

- Important Note: 1. This portion of the proposed trans-Alaska pipeline route is considered to be subject to a maximum probable earthquake with a Richter magnitude of 7.0.
2. Temperature of permafrost at depths below the zone of seasonal variation is generally above -2°C (about 28°F).

Map Unit											
Symbol	Name	Description	Distribution and Thickness	Topography and Vegetation	Permafrost	Susceptibility to Frost Action	Drainage Surface	Susceptibility to Erosion	Construction Uses	Remarks	
Qac	Active flood plain	Coarse, sandy gravel and sand with minor amounts of silt. Gravel clasts subrounded to rounded; locally many scattered boulders present. Generally poorly stratified with local beds and lenses of sand.	Occurs along the Copper River. Thickness generally less than 25 feet.	Complex network of braided channels with local relief of 1 to 10 feet. Generally bare of vegetation.	Generally absent	Low	Good	High	Sand and gravel excellent for fill, base course, surface course, and aggregate; locally, boulders can be screened for riprap.	Locally subject to seifs conditions, flooding, and intensive erosion. Shallow ground-water table restricts depth of excavation. Tazlina River subject to flooding caused by dumping of glacier-dammed lakes. Major rivers subject to flooding during spring break-up, especially when river ice jams occur.	
Qcr	Colluvium, river bluff type	Unsorted to poorly sorted gravely sandy silt; varies laterally and vertically from silt to sand to gravel, or to any mixture of these materials. Locally includes boulders, large blocks of unconsolidated silty soil, and organic matter. Stratification, where present, generally parallels surface at about angle of repose.	Occurs on and at base of slopes of river bluffs 50 to 250 feet high along the Gulkana, Copper, and Tazlina rivers, and their major tributaries. Thickness generally less than 15 feet on slopes but at base of slopes can be 50 feet or more.	Very steep to moderately steep river bluffs 50 to 250 feet high. Unstable slopes generally bare of vegetation, steep, stable slopes have grass and low brush, and stable, moderately steep slopes have high brush and scattered small trees.	Generally present within 4 feet of the surface on north-facing slopes, but much deeper on south-facing slopes, and where materials are granular, commonly absent.	Variable, but generally high.	Good	High	Gravel-sand-silt mixtures generally fair to poor for fill and base course and unsuited for surface course.	Where ice-rich permafrost is present, construction disturbance can cause unstable slope conditions to develop.	
Qsw	Swamp deposits	Fibrous, matted peat with lenses and beds of organic-rich silt and fine sand.	Bogs, marshes, and muskeg developed on lacustrine deposits (qlc) in the Copper River Basin, and in poorly drained depressions in the uplands, which are generally underlain by moraine deposits (qmy). Generally less than 6 feet thick, but locally as much as 15 feet.	Flat areas in the Copper River Basin and depressions in the undulating terrain of the uplands. Vegetation consists of peat and sedge grasses in very wet areas; in drier areas, low brush and scattered small spruce trees.	Generally present within 5 feet of surface in wet areas and within 2 feet in drier areas. Permafrost commonly ice-rich.	High	Poor	Generally low	Unsuited for all construction purposes, except possible limited development of peat for use as insulation.	Locally, where soils are saturated, seasonal frost does not penetrate to the permafrost table during the winter season, thereby leaving a thawed zone 1 to 2 feet below the surface. Because of unusually dry weather the past several years in the Copper River Basin, many marshy areas have dried up.	
Qaf	Alluvial fans	Poorly sorted silty gravel and sand. Deposits coarse-grained at apex of fan, but grade to finer-grained material at toe.	Occur on hillsides bordering Paxson Lake. Thickness highly variable ranging from a few feet at apex and along sides of fan to more than 50 feet in the middle.	Moderately steep slopes at apex and gentle slopes at toe. Vegetation consists of low or high brush with a few scattered spruce trees on gentle slopes.	Generally absent in granular deposits, but present in fine-grained soils.	Variable, but generally low.	Good	High along stream courses	Generally fair to poor for fill and base course. Where fine grained, generally unsuited.	Subject to torrential floods, shifting channels, and local icings.	
Qas	Fine-grained alluvium	Poorly sorted silty sand, sand, and locally, gravely sand. Includes fine-grained colluvial deposits where valley walls border unit.	Occurs as terrace and flood-plain deposits of sluggish, low-gradient streams. Thickness generally ranges from 10 to 75 feet.	Flat terraces and flood plains in valleys of small streams. Vegetation consists of low brush, scattered small spruce trees, and numerous small areas of marsh and muskeg.	Generally present within 2 feet of the surface. Absent locally where soils are coarse grained. Ice-rich permafrost common in silty soils.	Generally high	Generally poor	Moderately high	Generally unsuited for construction purposes. Locally, where granular and not silt rich, suitable for fill.	Severe differential settlement occurs when ice-rich permafrost is allowed to thaw.	
Qt	Alluvial terraces	Coarse, sandy gravel and sand with minor amounts of silt. Gravel clasts subrounded to rounded; locally includes many scattered boulders. Generally poorly stratified with local beds and lenses of sand. Commonly mantled by 1 to 5 feet of organic-rich silty sand and sandy silt; however, along the Gulkana River near Sourdough as much as 15 feet is present.	Occurs as terrace deposits along the Gulkana, Copper, and Tazlina rivers, and Moose Creek near Glennallen. Thickness generally ranges from 15 to 150 feet.	Series of flat-topped terraces bordering the major streams of the area. Separated from the active flood plain by a terrace scarp. Vegetation generally dense deciduous and evergreen trees or high brush.	Generally absent except for local lenses of silty, gravely sand. Silty overburden generally frozen if more than 5 feet thick.	Generally low, except for silty overburden.	Good, except for thick, silty overburden.	Generally low, except moderately high for silty overburden.	Sand and gravel excellent for fill, base course, surface course, and aggregate; locally, boulders can be screened for riprap.	Local concentrations of large boulders cause excavation problems, and shallow ground-water table under low terraces limits depth of excavation. Low terraces near active flood plain are subject to bank erosion and occasional flooding.	
Qgn	High-level alluvium	Coarse to medium sandy gravel south of Paxson Lake, gravely sand with boulders north of Hogan Hill and east of Haggard Creek, and sandy pebble gravel near the Tazlina River south of Glennallen.	Occurs at altitudes higher than present-day streams south of Paxson Lake, north of Hogan Hill, and east of Haggard Creek, and near the Tazlina River south of Glennallen. Thickness generally less than 25 feet.	Flat terrace remnants and surfaces of old deltas. Vegetation consists of high or low brush and scattered spruce trees, except near Glennallen where dense spruce and aspen occur.	Generally absent or if present has low ice content. Local lenses of fine-grained material in the deposits near Glennallen are ice rich.	Low	Good	Low		Large boulders pose problems for excavation of deposits north of Hogan Hill and east of Haggard Creek.	
Qmy	Young moraine	Unsorted heterogeneous mixture of gravel, sand, silt, and minor amounts of clay, generally ranging from gravely sandy silt to silty sandy gravel. Gravel clasts generally subangular to subrounded. Deposits include irregular lenses and pockets of sandy gravel and gravely sand.	Occurs as a blanket of till covering most of mountains in the uplands just north of the Copper River Basin. Thickness highly variable.	Hummocky to gently undulating terrain. Small lakes and marshy areas present in the numerous undrained depressions. Vegetation at high altitudes, low brush or alpine tundra, at low altitudes, high brush and scattered small spruce trees.	Where soils are granular permafrost is absent or if present has low ice content.	Variable	Moderately good to poor	Generally low; locally moderately high	Generally poor as a source of borrow for all purposes except deep fill; local beds and pockets of sand and gravel fair to good for fill, surface and base course, and aggregate.	Excavation commonly hindered by large boulders.	
Qlc	Lacustrine deposits	Predominantly massive to well-laminated clayey silt and gravely sandy silt with beds and lenses of sand and sandy gravel. Iceberg-rafter pebbles, cobbles, and locally, boulders, are scattered throughout fine-grained materials. North of Sourdough and south of Hogan Hill, silty sand occurs at the surface, and near Glennallen local areas are underlain by sand.	Underlie most of the Copper River Basin below an altitude of 2450 feet. Thickness generally greater than 50 feet and locally greater than 100 feet in central part of basin.	Flat to gently sloping broad lowlands. Vegetation consists of dense evergreen and deciduous trees or high brush in better-drained areas, and scattered spruce trees and low brush in poorly drained areas.	Generally present within 2 feet of the surface, except for areas burned over in forest fires or disturbed in other ways where permafrost is as deep as 30 feet below the surface. Thickness is estimated to be as much as 200 feet in central part of Copper River Basin.	High, except for local areas of clean sand.	Generally poor	High	Generally unsuited as a source of borrow for all purposes. Local sandy near-shore deposits fair to good as a limited source of borrow.	The rapid vertical and horizontal changes in the character of these deposits and the unpredictable distribution of ice-rich permafrost, even at considerable depths (greater than 50 feet), pose serious differential settlement problems if permafrost is allowed to thaw.	
Qgu	Glacial and lacustrine deposits undifferentiated	Undifferentiated young moraine deposits (qmy) and lacustrine deposits (qlc). Lacustrine deposits generally include less silt- and clay-sized material than the typical deposits mapped as qlc.	Occur between Paxson Lake and Hogan Hill at an altitude generally between 2,650 feet and 2,300 feet. Thickness generally greater than 50 feet at lower altitudes, but thins considerably at higher altitudes.	Gently sloping to flat terrain. Vegetation consists of high brush, or low brush with scattered spruce trees.	Generally present within 2 feet of surface. Locally where soils are granular, permafrost absent or if present has low ice content.	Variable	Generally poor	Moderately high		Subject to differential settlement if ice-rich permafrost is allowed to thaw.	
gr	Granitic intrusive rocks	Predominantly diorite and granite with a well-developed joint pattern. Rock essentially unaltered and surfaces little weathered. On flat and gentle slopes commonly frost rived into coarse rubble.	Occur in a wide belt between Sourdough and Paxson Lake along the northern margin of the Copper River Basin.	Gentle to moderate slopes in most areas, locally very steep. Vegetation of low or high brush with scattered spruce trees.	Depth to permafrost quite variable depending on thickness and character of soil and vegetation cover, and exposure to solar radiation. Essentially no ice present except in fractures and joints.	Low, but very susceptible to riving.	Good	Low	Excellent as a source of riprap, crushed rock, coarse fill, and dimension stone; good for base course and surface course. Generally poor for aggregate because of mica content.	No special problems	
me	Mafic extrusive rocks	Unaltered to slightly altered, dark gray, hard, volcanic rock (basaltic).	Underlie mountains on both sides of Paxson Lake at the north end of the lake.	"	"	Low	Good	Low	Unaltered rock good for riprap, dimension stone, crushed rock, and coarse fill.	No special problems	
grn	Greenstone	Highly altered, green, hard, volcanic rock with minor amounts of interbedded argillite and crystalline limestone present locally.	Underlie portions of east-west trending mountains south of Paxson Lake and portions of Hogan Hill.	"	"	Low	Good	Low	Generally good for crushing, fill, and riprap. Poor for dimension stone and aggregate.	No special problems	