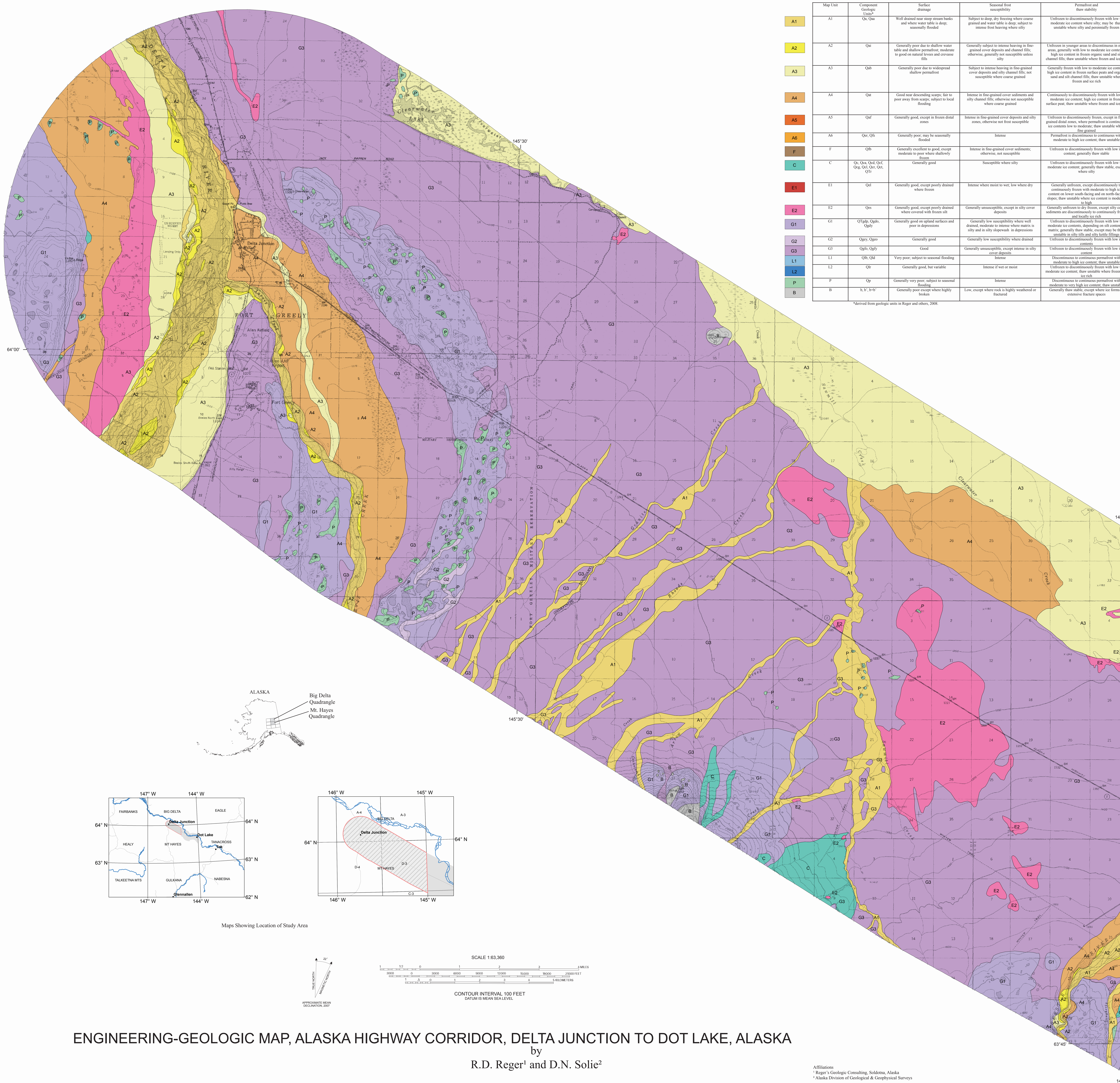
ALASKA DIVISION OF GEOLOGICAL &
GEOPHYSICAL SURVEYS

Map Unit	Component Geologic Units*	Surface drainage	Seasonal frost susceptibility	Permafrost and thaw stability	Slope stability	Suitability for construction	Potential engineering considerations
A1	Qa, Qaa	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 heaving where silty	Unfrozen to discontinuously frozen with low to moderate ice content where silty; may be thaw unstable where silty and perennially frozen	Highly susceptible to lateral erosion and collapse near active channels	Excellent source of clean, sandy gravel aggregate and clean fill material; may be poorly graded; well-drained sand and gravel provide excellent foundation	Subject to inundation every 1-5 yr during high stream stages (Chapin and others, 2006) 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 may vary considerably, especially near frozen zones
A2	Qai	Generally poor due to shallow water table and shallow permafrost; moderate to good on natural levees and crevasse fills	Generally subject to intense heaving in fine-grained cover deposits and channel fills; otherwise, generally not susceptible unless silty	Unfrozen in younger areas to discontinuous in older areas, generally with low to moderate ice contents; 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 table may limit potential as source of sandy gravel aggregate and suitability for foundation	Subject to inundation at least once or twice every 100 yr (Chapin and others, 2006); shallow water table limits depth of excavation; where thawed, fine sand and silt subject to liquefaction; responses to seismic shaking may vary considerably.
A3	Qab	Generally poor due to widespread shallow permafrost	Subject to intense heaving in fine-grained cover deposits and silty 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 limit potential as source of sandy gravel aggregate and suitability for foundation	Subject to inundation every 500 to 1,000 yr (Mann and others, 1995; Mason and Begét, 1991); shallow water table and presence of permafrost limit depth of excavation; subject to liquefaction where thawed; responses to seismic shaking may vary considerably; sensitive to surface disturbance
A4	Qat	Good near descending scarps; fair to poor away from scarps; subject to local flooding	Intense in fine-grained cover sediments and silty channel fills; otherwise 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 may limit depth of excavation; bedrock shallow in strath terraces; excellent foundation where thawed	Bedrock shallow in strath terraces; locally subject to seasonal slope and stream flooding; where saturated, fine-grained cover sediments subject to liquefaction; seismic shaking may vary considerably, especially near frozen zones; locally sensitive to surface disturbance
A5	Qaf	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 continuous; ice contents low to moderate; thaw unstable where fine grained	Subject to lateral erosion and collapse near active channels and in proximal zone of fan	Generally unsuitable as aggregate source because of 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	Generally poor; may 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; suitable for foundations only when permafrost is preserved	Thawing produces mudflows and hyperconcentrated flows; subject to seasonal stream and slope icings; sensitive to surface disturbance
F	Qfb	Generally excellent to good, except moderate to poor where shallowly frozen	Intense in fine-grained cover sediments; otherwise, not susceptible	Unfrozen to discontinuously frozen with low ice content; generally thaw stable	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
C	Qc, Qca, Qcd, Qcf, Qcg, Qcl, Qcr, Qct, QTr	Generally good	Susceptible where silty	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; where frozen, may require ripping or blasting; poor foundation where blocks are loose and unstable to good foundation where coarse and fine fractions are mixed and stable	May become unstable if margins or toe removed
E1	Qel	Generally good, except poorly drained where frozen	Intense where moist to wet; low where dry	Generally unfrozen, except discontinuously to continuously frozen with 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 fines for landscaping and mixing; makes good foundation where thawed and dry; muddy when wet; dusty when dry	Vertical cuts can be stable if drainage is provided. Ice-rich areas sensitive to surface disturbance
E2	Qes	Generally good, except poorly drained where covered with frozen silt	Generally unsusceptible, except in silty cover deposits	Generally unfrozen to dry frozen, except silty cover sediments are discontinuously to continuously frozen and locally ice rich	Highly susceptible to gullying and deflation where vegetation cover is disturbed	Difficult to compact for foundations	Subject to deflation where unprotected
G1	QTgdp, Qgdo, Qgdy	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 in depressions	Unfrozen to discontinuously frozen with low to moderate ice contents, depending on silt content of matrix; generally thaw stable, except may 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 can be good local source of mixed coarse and fine fractions for fill; local sources of water-washed sand and gravel; good foundation where thawed and dry	Subject to gullying where surface runoff is concentrated
G2	Qgey, Qgeo	Generally good	Generally low susceptibility where drained	Unfrozen to discontinuously frozen with low ice contents	Generally stable except subject to raveling where steep gravel slopes are undercut	Highly variable but may be good source of water-washed sand and gravel; good foundation where thawed and dry	Locally rich in oversize material
G3	Qgfo, Qgfy	Good	Generally unsusceptible, except intense in silty cover deposits	Unfrozen to discontinuously frozen with low ice content	Subject to lateral erosion and collapse near active channels, steep cut faces subject to raveling	Excellent source of sand and gravel; excellent foundation	Easily compacted, although locally contains numerous large boulders
L1	Qlb, Qld	Very poor; subject to seasonal flooding	Intense	Discontinuous to continuous permafrost with moderate to high ice content; thaw unstable	Subject to lateral thermoerosion and collapse near active channels	Generally unsuitable; muddy when wet	Subject to seasonal flooding during high stream stages
L2	Qlr	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
P	Qp	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; unsuitable for foundations unless permafrost is preserved	Difficult to excavate and compact; subject to seasonal slope and stream icings
B	b, b’, b+b’	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 may cause failure	Can be good source for crushed aggregate and rip rap where rock is hard, fresh, and not highly fractured	Quality of rock will vary depending on lithology, degree of weathering, and fracturing; local zones of weathering or shearing may be clay rich

*derived from geologic units in Reger and others, 2008.



Maps Showing Location of Study Area

SCALE 1:63,360

CONTOUR INTERVAL 100 FEET
DATUM IS MEAN SEA LEVEL

ENGINEERING-GEOLOGIC MAP, ALASKA HIGHWAY CORRIDOR, DELTA JUNCTION TO DOT LAKE, ALASKA

by
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INTRODUCTION

This map is derived electronically from the surficial-geologic map of the initial segment of the proposed natural gas pipeline corridor through the upper Tanana valley (Reger and others, 2008) using Geographic Information System (GIS) software. Surficial-geologic units were initially identified by interpretation of false-color 1:65,000-scale infrared aerial photographs taken in July 1978, August 1980, and August 1981 and locally verified by field checking in 2006 and 2007. 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 (includes some flood deposits)
F – Flood deposits
C – Colluvial deposits
E – Eolian deposits
G – Glacial deposits
L – Lake deposits
P – Paludal peat deposits
B – Bedrock

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 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.

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