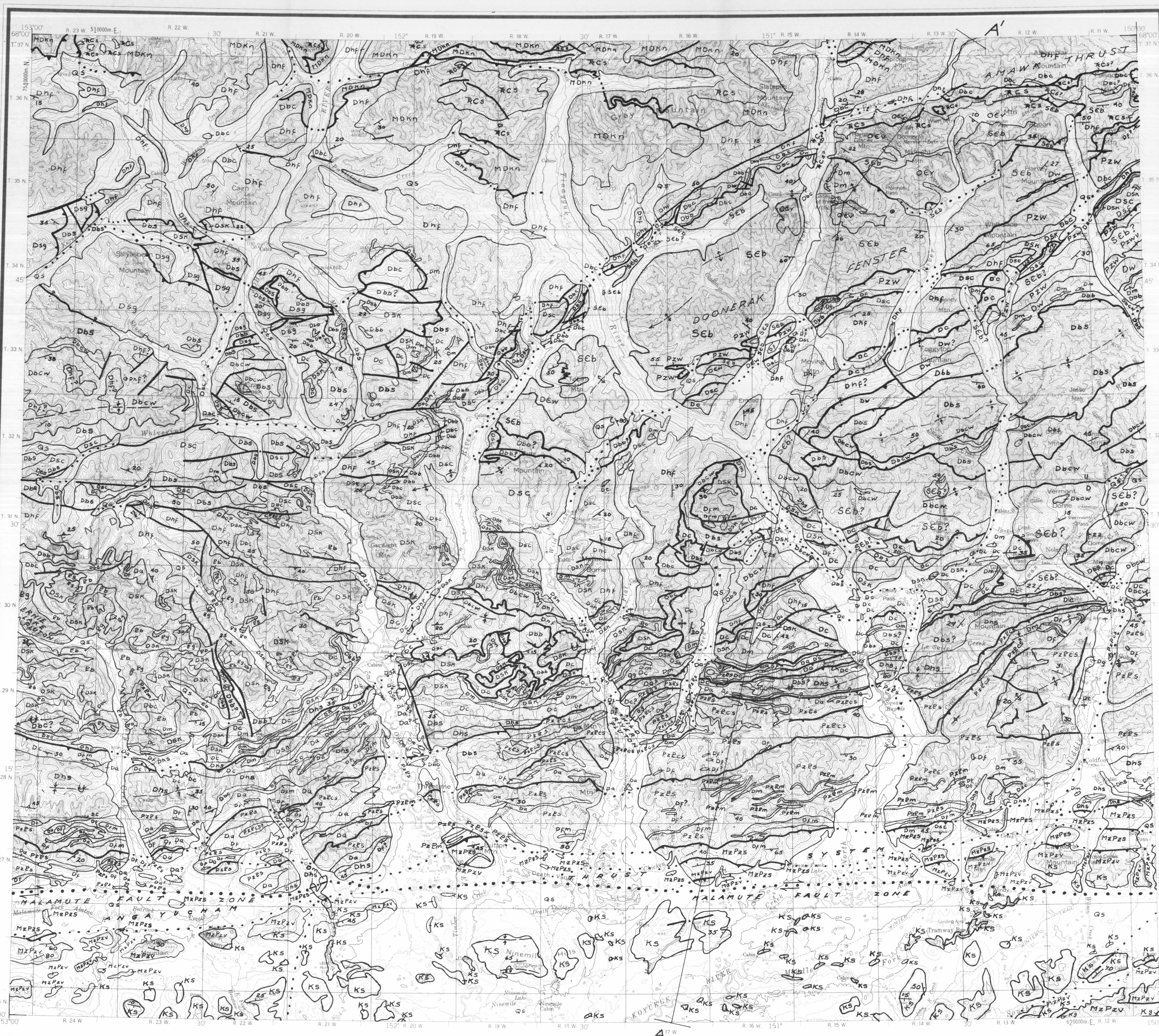
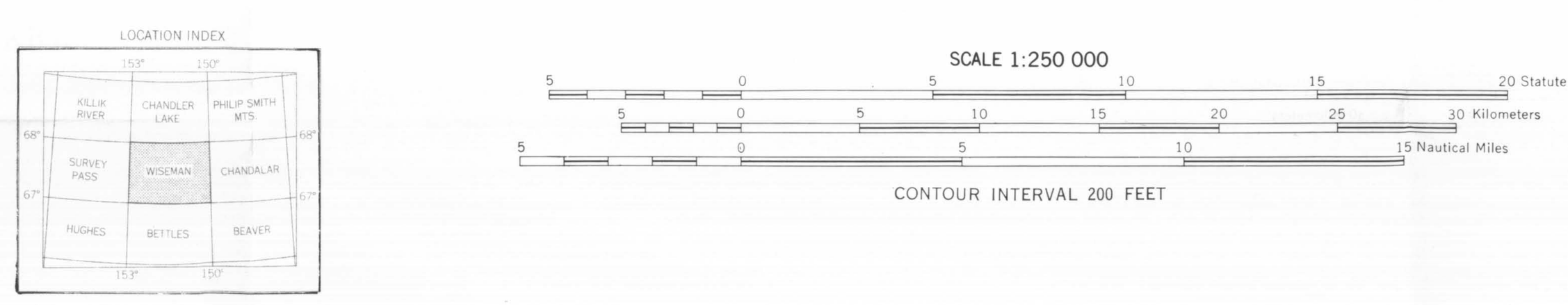
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

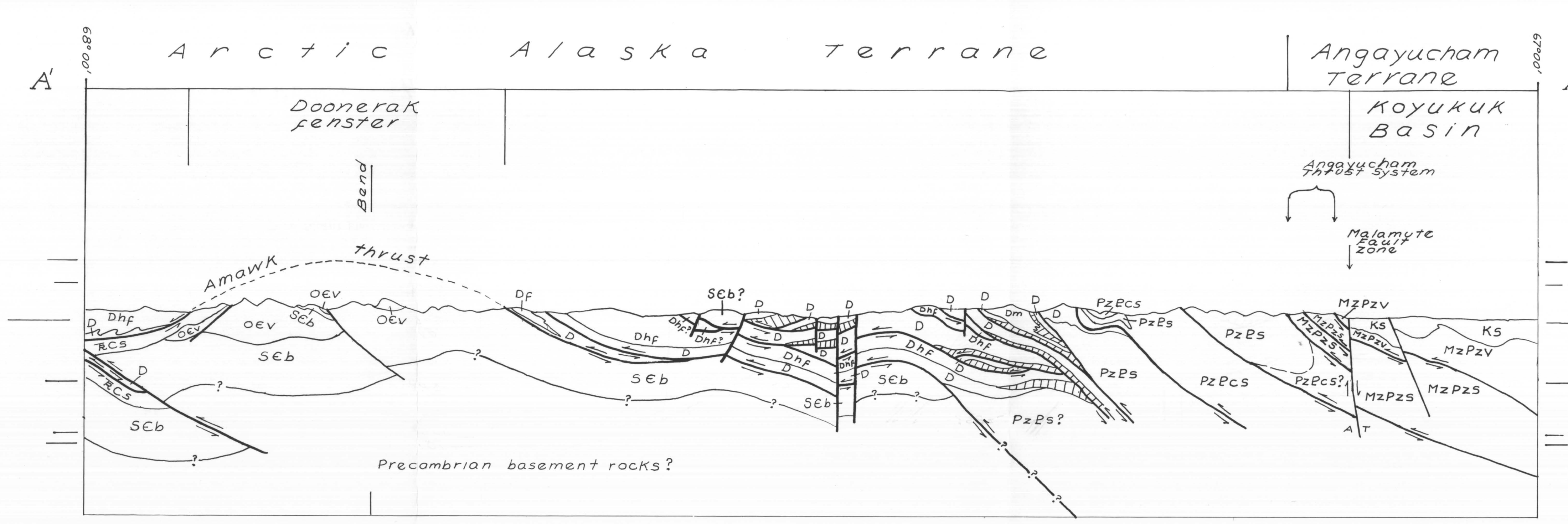
PREPARED IN COOPERATION WITH STATE OF ALASKA, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

OPEN-FILE REPORT OF 86-219



Base by U. S. Geological Survey, 1956, unrevised.





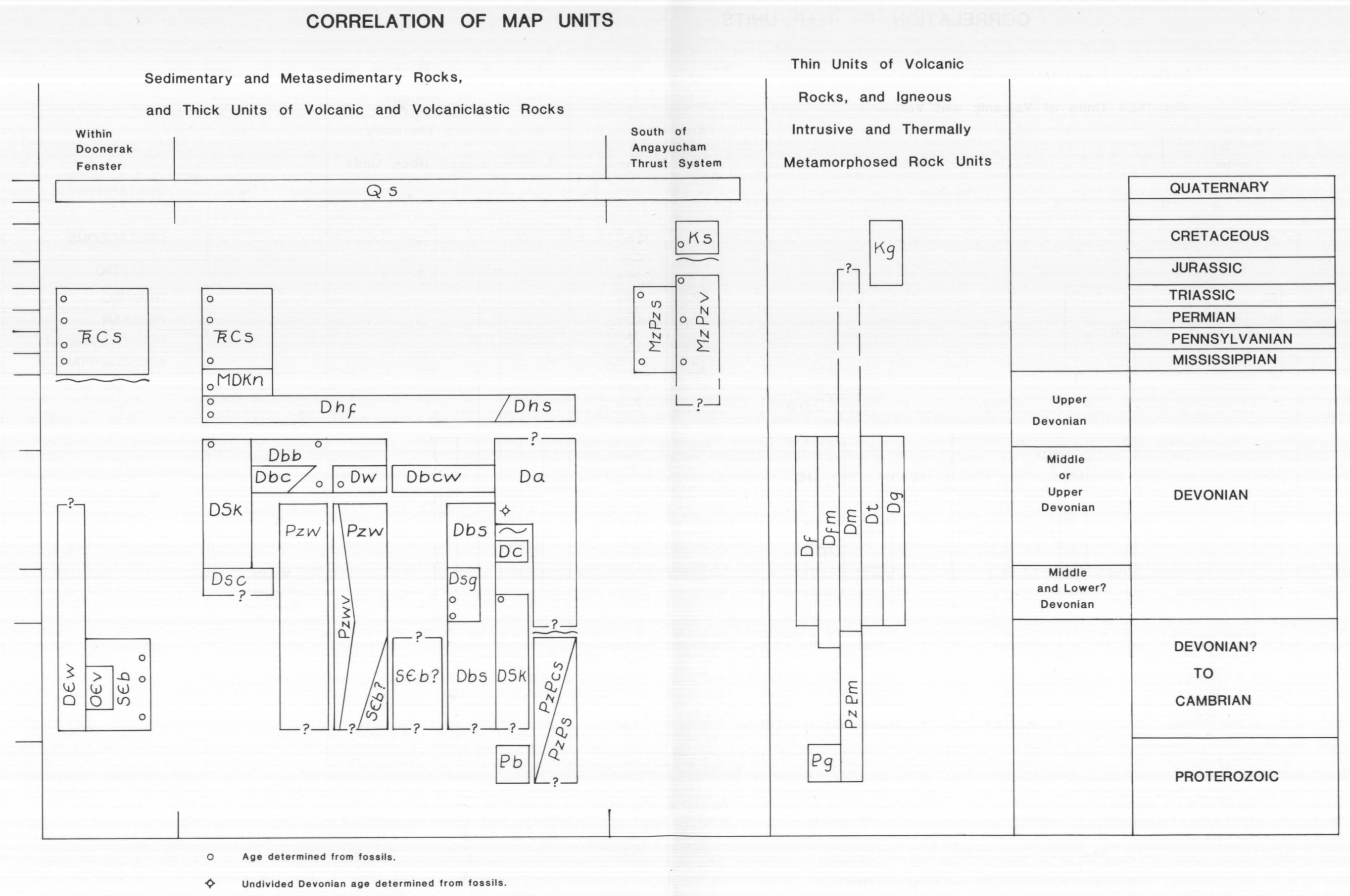
Simplified cross-section showing location of Doonerak fenster and Angayucham terrane.

Letter symbols are same as those on the geologic map, except that unit D comprises units Dhs, Dbb, Dbcw, Da, Dbs, Dw, Dc, Dsc, and Pzw undivided, and Skajit Limestone is shown by ruled pattern only.

GENERALIZED GEOLOGIC MAP OF THE WISEMAN QUADRANGLE, ALASKA

by J. T. Dillon, W. P. Brosge, and J. T. Dutro Jr. 1986

CORRELATION OF MAP UNITS



GEOLOGIC SYMBOLS

Thrust Fault--Sawteeth on upper plate; dotted where concealed.

Fault--Dashed where approximately located; dotted where concealed. Arrows show relative movement.

Geologic contact.

Dip and strike of beds.

Dip and strike of Foliation.

Strike of vertical Foliation.

Horizontal beds.

Axis of syncline.

Axis of anticline.

Overturned anticline.

Overturned syncline.

Location of cross section.

INTRODUCTION

The most recent geologic map of the Wiseman quadrangle was published by the U.S. Geological Survey at 1:250,000 scale in 1971 (Brosgé and Reiser, 1971). Since then the Division of Geological and Geophysical Surveys of the State of Alaska has remapped half of the quadrangle at 1:63,360 scale beginning in 1977, (see Dillon and others, 1981a, 1981b, 1984) and the U.S.G.S. has intermittently remapped parts of the other half at 1:125,000 scale. During 1981 and 1982 all of the U.S.G.S. mapping and part of the A.D.G.G.S. mapping was done under the auspices of the Alaska Mineral Resources Assessment Program (AMRAP), and the geochemical sampling of the quadrangle that had been begun by the A.D.G.G.S. was also completed for that program in those years (Dillon and others 1981c, 1981d; O'Leary and others, 1984; Cathrall and others, 1984).

GEOLOGIC MAP AND CROSS-SECTION

The accompanying generalized geologic map is intended to provide a lithologic base for the interpretive geochemical and resource maps of the Wiseman quadrangle that are parts of the AMRAP assessment. The map is simplified from a more detailed geologic map which is being prepared for publication. It shows the major lithic units and known faults and all of the known felsic igneous bodies, but many thin sedimentary units and most of the small mafic igneous bodies have been combined into the thicker units, or have been omitted.

The simplified cross-section, more generalized than the map, shows all of the major known faults, but in order to save space most of the thinner Devonian units shown on the map have been grouped into a single unit labelled "D". The most important faults are those of the Angayucham thrust system and the Amawk fault system. According to Jones and others (1984), the Angayucham thrust system is a major lithotectonic terrane boundary between the Angayucham terrane on the south and the Arctic Alaska terrane which comprises all of the rocks to the north. As shown in the cross section, this thrust system consists of three strands along which volcanic rocks, graywacke and phyllite of Paleozoic to Mesozoic age have been thrust successively northward over the schists of the Arctic Alaska terrane in the southern Brooks Range. Our interpretation differs slightly from that of Jones and others who place the terrane boundary at our southernmost strand at the base of the volcanic rocks, and exclude the graywacke and phyllite from their Angayucham terrane. The Amawk thrust system is a series of closely-spaced faults that bound the Doonerak fenster and displace Devonian rocks over Triassic to Lower Paleozoic rocks.

Large thrust faults, that generally dip southward and displace older rocks northward over younger rocks, and cut up section into younger rocks to the north, divide the Paleozoic and Precambrian(?) rocks north of the Angayucham thrust system into a series of fault slices that represent at least nine different stratigraphic sequences. The differences in facies between some of these sequences have been obscured by generalizing the lithic units, and some apparent differences in time-stratigraphic succession are uncertain because of poor age control. Consequently, (1) most of these sequences have not been separately identified on the cross-section, and (2) there may be more faults than are shown on the map. This is especially probable in the two large synforms east and west of the line of section at Jesse Mountain and Wolverine Creek respectively. Although Devonian fossils have been found at several horizons in these synforms, the recent discovery of Cambrian and Ordovician fossils in similar rocks in the Chandalar quadrangle to the east (Anita Harris and A. R. Palmer, written comm., 1985) suggests that fault slices of pre-Devonian rocks may lie structurally or stratigraphically within some of the Devonian map units in the synforms. The small klippe of questioned pre-Devonian rocks (S€b?) in the cross-section is one of these probable fault slices.

The stratigraphic sequence in the Doonerak fenster is fairly well controlled by fossils and is so different from the sequences that have been thrust over it that Jones and others (1984) identified it as a separate subterrane within the Arctic Alaska terrane. According to Mull and others (1976), the Lower Paleozoic basement rocks of the North Slope, unconformably overlain by Mississippian rocks, rise to the surface within this fenster from beneath thrust slices of the dominantly Devonian rocks of the central Brooks Range. In the cross section the Amawk thrust that overlies this fenster is interpreted to continue southward beneath all the other rocks of the southern Brooks Range.

CORRELATION OF MAP UNITS

Rock units are arranged in the correlation diagram both in the order of their stratigraphic succession and in such a way that the height of each column shows the span of possible ages for that unit. Symbols show the fossil control for the ages of the sedimentary and metasedimentary units and for the age of the thick volcanic unit south of the Angayucham thrust system. Ages of Proterozoic and Devonian felsic intrusive and effusive rocks (Pg, Dg, Df, Dfm) in the southern half of the quadrangle are based on Uranium-Lead dates of zircons (Dillon and others, 1980; J. T. Dillon, unpublished data). Ages of the undated felsic rocks in the north are assumed to be Devonian, like similar rocks in the south. Ages of the Lower Paleozoic volcanic rocks (O€v) and Devonian mafic sills (Dm) in the Doonerak fenster are based on Potassium/Argon dates of hornblende (Dutro and others, 1976).

As shown by the symbols, Devonian fossils have been found in many of the sedimentary units in the Wiseman quadrangle, but older fossils have been found only within the Doonerak fenster (Dutro and others, 1984). In spite of the lack of pre-Devonian fossils, one of the map units outside the fenster in the northern Wiseman quadrangle is probably pre-Devonian (S€b?) and three of the map units that are inferred to be Devonian (DSk, Dbs and Pzw) may be partly pre-Devonian. Rocks similar to the Skajit Limestone (DSk); the black slate, phyllite, and limestone unit (Dbs); and to part of the wacke and limestone unit (Pzw) contain Silurian, Ordovician and Cambrian fossils, respectively, farther east in the Philip Smith Mountains quadrangle (Brosgé and others, 1979) and in the Chandalar quadrangle (J. T. Dillon, unpublished data). For this reason, the age range of these units has been extended below the Devonian in the correlation diagram even though there are Devonian fossils in unit DSk; and parts of unit Dbs are similar to fossiliferous Devonian rocks of the Beaucoup Formation; and there are felsic rocks in unit Pzw that are similar to dated Devonian felsic rocks farther south. The pre-Devonian rocks identified farther east cannot be traced directly into the Wiseman quadrangle because of the difficulty of correlating rock units and faults across the Dietrich valley, about five miles east of the quadrangle boundary. These uncertainties have been accommodated here by mapping three thick units of indefinite age range (DSk, Dbs and Pzw), and by tentatively assigning the phyllites that correlate best with the eastern pre-Devonian rocks to the same pre-Devonian black siltstone and phyllite unit (S€b) found in the Doonerak fenster.

DESCRIPTION OF MAP UNITS

The bedrock in the Wiseman Quadrangle ranges in age from Proterozoic(?) to Cretaceous, and in metamorphic grade from unmetamorphosed rocks to gneiss of the amphibolite facies that may have been metamorphosed three times. For descriptive purposes, all of the rocks in the following list have been grouped by degree of lithification and metamorphism; and these rock groups have then been arranged in order of increasing age of the rocks comprised by each group.

The youngest rocks and the least metamorphosed rocks are those of the Angayucham terrane and Koyukuk basin south of the Brooks Range and in its southernmost spurs. Within the Brooks Range the degree of metamorphism and the age of the rocks in each rock group in the Arctic Alaska terrane generally decreases from south to north.

In the following description of units, each of the intrusive and the effusive igneous rocks units has been listed with its appropriate rock group, and consequently, has been assigned to the specific stratigraphic interval in which it most commonly occurs. As shown by the range of possible ages for the igneous rocks on the correlation diagram, many of the smaller bodies may be older or younger than indicated by their place in the descriptive list.

DESCRIPTION OF MAP UNITS

QUATERNARY UNCONSOLIDATED DEPOSITS

Qs SURFICIAL DEPOSITS (Quaternary)--Glacial deposits, alluvium, colluvium and landslides.

CRETACEOUS SEDIMENTARY ROCKS

Ks NONMARINE AND MARINE SANDSTONE AND CONGLOMERATE--(Cretaceous, Albian and Cenomanian ?) Nonmarine conglomerate, sandstone, mudstone, carbonaceous shale and coal, and marine sandstone, siltstone, shale and conglomerate.

MESOZOIC GRANITIC PLUTONIC ROCKS OF THE HODZANA HIGHLANDS

Kg QUARTZ MONZONITE (Jurassic ? and Cretaceous) -- Coarse-grained, hornblende-biotite quartz monzonite.

ROCKS WITH AT LEAST ONE REGIONAL METAMORPHIC FABRIC. PHYLLITE, SEMISCHIST AND GREENSTONE WITH RELIC CLASTIC AND IGNEOUS TEXTURE

MzPzs METAGRAYWACKE AND PHYLLITE (Mississippian to Triassic)--Metagraywacke and phyllite with chert interlayers and metagabbro dikes.

MzPzv MAFIC VOLCANIC ROCKS (Devonian to Lower Jurassic)--Pillow basalt, diabase, radiolarian chert, and minor limestone of the Angayucham Terrane.

SLIGHTLY METAMORPHOSED SEDIMENTARY AND VOLCANIC ROCKS WITH TWO REGIONAL METAMORPHIC FABRICS. METAMORPHIC GRADE INCREASES SOUTHWARD FROM LOWERMOST TO MIDDLE GREENSCHIST FACIES; RELIC SEDIMENTARY AND PHYLLITIC TEXTURES

TrCs SEDIMENTARY ROCKS (Carboniferous through Upper Triassic)--unconformably overly basement rocks of the Doonerak fenster; elsewhere rest on Kanayut Conglomerate. Includes:

SHUBLIK AND OTUK FORMATIONS (Middle and Upper Triassic) --Black shale, siltstone and limestone; black chert and shale; fossiliferous.

SADLEROCHIT GROUP (Permian and Lower Triassic)--Black shale, buff calcareous siltstone; fossiliferous. Occurs only in the Doonerak fenster.

SIKSIKPUK FORMATION (Permian)--Black, red, and green shale and siltstone; buff calcareous siltstone.

LISBURNE GROUP (Mississippian and, locally, Pennsylvanian)--Gray cherty fossiliferous limestone; black chert and shale.

UPPER ENDICOTT GROUP

KAYAK SHALE (Lower Mississippian)--Black shale and minor limestone; fossiliferous.

KEKIKTUK CONGLOMERATE (Mississippian)--Quartzite and minor conglomerate. Felsic volcaniclastic interlayers and basal conglomerate. Occurs only in Doonerak fenster.

MIDDLE ENDICOTT GROUP

MDkn KANAYUT CONGLOMERATE AND NOATAK SANDSTONE (Upper Devonian and Lower Mississippian?)

KANAYUT CONGLOMERATE (Upper Devonian and Lower Mississippian?)--Nonmarine sandstone, conglomerate and shale with minor marine tongues.

NOATAK SANDSTONE (Upper Devonian)--Marine, partly calcareous, sandstone and shale.

TWICE METAMORPHOSED SEDIMENTARY AND VOLCANIC ROCKS; MIDDLE TO UPPER GREENSCHIST FACIES. METAMORPHIC FACIES AND TEXTURE INCREASES SOUTHWARD; MOSTLY PHYLLITE AND LIMESTONE IN NORTH; SCHIST AND MARBLE IN SOUTH.

LOWER ENDICOTT GROUP---Carbonaceous siliceous clastic rocks. Grades downward into Beaucoup Formation in some places; unconformably overlies upper Middle Devonian and older rocks in other places.

Dhf HUNT FORK SHALE (Upper Devonian)--Black slate and phyllite, minor fossiliferous limestone; lithic wacke locally in upper part; basal quartz-chert clast conglomerate and sandstone.

Dhs HUNT FORK SCHIST (Upper Devonian?)--Black quartz schist and biotite garnet quartz schist.

BEAUCOUP FORMATION (Middle and Upper Devonian)--Carbonaceous, siliceous, and calcareous sedimentary rocks and felsic volcanic rocks. Grades downward and southwestward into DSk. Laterally equivalent to the Whiteface Mountain and Ambler rocks.

Dbb BLACK ROCKS (Middle or Upper Devonian and Upper Devonian)--Black calcareous phyllite and thin, dark limestone.

Dbcw CALCAREOUS CHLORITIC WACKE (Middle or Upper Devonian?)--Upper part; calcareous wacke with common plagioclase clasts. Lower part; interbedded calcareous, limonitic quartz sandstone and conglomerate, limestone, and gray, red and green phyllite. Local basal conglomerate. Correlates with Dw.

Dbc CONGLOMERATE (Middle or Upper Devonian)--Quartz and chert pebble conglomerate.

BEAUCOUP FORMATION(?) (Devonian or older?)

Dbs BLACK SLATE, PHYLLITE AND LIMESTONE (Middle or Upper Devonian?, or older?)--Black, calcareous, phyllitic silstone, slate and quartzite with lenses of brown dolomite; black, calcareous phyllite and schist with thin limestone interbeds. No faunal control. In part resembles fossiliferous Ordovician rocks of the Chandalar Quadrangle.

ROCKS OF WHITEFACE MOUNTAIN (Middle and Upper Devonian and older?)--Metavolcanic and metasedimentary rocks, stratigraphically and lithologically equivalent to the Beaucoup Formation and to the Ambler metavolcanic rocks.

Dw WACKE (Middle or Upper Devonian?)-- Fine-grained wacke, graywacke, calcareous shale-chip and granule conglomerate with some volcanic clasts, thin fossiliferous limestone.

Pzw WACKE AND LIMESTONE (Devonian or older)--Fine-grained wacke and conglomerate, calcareous schist and phyllite, micaceous platy limestone, sandy limestone and sandstone, purple, green and gray phyllite, and felsic flows, plugs and tuff.

Pzwv VOLCANIC CONGLOMERATE (Middle or Upper Devonian? or older?)--Polymictic conglomerate with metavolcanic, carbonate, and vein quartz clasts.

Da AMBLER METAVOLCANIC ROCKS (Lower?, Middle and Upper Devonian)--Interbedded black quartz schist and quartzite, marble and calcareous schist. Devonian fossils at one locality. Abundant mafic and felsic volcanic rocks. Correlative with Ambler sequence of Hitzman and others (1982).

Df FELSIC METAVOLCANIC ROCKS (Devonian)--Felsic flow, tuff, and blastoporphyritic intrusive rocks with interlayers of metasedimentary rocks. Felsic portion of Da and Pzw units.

Dm METABASITE (Devonian and Devonian ?, and Jurassic?)--Metabasite of the bimodal Ambler volcanics in southwestern portion of quadrangle. Basic intrusive and extrusive rocks elsewhere in quadrangle.

Dfm METAMORPHOSED BIMODAL IGNEOUS ROCKS (Devonian and Devonian?)--Complexly interlayered felsic and mafic extrusive and intrusive rocks, undivided, of Ambler metavolcanic rocks in southern portion of quadrangle; mixed with clastic rocks at the head of Michigan Creek.

Dg GRANITE GNEISS (Devonian and Devonian?)--Coarse-grained, muscovite-biotite quartz monzonite gneiss.

Dt TACTITE (Devonian?)--Calcsilicate hornfels and skarn.

Dc CHLORITIC AND CARBONATE ROCKS (Middle or Upper Devonian?)--Green and gray phyllite and dolomite; chloritic, calcareous metasandstone and marble; and carbonate-clast conglomerate.

DSk SKAJIT LIMESTONE (Devonian and older?)--Marble, dolomite, carbonate conglomerate, and minor quartzite and graphitic and calcareous schist. Locally may include marble layers of undifferentiated older formations.

Dsc SILICEOUS CLASTIC ROCKS (Middle Devonian?)--Partly calcareous, chloritic siliceous metasiltstone, sandstone, phyllite, grit and conglomerate and felsic volcaniclastic rocks. Underlies DSk; correlative with unit Dsg and upper part of unit Pzw.

Dsg GRAYWACKE OF SILLYASHEEN MOUNTAIN (Middle Devonian)--Calcareous graywacke and conglomerate with shale chip, chert and volcanic clasts; green and purple phyllite and siltstone; lenses of fossiliferous, tuffaceous limestone.

BANDED SCHIST, PARAGNEISS, AND ORTHOGNEISS THAT MAY HAVE BEEN REGIONALLY METAMORPHOSED THREE TIMES. UPPER GREENSCHIST FACIES ROCKS PREDOMINATE, BUT INCLUDES AMPHIBOLITE FACIES PARAGNEISS, AND LOCAL RELICT BLUESCHIST AND ECLOGITE FACIES METABASITE.

PzPm METABASITE (Proterozoic or Lower Paleozoic?)--Diabase and gabbro dikes and actinolite-epidote chlorite albite greenschist.

PzPs SCHIST (Proterozoic or Lower Paleozoic)--Coarse mica-schist and paragneiss with lenses and bands of black, graphitic schist in muscovite quartzite and quartzo-feldspathic schist; a few layers of marble and calcareous schist.

PzPcs CALCAREOUS SCHIST (Proterozoic or Paleozoic)--Calcareous schist with layers of marble and PzPs.

Pg GRANITE GNEISS (Proterozoic?)--Blastoporphyritic, foliated, coarse-grained, biotite granite orthogneiss.

Pb BANDED SCHIST (Proterozoic?)--Interlayered coarse quartz-mica schist, quartzite, calcareous schist, marble, graphitic phyllite and metabasite. Locally gneissic.

BASEMENT ROCKS OF THE DOONERAK WINDOW. LOWER GREENSCHIST AND PREHNITE-PUMPELLYITE FACIES. UNCONFORMABLY OVERLAIN BY MISSISSIPPIAN KEKIKTUK CONGLOMERATE

D€w WACKE (Paleozoic)--Meta-wacke and calcareous meta-tuff. Abundant clasts of epidote - rich, intermediate plutonic rocks. May be equivalent to unit Pzw.

S€b BLACK SILTSTONE AND PHYLLITE (Cambrian to Silurian)--Black phyllite and metasiltstone, minor quartzite, graywacke, red and green and purple phyllite, green chert, siliceous metatuff; lenses of brown dolomite and thin limestone beds. Abundant unmapped mafic sills.

O€v VOLCANIC ROCKS (Cambrian? and Ordovician)--Andesitic to basaltic volcaniclastic rocks and local tuffaceous phyllite, gabbro and diabase, and black phyllite.

REFERENCES CITED

Brosgé, W. P., and Reiser, H. N., 1971, Preliminary bedrock geologic map, Wiseman and Survey Pass Quadrangles, Alaska: U.S. Geological Survey Open-File Map 479, scale 1:250,000, 2 sheets.

Brosgé, W. P., Reiser, H. N., Dutro, J. T. Jr., and Detterman, R. L., 1979, Bedrock geologic map of the Philip Smith Mountains quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-879B, scale 1:250,000, 2 sheets.

Cathrall, J. B., Dillon, J. T., and Chazin, Barbara, 1984, Maps of anomalous trace metals in rocks and stream-sediment pebbles of the Wiseman 1x3 quadrangle, Brooks Range, Alaska: U.S. Geological Survey Open-File Report 84-161-B, 35 p., 2 sheets, 1:250,000 scale.

Dillon, J. T., Pessel, G. H., Chen, J. A., and Veach, N. C., 1980, Middle Paleozoic magmatism and orogenesis in the Brooks Range, Alaska: Geology, v. 8, p. 338-343.

Dillon, J. T., Hamilton, W. B., and Lueck, L. L., 1981a, Geologic map of the Wiseman A-3 Quadrangle, Alaska, 1981 (with W. B. Hamilton and L. L. Lueck): Alaska Division of Geological and Geophysical Surveys Open-File Report 119.

Dillon, J. T., Pessel, G. H., Lueck, L. L., and Hamilton, W. B., 1981b, Geologic map of the Wiseman A-4 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 124.

_____ 1986, Geologic map of the Wiseman A-4 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 78, in press.

Dillon, J. T., Moorman, M. A., and Lueck, L. L., 1981C, Geochemical reconnaissance of the S. W. Wiseman quadrangle; summary of data on rock samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133B, 164 p., scale 1:125,000, one sheet.

Dillon, J. T., Cathrall, J. B. and Moorman, M. A., 1981d, Geochemical reconnaissance of the S. W. Wiseman quadrangle; summary of data on pan-concentrate and stream sediment samples: Alaska Division of Geological and Geophysical Surveys Open-File Report 133A, 176 p., scale 1:125,000, one sheet.

Dutro, J. T., Jr., Brosgé, W. P., Lanphere, M. A., and Reiser, H. N., 1976, Geologic significance of the Doonerak structural high, central Brooks Range, Alaska: American Association of Petroleum Geologists Bulletin, v. 60, no. 6, p. 952-961.

Dutro, J. T. Jr., Palmer, A. R., Repetski, J. E., and Brosgé, W. P., 1984, Middle Cambrian fossils from the Doonerak anticlinorium, Central Brooks Range, Alaska: Journal of Paleontology, v. 58, no. 6, p. 1364-1371.

Hitzman, M. W., Smith, T. E., and Proffet, J., 1982, Bedrock geologic map of the Ambler district, southwest Brooks Range, Alaska: Alaska Division of Geological and Geophysical Surveys Geologic Report 75, scale 1:125,000, 2 sheets.

Jones, D. L., Silberling, N. J., Coney, P. J., and Plafker, George, 1984, Lithotectonic terrane maps of the North American Cordillera, Part A - Lithotectonic terrane map of Alaska: U.S. Geological Survey Open File Report 84-523, sheet 1 of 4, 1:2,500,000 scale, p. A3-A12.

Mull, C. G., Tailleur, I. L., Mayfield, C. F. and Pessel, G. H., 1976, New structural and stratigraphic interpretations, central and western Brooks Range and Arctic Slope: U.S. Geological Survey Circular 733, p. 24-26.

O'Leary, R. M., Hoffman, J. D., Sutley, S. J. and Lewis, J. S., 1984, Analytical results and sample locality maps of stream-sediment, heavy-mineral-concentrate, pebble, and rock samples from the Wiseman quadrangle, Alaska: U.S. Geological Survey Open-File Report 84-161-A, 398 p., scale 1:250,000, 3 sheets.