DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF- 765

CLARK-ANCHORAGE A-7, A-8 QUADS,

ALASKA

SHEET 1 OF 3

INTRODUCTION AND PREVIOUS WORK

As part of a U.S. Geological Survey project to map basement rocks in the western Chugach Mountains, bedrock was mapped in the Anchorage A-7 and A-8 1:63,360-scale quadrangles in 1969, 1970, and 1971; 173 stream-sediment samples and 32 rock samples were taken for analysis. The accompanying reconnaissance geologic map and statistical treatment of geochemical data result from this work.

Most of the early work on the bedrock geology of the Anchorage A-7 and A-8 quadrangles and the surrounding areas was by S. R. Capps (1916 and 1940) and Park (1933). Reconnaissance geologic maps (scale 1:63,360) from adjacent quadrangles have been released by Clark and Bartsch (1971a, b) and Clark and Yount (1972). A preliminary geologic map (1:250,000) and report by Clark describes the regional setting (1972). Surficial deposits in the Anchorage A-8 were mapped and described by Miller and Dobrovolny (1959). The surficial deposits of the Anchorage Borough, including those in the Anchorage A-7 and A-8 quadrangles, have been mapped by H. R. Schmoll and Ernest Dobrovolny (1972 and unpublished maps).

The west part of the mapped area is included within an aeromagnetic study of the Cook Inlet basin by Grantz and others (1963).

MAP UNITS

Undifferentiated metasedimentary and metavolcanic rocks

Outcrops near the mouth of Little Rabbit Creek (fig. 1) include a thick marble layer, greenstone, and fine-grained metasedimentary rocks. Because of lithologic similarity and position near the range front, these rocks are tentatively correlated with similar undifferentiated metaplutonic, metasedimentary, and metavolcanic rocks exposed between Eagle River and Eklutna 25 to 40 kilometres north of Anchorage (Clark, 1972; Clark and Bartsch, 1971b). Fusulinids in a marble layer near Eklutna were dated as Permian by R. C. Douglass of the U.S. Geol. Survey (written commun., 1970). The Permian age of the marble does not preclude the possibility that rocks of other ages have been included in the unit. The probable age range of the unit is considered to be Permian to Jurassic (Clark, 1972).

McHugh Complex

The McHugh Complex (Clark, 1973) consists of a metaclastic sequence and a metavolcanic sequence that are lithologically distinct but chaotically juxtaposed. The metaclastic rocks, which make up the bulk of the complex, are predominantly weakly metamorphosed siltstone, graywacke, arkose, and conglomeratic sandstone. The metavolcanic sequence includes massive and pillow greenstones with basaltic compositions and textures, commonly associated with very fine grained metasediments and bedded metachert. Radiolarians are observed as ghosts in some cherts.

Ultramafic rocks occur locally in the McHugh Complex in three localities in the northeast part of the Anchorage A-7 quadrangle (fig. 2); these rocks are mainly serpentinite; one area contains peridotite. The ultramafic rocks have been found as rubble in areas a few metres in diameter; relation to adjacent outcrops is not known.

Small amounts of marble occur locally in the complex as clasts in metaconglomeratic sandstones and as isolated discontinuous outcrops, probably blocks or lenses. Most of the marble is thoroughly crystallized and nonfossiliferous. One isolated lenslike outcrop of marble (locality A, fig. 2) contains poorly preserved fossils. Examination of thin sections by Raymond C. Douglass and Betty Skipp of the U.S. Geological Survey showed the presence of the following calcareous Foraminifera and calcareous algae:

Foraminifera	Algae
Nankinella	Gymnocodium
Geinitzina	
? Planospirodiscus	
? Padangia	
Endothyra sp.	
? Cribrogenerina	
Fusulinid fragments with schwagerinid walls	

Gymnocodium, a red alga, is restricted to Permian rocks, largely those of Middle and Late Permian age as presently known; the Foraminifera assemblage is in agreement with a Middle or Late Permian age (Betty Skipp, written commun., 1972).

A granitoid clast from a metaconglomeratic sandstone (locality 2, fig. 1) yielded a K-Ar date on hornblende of 145 ± 7 m.y. (M. A. Lanphere and Arthur Grantz, oral commun., 1971), that is, Late Jurassic. Because the metaconglomeratic sandstone must be younger than the clast, the maximum age of deposition of the metaconglomeratic sandstone is Late Jurassic. The clast is the youngest dated rock from the McHugh Complex.

Because the age of the McHugh Complex itself must be younger than any of its components, Late Jurassic is considered the maximum age. The minimum age of the complex is limited by the beginning of accumulation of Tertiary sedimentary deposits in nearby areas. Therefore, the age of the McHugh Complex is Late Jurassic and (or) Cretaceous (Clark, 1973, p. D7-D8).

In most areas, bedding is not preserved or is difficult to see in the McHugh Complex. Predominant structures are pervasive shear fractures. A melangelike style of deformation is characteristic of much of the unit. Tight folds are recognizable locally. Laumontite is abundant locally as veinlets in outcrops near the range front. Pumpellyite and prehnite are widespread and occur in both the metaclastic and metavolcanic sequences. Prehnite is the most common and characteristically occurs in short irregular veinlets that are most conspicuous in dark-green-weathering metasandstone. The distribution of these minerals suggests that metamorphic grade may increase from zeolite facies near the range front to prehnite-pumpellyite facies to the east (Clark, 1972).

Valdez(?) Group

Rocks of the Valdez(?) Group, a thick sequence of metasandstone (mostly metagraywacke) and slaty metasiltstone and argillite, locally calcareous, are exposed in the north and southeast parts of the Anchorage A-7 quadrangle. The Valdez(?) Group in the south part of the Anchorage A-7 quadrangle is mostly composed of rhythmically alternating, thin-bedded (a few centimetres) metagraywacke and slaty metasiltstone intercalated with thick, massive, metagraywacke layers 3 to more than 30 m thick. Small-scale sedimentary features seen in many places in the Valdez(?) Group are indicative of rapid deposition of unsorted material, probably by turbidity currents.

The only fossils found in the Valdez(?) Group in the Anchorage A-7 quadrangle are worm trails and possible plant fragments. Inoceramus kusiroensis (Nago and Matsamoto) of Late Cretaceous (Maestrichtian) age have been described from nearby areas in the Anchorage A-6 quadrangle (Jones and Clark, 1973; Clark and Yount, 1972).

Deformation of the Valdez(?) Group is characterized by tight, similar folds with well-developed slaty cleavage approximately parallel to steeply dipping axial surfaces. The general trend of the fold axes in the mapped area is northeasterly. Small-scale features of the folds indicate that folding and cleavage formation were initiated before the sediments were completely dewatered.

Felsic to intermediate hypabyssal rocks

Swarms of Tertiary dikes, sills, and other small intrusive bodies cut the Valdez(?) Group and McHugh Complex in the area around Eagle Lake and the South Fork of the Eagle River (fig. 2) The rocks are mostly white, light gray, or light green, a few tens of metres wide and a few hundred metres long. The hypabyssal rocks are generally composed predominantly of plagioclase, quartz, chlorite, sericite, and sometimes calcite. Mafic minerals are generally absent or completely replaced.

Dacite porphyry crops out beside Seward-Anchorage Highway in the southern part of the Anchorage A-8 quadrangle (locality 1, fig. 1). The rock is similar to that of dacite porphyry dikes in other areas near the range front. The rock contains zoned plagioclase, hornblende, and quartz phenocrysts in an aphanitic matrix composed predominantly of lath-shaped plagioclase with a distinct flow structure. The age of this dacite, based on a potassium-argon determination on hornblende, is 33.9 ± 2 m.y. (J. C. Von Essen, written commun., 1972), that is, Oligocene.

Surficial deposits

Surficial deposits include a variety of unconsolidated glacial, lacustrine, alluvial, and colluvial materials. They have been mapped and described by Miller and Dobrovolny (1959) and Schmoll and Dobrovolny (1972 and unpub. data) and will not be considered here. The contacts between bedrock and surficial deposits (fig. 1 and 2) are from Schmoll and Dobrovolny's work.

FAULTS

At least two major faults, the Knik fault and the Eagle River thrust fault (Clark, 1972), are in the mapped area. The Knik fault, part of the Border Ranges fault (MacKevett and Plafker, 1973), is concealed beneath surficial deposits along the range front in the Anchorage A-8 quadrangle. Its presence is inferred from the juxtaposition of two lithologically distinct terranes (described by Clark, 1972 and Clark and Bartsch, 1971). The Knik fault zone may be in the same or approximately the same area as a younger buried fault zone (Karlstrom, 1964, p. 21; Plafker, 1969) along the east side of the Cook Inlet-Susitna Lowland. Because the position of these two faults is not known precisely, they are represented on the map by only one line of fault symbols.

The Eagle River thrust fault juxtaposes the McHugh Complex and underlying or adjacent Valdez(?) Group (Clark, 1972). The fault dips west or northwest at low to moderate angles in the southern part of the Anchorage A-7 quadrangle and near the Ski Bowl Road in the northwest part of the quadrangle. In the area north of Eagle Lake (northeast part of the quadrangle), the fault probably dips steeply.

REFERENCES CITED

Capps, S. R., 1916, The Turnagain-Knik region: U.S. Geol. Survey Bull. 642, p. 147-194.

_____1940, Geology of The Alaska Railroad region: U.S. Geol. Survey Bull. 907, 201 p.

Clark, S. H. B., 1972, Preliminary geologic map of the Chugach Mountains near Anchorage, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-350.

_____1973, The McHugh Complex of south-central Alaska: U.S. Geol. Survey Bull. 1372-D, 11 p.

Clark, S. H. B., and Bartsch, S. R., 1971a, Reconnaissance geologic map and geochemical analyses of stream-sediment and rock samples of the Anchorage B-6 quadrangle, Alaska: U.S. Geol. Survey open-file report.

_____1971b, Reconnaissance geologic map and geochemical analyses of stream-sediment and rock samples of the Anchorage B-7 quadrangle, Alaska: U.S. Geol. Survey open-file report.

Clark, S. H. B., and Yount, M. E., 1972, Reconnaissance geologic map and geochemical analyses of stream-sediment and rock samples of the Anchorage A-6 quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-351.

Grantz, Arthur, Zietz, Isidore, and Andreasen, G. E., 1963, An aeromagnetic reconnaissance of the Cook Inlet area, Alaska: U.S. Geol. Survey Prof. Paper 316-G, p. 117-134.

Jones, D. L., and Clark, S. H. B., 1973, Upper Cretaceous (Maestrichtian) fossils from the Kenai-Chugach Mountains, Kodiak, and Shumagin Islands, southern Alaska: U.S. Geol. Survey Jour. Research, v. 1, no. 2, p. 125-136.

Karlstrom, T. N. V., 1964, Quaternary geology of the Kenai Lowland and glacial history of the Cook Inlet region, Alaska: U.S. Geol. Survey Prof. Paper 443, 69 p.

MacKevett, E. M., Jr., and Plafker, George, 1973, The Border Ranges fault in south-central Alaska: U.S. Geol. Survey Jour. Research, v. 2, no. 3, p. 323-329.

Miesch, A. T., 1963, Distribution of elements in Colorado Plateau uranium deposits--A preliminary report: U.S. Geol. Survey Bull. 1147-E, 57 p.

_____1967, Methods of computation for estimating geochemical abundance: U.S. Geol. Survey Prof. Paper 574-B, 15 p.

Miller, R. D., and Dobrovolny, Ernest, 1959, Surficial geology of Anchorage and vicinity, Alaska: U.S. Geol. Survey Bull. 1093, 128 p.

Park, C. F., Jr., 1933, The Girdwood district, Alaska: U.S. Geol. Survey Bull. 849-G, p. 381-424.

Plafker, George, 1969, Tectonics of the March 27, 1964, Alaska earthquake: U.S. Geol. Survey Prof. Paper 543-I, 74 p.

Schmoll, H. R., and Dobrovolny, Ernest, 1972, Generalized geologic map of Anchorage and vicinity, Greater Anchorage Area Borough, Alaska: U.S. Geol. Survey open-file map.

EXPLANATION

QUATERNARY

Qs

Surficial deposits

TERTIARY

Tf

Felsic to intermediate hypabyssal rocks

Dikes, sills, and other small intrusive bodies

JURASSIC(?) AND CRETACEOUS

KJv

Valdez(?) Group

Predominantly metagraywacke, metasiltstone, and slaty argillite flysch deposits; includes some calcareous metasandstone. Small dot pattern, predominantly thin-bedded siltite and metagraywacke. Open dot pattern, characterized by thick (3 metres or more) metagraywacke beds alternating with thinly bedded metagraywacke-siltite deposits and areas of alternating metagraywacke and siltite layers several centimetres to a metre thick. Large solid dot pattern, predominantly graywacke; areas where massive graywacke beds 3 metres or more thick are predominant

JURASSIC AND (OR) CRETACEOUS

KJm

McHugh Complex

Includes marine metaclastic and metavolcanic rocks. Predominantly metasandstone to metaconglomeratic sandstone; subordinate greenstones (including basaltic pillow lavas) usually associated with metachert, cherty argillite, and argillite. Includes blocks or lenses of marble in localities designated by "m" and ultramafic rocks in areas designated by "u". Triangle pattern, predominantly metavolcanic sequences. Double-dash pattern, predominantly metaclastic sequences

PERMIAN(?) TO JURASSIC(?)

JPu

Undifferentiated metasedimentary and metavolcanic rocks

Mainly greenstone, marble, and argillite. Areas of thick layers of marble designated "m"

SYMBOLS

Contact, approximately located

Fault, high angle, approximately located, dotted where concealed

Probable thrust fault, sawteeth on upper plate, dotted where concealed

20 Inclined — 20 Upright — 20 Overturned

Strike and dip of beds

20

Strike and dip of cleavage or pervasive shear fractures

20 Inclined — Vertical

Strike and dip of parallel cleavage and bedding

83

Strike and dip of foliation

Approximate strike and dip direction taken from distant observation or aerial photographs

Trace of anticlinal axial plane, approximately located

Trace of synclinal axial plane, approximately located

1 Locality of sample dated by K-Ar method

A Fossil locality

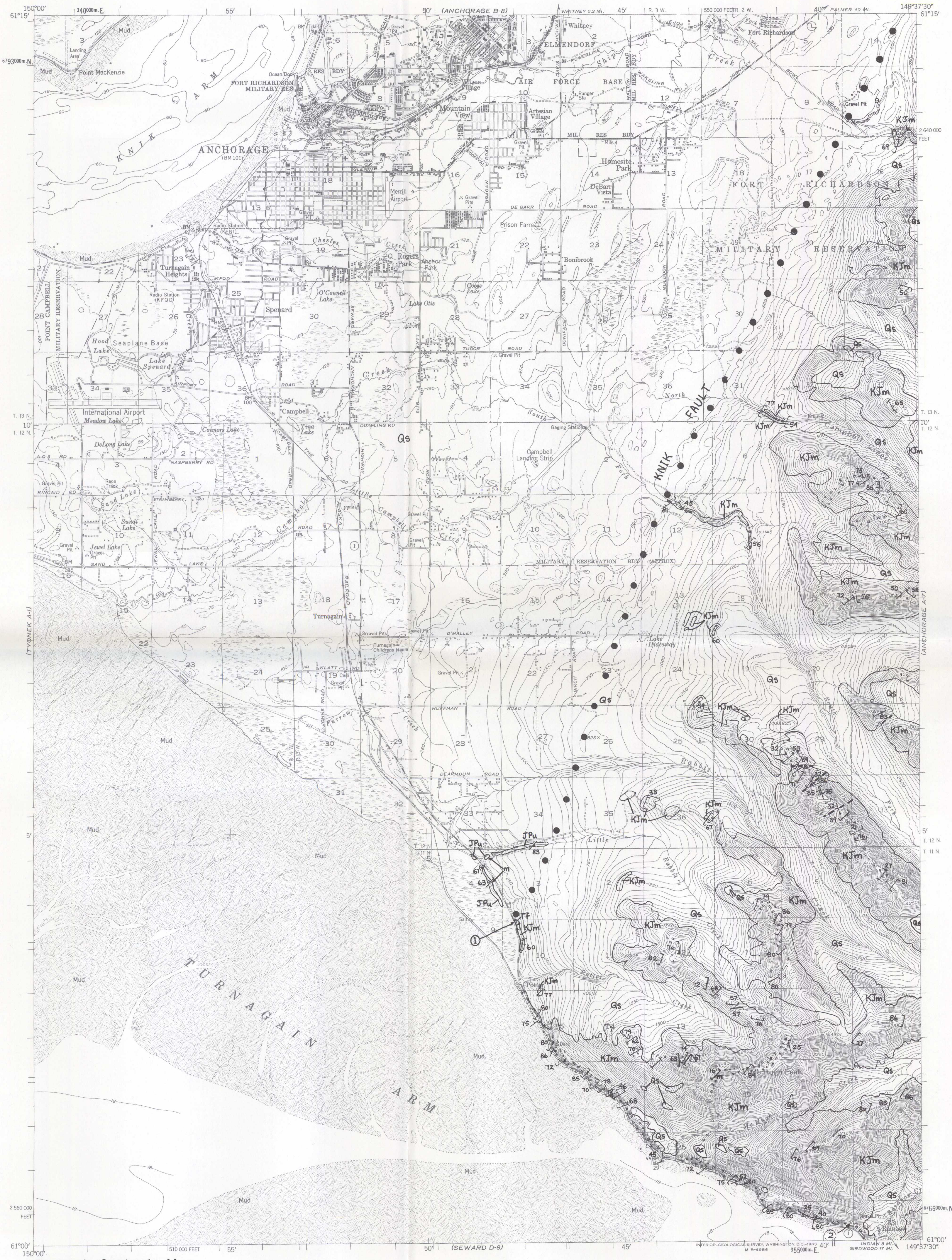

Figure 1. Geologic Map, Anchorage A-8 quadrangle.

BASE BY U.S. GEOLOGICAL SURVEY, 1952.

TRUE NORTH — MAGNETIC NORTH — 27°
APPROXIMATE MEAN DECLINATION, 1952

1 0 1 2 3 4 5 Kilometres
1 ½ 0 1 2 Miles

CONTOUR INTERVAL 50 FEET
DOTTED LINES REPRESENT 25-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

ALASKA
QUADRANGLE LOCATION

BEDROCK GEOLOGY MAPPED BY SANDRA H. B. CLARK, 1969-72, MARTHA E. YOUNT, 1971-72, AND SUSAN BARTSCH, 1969-70. CONTACTS OF BEDROCK AND SURFICIAL DEPOSITS FROM SCHMOLL AND DOBROVOLNY, 1972.

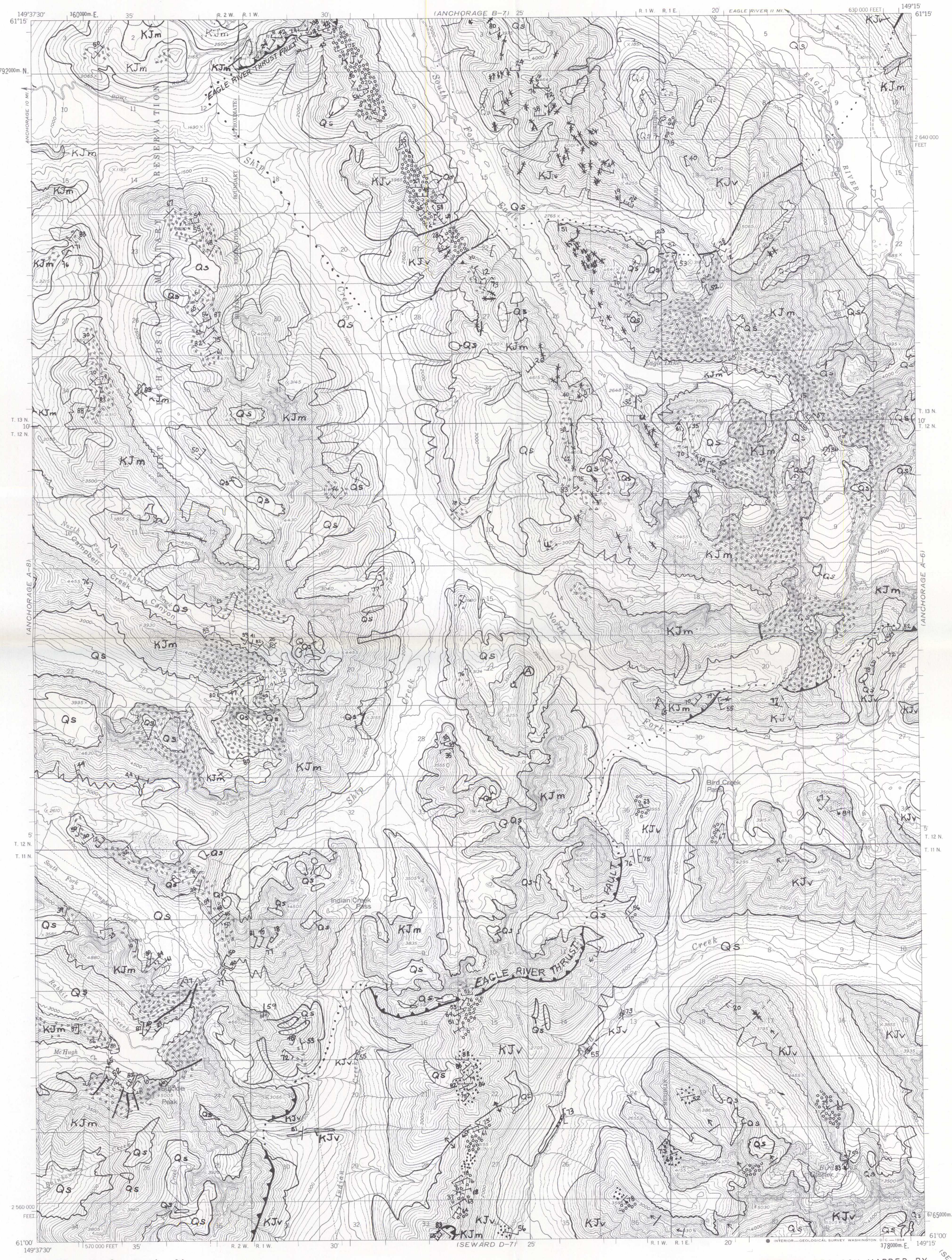

Figure 2. Geologic Map, Anchorage A-7 quadrangle.

BASE BY U.S. GEOLOGICAL SURVEY, 1960.

TRUE NORTH — MAGNETIC NORTH — 26°
APPROXIMATE MEAN DECLINATION, 1960

1 0 1 2 3 4 5 Kilometres
1 ½ 0 1 2 Miles

ALASKA
QUADRANGLE LOCATION

BEDROCK GEOLOGY MAPPED BY SANDRA H. B. CLARK, 1969-72, MARTHA E. YOUNT, 1971-72, AND SUSAN BARTSCH, 1969-70. CONTACTS OF BEDROCKS AND SURFICIAL DEPOSITS FROM SCHMOLL AND DOBROVOLNY, 1972.

RECONNAISSANCE GEOLOGIC MAP AND GEOCHEMICAL ANALYSES OF STREAM-SEDIMENT AND ROCK SAMPLES OF THE ANCHORAGE A-7 AND A-8 QUADRANGLES, ALASKA

by

Sandra H.B. Clark, Martha E. Yount, and Susan R. Bartsch

1976

For sale by U. S. Geological Survey, price $1.50 per set