ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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Reger and Hubbard, 2021
SHEET 17 OF 18
Explanatory report accompanies map
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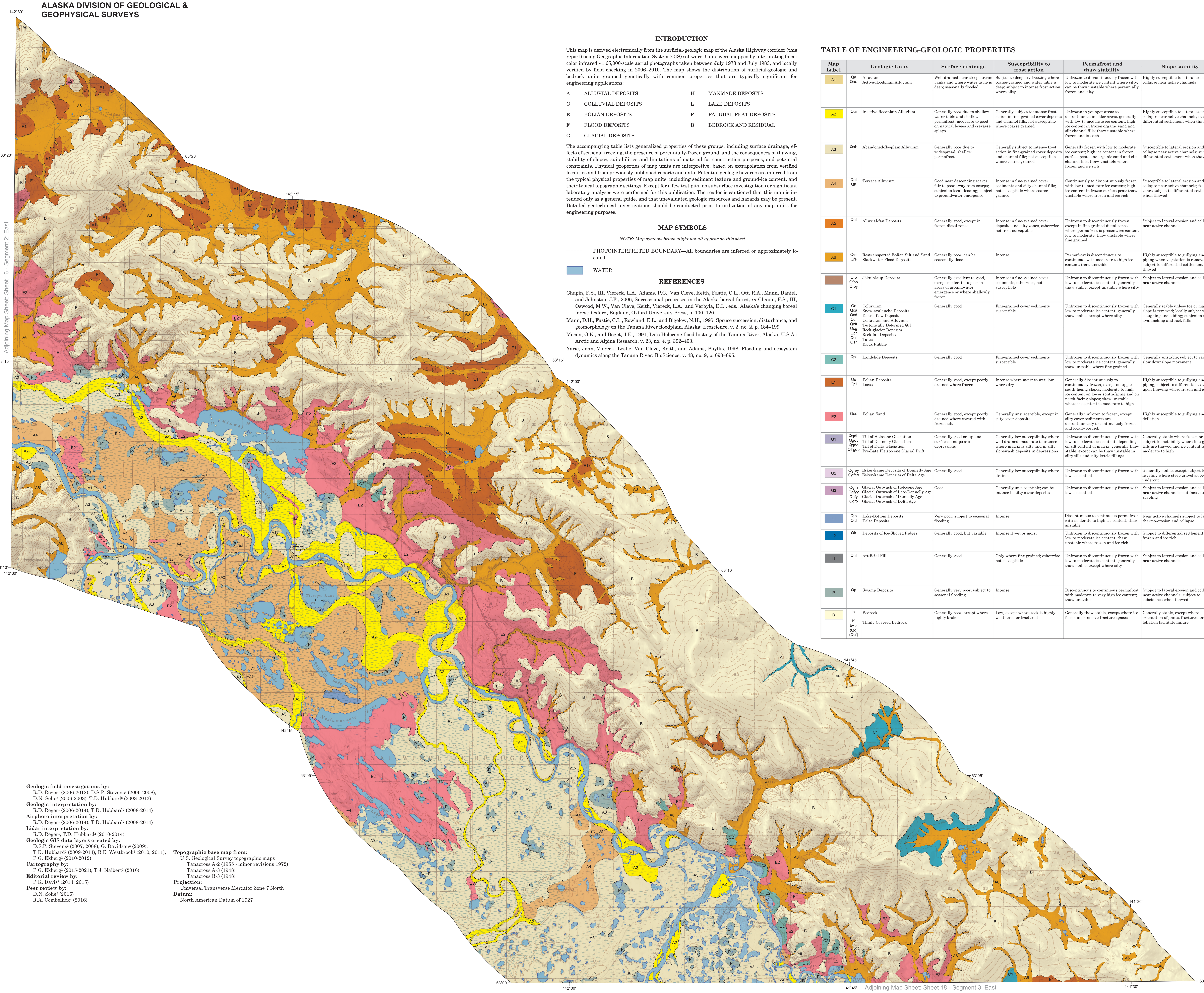

INTRODUCTION

This map is derived electronically from the surficial-geologic map of the Alaska Highway corridor (this report) using Geographic Information System (GIS) software. Units were mapped by interpreting false-color infrared ~1:65,000-scale aerial photographs taken between July 1978 and July 1983, and locally verified by field checking in 2006–2010. The map shows the distribution of surficial-geologic and bedrock units grouped genetically with common properties that are typically significant for engineering applications:

A	ALLUVIAL DEPOSITS	H	MANMADE DEPOSITS
C	COLLUVIAL DEPOSITS	L	LAKE DEPOSITS
E	EOLIAN DEPOSITS	P	PALUDAL PEAT DEPOSITS
F	FLOOD DEPOSITS	B	BEDROCK AND RESIDUAL
G	GLACIAL DEPOSITS		

The accompanying table lists generalized properties of these groups, including surface drainage, effects of seasonal freezing, the presence of perennially-frozen ground, and the consequences of thawing, stability of slopes, suitabilities and limitations of material for construction purposes, and potential constraints. Physical properties of map units are interpretive, based on extrapolation from verified localities and from previously published reports and data. Potential geologic hazards are inferred from the typical physical properties of map units, including sediment texture and ground-ice content, and their typical topographic settings. Except for a few test pits, no subsurface investigations or significant laboratory analyses were performed for this publication. The reader is cautioned that this map is intended only as a general guide, and that unevaluated geologic resources and hazards may be present. Detailed geotechnical investigations should be conducted prior to utilization of any map units for engineering purposes.

MAP SYMBOLS

NOTE: Map symbols below might not all appear on this sheet

- - - - - PHOTOINTERPRETED BOUNDARY—All boundaries are inferred or approximately located

WATER

REFERENCES

Chapin, F.S., III, Viereck, L.A., Adams, P.C., Van Cleve, Keith, Fastie, C.L., Ott, R.A., Mann, Daniel, and Johnston, J.F., 2006, Successional processes in the Alaska boreal forest, *in* Chapin, F.S., III, Oswood, M.W., Van Cleve, Keith, Viereck, L.A., and Verbyla, D.L., eds., Alaska's changing boreal forest: Oxford, England, Oxford University Press, p. 100–120.

Mann, D.H., Fastie, C.L., Rowland, E.L., and Bigelow, N.H., 1995, Spruce succession, disturbance, and geomorphology on the Tanana River floodplain, Alaska: Ecoscience, v. 2, no. 2, p. 184–199.

Mason, O.K., and Beget, J.E., 1991, Late Holocene flood history of the Tanana River, Alaska, U.S.A.: Arctic and Alpine Research, v. 23, no. 4, p. 392–403.

Yarie, John, Viereck, Leslie, Van Cleve, Keith, and Adams, Phyllis, 1998, Flooding and ecosystem dynamics along the Tanana River: BioScience, v. 48, no. 9, p. 690–695.

TABLE OF ENGINEERING-GEOLOGIC PROPERTIES

Map Label	Geologic Units		Surface drainage	Susceptibility to frost action	Permafrost and thaw stability	Slope stability	Suitability for construction	Potential engineering considerations
A1	Qa Qaa	Alluvium Active-floodplain Alluvium	Well-drained near steep stream banks and where water table is deep; seasonally flooded	Subject to deep dry freezing where coarse-grained and water table is deep; subject to intense frost action where silty	Unfrozen to discontinuously frozen with low to moderate ice content where silty; can be thaw unstable where perennially frozen and silty	Highly susceptible to lateral erosion and collapse near active channels	Excellent source of clean, sandy gravel aggregate and clean fill material; can be poorly graded; well-drained sand and gravel provide excellent foundation	Subject to inundation every 1–5 years during high stream stages and by aufeis in braided reaches; shallow water table limits depth of excavation; thawed fine sand and silt subject to liquefaction; responses to seismic shaking can vary considerably, especially near frozen zones
A2	Qai	Inactive-floodplain Alluvium	Generally poor due to shallow water table and shallow permafrost; moderate to good on natural levees and crevasse splays	Generally subject to intense frost action in fine-grained cover deposits and channel fills; not susceptible where coarse grained	Unfrozen in younger areas to discontinuous in older areas, generally with low to moderate ice content; high ice content in frozen organic sand and silt channel fills; thaw unstable where frozen and ice rich	Highly susceptible to lateral erosion and collapse near active channels; subject to differential settlement when thawed	Where thawed, excellent source of sandy gravel aggregate beneath silty surface layer; presence of permafrost and shallow water can limit potential as source of sandy gravel aggregate and suitability for foundation	Subject to inundation at least once or twice every 100 years (Chapin and others, 2006; Yarie and others, 1998); shallow water table limits depth of excavation; where thawed, fine sand and silt subject to liquefaction; responses to seismic shaking can vary considerably
A3	Qab	Abandoned-flooplain Alluvium	Generally poor due to widespread, shallow permafrost	Generally subject to intense frost action in fine-grained cover deposits and channel fills; not susceptible where coarse grained	Generally frozen with low to moderate ice content; high ice content in frozen surface peats and organic sand and silt channel fills; thaw unstable where frozen and ice rich	Susceptible to lateral erosion and collapse near active channels; subject to differential settlement when thawed	Widespread permafrost and shallow water table can limit potential as source of sandy gravel aggregate and suitability for foundation	Subject to inundation every 500 to 1,000 years (Mann and others, 1995; Mason and Beget, 1991); shallow water table and presence of permafrost limit depth of excavation; subject to liquefaction where thawed; responses to seismic shaking can vary considerably; sensitive to surface disturbance
A4	Qat Qft	Terrace Alluvium	Good near descending scarps; fair to poor away from scarps; subject to local flooding; subject to groundwater emergence	Intense in fine-grained cover sediments and silty channel fills; not susceptible where coarse grained	Continuously to discontinuously frozen with low to moderate ice content; high ice content in frozen surface peat; thaw unstable where frozen and ice rich	Susceptible to lateral erosion and collapse near active channels; frozen zones subject to differential settlement when thawed	Excellent source of sand and gravel beneath fine- grained cover sediments, although shallow permafrost can limit depth of excavation; bedrock may be shallow in strath terraces; excellent foundation where thawed; subject to groundwater emergence	Bedrock shallow in strath terraces; locally subject to seasonal slope and stream flooding; where saturated, and where groundwater emerging fine-grained cover sediments subject to liquefaction; seismic shaking can vary considerably, especially near frozen zones; locally sensitive to surface disturbance
A5	Qaf	Alluvial-fan Deposits	Generally good, except in frozen distal zones	Intense in fine-grained cover deposits and silty zones, otherwise not frost susceptible	Unfrozen to discontinuously frozen, except in fine grained distal zones where permafrost is present; ice content low to moderate; thaw unstable where fine grained	Subject to lateral erosion and collapse near active channels	Engineering qualities variable but can be good, depending on rock quality upstream; generally unsuitable as aggregate source in proximal and distal areas due to numerous boulders, high silt content, and permafrost; moderate suitability for foundations	Proximal zones subject to torrential flooding, snow avalanches, debris flows, and mudflows; subject to sudden shifts in channels and sites of deposition and erosion
A6	Qer Qfs	Restransported Eolian Silt and Sand Slackwater Flood Deposits	Generally poor; can be seasonally flooded	Intense	Permafrost is discontinuous to continuous with moderate to high ice content; thaw unstable	Highly susceptible to gullying and piping when vegetation is removed; subject to differential settlement when thawed	Source of organic material for landscaping; generally unsuitable as an aggregate source; can be suitable for foundations when permafrost is preserved	Thawing produces mudflows and hyperconcentrated flows; subject to seasonal stream and slope icings; sensitive to surface disturbance
F	Qfb Qfbo Qfby	Jökulhlaup Deposits	Generally excellent to good, except moderate to poor in areas of groundwater emergence or where shallowly frozen	Intense in fine-grained cover sediments; otherwise, not susceptible	Unfrozen to discontinuously frozen with low to moderate ice content; generally thaw stable, except unstable where silty	Subject to lateral erosion and collapse near active channels	Good source of sand and gravel; large flood boulders locally abundant; excellent foundation material	Bedrock shallow in strath terraces; areas of groundwater emergence can be subject to seasonal surface icings and saturated soil conditions
C1	Qc Qca Qcd Qcf Qcft Qcg Qcr Qct QTr	Colluvium Snow-avalanche Deposits Debris-flow Deposits Colluvium and Alluvium Tectonically Deformed Qcf Rock-glacier Deposits Rock-fall Deposits Talus Block Rubble	Generally good	Fine-grained cover sediments susceptible	Unfrozen to discontinuously frozen with low to moderate ice content; generally thaw stable, except where silty	Generally stable unless toe or margin of slope is removed; locally subject to sloughing and sliding; subject to snow avalanching and rock falls	Generally unsuitable as aggregate source because numerous large, angular fragments require special handling; rubble sheets can be suitable as a aggregrate and rip-rap source locally; where frozen, can require ripping or blasting; poor foundation where blocks are loose and unstable to good foundation where coarse and fine fractions are mixed and stable	Could become unstable if margins or toe removed
C2	Qcl	Landslide Deposits	Generally good	Fine-grained cover sediments susceptible	Unfrozen to discontinuously frozen with low to moderate ice content; generally thaw unstable where fine grained	Generally unstable; subject to rapid to slow downslope movement	Generally unsuitable for foundation and construction because of slope instability; suitability as an aggregate source is variable, depending on bedrock character	Could become unstable if margin or toe is removed; building on, below or adjacent to landslide deposits is not recommended
E1	Qe Qel	Eolian Deposits Loess	Generally good, except poorly drained where frozen	Intense where moist to wet; low where dry	Generally discontinuously to continuously frozen, except on upper south-facing slopes; moderate to high ice content on lower south-facing and on north-facing slopes; thaw unstable where ice content is moderate to high	Highly susceptible to gullying and piping; subject to differential settlement upon thawing where frozen and ice rich	Source of organics and fine fractions for landscaping and mixing; makes good foundation where thawed and dry	Vertical cuts can be stable if drainage is provided; ice-rich areas sensitive to surface disturbance; muddy when wet; dusty when dry
E2	Qes	Eolian Sand	Generally good, except poorly drained where covered with frozen silt	Generally unsusceptible, except in silty cover deposits	Generally unfrozen to frozen, except silty cover sediments are discontinuously to continuously frozen and locally ice rich	Highly susceptible to gullying and deflation	Possible source of fines for landscaping and mixing; makes good foundation where thawed and dry; compaction difficulties affect its utility as a foundation material	Subject to deflation where unprotected; prone to liquefaction where saturated and thawed
G1	Qgdh Qgdy Qgdo QTgdp	Till of Holocene Glaciation Till of Donnelly Glaciation Till of Delta Glaciation Pre-Late Pleistocene Glacial Drift	Generally good on upland surfaces and poor in depressions	Generally low susceptibility where well drained; moderate to intense where matrix is silty and in silty slopewash deposits in depressions	Unfrozen to discontinuously frozen with low to moderate ice content, depending on silt content of matrix; generally thaw stable, except can be thaw unstable in silty tills and silty kettle fillings	Generally stable where frozen or dry; subject to instability where fine-grained tills are thawed and ice content is moderate to high	Highly variable but may be good local source of mixed coarse and fine fractions for fill; local sources of water-washed sand and gravel; good foundations where thawed and dry	Subject to gullying where surface runoff is concentrated
G2	Qgfey Qgfeo	Esker-kame Deposits of Donnelly Age Esker-kame Deposits of Delta Age	Generally good	Generally low susceptibility where drained	Unfrozen to discontinuously frozen with low ice content	Generally stable, except subject to raveling where steep gravel slopes are undercut	Highly variable but can be good source of water-washed sand and gravel; good foundation where thawed and dry	Locally rich in oversize material
G3	Qgfh Qgfyy Qgfy Qgfo	Glacial Outwash of Holocene Age Glacial Outwash of Late-Donnelly Age Glacial Outwash of Donnelly Age Glacial Outwash of Delta Age	Good	Generally unsusceptible; can be intense in silty cover deposits	Unfrozen to discontinuously frozen with low ice content	Subject to lateral erosion and collapse near active channels; cut faces subject to raveling	Excellent source of sand and gravel; excellent foundation where thawed and well drained	Easily compacted, although locally contains numerous large boulders
L1	Qlb Qld	Lake-Bottom Deposits Delta Deposits	Very poor; subject to seasonal flooding	Intense	Discontinuous to continuous permafrost with moderate to high ice content; thaw unstable	Near active channels subject to lateral thermo-erosion and collapse	Generally unsuitable as an aggregate source; generally unsuitable for foundations	Subject to seasonal flooding during high stream stages; muddy during wet weather
L2	Qlr	Deposits of Ice-Shoved Ridges	Generally good, but variable	Intense if wet or moist	Unfrozen to discontinuously frozen with low to moderate ice content; thaw unstable where frozen and ice rich	Subject to differential settlement where frozen and ice rich	Possible low-volume source of sandy gravel and organic material for landscaping; generally unsuitable for foundations	Subject to ice shoving in winter near lake shores
H	Qhf	Artificial Fill	Generally good	Only where fine grained; otherwise not susceptible	Unfrozen to discontinuously frozen with low to moderate ice content; generally thaw stable, except where silty	Subject to lateral erosion and collapse near active channels	Fill material used for runways, taxiways, ramps, roads, building foundations, embankments, and artificial levees may be suitable for construction; may not be suitable for all uses	Subject to inundation every 500 to 1,000 years (Chapin and others, 2006; Yarie and others, 1998); shallow water table; potentially unstable where underlying material is thawed and subject to liquefaction; can become locally unstable if margins undercut
P	Qp	Swamp Deposits	Generally very poor; subject to seasonal flooding	Intense	Discontinuous to continuous permafrost with moderate to very high ice content; thaw unstable	Subject to lateral erosion and collapse near active channels; subject to subsidence when thawed	Source of organic material for landscaping; generally unsuitable as an aggregrate source; generally unsuitable for foundations	Difficult to excavate and compact; subject to seasonal slope and stream icings; subject to considerable thaw strain and compaction upon thawing
B	b b' b+b' (Qc) (Qcf)	Bedrock Thinly Covered Bedrock	Generally poor, except where highly broken	Low, except where rock is highly weathered or fractured	Generally thaw stable, except where ice forms in extensive fracture spaces	Generally stable, except where orientation of joints, fractures, or foliation facilitate failure	Can be good source for crushed aggregate and rip rap where rock is hard, fresh, and not highly fractured; variable suitability as a foundation material depending on the character of the bedrock	Quality of rock varies, depending on lithology, degree of weathering, and fracturing; local zones of weathering or shearing can be clay rich

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Topographic base map from:
U.S. Geological Survey topographic maps
Tanacross A-2 (1955 - minor revisions 1972)
Tanacross A-3 (1948)
Tanacross B-3 (1948)
Projection:
Universal Transverse Mercator Zone 7 North
Datum:
North American Datum of 1927

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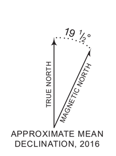
ENGINEERING-GEOLOGIC MAP, ALASKA HIGHWAY CORRIDOR, DELTA JUNCTION, ALASKA, TO THE CANADA BORDER: SEGMENT 3 WEST

by
R.D. Reger[1] and T.D. Hubbard[2]
2021

MAP LOCATION



APPROXIMATE MEAN DECLINATION, 2016

SCALE 1:63,360

1 ½ 0 1 2 3 4 5 MILES

1 .5 0 1 2 3 4 5 6 7 KILOMETERS

CONTOUR INTERVAL 100 FEET
TANACROSS A-3 AND B-3 — SUPPLEMENTAL CONTOUR INTERVAL 50 FEET
TANACROSS A-2 — DATUM IS MEAN SEA LEVEL
TANACROSS A-3 AND B-3 — NATIONAL GEODETIC VERTICAL DATUM OF 1929

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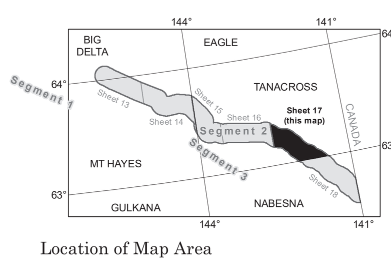

Location of Map Area

List of Map Sheets