CPN Copter Peak & Nuka Ridge allochthons

38.

Contact—Dashed where approximately located; dotted where concealed.

Fault—Dashed where approximately located; dotted where concealed; queried where uncertain.

Major thrust fault bounding allocthons; sawteeth on upper allochthon.

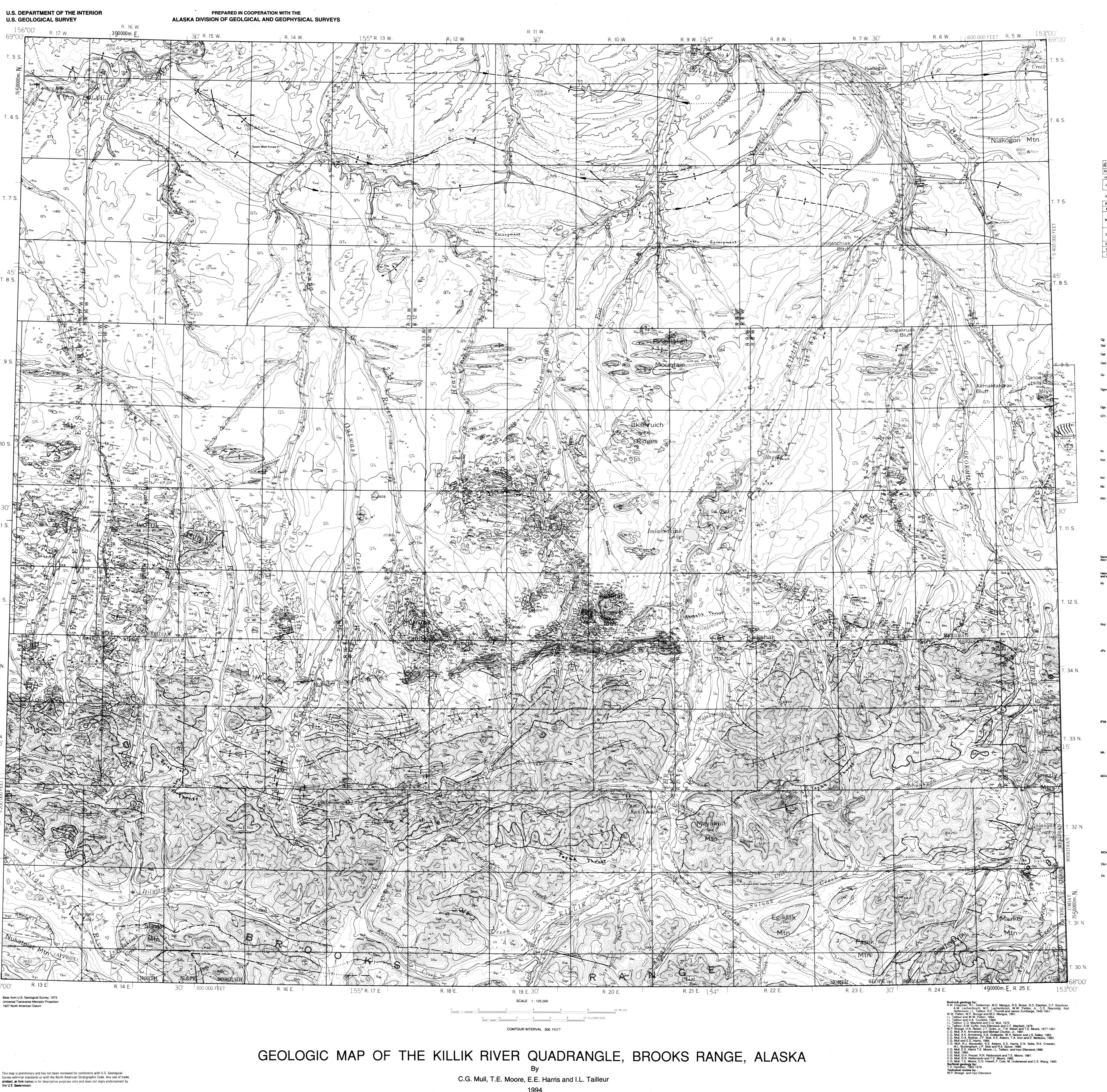
Fold axis—Showing direction of plunge. Dashed where approximately located; dotted where concealed.

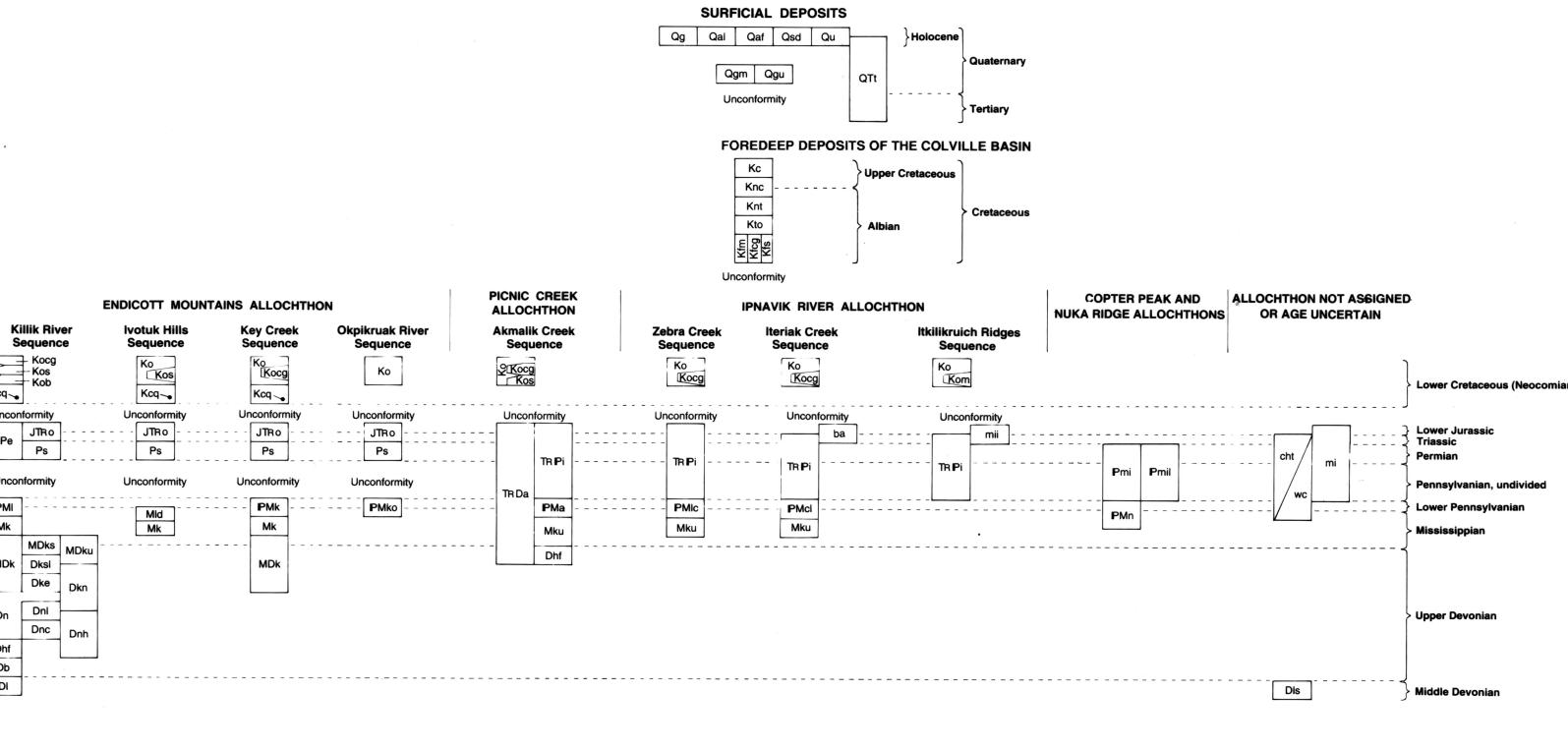
High angle fault—U, upthrown side, D, downthrown side.

Fault—Arrows show relative horizontal movement.

Thrust fault—Sawteeth on upper plate.

Strike and dip of beds





SURFICIAL DEPOSITS, UNDIVIDED (Quaternary)—Includes colluvium and older vegetated alluvial deposits above present stream levels, alluvial fans, upland silt deposits, lacustrine material in Killik, Okokmilaga, and Okpikruak River valleys, and other surficial material not otherwise differentiated. MORAINAL DEPOSITS (Quaternary)—Poorly sorted unstratitified till ranging from clayey stony silt to sandy bouldery gravel, contains large erratic boulders in some places; deposits form subdued to distinct, lightly to heavily vegetated, lateral and terminal moraines that in some places form well defined nested concentric ridges. Includes deposits of Anaktuvuk River, Sagavanirktok River, and Itkillik glaciations.

> Named for exposures in the area of the Ivotuk Hills in the westcentral part of the Killik River Quadrangle (Martin, 1970). OKPIKRUAK FORMATION (Lower Cretaceous, Berriasian or Valanginian)—Greenish gray graywacke with interbedded mudstone and shale, forms rubble covered hills, generally poorly exposed. Along Otuk Creek north of Ivotuk Hills contains poorly sorted polymict cobble-to boulder- conglomerate and breccia, clasts consist of chert, mafic igneous rocks, gabbro, granitic rocks, limestone, and quartzitic sandstone, probably deposited as debris flows. Thickness unknown but probably <500 m, in places contains:

NANUSHUK GROUP, CHANDLER FORMATION (Lower Cretaceous, Albian to Upper Cretaceous, Cenomanian)—Dominantly nonmarine, gray to light-gray sandstone and quartz-and chert-pebble conglomerate interbedded with dark-gray shale and coal, forms rolling tundracovered hills with occasional resistant sandstone or conglomerate ledges north of Tuktu Escamment NANUSHUK GROUP, TUKTU FORMATION (Lower Cretaceous, Albian)—Dominantly gray to greenish-gray very-fine to fine-grained sandstone and conglomeratic sandstone. Kfcg- —As above, contains thick massive beds of pebble- to boulder-conglomerate, clasts are well rounded and consist dominantly of gray, black, and green chert and a large variety of altered mafic igneous rocks.

ALLOCHTHONOUS ROCKS

Kfs —As above, dominantly dark-gray shale and mudstone.

SURFICIAL DEPOSITS

GLACIAL DEPOSITS, UNDIFFERENTIATED (Quaternary)—Stratified and unstratified drift of various glacial intervals. Includes till, outwash and ice-contact deposits.

TERRACE GRAVEL (Quaternary and Tertiary)—Gravel and sandy gravel, forms terraces ranging from 3-4 m above modern stream levels, to high-level terraces as much as 110 m above modern stream levels. Includes extensive low level terrace material near major stream valleys and extensive higher level surfaces near Killik River.

FOREDEEP DEPOSITS OF THE COLVILLE BASIN

Kocg —As above, contains massive cobble- to boulder-conglomerate, in many places is chaotic and unsorted to poorly sorted debris flow deposit; clasts consist dominantly of conspicuous white-weathering diorite and granodiorite, varicolored chert, and some Kos —As above, dominantly dark-gray shale and mudstone.

bearing exotic blocks of chert, silicified limestone or mudstone in sheared mudstone thickness less than 10 m. Unit is complexly delormed and continuing delong associated with Otuk Formation; in Killik River sequence, is observed only in small outcrops at mountain front east of Kurupa Lake, near the west fork of Kurupa River, west of Outwash Creek, and in float overlying Otuk Formation at "The Flap" near Killik River; also present in scattered outcrops in the foothills along Imnaitchiak Creek. Known occurrences shown by large dots on map. JPe ETIVLUK GROUP (Middle Jurassic to Permian)—Divided into:

limestone member—thinly interbedded shale and thin-bedded black- and light-grabanded limestone and silicified limestone commonly with abundant *Monotis* at Halobia sp. pelecypods, weathers yellowish-tan (Late Triassic); and at the top, the Blankenship Member—organic-rich black shale and thin bedded chert, represent condensed deposition (Early and Middle Jurassic). Formation generally not we

KAYAK SHALE (Lower Mississippian)—Dark-gray to black fissile clay shale with yellowish-brown-weathering thin fossiliferous limestone beds near top, commonly contains conspicuous reddish-brown-weathering nodules; lower part contains thin interbeds of gray sandstone, gradational downward into Kanayut Conglomerate. Forms broad bare shale slopes south of frontal Lisburne ridges in central part of quadrangle, is complexly deformed by isoclinal folding, and acts as a detachment zone for overlying Lisburne; thickness unknown, appears very thick, probably >500 m thick. KANAYUT CONGLOMERATE (Lower Mississippian(?) to Upper Devonian)—Thick succession of gray- to brown-weathering quartzitic sandstone, quartz- and chert-pebble conglomerate, and shale, forms high mountains in the southern part of quadrangle, interpreted as dominantly fluvial deltaic deposits, thins and becomes finer grained westward in the quadrangle;

SHAININ LAKE MEMBER (Upper Devonian)—Pebble to cobble conglomerate, quartzitic sandstone, and minor shale; conglomerate clasts consist of chert, quartz, and minor quartzite; braided stream deposit, forms a massive dark gray to black weathering resistant marker unit up to 600 m thick; becomes thinner and less conspicuous in the western and southern part of the quadrangle; grades down into Ear Peak Member. Dke EAR PEAK MEMBER (Upper Devonian)—Shale, siltstone, sandstone, quartzite, and conglomerate. Shale is red to brown in northern part of area and black in southern part of area, quartzite, conglomeratic sandstone, and conglomerate generally in beds 1 to 3 m thick, conglomerate clasts of quartz and gray, black, green, and occasionally red to maroon chert, generally fining and upward thinning cycles, meandering stream deposit, unit is up to 300 m thick. MDku UPPER PART OF KANAYUT CONGLOMERATE, UNDIVIDED (Lower Mississippian(?) and Upper Devonian)—Includes part of Stuver and Shainin Lake Members north of the Toyuk thrust, mapped in area of upper drainages of East Fork of Etivluk River and Outwash Creek.

NOATAK SANDSTONE (Upper Devonian, Famennian)—Light gray- to light-brown, fine- to coarse-grained thick bedded sandstone and quartzite in units up to 20 m thick; interbedded with dark-gray to brown shale with ironstone nodules; upper part generally forms steep tan-weathering rubble-covered mountain slopes, becomes thinner bedded downward in section. In southwestern part of quadrangle south of Toyuk thrust formation is locally differentiated into: NOATAK SANDSTONE, LOWER PART (Upper Devonian)—gray to greenish-gray, medium-bedded sandstone, generally fine-grained, calcareous, finely micaceous, contains abundant yellow-orange limonitic spots, commonly contains conspicuous cross beds and ripple marks; beds up to 2 m thick, interbedded with gray silty micaceous shale and local thin silty limestone beds; interval forms generally snifooth, dark reddish-brown to brown weathering, rubble-covered mountain slopes, dominantly marine shelf sediments, probably >500 m thick. Contains Late Devonian (Famennian) brachiopods and conodonts (J. T. Dutro, Jr. and R. B. Blodgett, and A.G.

UNNAMED LIMESTONE (Upper Devonian)—Possibly part of Beaucoup Formation, mapped locally south of Toyuk thrust near head of Kakivilak Creek in southcentral part of quadrangle.

Kos —As above, dominantly dark-gray shale and mudstone. OTUK FORMATION (Middle Jurassic to Early Triassic)—See description of Otuk Formation in Killik River sequence. In the Ivotuk Hills sequence, unit is generally not well exposed, commonly exposed only as yellow-gray weathering rubble of the limestone member or in a few well exposed but structurally complicated partial sections in stream cuts. Type locality of formation on east bank of Otuk Creek 6.3 km north of Ivotuk Hills. Exposed thickness <50 m at type locality shale member mostly covered. SIKSIKPUK FORMATION (Permian)—See description of Siksikpuk Formation in Killik River sequence. In the Ivotuk Hills sequence, unit is exposed only on south side of Ivotuk Hills, contains barite nodules on tributary of Otuk Creek at west end of Ivotuk Hills. Thickness probably <75 m. LISBURNE GROUP, UNDIVIDED (Mississippian, Meramecian to Chesterian)—Dolomite, light to medium gray, thin- to thick-bedded, massive, with white to bluish-gray weathering chert, some bioclastic beds, some beds of spiculitic mudstone and chert, dominantly thin-bedded chert and minor shale in lower part. In some zones, contains abundant pinpoint to vugular porosity filled with tarry oil and solid hydrocarbons. Forms high rubble covered ridges of Ivotuk Hills. Contains conodonts ranging from late Meramecian to latest Chesterian (Dumoulin and Harris, 1993). 225 m thick.

Named for exposures along Key Creek, a tributary of the Kelly River in the De Long Mountains Quadrangle (Mayfield and others, 1982); in the Killik River Quadrangle exposed along the mountain front west of Outwash Creek. OKPIKRUAK FORMATION (Lower Cretaceous, Berriasian or Valanginian)—Dominantly graywacke with interbedded poorly exposed mudstone, exposed only locally between Ivotuk River and East Fork of Etivluk River, in places contains differentiated unit:

SIKSIKPUK FORMATION (Permian)—See description of Siksikpuk Formation in Killik River sequence. In the Key Creek sequence, unit is present mostly in rubble along mountain front in western part of quadrangle. Thickness probably <100 m. KUNA FOHMATION, OF LISBURNE GHOUP (Lower Pennsylvanian, Morrowan Mississippian, Osagean)—Interbedded black siliceous mudstone, sooty limestone and dolomi and shale; forms low resistant ridges north of mountain front. Reference section for formation located on Otuk Creek 2.5 km north of mountain front. In Howard Pass Quadrangle, contai Osagean (Late Tournaisian) conodonts, (Durnoulin and Harris, 1993, 1994), but siliceous zon at top elsewhere contain Osagean to Morrowan (early Visean? to Bashkirian) (La Mississippian to early Middle Pennsylvanian) radiolarians, (Murchey and others, 198 Thickness <75 m.

MDk KANAYUT CONGLOMERATE (Lower Mississippian to Upper Devonian)—See descriptions of Kanayut units in Killik River sequence.

Here named for exposures along the Okpikruak River, 15-19 km north of Endicott Mountain front in the eastern Killik River Quadrangle. Mapped in scattered exposures between Killik River and Okokmilaga OTUK FORMATION (Middle Jurassic to Early Triassic)—See description of Otuk Formation in Killik River sequence. In Okpikruak River sequence unit is exposed mostly as yellow-gray weathering rubble of the timestone member in Okpikruak River area. Blankenship Member at top and shale member at base not exposed. Thickness probably <75 m. IPMko KUNA FORMATION, OF LISBURNE GROUP (Lower Pennsylvanian, Morrowan to Mississippian, Osagean)—Dark-gray, fine grained micritic limestone, with black chert and sooty black shale, in tightly folded crumpled exposures that form low resistant ridges and rubble exposures along Okpikruak River, Okokmilaga River, and Killik River north of mountain front. Dated by analogy to dated Kuna in Key Creek sequence to the west. Exposed thickness < 50 m.

PICNIC CREEK ALLOCHTHON Named for exposures in the Picnic Creek fenster in the eastern De Long Mountains of the western Brooks Range (Mayfield and others, 1982). New formations in this quadrangle named by Mull and others (1987). Akmalik Creek Sequence Here named for exposures on Akmalik Creek, a tributary of the Killik River near Kikiktat Mountain.

Koog —As above, contains cobble to boulder conglomerate. In Heather Creek and Imnaitchiak Creek area, unit is an olistostrome containing large rounded cobbles and boulders of white, gray, and blank chert, light-gray limestone, granodiorite, diorite, gabbro, basalt, fine-grained mafic igneous rock, and angular blocks of limestone up to 5 m long. AKMALIK CREEK SEQUENCE, UNDIVIDED (Triassic to Upper Devonian(?))—Consists of, in descending order, Imnaitchiak Chert, Akmalik Chert, Kayak Shale, Kurupa Sandstone, and Hunt Fork Shale, mapped in poorly exposed rubble-covered hills between East Fork Etivluk River and Ivotuk Creek.

1987)—Yellowish-orange weathering gray to greenish gray thin-bedded chert or silicifi mudstone, with interbedded siliceous shale, overlain by greenish-gray to maroon silty mudsto base contains a distinctive dark gray evenly laminated glauconitic, phosphatic siltstone bed up 1 m thick; locality at Akmalik Creek marked by an oncolitic conglomerate replaced by bar Unit commonly structurally contorted, thickness <75 m thick.

KURUPA SANDSTONE (Lower Mississippian) (Mult and others, 1987)—Sandstone, light-to medium-gray, beds up to 1 m thick, abundant amalgamated graded beds, abundant flutes and grooves and well developed Bouma sequences. Sand 80-85% quartz, <10% chert, <10% feldspar. Weathers reddish brown, forms resistant ridges or spurs on valley walls. Well exposed at type locality in Kurupa Hills and in Akmalik Creek. Contains abundant plant fossils particularly near top formation, and scattered brachiopods near Otuk Creek. Dated as Kinderhookian to Meramecian. Thickness <40 m, grades downward into Hunt Fork Shale. HUNT FORK SHALE (Upper Devonian)—Greenish gray to gray silty mudstone and fissile shale, usually poorly exposed, but up to ~500 m thick in Kurupa Hills. IPNAVIK RIVER ALLOCHTHON

OKPIKRUAK FORMATION (Lower Cretaceous, Valanginian)—Graywacke, greenish-gray fine-grained to very coarse-grained, dominantly rubble exposures, in places contains:

PMic UNNAMED LIMESTONE AND BLACK CHERT OF LISBURNE GROUP (Pennsylvanian to Mississippian)—Rhythmically thinly interbedded dark gray to black micritic limestone, black silicified limestone, and siliceous mudstone; upper third of section contains thick section of bedded black chert or silicified limestone and mudstone; has a distinctive black and gray banded appearance where well exposed. Deposited as a carbonate turbidite (A.K. Armstrong, oral commun., and Dumoulin and Harris, in press). Distinguished from Akmalik Chert by presence of abundant thin-bedded micritic limestone beds. On Zebra Creek, contains Osagean to Meramecian conodonts (A.G. Harris, written commun., 1991). In Howard Pass Quadrangle, contains Osagean (late Tournaisian to middle Visean) (early Mississippian) conodonts. (Dumoulin and Harris, 1993, 1994). >145 m thick on Zebra Creek, contains poorly exposed Kurupa Sandstone at base.

Here named for exposures in the Iteriak and Otuk Creek area in the western part of the quadrangle, where it may consist of two separate thrust panels, one of which is distinguished by more abundant igneous rocks. Forms mostly rubble-covered ridges with few good outcrops. OKPIKRUAK FORMATION (Lower Cretaceous, Berriasian(?) to Valanginian)—Greenish-gray, thin- to thick-bedded, fine-to very coarse-grained graywacke sandstone and siltstone, with rhythmically interbedded mudstone and shale, some beds contain sole markings and small scale ripple cross-lamination and convolute bedding; in other localities contains slightly calcareous and micaceous sandstones, coarse-grained beds contain conspicuous white leached chert grains and black shale flakes; intruded by white felsic dike at one locality on Otuk Creek. Locality on Iteriak Creek contains Valanginian Buchia sublaevis (W.P. Elder, written commun., 1992). Locally contains: Kocg —Cobble to boulder conglomerate. On tributary of Iteriak Creek forms 7 m-high pinnacle, composed dominantly of round boulders of felsite, granite, granodiorite, tonalite, fine-grained altered mafic and intermediate igneous rock, and tuff-breccia up to 70 cm diameter, and small black chert pebbles. On a tributary of Otuk Creek, a 25 m-thick chaotic disorganized conglomerate debris flow contains round cobbles and boulders to 45 cm diameter consisting of granodiorite, gabbro, fine-grained altered mafic igneous rock, limestone, tasmanite (organic-rich shale), and smaller pebbles of black, gray, blue-green, and white chert; interbedded graywacke contains blue amphibole grains (J.A. Dumoulin, oral commum.); interval forms conspicuous channel cut into graywacke and underlying cherts.

IMNAITCHIAK CHERT (OF ETIVLUK GROUP) (Triassic to Pennsylvanian) (Mull and others, 1987)—Gray, greenish gray, and maroon bedded chert, silicified mudstone, and silty shale; commonly contains brilliant turquoise-blue-green chert where associated with basalt, commonly contains associated blocks and beds of tasmanite—a distinctive organic-rich shale. Forms mostly rubble exposures, commonly structurally contorted. PMcI UNNAMED GRAY LIMESTONE AND CHERT OF LISBURNE GROUP (Pennsylvanian(?) to Mississippian)—Thinly interbedded gray to dark gray micritic limestone and gray to black chert; imestone contains abundant sponge spicules in places; chert frequently weathers white; limestone weathers gray; forms smooth rubble covered hillsides with few bedrock exposures. Dated by analogy to rocks of Akmalik Creek sequence. Near Iteriak Creek contains conodonts no older than middle Osagean (Dumoulin and Harris, 1993, 1994).

OKPIKRUAK FORMATION (Lower Cretaceous, Berriasian(*) to Valanginian)—Green greenish gray graywacke, fine to coarse grained and poorly exposed gray silty mudstone; local Kom —As above, contains abundant mafic igneous clasts, some agglomerate, and breccia; generally poorly exposed, apparently derived from and difficult to differentiate from associated mafic igneous rocks (mii). IMNAITCHIAK CHERT, OF ETIVLUK GROUP (Triassic to Pennsylvanian) (Mull and other 1987)—Gray, greenish gray, to black chert and silicified mudstone, mostly rubble exposures. MAFIC IGNEOUS ROCKS—Dark green, fine- to coarse-grained basalt, underlies Itkilikruich Ridge, light gray to greenish gray aphanitic rocks and volcanic breccia form isolated hills to south; on prominent cone-shaped mountain west of Ivotuk airstrip unit is conspicuously vesicular and amygdaloidal, age uncertain.

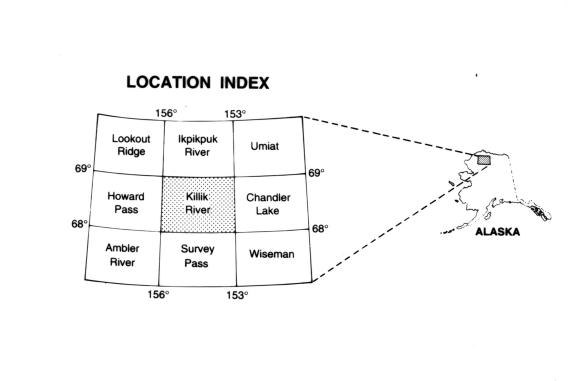
COPTER PEAK AND NUKA RIDGE ALLOCHTHONS, UNDIVIDED Named for Copter Peak and Nuka Ridge in the De Long Mountains of the western Brooks Range (Mayfield and others, 1982).

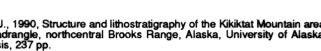
Kikiktat Mountain Klippe Forms Kikiktat Mountain, north of mountain front in central part of quadrangle. Upper part of klippe occupies structural position of Copter Peak allochthon. However, it differs from the Copter Peak allochthon because basalt that forms the top of the klippe overlies clastic sedimentary rocks of the Nuka Formation at a baked contact rather than at a thrust fault, suggesting that the basalt and Nuka at this location represent a single allochthon (Solie and Mull, 1991). Similar rocks closely associated with Nuka Formation also crop out in a small area west of Iteriak Creek. Basalt in the lower part of the klippe occupies the structural position and is similar to basalt in the Ipnavik River allochthon.

NUKA FORMATION (Pennsylvanian-Mississippian)—Arkosic limestone and sandstone, medium gray, weathers light gray, and interbedded black clay shale. Sandstone is fine to medium grained, calcareous, in thickening- and coarsening-upward beds, section has turbidite characteristics with graded beds up to 1 m thick with convolute bedding and large flute casts at base of some beds; base of section dominantly black clay shale. Arkosic limestone contains Late Mississippian to Early Pennsylvanian fossils in scattered localities (Solie and Mull, 1991). Section approximately 30 m thick, overlain by mafic igneous complex (Pmi) at a baked contact. Thrust fault contact with underlying mafic igneous rock (Pmil). MAFIC IGNEOUS COMPLEX, LOWER PART (Pennsylvanian(?))—Basalt with intervals of intercalated black chert, dolomitic(?) limestone, and shale. Basalt is fine grained and homogeneous although sheared in places, is composed of several 2 m-thick layers that may be either sills or flows; near top of unit one zone appears to contain pillows. A 3 m-thick interval of chert, limestone, and shale forms a prominent white to light-gray weathering band near middle of basalt interval; chert beds appear to be diagenetic and preserve parallel and cross bedded lamination in some places, are up to 9 cm thick, in some places have irregular bedding or occur as small isolated masses. Limestone contains bryozoans in at least two localities. Some basalt-sediment contacts are concordant, with no indication of fault movement; other contacts are thrust contacts. Age uncertain. Unit 30-50 m thick. Associated basalt and limestone, and structural position beneath Nuka Formation are characteristics of the Ipnavik River allochthon, but for convenience, unit is mapped as part of Kikiktat Mountain klippe. Base is a thrust fault.

ROCKS NOT ASSIGNED TO A SPECIFIC ALLOCHTHON LIMESTONE AND MARBLE (Devonian)—Coarse-grained, light-gray limestone, commonly recrystallized, forms white-weathering pinnacles up to 10 m high surrounded by tundra near Nogak Creek and Otuk Creek. Distinguished from limestone of Lisburne Group by light-gray color and absence of chert; resembles Baird Group carbonates in southern Brooks Range. Probably emplaced as tectonic slivers at base of Ipnavik River allochthon. Unfossiliferous, but similar rocks 30 km west in Howard Pass Quadrangle contain Middle or Late Devonian fossils (Chapman and others, 1964). WHITE-WEATHERING CHERT OR SILICIFIED LIMESTONE—Forms, isolated rubble exposures surrounded by tundra; weathering character similar to chert in Ipnavik River allochthon but in places difficult to distinguish from weathered rubble exposures of limestone member of Otuk Formation.

GRAY, BLUISH-GRAY, GREENISH-GRAY, OR BLACK CHERT AND SILICIFIED MUDSTONE—Undivided siliceous sediments of Etivluk Group or Lisburne Group; mostly rubble patches not examined on the ground. FINE-GRAINED MAFIC-IGNEOUS ROCKS—Mostly small isolated masses of weathered basalt, probably part of either Ipnavik River or Copter Peak allochthon emplaced as tectonic slivers or olistoliths within Okpikruak Formation.





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