

EXPLANATION

Permafrost is classified below in four categories arranged in order of increasing ice content. Local variations in extent, thickness, and ice content of permafrost occur. Permafrost is defined here as any material that remains at or below 32° F continuously for more than two years; ice may or may not be present.

Ice content is defined as follows: (1) Low-Ice generally restricted to pore spaces between particles and to thin seams less than 1/16 inch thick in silt and clay. (2) Moderate-Ice generally restricted to pore spaces between particles and to thin seams greater than 1/16 inch and less than 1/4 inch thick in silt and clay. (3) High-Ice generally in seams greater than 1/4 inch thick and (or) large ice masses. As much as 50 percent of the ground may be ice (confined to upper 30 feet).

- I
FREE OF PERMAFROST
- II
FLOOD-PLAIN SILT, SAND, AND GRAVEL
Permafrost with low ice content
Permafrost is discontinuous in many areas such as beneath lakes, rivers, and creeks. If frozen, 1-15 feet of silt overlying sand and gravel may have low to moderate ice content in the form of thin seams; underlying sand and gravel have low ground ice content that is primarily restricted to pore spaces. Depth to permafrost 2-4 feet in older parts of flood plain and more than 4 feet on level of meander curves near river. Depth to permafrost 25-40 feet in clear areas. Seasonal frost layer 2-9 feet thick. Permafrost 5-275 feet thick. Silt will show some subsidence upon thawing; sand and gravel will show no subsidence upon thawing. Silt may undergo intense seasonal frost action but sand and gravel will undergo none.
- III
FLOOD-PLAIN SLOUGH AND SMALL DEPOSITS
Permafrost with moderate to high ice content
Broad basinlike areas and elongate, sinuous meander scars may be perennially frozen. Permafrost is discontinuous; young sloughs and swales, especially those with intermittent streams, generally contain no permafrost. If frozen, thickness of permafrost 5-30 feet with moderate to high ice content as thin seams and small lenses. Depth to permafrost 1 1/2-4 feet; seasonal frost layer 1 1/2-4 feet. Seasonal frost action intense. Moderate to great subsidence upon thawing.
- IV
VALLEY-BOTTOM MUCK
Permafrost with high ice content
Silt on lower slopes and in valley bottoms is perennially frozen. Top layer (3-30 feet thick) has moderate to high ice content in the form of seams and lenses; lower layer contains abundant ice as seams, horizontal sheets, vertical sheets, wedges, and saucer-shaped and irregular masses 1-50 feet in diameter. Near the contact with the unfrozen silt zone topsoils, ice content may be low and permafrost sporadic. Depth to permafrost 1 1/2-3 feet on lower slopes and valley bottoms; 5-20 feet near contact with unfrozen silt zone; 10-25 feet under cleared areas. Seasonal frost layer 1 1/2-3 feet thick. Thickness of permafrost 5-175 feet. Seasonal frost action intense. Great subsidence upon thawing of permafrost. Average temperature of permafrost 31-32° F.

SELECTED BIBLIOGRAPHY

Ferrians, O. J., Jr., Kachadorian, R., and Greene, G. W., 1969, Permafrost and related engineering problems in Alaska: U. S. Geol. Survey Prof. Paper 678, 37 p.

Holmes, G. W., Hopkins, D. M., and Foster, H. L., 1968, Pingos in central Alaska: U. S. Geol. Survey Bull. 1251-c, p. H1-H40.

Lachenbruch, A. H., 1968, Permafrost, in Fairbridge, R. W., ed., The encyclopedia of geomorphology: New York, Reinhold Publishing Corp., p. 833-839.

Muller, S. W., 1945, Permafrost or perennially frozen ground and related engineering problems: U. S. Engineers Off., Strategic Eng. Study Spec. Rept. 62, 2d ed., also 11th reprint by Edwards Brothers, Ann Arbor, Mich., 1947, 231 p.

National Research Council, 1966, Proceedings, 1st International Permafrost Conference: Washington, Nat. Research Council, 748 p.

—, 1972, North American Papers, 2d International Permafrost Conference: Washington, Nat. Research Council, 748 p.

Péwé, T. L., 1954, Effect of permafrost on cultivated fields, Fairbanks area, Alaska: U. S. Geol. Survey Bull. 989-F, p. 315-351.

—, 1955, Geologic map of the Fairbanks D-2 quadrangle, Alaska: U. S. Geol. Survey Geol. Quad. Map 60-110, scale 1:63,360.

—, 1966, Permafrost and its effect on life in the north: Corvallis, Ore., Oregon State Univ. Press, 40 p.

—, 1974, Permafrost: Encyclopedia Britannica, p. 89-95.

Péwé, T. L., and Bell, J. W., 1975a, Map showing ground water conditions in the Fairbanks D-1 SW quadrangle, Alaska: U. S. Geol. Survey Misc. Field Studies Map MF-671B, scale 1:24,000.

—, 1975b, Map showing construction materials in the Fairbanks D-1 SW quadrangle, Alaska: U. S. Geol. Survey Misc. Field Studies Map MF-671C, scale 1:24,000.

—, 1975c, Map showing foundation conditions in the Fairbanks D-1 SW quadrangle, Alaska: U. S. Geol. Survey Misc. Field Studies Map MF-671D, scale 1:24,000.

Péwé, T. L., Bell, J. W., Williams, J. R., and Paige, R. A., 1977, Geologic map of the Fairbanks D-1 SW quadrangle, Alaska: U. S. Geol. Survey Misc. Inv. Series Map I-949, scale 1:24,000. (In press)

Péwé, T. L., and Paige, R. A., 1963, Frost heaving of piles with an example from Fairbanks, Alaska: U. S. Geol. Survey Bull. 1111-F, p. 327-307.

Williams, J. R., Péwé, T. L., and Paige, R. A., 1959, Geologic map of the Fairbanks D-1 quadrangle, Alaska: U. S. Geol. Survey Geol. Quad. Map 60-124, scale 1:63,360.

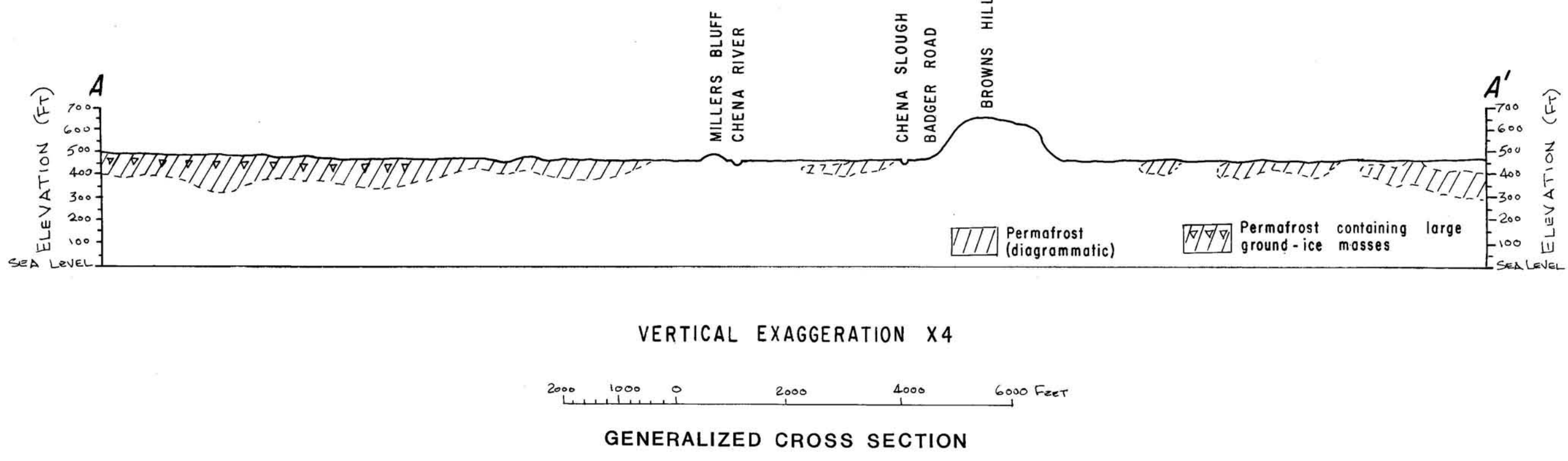
SYMBOLS

Contact
Contacts generally indefinite or gradational

Borehole location
○ 2-45°

First number indicates depth to top of permafrost; second number indicates depth to bottom of permafrost or to bottom of hole if bottomed in permafrost. The notation "Pm" indicates permafrost present but depth unknown. * indicates that hole bottomed in permafrost.

Detailed subsurface information may be obtained from the geologic map (Map I-949, Péwé and others, in press) and the map showing foundation conditions in the Fairbanks D-1 SW quadrangle, Alaska (MF-671D, Péwé and Bell, 1975c).



**MAP SHOWING DISTRIBUTION OF PERMAFROST
IN THE FAIRBANKS D-1 SW QUADRANGLE, ALASKA**
BY
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