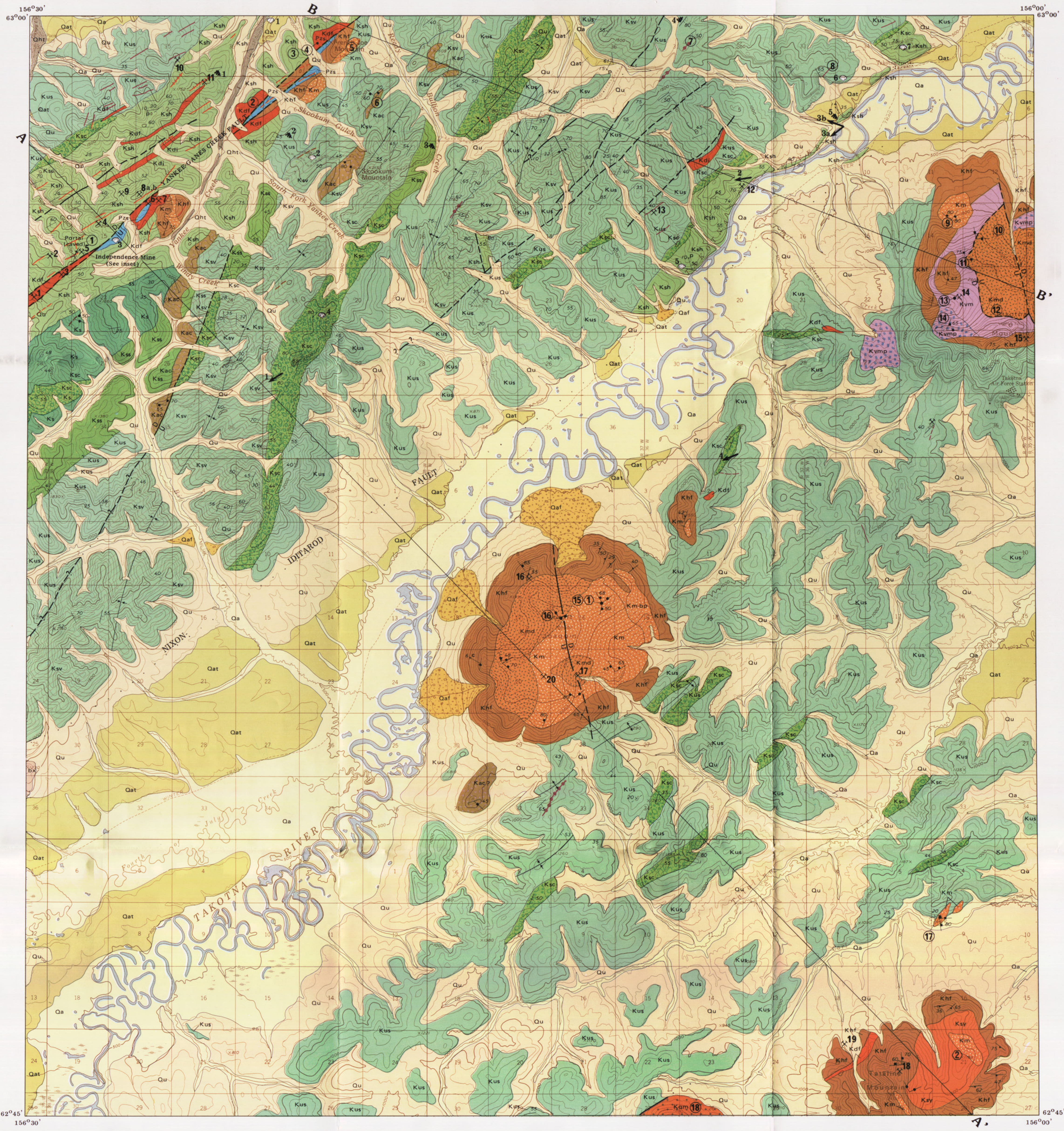
PR78-SH1



Base by U.S. Geological Survey, 1954.
Universal Transverse Mercator projection, 1927.

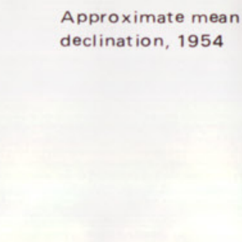
SCALE 1:63,360

1 ½ 0 1 2 3 4 miles

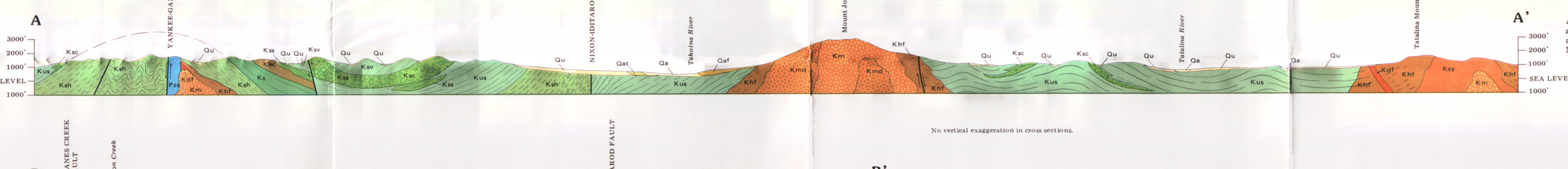
1 .5 0 1 2 3 4 5 kilometers

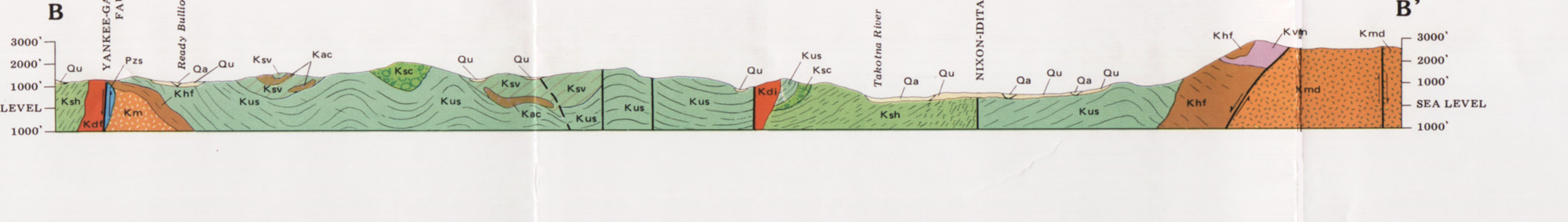
CONTOUR INTERVAL 100 FEET

DATUM IS MEAN SEA LEVEL



Geology by T.K. Bundtzen and G.M. Laird, May and June 1978, and May, June, and July 1979. Assisted by V.F. Ferrell, K.S. Emmel, and N.D. Coursey, 1979. Reviewed by M.S. Robinson and J. T. Kline. Cartography by G.M. Laird.





No vertical exaggeration in cross sections.

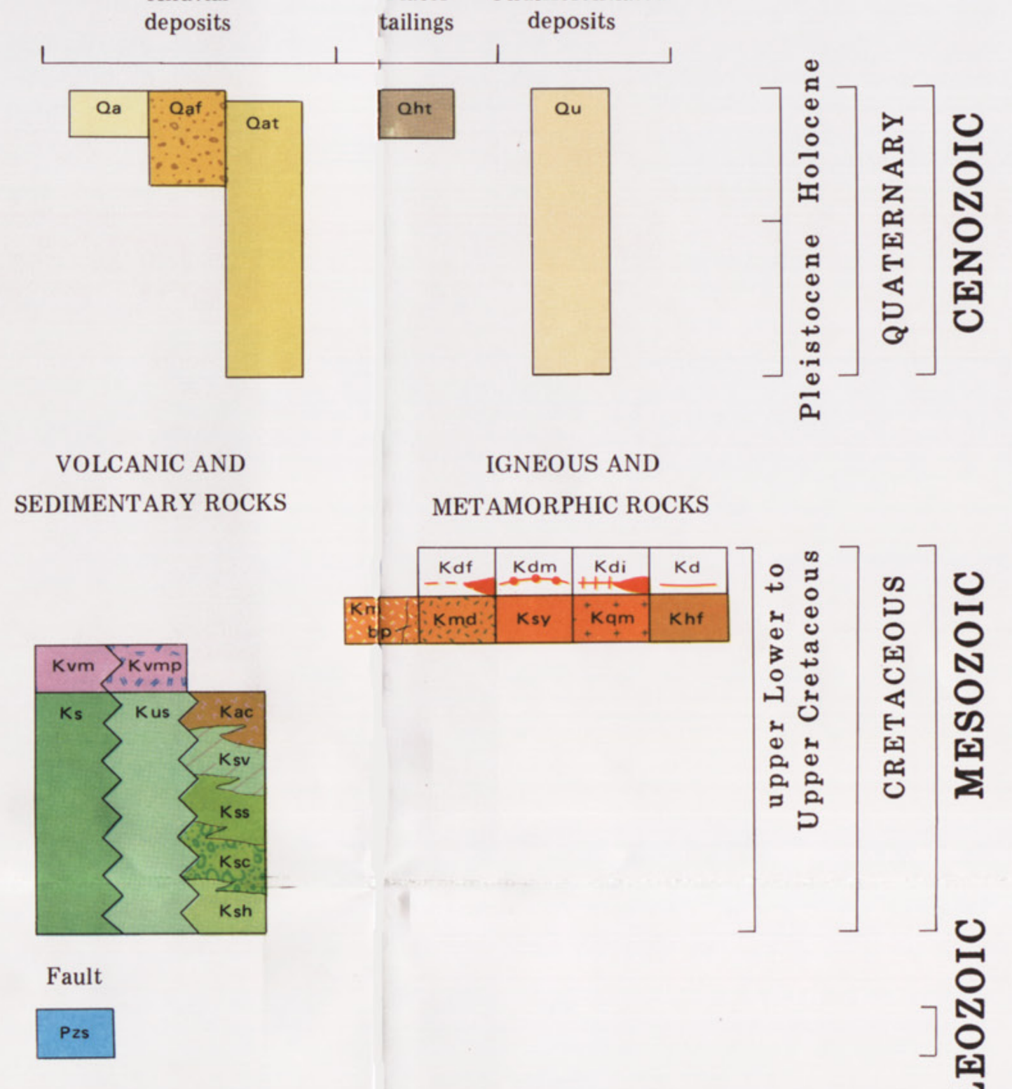
GEOLOGIC MAP OF THE IDITAROD D-1 QUADRANGLE, ALASKA

By

T. K. Bundtzen and G. M. Laird

1983

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

UNCONSOLIDATED DEPOSITS

Qa STREAM ALLUVIUM — Unconsolidated, well-stratified layers of silt, sand, and gravel deposited by modern streams on flood plains; commonly covered by pioneer vegetation.

Qaf ALLUVIAL-FAN DEPOSITS — Poorly sorted, partially stratified silt, sand, and coarse gravel in alluvial fans. May contain significant colluvial component.

Qat TERRACE ALLUVIUM — Well-sorted, moderately stratified gravel and sand, locally cemented by iron oxides; may include alluvial and colluvial aprons and strath terraces. Vegetated surface dissected by modern streams and mantled by eolian silt.

Qht PLACER-MINE TAILINGS — Symmetrical to irregular stacked piles of sorted gravels; fine fractions artificially removed or diluted during placer-mining process.

Qu QUATERNARY DEPOSITS, UNDIFFERENTIATED — Unconsolidated alluvial, colluvial, and eolian deposits; eolian and colluvial deposits locally ice rich in valley fill.

VOLCANIC AND SEDIMENTARY ROCKS

Kvm MAFIC VOLCANIC ROCKS — Dark-greenish-gray, aphanitic to fine-grained olivine-pyroxene basalt and basaltic andesite, locally porphyritic with plagioclase, clinopyroxene, and olivine phenocrysts to 5 mm in diameter. Usually hornfelsed; contains tourmaline-andalusite porphyroblasts and amygdules.

Kvmp PORPHYRITIC VOLCANIC ROCKS — Dark-greenish-gray, porphyro-aphanitic, pyroxene-potassium feldspar basaltic andesite to dacite. Feldspar phenocrysts up to 2 cm long are usually zoned with calcic cores and sodic rims.

Kac AGGLOMERATE, CHERT, TUFF, AND SANDSTONE — Medium- to dark-green agglomerate, green chert, lapilli tuff, and volcaniclastic sandstone. Forms prominent hogbacks and ridges.

Ksv SILICEOUS VOLCANICLASTIC SANDSTONE — Gray, fine- to coarse-grained, indurated volcaniclastic sandstone with distinctive green tinge. Locally siliceous and composed of up to 40 percent volcanic clasts. May be lateral facies equivalent of Kac. Very resistant in outcrop.

Kss LITHIC SANDSTONE — Light-gray, tan-weathering, fine-grained lithic sandstone with 25 percent siltstone interbeds. Moderately resistant in outcrop.

Ks SANDSTONE — Light- to medium-gray, fine- to coarse-grained lithic sandstone exhibiting graded bedding, flute casts, ripple marks, and cross-bedding; contains 15-40 percent shale and siltstone; wood chips and *Inoceramus* prisms locally abundant. ABCD and BCDE Bouma intervals present. Resistant in outcrop.

Ksc SANDSTONE AND CONGLOMERATE — Generally light-gray, coarse-grained lithic sandstone and pebble conglomerate containing chert, quartz, phyllite, and mafic volcanic clasts; *Inoceramus* prisms locally abundant. Graded bedding with ABC Bouma interval present. Resistant in outcrop.

Ksh SHALE AND SILTSTONE — Medium- to dark-gray, finely laminated, locally graded siltstone and shale with up to 15 percent fine-grained lithic wacke. Thin BCDE Bouma intervals present locally. Flysch trace fossil *Paleodictyon* locally abundant. Nonresistant in outcrop.

Kus UNDIFFERENTIATED SEDIMENTARY ROCKS — Predominantly a heterogeneous package of medium-grained lithic sandstone and siltstone, with shale, siltstone, conglomerate, and sandstone of previously listed sedimentary-rock units.

Pzs CHERT, TUFF, ORTHOQUARTZITE, ARGILLITE, AND LIMESTONE — Medium-gray to green radiolarian chert; light-green, aphanitic siliceous tuff; very minor medium-grained, indurated orthoquartzite; dark-gray argillite; lenses of medium-gray, fossiliferous limestone.

INTRUSIVE AND METAMORPHIC ROCKS

Kdf, Kdm, Kdi, Kd DIKES AND SUBVOLCANIC ROCKS — Aphanitic to very fine grained dikes of variable composition; usually altered. Kdf, porphyritic felsite dikes geochemically identical to rhyolite plugs (Tf) in Iditarod D-2 and eastern D-3 Quadrangles (Bundtzen and Laird, 1982); Kdm, olivine-bearing mafic dike; Kdi, intermediate dike; Kd, altered dike or silica-carbonate rock. Thickness of dikes schematic.

Km bp MONZONITE — Light- to medium-greenish-gray, medium- to coarse-grained, porphyritic to locally equigranular, tourmaline-bearing biotite-augite monzonite. Feldspar phenocrysts commonly zoned within altered, finer grained groundmass; Color Index (CI) = 15-35; fine-grained border phase (bp). Mertie (1936) reports olivine in Km in study area.

Kmd MONZODIORITE — Medium- to dark-greenish-gray, coarse-grained, usually porphyritic tourmaline-augite-biotite monzodiorite; plagioclase feldspar phenocrysts usually zoned with potassic rims and sodic cores; secondary biotite common; groundmass commonly altered; CI = 40.

Ksy SYENITE — Light-gray, bleached, fine- to medium-grained, usually porphyritic biotite syenite ± augite; generally less altered than monzonite or monzodiorite phases. Color Index (CI) = 15. Probably early phase of Tatalina Mountain stock.

Kqm QUARTZ MONZONITE — Medium-gray, medium-grained, equigranular, tourmaline-bearing biotite quartz monzonite.

Khf HORNFELS OR METASOMATITE — Brown to gray, massive to porphyroblastic, chlorite ± cordierite hornfels, locally tourmaline rich. Massive dark-gray varieties sometimes difficult to distinguish from aphanitic basalt.

bx UNDIFFERENTIATED BEDROCK — No age inferred.

MAP SYMBOLS

Contact, approximately located, queried where questionable.

High-angle fault — Dashed where approximately located, queried where questionable, dotted where concealed. U, upthrown side; D, downthrown side; arrows show direction of relative movement.

Photogeologic lineament.

Anticline, showing trace of axial plane and direction of plunge.

Syncline, showing trace of axial plane and direction of plunge.

Strike and dip of beds
- Inclined
- Vertical
- Uncertain

Strike and dip of foliation
- Inclined
- Vertical

Strike and dip of cleavage
- Inclined
- Vertical

Strike and dip of joints
- Inclined
- Vertical

Trend and plunge of lineation
- Slate pencil
- Crenulation
- Overturned isoclinal fold

① K-Ar age-date locality (table 1)

⚒1 Mineral occurrence, prospect (table 2)

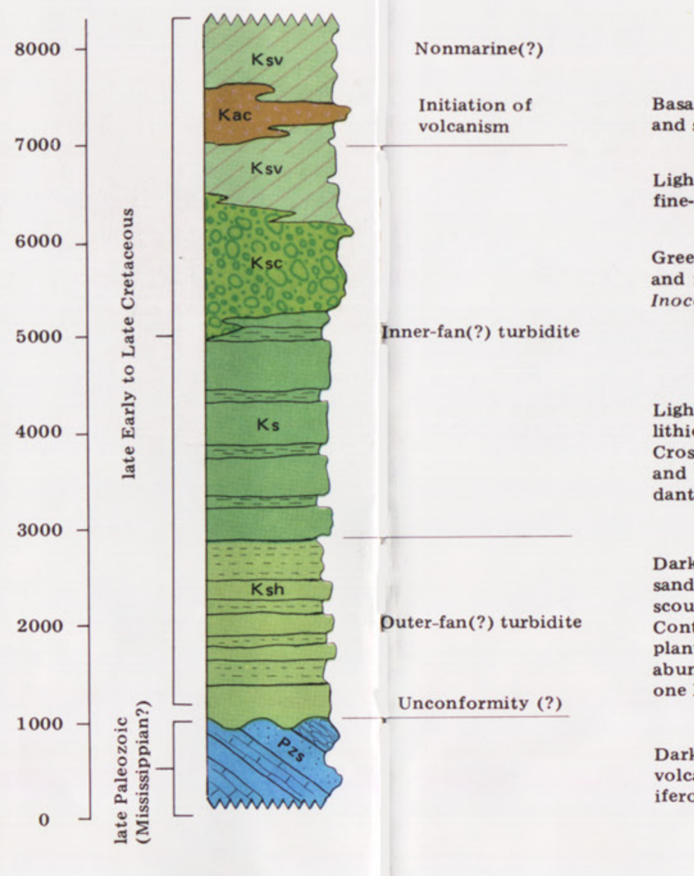
① Major-oxide analysis (table 3)

← Bearing of paleocurrent (table 4)

1 Plant-fossil locality (table 5)

1 Invertebrate-fossil locality (table 6)

COMPOSITE STRATIGRAPHIC SECTION OF THE IDITAROD D-1 QUADRANGLE, ALASKA



DESCRIPTION

Basaltic agglomerate, amphibole crystal tuff, and siliceous volcaniclastic sandstone.

Light-gray to olive-green, locally siliceous, fine- and medium-grained sandstone.

Green-chert pebble to cobble conglomerate and medium- to coarse-grained lithic sandstone; *Inoceramus* (sp?) prisms locally abundant.

Light- to medium-gray, fine- to medium-grained lithic sandstone with minor shale and siltstone. Cross-bedding uncommon. Plant-fossil stems and dicotyledon leaf fragments locally abundant.

Dark-gray lithic siltstone, with fine channel sandstone and shale exhibiting graded bedding, scour and fill structures, and moderate sorting. Contains abundant *Inoceramus* (sp?) and some plant stems. Cross-bedded sandstone locally abundant. Turbidite trace fossils present at one locality.

Dark-greenish-gray, banded radiolarian chert; volcanic exhalite; medium-gray, locally fossiliferous limestone; and light-gray orthoquartzite.

INTERPRETATION OF SEDIMENTARY SECTION

Thin structural slivers of late Paleozoic limestone, chert, and orthoquartzite correlative with the 'Innoko terrane' (Jones and others, 1981; Patton and others, 1980) are exposed in the core of a major anticline east of Ganes Creek. In the Ophir A-2 Quadrangle, Lower(?) Cretaceous sandstone and impure limestone rich in *Inoceramus* prisms overlies(?) the Paleozoic section (Bundtzen and Laird, 1980). The upper Lower to Upper Cretaceous section, known for many years as the Kuskokwim Group (Cady and others, 1955), unconformably overlies these older rock units.

Cretaceous lithologies in the area interfinger laterally and vertically. A basal 1,450-ft-thick, lithic, rhythmically layered shale, sandstone, and siltstone horizon exhibits graded BCDE Bouma intervals (after Mutti and Ricci Lucchi, 1978), moderate sorting, and scour and fill structures probably formed in an outer to inner turbidite-fan facies. The trace fossil *Paleodictyon* (Ksh unit on Yankee Creek, table 6) usually indicates a deep-water environment (Swinbanks, 1982).

Increasing amounts of flora-rich, medium- to coarse-grained lithic to sublithic sandstone, pebble sandstone, and conglomerate (Ks, Ksc units) appear progressively higher in the section. ABCD Bouma intervals, sand-to-shale ratios exceeding 5:1, channelled sandstone bodies, and large channel slump blocks suggest an inner turbidite-fan facies or foreslope depositional environment.

Near the top of the section, basaltic agglomerate, chert or exhalite, and siliceous volcaniclastic sandstone (Kac, Ksv units) vary from 150 to 500 ft in thickness and serve as distinctive marker units in the section. They represent initiation of volcanic activity that may or may not be correlative with upper Cretaceous volcanic units at Takotna Mountain or the Beaver Mountains. A limy sandstone rich in plant debris and dicotyledon leaves caps the section west of Ganes Creek in the Iditarod D-2 Quadrangle (Bundtzen and Laird, 1982). Volcanic units in the uppermost part of the section indicate uplift, cessation of basin infilling, and transition to a nonmarine environment in Late Cretaceous time. Limited paleocurrent data suggest basinal detritus was derived from a shoreline to the northeast.

The 6,500-ft-thick Cretaceous section appears to represent a gradual progression from a turbidite-fan facies to a shallow marine to nonmarine progradational river-delta facies.

GEOLOGIC SKETCH MAP OF THE INDEPENDENCE MINE, INNOKO MINING DISTRICT

(See map ⚒5 and table 2)

Table ① *Analytical data for* ^{40}K-^{40}Ar *age determinations.*

Map (field) number	1 (78BT436)	2 (79BT261)
Rock type	Monzonite	Syenite
Mineral dated	Biotite	Biotite
K_2O (wt%)	8.573	6.473
Sample wt(g)	0.1297	0.1068
$^{40}Ar(rad)$ (moles/g) x 10^{-11}	88.835	58.075
$^{40}Ar(rad)$ / ^{40}K x 10^{-3}	4.182	3.620
$^{40}Ar(rad)$ / ^{40}Ar (total)	0.907	0.680
Age (m.y.) ± 1σ	70.6 ± 2.1	61.3 ± 1.8 (Minimum age)

Constants used in age calculations
$\lambda_\epsilon = 0.585 \times 10^{-10}\ yr^{-1}$
$\lambda_\beta = 4.72 \times 10^{-10}\ yr^{-1}$

Analyses by D.L. Turner and B.J. Spell, Geophysical Institute, University of Alaska, Fairbanks.

⚒ Table 2. *Description and analytical results of mineral occurrences and prospects, Iditarod D-1 Quadrangle, Alaska (sample data in ppm).*

Map no.	Field no.	Au	Ag	Cu	Pb	Zn	Ni	Cr	V	Y	Remarks
1	79BT122B	1.11	ND	10	ND	ND	5	ND	300	ND	Mineralized quartz vein in dacite dike.
2	79BT126	0.01	5.0	100	ND	ND	50	1,000	500	ND	Altered mafic-dike gossan.
3	79BT127A	0.44	2.0	50	ND	ND	10	20	300	ND	Andesite(?)-dike gossan.
	79BT127B	0.14	ND	7	ND	ND	10	ND	300	ND	Rhyolite-dike gossan.
	79BT127C	0.00	ND	70	ND	ND	20	ND	100	ND	Quartz vein with ferricrete cement.
4	79GL57	0.28	ND	15	ND	ND	20	ND	200	ND	Quartz-vein chips from prospect pit.
5	79BT114	0.19	2.0	100	ND	ND	10	ND	500	ND	Mineralized samples from trenched
	79BT114A	0.19	ND	50	ND	ND	10	20	300	ND	vein system at Independence Mine.
	79BT114B	0.11	ND	15	ND	ND	50	ND	300	ND	Samples 114A-F are channel samples
	79BT114C	0.06	ND	15	ND	ND	10	ND	300	ND	of quartz-carbonate-sulfide vein
	79BT114D	0.21	ND	10	ND	ND	20	ND	300	ND	along 400 ft of lode strike length;
	79BT114E	2.98	NA	NA	NA	NA	NA	NA	NA	NA	sample 114E is from vein near caved
	79BT114F	0.16	ND	7	ND	ND	20	ND	300	ND	portal (see Independence Mine inset and Eakin, 1913).
6	79GL62	0.35	ND	50	ND	ND	20	ND	150	ND	Ferricrete-stained quartz in prospect pit.
7	79GL61	7.02	ND	70	ND	200	15	ND	300	ND	Ferricrete-stained quartz in prospect pit; free gold in hand specimen.
8a	79BT103	0.73	5.0	50	ND	ND	50	150	500	ND	Prospect pit near map; free gold in hand specimen.
8b	79BT102	0.12	5.0	30	ND	ND	10	20	500	ND	Quartz vein-rhyolite dike in prospect pit.
9	79BT104	0.23	ND	70	ND	ND	20	ND	50	ND	Quartz-vein chip sample from altered dike in prospect pit.
10	79BT20	0.03	7.0	30	ND	ND	50	1,000	1,000	ND	Altered mafic dike.
11	79BT16	0.00	5.0	10	ND	ND	200	2,000	500	ND	Altered mafic dike with gossan.
12	79BT205	0.01	5.0	700	ND	200	10	ND	300	ND	Siderite-quartz vein in sandstone.
13	79BT194	0.01	5.0	50	ND	200	50	1,000	500	100	Mafic dike with alteration.
14	78BT387	ND	0.6	68	23	55	70	1,000	500	ND	Iron-stained, porphyroblastic hornfels.
15	77BT249	0.03	13.7	280	99	1,050	81	NA	NA	NA	Iron-stained, hornfelsed intrusive border phase.
16	78GL328	ND	0.5	77	10	61	20	1,000	500	ND	Iron-stained mafic intrusive rock near contact with country rock.
17	78BT446	0.24	0.8	39	18	75	ND	20	300	ND	Cinnabar ore from prospect dump; contains 2 percent cinnabar and some arsenopyrite.
18	79BT267A	0.00	2.0	10	ND	ND	10	ND	500	ND	Manganese-stained breccia in hornfels aureole; samples from prospect pits.
	79BT267B	0.01	5.0	100	ND	ND	15	ND	1,000	ND	
19	79BT104	0.01	23.0	70	5,000	ND	50	ND	500	ND	Anomalous pan concentrate containing specks of galena.
20	78BT490	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	Disseminated chalcopyrite in intrusive; not analyzed.

Analytical work by M.R. Ashwell and N.C. Veach, DGGS Minerals Laboratory. Cu, Pb, Zn, Ag, Au, and Ni in 1977 and 1978 samples and gold in 1979 samples (see field-number prefix) analyzed by atomic-absorption spectrophotometry. All remaining elements in 1978 and 1979 samples analyzed by emission spectrography. Underlined samples are considered anomalous. Be, Sn, Mo, Co, W, Sb, Bi, Zr, and Nb were below limits of detection in all rock samples; NA = not analyzed, ND = not detected.

← Table 4. *Paleocurrent data from Cretaceous sedimentary rocks, Iditarod D-1 Quadrangle, Alaska (measurements taken on striation casts, groove casts, flow casts, and cross-beds).*

Map number	Location and description of collection site	Azimuth(°) (corrected for tilt)	Grand mean(°)	Standard deviation(σ)	Remarks
1	About 62°55', 156°23'; 1 mi south of headwaters of Windy Creek.	234, 237, 240, 229	235.0	3.0	Statistically significant
2* (Takotna River)	About 62°57', 156°11'; west bank of Takotna River, 3 mi southwest of Takotna.	266, 266, 260	264.0	3.5	Statistically significant.
3a* (Takotna Dump A)	62°58', 156°08'; Takotna Dump, 1-1/2 mi southwest of Takotna.	274, 292	286.0	11.5	Statistically significant.
3b* (Takotna Dump B)	About 100 yd west of locality 4.	213, 228, 54	207.5	109.6	Statistically random.
3a + 3b			272.5	66.7	Statistically random.
4	62°51', 156°11'; 1,100-ft elevation on ridgeline 4-1/2 mi southwest of Tatalina Air Force Station.	250, 248	249.0	- - -	Statistically significant based on two available measurements

*Collected and interpreted by Bruce Panuska, University of Alaska, Fairbanks.

Table 5. *Cretaceous plant-fossil identifications from McGrath-Upper Innoko River area, Alaska (by C.J. Smiley, University of Idaho, Moscow).*

Map number	Location and description of collection site	Remarks
1	62°59', 156°25'; 2 mi southwest of Rosander gold camp, Yankee Creek.	Very small piece of silty sandstone containing small, flat wood chip that appears to be rounded by abrasion.
2	62°58', 156°22'; 1 mi east of junction between South Fork and Yankee Creek.	Fairly 'clean,' medium-grained sublithic sandstone with unidentifiable wood chips.
3	62°58', 156°18'; headwaters of Ready Bullion Creek.	Gray, medium-grained sublithic sandstone with a large, flat, carbonized wood stem.
4	63°00', 156°10'; headwaters of Canadian Creek on boundary of Ophir A-1 and Iditarod D-1 Quadrangles.	Long, narrow wood chips on bedding surface of medium-grained, light-gray sandstone.
5	62°58', 156°08'; Takotna dump 1-1/2 mi southwest of Takotna.	Abundant plant debris in sheared and deformed lithic sandstone-siltstone section; lignitic mat is 1 in. thick (not examined in detail).

Table 6. *Invertebrate-fossil identifications, Iditarod D-1 Quadrangle, Alaska (by R.B. Blodgett, Oregon State University, Corvallis; Carol Allison, University of Alaska, Fairbanks; and T.K. Bundtzen).*

Map number	Location and description of collection site	Remarks
1	63°00', 156°21'; in bedrock drain about 1/3 mi south of Rosander gold camp, Yankee Creek.	Similar to trace fossils reported by Hantzschel (1975) in Mesozoic flysch deposits worldwide. Dominant forms are *Cosmorhapre* and *Paleodictyon*. Also contains *Helminthoida* (previously reported in Cretaceous rocks from Alaska); *Helminthopsis*, and *Dendrothichnium* (reported from Upper Cretaceous rocks in Spain); *Protopaleodictyon* (reported from North American flysch deposits of Mississippian to Tertiary age).
2	62°58', 156°21'; along cat trail 1-1/2 mi west of Skookum Mountain.	*Inoceramus* sp? fragment in siltstone (Ksv unit).
3	62°57', 156°28'; about 1 mi south of road on high ridge line near divide between Ganes and Yankee Creeks.	Undetermined crinoid columnals and brachiopods in light-gray sandy limestone. Radiolaria dissolved from chert yield late Paleozoic age.
4	62°54', 156°20'; about 2-1/2 mi south of invertebrate-fossil locality 2.	*Inoceramus* sp? prisms in coarse lithic sandstone (Ksc unit).
5	62°58', 156°10'; 6 mi southwest of Takotna.	*Inoceramus* sp? prisms in channel sandstone (Ksh unit).
6	62°59', 156°05'; 1 mi southwest of Takotna.	Two unidentified gastropods about 1/2 in. diameter.
7	62°59'30", 156°03'; west end of Takotna airstrip.	Large (8-10 cm long) *Inoceramus* sp. *I. dunveganensis(?)* in 1-ft-thick shale-siltstone bed; most specimens destroyed upon retrieval.

Table ③ *Major-oxide analyses*[a] *and CIPW norms of igneous rocks in the Iditarod D-1 Quadrangle, Alaska.*

Map no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Field no.	79BT117	79BT159	79BT14	79BT6b	79BT6a	78BT408	79BT36	79BT53	78BT473	78BT393	78BT390	78GL343	78BT387	78GL346	78BT436	78BT435	79BT281	79GL150
Rock type	Altered mafic dike[b]	Rhyolite dike	Mafic dike[b]	Rhyolite dike	Monzonite	Basaltic andesite (Kac)	Altered mafic dike[b]	Fresh(?) mafic dike[b]	Monzonite	Monzonite	Monzodiorite border phase	Monzonite	Basalt border phase	Basalt	Monzonite	Monzodiorite	Monzonite	Quartz monzonite
SiO_2	50.00	70.80	49.10	72.10	60.80	54.30	48.40	50.10	52.20	60.10	50.70	56.50	51.90	55.40	60.70	54.40	55.80	64.90
Al_2O_3	11.50	14.50	11.00	14.00	16.50	13.80	11.00	12.50	18.00	16.40	17.50	17.60	14.20	16.70	19.30	16.70	15.40	14.90
Fe_2O_3	0.41	0.50	1.38	1.01	0.31	1.79	0.82	1.03	1.88	0.74	0.03	1.67	1.13	1.24	0.33	1.14	1.19	1.48
FeO	6.28	0.63	5.65	0.54	3.80	4.86	5.78	5.72	5.58	4.05	8.23	4.52	8.16	5.89	2.38	6.09	5.45	2.25
MnO	0.21	0.01	0.16	0.01	0.09	0.09	0.22	0.16	0.14	0.09	0.16	0.10	0.24	0.13	0.05	0.14	0.12	0.08
MgO	7.96	0.17	8.60	0.25	2.22	6.65	9.10	6.89	3.35	2.12	4.79	3.26	7.87	5.23	1.80	3.66	2.72	1.20
CaO	5.93	0.88	7.38	0.08	4.90	4.62	8.89	8.05	6.49	3.63	8.08	6.18	7.11	7.59	4.84	6.58	4.96	2.54
Na_2O	1.40	3.60	1.36	2.65	3.23	2.38	1.27	1.66	4.23	4.19	3.31	3.35	2.16	3.38	3.71	3.51	4.27	3.76
K_2O	1.11	3.98	1.67	2.70	3.17	1.98	0.25	0.87	3.52	4.60	2.49	3.88	2.32	2.98	4.99	3.20	2.27	4.34
TiO_2	0.61	0.09	0.71	0.07	0.54	0.86	0.62	0.68	1.05	0.69	1.22	0.92	0.74	0.93	0.49	0.95	0.85	0.51
H_2O	0.30	0.17	0.35	0.38	0.21	0.90	0.42	0.55	0.25	0.22	0.19	0.34	2.21	0.17	0.00	0.16	0.32	0.31
LOI[c]	11.20	1.12	10.60	1.86	1.96	4.51	10.70	8.48	0.08	0.06	0.05	1.16	0.31	0.37	0.31	0.27	4.53	0.34
Total	96.91	96.45	97.96	95.65	97.73	96.74	97.47	96.69	96.77	96.89	96.75	99.48	98.35	100.01	98.90	96.80	97.88	96.61
Norms																		
Quartz	9.86	32.31	6.17	45.78	14.02	10.63	7.63	9.00	0.00	5.74	0.00	3.49	0.27	0.00	6.02	0.77	5.85	18.53
Orthoclase	6.56	23.52	9.87	15.96	18.73	11.70	1.48	5.14	20.80	27.18	14.71	22.93	13.71	17.61	29.49	18.91	13.41	25.65
Albite	11.85	30.46	11.51	22.42	27.33	20.14	10.75	14.05	30.19	35.45	27.05	28.35	18.28	28.60	31.39	29.70	36.13	31.82
Anorthite	21.82	4.37	18.98	0.40	21.16	21.12	23.58	24.09	19.73	12.36	25.54	21.53	22.20	21.59	21.27	20.38	16.15	10.96
Nepheline	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.04	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diopside	6.17	0.00	14.18	0.00	2.61	1.44	16.53	12.84	10.26	4.69	12.08	7.46	10.68	13.10	2.25	10.15	7.03	1.34
Hypersthene	27.41	1.04	22.96	0.68	10.23	22.06	24.02	19.76	0.00	8.80	0.00	10.06	27.65	14.66	6.76	13.02	11.12	4.55
Olivine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.68	0.00	14.25	0.00	0.00	0.34	0.00	0.00	0.00	0.00
Magnetite	0.59	0.72	2.00	1.46	0.45	2.60	1.19	1.49	2.73	1.09	0.04	2.42	1.64	1.80	0.48	1.65	1.73	2.15
Ilmenite	1.16	0.17	1.35	0.13	1.03	1.63	1.18	1.29	1.99	1.31	2.32	1.75	1.41	1.77	0.93	1.80	1.61	0.97
Corundum	0.00	2.67	0.00	6.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Differentiation index	28.27	86.19	27.54	84.16	60.08	42.47	19.85	28.19	54.02	58.38	42.28	54.77	32.26	46.21	66.90	49.38	55.39	76.00

[a]Analyses by X-ray fluorescence, DGGS Minerals Laboratory.
[b]Petrographic studies show interstitial calcite alteration(?) in groundmass of some mafic-dike samples. Large loss on ignition (LOI) rendered norm calculations questionable.
[c]Loss on ignition.

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