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Bundtzen and others 1992, sheet 1 of 2
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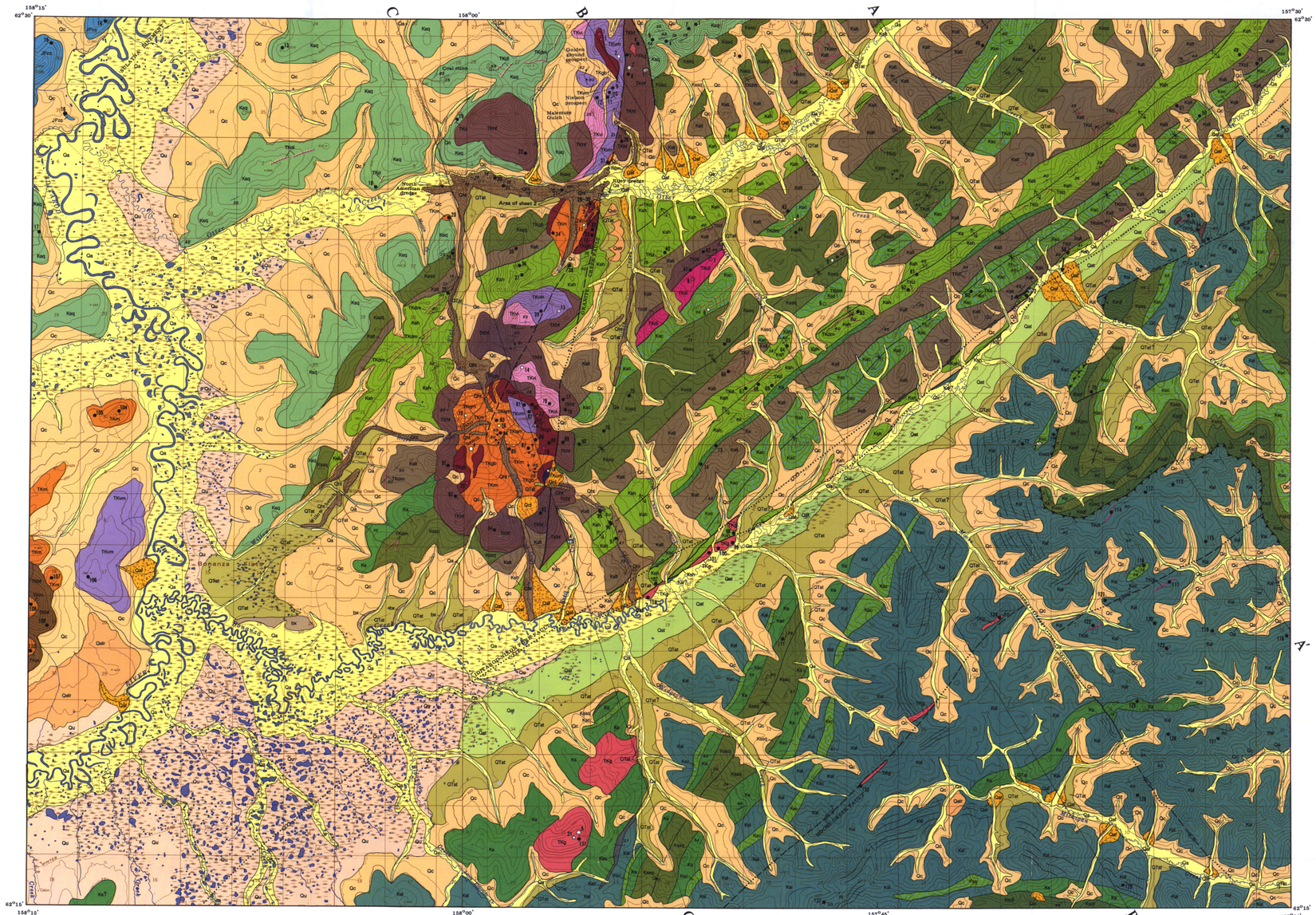
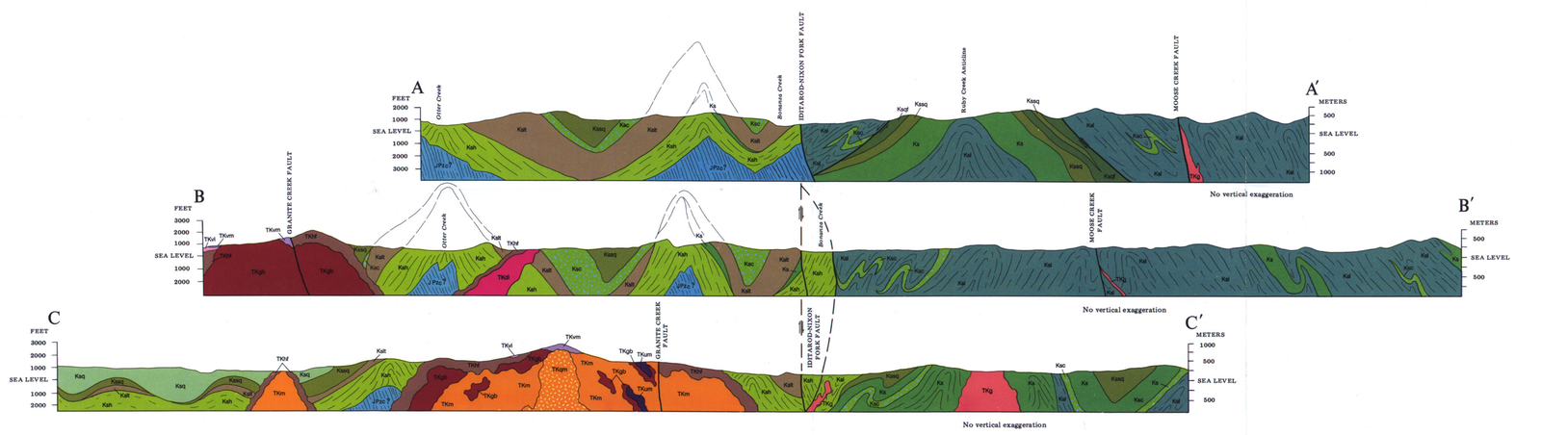


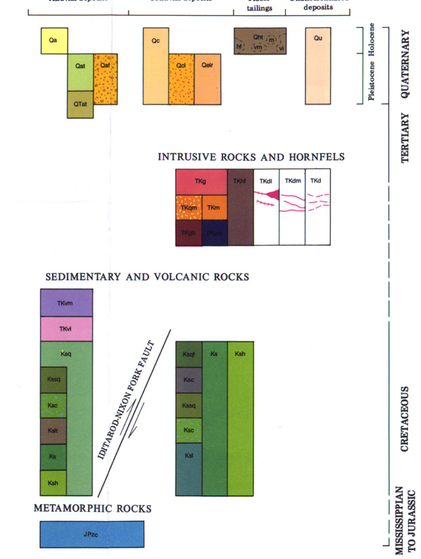


GEOLOGIC MAP OF THE IDITAROD B-4 AND EASTERN B-5 QUADRANGLES, ALASKA

By
T.K. Bundtzen, M.L. Miller, G.M. Laird, and K.F. Bull

1992

CORRELATION OF MAP UNITS

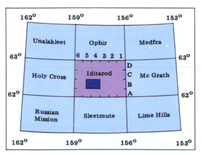


MAP SYMBOLS

- Contact—Approximately located
- High-angle fault—Dashed where inferred; dotted where uncertain. U, upthrown side; D, downthrown side. Arrows show direction of relative movement
- Thrust fault—Sawteeth on upper plate; dotted where concealed; queried where uncertain
- Anticline, showing trace of axial plane and direction of plunge. Dashed where inferred or concealed; queried where doubtful
- Syncline, showing trace of axial plane and direction of plunge. Dashed where inferred or concealed; queried where doubtful
- Strike and dip of beds
  - Inclined
  - Vertical
  - Overturned
- Strike and dip of cleavage
  - Inclined
  - Vertical
- Strike and dip of joints
  - Inclined
  - Vertical
- Fossil locality (table 1)
- Bearing of paleocurrent (table 2)
- Major-oxide chemical analysis (table 3)
- K-Ar age-date locality (table 6)
- Geochemical sample locality (table 10, back pocket)
- Pingo
- Traces of bedding from aerial photographs
- Adit

ALASKA

LOCATION INDEX



DESCRIPTION OF MAP UNITS

UNCONSOLIDATED DEPOSITS

Qa STREAM ALLUVIUM—Unconsolidated silt, sand, and gravel deposited by modern streams; includes flood-plain deposits, which are commonly covered by sphagnum moss. Extensive willow-alder thicket concentrations grow in mature valley fills. Highly variable thickness, 3-10 m (10-33 ft); measurements made in mine and road cuts near Chicken Mountain.

Qaat YOUTHFUL TERRACE ALLUVIUM—Moderately to well-sorted, well-stratified sand and gravel, weakly cemented by iron oxides. Unit is 5-10 m (16-33 ft) above active river flood plains and probably includes some stripped strath terraces in Bonanza Creek valley. Surfaces are generally vegetated, dissected by Holocene streams, and mantled with eolian silt. No absolute age control is available, but unit is believed to be equivalent to Middle Pleistocene deposits in interior Alaska (Péwé, 1975) and Beaver Mountains (Kline and Bundtzen, 1986).

Qaf ALLUVIAL FAN DEPOSITS—Poorly sorted, partially stratified, channelized silt, sand, and gravel. Significant colluvial component generally localized at intersection of tributary and trunk streams. Age range estimated as pre-Wisconsin to early Holocene. Thickness 3-20 m (10-66 ft).

QTat OLDER TERRACE ALLUVIUM—Moderately to well-sorted, well-stratified sand and gravel, usually cemented by iron oxides to a greater degree than Qat. Unit is 10-30 m (33-98 ft) above active river flood plains and includes stripped strath terraces throughout map area. Unit is covered by mature vegetation mat consisting of eolian silt and other poorly drained soils. Extensively dissected by Quaternary streams. No absolute age control is available. Conventional thinking is that most older terrace levels in interior or western Alaska placer districts are Quaternary; however, Hopkins and others (1971) demonstrate 5.7-m.y.-old terrace levels in Seward Peninsula placer fields. Livengood Bench near Fairbanks is now known to be late Tertiary (Karl and others, 1988). Hence, older auriferous terrace levels in the Iditarod district may also be late Tertiary. Estimated 5 m (16 ft) thick.

Qc COLLUVIAL DEPOSITS—Composite unit of poorly sorted silt, sand, and minor gravel in alluvial-colluvial fans, in colluvial debris slopes, and eolian silt. Usually forms on slopes and shows some downslope movement caused by water action. Heavily vegetated and variable thicknesses.

Qcd LANDSLIDE DEPOSITS—Diamictite material consisting of angular bedrock blocks, vegetation mats, stream gravels, and colluvium transported downslope by mass failure. Largest unit exposed on south side of Chicken Mountain.

Qslf SILT-FAN DEPOSITS—Moderately stratified silt, sand, and very minor stream-gravel deposits put there mainly by water gullying action and incision in loess-covered hillslopes; generally reworked loess (eolian) deposits. Heavily vegetated. Contacts with other Quaternary units based largely on airphoto interpretation.

Qm PLACER MINE TAILINGS—Symmetrical or irregular, stacked piles of water-washed, sorted gravels and in-place slab rock derived from bedrock; mostly artificially modified stream alluvium. Cobbles of dominantly resistant metabasalt, monzonite, and hornfels derived from Chicken Mountain and Otter Creek drainage. Fine silt and clay fractions diluted during the placer mining process. Amount of fine material remaining in Qht unit depends on the number of times reworked by placer mining process. Most Qht tailings in Otter, Black, and Flat Creeks are stacked, curvilinear ribs 2-6 m (7-20 ft) high and 1-2 m (3-7 ft) thick; tailings were derived from three floating, bucketline, stacker dredges in operation from 1912 to 1966. Dredges commonly dug 1 m (3.2 ft) into bedrock, so the last material to land on tailing piles was bedrock rubble. Qht tailings on Prince, Chicken, Willow, Black, Upper Otter, Happy, Granite, and Slate Creeks are cone-shaped, gravel piles, 3-6 m (10-20 ft) high and 8-15 m (26-50 ft) in diameter, that were stacked by draglines or tractors during mechanized placer mining activities. Tailings 2-6 m (6.4-20 ft) thick throughout map area. Symbols within dashed areas in Qht unit indicate bedrock type underneath the processed alluvium: m (monzonite), hf (hornfels), vi (intermediate volcanics), vm (mafic volcanics). Bedrock in these areas was determined by mapping formerly active mine cuts (now buried) and by examining tops of dredge tailing piles.

Qu QUATERNARY DEPOSITS UNDIFFERENTIATED—Unconsolidated alluvial, colluvial, and eolian deposits. Eolian deposits in valley fills are usually ice rich. Colluvial and alluvial deposits are bedrock-derived talus and alluvial aprons. Unit almost always obscured by vegetation, but good exposures of ice-rich eolian deposits appear in mine cuts on Willow and Happy Creeks, on Bonanza Creek, and in upland areas of Moose Creek.

INTRUSIVE ROCKS AND HORNFELS

TKg GRANITE PORPHYRY—Light-gray, bleached, aphanitic to fine-grained, locally garnet-bearing, quartz porphyritic, muscovite, biotite dacite, and granite porphyry, locally alaskite. Generally restricted to dikes and small stocks or sills; conspicuous tan rubble contrasts with gray rubble of most other lithologies. Color index (CI) ranges from 3 to 5. K-Ar mineral separates show radiometric ages of 69.97 and 69.32 Ma in one sample and 64.30 Ma in the second sample (table 6).

TKqm QUARTZ MONZONITE—Light to medium gray, fine-grained, equigranular to locally porphyroaphanitic, biotite, clinopyroxene quartz monzonite, locally syenite. Confined to a small mapped area near the center of the Chicken Mountain stock. Distinguished by its generally fine-grained texture.

TKm MONZONITE AND SYENITE—Light to dark gray, porphyritic hypidiomorphic granular, tourmaline-bearing, olivine, biotite, diopside monzonite and syenite. Includes both fine- and coarse-grained variants. A typical monzonite on Chicken Mountain contains zoned plagioclase (30 percent, An_{35-45}), interstitial and poikilitic orthoclase and sanidine (20-25 percent), clinopyroxene; typically diopside (15 percent), biotite (15 percent), olivine (≤2 percent), and minor or trace tourmaline, sphene, hornblende, and zircon. K-spar contains inclusions of plagioclase, biotite, hornblende, and zircon. Color index ranges from 15-35. Opaque minerals are very uncommon (≤2 percent) and, where present, appear to be dominantly ilmenite and chrome spinel. Appears to intrude more mafic TKgb and TKum phases.

TKgb ALKALI GABBRO AND MONZODIORITE—Medium-to coarse-grained, dark gray, hypidiomorphic granular, olivine, edenite, diopside, bronzite, biotite gabbro. Color index ranges from 30 to 60. Forms a discontinuous rim around Chicken Mountain stock; has been intruded by monzonite, syenite, and quartz monzonite. TKgb north of Granite Creek and west of Granite Creek fault is very coarse grained and contains biotite and augite grains up to 1 cm (0.4 in.) in diameter. TKgb in upper Prince Creek drainage contains crystallization nuclei of diopside and olivine rimed by biotite (rarely amphibole) and surrounded by medium-grained normal groundmass of leucocratic minerals.

TKum WEHRLITE—Coarse-grained olivine, diopside, bronzite, edenite, green biotite picrite, a variant of wehrlite, found on Chicken Mountain and as dikes near Golden Horn deposit. Some variants appear to be biotite lamphophyres. Small pod in southeast corner of Chicken Mountain stock, also as dikes and xenoliths in Black Creek stock. Orthopyroxene forms reaction rim around diopside and olivine; amphibole is edenite. Opaque mineralogy is ilmenite ($FeTiO_3$) and minor chrome-spinel. TKum unit appears to be related to alkali gabbro (TKgb); both are intruded by younger(?) monzonite and monzodiorite on Chicken Mountain.

TKhf HORNFELS—Brown to gray, massive to porphyroblastic, chlorite, biotite, locally tourmaline-rich hornfels largely derived from Kuskokwim Group clastic rocks. Dark gray, massive, aphanitic variants sometimes difficult to distinguish from aphanitic volcanic rocks of TKvi and TKvm units. Very resistant and forms hogbacks around Chicken Mountain pluton and two prominant hills north of Otter Creek. Overall distribution suggests that a much larger pluton than is exposed on Chicken Mountain and in Otter Creek underlies much of the Otter Creek drainage.

TKd, TKdi, TKdm DIKES AND DIKE SWARMS—Variety of mafic (TKdm), intermediate (TKdi) and undifferentiated (TKd) dikes and dike swarms most of which are extensively altered. The vast majority of dikes of the TKd unit are believed to be originally mafic (TKdm) in composition, now largely altered to silica, carbonate, calcite, and chlorite rock. A few mafic dikes have central unaltered zones that contain fresh grains of olivine, clinopyroxene, plagioclase, and undifferentiated opaque minerals in a chloritized groundmass.

SEDIMENTARY AND VOLCANIC ROCKS

TKvm MAFIC VOLCANIC ROCKS—Mainly dark greenish gray to maroon, fine-grained to porphyritic, pyroxene-rich, basaltic andesite, and mafic volcanic breccia. Dominant pyroxene is titanoaugite that contains a minor component of hypersthene. Rare olivine grains and phenocrysts from 0.1 to 5 mm in diameter, is usually altered to secondary minerals including serpentine minerals. Unit has locally undergone contact metamorphism by adjacent or underlying plutons and contains secondary biotite, chlorite, and amphibole, that indicate metamorphic grades up to the hornblende hornfels facies. Very resistant; forms prominent knobs and ridges. Estimated 150 m (492 ft) thick.

TKvi INTERMEDIATE VOLCANIC ROCKS—Light- to medium greenish gray, aphanitic to fine-grained, biotite pyroxene andesite and hornblende dacite. Locally contains mafic to intermediate coarse grained volcanic breccia and greenish siliceous tuff layers 1-4 cm (0.4-1.6 in.) thick on Chicken Mountain. Like TKvm unit, has undergone contact metamorphism from adjacent and underlying plutons. Secondary white mica, biotite, and hornblende recognized. Less resistant than TKvm; forms rubble-blocky slopes and ridges. Estimated 100 m thick.

Kaq QUARTZOSE SUBLITHIC SANDSTONE AND SILICEOUS SHALE—Gray to light gray, fine- to coarse-grained, locally conglomeratic, well sorted subangular to subrounded, quartz-rich sandstone and shale; also contains siltstone of similar composition. Fine sand layers are locally crossbedded and lack graded sequences. Unit extends from map area both northward and southward for more than 200 km (124 mi) but is visible only northwest of Iditarod-Nixon Fork fault. Petrographic studies indicate that monocrystalline quartz, polycrystalline quartz fragments, and metamorphic rock fragments predominate, but volcanic-lithic components are present in several samples. Metamorphic class may be derived from nearby Precambrian Idono sequence (Miller and Bundtzen, 1985; Miller and others, 1991). Estimated maximum thickness is 800 m (2,625 ft) but may decrease to 200 m (656 ft) to the southeast.

Kssf GRAY FINE- TO MEDIUM-GRAINED SANDSTONE—Medium- to dark-gray, fine-grained, siliceous sandstone similar to Kasq, but lacking siltstone and shale. Outcrops are massive in appearance.

Kac VOLCANIC BRECCIA, CHERT, TUFF, AND SANDSTONE—Dark green or gray, aphanitic to very fine-grained, massive to brecciated, distinctly tan oxide weathering, volcanic breccia and minor tuffaceous sandstone and chert. Stratigraphic relationship with enclosing Kuskokwim Group clastic rocks is uncertain. However, we speculate that Kac is equivalent to units west of Ganes Creek in Iditarod D-2 Quadrangle and north of Moore Creek in Iditarod C-3 Quadrangle. In both locations, volcanic agglomerate and flow rocks are interbedded near the top of the Cretaceous section. Therefore, Kac may represent initial volcanism as represented in TKvm and TKvi units in study area.

Ksaq FINE-GRAINED SUBLITHIC SANDSTONE AND SILTSTONE—Light- to dark-gray, sometimes olivine-green, mostly fine- to very fine-grained, tight, siliceous sublithic sandstone and medium-gray, plant-rich siltstone and shale. Limited point count analysis (N=3) indicates clast compositions of tightly packed quartz and polycrystalline quartz (50-65 percent), sedigenic sand to shale rip-up clasts (10-15 percent), and variable amounts of radiolarian chert and metamorphic fragments. Dicot leaves found in shales and siltstones, but invertebrate fossils rare to absent. Crossbeds composed of several stacked cosets 3-10 cm (1-4 in.) thick; graded bedding is rare. Ksaq unit lies just below Kaq unit northwest of Idiarod-Nixon Fork fault and near the stratigraphic top of the Kuskokwim group southeast of the Idiarod-Nixon Fork fault. Estimated 400 m (1,300 ft) thick near Flat and 200 m (660 ft) thick on Ruby Creek anticline (sheet 1). Forms conspicuous black-lichen-covered resistant rubble. Individual beds are traceable for 10-20 km (6-12 mi) along strike.

Kac COARSE SANDSTONE AND PEBBLE CONGLOMERATE—Gray to medium greenish gray, indurated, fine- to coarse-grained, volcaniclastic sandstone interbedded with beds to 5 m (16 ft) thick of pebble sandstone and pebble conglomerate. Clast composition based on eight samples shows angular clasts of volcanic lithics (20 percent), chert (20 percent), polycrystalline quartz (20 percent), mixed felsic igneous rocks (12 percent), chlorite (6 percent), white mica (2 percent), limestone (6 percent), opaque minerals (4 percent), and amphiboles and pyroxenes (10 percent) in an oxidized matrix of undetermined composition. Coarse Bouma Tab intervals recognized locally; *Inoceramus* prisms locally common. Thickness 50-200 m (164-656 ft) Kac unit is often wedge-shaped in cross section. Observed on both sides of Iditarod-Nixon Fork fault, but stratigraphic correlation between the two fault-separated sections is uncertain.

Kalt TAN CALCAREOUS SANDSTONE AND SILTSTONE—Heterogeneous unit consisting of gray or (locally) tan weathered, fine- to coarse-grained, subangular to subrounded (clasts), lithic rich, distinctly calcareous sandstone with lesser amounts of noncalcareous sandstone and interbedded micaceous siltstone. Limited point count analysis (N=2) shows subangular to subrounded clasts of altered carbonate (5 percent), chert (15 percent), polycrystalline quartz (15 percent), clinopyroxene(?) and amphibole (3 percent), white mica (9 percent), undetermined mafics and opaques (8 percent), and matrix (35 percent). Unit conspicuously contains *Inoceramus* prisms, plant stems, and occasional dicot leaf fragments. Rip-up clasts, graded Bouma Tabcd intervals, and scour features suggest deposition by turbidity currents. Local distinct tan weathering is believed to be caused by one or several features: (1) extent of oxidation in outcrop, (2) iron rich fluid flow in sediments, or (3) alteration caused by dike swarm density, which is locally conspicuous. Unit probably 400 m (1,312 ft) thick northwest of Iditarod-Nixon Fork fault.

Ks LITHIC SANDSTONE—Light to medium gray, subangular to subrounded, generally medium-grained lithic sandstone, and minor siltstone and shale. Three thin sections contain quartz, polycrystalline quartz, radiolarian chert, metamorphic rock, white mica, chlorite, biotite, and very minor metavolcanic clasts and fragments. Calcareous clasts generally absent and clast provenance is dominantly sedigenic. Exhibits high energy flow regime indicators such as graded bedding Bouma Tabc intervals, and flute casts suggestive of deposition by turbidity currents. Occurs as a 100 m (330 ft) thick unit near base of Cretaceous section northwest of Iditarod-Nixon Fork fault. Interbedded throughout section southeast of Iditarod-Nixon Fork fault.

Ksh SHALE AND SILTSTONE—Medium to dark gray, finely laminated siltstone and shale. Contains very thin fine-grained lithic sandstone layers from 1-2 cm (0.4-0.8 in.) thick. Traces of burrowing organisms found locally in micaceous shale. Contains clasts of radiolarian chert, mica, chlorite, and minor volcaniclastic debris, similar to those found in interbedded coarser grained clastic rocks. Forms base of Cretaceous section northwest of Iditarod-Nixon Fork fault. Estimated 250 m (820 ft) thick.

Kil LIMEY SANDSTONE AND SHALE—Thick heterogeneous unit of medium greenish gray, bleached, weathered, fine- to coarse-grained calcareous lithic sandstone and interbedded shale. Similar to Kalt unit northwest Iditarod-Nixon Fork fault except that coarse-grained facies less dominant than in Kalt, and distinctive iron-stained, tanned zones that typify Kalt are much less intense in Kal. Nevertheless, Kal may be equivalent to Kalt. Kal forms the bulk of sedimentary rock section southeast of Iditarod-Nixon Fork fault and is equivalent to undifferentiated units (Kus) mapped by Bundtzen and Laird (1983). Total thickness unknown, but the basal unit is at least 5,000 m (16,404 ft) thick in eastcentral part of map area. Characteristically nonresistant and forms low, rounded hills.

METAMORPHIC ROCKS

JPzc CHERT AND VOLCANIC ROCKS—Mixed unit of black, recrystallized radiolarian chert, tuffaceous sandstone, and basaltic-andesite flows and flow breccia. Volcanic rocks are metamorphosed to prehnite-pumpellyite facies. Unit is probably equivalent to Innoko terrane of Chapman and others (1982). Assigned Paleozoic to Jurassic(?) age based on Mississippian through Triassic radiolarians found in Ophir Quadrangle (Chapman and others, 1982; Patton and others, 1980) and a possible Jurassic radiolarian from equivalent unit in the Iditarod D-1 Quadrangle (Miller and Bundtzen, 1987).

bx Undifferentiated bedrock may include any lithologies previously described.