ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

REPORT OF INVESTIGATIONS 86-8
Rawlinson, sheet 1 of 1



Base from U.S. Geological Survey, 1975.
Geology based on field reconnaissance and interpretation of NASA Ames photos 2420-2423, 2487-2489, accession 2786, July 1979, and 9706-9708, accession 3101, July 1982.



QUADRANGLE LOCATION

SCALE 1:63,360
1 0 1 2 3 4 MILES
1 0 1 2 3 4 5 KILOMETERS
CONTOUR INTERVAL 50 FEET
DATUM MEAN SEA LEVEL



APPROXIMATE MEAN DECLINATION, 1975

Geology by S.E. Rawlinson, 1981-85, assisted by S.B. Hardy, 1981-82, and D.R. Hickmott, 1983-85. Reviewed by R.D. Reger.

SURFICIAL-GEOLOGIC MAP OF THE BEECHEY POINT A-3 QUADRANGLE, ALASKA

By
Stuart E. Rawlinson
1986

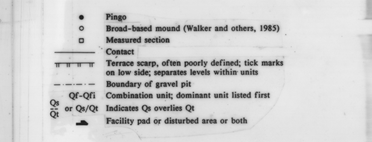
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MAP SYMBOLS

- Pingo
- Broad-based mound (Walker and others, 1985)
- Measured section
- Contact
- Terrace scarp, often poorly defined; tick marks on low side; separates levels within units
- Boundary of gravel pit
- Qf-Qfi — Combination unit; dominant unit listed first
- Qs or Qs/Qt — Indicates Qs overlies Qt
- Facility pad or disturbed area or both

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qs **SAND COVER DEPOSITS** - Fine to medium sand derived from dune deposits (Qsd) and deposited downwind in a sheet. Deposits proximal to the dunes are several meters thick and thin downwind from the dunes. As seen on aerial photographs, the deposits infill low-center ice-wedge polygons, thaw ponds, and small thaw lakes. The deposits are arbitrarily mapped to the boundaries of underlying units because actual boundaries cannot be distinguished. Surfaces support grasses, sedges, and tundra.

Qsd **SAND-DUNE DEPOSITS** - Fine to medium sand derived from barren flood-plain, delta, and beach deposits and deposited as dunes by wind. Dune deposits are as thick as 6 m, but generally range in thickness from 1 to 4 m. Dunes are most commonly longitudinal and trend northeast-southwest. Unvegetated dunes are being reworked.

Qt **THAW-LAKE DEPOSITS** - Peat and pebbly silt or fine sand, or mixtures or interbeds of all three, deposited in basins of thaw lakes by lacustrine and eolian processes, as topmost and often a basal bed of peat bound interbeds of peat and silt or fine sand. These deposits rarely exceed 2 m total thickness and are generally less than 1 m thick; superposition of deposits accounts for thicker deposits. Deposits overlie Qap unless otherwise indicated. Cryoturbation is common. Surfaces are very wet and are featureless or marked by indistinct large-diameter ice-wedge polygons. Surfaces support grasses and sedges.

Qti **ICE-RICH THAW-LAKE DEPOSITS** - Peat and pebbly silt or fine sand, or mixtures or interbeds of all three, deposited in basins of thaw lakes by lacustrine and eolian processes. A topmost and often a basal bed of peat bound interbeds of peat and pebbly silt or fine sand. These deposits rarely exceed 2 m total thickness and are generally less than 1 m thick; superposition of deposits accounts for thicker deposits. Deposits overlie Qap unless otherwise indicated. Cryoturbation is common. Surfaces range from wet to dry and are marked by low-center ice-wedge polygons. Surfaces support tundra, sedges, and tundra.

Qf **ACTIVE FLOOD-PLAIN DEPOSITS** - Fine to medium sand or sandy gravel, or both, deposited in channels of modern flood plains by streams. Sandy gravel is dominant. Where present, sand deposits are moderately sorted, generally 0.5 m or less thick, and overlie poorly sorted sandy gravel with a sharp contact. Subrounded to rounded pebbles and cobbles are common in the sandy gravel. Deposits extend up to 1 m above the mean stream surface. Surfaces of sandy gravel are unvegetated; sandy surfaces are unvegetated or support sparse grasses, sedges, and willow.

Qfi **INACTIVE FLOOD-PLAIN DEPOSITS** - Peat and pebbly silt or fine to medium sand, or mixtures or interbeds of all three, deposited in flood-plain overbank environments by fluvial, eolian, and lacustrine processes and underlying sand, sandy gravel, or gravel, or interbeds of all three, deposited in channels by streams; sandy gravel is the dominant underlying deposit. Overbank deposits generally consist of a topmost bed of peat up to 0.5 m thick and underlying pebbly silt or sand about 0.5 m thick. These deposits are in sharp contact with underlying channel deposits. Subrounded to rounded, occasionally imbricated pebbles and cobbles are common in channel deposits. Exposures of these deposits rarely exceed 2 m high and are generally less than 1 m high. Surfaces support grasses, sedges, and tundra.

Qfa **ABANDONED FLOOD-PLAIN DEPOSITS** - Peat and pebbly silt or fine to medium sand, or mixtures or interbeds of all three, deposited in flood-plain overbank environments by fluvial, eolian, and lacustrine processes, and underlying sand, sandy gravel, or gravel, or interbeds of all three, deposited in channels by streams; sandy gravel is the dominant underlying deposit. Overbank deposits generally consist of a topmost bed of peat up to 1 m thick that is often cryoturbated and vertically foliated and underlying, interbedded pebbly silt, pebbly fine sand, and peat all up to 2 m thick. Overbank deposits are in sharp contact with underlying channel deposits. Subrounded to rounded, occasionally imbricated pebbles and cobbles are common in channel deposits. Exposures of these deposits rarely exceed 3 m high and are generally less than 2 m high. Scarps that bound the unit are indistinct. Surfaces are marked by low-center ice-wedge polygons. Surfaces support tundra; centers of polygons support grasses and sedges.

Qat **ALLUVIAL-TERRACE DEPOSITS** - Peat and pebbly silt or fine to medium sand, or mixtures or interbeds of all three, deposited in flood-plain overbank environments by fluvial, eolian, and lacustrine processes and underlying sand, sandy gravel, or gravel, or interbeds of all three, deposited in channels by streams; sandy gravel is the dominant underlying deposit. Overbank deposits generally consist of a topmost bed of peat up to 1 m thick that is often cryoturbated and vertically foliated and underlying, interbedded pebbly silt and fine sand and peat up to 2 m thick. The overbank deposits are in sharp contact with underlying channel deposits. Subrounded to rounded pebbles and cobbles are common in the channel deposits; these clasts are sometimes imbricated. Exposures of these deposits rarely exceed 4 m high and are generally less than 3 m high. Scarps that bound the unit are indistinct. Surfaces are marked by low-center ice-wedge polygons. Surfaces support tundra; centers of polygons support grasses and sedges.

Qal **UNDIFFERENTIATED ALLUVIUM** - Peat and silt or fine to medium sand, or mixtures or interbeds of all three, deposited in flood-plain overbank environments by fluvial, eolian, and lacustrine processes and underlying sand, sandy gravel, or gravel, or interbeds of all three, deposited in channels of flood plains by streams; sandy gravel is the dominant underlying deposit. Overbank deposits are up to 5 m thick but average 2.5 m thick. The top of these deposits is composed of peat and peat-rich pebbly silt up to 4.5 m thick; average thickness is 1 m. These deposits are often cryoturbated and vertically foliated. Pebbly silt, silty sand, and fine sand compose up to 3.5 m of the bottom of these deposits; average thickness is 1.5 m. Channel deposits are poorly to moderately sorted; pebbles and cobbles are common and subrounded to rounded. Scarps that bound the unit are indistinct. The surfaces are generally wet and marked by low-center ice-wedge polygons. Surfaces support grasses, sedges, and tundra.

Qap **ALLUVIAL-PLAIN DEPOSITS** - Pebbly fine sand and silt deposited by wind; underlying, interbedded pebbly fine to medium sand and sandy gravel; and sandy gravel deposited by braided streams on an alluvial plain. The uppermost part of a section often consists of peat (0.3 to 1.3 m thick) with an interbed of pebbly sandy silt (0.1 to 0.4 m thick) and sometimes underlying thaw-lake deposits. The pebbly sandy silt is dark grayish brown when wet and light gray when dry. When dry, it shows a boxwork structure caused by melting of segregated ice. The pebbly sandy silt is probably loess with pebbles because its distribution is extensive. Thaw-lake deposits often overlie the pebbly fine sand and silt, but are not mapped because they cannot be recognized outside lake-basin boundaries on aerial photographs. The pebbly fine sand is gray to olive gray but often oxidized brownish yellow. Pebbles in the sand are most commonly brown and black chert; all are polished and some are wind scoured. These deposits are up to 4 m thick, including the peat, loess, and thaw-lake deposits.
The top part to the alluvial-plain deposits often consists of interbedded pebbly fine to medium sand and sandy gravel. When present, the interbedded interval is up to 6 m thick, and averages 3 m thick. The modal diameter of the gravel is 3 cm; pebbles are subrounded to rounded. The lower part of the alluvial-plain deposits is dominantly sandy gravel, although thin beds of gravel, sand, and organic- and wood-rich silt are present. Alluvial-plain deposits have been measured as deep as 16 m below the ground surface in gravel pits. The modal diameter of the gravel varies from 2 to 5 cm; cobbles are common and boulders are sometimes present near the base of a section. Thin beds of sand and organic- and wood-rich silt sometimes mark changes in the clast mode.
Discontinuously along the coast and up to 9 km inland, pebbly marine mud, interbedded sand and gravelly sand, and cobbles and boulders of the Flaxman Member of the Gubik Formation (Dinter, 1985) crop out at or near sea level. These deposits are generally less than 1 m thick and are overlain by the wind-deposited pebbly fine sand. Surfaces are moist to dry and marked by low- and high-center ice-wedge polygons.

Tsg **SAND AND GRAVEL** - Unconsolidated sand and gravel deposited by fluvial and eolian processes and underlying thinly laminated, gray to brown clay and silt beds deposited in lakes (Detterman and others, 1975). According to Detterman and others, the clay and silt beds commonly contain organic matter, small chert pebbles, and mud lumps along the bedding planes. Most pebbles are on the upper surface of the clay units and are of a size and shape that could be moved by wind. Desiccation cracks are preserved in a few beds. Limonite staining is common. The sand and gravel unit is pink, tan, orange, and yellow. Limonitic zones several centimeters thick locally cement the sand and gravel into well-indurated rock. Large-scale irregular crossbedding, probably of eolian origin, is common in some sand units. Beds of volcanic ash are interlayered with the sand and gravel. Coarse gravel deposited by river processes often caps the unit. The gravel cap is composed primarily of pebbles and cobbles of light-colored quartz, gray and green tuff, gray to black chert, and minor amounts of limestone, which give surfaces a characteristic white appearance. The age of this capping gravel is uncertain. Surfaces support tundra.

REFERENCES CITED

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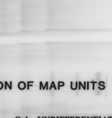
Walker, D.A., Walker, M.D., Everett, K.R., and Webber, P.J., 1985, Pingos of the Prudhoe Bay region, Alaska: Arctic and Alpine Research, v. 17, no. 3, p. 321-336.

AGE-DATE INFORMATION

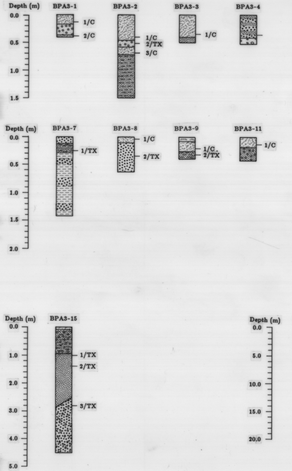
Station	Coordinates	Sample	Type	Material	Age (y. B.P.)	Stratigraphy and significance
BPA3-2	N 70° 6'35" W148°37'58"	BPA3-2-3	C-14	Sandy peat	10,540 ± 310	0.7 m below surface; basal peat; minimum age of earliest alluviation associated with drainage of Sagavanirktok River through Putuligayuk River basin.
BPA3-10	N 70°14'33" W148°15'47"	BPA3-10-3	C-14	Peat	4,640 ± 90	5.1 m below surface; paleosol that suggests sea level was several meters lower than at present; probably represents base of Holocene alluvium.
BPA3-10	N 70°14'33" W148°15'47"	BPA3-10-5	C-14	Wood	>38,400	8.7 m below surface; minimum age of deposits deeper than 8.7 m.
BPA3-13	N 70° 0'24" W148°27'30"	BPA3-13-4	C-14	Peat	>34,800	7.4 m below surface; peat in topmost silt of sequence of alternating channel and overbank alluvium; minimum age of this sequence.
BPA3-13	N 70° 0'24" W148°27'30"	BPA3-13-7	TL	Silt	3,140 ± 500	8.1 m below surface; basal sample of silt bed (see BPA3-13-4); date is inconsistent with C-14 date of peat in silt bed.

EXPLANATION OF STRATIGRAPHIC SECTIONS

- Vegetative mat
- Peat
- Silty peat
- Sandy peat
- Silt
- Sandy silt
- Peaty silt
- Fine sand
- Medium sand
- Coarse sand
- Silty sand
- Pebbly sand
- Gravelly sand
- Gravel
- Sandy gravel
- Pebbles (occur with other units)
- Ice-wedge pseudomorph
- Ice-wedge
- Ice pods or lenses
- Wood
- Organic stringer
- Gastropod (fresh water)



STRATIGRAPHIC SECTIONS



PALYNOLOGY ANALYSIS

Station	Coordinates	Sample	Palynormorphs
BPA3-3-13	N 70° 0'24" W148°27'30"	BPA3-13-3	Betulaceae (F) Lycopodiumsporites sp. (R) Ericaceae (V)

F = frequent (6-15 specimens), R = rare (2-5 specimens),
V = very rare (1 specimen)

FAUNA ANALYSIS

Station	Coordinates	Sample	Fauna
BPA3-3-13	N 70° 0'24" W148°27'30"	BPA3-13-3	shell fragments (F) Cyclammina cf. pacifica (V) reworked

F = frequent (11-32 specimens), V = very rare (1 specimen)

ENGINEERING CHARACTERISTICS

	PERMAFROST	FROST-ACTION SUSCEPTIBILITY
Qs	Continuously frozen, but seasonally thawed to about 1 m deep; may contain pore ice.	Not frost susceptible except where silt is included.
Qsd	Continuously frozen, but seasonally thawed to about 1 m deep; may contain pore ice.	Not frost susceptible except where silt is included.
Qt	Continuously frozen, but seasonally thawed to about 0.6 m deep; massive ice may be present, especially below shallow lake basins.	Moderately to highly frost susceptible; susceptibility increases with increase in silt content.
Qti	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore, segregated, and massive ice are present.	Moderately to highly frost susceptible; susceptibility increases with increase in silt content.
Qf	Continuously frozen, but seasonally thawed to about 1 m deep; also thawed in zones below channels with water greater than 2 m deep; pore ice may be present.	Not frost susceptible.
Qfi	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore and segregated ice are present in top fine-grained sediments; some massive ice may be present.	Low to moderately frost susceptible; susceptibility increases with increase in silt content.
Qfa	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore, segregated, and massive ice are present in top fine-grained sediments.	Low to moderately frost susceptible; susceptibility increases with increase in silt content; highly frost susceptible in channel fills where silt content is high.
Qat	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore, segregated, and massive ice are present in top fine-grained sediments.	Low to moderately frost susceptible; susceptibility increases with increase in silt content; highly frost susceptible in channel fills where silt content is high.
Qal	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore, segregated, and massive ice are present in top fine-grained sediments.	Highly frost susceptible especially in channel fills; susceptibility increases with increase in silt content.
Qap	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore, segregated, and massive ice are present in top fine-grained sediments.	Moderately to highly frost susceptible; susceptibility increases with increase in silt content.
Tsg	Continuously frozen, but seasonally thawed to about 0.6 m deep; pore, segregated, and possibly massive ice are present in top fine-grained sediments.	Fine-grained sediments; highly frost susceptible.

	CONSTRUCTION SUITABILITY	POTENTIAL PROBLEMS
Qs	Good as fill with addition of binder; limited quantity; good foundation base except where very thin and/or silt is included.	Easily eroded when vegetation is removed; often very thin so that settlement of underlying deposits may occur upon thawing.
Qsd	Good as fill with addition of binder; good foundation base except where silt is included.	Easily eroded when vegetation is removed or not present.
Qt	Not good as fill; not good for foundations because of frost susceptibility and possible massive ice.	Differential settlement upon thawing; very poor drainage; possible pingo formation, especially in recently drained basins.
Qti	Not good as fill; not good for foundations because of frost susceptibility, presence of massive ice, and poor drainage.	Severe differential settlement upon thawing; very poor drainage; possible pingo formation.
Qf	Good as fill; good foundation base except that potential of flooding is high.	Frequent flooding, ice jams, and scour.
Qfi	Good as fill, although thin, fine-grained cover must be removed; acceptable for foundations except where silt content is high, although potential of flooding is high and drainage is poor.	Frequent flooding, ice jams, and scour; differential settlement upon thawing; poor drainage.
Qfa	Good as fill, although thin, fine-grained cover must be removed; acceptable for foundations except where silt content is high, although potential of flooding is moderate to high and drainage is poor.	Frequent flooding in low areas, ice jams, and scour; occasional extensive flooding; severe differential settlement upon thawing; poor drainage.
Qat	Good as fill, although thin, fine-grained cover must be removed; acceptable for foundations except where silt content is high.	Severe differential settlement upon thawing; poor drainage.
Qal	Good as fill, although thin, fine-grained cover must be removed; not good for foundations because of frost susceptibility, presence of massive ice, and poor drainage.	Severe differential settlement upon thawing; poor drainage.
Qap	Coarse-grained deposits may be good as fill, although clast size may be too large and/or percent of fine-grained clasts may be too large or small (drilling is required for confirmation of suitability); coarse-grained deposits may be buried by up to 10 m (generally about 7 m) of fine-grained deposits; not good for foundations because of frost susceptibility, massive ice, and poor drainage.	Severe differential settlement upon thawing; poor drainage.
Tsg	Some coarse-grained deposits may be good as fill, although clast size may be too large and/or percent of fine-grained clasts may be too large or small; acceptable for foundations if coarse-grained deposits are thick (10 m) and silt content is not high.	Severe differential settlement upon thawing and poor drainage if coarse-grained deposits are thin or absent; fine-grained deposits are liquefiable when thawed; solifluction.