Appendix I—Soil Characteristics of North Campus

TABLE 1. Classification of major soil series occurring in the North Campus area (USDA Soil Conservation Service and Alaska Agricultural Experiment Station 1963)

Soil Type	Susceptibility to Frost Action	Characteristics
Minto silt loam	High to moderate	Subarctic Brown Forest Soil. Deep, silty material over bedrock, Occurs at the bases of hills dominated by Fairbanks series soils. erodible, seasonably high water table, susceptible to piping, poor stability in embankments, moderate permeability, moderate water holding capacity, May have irregular, discontinuous masses of ice at a depth of 6 feet or more, melting of underground ice masses may result in irregular subsidence, pitting. Plant cover is mostly aspen, birch or white spruce. May also have some black spruce forests; ; permeability 0.2 – 0.6 inches per hour*; available water, 2.0 – 2.5 inches per foot of depth; pH 4.5 – 5.0 grading to 7.5 – 8.0 below 15 inches; dispersion* in water, high; shrink-swell potential**, moderate; plasticity index, 2-10, liquid limit, 25-40
Fairbanks silt loam	High to moderate	Subarctic Brown Forest Soil. Well drained upland soils, moderately deep to deep micaceous silt; shallow to bedrock in places; erodible; cleared areas are highly susceptible to sheeting and gully erosion; susceptible to piping, not usually susceptible to thermokarst pitting; poor stability in embankments; moderate water holding capacity; water table usually more than 15 ft depth; occurs mostly on middle of long, south facing slopes and on low hills near the alluvial plain; supports stands of birch, white spruce, aspen and sometimes alder, micaceous loess parent material; permeability 0.2 – 0.6 inches per hour; available water, 2.0 – 2.5 inches per foot of depth; pH 5.0 – 6.5; dispersion in water, high; shrink-swell potential, low, plasticity index, 2-10, liquid limit, 25-40.
Goldstream silt loam	High	Low-Humic Gley Soil. Deep, poorly drained silty soils with permafrost; wet to surface; susceptible to piping; poor stability in embankments; moderate erodibility; ground water perched above permafrost; depth from surface to water table, less than 1 ft; occurs in broad low areas of the alluvial plain along drainage ways and rivers and at the base of hills; vegetation is dense growth of shrubs with a few black ; permeability0.2 – 0.6 inches per hour; available water 2.0 – 2.5 inches per foot of depth; pH 5.0 – 7.0; dispersion in water, high; shrink-swell potential, moderate; spruce, willow and tamarack; sedge tussocks common; permafrost at 10-24 inches depth; soils above permafrost are always semi-fluid; contains black streaks of organic matter locally known as muck; plasticity index, 0 - 10, liquid limit, 30 – 50.

• dispersion refers to the degree and rapidity with which the soil structure breaks down in water

** shrink-swell potential is an indication of the volume change to be expected in the soil with changes in moisture content

TABLE 2. Interpretation of engineering properties of soils (USDA Soil Conservation Service 1974)

	Soil Series Rating for engineering properties		
	Fairbanks	**Goldstream**	**Minto**
Shallow excavations	Moderate to severe limitations on slopes greater than 7% slope, steepness	Too wet, severe restrictions, subject to flooding, permafrost restricts use	Moderate to severe limitations on slopes greater than 3%, wet, too steep
Small commercial buildings	Severe limitations over 7% slope, too steep	Too wet, severe restrictions, subject to flooding, permafrost restricts use	Severe restrictions due to thermokarst pitting
Local roads and streets	Frost action likely	Too wet, severe restrictions	Severe limitations due to frost action, thermokarst pitting
Picnic areas	Moderate limitations on slopes greater than 7% slope, too steep	Too wet, severe restrictions	Moderate limitations due to wetness
Playgrounds	Moderate limitations on slopes greater than 3% slope, too steep	Too wet, severe restrictions	Moderate limitations due to wetness; severe limitations at slopes greater than 7%, too steep
Pond reservoir area	Piping likely	Permafrost restricts use	Restrictions due to thermokarst pitting, erosion, and steepness
Embankments, dikes, levees	Soil has low bearing strength, hard to compact, piping likely	Soil has low bearing strength, piping likely	Soil has low strength or bearing strength, compacts poorly, susceptible to piping

Thermokarst mounds in the Fairbanks area are polygonal or circular hummocks 10 to 50 feet in diameter, 1-8 feet in height and are composed of loess. They are commonest in cultivated field but there are also some in abandoned fields now reforested. In some fields the mounds are separated by trenches 1-5 feet wide, but in others the trenches are poorly developed. The trenches form as a result of melting of ice masses.

A field on a gentle north-facing slope at the AES has the best developed mounds and the most detailed record in the Fairbanks area. The surface of the field was smooth before clearing in 1908. By 1922 pronounced individual and connected depressions had formed and by 1926 some trenches between mounds were as much as 5 feet deep. Cultivation stopped a year or two later because the irregular topography formed by the pits and mounds was dangerous to the operation of farm machinery. The field then was seeded to pasture. By 1938, the mounds were 3 to 8 feet high and about 20 to 50 feet in diameter. Rockie studied the field in November 1938 in order to determine whether the ice still was actively melting "A tractor bulldozer was used to remove the upper part of every hummock and fill each pit until the land surface assumed approximately a uniform slope. The surface remained smooth for nearly a year but in July 1939 irregularities began to form. In succeeding years polygonal mounds formed as the ground surface subsided over melting ice.

Mounds in the test area smoothed in 1938 were as large and as high as those in the part of the field that had not been smoothed when the writer first studied the field in 1947. Maximum mound height was 8 feet. Comparisons of aerial photos with those taken 10 years earlier reveal that in 1948 mounds were about the same size and shape and in the same position as in 1938. Probing with a soil auger on 14 July 1948, revealed no ice or frozen ground at a depth of 9 feet below the surface of a trench (Pewe1954, 1982)