project Status: This project is of a continuing nature; the station has functioned as a geomagnetic observatory since 1902 and as a seismic station since 1925. Besides telemetering seismic data to Palmer, the station furnishes seismic recordings to the National Earthquake Information Service for epicenter studies. As a geomagnetic observatory, Sitka plays an important role in the international scientific community, being one of 13 stations used in the derivation of  $K_p$ , the planetary geomagnetic activity index. Geomagnetic data collected at the station find a wide variety of uses, including the compiling of magnetic charts, radio propagation studies, and ionospheric studies.

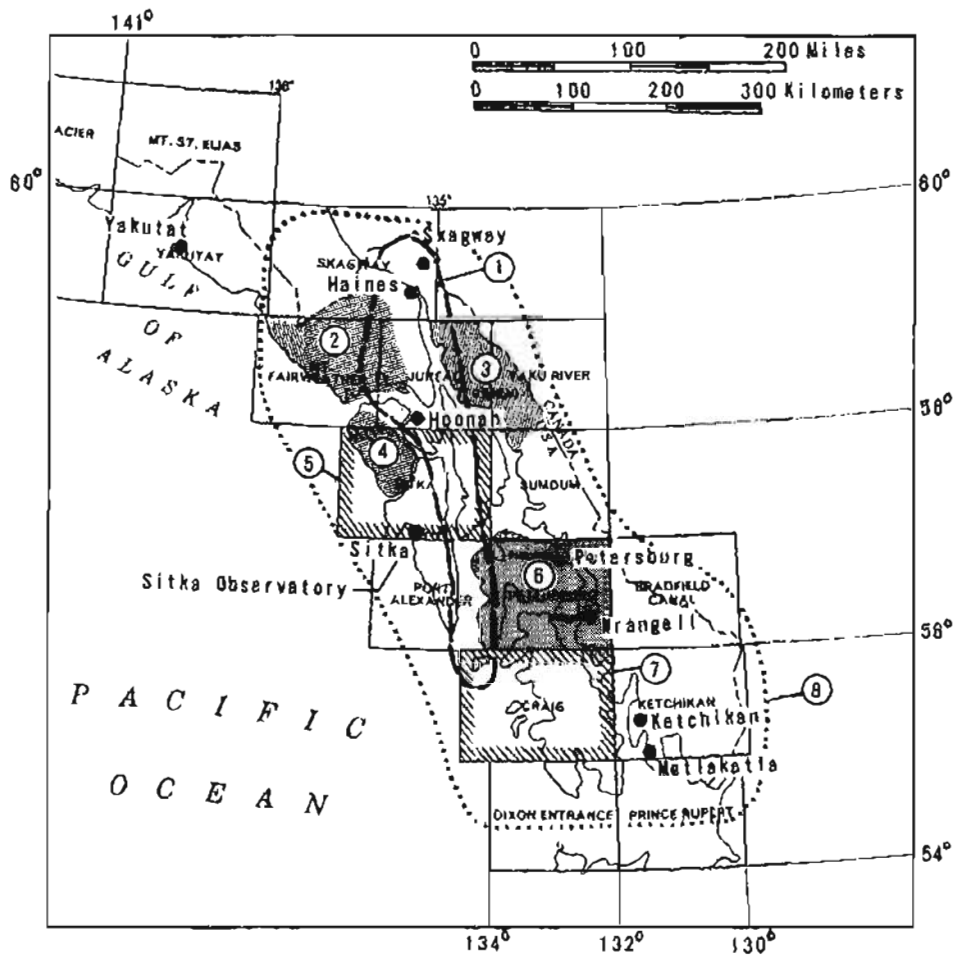
Project location is shown in figure 11.

\* \* \*

Project Title: Mineral Resources of Glacier Bay National Monument Wilderness Study Area

Project Chief: David A. Brew  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To appraise the mineral-resource potential of a large area of complex geology just northwest of the Alexander Archipelago, using: (1) reconnaissance geologic, geochemical, and detailed mineral-occurrence information gathered in the 1966 Geological Survey study of the Monument (Professional Paper 632); (2) reconnaissance geologic mapping of previously unmapped areas; (3) reconnaissance bedrock geochemical sampling; (4) reconnaissance stream-sediment geochemical sampling of previously unsampled areas; (5) aeromagnetic surveying; (6) gravity surveying; and (7) detailed examination and sampling of selected known mineral occurrences and of areas containing anomalous concentrations of selected metallic elements. Geochronologic studies are being done in cooperation with the Branch of Isotope Geology. The appraisal is part of the U.S. National Park Service study of the suita-



#### EXPLANATION

1. EARTHQUAKE HAZARDS (SEE STATEWIDE, FIGURE 5)
2. GLACIER BAY
3. JUNEAU
4. WEST CHICHAGOF-YAKOBI
5. GEOCHEMICAL EXPLORATION OF WILDERNESS AREAS
6. PETERSBURG QUADRANGLE
7. CRAIG QUADRANGLE
8. GEOTECTONICS, METALLOGENESIS, AND RESOURCE ASSESSMENT OF SOUTHEASTERN ALASKA

Figure 11.--Geologic activities in Southeastern Alaska.

bility of the areas for inclusion in the National Wilderness Preservation System established by the Wilderness Act of 1964.

Project Status: The geologic mapping and mineral resources assessment were completed, and an open-file report transmitted by the August 1, 1978, deadline agreed upon by the Survey and the Park Service. The reconnaissance geologic mapping is not satisfactorily complete. A bulletin report is in review; a "detailed-reconnaissance" geologic map and a report on the intrusive rocks are in progress; and an analysis of the stream-sediment geochemistry of the southeastern part of the monument and contiguous outside areas is underway.

Project location is shown in item 2, figure 11.

\* \* \*

Project Title: Juneau, Alaska, Geologic Mapping and Related Investigations

Project Chief: David A. Brew  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To conduct reconnaissance (in part) and detailed (in part) geologic and geochemical mapping and a mineral-resource appraisal of a broad transect across the Coast Range batholithic complex. The transect begins in metavolcanic and metaclastic rocks of a low-grade intermediate pressure and temperature facies series on the southwest and progresses through higher grade schists, gneisses, and spatially associated meta-intrusive rocks to the relatively young intrusive rocks and associated metavolcanic and metaclastic rocks of a low-pressure - high-temperature facies series along the international boundary. This information will provide the regional framework for the Juneau Gold Belt and for mineral occurrences immediately east of the U.S. - Canada boundary.

Project Status: Geologic mapping at 1:63,360 or larger scale has been completed for all but the easternmost and northwesternmost parts of the project area. Three 1:131,680-scale maps have been published and three more are in progress. Several topical papers concerning metamorphism, geochemistry of Mesozoic metavolcanic rocks, mineral resources, and structure have been published, and more are in progress.

Project location is shown in item 3, figure 11.

\* \* \*

Project Title: West Chichagof-Yakobi Wilderness Study Area

Project Chief: Bruce R. Johnson  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To appraise the mineral-resource potential of an area at the northwest corner of the Alexander Archipelago. The appraisal is part of a U.S. Forest Service study of the suitability of the area for inclusion in the National Wilderness Preservation System. The appraisal will evolve from: (1) reconnaissance geologic, geochemical, and structural information gathered in the 1975 Geological Survey study of the northwestern Alexander Archipelago (Professional Paper 792); (2) detailed geologic mapping of selected parts of previous reconnaissance studies; (3) reconnaissance bedrock geochemical sampling; (4) reconnaissance stream-sediment geochemical sampling; (5) aeromagnetic surveying; and (6) detailed examination and sampling of selected known mineral occurrences and of areas containing anomalous concentrations of selected metallic elements.

Project Status: The project started in 1978. During the 1978 field season, stream geochemical sampling was completed, approximately 30 percent of the area was mapped at a scale of 1:125,000 by foot-traverse, small-boat traverse, and helicopter spot-station, and gravity stations were occupied to complete the existing gravity network. Fieldwork was also initiated on a study of the nickel deposits on Yakobi Island and at Mirror Harbor. Further field mapping and data analysis are planned for 1979.

Project location is shown in item 4, figure 11.

\* \* \*

Project Title: Geochemical Exploration of Alaska Wilderness Areas

Project Chief: Thomas Hessin  
(Office of Mineral Resources, Branch of Exploration Research)

Project Objectives: To provide expertise in geochemical exploration to the Survey's program of Wilderness Studies.

Project Status: The second and final field season will be the summer of 1979; the publication of all data is planned for 1980.

Project location is shown in item 5, figure 11.

\* \* \*

Project Title: Geology and Mineral Resources of the Petersburg 1:250,000-scale Quadrangle and Some Contiguous Areas

Project Chief: David A. Brew  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To carry out reconnaissance geologic and geochemical mapping and mineral-resource assessment of this critical area where diverse structural, stratigraphic, and tectonic units come together. The project will include geophysical surveys and will draw upon previous geologic studies to the west and northwest by L.J.P. Muffler, to the south and west by A.T. Ovenshine, to the south by G.O. Eberlein and Michael Churkin, Jr., to the southeast by H.C. Berg and D.L. Jones, and to the north and east by D.A. Brew, A.L. Clark, and Donald Grybeck.

Project Status: The 1978 field season was the first for this project. A broad transect from southwest to northeast across the project area was almost completely mapped, and stream-sediment samples were collected for about two-thirds of the area. Compilation of data from previous mapping in the area is underway, as is a major-element study of the granitic rocks. An aeromagnetic survey has been completed, and results will be open-filed as soon as available.

Project location is shown in item 6, figure 11.

\* \* \*

Project Title: Craig Quadrangle

Project Chiefs: G. Donald Eberlein and Michael Churkin Jr.  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To provide the public and other governmental agencies with a modern geologic map of the Craig Quadrangle at 1:250,000 scale as a graphic frame of reference for resource assessment, development and multi-use planning. Secondary objectives relate to developing the stratigraphic, structural and petrologic data base needed to understand the geologic evolution of this segment of the Alexander terrane, especially in terms of modern plate tectonic concepts.

Project Status: The project has been formally active since 1973 and has yielded 24 topical papers, 9 abstracts of papers presented at scientific meetings, and 7 short summaries of noteworthy findings. Fieldwork was completed in 1975, but final compilation of the 1:250,000-scale map and completion of final reports have been delayed due to the reassignment of the project leaders to other higher priority missions. Attention has now been redirected to the Craig quadrangle, and open-file release of a 1:250,000-scale geologic map is planned. In addition, Eberlein will initiate a pilot study combining major and minor element and isotope geochemistry of volcanic and plutonic rocks in the area in an attempt to (1) determine the environments of volcanism and intrusion, and (2) deduce the origin of the magmas in this part of the Alexander terrane.

Project location is shown in item 7, figure 11.

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Project Title: Bradfield Canal Quadrangle (AMRAP)

Project Chief: Raymond L. Elliott  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: To conduct reconnaissance geologic, geochemical, geophysical, and telegeologic mapping to provide the data for a rapid assessment of the mineral resources of the quadrangle. Fieldwork is to include: (1) geologic mapping at a scale of 1:250,000; (2) geochemical survey utilizing stream-sediment and bedrock samples; (3) an aeromagnetic survey and interpretation; (4) geologic and geochemical studies of mineral deposits; and (5) investigation of potential for radioactive energy resources.

Project Status: Geologic mapping and geochemical sampling for this 2-year project began in 1978. Approximately one-third of the quadrangle was mapped during the 25-day field season, and geochemical sampling is about 25 percent complete. Chemical and geochemical analyses of samples from the 1978 field season had not been completed, nor had thin sections been prepared as of mid-February. Because of delays in receipt of analyses and support materials, the project is seriously behind schedule. Fieldwork in 1979 will consist of continued geologic mapping and geochemical sampling, investigations of mineralized areas, and related topical studies. Maps and reports are currently anticipated for 1981.

Location of the project quadrangle is shown in figure 4.

\* \* \*

Project Title: Geotectonics, Metallogensis, and Resource Assessment of Southeastern Alaska

Project Chief: Henry C. Berg  
(Office of Mineral Resources, Branch of Alaskan Geology)

Project Objectives: (1) To complete a 1:1,000,000-scale multidisciplinary mineral resource assessment of southeastern Alaska. This report will constitute the final component in a 1:1,000,000-scale appraisal of virtually all of Alaska's lands having significant hard-rock mineral potential. (2) To complete a metallogenic analysis of southeastern Alaska based on a geotectonic model of accreted terranes and to apply this analysis to the aforementioned resource assessment.

Project Status: This new project is scheduled to run for 3 years. Its purpose is to furnish timely and objective information on Southeastern Alaska's mineral endowment, and to provide reliable geological estimates of its undiscovered mineral resources. This information is required by the Administration, by Congress, and by commercial and private interests concerned with classifying and allocating this region's public lands. Two examples of anticipated demands for such information are (1) Congressional and industry responses to recent Executive actions establishing national monuments in southeastern Alaska, and (b) interagency (U.S. Geological Survey-U.S. Bureau of Mines) mineral appraisals stemming from recent U.S. Forest Service Wilderness allocations under "RARE II".

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#### SOUTHWESTERN AND SOUTHERN REGIONS

Project Title: Petroleum Geology of Cook Inlet Basin

Project Chief: Leslie B. Magoon  
(Office of Energy Resources, Branch of Oil and Gas Resources)

Project Objectives: To assess the oil resources of the Cook Inlet basin and the Shelikof Strait by studying concurrently the geologic framework and petroleum geology. The principal parts of this study include: (1) preparation of a geologic map which displays those elements that relate to oil and gas activity; (2) preparation of a structural and stratigraphic framework that ties subsurface to surface geology; (3) oil and gas source rock evaluation; and (4) examination of the composition and diagenesis of possible reservoir sandstones.

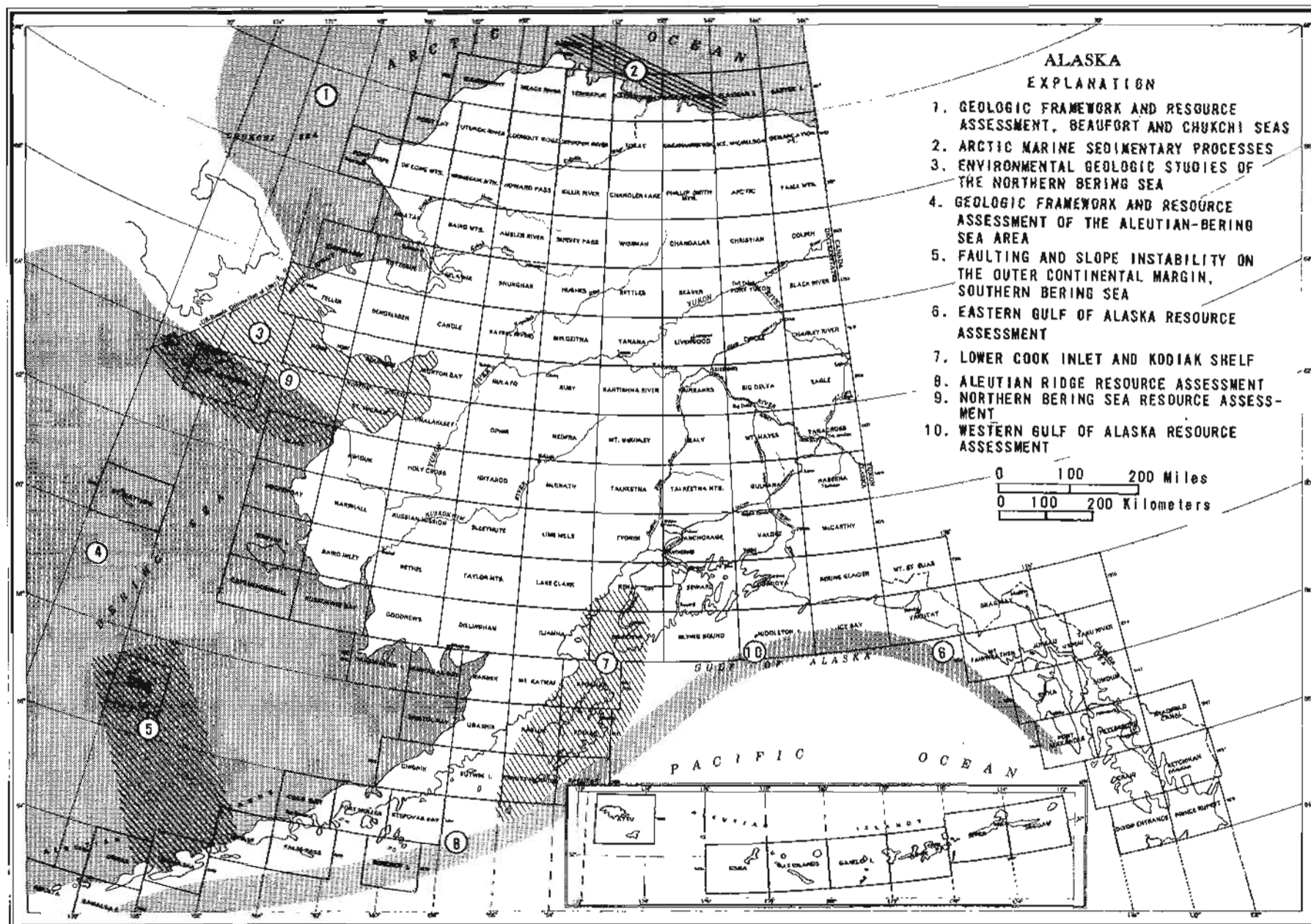


Figure 12.--Offshore geologic activities in Alaska, Marine Geology Program.

Base from U.S. Geological Survey Alaska Map A

Project Status: Fieldwork in Kamishak Hills-Cape Douglas and Seldovia areas is complete, and papers are being written. R.M. Egbert completed fieldwork in the Tuxedni Bay area in 1978. A paper by L.B. Magoon and G.E. Claypool containing the results of the oil and gas source rock study is to be published in 1979. The lower Cook Inlet COST no. 1 well data are being interpreted and incorporated into the framework geology. Fieldwork in the Shelikof Strait area on the Alaska Peninsula is planned for June 1979. Further work in other parts of the basin is to be completed over the next few years.

Location of the project is shown in item 2, figure 10. It includes the offshore portion of the area indicated.

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#### OFFSHORE REGION

Project Title: Geologic Framework and Resource Assessment, Beaufort and Chukchi Seas

Project Chief: Authur Grantz  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To determine the regional geology and mineral fuel potential of the Alaskan continental margin in the Beaufort and Chukchi Seas.

Project Status: Geophysical data collection is essentially complete, and report preparation is underway. Geologic sampling will be accomplished as ships become available, perhaps in 1980.

Project location is shown in item 1, figure 12.

\* \* \*

Project Title: Arctic Marine Sedimentary Processes

Project Chiefs: Peter Barnes and Erk Reimnitz  
(Office of Marine Geology, Branch of Pacific-Arctic Marine Geology)

Project Objectives: (1) To characterize the surficial geology of the shelf and coast of the Beaufort and Chukchi Seas; (2) to understand and quantify the unique marine geologic processes operating on arctic shelves; and (3) to provide information and data to the Survey's Conservation Division and to the Bureau of Land Management and others as an aid to leasing decisions on Federal lands. Specific objectives are: to delineate the ice gouging process; to understand pathways and rates of sediment transport; to assess coastal stability; to characterize Pleistocene and Holocene sediments on the shelf; and to delineate the river-ocean interactions.

Project Status: Information has been gathered regarding all objectives, and the characterization of the shelf geologic environment is reasonably complete. Present efforts are aimed at understanding arctic processes and quantifying the rates of these processes.

Project location is shown in item 2, figure 12.

\* \* \*

Project Title: Environmental Geologic Studies of the Northern Bering Sea

Project Chief: Hans Nelson  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To study dynamic geologic processes and potential geologic hazards in preparation for the Outer Continental Shelf (OCS) leasing program. Factors being considered are (1) tectonics, including active faulting and seismicity; (2) sediment instability, including thickness and geotechnical properties of surficial and near-surface sediments, regions of near-surface gas-charged sediment, thermogenic gas seeps, and sediment-liquefaction potential; (3) sediment dynamics, including identification of significant sediment scour areas by currents and by ice, sediment transport by storm surges, and mobility of bedform fields; and (4) contaminant dispersal pathways of artificially and naturally induced materials.

Project Status: This project is a continuing study that has been underway since 1976. Papers or reports have been prepared on the following topical subjects: biogenic and thermogenic gas-charged sediment, biogenic gas and surficial crater formation, dynamics of sand waves, current-scour depressions, ice gouge density and distribution, type and distribution of surficial sediment, current and sediment dynamics, benthic fauna and sedimentary structures, distribution of trace metals, geotechnical properties of near-surface and surficial sediment, surface and subsurface faulting, and potential geologic hazards. A final geologic and hazard-potential report will be released as an open-file report at the end of 1979 in anticipation of a later lease sale of the northern Bering Sea (Norton Basin) tracts.

Project location is shown in item 3, figure 12.

\* \* \*

Project Title: Geologic Framework and Resource Assessment of the Aleutian-Bering Sea Area

Project Chief: Michael S. Marlow  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To map the Bering Sea geologically and geophysically on a regional basis in order to evaluate the resource potential of the area. Data gathered have included marine seismic reflection profiles, gravity, magnetic, and bathymetric information, and dredge samples. Another important objective is the evaluation of the oil and gas potential of several large subshelf basins adjacent to Alaska.

Project Status: During 1978, 20 sites were dredged along the Beringian margin. Acoustic basement was sampled at nine localities, and at one site it consisted of lithic sandstone containing Late Jurassic *Buchia rugosa*. These basement rocks are overlain unconformably by Eocene and Oligocene diatomaceous mudstone. Plans for geophysical surveying over Navarin and Anadyr basins in 1979 were cancelled due to funding problems. Regional surveying of the Bering Sea shelf and the rest of the Bering Sea are 50 percent and 10 percent complete, respectively. More surveying and sampling are planned for 1980.

Project location is shown in item 4, figure 12.

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Project Title: Faulting and Slope Instability on the Outer Continental Margin, Southern Bering Sea

Project Chiefs: Tracy L. Vallier and James V. Gardner  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To determine offshore environmental problems associated with faulting and slope instability in the St. George Basin region, southern Bering Sea.

Project Status: The project will be completed in May 1979.

Project location is shown in item 5, figure 12.

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Project Title: Eastern Gulf of Alaska Resource Assessment

Project Chief: George Plafker  
(Offices of Energy Resources and Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To evaluate the tectonic framework, petroleum potential, and geologic hazards of the eastern Gulf of Alaska Outer Continental Shelf.

Project Status: Acquisition of marine geophysical data is essentially complete. Maps and reports on the structure, magnetics, gravity, and bathymetry of the region are in various stages of preparation or have been published for the northern Gulf of Alaska. In addition, 14 reconnaissance crossings of the continental margin in the eastern part of the Gulf of Alaska between Cross Sound and Dixon Entrance indicate a general absence of potentially petroliferous Tertiary basins and provide data on the tectonic style of this transform margin. Sparker profiling and dredging along the continental margin by the R/V

Sea Sounder in 1977 and 1978 indicate the presence of a potentially petroliferous Eocene section beneath the Yakutat Shelf. The dredge program will be continued in September 1979.

Project location is shown in item 6, figure 12.

\* \* \*

Project Title: Environmental Geologic Investigations of Lower Cook Inlet and the Kodiak Shelf

Project Chiefs: Monty Hampton and Arnold Bouma  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To study offshore environmental geologic features of concern to resource development for Lower Cook Inlet. The study concentrates on type, distribution, and dynamics of bedforms, and on grain size, petrography, and surface textures of the sediments. On the Kodiak Shelf, pollutant dispersal pathways are being determined, shallow faults and sediment thicknesses are being mapped, submarine slides are being located, and gas-charged sediments are being analyzed.

Project Status: Cruises were made in 1976, 1977, and 1978. The results have been reported to the Bureau of Land Management for input to an environmental impact statement. Further analyses of bedform migration and gas-charged sediments are underway.

Project location is shown in item 7, figure 12.

\* \* \*

Project Title: Aleutian Ridge and Basic Resource Assessment

Project Chief: David W. Scholl  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objectives: To determine the geologic framework and history of the OCS project area and adjacent continental margin and using this knowledge to assess the energy and mineral resource potential of the project area.

Project Status: Data collection cruises are scheduled for the summer of 1979.

Project location is shown in item 8, figure 12.

\* \* \*

Project Title: Northern Bering Sea Resource Assessment

Project Chief: Michael Fisher  
(Office of Energy Resources, Branch of Oil and Gas Resources)

Project Objectives: To determine the geologic framework and history of the northern Bering Sea OCS region and adjacent continental margin in order to assess the energy and mineral resource potential of the project area.

Project Status: Cruises are scheduled for 1979.

Project location is shown in item 9, figure 12.

\* \* \*

Project Title: Western Gulf of Alaska Resource Assessment

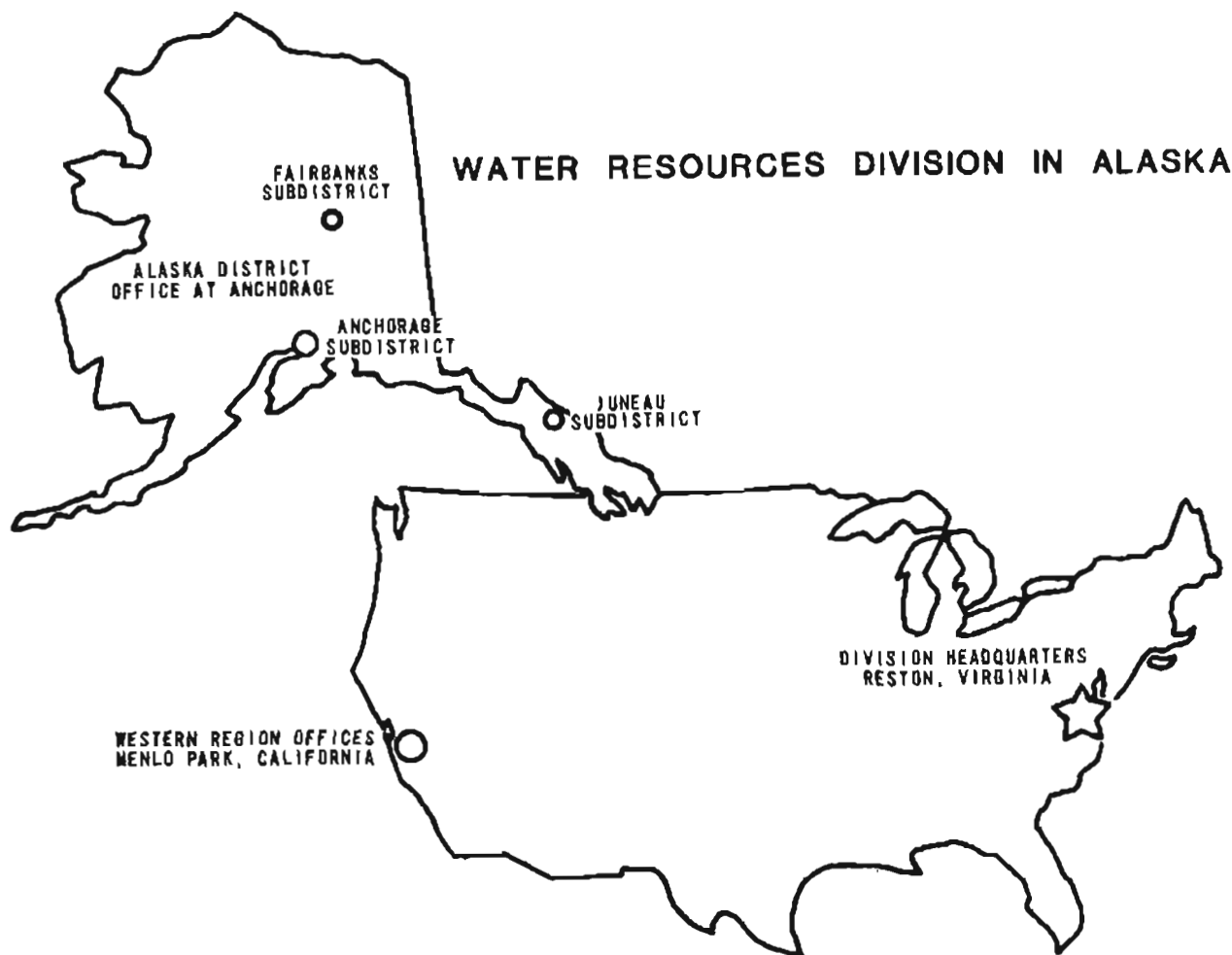
Project Chief: Roland Von Huene  
(Office of Marine Geology, Branch of Pacific-Arctic Geology)

Project Objective: To determine the geologic framework and history of the western Gulf of Alaska OCS region and adjacent continental margin in order to assess the energy and mineral resource potential of the project area in preparation for future continental shelf lease sales.

Project Status: A data collection cruise is scheduled for the summer of 1979.

Project location is shown in item 10, figure 12.

\* \* \*



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## WATER RESOURCES INVESTIGATIONS

As traditionally stated, the water-resources investigations program of the Geological Survey "has the objective of seeing that the Nation's water resources are appraised and that the necessary water data to develop and manage them efficiently are available when needed."<sup>1</sup> In the course of time and in the consequence of its carrying out this objective, there have emerged two principal aspects. The first of these is the role of the Survey as the primary source of hydrologic data that are basic not only to quantification of the water resource but also to its development and conservation, including data for both planning and management. This role, practiced for many years and tacitly accepted by the water-resource community, was given express recognition in 1964 when the responsibility for coordinating water-data programs of Federal agencies was delegated to the Geological Survey (Office of Management and Budget Circular A-67). The second aspect, which has emerged within the past several years, largely in response to the new public awareness of the environment, is to provide data and technology needed to predict the impact of man's activities upon the water resource and the water environment.

To accomplish its mission, the Geological Survey determines the source, quantity, quality, distribution, movement, and availability of surface and ground water. This work includes investigations of floods and shortages of water supply; evaluation of available waters in river basins and ground-water provinces; determination of the chemical and physical quality of water resources and their relation to various parts of the hydrologic cycle; special hydrologic studies of the inter-relations between climate, topography, vegetation, soils, and the water supply; research to improve the scientific basis of investigations and techniques; scientific and technical assistance in hydrologic fields to other Federal agencies and to licensees of the Federal Power Commission; coordination of Federal water-data acquisition activities; design and operation of a national water-data network; and publication of results of investigations.

In Alaska, the Water Resources Division operates through three subdistrict offices, in Anchorage, Fairbanks, and Juneau. Each of the subdistrict offices maintains files of data for a geographic area commensurate with its physical location. Anyone wanting site-specific information on water resources should contact the subdistrict office nearest the site in question. For general information on State wide projects or activities, persons should contact the District Office in Anchorage.

Alaska's water resource investigations are part of several national programs. These are described briefly below:

### COLLECTION OF BASIC RECORDS

The Collection of Basic Records or CBR program in Alaska entails the operation of long-term and key river gaging stations and observation wells. The Survey currently operates 108 river gaging stations, 83 crest gage stations and 29 observation wells. The data collected at these sites appear in the annual publication "Water Resources Data for Alaska". (In addition, about 70 wells and several other gaging stations are operated for short periods for specific projects.) The CBR program is described in more detail in the appropriate projects which follow this summary.

### NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN)

This is a data collection facility for obtaining regional and nation-wide overviews of the quality of our streams. Water-quality data from NASQAN stations provide the information needed to: (1) account for the quantity and quality of water moving within and from the United States; (2) develop a large-scale picture of how stream quality varies from place to place; and (3) detect changes in stream quality with time. At a NASQAN station a continuous record of stream stage is obtained, from which streamflow is computed. Most of these stations are also equipped with a recorder for obtaining continuous data on water temperature and specific electrical conductance. In addition to the continuous records that are kept by instruments, the following data are collected by a field party approximately six times per year at each site: temperature, specific conductance, pH, bacteria indicators, inorganic compounds, biological nutrients, suspended sediment, and floating algae. Also, samples are collected less frequently for trace element and organic carbon analysis, and study of attached organisms.

In Alaska, the following NASQAN stations are currently in operation: Stikine River near Wrangell, Susitna River near Susitna Station, Kuskokwim River near Crooked Creek, Yukon River near Pilot Station, Kobuk River near Kiana, Kuparuk River near Deadhorse, and Tanana River near Nenana.

<sup>1</sup>The Budget of the United States Government, Fiscal Year 1974, Appendix, p. 552.

## NATIONAL WATER DATA EXCHANGE (NAWDEx)

This is a national confederation of water-oriented organizations working together to improve access to water data. Its primary objective is to assist users of water data in the identification, location, and acquisition of needed data. For the users' convenience, NAWDEX services are available through a nation-wide network of local assistance centers. In Alaska, the NAWDEX assistance center is located in the District Office of the Water Resources Division, 218 E Street, in Anchorage.

Through its master water data exchange, NAWDEX provides a nation-wide indexing service. This computerized index identifies more than 180,000 sites for which water data are available from over 300 organizations, the geographic location of these sites, the data-collecting organization, the types of data available, the periods of time for which the data are available, the major water data parameters for which data are available, the frequency of measurements, and the media in which the data are stored. NAWDEX has direct access to the computerized data files of the U.S. Geological Survey's national water data storage and retrieval system (WATSTORE, which includes several types of files and indexes such as the Ground Water Site Inventory, or GWSI). NAWDEX is also an authorized user of the storage and retrieval (STORET) system of the U.S. Environmental Protection Agency.

In Alaska, water-resource studies are carried out in cooperation with a wide variety of Federal, State, and local agencies. Those cooperators for FY 1979 are:

## Federal

USGS, Geologic Division (pipeline-related studies)  
Office of National Petroleum Reserve in Alaska  
International Water Resources Council  
Bureau of Land Management  
U.S. Fish and Wildlife Service  
Department of Agriculture, Soil Conservation Service  
U.S. Public Health Service  
Environmental Protection Agency  
U.S. Army, Corps of Engineers  
Forest Service  
Alaska Power Administration

## State

Department of Fish and Game  
Department of Natural Resources  
Department of Environmental Conservation  
Department of Transportation  
Capitol Site Planning Commission  
Alaska Power Authority

## Local

Kenai Peninsula Borough  
Thomas Bay Power Commission  
Fairbanks North Star Borough  
Municipality of Anchorage



## PROJECTS OF THE WATER RESOURCES DIVISION

## STATEWIDE

Project Title: Surface-water Stations

Project Chief: Robert D. Lamke  
(Alaska District Office)

Project Objectives: To provide data on (1) streamflow, (2) flood discharge and stages, (3) lake stage and contents, and (4) estuary flow conditions through a network of gaging stations. This project is part of an ongoing assessment of the Nation's water resources and is part of the CBR program. The data are used in project design and planning of water-supply and waste-disposal systems and of bridges and are useful in the assessment of environmental impacts of these and other proposed activities.

Project Status: This is a continuing project; all data are published in the annual series "Water Resources Data for Alaska." The 1978 report is expected to be completed by September 1979.

Project location is shown in figure 13.

\* \* \*

Project Title: Quality-of-Water Stations

Project Chief: Robert J. Madison  
(Alaska District Office)

Project Objectives: To provide information on the physical and chemical properties of water by: (1) determining the mineral content and biological aspects of water, thereby establishing a base line from which changes can be evaluated; and (2) determining mineral composition of water to evaluate its use for domestic, municipal, and industrial water supplies. These objectives are accomplished by operation of a network of water-quality stations.

Project Status: This is a continuing project; all data are released in the annual Survey publication "Water Resources Data for Alaska."

Project location is shown in figure 13.

\* \* \*

Project Title: Collection, Recording, and Management of Basic Ground-water Data in Alaska

Project Chief: Larry L. Dearborn  
(Anchorage Subdistrict Office)

Project Objectives: To collect, compile, and publish basic ground-water data acquired throughout Alaska, with emphasis on areas not being covered by specific Division projects; and to develop mutually beneficial exchanges of information with well drillers, contractors, and engineers that will expand knowledge of ground-water occurrence and potential development problems.

Project Status: The data-processing mechanism for entering well-log information into the Survey's national computer storage, Ground Water Site Inventory (GWSI) has been established. Several hundred new data sites have been entered in the last year, as have data for 125 springs from across the state. New drillers' logs have been collected from Dillingham. Computer retrievals and data verification for some geographical areas have been accomplished. About 500 new sites will be entered in 1979.

Project location is shown in figure 14.

\* \* \*

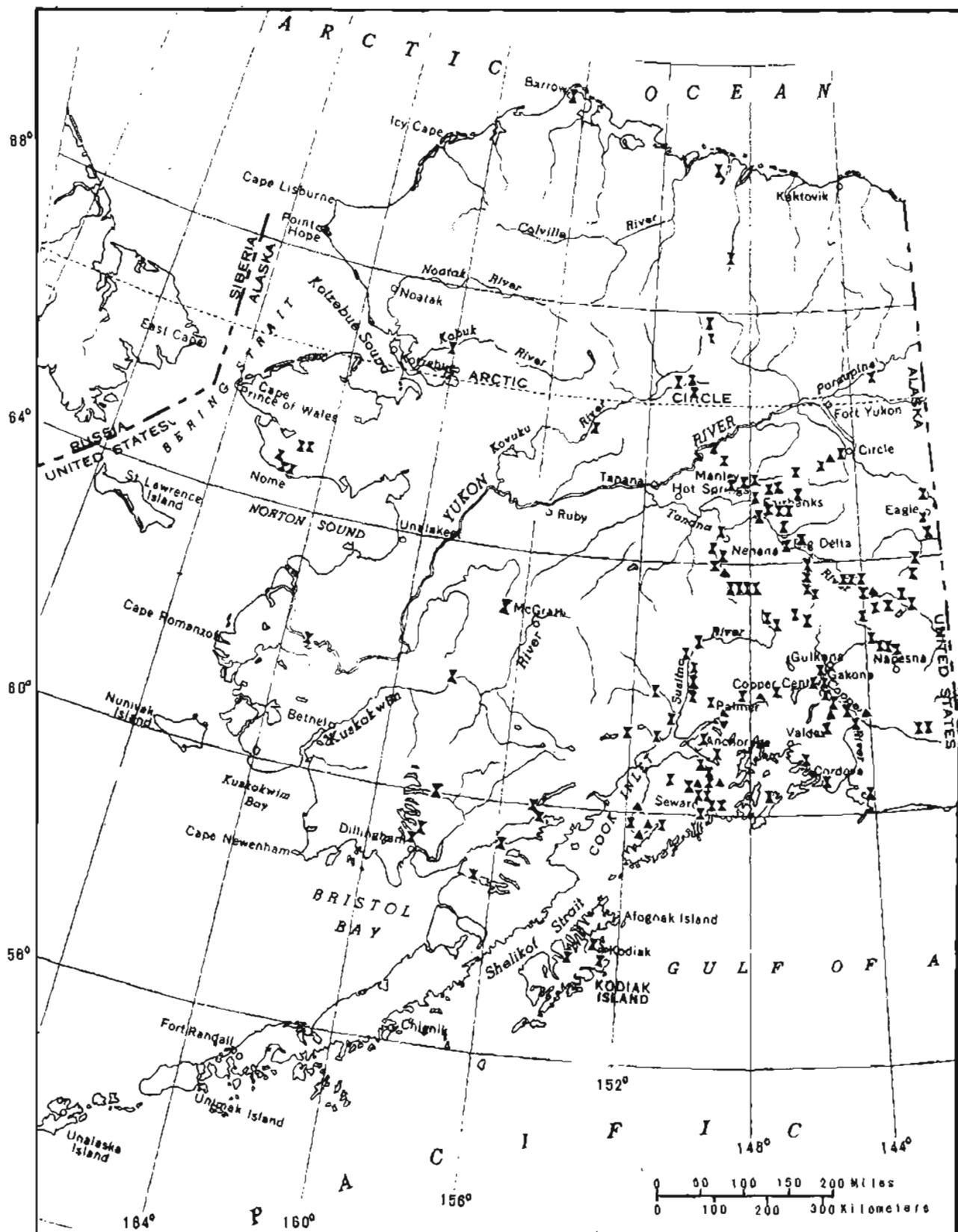


Figure 13.--Location of surface-water data stations.

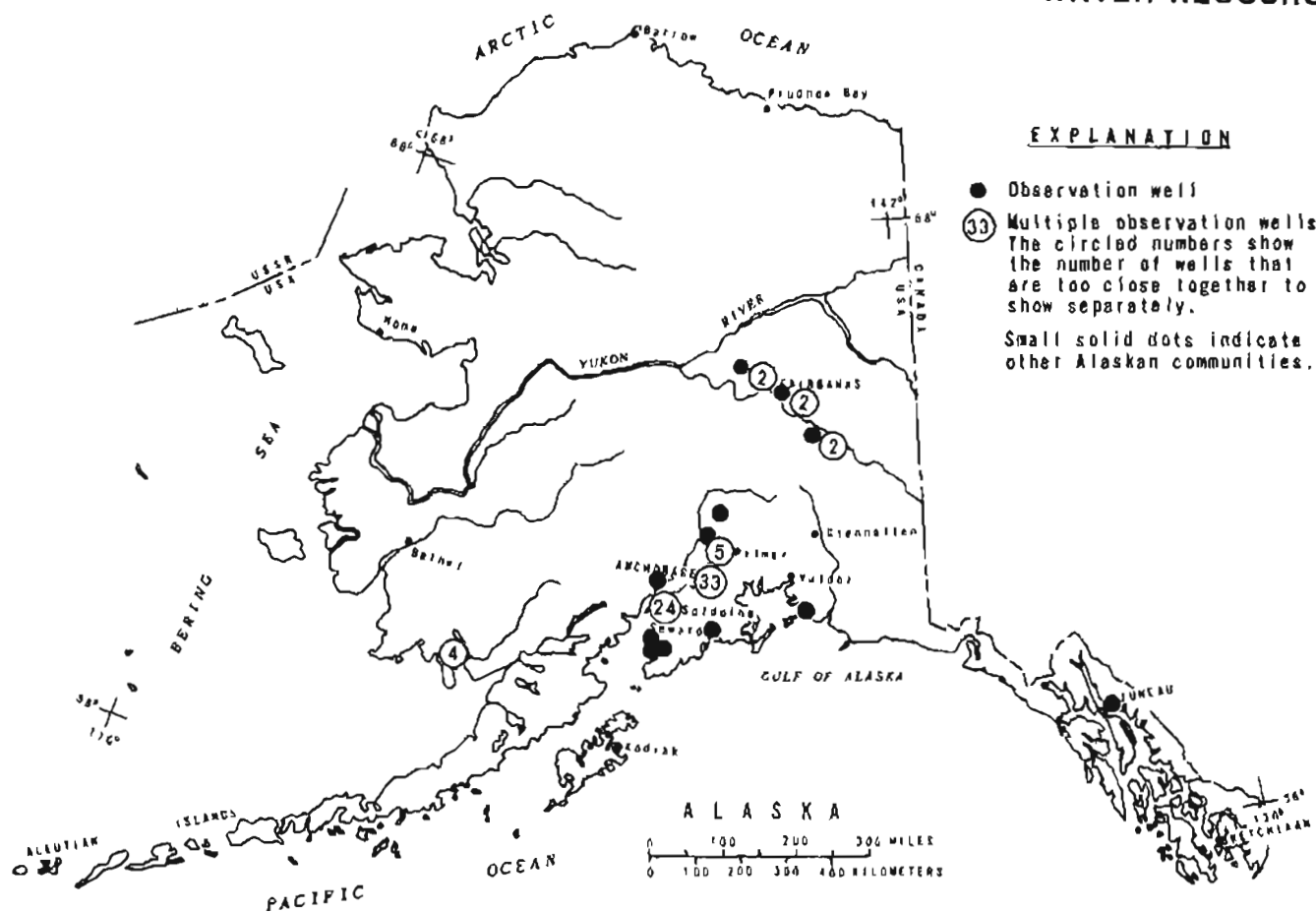
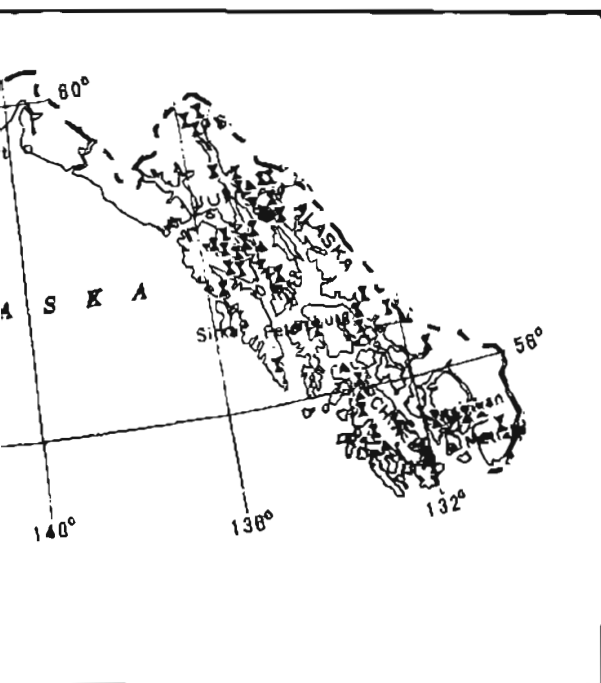


Figure 14.--Location of ground-water observation wells in Alaska.



EXPLANATION FOR FIGURE 13

- ▲ Streamflow or stage station on stream, lake, or reservoir
- ▼ Water-quality station

## WATER RESOURCES

Project Title: Ground-water Stations

Project Chief: Larry L. Dearborn  
(Anchorage Subdistrict Office)

Project Objectives: To maintain a network of about 100 observation wells to provide data on ground-water-level fluctuations in Alaska. The data indicate the status of ground water in storage, changes in levels due to development (pumping), areas where proposed changes in the hydrologic system may affect current or planned land use or water-supply development, and probable base flow of streams in hydraulic connection with the ground-water body being monitored. The well network provides long-term records for regional studies that, in turn, serve as a basis for correlation of short-term hydrologic records for specific purposes. This project is part of the CBR program.

Project Status: Water-level records for about 25 federally funded observation wells are published each year in "Water Resources Data for Alaska." Water levels of other wells in the network are recorded for specific projects and these data are commonly published in project reports. The network was expanded into several new areas in 1978; however, a number of important unmonitored areas remain.

The locations of project sites are shown in figure 14.

\* \* \*

Project Title: Water, Ice and Energy Balance of Snow and Glaciers, and Snow and Ice Physics

Project Chief: Mark F. Meier  
(Office of the Regional Hydrologist)

Project Objectives: This project seeks to improve the understanding of aspects of snow accumulation, melt, and runoff processes on glaciers and in high mountains, the mechanics of water flow through and under glaciers, and the dynamics of glaciers, and to apply this understanding to certain problems such as the nature of glacier surges and the stability of iceberg-calving glaciers.

Project Status: Major activities in 1978 included development of a short-term snowmelt forecast model, experiments on hot-water drilling of glaciers to monitor subglacial water, use of Landsat images to detect glacier surges. Special effort was devoted to study of Columbia Glacier, near Valdez, Alaska. Surface motion, strain, and thickness change were monitored by photogrammetry; mass balance, surface thickness change and motion by stakes, thickness by airborne and surface radio-echo sounding; iceberg calving rate by boat-based studies at the terminus of this and 27 other Alaska calving glaciers. (See also Alaska Glaciology Studies, under Mayo's direction.)

Project location is shown in item 9, figure 17.

\* \* \*

### NORTHERN REGION

Project Title: Arctic Water Resources and Environmental Studies

Project Chief: Joseph M. Childers  
(Alaska District Office)

Project Objectives: To describe hydrologic hazards (floods, icings, glaciers, channel erosion) and characteristics of water resources (streams, lakes, springs) in frontier areas of Alaska where economic and social development requires such information. Hydrologic reconnaissance techniques or short cut methods must be developed and used to accomplish the objectives of this project.

Project Status: Reconnaissance surveys have been completed for all of Arctic Alaska and the trans-Alaska pipeline corridor. Reports have been published for most of these surveys. Surveys in 1978 provided data on the Noatak River; a report is in preparation. During 1979 surveys may be made of the Chilikadrotna, Mulchatna and Nushagak Rivers near Dillingham. Some arctic hydrologic research may also be done.

Project location is shown in figure 15.

\* \* \*



Figure 15.--Area of arctic water resources and environmental studies (shaded area).

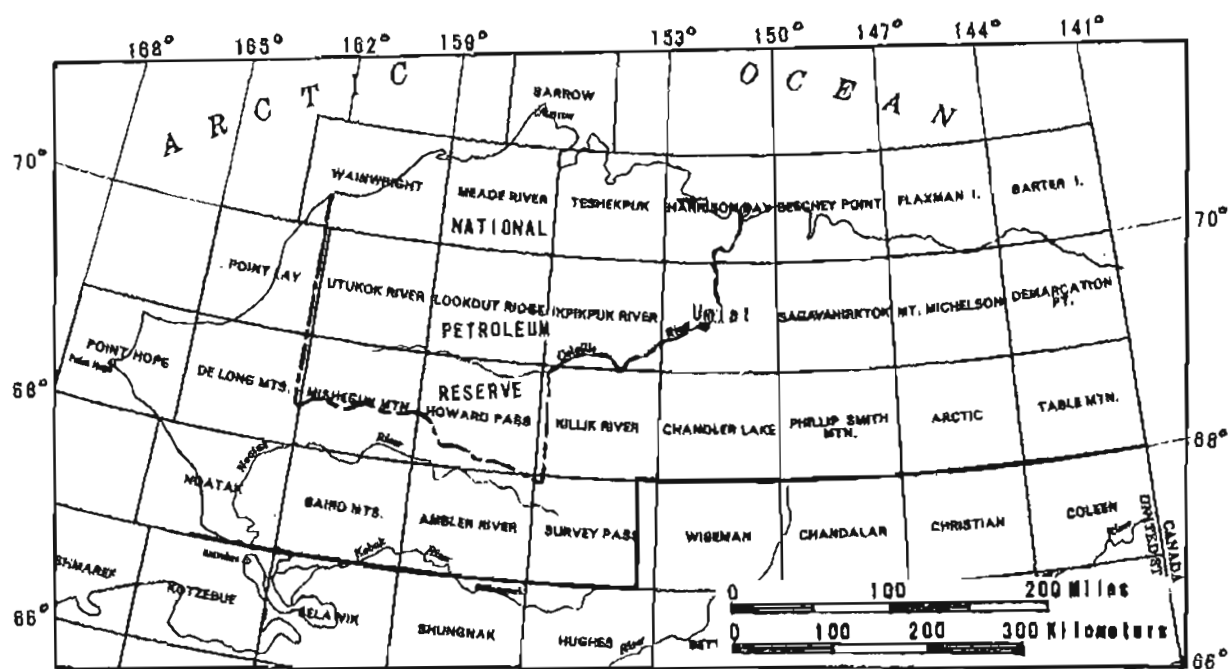


Figure 16.--Northern Alaska showing National Petroleum Reserve and Umiat.

Project Title: Nutrient Limitation in two Arctic Lakes Near Umiat, Alaska

Project Chief: George McCoy  
(Anchorage Subdistrict Office)

Project Objectives: To determine the nutrients that limit primary productivity using bioassays and lake fertilization.

Project Status: The project is funded. A site has been selected, and initial planning is complete. Data collection will begin in mid-June 1979.

Project location is shown in figure 16.

\* \* \*

Project Title: Water Resources of National Petroleum Reserve in Alaska (NPRA)

Project Chief: Charles E. Sloan  
(Alaska District Office)

Project Objectives: To collect and provide hydrologic information to the Office National Petroleum Reserve in Alaska (ONPRA) regarding water supply for drilling sites and ice road construction; to measure baseline water-quality conditions and monitor receiving water and water-supply sources for water-quality changes; to collect and provide ONPRA information on snow depth, density, and distribution.

Project Status: A hydrologic reconnaissance of ground-water potential at the Lisburne drill site (fig. 2) was made in 1978, and an administrative report of the results was transmitted to ONPRA. A snow survey of NPRA was made in April 1979, and water supply studies will be made at proposed drilling sites during the summer of 1979.

Project location is shown in figure 16.

\* \* \*

Project Title: Hydrology of National Petroleum Reserve in Alaska (NPRA)

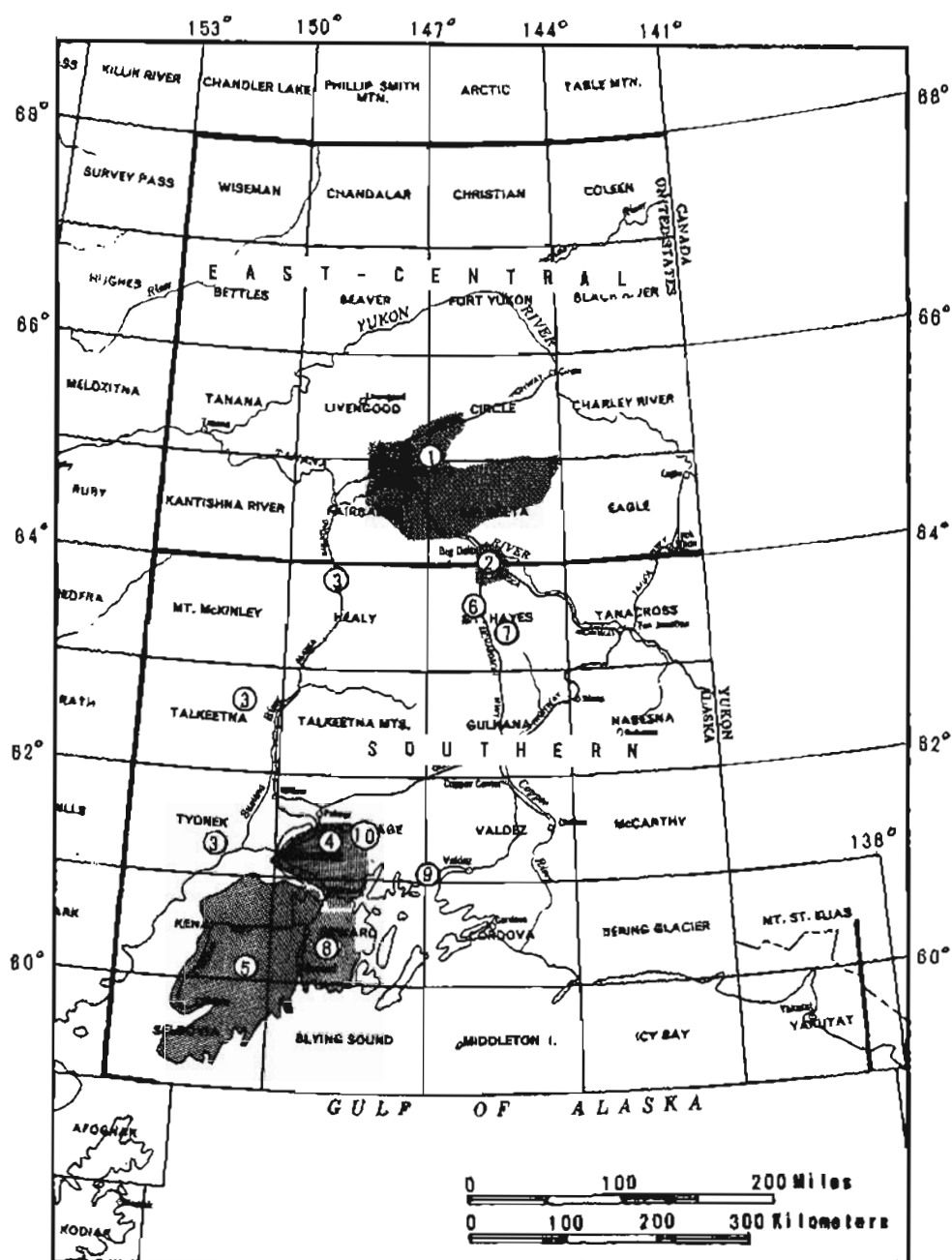
Project Chief: Charles E. Sloan  
(Alaska District Office)

Project Objectives: To investigate streamflow characteristics, flood risk zones, stream hydrology and lake limnology, ground-water occurrence, and snow hydrology to provide input for an environmental assessment and land-use study of NPRA.

Project Status: Basic data from the 1977 field season were published in the annual basic data report for Alaska in 1977 ("Water Resources Data for Alaska, Water Year 1977"). Interpretive reports were prepared for the NPRA 105(c) land use study under the direction of the Bureau of Land Management. A description of the potential environmental impacts of oil development in NPRA on water resources was prepared for the 105(b) study directed by the Survey. A snow survey was made in April 1979, and additions to the 1977 and 1978 survey results were made. In winter, samples were taken of water under ice in streams and lakes of NPRA that have potential as overwintering sites for fish. The project will be finished in 1979; the land use study reports have been published and the environmental assessment of NPRA is to be completed by January 1, 1980.

Project location is shown in figure 16.

\* \* \*



## EXPLANATION

- |                                       |                                |
|---------------------------------------|--------------------------------|
| 1. FAIRBANKS NORTH STAR BOROUGH       | 6. BLACK RAPIDS GLACIER        |
| 2. DELTA-CLEARWATER                   | 7. GULKANA GLACIER             |
| 3. COAL AREAS                         | 8. SNOW AND WOLVERINE GLACIERS |
| 4. MUNICIPALITY OF ANCHORAGE          | 9. COLUMBIA GLACIER            |
| 5. PORTION OF KENAI PENINSULA BOROUGH | 10. KNIK GLACIER               |

Figure 17.--Water resources projects in East-Central and Southern Alaska.



## EAST-CENTRAL REGION

Project Title: Geohydrology of Fairbanks North Star Borough

Project Chief: Andrea P. Krumhardt  
(Fairbanks Subdistrict Office)

Project Objectives: To evaluate the quality and availability of water resources of the Fairbanks North Star Borough. Specific objectives for FY 1979 are to continue monitoring selected wells in the Fairbanks area, to evaluate methods that might be used to enhance natural recharge in parts of the uplands, and to define further the occurrences of arsenic contamination of ground water in the uplands.

Project Status: The results of the first 3 years' work of this program are summarized in the Survey's Open-file Report 78-959 titled "Hydrologic Information for Land-Use Planning, Fairbanks Vicinity, Alaska". Open-file Report 78-1034, a map report entitled "Arsenic, Nitrate, Iron, and Hardness in Ground Water, Fairbanks Area, Alaska", has been published. A report summarizing the arsenic packer tests during FY 1977 and a map showing the piezometric surface and the artesian zone of the study area will be prepared during FY 79.

Project location is shown in item 1, figure 17.

\* \* \*

Project Title: Geohydrology of the Delta-Clearwater Area

Project Chief: Dorothy E. Wilcox  
(Fairbanks Subdistrict Office)

Project Objectives: To produce hydrologic data that can be used to assess the environmental impacts of agricultural development in the Delta-Clearwater area and to provide a hydrologic interpretation of the area that can be used to plan for and manage orderly agricultural development.

Project Status: This project began in August 1977. Existing U.S. Geological Survey hydrologic data were compiled and summarized in a report to the cooperators. Field data collection has included maintaining a gaging station at Clearwater Creek, collecting surface-water-quality samples, and maintaining water-level recorders on four wells. Three test wells were completed in the aquifer at the Delta Barley Project test clearing site and three additional test wells were drilled near the Tanana River 18 miles above the Gerstle River. Hydraulic gradient data obtained from these wells have been used to determine ground-water flow directions. Additional water-quality samples will be collected to aid analysis of what appears to be a "chemical signature" in the spring discharge water which may indicate sources of aquifer recharge. An aquifer test has been scheduled for spring 1979. A progress report on work completed through fall 1978 was submitted to the cooperators, and a report summarizing results and an interpretation of the geohydrology should be completed by January 1981.

Project location is shown in item 2, figure 17.

\* \* \*

Project Title: Hydrologic Studies Related to Coal Mining

Project Chief: David R. Scully  
(Anchorage Subdistrict Office)

Project Objectives: To collect data that characterize present hydrologic conditions in areas of known potential for coal development and in an area of active mining. Information obtained includes: (1) quantity and seasonal distribution of water discharge; (2) seasonal and areal variations in surface-water quality, including organic and inorganic constituents, minor-element concentration, sediment, and temperature; (3) stream-basin characteristics; and (4) aquatic benthic invertebrate communities.

Project Status: Field investigations were started in 1975 and completed in October 1978 in the Beluga, Healy, and Peters Creek coal areas.

Project location is shown in item 3, figure 17.

\* \* \*

## WATER RESOURCES

Project Title: Geohydrology of the Anchorage Area

Project Chief: Derrill J. Cowling  
(Anchorage Subdistrict Office)

Project Objectives: To assess the water resources of the Anchorage area, particularly the availability of water for increasing water supply demands and the effects of urbanization on the hydrologic system. In addition, project personnel maintain a hydrologic data collection network that provides a basis for interpretive studies and hydrologic analyses.

Project Status: The general hydrologic character and urban hydrology of this area were described early in this 12-year-old project. Current project activities include continued operation of a basic hydrologic data-collection network, continued refinement of the hydrologic model analysis of the confined ground-water system, a study of hydrology for land-use planning in the southeastern part of the Anchorage bowl, and accelerated processing of well data into the ground-water computer storage and retrieval system (GWSI). Reports are planned for publication on results of the Eagle River-Chugiak area ground-water resources study (Water Resources Investigations WRI 79-59), the confined aquifer model study, and the Merrill Field landfill study.

Project location is shown in item 4, figure 17.

\* \* \*

Project Title: Water Resources of the Kenai Peninsula Borough

Project Chief: Gordon L. Nelson  
(Anchorage Subdistrict Office)

Project Objectives: (1) To maintain a basic hydrologic data-collection and monitoring network on streamflow, lake levels, and ground-water levels in the Kenai Peninsula Borough; (2) to evaluate surface-water availability in streams draining to Cook Inlet between Kasiloof and Seldovia; (3) to evaluate the geohydrology of the Seldovia area; (4) to evaluate the geohydrology of the Fourth of July Creek alluvial fan near Seward; (5) to identify the major aquifers of the Kenai Peninsula between Kasiloof and Kachemak Bay and west of the Kenai Mountains; (6) to evaluate the hydrologic effects of ground-water withdrawals in the North Kenai area; and (7) to evaluate, on a reconnaissance basis, the potential for ground-water development in the area between Nikiski and upper Beaver Creek.

Project Status: Ground-water levels, lake levels, and streamflow are being monitored throughout the Kenai Peninsula, but most intensively in the North Kenai area. A six-well drilling program has indicated good potential for ground-water development in the upper Beaver Creek area. Two new gaging stations and 37 partial-record stations have been established on streams between Kasiloof and Seldovia. Eight test holes were drilled in the Seldovia area to evaluate the potential for ground-water development; a report on the hydrogeology of the Seldovia area is in preparation.

Project location is shown in item 5, figure 17.

\* \* \*

### SOUTHERN REGION

Project Title: Alaska Glaciology

Project Chief: Larry R. Mayo  
(Fairbanks Subdistrict Office)

Project Objectives: To analyze long-term climate and glacier data to detect significant changes, discover cause-and-effect relations, and determine characteristics of glacier-related hydrologic systems. To study the regimes of glaciers which present specific types of hazards or benefits, and to understand the cycle of glacier behavior and develop and employ predictive capabilities. To assess the importance of Alaskan glaciers to worldwide concerns regarding a deteriorating climate and glacier growth.

Project Status: This is a continuing project to analyze the modes of behavior or response of glaciers in Alaska. From year to year climatic factors vary widely and produce an ever-changing series of

responses in glacier activity. Data to analyze these glacier responses consist of year-round surveys of climate, glacier gains and losses, and river runoff. During the last 2 years project personnel have been conducting studies on Columbia Glacier.

The locations of the glacier study sites are shown in items 6-9, figure 17.

\* \* \*

Project Title: Knik Glacier

Project Chief: Larry R. Mayo  
(Fairbanks Subdistrict Office)

Project Objectives: To determine annually the changes in glacier thickness and glacier slope for analysis of the mechanism of formation and outburst of Lake George.

Project Status: This is the first year of a 5-year project. A geodetic survey network has been installed and measurements of snow depth and altitude have been made along the longitudinal center line of the glacier. An open-file report on the results of this work is planned.

Project location is shown in item 10, figure 17.

\* \* \*

#### SOUTHWESTERN REGION

Project Title: Water Resources of the Bristol Bay Region, Alaska

Project Chief: Larry L. Dearborn  
(Anchorage Subdistrict Office)

Project Objectives: To collect, compile, and publish hydrologic data pertaining to the occurrence, availability, and quality of water resources in the Bristol Bay region.

Project Status: 1979 is the first year of a planned 3-year study, and the evaluation of existing streamflow records, well records, and other related geohydrologic information has begun. The gathering and evaluation of ground-water data for the Dillingham area and the Bristol Bay Borough will be emphasized this year. A continuous water-level fluctuation record is being collected at one well in Dillingham, and several other area wells are measured periodically.

Project location is shown in figure 18.

\* \* \*

#### SOUTHEASTERN REGION

Project Title: Hydrology and Water Quality of the Keta River Basin near Ketchikan, Alaska

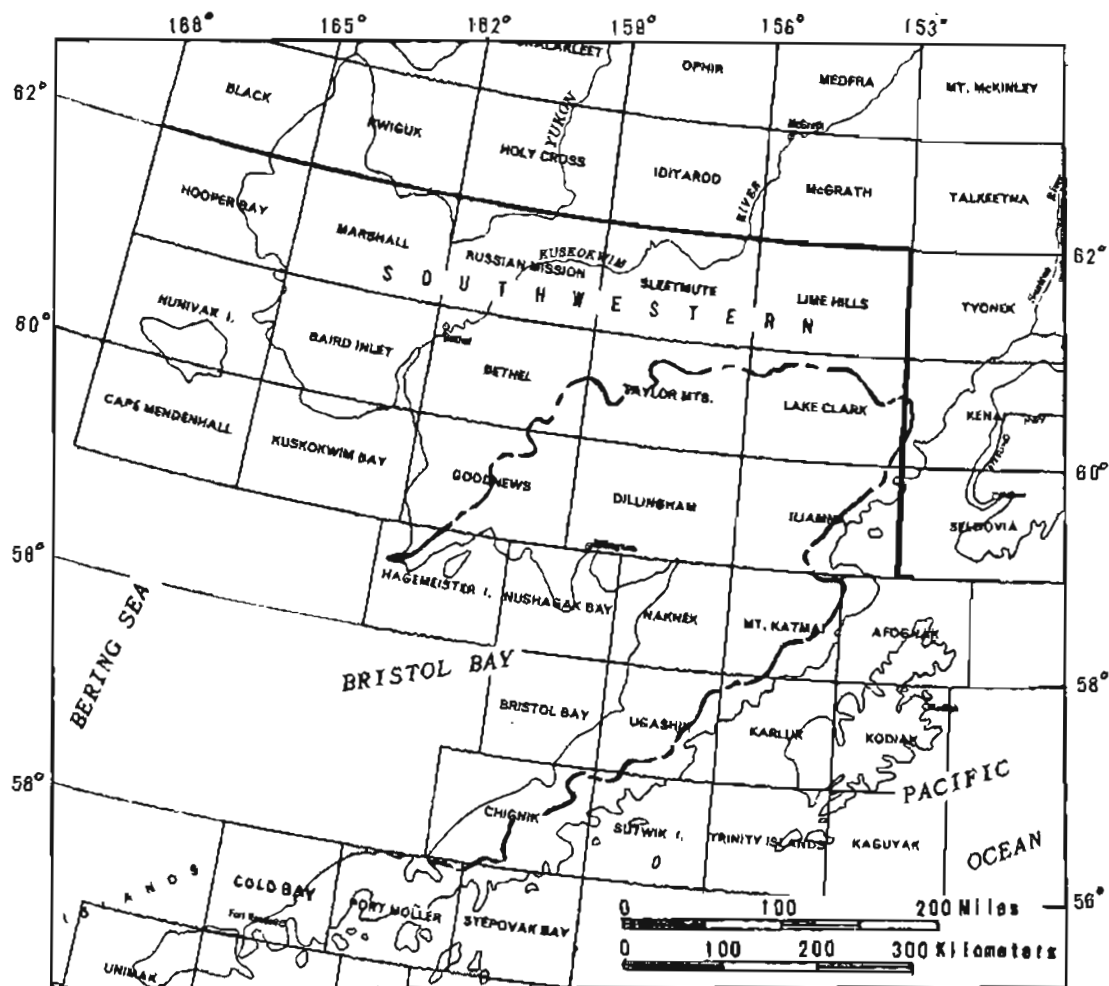
Project Chief: Gary O. Balding  
(Juneau Subdistrict Office)

Project Objectives: To collect baseline data that will characterize the present hydrologic conditions in an area of known potential for molybdenum development. Information to be obtained includes: (1) quantity and seasonal distribution of stream discharge; (2) seasonal and areal variations in surface-water quality including inorganic and organic constituents, minor elements (both dissolved and adsorbed to bed material), sediment and temperature; and (3) evaluating the occurrence and quality of ground water.

Project Status: Stream-gaging stations were installed on Keta River and White Creek to monitor streamflow, water temperature and specific conductance. Periodic measurements of instantaneous stream discharge and water quality were made at four other sites. Geophysical logs and water-quality samples were collected from two exploratory coreholes. Logs run included geothermal, natural gamma, and gamma-gamma. Data collection in the basin is continuing.

Project location is shown in figure 19.

\* \* \*



--- BOUNDARY OF BRISTOL BAY REGION (HYDROLOGIC SUBAREA 19040002)

Figure 18.--Hydrologic assessment area in Southwestern Alaska.

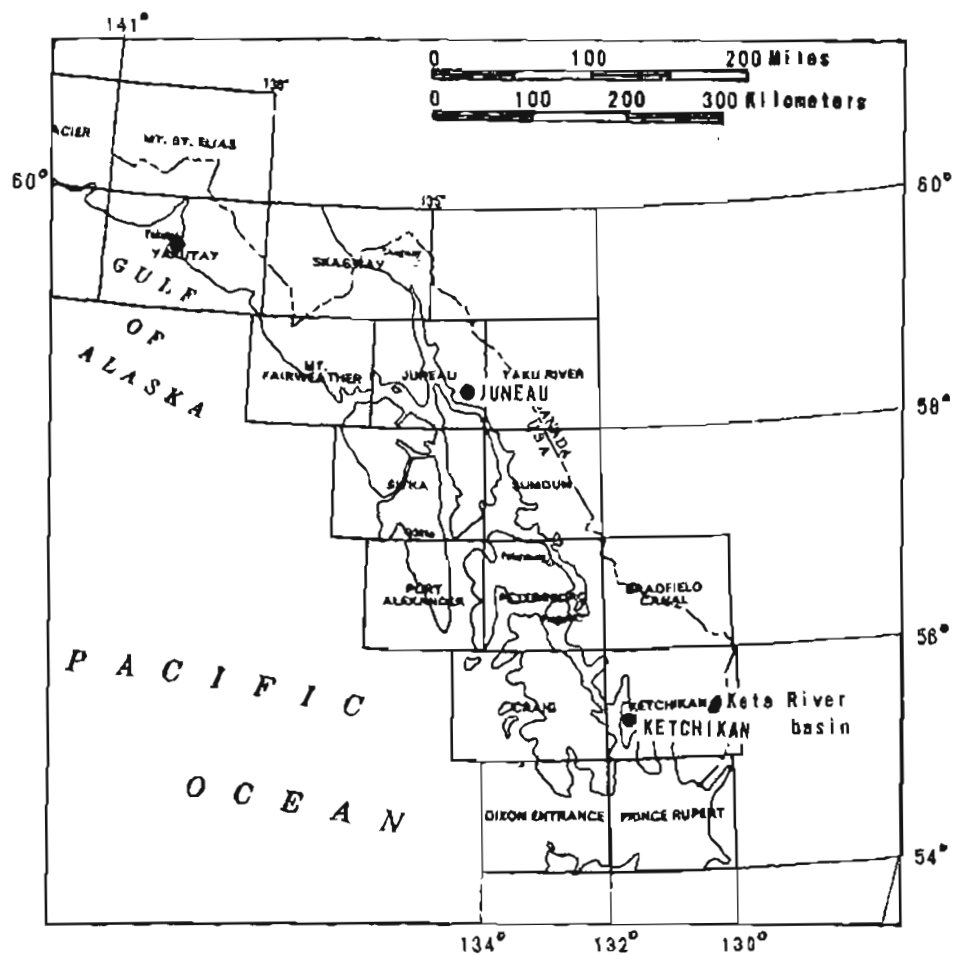
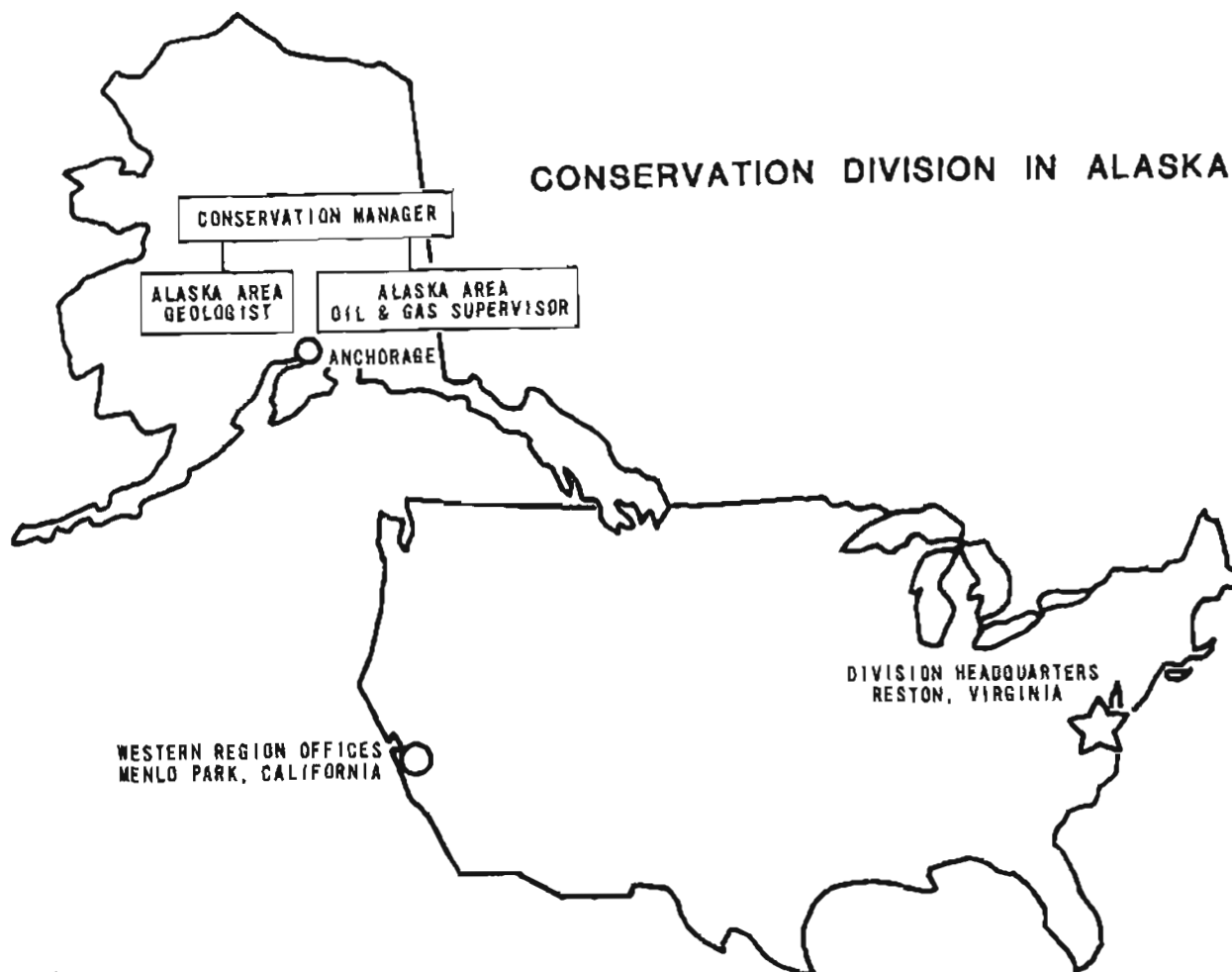


Figure 19.--Location of Keta River basin in Southeast Alaska.

## CONSERVATION



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National Center, Reston, VA 22092

## RESOURCE EVALUATION AND LEASE REGULATION

The primary functions of the Conservation Division are to examine and classify Federal lands as to their mineral resources and waterpower and water-storage values; to determine estimated petroleum values for onshore and offshore competitive lease sales; to supervise exploration and development for leases on the Outer Continental Shelf (OCS), as well as on Federal, Indian, and certain Naval petroleum reserve lands; and to maintain accounts and collect rentals and royalties from petroleum production.

Consistent with the national concern for environmental protection, the Division's regulations and procedures are subject to frequent reappraisal and revision in order to avoid or mitigate consequences that may result from pollution incidents, surface damage from mining, geothermal and petroleum operations, or other hazards that may be associated with mineral operations conducted under leases and prospecting permits.

The Conservation Division performs the following functions in Alaska:

**REGULATORY ACTIVITIES:** Supervision and inspection of oil and gas exploration and production operations on Federal lands in Alaska to insure safety, prevent pollution, and assure environmental protection are carried out by personnel in the Oil and Gas Supervisor's office. This work presently includes supervision and inspection of onshore lease operations on the Kenai Peninsula, the Cook Inlet area, and the OCS lease operations in the Gulf of Alaska and in the lower Cook Inlet. In addition, the Oil and Gas Supervisor regulates all pre-lease exploration activities on the OCS and supervises and inspects drilling operations in the National Petroleum Reserve in Alaska (NPR).

**ROYALTY ACCOUNTING:** The Oil and Gas Supervisor is responsible for the collection of all money due the Federal Government from oil and gas produced from Federal onshore leases and rental and royalty from OCS leases.

**PRE-SALE REPORTS:** Several years prior to scheduled lease sale dates, which are shown in table 2, the Division prepares reports and background material on OCS lease sale areas in Alaska (fig. 20). This work is closely coordinated with the Bureau of Land Management and other Federal and State agencies. Results of this coordinated effort include:

1. A summary report is prepared in cooperation with the Geologic Division, and consists of information on the stratigraphy, structure, petroleum resource potential, environmental geology and geologic hazards, technology, time-frame, and infrastructure needed for exploration and development. Work on this report begins several years prior to the lease sale and continues until the report is published at the beginning of the tract-selection process.
2. Tract selection is based on data from the summary report, as well as on other geologic and geophysical data that may exist at the time tentative tracts are selected for the lease sale. Tract selection is planned for completion 2 years prior to sale.
3. Draft and Final Environmental Impact Statements for OCS sales are based on technical and infrastructure information provided by the U.S. Geological Survey. The Bureau of Land Management uses such impact statements to assess socioeconomic and environmental impacts. Work begins on the draft statement 24 months prior to the lease sale, and the final statement is issued before the sale.

**RESOURCE ESTIMATES:** The Geologic Division estimates petroleum resources for geologic basins using volumetric yield methods. These estimates are revised periodically when new data become available. Prior to tract selection, more refined estimates are made by the Conservation Division's Area Geologist's office using geological (COST Well) and geophysical (seismic) data. These estimates are further refined by detailed structural mapping and analysis. The evaluation process continues up to the lease sale date.

**GEOLOGIC HAZARDS:** For areas being considered for leasing, high-resolution seismic data are used to delineate geologic conditions that could be detrimental to man-made structures. All parties are made aware of these potential hazards, and thus, mitigating measures can be taken, if necessary, in the leasing, exploration, and production processes.

**TRACT EVALUATION:** The Conservation Division makes detailed prospect and tract evaluations for each geologic structure within a sale area by using all available geological and geophysical data. Utilizing a Monte Carlo Range of Values Program, a net present worth is calculated for each tract. This value serves as a basis for accepting or rejecting bids for tracts during the lease sale.

**SPECIAL STUDIES:** The Division has several special projects underway which will provide data for appraisal and regulation of Federal mineral and oil and gas resources. The projects include two recon-

## CONSERVATION

naissance coal appraisal studies; three geologic studies to help to define the presence and distribution of oil and gas source rock in potential oil and gas basins; and three geotechnical studies which will provide detailed environmental data on sea floor surficial geology and foundation conditions in future OCS lease sale areas. These projects are described in more detail in the following section.



## PROJECTS OF THE CONSERVATION DIVISION

## NORTHERN REGION

Project Title: National Petroleum Reserve in Alaska Coal Resource Study - Shallow Geophysical Logging for Coal

Project Chief: James E. Callahan  
(Office of Alaska Area Geologist, Onshore Section)

Project Objective: To assess coal resources in the Reserve as part of the land-use study mandated by the Naval Petroleum Reserves Production Act, Section 105(c).

Project Status: A general summary report on coal resources was submitted to the 105(c) Planning Team in 1978 and later released as USGS Open-file Report 78-1033. Investigations will continue to take advantage of oil and gas exploration activities. Geophysical logging will be completed in seismic shot holes in parts of western NPRA, and coal cuttings from oil and gas exploratory wells will be analyzed. Helicopter reconnaissance of the west-central foothills of the Brooks Range, Kukpowruk River, Wainwright River, and Meade River will be conducted in the summer of 1979.

Project location is shown in item 1, figure 21.

\* \* \*

Project Title: Arctic Wildlife Range Stratigraphic Project

Project Chiefs: Irven F. Palmer and William M. Lyle  
(Office of Alaska Area Geologist; State of Alaska, Division of Geological and Geophysical Surveys)

Project Objectives: To provide petroleum source-rock, hydrocarbon maturation, and potential reservoir information on the area adjacent to an OCS area being proposed for leasing under the five-year leasing schedule. These data facilitate extrapolation of geologic parameters into the OCS area for prospect area and specific tract selections and block evaluations prior to a sale.

Project Status: The final planning is complete. The project is funded and will commence July 1979. This is a cooperative project with the State of Alaska, Division of Geological and Geophysical Surveys.

Project location is shown in item 2, figure 21.

\* \* \*

Project Title: Geotechnical Investigation, Beaufort Sea

Project Chief: Gerald B. Shearer  
(Office of Alaska Area Geologist, Geohazards)

Project Objectives: To identify features which might represent conditions hazardous to petroleum exploration and production in this area of proposed leasing activity. To provide subsurface control for available geophysical data, supply regional geotechnical and geochemical data for preliminary engineering design purposes, and provide information for tract selection and evaluation. Of particular interest in this area are depth to permafrost, presence of ice-rich zones in permafrost, gas hydrates and shallow gas, salinity of pore fluids, availability of gravel, and the geotechnical properties of the soil.

Project Status: During late winter 1979, 20 holes were drilled to depths of 100-300 feet below mudline in water depths up to 50 feet. The drilling was carried out from stable shorefast ice. Preliminary logs have been compiled and will be published soon. The logs show lithology, depth to ice-bonded permafrost, and field strength-test results from Torvane and pocket penetrometer tests. A comprehensive laboratory testing program of the drilling samples is underway. Several of the holes will be logged with sonic tools to obtain seismic velocity data. These data and a comprehensive final report should be released to the public in August 1979. After the laboratory testing is completed, a large quantity of representative samples and possibly some "undisturbed" samples of both unbonded and ice-bonded sediments

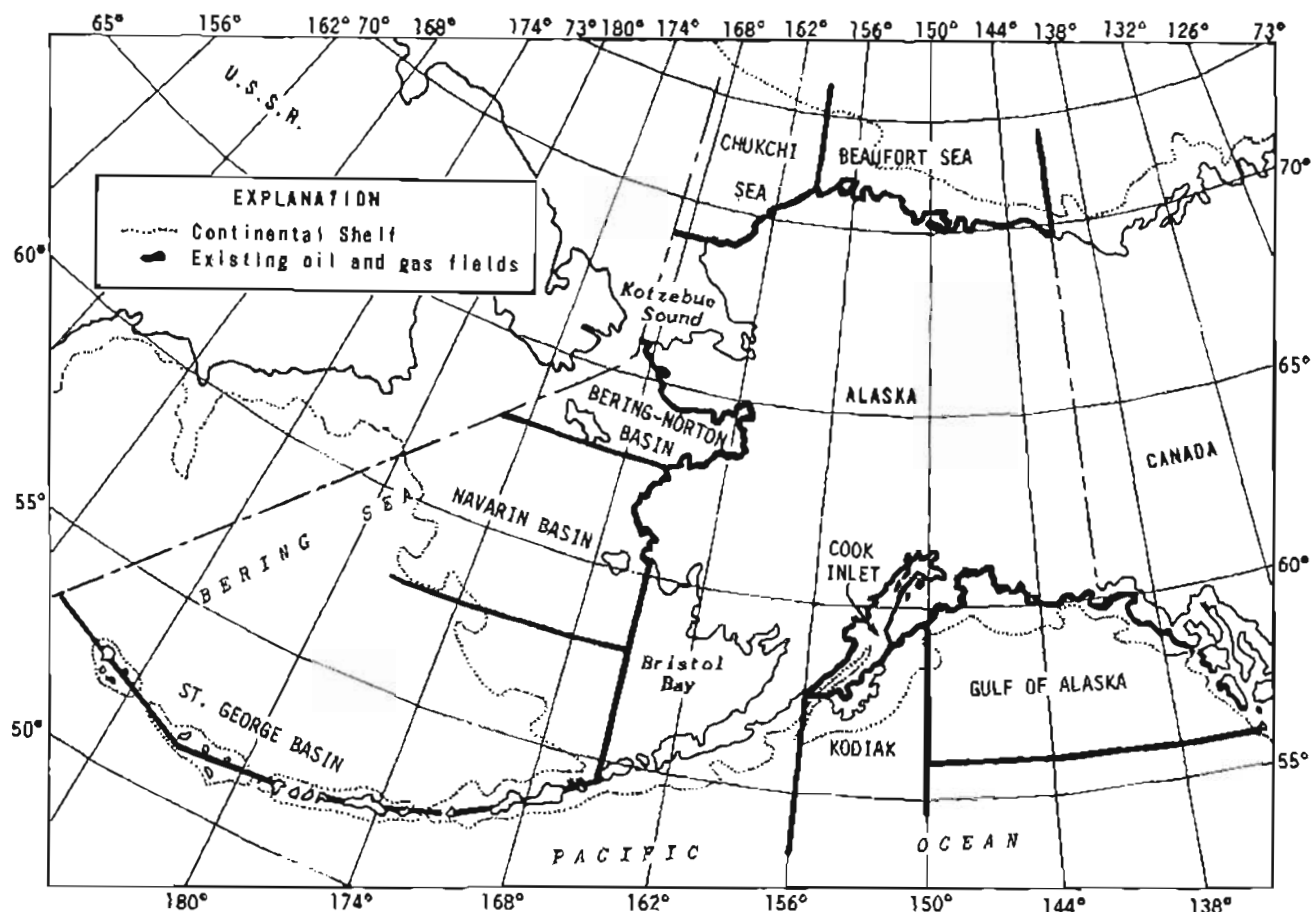


Figure 20.--Location of proposed oil and gas Outer Continental Shelf lease tracts.

0 300 Miles

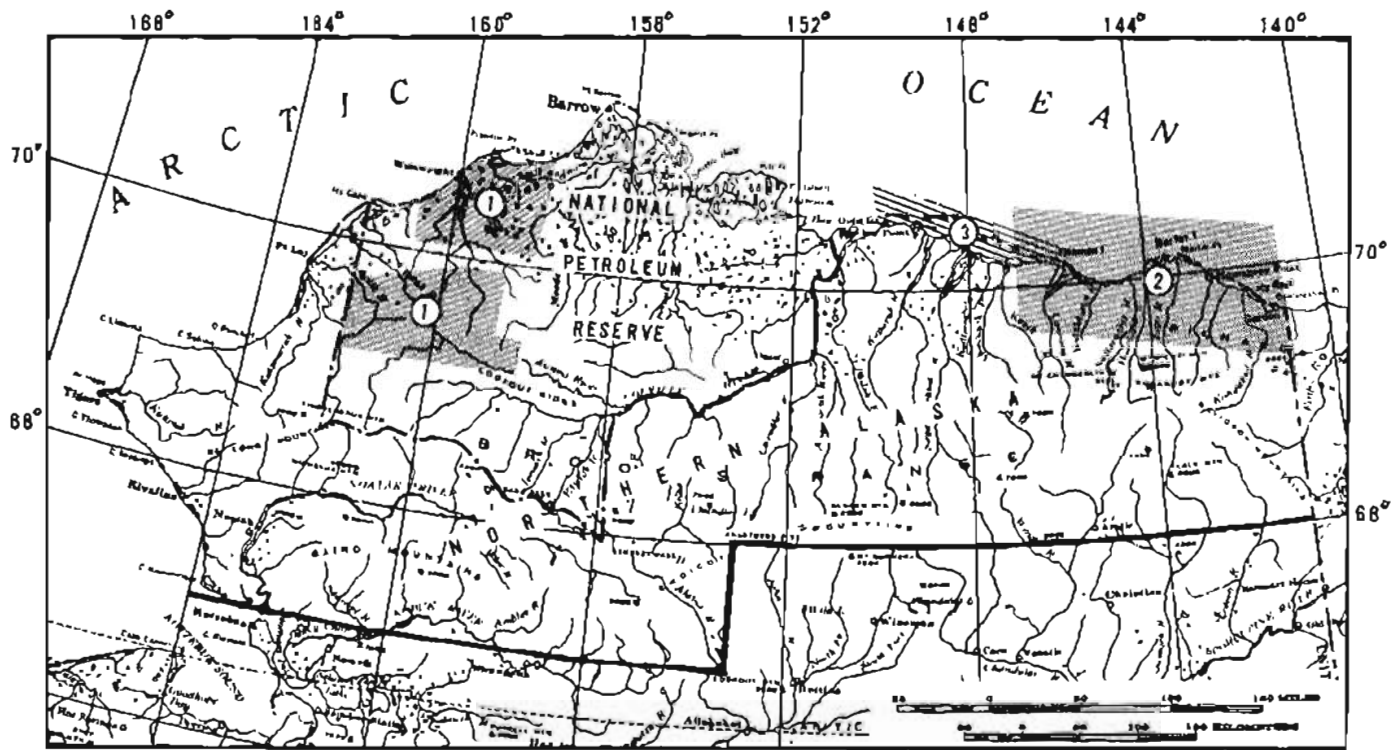
0 300 Kilometers

Table 2.--Tentative proposed Outer Continental Shelf oil and gas leasing schedule. The schedule is in a constant process of revision by the Departments of the Interior and Energy. Plans for sales depend heavily on the success of drilling. For locations see map above.

C - Call for nominations T - Tract selection H - Public hearing P - Proposed notice of sale R - Energy review  
D - Nomination due E - Draft Environ. Statement X - Final Environ. Statement Z - State comments due  
N - Notice of sale S - Sale

LEASE TRACT	1978	1979	1980	1981	1982	1983	1984
BEAUFORT SEA NEARSHORE	X	N	S				
GULF OF ALASKA	E	H	X	P	N	S	
KODIAK			H	X	P	Z	R
COOK INLET I			E	H	X	P	Z
BERING-NORTON BASIN	D	T		E	H	X	P
BEAUFORT SEA		D	T		E	H	X
COOK INLET II*				C	D	T	E
CHUKCHI SEA				C	D	T	E
NAVARIN BASIN				C	D	T	E
ST. GEORGE BASIN				C	D	T	E

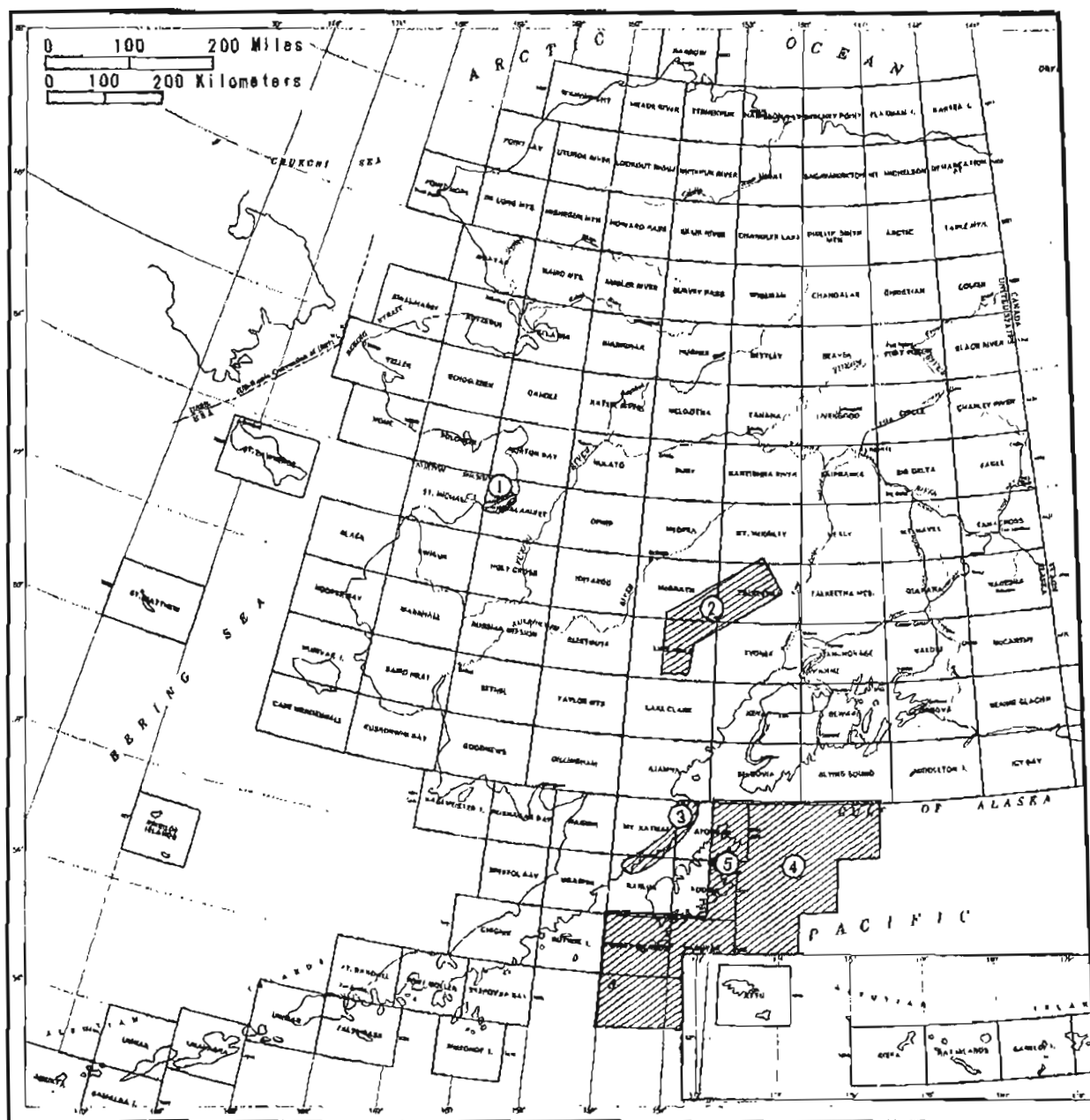
\*If Cook Inlet I is successful then will be followed by Cook Inlet II



## EXPLANATION

1. SHALLOW GEOPHYSICAL LOGGING FOR COAL-NATIONAL PETROLEUM RESERVE IN ALASKA
2. NORTHEASTERN ARCTIC SLOPE - FEDERAL/STATE FIELD PROJECT
3. BEAUFORT SEA OVER THE ICE COREHOLE PROGRAM

Figure 21.--Conservation activities in Northern Alaska.



EXPLANATION

Base from U.S. Geologic Survey Alaska Map A

1. NORTON SOUND ONSHORE STRATIGRAPHIC PROJECT
2. COAL RECONNAISSANCE SURVEY NEAR FAREWELL
3. LOWER COOK INLET/SHELIKOF STRAIT FIELD PROGRAM
4. KODIAK OUTER CONTINENTAL SHELF BATHYMETRIC
5. KODIAK OUTER CONTINENTAL SHELF GEOLOGIC

Figure 22.--Conservation activities in West-Central, Southern, and Southwestern Alaska.

will be made available for additional studies of the geologic history of the area and of the engineering properties of unbonded and ice-bonded sediments in the marine environment.

Project location is shown in item 3, figure 21.

\* \* \*

#### WEST-CENTRAL REGION

Project Title: Norton Sound Onshore Stratigraphic Project

Project Chief: Taber O. Flett  
(Office of Alaska Area Geologist)

Project Objectives: To conduct detailed geologic studies adjacent to a proposed OCS lease area to aid in prospect area tract selections and block evaluations.

Project Status: Fieldwork is to be carried out between July 6 and July 20, 1979.

Project location is shown in item 1, figure 22.

\* \* \*

#### WEST-CENTRAL, SOUTHERN, AND SOUTHWESTERN REGIONS

Project Title: Minchumina Basin Coal Reconnaissance Survey, near Farewell

Project Chief: Ernest G. Sloan  
(Office of Alaska Area Geologist)

Project Objectives: To acquire geological data on the coal resources of the Minchumina basin near Farewell.

Project Status: A reconnaissance field survey for coal in the Minchumina basin near Farewell was conducted in August 1977, and the results were released in February 1979 as U.S. Geological Survey Open-file Report 79-410. The data indicate the presence of a large resource of subbituminous coal in the area, but the areal extent of the coal-bearing rocks and the maximum depth of burial are not yet known.

Project locations is shown in item 2, figure 22.

\* \* \*

#### SOUTHWESTERN REGION

Project Title: Lower Cook Inlet/Shelikof Strait Field Program

Project Chiefs: George Petering and Tom Smith  
(Office of Alaska Area Geologist)

Project Objectives: To investigate potential reservoir and source rocks in upland areas adjacent to proposed OCS sale areas to aid in tract selections and block evaluations.

Project Status: The project will commence June 1 and continue through July 6.

Project location is shown in item 3, figure 22.

\* \* \*

## CONSERVATION

Project Title: Kodiak Outer Continental Shelf (OCS) Bathymetric Mapping

Project Chief: Bruce W. Turner  
(Office of Alaska Area Geologist)

Project Objective: To show topographic features of the sea bottom that may be of concern to future oil and gas exploration and development."

Project Status: Thirteen bathymetric maps of the Kodiak OCS area, where an oil and gas lease sale is scheduled for 1980, were released in February 1979 as U.S. Geological Survey Open-file Report 79-263. These 1:250,000-scale bathymetric maps were constructed using high-resolution seismic data from two surveys.

Project location is shown in item 4, figure 22.

\* \* \*

Project Title: Kodiak Outer Continental Shelf (OCS) Geologic Mapping

Project Chief: Glenn P. Thrasher  
(Office of Alaska Area Geologist)

Project Objectives: To map geologic interpretations of geophysical data.

Project Status: Two geologic maps of the sea floor on the OCS near Kodiak Island will be released in July 1979 as an open-file report. Surficial map units were primarily mapped on the basis of geologic interpretations of geophysical data and are superimposed on a 1:250,000-scale bathymetric base map. More than 200 samples from the study area were used to determine the material composition of each map unit.

Project location is shown in item 4, figure 22.

\* \* \*

# **SUPPORTING DIVISIONS AND SERVICES**

## **PUBLICATIONS DIVISION**

The functions and responsibilities of the Publications Division are to edit manuscripts of scientific papers and technical reports prepared by members of the U.S. Geological Survey, to reproduce topographic, geologic and other maps, to prepare exhibits and visual aids, and to disseminate general Survey program and publications information to the public. The Division maintains two offices in Alaska for the customers' convenience.

The Alaska Distribution Section office in Fairbanks distributes Survey maps, indexes, and leaflets by mail and over the counter to the public and to Federal and State agencies. It also supplies maps to 30 commercial dealers in Alaska. The Alaska Distribution Section is under the direction of the Western Region of the Publications Division and is supervised by:

Natalie A. Cornforth  
Federal Building  
Box 12  
101 12th Avenue, Room 126  
Fairbanks, Alaska 99701  
Tel. (907) 456-7535

The Public Inquiries Office in Anchorage serves as a public contact for general information about Survey activities, keeps a stock of Alaska maps for over-the-counter sales, and, as an agent of the Superintendent of Documents, sells Geological Survey books relating to Alaska. The office is a depository for open-file reports on Alaska and maintains a reference library of Geological Survey publications, as well as a browse-file containing microforms of Landsat (satellite) imagery. Itineraries and personnel lists for all Branch of Alaskan Geology field parties are available for inspection at the office. The office is under the direction of the Office of Public Inquiries headquartered at the National Center in Reston, Virginia. The Public Inquiries Office is supervised by:

Margaret I. Erwin  
108 Skyline Building  
508 Second Avenue  
Anchorage, Alaska 99501  
Tel. (907) 277-0577

## ADMINISTRATIVE DIVISION

The Alaska Field Office of the Administrative Division provides service and supply support to the Survey offices and personnel in Alaska. The office is supervised by:

Betty J. McIntire  
204 Skyline Building  
218 E Street  
Anchorage, Alaska 99501  
Tel. (907) 271-4145

A warehouse for Survey equipment is located just inside the Elmendorf Air Force Base to the east of Anchorage. The warehouse is under the immediate supervision of:

Harvey Haynes  
5500 Oilwell Road  
Elmendorf Air Force Base  
Anchorage, Alaska 99506  
Tel. (907) 752-3834

A warehouse for the Fairbanks area is located at Fort Wainwright but is not staffed. The telephone number at Fort Wainwright is (907) 353-4219.

A radio network is operated during the field season for communicating among the field camps and with Anchorage or Fairbanks. The official Survey frequencies are 5380 (USB 5381.5) and 3211 (USB 3212.5) kHz. The Anchorage base station (KWA 351) is located at 218 E Street and monitors 5380 during office hours, or other hours by arrangement. Commercial stations WKD 22 in Anchorage and KGA 85 ("Broadmoor") in Fairbanks, both of which monitor 5167.5 (USB 5168.9), handle non-routine Survey messages. For further information about the Survey's radio operations, contact:

Florence R. Weber  
P.O. Box 80586  
Fairbanks, Alaska 99708  
Tel. (907) 479-7245

The Administrative Division office also handles emergency messages to or from Survey offices or families of employees. During regular office hours, the Anchorage office can be contacted, and at other times Mrs. McIntire can be contacted at (907) 272-5398.



## ALASKA CORE LIBRARY

The Core Library preserves and makes available for study the Survey's large collection of Alaskan well cores. Most of these cores are from the National Petroleum Reserve in Alaska (NPRA), formerly known as the Naval Petroleum Reserve No. 4 (NPR-4); the nucleus of the library is about 25,000 feet of cores taken during exploration of the Reserve in the 1940's and 1950's. The library also includes some cores and a large amount of ditch cuttings from wells drilled on Federal land in other parts of Alaska. The library is currently receiving and storing core from the Survey's NPRA operations.

The Alaska Core Library is housed in three buildings at the corner of Boyd and Manor Streets, Government Hill, in Anchorage. The library is managed by the Branch of Alaskan Geology, Branch of Oil and Gas Resources, Conservation Division, and Office of National Petroleum Reserve in Alaska.

The director of the library's activities is:

W.L. (Doc) Adkison  
2525 C Street  
Suite 400  
Anchorage, Alaska 99501  
Tel. (907) 276-7422  
Library: (907) 274-1345

## TECHNICAL DATA UNIT

The Technical Data Unit, located in Menlo Park, California, has as its objectives to provide prompt, complete, and up-to-date listings of all geological data and reports on Alaska published by the U.S. Geological Survey, the U.S. Bureau of Mines, and the State of Alaska Division of Geological and Geophysical Surveys. In addition, the unit serves as a source of maps and Survey publications for geologists of the Alaskan Branch or personnel of other branches or divisions doing research in Alaska. For more information, contact:

Technical Data Unit  
U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, CA 94025  
Tel. (415) 323-8111x2342

Table 3. Alphabetical listing of project chiefs with associated personnel and description of type of work and area.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Balding, G. O.	--	Water Resources Div.	Southeastern	Data collection in Keta River basin, molybdenum area.
Barnes, P.	Reimnitz, E.	Geologic Div.	Offshore	Marine sedimentary processes in Arctic areas, Beaufort Sea.
Berg, H. C.	--	Geologic Div.	Southeastern	Geologic mapping; tectonic, metallogenic, isotopic, trace element studies; mineral deposits examination.
Bird, K. J.	--	Geologic Div.	Northern	Study of reservoir properties, Lisburne Group.
Bird, K. J.	--	Geologic Div.	Northern	Study of structure of Brooks Range front.
Brew, D. A.	Morrell, R. P.	Geologic Div.	Statewide	Compilation of a 1:2,500,000 map of metamorphic facies in Alaska.
Brew, D. A.	Morrell, R. P. Sonnevill, R. A.	Geologic Div.	Southeastern	Mineral resource appraisal and geologic mapping of Glacier Bay National Monument, Wilderness Study Area.
Brew, D. A.	Ford, A. B.	Geologic Div.	Southeastern	Geologic and geochemical mapping, resource assessments, Juneau and Taku River area.
Brew, D. A.	Berg, H. C. Cathrall, J. B. Churkin, Michael, Jr. Day, A. W. Ford, A. B. Grybeck, D. Hoffman, J. D. Hunt, S. J. Karl, S. Miller-Moore, M. Morrell, R. P. Ovenshine, A. T. Sonnevill, R. A.	Geologic Div.	Southeastern	Geologic mapping and mineral resource assessment of Petersburg area.
Brosge, W. P.	Reiser, H. N. Dutro, J. T., Jr.	Geologic Div.	Northern	Geologic mapping, geochemical sampling, Arctic and Table Mountain quadrangles, Brooks Range.
Brosge, W. P.	Reiser, H. N. Nilsen, T. H. Dutro, J. T., Jr.	Geologic Div.	Northern	Structural and stratigraphic studies, geologic mapping, paleomagnetism study, north-central and eastern Brooks Range.

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Callahan, J. E.	Albright, D. Sloan, E. G. Martin, G.	Conservation Div.	Northern	Shallow logging for coal in Nanushuk Group, NPRA.
Carter, L. D.	Galloway, J. P.	Geologic Div.	East-Central	Geologic mapping of surficial deposits, Tanana Valley to Canadian border.
Carter, L. D.	Galloway, J. P.	Geologic Div.	Northern	Stratigraphic and geomorphic studies of surficial deposits, western Arctic coastal plain.
Carter, R. D.	Madrid, R. J.	ONPRA	Northern	Collection and organization of basic data for public release, NPRA.
Case, J. E.	Griscom, A. Barnes, D.	Geologic Div.	Statewide	Geophysical aeromagnetic, gravity studies for AMRAP projects.
Chapman, R. M.	Yeend, W. E. Silberman, M. L. Jones, D. L.	Geologic Div.	East-Central	Stratigraphic and structural studies, geologic mapping, dating by chemistry and paleontology, Kantishna and Ruby areas.
Childers, J. M.	Kernodle, D. R. Knudsen, K. R.	Water Resources Div.	Statewide	Investigations of hydrologic hazards and water resources in Arctic and sub-arctic Alaska.
Churkin, M., Jr.	Carter, C.	Geologic Div.	Statewide	Delineation of past and present lithosphere plates, U.S. and Canada (Arctic Map).
Cobb, E. H.	--	Geologic Div.	Statewide	Compilation of data on mineral resources.
Cowing, D. J.	--	Water Resources Div.	Southern	Geohydrology of Anchorage area.
Csejtey, B., Jr.	Coney, P. Stricker, G. D. Cox, D. P. St. Aubin, D.	Geologic Div.	Southern	Geologic mapping and mineral assessment of Healy quadrangle (AMRAP).
Dearborn, L. L.	--	Water Resources Div.	Southwestern	Water resources of Bristol Bay region.
Dearborn, L. L.	Marshall, J. Bailey, B.	Water Resources Div.	Statewide	Maintain observation wells in network for basic data on ground-water levels.
Dearborn, L. L.	Whiteman, K. Bailey, B. Lee, M. Best, B. Rasmussen, K.	Water Resources Div.	Statewide	Collection recording and management of basic ground-water data.

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Detterman, R. L.	Miller, T. P. Yount, M. E. Wilson, F. H. Detra, D. Case, J. E. Richter, D. H. Cox, D. P.	Geologic Div.	Southwestern	Geologic mapping geochemical sampling, mineral resource assessment (AMRAP), Chignik and Sutwick Island quadrangle.
Detterman, R. L.	Miller, T. P. Yount, M. E. Wilson, F. H. Detra, D.	Geologic Div.	Southwestern	Geologic mapping, mineral resource and geothermal assessment (AMRAP), Ugashik and Karluk quadrangles.
Dickinson, K. A.	Campbell, J. A.	Geologic Div.	Statewide	Evaluation of uranium potential in selected Tertiary basins in Alaska.
Dusel-Bacon, C.	Bentz, J. L.	Geologic Div.	East-Central	Petrography and petrology, Big Delta quadrangle.
Outro, J. T., Jr.	Armstrong, A. K. Other personnel	Geologic Div.	Statewide	Biostratigraphic and paleontologic studies of Paleozoic rocks.
Eberlein, G. D.	Churkin, M., Jr.	Geologic Div.	Southeastern	Geologic mapping and geochemical studies, Craig quadrangle.
Eberlein, G. D.	Lanphere, M. A.	Geologic Div.	Statewide	Compilation of geochronological data on the Precambrian rocks of Alaska.
Elliott, R. L.	Koch, R. D. Diggles, M. F.	Geologic Div.	Southeastern	Geologic mapping, geochemical and geophysical studies, mineral assessment (AMRAP), Bradfield Canal quadrangle.
Ferrians, O. J., Jr.	--	Geologic Div.	Northern	Reconnaissance engineering and geologic studies and mapping, northeast Alaska.
Ferrians, O. J., Jr.	Williams, J. R. Churkin, M., Jr. Nockelberg, W. J. Carter, L. D. Yeend, W. E. Johnson, K. M. Theobald, P. K. and others	Geologic Div.	Northern	Surficial geologic and mineral resource studies of NPRA.

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Ferrians, D. J., Jr.	Schmoll, H. R. and others	Geologic Div.	Southern	Earthquake hazards investigations and mapping, Anchorage, Susitna lowlands.
Flett, T. O.	Kornbrath, R. Larson J. Lynch, M.	Conservation Div.	Northern	Geologic studies adjacent to proposed UCS lease area.
Foster, H. L.	Weber, F. R. Dusel-Bacon, C. Crim, K. D. Menzie, W. D. and others	Geologic Div.	East-Central	Geologic mapping, geochemical sampling, mineral resource assessment, primarily Circle quadrangle (AMRAP).
Gaydos, L.	Morrissey, L. A. Ennis, R. A. Wray, J. R. Witmer, R. E. Acevedo, W.	LIA	Northern	Vegetation mapping by Landsat imagery, NPRA.
Grantz, A.	--	Geologic Div.	Offshore	Regional geology and fuel potential of continental margin - Beaufort and Chukchi Seas.
Grybeck, D.	Nelson, S. W. Cathall, J. B. Brew, D. A. Miller-Hoare, M. Cady, J. LeCompte, J. R. Silberman, M. L.	Geologic Div.	Northern	Geologic mapping, geochemical sampling, geophysical surveys and mineral resource assessment, Survey Pass quadrangle (AMRAP).
Hamilton, T. D.	Lamb, B. M.	Geologic Div.	Northern	Surficial geologic mapping, stratigraphic studies, central Brooks Range (6 quadrangles).
Hampton, M.	Bouma, A. Orlando, R. Torresan, M. Rappeport, M.	Geologic Div.	Southern, Southwestern	Geo-environmental assessment of Cook Inlet and Kodiak Shelf.
Hessin, T.	Crenshaw, G. Day, G. and others	Geologic Div.	Southeastern	Geochemical exploration in Sitka Wilderness Area.
Hoare, J. M.	Coonrad, W. L. Decker, J. E.	Geologic Div.	Southwestern	Geologic mapping, geochemical studies, Iikchik Lakes, Taylor Mountains.
Hopkins, D. M.	Hartz, R. W. Nelson, R. E. Smith, P. A.	Geologic Div.	Northern	Onshore and offshore investigations of permafrost, mapping, sampling and drill core analysis, Beaufort Sea coast and shelf.

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Hudson, T.	--	Geologic Div.	Statewide	Petrologic, geochemical and geochronological studies of selected Sn, W, Mo deposits.
Huffman, A. C.	Other Geologic Division personnel	Geologic Div.	Northern	Stratigraphic, paleontologic and economic studies, Nanushuk Group, North Slope.
Johnson, B. R.	--	Geologic Div.	Southeastern	Geologic mapping, geochemical and geophysical surveys, mineral resource assessments, western Chichagof and Yakobi Islands Wilderness Study Area.
Kachadoorian, R.	--	Geologic Div.	Northern	Engineering geology investigations, NPRA.
Kachadoorian, R.	Moore, H.	Geologic Div.	Southern	Evaluation of geologic and seismic hazards for dam and reservoir sites and preparation of EIS, Susitna River area.
Kienzle, S. K.	--	Geologic Div.	Northern	Seismic and gravity data collection and analysis, NPRA.
Krumhardt, A. P.	--	Water Resources Div.	East-Central	Geohydrologic studies of Fairbanks North Star Borough.
Lahr, J. C.	Stephens, C. D. Roger, J. Fogleman, K.	Geologic Div.	Southern	Evaluate hazards associated with earthquake activity, Cook Inlet to Yakutat Bay.
Lahr, J. C.	Stephens, C. D. Roger, J. Fogleman, K.	Geologic Div.	Southern	Assessment of seismicity and potential seismic risk, eastern Gulf of Alaska.
Lamke, R. D.	--	Water Resources Div.	Statewide	Flow and stage basic data collection.
Lantz, R. J.	Carter, R. D. Adkison, W. L.	ONPRA	Northern	Subsurface petroleum exploration and evaluation, gas field operation.
Letey, A. E.	Other Division personnel	Topographic Div.	Northern	Mapping in Eastern Brooks Range, 1:63,360
Letey, A. E.	Other Division personnel	Topographic Div.	Northern	Mapping in coal resource area, 1:50,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Northern	Mapping in National Petroleum Reserve, 1:50,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Northern	Mapping in Ambler River, geodetic control.
Letey, A. E.	Other Division personnel	Topographic Div.	West-Central	Mapping in Hughes-Shungnak area, 1:50,000.

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Letey, A. E.	Other Division personnel	Topographic Div.	East-Central	Mapping in Christian East area, 1:63,000.
Letey, A. E.	Other Division personnel	Topographic Div.	East-Central	Mapping in Christian area, geodetic control.
Letey, A. E.	Other Division personnel	Topographic Div.	Southwestern	Mapping in Port Moller area, 1:63,360.
Letey, A. E.	Other Division personnel	Topographic Div.	Southwestern	Mapping in Russian Mission, Bethel, Goodnews (Bay) area, 1:250,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping for Bureau of Land Management support, public land surveys.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Anchorage, 1:25,000 for 31 quadrangles.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Bering Glacier area, 1:63,360.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Cordova area, 4 quadrangles at 1:25,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Seward area, 6 quadrangles at 1:25,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Whittier area, 7 quadrangles at 1:25,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Willow South area, 4 quadrangles for capitol site, metric contours, 1:25,000.
Letey, A. E.	Other Division personnel	Topographic Div.	Southern	Mapping in Valdez area, 5 quadrangles at 1:25,000 with metric contours.
Madison, R. J.	--	Water Resources Div.	Statewide	Monitoring network of quality-of-water stations.
Magoon, L. B.	Claypool, G. E.	Geologic Div.	Northern	Data collection, oil and gas rocks, NPRA.
Magoon, L. B.	Fisher, M. A. Claypool, G. E. Scott, E. Egbert, R. M.	Geologic Div.	Southwestern, Southern, Offshore	Geologic mapping, geochemical and geophysical studies, petroleum resource assessment, Cook Inlet/Shelikof Strait.
Marlow, M. S.	Cooper, A. K.	Geologic Div.	Offshore	Geophysical and geologic mapping, Bering Sea.

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Mayo, L. R.	Trabant, D. C.	Water Resources Div.	Statewide	Collection and analysis of snow- and ice-balance, ice motion and climatic data and aerial photography on glaciers.
Mayo, L. R.	Trabant, D. C.	Water Resources Div.	Southern	Research on climate-glacier-river responses, glacier surges and stability, Alaska Range, Chugach Mountains.
Mayo, L. R.	Trabant, D. C.	Water Resources Div.	Southern	Thickness and slope measurements on Knik Glacier.
Meier, M. F.	Mayo, L. R. Tangborn, W. V. Post, A. S. Hodge, S. M. Krimmel, R. M. Sikonia, W. G. Taylor, P. L. Rasmussen, L. A.	Water Resources Div.	Statewide (Southern)	Research on glacier physics and snow hydrology, primarily on Columbia Glacier, also statewide.
McCoy, G.	Frost, C.	Water Resources Div.	Northern	Nutrient limitation in arctic lake, NPRA.
Nelson, G. L.	Scully, D. R. (Freethy, G. W.)	Water Resources Div.	Southern	Water resources of the Kenai Peninsula Borough, including Kaslof, Seward, Seldovia, Kenai and other areas.
Nelson, H.	Thor, D. R. Larsen, M. C.	Geologic Div.	Offshore	Seismic, photographic and other means of studying potential geologic hazards, northern Bering Sea.
Nelson, W. H.	Reed, B. L. Carlson, C. Lanphere, M. A. Case, J. E. Steele, W. C. Ratte, J. Cox, D. P.	Geologic Div.	Southwestern	Geologic mapping, geochemical sampling, mineral resource assessment (AMRAP), Lake Clark quadrangle.
Nockelberg, W. J.	Albert, N. R. D. Zehner, R. Kerzon, P. Lange, I. Yeend, W. E. Curtin, G. Jones, D. L. Silberling, N. Richter, D. H. Gromme, S. Hillhouse, J.	Geologic Div.	Southern	Geologic mapping and mineral assessment (AMRAP), Mount Hayes quadrangle.



Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Osbakken, W. E.	--	Geologic Div.	Southeastern	Maintaining seismic observatory at Sitka.
Palmer I. F.	Lyle, W. M. (State of Alaska)	Conservation Div.	Northern	Source and reservoir rock investigations near UCS areas.
Patton, W. W., Jr.	Moll, E. J. Silberman, M. L. Dutro, J. T., Jr. King, H. D. and others	Geologic Div.	Southwestern	Geologic mapping, geochemical sampling and mineral resources assessment (AMRAP), Medfra quadrangle.
Petering, G.	Smith, T. Magoon, L. B. Egbert, B. Bohm, J.	Conservation Div.	Southwestern	Reservoir and source rock investigations in areas adjacent to proposed UCS sale areas.
Plafker, G.	Bruns, T.	Geologic Div.	Southern	Dredging and sparker profiling on continental slope, North Gulf.
Plafker, G.	Hudson, T. Hunt, S. Carlson, P.	Geologic Div.	Statewide	Evaluation of risks associated with earthquakes.
Repenning, C. A.	Marincovich, L. Spicer, R. Roth, B. Schorn, H. Hazel, J.	Geologic Div.	Northern	Paleontologic studies of NPRA.
Schmoll, H. R.	Yehle, L. A. Chleborad, A. F. Pasch, A. D. Gardner, C. A.	Geologic Div.	Southern	Mapping of surficial deposits, sampling for physical properties, Cook Inlet coal, Tyonek area.
Scully, D. R.	--	Water Resources Div.	Southern	Hydrologic studies in upper Cook Inlet and Healy coal fields.
Shearer, G.	Holden, K. D. Turner, B. W.	Conservation Div.	Offshore	Geohazards, foundations for structures, Beaufort Sea.
Silberman, M. L.	Connor, C.	Geologic Div.	Statewide	Geochemical and geochronological studies of igneous rocks and related ore deposits.
Sloan, C. E.	Glude, W. J. Swanton, N. K.	Water Resources Div.	Northern	Water resources for exploration. Snow survey for DNRA.
Sloan, C. E.	Glude, W. J. Swanton, N. K.	Water Resources Div.	Northern	Hydrology of NPRA [105(c) studies].

Table 3. Listing of project chiefs--Continued.

Project Chief	Associated Personnel	Organizational Designation	Region of Operations	Type of Work
Sloan, E. G.	Personnel from USGS and Conservation	Conservation Div.	West-Central	Reconnaissance coal survey (Farewell Area).
Steele, W. C.	LeCompte, J. R. Albert, N. R. D.	Geologic Div.	Statewide	Interpretation of Landsat imagery for AMRAP projects.
Stricker, G. D.	--	Geologic Div.	Statewide	Evaluation of coal resources for AMRAP projects and NPRA.
Thrasher, G. P.	--	Geologic Div.	Southwestern	Geologic mapping, Kodiak UCS area.
Turner, B. W.	--	Geologic Div.	Southwestern	Bathymetric mapping, Kodiak UCS area.
Vallier, T. L.	Gardner, J. V.	Geologic Div.	Offshore	Offshore slope stability and faulting, southern Bering Sea.
Wilcox, D. E.	--	Water Resources Div.	East-Central	Geohydrologic studies of Delta-Clearwater area (agricultural).
Winkler, G. R.	Williams, J. R. Johnson, K. M. Silberman, M. L. Miller, R. J. Pickthorn, W. Vickery, D.	Geologic Div.	Southern	Geologic mapping and mineral assessment (AMRAP) of Valdez quadrangle.
Yeend, W. E.	--	LIA	Northern	Environmental assessment, NPRA.
Yehle, L. A.	--	Geologic Div.	Southern, Southeastern	Geologic mapping evaluation of geologic hazards, coastal communities.

Table 4. Agencies currently cooperating in U.S. Geological projects.

Federal	State	Local	Project Title	Project Chief	Organizational Designation
Alaska Power Admin.; U.S. Army Corps of Eng.; U.S. Dept. of Agriculture, Soil Conservation Service; Environmental Protection Agency; coal studies; U.S. Public Health Service	State of AK, Dept. of Fish and Game; Dept. of Transportation and Facilities; Dept. of Environmental Conservation (DEC) Alaska Power Authority	Municipality of Anchorage; Kenai Pen. Borough; Thomas Bay Power Authority	Surface-water stations	Lanke, R. D.	Water Resources Div.
Bureau of Land Management (BLM)			Environmental geologic investigations of lower Cook Inlet and Kodiak Shelf.	Hampton, M.	Geologic Div.
BLM			Bureau of Land Management Alaska support	Letey, A. J.	Topographic Div.
BLM; and Bureau of Mines			National Petroleum Reserve in Alaska (NPRA 105(c) Land Use Study	Ferrians, U. J., Jr.	Geologic Div.
Bureau of Mines			Geochemical exploration of Alaska Wilderness areas	Hessin, T.	Geologic Div.
Bureau of Mines			Mineral resources of Glacier Bay National Monument Wilderness Study area	Brew, D. A.	Geologic Div.
Bureau of Mines, (U.S. Forest Service)			West Chichagof-Yakobi Wilderness Area	Johnson, B. R.	Geologic Div.
BLM; and National Oceanic and Atmospheric Admin. (NOAA)			Faulting and slope stability on the continental margin, southern Bering Sea	Vallier, I. L.	Geologic Div.
Environmental Protection Agency (EPA)			Nutrient limitation in two arctic lakes	McCoy, G.	Water Resources Div.
BLM			NPRA hydrology	Sloan, C. E.	Water Resources Div.
		Fairbanks North Borough	Geohydrology Fairbanks North Star Borough	Krumhardt, A. P.	Water Resources Div.
		Municipality of Anchorage	Geohydrology of the Anchorage area	Cowing, D. J.	Water Resources Div.
EPA			Hydrologic studies related to coal mining	Scully, D.	Water Resources Div.
NOAA; Environmental Data Service			NPRA Data open file	Carter, L. D.	UNPRA

Table 4. Cooperating agencies--Continued.

Federal	State	Local	Project Title	Project Chief	Organizational Designation
NOAA			Northern Alaska Cenozoic	Hopkins, D. M.	Geologic Div.
NOAA			Eastern Gulf of Alaska seismicity	Lahr, J. C.	Geologic Div.
U.S. Army Corps of Engineers; U.S. Forest Service	DEC; Dept. of Fish and Game		Quality-of-water stations	Madison, K. J.	Water Resources Div.
U.S. Army Corps of Engineers	Dept. of Geological and Geophysical Surveys (DG&GS)	Kenai Peninsula Bor.; Municipality of Anchorage	Collection, recording and management of basic ground-water data in Alaska	Dearborn, L. L.	Water Resources Div.
	DG&GS		Beaufort Sea over the ice corehole program	Shearer, G.	Conservation Div.
	DG&GS		Metamorphic facies of Alaska	Brew, D. A.	Geologic Div.
	DG&GS		Water resources of the Bristol area	Dearborn, L. L.	Water Resources Div.
	DG&GS		Arctic wildlife range stratigraphic project	Palmer, I. F.	Conservation Div.
	DEC		Hydrology and water resources of the Keta River basin near Ketchikan	Balding, G. O.	Water Resources Div.
	Dept. of Natural Resources		Geohydrology of the Delta-Clearwater area	Wilcox D. E.	Water Resources Div.
	Dept. of Natural Resources	Kenai Peninsula Bor.	Water resources of the Kenai Peninsula	Nelson, G.	Water Resources Div.