

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

REGIONAL BEDROCK GEOLOGIC MAPS
ALONG THE DALTON HIGHWAY,
YUKON CROSSING TO TOOLIK, ALASKA

Compiled by

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This report is preliminary and
has not been reviewed for con-
formity with U.S. Geological
Survey editorial standards and
stratigraphic nomenclature.

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INTRODUCTION

The Dalton Highway was originally built as a haul road for construction of the trans-Alaska pipeline, and has now been opened to the public from Livengood to the southern Brooks Range. Reconnaissance geological quadrangle maps at 1:250,000 scale show the bedrock geology of the region crossed by the highway between Livengood and the North Slope; several of these maps were published before the highway was built. In preparation for a highway field trip to be sponsored by the Fourth International Conference on Permafrost in Fairbanks in 1983, we have summarized the geology from these maps for a 50-km wide strip along the highway from the Yukon River to the northern foothills of the Brooks Range.

The strip map, at 1:500,000 scale, is in two parts (Fig. 1). Map A covers the region from the Yukon crossing to the town of Wiseman in the southern Brooks Range. Map B covers the region from Wiseman to the northern foothills of the Brooks Range near the abandoned Toolik construction camp. These maps emphasize the regional differences in character of the various bedrock terranes crossed by the highway; therefore, some geologic units shown on the original maps have been grouped and generalized. An even broader regional overview is given briefly in the report by Patton and others (1977) listed in the references for Map A. The traveler interested in the details of the roadside geology will need to consult the original geologic quadrangle maps listed as sources of map information as well as the new editions of the topographic quadrangles that show the location of the highway.

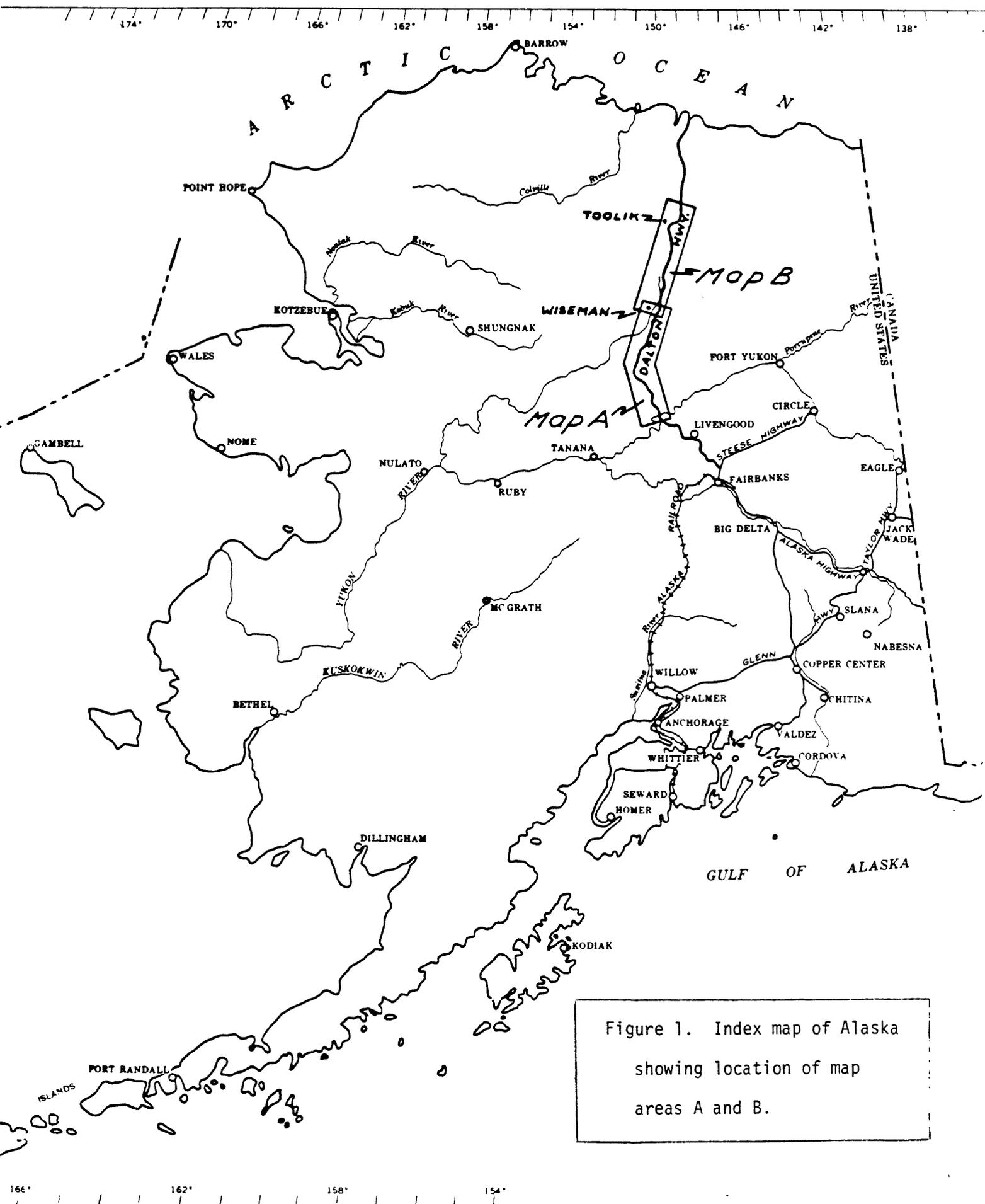


Figure 1. Index map of Alaska showing location of map areas A and B.

DESCRIPTION OF MAP UNITS

Map A, Yukon crossing to Wiseman

Sedimentary Rocks

- Qu UNDIFFERENTIATED SURFICIAL DEPOSITS (Quaternary)--Shown only in the largest valleys.
- Ts SEDIMENTARY ROCKS (Miocene?)--Tuff, siltstone, conglomerate and coal. Nonmarine.
- Ks CONGLOMERATE AND SANDSTONE (Upper and Lower Cretaceous)--Clasts of quartz, quartzite, schist and igneous rocks. Nonmarine.
- Kc IGNEOUS PEBBLE CONGLOMERATE (Lower Cretaceous; Albian)--Clasts of mafic volcanic rocks, chert and graywacke. Marine(?).
- Km MARINE GRAYWACKE AND MUDSTONE (Lower Cretaceous; Albian)--Clasts of volcanic rocks.
- Dg UNDIVIDED GRAYWACKE AND SILTSTONE (Upper and Middle(?) Devonian)--Dark gray phyllite and polymetamorphosed chloritic metasilstone. Thin beds of marble in upper part. Undivided unit also includes metagraywacke farther north (Map B).
- Dc UNNAMED CHLORITIC AND CALCAREOUS METASEDIMENTS (Middle(?) Devonian)--Brown and gray weathering partly calcareous slate and phyllite. Polymetamorphosed.
- Dp PHYLLITE AND GRAYWACKE (Devonian(?) or younger)--Dark gray phyllite and fine-grained lithic wacke. Slightly metamorphosed.
- ca UNDIVIDED CARBONATE ROCKS (Devonian(?) or younger)--Marble and calc-silicate hornfels.

Igneous Rocks

- QTV VOLCANIC ROCKS (Quaternary or Upper Tertiary)--Flat-lying flows of olivine basalt.
- Tf FELSIC AND INTERMEDIATE VOLCANIC ROCKS (Paleocene)--Porphyritic flows, breccia, conglomerate and tuff.
- Kg GRANITIC ROCKS (Lower Cretaceous)--Porphyritic quartz monzonite; granodiorite and monzonite.
- umf ULTRAMAFIC ROCKS (Jurassic to Mississippian)--Ophiolitic assemblage of serpentinized peridotite and dunite thrust over volcanic rocks (TrMv). Jurassic K/Ar ages may date thrusting rather than protolith (Patton and others, 1977).

Tr Mv VOLCANIC ROCKS (Triassic, Permian, Pennsylvanian, and Mississippian)
--Pillow basalt, diabase and gabbro; chert and cherty mudstone;
limestone.

Metamorphic Rocks

Dv VOLCANIC ROCKS (Upper and Middle(?) Devonian)--Mafic greenschist.

qms UNDIVIDED QUARTZ-MICA SCHIST (Precambrian (?), lower Paleozoic (?),
Devonian(?), and Mississippian (?))--Quartz-mica schist,
chlorite schist and minor quartzite. Lower greenschist to
almandine-amphibolite facies; andalusite-cordierite hornfels
near Cretaceous granites.

csm UNDIVIDED CALCAREOUS SCHIST AND MARBLE (Precambrian(?) to
Devonian(?))--Brown-weathering muscovite-quartz-calcite schist
interbedded with schistose marble and quartz-mica schist.

SOURCES OF MAP INFORMATION

Map A, Yukon crossing to Wiseman

Brosge¹, W. P., and Reiser, H. N., 1964, Geologic map and section of the
Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous
Geologic Investigations Map I-375, scale 1:250,000.

____ 1971, Preliminary bedrock geologic map, Wiseman and eastern Survey Pass
quadrangles, Alaska: U.S. Geological Survey Open-File Report 71-56, 2
sheets, scale 1:250,000.

Brosge¹, W. P., Reiser, H. N., and Yeend, Warren, 1973, Reconnaissance geologic
map of the Beaver quadrangle, Alaska: U.S. Geological Survey
Miscellaneous Field Studies Map MF-525, scale 1:250,000.

Chapman, R. M., Weber, F. R., and Taber, Bond, 1971, Preliminary geologic map
of the Livengood quadrangle, Alaska: U.S. Geological Survey Open-File
Report 71-66, 2 sheets, scale 1:250,000.

Chapman, R. M., Yeend, Warren, Brosge¹, W. P., and Reiser, H. N., 1982,
Reconnaissance geologic map of the Tanana quadrangle, Alaska: U.S.
Geological Survey Open-File Report 82-734, scale 1:250,000.

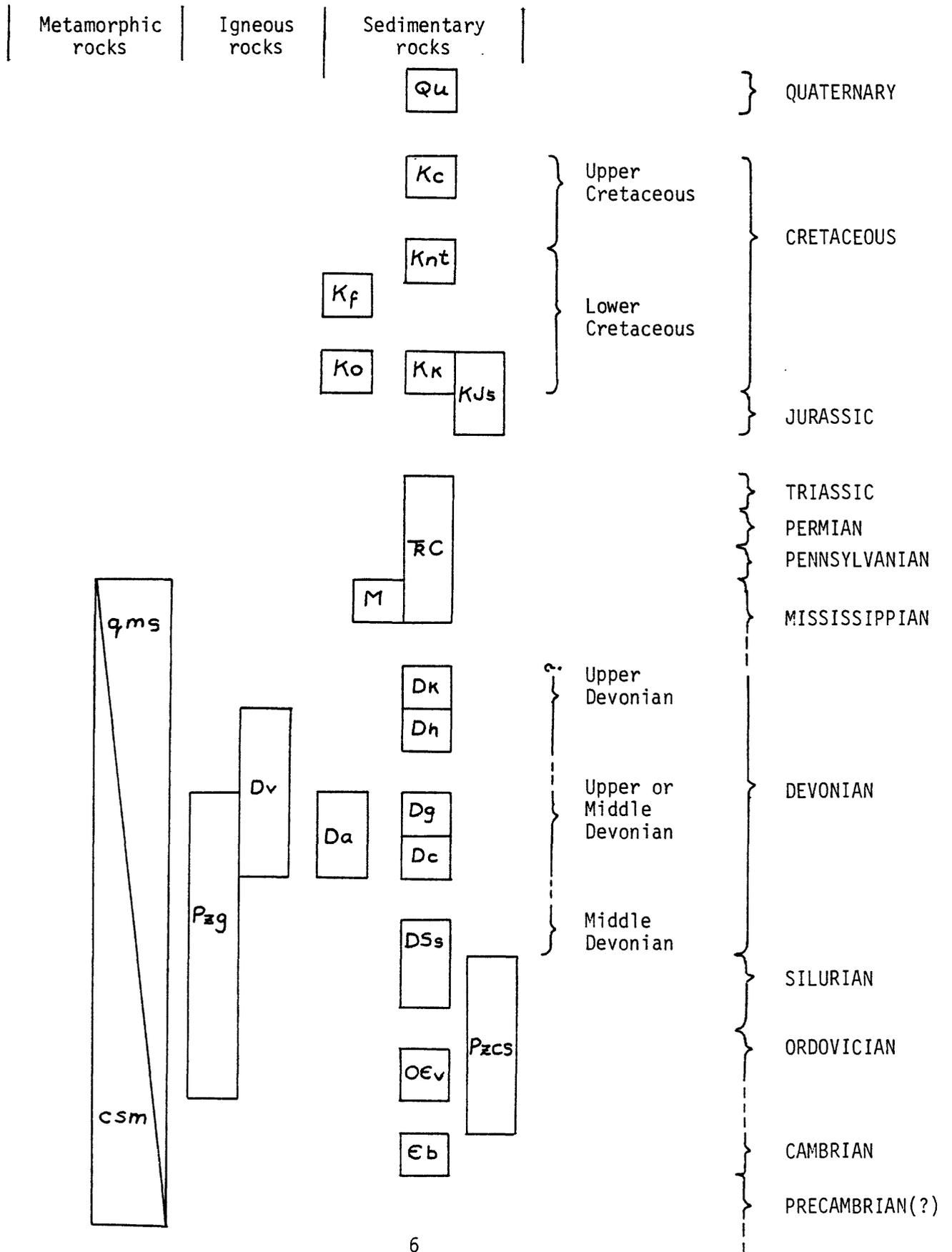
Patton, W. W., Jr., and Miller, T. P., 1973, Bedrock geologic map of Bettles
and southern part of Wiseman quadrangles, Alaska: U.S. Geological Survey
Miscellaneous Field Studies Map MF-492, scale 1:250,000.

Patton, W. W., Jr., TAILLEUR, I. L., Brosge¹, W. P., and Lanphere, M. A., 1977,
Preliminary report on the ophiolites of northern and western Alaska, in
North American Ophiolites: Oregon State Department of Geology and
Mineral Industries, Bulletin 95, p. 51-57.

CORRELATION OF MAP UNITS

Map B

Wiseman to Toolik



DESCRIPTION OF MAP UNITS

Map B, Wiseman to Toolik

Sedimentary Rocks

- Qu UNDIFFERENTIATED SURFICIAL DEPOSITS (QUATERNARY)--Shown only in the largest valleys.
- Kc COLVILLE GROUP (Upper Cretaceous)--Sandstone, shale and tuff. Mostly nonmarine. Exposed thickness about 60 m.
- Knt NANUSHUK GROUP AND TOROK FORMATION (Upper and Lower Cretaceous; Cenomanian and Albian)--Nanushuk Group: conglomerate, sandstone and shale; fluvial and shallow marine; thickness at least 600 m. Underlying Torok Formation: marine shale and siltstone; more than 130 m thick.
- Kf FORTRESS MOUNTAIN FORMATION (Lower Cretaceous; Albian)--Polymict conglomerate, wacke, siltstone and shale. Marine and nonmarine. Thickness 1300 m.
- Ko OKPIKRUAK FORMATION (Lower Cretaceous)--Rhythmically-bedded siltstone, graywacke and conglomerate. Marine. More than 600 m thick.
- Kk KONGAKUT FORMATION (Lower Cretaceous)--Black shale and siltstone; floating chert pebbles in lower part. Marine. More than 300 m thick.
- KJs KONGAKUT FORMATION AND KINGAK SHALE, UNDIVIDED (Lower Cretaceous and Jurassic)--Black shale and siltstone. Marine. As much as 700 m thick.
- RC SHUBLIK FORMATION, OTUK FORMATION, SADLEROCHIT GROUP, LISBURNE GROUP AND KAYAK SHALE UNDIVIDED (Triassic, Permian, and Carboniferous)--Shublik Formation: black calcareous phosphatic shale and siltstone and gray limestone; marine; 30 to 150 m thick. Otuk Formation: varicolored chert laterally equivalent to Shublik Formation. Sadlerochit Group: siltstone, shale, sandstone and limestone; marine in this area; about 500 m thick. Lisburne Group: gray cherty limestone and dolomite; marine; about 700 to 1000 m thick. Kayak Shale: black shale, limestone and sandstone; marine; about 300 m thick.
- M LISBURNE GROUP, KAYAK SHALE AND KEKIKTUK CONGLOMERATE UNDIVIDED (Pennsylvanian and Mississippian)--Pennsylvanian part of Lisburne Group is thin to absent in this area. Kekiktuk Conglomerate: quartzite and granule conglomerate about 10 m thick present only in southernmost outcrops, where it underlies Kayak Shale and rests unconformably on Lower Paleozoic rocks.

- Dk KANAYUT CONGLOMERATE (Mississippian(?) and Upper Devonian)--Quartzite, sandstone, conglomerate and gray to red shale and siltstone. Fluvial; deposited by southwestward flowing streams. About 1000 m thick; absent where Kekiktuk Conglomerate rests on Lower Paleozoic rocks.
- Dh NOATAK SANDSTONE, HUNT FORK SHALE AND BEAUCOUP FORMATION UNDIVIDED (Upper Devonian)--Mostly dark gray shale and siltstone; interbedded wacke in upper part; some reefal limestone and conglomerate in lower part; minor sandstone throughout. Marine. Upper part consists of prodeltaic and shoreline deposits gradational into Kanayut Conglomerate. About 1500 to 2000 m thick; absent where Kekiktuk Conglomerate rests on Lower Paleozoic rocks. Metamorphosed to slate and phyllite in southern part of area.
- Dg UNDIVIDED GRAYWACKE AND SILTSTONE (Upper and Middle (?) Devonian)--Dark gray and gray-green slate and phyllite, meta-graywacke with mafic rock clasts, and chloritic meta-siltstone; thin fossiliferous Upper Devonian limestones in upper part. Polymetamorphosed.
- Dc UNNAMED CHLORITIC AND CALCAREOUS METASEDIMENTS (Middle(?) Devonian)--Green, red, purple and dark gray slate and phyllite; brown and orange weathering calcareous slate, metasandstone and schist; gray marble. Polymetamorphosed.
- Da UNNAMED VOLCANIC CONGLOMERATE (Devonian(?))--Sheared mafic pebble conglomerate and breccia grades into volcanic phyllite.
- DSs SKAJIT LIMESTONE (Middle Devonian and Silurian)--Gray, non-cherty marble, and gray and orange dolomite. As much as 600 m thick.
- Pzcs UNNAMED CALCAREOUS METASILTSTONE (Lower Paleozoic)--Gray and gray-green partly calcareous slate and metasiltstone, and gray thin-bedded micaceous limestone. Weathers brown and orange.
- 06v UNNAMED VOLCANIC AND SEDIMENTARY ROCKS (Ordovician and Cambrian(?))--Andesitic and basaltic pyroclastic rocks and volcanic conglomerate; black and green phyllite; sills and dikes of gabbro and diorite.
- 6b UNNAMED BLACK METASILTSTONE (Cambrian)--Black, pyritic metasiltstone and phyllite; thin fossiliferous limestone locally in upper part. Includes many small unmapped mafic sills and dikes.

Igneous Rocks

- Dv UNNAMED VOLCANIC ROCKS (Upper and Middle(?) Devonian)--Gabbro and diabase sills as much as 100 m thick; pillow basalt flows 10-80 m thick. Metamorphosed to greenstone and greenschist.
- Pzg GRANITIC ROCKS (Devonian(?) and/or Ordovician(?))--Gneissic granodiorite and quartz monzonite with conflicting Ordovician, Devonian and Cretaceous isotopic ages.

Metamorphic Rocks

- qms UNDIVIDED QUARTZ-MICA SCHIST (Precambrian(?), Devonian(?) and Mississippian(?))--Gray to black, coarse to fine-grained quartz-muscovite-chlorite-albite schist, locally with biotite and garnet. Includes some mafic greenschist. Polymetamorphosed. Ages are from Dillon, Hamilton, and Lueck (1981) and Nelson and Grybeck (1980).
- csm UNDIVIDED CALCAREOUS SCHIST AND MARBLE (Precambrian(?) to Devonian(?))--Brown weathering muscovite-quartz-calcite schist interbedded with schistose marble and quartz-mica schist. Polymetamorphosed. Altered to calc-silicate hornfels around granitic rocks Pzg.

SOURCES OF MAP INFORMATION

Map B, Wiseman to Toolik

- Brosge, 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, 2 sheets, scale 1:250,000.
- Brosge, W. P., and Reiser, H. N., 1964, Geologic map and section of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-375, scale 1:250,000.
- Brosge, W. P., and Reiser, H. N., 1971, Preliminary bedrock geologic map, Wiseman and eastern Survey Pass quadrangles, Alaska: U.S. Geological Survey Open-File Report 71-56, 2 sheets, scale 1:250,000.
- Brosge, W. P., Reiser, H. N., Dutro, J. T., Jr., and Nilsen, T. H., 1979, Geologic map of Devonian rocks in parts of the Chandler Lake and Killik River quadrangles, Alaska: U.S. Geological Survey Open-File Report 79-1224, scale 1:200,000.
- Dillon, J. T., Hamilton, W. B., and Lueck, Larry, 1981, Geologic map of the Wiseman A-3 quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report 119, scale 1:63,360.
- Nelson, S. W., and Grybeck, Donald, 1980, Geologic map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-A, 2 sheets, scale 1:250,000.