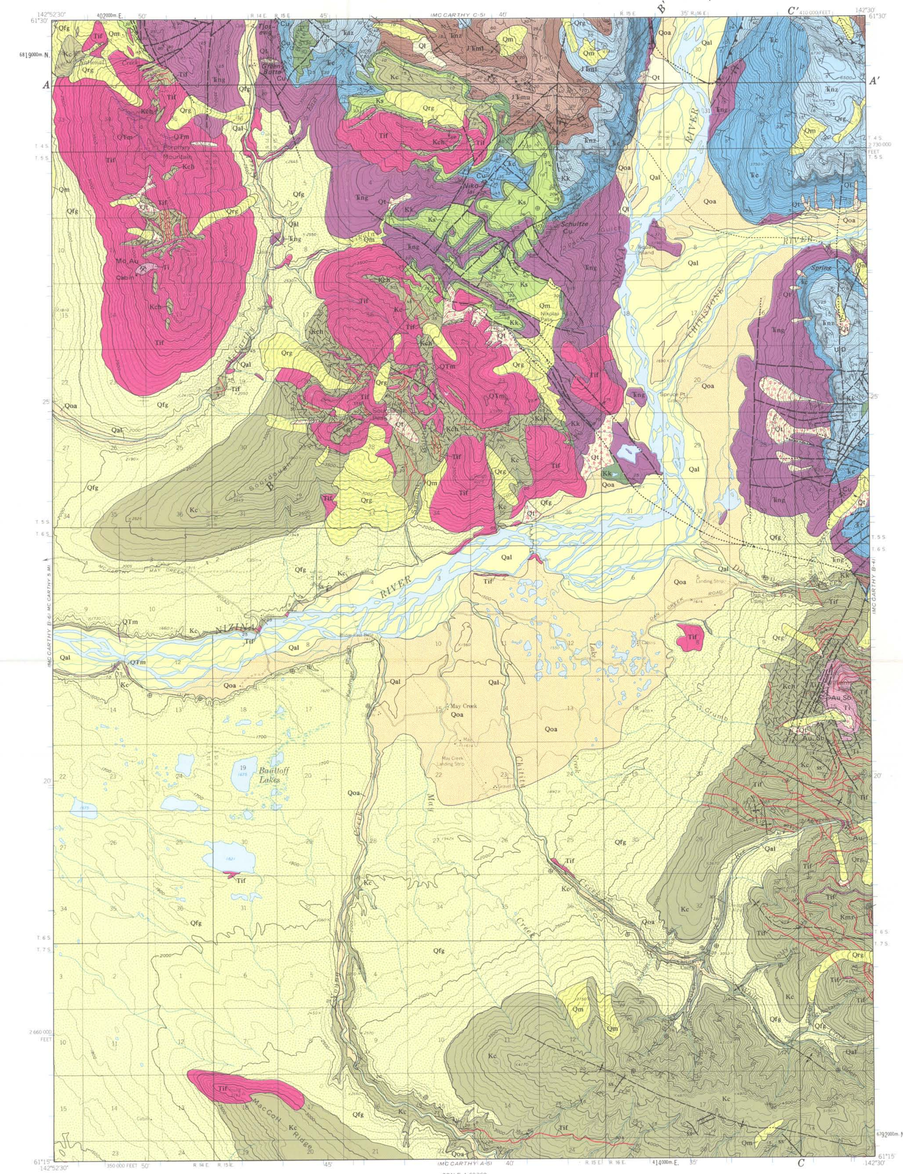
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

GEOLOGIC QUADRANGLE MAP
McCARTHY B-5 QUADRANGLE, ALASKA
GQ-1146

COMPOSITE COLUMNAR SECTION

SYSTEM	SERIES	STAGE	Distance from base of section, in feet	LITHOLOGY	FORMATION OR MEMBER	DESCRIPTION	CHARACTERISTIC MEGAFOSSILS
						(Intraformational stratigraphic position not implied)	
QUATERNARY						Credit for identifications and age assignments: Cretaceous invertebrates, D. L. Jones, U.S. Geological Survey; Jurassic invertebrates, R.W. Imlay, U.S. Geological Survey; Triassic invertebrates, N. J. Silberling, Stanford University and U.S. Geological Survey	
			15,000		Surficial deposits	Includes alluvium, older alluvium, talus, landslides, rock glaciers, moraines, and fluvioglacial deposits	
					UNCONFORMITY		
TERTIARY	?	?			Mainly mafic dikes and sills	Andesite, subordinate dacite, and lamprophyre, typically altered	
	Pliocene(?)				Felsic hypabyssal rocks	Dominantly dacite, characteristically altered porphyritic rocks with very fine grained groundmasses	
			14,000		Granodiorite	Granodiorite and subordinate quartz diorite, fine or medium grained with accessory biotite and hornblende	
CRETACEOUS	Upper Cretaceous	Campanian or Maestrichtian			Top not exposed		
					MacColl Ridge Formation	Sandstone, mainly medium-grained wacke	
		Cenomanian to Campanian	13,000		Sandstone dike		
					Chititu Formation		
					Metamorphosed Chititu rocks	Mudstone with subordinate siltstone, shale, and impure limestone, and rare pebble conglomerate; generally weakly metamorphosed near plutons	*Inoceramus* spp.
			12,000				
	Lower(?) and Upper Cretaceous	Albian(?) and Cenomanian	11,000		Schulze Formation	Sandstone, siltstone, and porcellanite; the sandstone includes fine- and very fine-grained arenite and wacke	*Inoceramus* spp. *Desmoceras (Pseudouhligella)* sp. *Calycoceras* sp.
	Lower Cretaceous	Albian			Concretions		
					Kennicott Formation	Sandstone and conglomerate with less siltstone and shale; the sandstone is fine- to very coarse-grained arenite with subordinate wacke; the conglomerate includes boulder, pebble, and granule conglomerate	*Brewericeras hulenense* Wood
					UNCONFORMITY		
TRIASSIC AND JURASSIC	Upper Triassic(?) and Lower Jurassic	Sinemurian	10,000		Top not exposed in B-5 quadrangle		
					Upper member of McCarthy Formation	Impure siliceous limestone and minor packstone	*Arnioceras* sp.
		Rhaetian(?) and Hettangian(?)	9000				
	Upper Triassic and Lower Jurassic(?)				Lower member of McCarthy Formation	Impure limestone with intercalated carbonaceous shale and minor siltstone	*Heterastridium* sp. *Monotis subcircularis*
					Chert nodules		
			8000		Concretions		
		Norian			Chert layer		*Pterotoceras* sp.
			7000		Nizina Limestone	Limestone with subordinate layered, lenticular, or nodular chert; the limestone consists of lime mudstone and grainstone with minor wackestone and packstone	*Juvavites* sp. *Gryphaea(?)* *Halobia austriaca* Mojsisovics
			?		Chert lenses		
	Upper Triassic		6000				
							Gryphaea(?) *Halobia* cf. *H. superba* Mojsisovics
		Karnian	5000		Chert nodules		
					Chitistone Limestone	Limestone, dolomitic limestone, and dolomite; subordinate chert nodules; carbonate rocks include lime mudstone and less abundant wackestone, packstone, grainstone, and microcrystalline limestone	*Tropites* cf. *T. welleri* Smith
			4000				
			?		DISCONFORMITY		
	Middle and (or) Upper Triassic		3000				
			2000		Nikolai Greenstone	Altered basalt, mainly fine grained and intergranular in texture; generally amygdaloidal, locally porphyritic	
			1000				
			0		Base not exposed in B-5 quadrangle		



CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS

Qal, Qoa, Ql, Qrg, Qm, Qfg — QUATERNARY

Unconformity

BEDROCK

QTm, Tif, Tif, Ti, Kmr, Kch, Kc, Ks, Kk	Pliocene(?)	TERTIARY
	Upper Cretaceous	CRETACEOUS
	Upper and Lower(?)Cretaceous	
	Lower Cretaceous	
Unconformity		
J'kmu, J'kml	Lower Jurassic and Upper Triassic(?)	JURASSIC AND TRIASSIC
	Lower Jurassic(?) and Upper Triassic	
Knz, Kc	Upper Triassic	TRIASSIC
Disconformity		
Tkng	Upper and (or) Middle Triassic	

- Contact, showing dip – Approximately located or gradational; dotted where concealed
- Vertical contact – Approximately located
- Fault – Approximately located, showing dip; dotted where concealed; queried where probable. U, upthrown side; D, downthrown side
- Vertical fault – Approximately located; dotted where concealed
- Thrust fault – Approximately located; dotted where concealed. Sawteeth on upper plate
- Fault intruded by dike
- Anticline – Showing approximate trace of axial surface. Dotted where concealed
- Overturned anticline – Approximately located; Showing direction of dip of limbs and trace of axial surface
- Syncline – Showing approximate trace of axial surface. Dotted where concealed
- Overturned syncline – Approximately located; Showing trace of axial surface and direction of dip of limbs
- Minor anticline – Showing direction of plunge
- Minor syncline – Showing direction of plunge
- Strike and dip of beds: Inclined; Horizontal; Overturned
- Strike and dip of lava flows: Inclined; Overturned
- Mine or prospect – Main commodities indicated by symbols. Name shown, if known

Mines and Prospects

Name (if known) and location	Symbol of main commodity or commodities	Type
--------, sec. 11, T. 5 S., R. 14 E.	Au, Mo	Quartz vein and lenses
Tjosevig, sec. 30, T. 4 S., R. 15 E.	Cu	Vein and replacement
Green Butte, sec. 30 T. 4 S., R. 15 E.	Cu	Vein and replacement
Nikolai, sec. 2, T. 5 S., R. 15 E.	Cu	Vein
Schulze, sec. 12, T. 5 S., R. 15 E.	Cu	Vein and replacement
------, sec. 34, T. 5 S., R. 16 E.	Cu	Vein
Crumb Gulch prospects, sec. 15, T. 6 S., R. 16 E.	Au, Sb	Vein
------, sec. 27, T. 6 S., R. 16 E.	Au	Vein

Gold and minor amounts of silver have been recovered from placer deposits along Chititu Creek and its tributaries and along Dan Creek. Native copper is associated with the gold placers.

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qal ALLUVIUM – Unconsolidated detritus that ranges from clay to boulders in size, dominantly silt and sand; deposited along presently active flood plains of streams and rivers; most extensive and best developed in flood plain of Nizina River; includes much glacial outwash; in places crudely stratified or imbricated; See MacKevett (1971)

Qc TALUS – Elongate, crudely lobate masses that are best developed along steep canyon walls; forms thin unconsolidated veneers consisting of angular fragments and slabs of fresh locally derived rocks; See MacKevett (1971)

Ql LANDSLIDES – Best developed near precipitous west wall of Nizina River valley; forms poorly consolidated or unconsolidated crudely lobate disarrayed masses of blocky boulders and associated finer particles; local hummocky surfaces

Qrg ROCK GLACIERS – Elongate to crudely lobate hummocky deposits as much as 2 miles long and a mile wide; exceptionally well developed near Sourdough Peak; composed of locally derived disarrayed angular or blocky boulders; partly cemented by ice; mainly active and composed of freshly broken rocks, but includes some older stable or dormant types that contain weathered rocks generally with moss- or lichen-coated surfaces; See MacKevett (1971)

Qoa OLDER ALLUVIUM – Compositionally and texturally similar to alluvium (Qal); occupies older flood plains of streams and rivers; particularly well developed over large areas south and east of Nizina River; supports vegetation; where best developed forms successive terraces with fronts 1-10 feet high; the young (innermost) terraces usually border modern alluvium (Qal) of active flood plains, the older terraces extend to outer limits of flood plains; See MacKevett (1971)

Qm MORAINES – Mainly relicts of ground moraines that reflect extensive glaciation; irregular in outline; jumbled poorly consolidated masses of weathered subangular lithologically diverse boulders and smaller fragments with a broad size range

Qfg FLUVIOGLACIAL AND GLACIOLACUSTRINE DEPOSITS – Sand and silt with subordinate clay, granules, pebbles, and boulders; generally poorly consolidated but in places weakly lithified; coextensive with deposits that mantle much of the Chitina River valley and adjacent lowlands; probably mainly deposited in a large periglacial lake during the Pleistocene; as much as 200 feet thick; generally well stratified with beds as much as 12 feet thick; mainly readily eroded; buff to light brown; the finer phases consist largely of subangular quartz and plagioclase; the coarser phases are composed largely of compositionally diverse subangular lithic clasts; See MacKevett (1970b)

BEDROCK

QTm, Tif MAFIC DIKES AND SILLS – Andesite, subordinate dacite and lamprophyre; forms bold outcrops; generally porphyritic rocks with fine- or very fine-grained altered groundmasses rich in mafic minerals; commonly 1 to 4 feet thick; exceptionally as much as 25 feet thick; dark gray or dark greenish gray where fresh; moderate or dark brown where weathered; the andesite and dacite contain plagioclase (andesine) phenocrysts as much as 2 mm long in felsitic or intersertal groundmasses; groundmass minerals include andesine, quartz (abundant in dacite and minor in andesite), fairly abundant to abundant biotite and hornblende, generally fairly abundant chlorite and clinopyroxene, and minor or trace amounts of K-feldspar, calcite, apatite, tremolite, actinolite, opaque minerals, clays, and sericite; the lamprophyre contains euhedral clinopyroxene and biotite phenocrysts as much as 2 mm long in a very fine grained altered groundmass; groundmass minerals include hornblende and lesser amounts of hematite, calcite, plagioclase, pumpellyite, and chlorite; See MacKevett (1970b, 1971)

Tif, Tif FELSIC HYPABYSSAL ROCKS – Dominantly dacite; forms epizonal stocks and dikes and sills as much as 150 feet thick; moderate to bold outcrops; breaks into numerous chips that mantle some outcrops; in places platy; local partly digested inclusions of Cretaceous rocks; white, buff, or light gray with pale-yellowish-brown weathered surfaces; rare amygdules that contain quartz, chalcedony, and chlorite; moderately to strongly altered; generally conspicuously porphyritic with very fine grained felty or intersertal groundmasses; subordinate nonporphyritic felsitic phases; phenocrysts mainly plagioclase (sodic andesine or calcic oligoclase) in locally embayed subhedral crystals 0.2-4 mm long that, in places, form glomeroporphyritic clusters; less abundant phenocrysts include quartz that ranges from euhedral bipyramids to strongly embayed anhedral crystals and hornblende and biotite and their chloritized relicts; primary groundmass minerals comprise abundant plagioclase (oligoclase or sodic andesine) and quartz, locally distributed K-feldspar and mafic minerals including hornblende, biotite, and uncommonly, augite, and minor pyrite and magnetite; typically characterized by copious alteration products including chlorite, calcite, clay minerals (chiefly kaolinite), sericite, hematite, limonite, and minor leucoxene, illite, and epidote; See MacKevett (1970b)

Ti, Ti GRANODIORITE – Includes subordinate quartz diorite; forms small stocks and dikes; rugged outcrops; fine or medium grained; typically hypidiomorphic granular, locally porphyritic with plagioclase phenocrysts; contains local mafic clots; rich in plagioclase (sodic andesine-calcic oligoclase) and quartz; less abundant biotite, hornblende, K-feldspar, and, in some places, augite; minor to trace amounts of magnetite, ilmenite, sphene, zircon, apatite, and pyrite; alteration products include chlorite; clay minerals, hematite, calcite, sericite, and epidote; See MacKevett (1970b)

Kmr MACCOLL RIDGE FORMATION – Sandstone; in beds 1-4 feet thick; forms bold outcrops; greenish gray; weathers light yellowish brown; typically medium-grained wacke composed of subangular clasts of quartz, plagioclase, lithic fragments, biotite, and calcite in a microcrystalline matrix rich in chalcedony, chlorite, and clay minerals; also contains scattered pyrite and other opaque minerals and their alteration products; locally contains marine fossils near base; See Jones and MacKevett (1969)

Kc CHITITU FORMATION – Dominantly mudstone, subordinately siltstone, shale, and impure limestone, rare pebble conglomerate; in places cut by steep sandstone dikes (*m*) as much as 3 feet thick; contains irregularly shaped, discoidal, or spherical limy concretions that range from a few inches to several feet in maximum dimension and local limy or sandy lenses; shaly thin-bedded to massive outcrops that commonly erode to smooth rounded surfaces; the dominant mudstone is silica rich with hackly or subconchoidal fracture, tends to fragment into chips, and is dark greenish gray or dark gray where fresh and grayish or yellowish brown where weathered; composed of fine particles of quartz, plagioclase (chiefly oligoclase), chlorite, calcite, muscovite and sericite, chert, clay minerals (mainly kaolinite), opaque iron minerals and their alteration products, and rare carbonaceous material and zeolites; most particles are moderately sorted and subangular; the siltstone is finely laminated and similar to the mudstone in composition and color; the shale typically is medium or olive gray and weathers pale yellow brown; it is composed of aggregates of very fine grained quartz and clay minerals, principally kaolinite, and lesser amounts of chlorite, calcite, sericite, plagioclase, iron oxides, and pyrite; the impure limestone is light gray and weathers light brown; it is very fine grained and composed of calcite pellets and subangular clasts of calcite, minor quartz, and plagioclase in a lime-mud matrix that contains some chlorite, clay, and opaque minerals; the conglomerate forms intraformational lenses with subrounded pebbles of quartz and lithic fragments in a sandstone matrix; the sandstone dikes are mainly fine- or medium-grained arenite that contains clasts, mainly quartz, plagioclase, chlorite, and calcite, that are calcite cemented; microfossils are not abundant in Chititu rocks; contains locally abundant marine fossils; See Jones and MacKevett (1969)

Kc, Kch METAMORPHOSED CHITITU ROCKS – Generally weakly metamorphosed; confined to contact aureoles of Tertiary plutons; includes baked mudstone and less common partly recrystallized sandstone and limestone; thin bedded to massive; moderate outcrops; medium or dark gray where fresh; characteristically dark yellow brown or reddish brown where weathered; well indurated with hackly fracture; very fine grained to medium grained; differ mineralogically from unmetamorphosed Chititu rocks by containing more biotite, muscovite, and pyrite, and, in places, hornblende and clinozoisite; See MacKevett (1970b)

Ks SCHULZE FORMATION – Sandstone, siltstone, and porcellanite; very fine grained and less abundant fine-grained platy or flaggy rocks that form subdued to moderate outcrops; typically light gray where fresh and light brown or yellowish brown where weathered; locally banded or exhibits concentric weathering rinds; generally finely laminated; rich in microfossils, chiefly Foraminifera and Radiolaria, and scraps of marine megafossils; the sandstone is moderately sorted arenite and wacke, including lithic varieties; arenite matrix is calcite rich; wacke matrix is microcrystalline silica, chlorite, and clay minerals; clasts in the arenite and wacke are subangular and include quartz, calcite, lithic fragments (mainly chert and McCarthy Formation rocks), and less abundant glauconite, plagioclase, and biotite; other minerals in these rocks comprise clay minerals (chiefly kaolinite), sericite, chlorite, and small amounts of hematite, pyrite, leucoxene, magnetite, limonite, illite, and rare zeolites; carbonaceous material is an uncommon matrix constituent; the siltstone is mineralogically similar to the wacke but characteristically better sorted and finer grained; the porcellanite consists of microcrystalline silica with subordinate kaolinite and a few scattered clastic grains, chiefly quartz; See Jones and MacKevett (1969)

Kk KENNICOTT FORMATION – Sandstone and conglomerate, subordinate siltstone and shale; grades upward from basal conglomerate through sandstone to siltstone and shale; nearly spherical limy concretions as much as 3 feet in diameter locally distributed in the sandstone and shale; beds between a few inches and 30 feet thick; outcrops range from bold, for the conglomerate, to subdued, for the shale; gray, mainly dark greenish gray, where fresh, and brown mainly moderate or dark yellowish brown, where weathered; the sandstone is fine to very coarse grained, mainly arenite, subordinately wacke; the arenite is cemented by calcite whereas the wacke has a matrix rich in silica, chlorite, and clay minerals; both rock types generally contain subrounded to subangular clasts including chert and other lithic fragments, quartz, plagioclase, calcite, and chlorite, and less abundant to rare biotite, glauconite, K-feldspar, hematite, sericite, ilmenite, leucoxene, magnetite, epidote, apatite, zeolites, pyrite and carbonaceous material; the conglomerate is mainly pebble conglomerate and subordinately boulder or granule conglomerate; it contains subrounded to subangular clasts of Nikolai Greenstone and less commonly of other Triassic rocks, chert, and quartz, typically in a matrix of coarse sandstone; fossil wood is locally abundant in the conglomerate and less abundant in the overlying sandstone; the siltstone is a very fine grained well-sorted counterpart of the arenite and wacke; the shale is rich in clay minerals and quartz; the pelitic and finely psammitic rocks contain Radiolaria and Foraminifera; marine megafossils are locally abundant; See Jones and MacKevett (1969)

MCCARTHY FORMATION

J'kmu Upper member; dominantly impure siliceous limestone, minor packstone (classification of Dunham, 1962); beds from 2 inches to 2 feet thick; ribby to moderately smooth outcrops; cut by calcite veinlets; generally hackly to subconchoidal fracture; rare stylolites; mainly very fine grained; dark gray, dark greenish gray, or greenish black where fresh; moderate brown or dark yellow brown where weathered; the typical impure limestone contains abundant grains of calcite in a microcrystalline matrix of quartz or chalcedony; besides calcite its detrital minerals include dolomite, which is locally abundant, plagioclase, and rare apatite; the silica-rich matrix contains scattered chlorite, pyrite, magnetite, hematite, and carbonaceous material; the packstone is composed largely of fine-grained subangular calcite; almost all upper-member rocks contain spicules and microfossils, including minute spherical and rodlike forms that generally are silica rich; locally contains marine megafossils; See MacKevett (1970a, b, 1971)

J'kml Lower member; impure limestone intercalated with carbonaceous shale and minor siltstone; minor small chert nodules and rare calcite concretions as much as 2 inches in diameter; the limestone beds are 1-2 feet thick and form bold outcrops; the shale and siltstone are fissile or platy and form subdued outcrops; most rocks of the member are dark gray, dark greenish gray, or grayish black and weather to dark shades of brown; many contain microfossils and finely dispersed carbonaceous material; the impure limestone is mainly fine-grained wackestone (Dunham, 1962) rich in bioclastic calcite with subordinate to rare clastic quartz, plagioclase, pyrite and other opaque minerals, dolomite, and apatite embedded in partly recrystallized lime mud; an uncommon variant of the impure limestone contains a matrix rich in microcrystalline silica; the shale and siltstone are finely laminated and rich in calcite and carbonaceous material; their lesser constituents include clay minerals, quartz, dolomite, chlorite, pyrite, and secondary iron minerals; contains locally abundant pelecypods (*Monotis*); See MacKevett (1970a,b, 1971)

Knz NIZINA LIMESTONE – Limestone that contains subordinate layered, lenticular, or nodular chert; beds typically ½ to 3 feet thick, exceptionally as much as 10 feet thick; forms bold outcrops; dark gray or medium gray where fresh; yellowish brown or brownish gray where weathered; locally fetid; typically hackly fracture; abundant trace-fossil debris and rare stylolites; abundant calcite veinlets; consists of lime mudstone and grainstone with minor wackestone and packstone (classification of Dunham, 1962); most of the grainstone is micropelletoidal; the limestones are very fine- or fine-grained rocks that are rich in calcite and contain minor to trace amounts of pyrite, hematite, magnetite (?), quartz, clay minerals, dolomite, chalcedony, and chlorite; the associated chert is dark gray to black; it contains abundant microcrystalline silica, siliceous microfossils, and rare rhombs of dolomite; See Armstrong and others (1970, p. D49-D62)

Tkc CHITISTONE LIMESTONE – Limestone, dolomitic limestone, dolomite, and subordinate chert nodules as much as 6 inches in diameter; ranges in thickness from shaly limestone near base to cliff-forming carbonates as much as 25 feet thick; local solution pits and caverns; fresh surfaces range from light to dark gray, mainly dark greenish gray; weathered surfaces yellowish brown or shades of gray; generally fractured and recemented by calcite veinlets; local stylolites; in places contains scattered bioclastic debris and microfossils; dominantly fine- or very fine grained rocks, chiefly lime mudstone, subordinately wackestone, packstone, grainstone, and microcrystalline limestone (classification of Dunham, 1962); the packstone and grainstone generally are oolitic; calcite predominates in all Chitistone rocks except dolomite-rich phases, which are confined to lower part of formation; besides carbonate minerals Chitistone rocks contain rare quartz, pyrite, hematite, and clay minerals; See Armstrong and others (1970, p. D49-D62)

Tkng NIKOLAI GREENSTONE – Subaerial basaltic lava in flows between 2 and 30 feet thick that form moderately rugged outcrops; typically altered; dark gray or dark greenish gray where fresh; brown, greenish or reddish brown, or maroon where weathered; amygdaloidal with amygdules generally 1-5 mm in diameter; typically fine grained and intergranular; locally subophitic or porphyritic with plagioclase phenocrysts 1-2 mm long; consists dominantly of plagioclase (labradorite) and augite along with minor pigeonite, relict olivine, magnetite, ilmenite, rare sphene, and fairly abundant alteration products, including chlorite, similar ferruginous serpentine minerals, hematite, epidote, calcite, and rare clay minerals, uralitic hornblende, quartz, and secondary copper minerals; cut by a few veinlets that generally are rich in calcite; the amygdules contain calcite, quartz, chlorite, epidote, prehnite, and zeolites, chiefly natrolite; See MacKevett (1970b,b, 1971)

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GEOLOGIC MAP OF THE McCARTHY B-5 QUADRANGLE, ALASKA

By

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