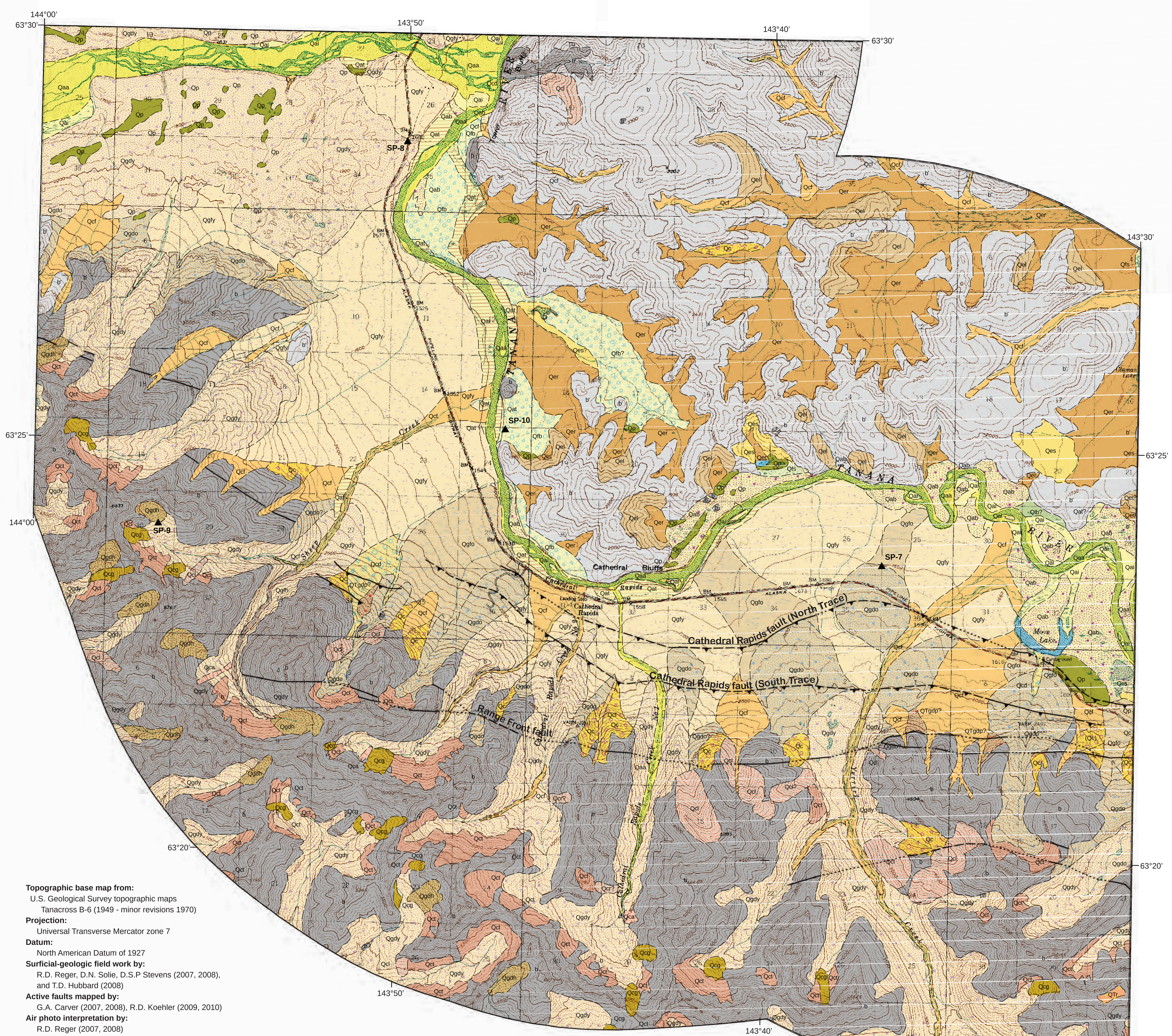
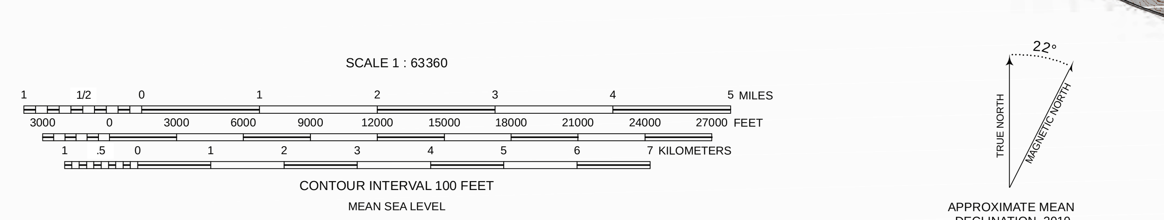
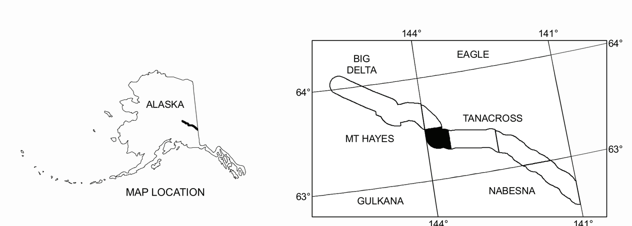


Topographic base map from:
U.S. Geological Survey topographic maps
Tanacross B-6 (1949 - minor revisions 1970)
Projection:
Universal Transverse Mercator zone 7
Datum:
North American Datum of 1927
Surficial-geologic field work by:
R.D. Reger, D.N. Solie, D.S.P Stevens (2007, 2008), and T.D. Hubbard (2008)
Active faults mapped by:
G.A. Carver (2007, 2008), R.D. Koehler (2009, 2010)
Air photo interpretation by:
R.D. Reger (2007, 2008)
GIS layers digitized by:
D.S.P. Stevens (2008) and G. Davidson (2009)
Digital cartography by:
P.E. Gallagher (2009, 2010, 2011), R.E. Westbrook (2010, 2011), and J.R. Weakland (2011)
Reviewed by:
D.S.P. Stevens and D.N. Solie (2009)

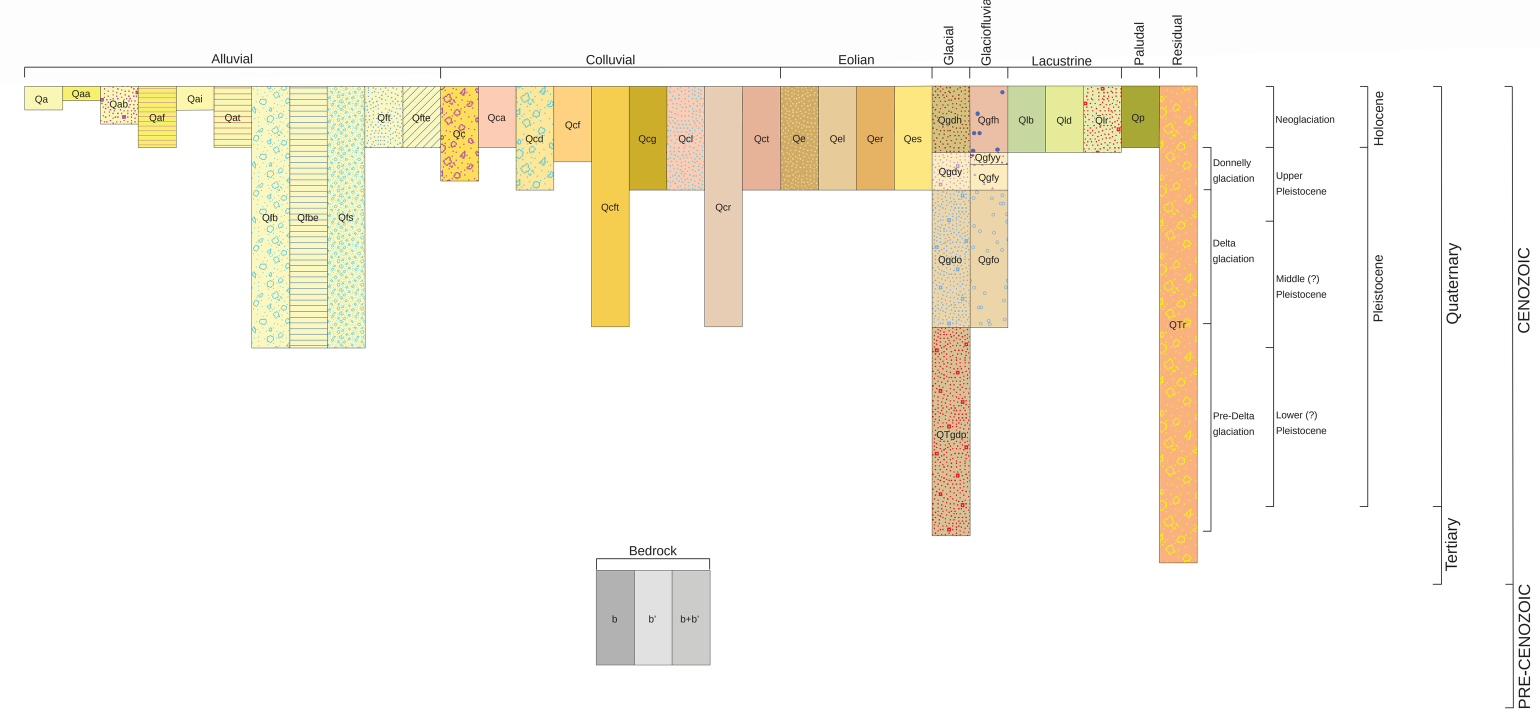




Location of Map Area in Proposed Corridor

CORRELATION OF MAP UNITS

(All map units may not appear on this sheet)



SURFICIAL-GEOLOGIC MAP, ALASKA HIGHWAY CORRIDOR, PART OF THE TANACROSS B-6 QUADRANGLE, ALASKA

by

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2011

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DESCRIPTION OF SURFICIAL-GEOLOGIC MAP UNITS

(Map units below might not all appear on this sheet)

This map shows the distribution of unconsolidated deposits and undifferentiated bedrock exposed at the surface in part of the central segment of the proposed natural-gas pipeline corridor straddling the Alaska Highway from Robertson River to Tetlin Junction in the Tanacross Quadrangle. Units were mapped by interpretation of false-color infrared ~1:65,000-scale aerial photographs taken in July 1978, August 1980, and July 1983 and verified by field checking in 2007 and 2008.

Map units shown in parentheses such as (Qcf), indicate combination map units consisting of bedrock overlain by thin to discontinuous material of the map unit shown.

UNCONSOLIDATED DEPOSITS[4]

ALLUVIAL DEPOSITS

Qa UNDIFFERENTIATED FLOODPLAIN ALLUVIUM—Chiefly well sorted and well stratified polymictic pebble gravel, sand, and silt comprising channel and overbank deposits of generally small streams; unfrozen to discontinuously frozen with low to moderate ice content

Qaa ACTIVE-FLOODPLAIN ALLUVIUM—Chiefly well sorted and well stratified layers and lenses of polymictic pebble gravel, sand, and silt with rare to scattered cobbles comprising river bars subject to recurrent inundation by streams every 5 yrs or less (Chapin and others, 2006); mapped extent is a function of river level (stage) and reflects the transitory extent of exposed river bars at the time the photographs were taken; in braided and anastomosing reaches, active channels typically shift positions from year to year and present channel locations may differ from locations in the photography on which the deposits were mapped; active alluvium underlies upper stream bank and active stream channels and includes point-bar and meander-scroll deposits (Brakenridge, 1988); composed dominantly of gravel and sand where stream is braided and anastomosing and sand and silt bars and cover deposits where meandering; prone to liquefaction where fine grained and unfrozen (Harp and others, 2003); where braided, subject to formation of extensive, thick seasonal-stream icings (aufeis); generally unfrozen, except seasonally frozen to depth of frost penetration; shallow water table

Qab ABANDONED-FLOODPLAIN ALLUVIUM—Chiefly 10 to 20 ft (3 to 6 m) of overbank sandy silt and silty sand overlying sandy, polymictic riverbed gravel beneath surfaces with widespread cover of lowland loess and local sand dunes and subject to stream flooding about once every 500 to 1,000 yrs (Mann and others, 1995); may include several surfaces at different levels; overbank sequences include flood-related features, like natural levees, crevasse splays, and expansion fans near channels and fine-grained, peaty back-levee swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); may contain organic-silt channel fills 7 to 20 ft (2.1 to 6 m) thick; surface peat generally discontinuous to widespread in backwater areas away from channels; floodplain lakes are larger than lakes on younger floodplain surfaces and typically have rounded to scalloped shorelines formed by thermokarst erosion; generally frozen with low to moderate ice content

Qaf ALLUVIAL-FAN DEPOSITS—Fan-shaped deposits of unsorted to well sorted gravel, sand, and silt with numerous cobbles and boulders in proximal zone; lithologies reflect bedrock of source area; in general, size of clasts decreases and degree of sorting increases downfan; typically mixed with debris-flow deposits in proximal part of fans; unfrozen to discontinuously frozen, except in fine-grained distal deposits where permafrost may be shallow and continuous; ice content low to moderate

Qai INACTIVE-FLOODPLAIN ALLUVIUM—Chiefly 2 to 20 ft (0.6 to 6 m) of overbank silty sand and sandy silt overlying gravelly, polymictic riverbed sand and sandy gravel beneath surfaces subject to flooding as often as two to ten times per century (Mason and Begét, 1991; Yarie and others, 1998; Chapin and others, 2006); may include more than one surface at different levels; overbank sequences include flood-related features such as natural levees, crevasse-splays, and expansion fans near channels, and fine-grained back-levee swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); scroll lakes have linear, arcuate, and coalesced outlines (Weber and Péwé, 1961, 1970; Péwé, 1970; Reger and Hubbard, 2009); surface peat generally absent; prone to liquefaction where fine grained and unfrozen (Harp and others, 2003); generally unfrozen in younger areas and discontinuously frozen in older areas with low to moderate ice content; active channels may be underlain by 5 to 20 ft (1.5 to 6 m) of generally unfrozen sand and silty sand; fills of inactive channels may include 7 to 12 ft (2.1 to 3.6 m) of discontinuously frozen organic sand and silt with moderate to high ice content over sand and gravelly sand

Qat STREAM-TERRACE ALLUVIUM—Chiefly 4 to >20 ft (0.6 to >6 m) of organic sandy silt and silty sand overlying well sorted, polymictic sand and gravel beneath stream terrace treads no longer subject to inundations by the stream that deposited the alluvium (Kreig and Reger, 1982); may include several levels and flood-related features such as natural levees, crevasse-splays, and expansion fans near channels; may incorporate outwash alluvium of Donnelly age in highest terraces; locally covered by ≤15 ft (≤4.5 m) of lowland loess and eolian-sand blanket and dune complexes, especially close to active sediment sources; thaw lakes with rounded to scalloped shorelines formed by thermokarst erosion are typically present (Weber and Péwé, 1961, 1970; Péwé, 1970; Reger and Hubbard, 2009); locally subject to seasonal stream icings where buildup of aufeis in stream channels diverts subsequent drainage and spreads aufeis and meltwater across terrace treads that would not otherwise be flooded (Springer and others, 1976; Sloan and others, 1976); continuously to discontinuously frozen with low to moderate ice content

Qfb FLOOD DEPOSITS—Expansion fans, crevasse-splay complexes, pendant bars, and linear bars fanning away from the modern floodplain of the Tanana River on terraces along the southern margin of the Yukon–Tanana Upland; typically located downstream from bedrock ridges that trend transverse to the Tanana River; include streamlined terrace remnants preserved downstream from bedrock ridges and knobs and are typically composed of clean, coarse to medium pebbly sand overlying cobble gravel with scattered large granitic flood boulders; impound clearwater lakes along the northern margin of the Tanana Lowland; include jökulhlaup deposits of the well-drained, low-gradient, western, older part of the broad Tok fan, which is composed of clast- and matrix-supported, tabular, massive to crudely bedded gravels interbedded with minor beds of crudely bedded pebbly sand; beds average ~3.3 ft (1 m) thick, parallel the fan surface, and contain rare extraordinarily large flood boulders; unfrozen to discontinuously frozen; low ice content

Qfbe ZONE OF GROUNDWATER EMERGENCE ON OLDER TOK FAN—Surface features on typically well drained western, older Tok fan that indicate emergence of groundwater include swampy vegetation, peat, and standing surface water; the presence of water in shallow, artificial trenches; networks of shallow drainage channels originating at clearwater springs; and a concentration of clearwater ponds and lakes

Qfs SLACKWATER FLOOD DEPOSITS—Chiefly organic sandy and silty backswamp sediments deposited during floods in slackwater basins separated from source streams by expansion fans and natural-levee and crevasse-splay complexes; typically inundated by shallow water between flood events; surface vegetation is water-tolerant shrubs and peat bogs; may be associated with open-system pingos, numerous thaw ponds and lakes, and thermokarst pits; inferred to be continuously frozen and ice-rich

Qft TERRACE DEPOSITS OF YOUNGER TOK FAN—Surface above inactive and abandoned floodplains of Tok River displays former meandering and anastomosing drainage channels of Tok River; composed of micaceous cover silt with trace clay up to 5 in (12.7 cm) thick overlying poorly sorted, generally massive to crossbedded, matrix-supported pebbly medium-to-coarse sand with trace silt and rare polymictic cobbles up to 4 in (10.2 cm) diameter; moderate imbricating; depth to carbonate-bottomed pebbles varies up to 32 in (0.8 m); carbonate cements granules and coarse sand to bottom of pebbles; silt caps discontinuous and <0.1 in (<0.25 cm) thick; matrix color dark yellowish brown (10YR4/6) to grayish brown (2.5Y5/2); locally poorly drained; discontinuously frozen with low to moderate ice content

Qfte ZONE OF GROUNDWATER EMERGENCE ON YOUNGER TOK FAN—Surface features on the eastern, younger Tok fan that indicate emergence of groundwater include swampy vegetation, peat, standing surface water, and networks of shallow drainage channels

COLLUVIAL DEPOSITS

Qc UNDIFFERENTIATED COLLUVIUM—Blankets, aprons, cones, and fans of heterogeneously mixed angular to subangular rock fragments, gravel, sand, and silt formed by complex, gravity-driven mass movements involving sliding, flowing, gelifluction, and frost creep of weathered bedrock and modified glacial drift; cobbles and boulders are scattered to numerous; lower headwalls of cirques and upper walls of glaciated valleys include talus aprons, incipient rock glaciers, and related features, as well as steep fans built by snow avalanches and debris flows; may include thin residual deposits and lags of former Tertiary bedrock and highly modified drift of ancient glaciations on high-level remnants of former pediments; morphologies of colluvial sheets generally reflect morphologies of underlying materials; discontinuously to continuously frozen with low to moderate ice content

Qca SNOW-AVALANCHE DEPOSIT—Steep fans of heterogeneous rubbly debris with some gravel, sand, and silt deposited by snow avalanches in and downslope of couloirs in steep alpine terrain; surface covered with scattered, angular rock fragments; may be crudely sorted by grain size with the largest fragments farther downslope; typically associated with talus cones and aprons; discontinuously frozen with low to moderate ice content

Qcd DEBRIS-FLOW DEPOSIT—Chiefly tongues of angular rock fragments and coarse gravel with a sandy matrix deposited on steep colluvial slopes and fans and in rock-walled upper stream valleys by flowing slurries of mud, sand, rock debris, and gravel generated during sudden intense summer rainstorms; initial fine fractions are later winnowed, leaving coarse gravel and rubble tongues and lobes, some with natural levees of cobbles and boulders up to 7 ft (2.1 m) high bounding medial channels with rectangular to U-shaped cross profiles measuring 10 to 70 ft (3 to 21.3 m) across and 10 to 60 ft (3 to 18.3 m) deep; many large boulders and blocks have small debris mounds and scattered cobbles on upper surfaces; generally unfrozen to discontinuously frozen with low ice content

Qcf MIXED COLLUVIUM AND ALLUVIUM—Primarily fan-shaped or elongate, massive to poorly stratified, generally inorganic silt mixed with sandy angular to subangular pebble gravels derived from weathered bedrock uplands and loess-covered moraines, and laid down by debris flows and hyperconcentrated flows produced during brief, intense local summer storms; colluvial processes > fluvial processes; surface slightly irregular; contains numerous cobbles in glacial terrain and angular to subangular, fresh to weathered rock fragments and grus in weathered granitic bedrock terrain; discontinuously to continuously frozen with low to moderate ice content

Qcft TECTONICALLY DEFORMED COLLUVIAL–FLUVIAL DEPOSITS—Arcuate ridges of poorly stratified, coarse, sandy grus fragments with trace silt, numerous pebbles and scattered subrounded to rounded granitic boulders up to 9 ft (2.7 m) diameter initially deposited as piedmont aprons southwest of Tanacross Airfield (sheet 3) by debris flows derived from the steep mountain valley to the southwest and later tectonically deformed (Carver and others, 2010); sandy granule matrix, color dark brown (7.5YR4/4) to light olive brown (2.5Y5/4); surface smoothly rounded with slopes between ~4° and ~17°; partially exhumed granitic boulders stand up to ~5 ft (~1.5 m) in relief; heights of surface boulders greater where surface slopes are steeper; surface stepped by ~20° to ~25° scarps of shallow, local slope failures; discontinuously frozen with low ice content

Qcg ROCK–GLACIER DEPOSITS—Tongue-shaped heterogeneous surface blanket of angular to subangular blocks of local bedrock overlying deformed ice with trace to some gravel, sand, and silt at depth; where active, blocky surface layer is disrupted on steep marginal slopes and core debris is exposed; accumulated on floors and lower walls of cirques and glaciated valleys by flow of rock glaciers derived from shrinking of former glaciers (ice cored) or from deposition, cementation, and deformation of precipitation-derived ground ice (ice cemented); surface typically has furrows, nested arcuate ridges arranged convexly downvalley, and pits, and may have prominent lateral ridges; perennially frozen where active with moderate to high ice content

Qcl LANDSLIDE DEPOSITS—Lunate to triangular or fan-shaped, heterogeneous mixtures of large fractured bedrock blocks and pebble gravel with scattered to numerous cobbles and boulders and trace to some sand and silt deposited by near-surface to deep creeping, flowing, and sliding of failed bedrock and unconsolidated surficial deposits; surface features include gaping ground cracks where active, slight irregularities, hummocks, low longitudinal ridges, and terminal bulges; unfrozen to continuously frozen with low to moderate ice content

Qcr ROCK-FALL DEPOSITS—Rubble blanket or apron of large, angular rock fragments of local bedrock formed by collapse of upslope outcrop; unfrozen to discontinuously frozen with low ice content

Qct TALUS—Cone- and apron-shaped heterogeneous mixtures of frost-rived, angular rock fragments downslope of bedrock outcrops with trace to some gravel, sand, and silt deposited on steep bedrock slopes and at the mouths of steep bedrock couloirs with U-shaped cross profiles by snow avalanches, free fall, tumbling, rolling, and sliding; surface steep, slightly irregular, and covered with numerous rock fragments, particularly in distal zones; includes debris-flow tongues; blocks and boulders covered by crustose lichens where stable and lichen free where freshly displaced; unfrozen to discontinuously frozen with low ice content

EOLIAN DEPOSITS

Qe UNDIFFERENTIATED EOLIAN DEPOSITS—Chiefly well sorted, massive to finely bedded , primarily airfall eolian sand and loess forming a blanket over bedrock ridges and hills and lowlands in the southern Yukon–Tanana Upland; complex stratigraphy may include retransported sand and silt; discontinuously to continuously frozen with low to high ice content

Qel LOESS—Silt with up to 15 percent very fine sand carried by winds and deposited as a blanket over downwind topography (Péwé, 1951, 1955); mixed with eolian sand on lower slopes and on lowland surfaces close to floodplain sources; may include intimate mixtures with retransported silt; thickness ranges from >20 ft (>6 m) close to active sediment sources to ~2 ft (~0.6 m) elsewhere (Lindholm and others, 1959); typically rilled where >3 ft (>0.9 m) thick on steep upper slopes, but areas of mapped loess should be considered minimal because rills are locally obscured by dense vegetation cover; organic rich on lower slopes and lowland sites; moderate to high moisture content (>15 percent) in lowland sites (Kreig and Reger, 1982); generally unfrozen, except discontinuously frozen with moderate to high ice content on some lower, south-facing slopes and continuously frozen and ice rich on some lower north-facing slopes and lowland sites

Qer RETRANSPORTED SILT AND SAND COMPLEXLY MIXED WITH LOWLAND LOESS—Chiefly massive to well stratified organic silt and sandy silt with lenses and tongues of locally derived gravel and scattered to numerous angular rock fragments (particularly in upper valleys of small ephemeral streams) in loess areas and organic fine sand in sand dune areas; deposited primarily by hyperconcentrated flows (Costa, 1988) draining weathered bedrock slopes thinly covered by upland silt (loess) and eolian sand and generated by thawing of ice-rich permafrost or brief, intense summer rainstorms; complexly mixed with debris-flow deposits in upper stream drainages, primary airfall loess and eolian fine sand in lowland sites, and fine-grained distal overbank sediments in slackwater flood basins; fluvial processes > colluvial processes; surface fairly smooth with scattered open-system pingos and local thermokarst pits, ponds, and lakes; may be subject to seasonal stream and slope icings; discontinuously to continuously frozen with moderate to high ice content

Qes EOLIAN SAND—Chiefly blankets and dunes of fine to medium, massive to cross-bedded eolian sand with trace to some silt (Kreig and Reger, 1982, pl. 9); dunes stand 5 to 15 ft (1.5 to 4.5 m) in relief and ridges may extend for up to 3 mi (4.8 km) in the direction of dominant summer winds; mapped extents, based on the presence of dunes, should be considered minimum; cliffhead dunes locally crown steep slopes that are the sand sources; discontinuous with thicknesses up to ~25 ft (~7.6 m); unweathered color grayish brown (2.5Y5/2); generally covered by 1 to 3 ft (0.3 to 0.9 m) of loess (Lindholm and others, 1959); locally being deposited along the margins of braided floodplains; average moisture content ~8 percent (Kreig and Reger, 1982); discontinuously frozen with low to moderate ice content

GLACIAL DEPOSITS

Qgdh TILL AND ASSOCIATED MORAINAL DEPOSITS OF POST-DONNELLY GLACIATION—Heterogeneous, non-stratified, polymictic pebble–cobble gravel with some sand and silt and numerous angular to subrounded boulders deposited by glacial ice and associated colluvial processes in upper mountain valleys during Holocene time; boulders of younger deposits are unvegetated or bear crustose lichens; older moraines are typically covered with tundra; loess cover thin and patchy to nonexistent; ice cores may be present, especially in younger moraines; unfrozen to discontinuously frozen with low to moderate ice content

Qgdy TILL AND ASSOCIATED MORAINAL DEPOSITS OF DONNELLY GLACIATION—Heterogeneous, nonstratified, polymictic pebble–cobble gravel with some sand and silt and few to numerous subangular to subrounded boulders deposited by glacial ice and locally reworked by meltwater washing and associated mass-movement processes; may locally include esker and kame deposits; morainal relief 50 to 175 ft (15.2 to 53.3 m); kettle frequency ~16/mi² (~6.4/km²); kettle fillings of silt, peat, and silty colluvium generally thin but may be several feet (meters) thick close to active sources of eolian deposits; maximum till thickness ~300 ft (~91 m); surface weathering profiles 1.5 to 2.5 ft (0.5 to 0.8 m) thick; friable; sand matrix weathered to brown (10YR5/3); 25 to 35 percent of schist clasts are intact in weathering profiles and granitic clasts are fresh to slightly weathered; silt caps generally <1 mm thick; discontinuous cover of loess generally ≤3 ft (≤0.9 m) thick and weathered yellowish brown (10YR5/8) to light yellowish brown (10YR6/4) but eolian sand and silt mantle may be >20 ft (>6 m) thick close to active sediment sources and may obscure primary surface morphology; ventifacts exhibit slight to moderate surface polish and shallow pitting but lack facets and keels in lags developed beneath loess covers; ice-wedge casts generally rare and up to 3 ft (0.9 m) wide; unfrozen to discontinuously frozen with low to moderate ice content (Péwé and Holmes, 1964; Holmes, 1965; Carter and Galloway, 1978; Péwé and Reger, 1983a, table 3)

Qgdo TILL AND ASSOCIATED MORAINAL DEPOSITS OF DELTA GLACIATION—Heterogeneous, nonstratified, polymictic pebble–cobble gravel with some sand and silt and few to numerous subangular to subrounded boulders deposited by glacial ice and massive, sandy pebble gravel with rare cobbles deposited by glacial meltwater and associated mass-movement processes; may include esker and kame complexes; morainal relief 25 to 225 ft (7.6 to 68.6 m); kettle frequency ~3/mi² (~1.2/km²); kettle fillings of silt, peat, and silty colluvium may be several feet (meters) thick; maximum till thickness ~200 ft (~60 m); surface weathering profiles generally 3–7 ft (0.9–2.1 m) deep, on high-level surfaces may locally be >10 ft (>3 m) deep; friable to strongly cemented with numerous clast molds; sand matrix weathered light yellowish brown (10YR6/4) to brownish yellow (10YR6/6); 1 to 10 percent of schist clasts are intact in weathered profiles and ≤50 percent of granitic clasts are partially decomposed; silt caps range from <0.04 to 0.12 in (<1 to 3 mm) thick; discontinuously mantled by thin eolian sand and loess; loess cover weathered to light reddish brown (5YR6/4) (rubification); well-formed faceted and keeled ventifacts common in surface lags beneath loess covers; ice-wedge casts scattered to numerous and up to ~5 ft (~1.5 m) wide; wedge fillings include deformed eolian sand that is locally pebbly; unfrozen to discontinuously frozen with low to moderate ice content (Péwé and Holmes, 1964; Holmes, 1965; Carter and Galloway, 1978; Péwé and Reger, 1983a, table 3)

QTgdp UNDIFFERENTIATED GLACIAL DRIFT OF PRE-DELTA GLACIATION(S)—Thin, discontinuous to continuous sheets of heterogeneous pebble gravel, sand, and silt with rare to numerous cobbles, boulders, and blocks up to 8 ft (2.4 m) in diameter deposited directly from melting glacial ice and reworked by meltwater streams; includes drift of Darling Creek age and perhaps other pre-Delta glaciations on alpine surfaces and lower mountain slopes south of Tanana River; sandy matrix weathered pale brown (10YR6/3) to brown (10YR5/3); surface morphology extensively modified by mass-movement processes; unfrozen to discontinuously frozen with low to moderate ice content (Péwé and Reger, 1983a; Weber, 1986; Duk-Rodkin and others, 2004)

GLACIOFLUVIAL DEPOSITS

Qgfh OUTWASH OF POST-DONNELLY GLACIATION—Massive to well sorted, polymictic pebble–cobble gravel with some sand and numerous subrounded to angular boulders deposited by meltwater streams from Holocene glaciers in upper mountain valleys; locally includes deposits of debris flows and rockfalls; clasts are generally fresh; surfaces unvegetated to vegetated with thin tundra; loess cover nonexistent to thin and patchy; unfrozen to discontinuously frozen with low ice content

Qgfyy OUTWASH OF LATE DONNELLY AGE—Coarse outwash gravel in steep-walled, flat-floored, broad channel incised into surface of outwash fan of Robertson River glacier north of Jan Lake; connects with kame–esker deposits in the southeastern corner of Corridor Segment 1 (Reger and others, 2008, sheet 2)

Qgfy OUTWASH OF DONNELLY GLACIATION—Massive to well sorted, polymictic pebble gravel with some sand and scattered to numerous subrounded to subangular cobbles and boulders ≤7 ft (≤2.1 m) in diameter in proximal zones; surface weathering profiles ≤3 ft (≤0.9 m) deep; sand matrix color varies from pale brown (10YR6/3) to brown (10YR5/3); 5 to 10 percent of foliated tillstones are typically split into plates by frost action and granitic tillstones are fresh to slightly weathered in weathered profiles, except locally, where foliated tillstones are shattered to small, platy fragments and granitic clasts are reduced to crumbly remnants by the growth of calcite (caliche) in the upper 3 to 4 ft (0.9 to 1.2 m) of the outwash deposit; silt caps thin and discontinuous; cover sands discontinuous and up to ~10 ft (~3 m) thick; average loess cover ~0.4 ft (~0.1 m) thick and generally weathered light yellowish brown (10YR6/4) to brown (10YR5/3), except red (2.5YR5/6) where strongly oxidized after repeated wildfires (Ping and others, 2006); ventifacts exhibit slight to moderate surface polish and pitting but no facets or keels in lags developed beneath loess covers; ice-wedge casts generally rare, but locally common and ≤3 ft (≤0.9 m) wide (Péwé and Reger, 1983a, p. 62–66); deformed wedge fillings composed of brown to greenish gray silt with trace to some pebble gravel and scattered cobbles; unfrozen to discontinuously frozen with low ice content

Qgfo OUTWASH OF DELTA GLACIATION—Massive to well sorted, polymictic pebble gravel with some sand and numerous subrounded to subangular cobbles and boulders ≤3.5 ft (≤1.1 m) in diameter; coarser in proximal zones and finer where distal; surface weathering profiles ≥12 ft (≥3.6 m) deep; sand matrix color varies from pale brown (10YR6/3) to very pale brown (10YR7/4); ~50 percent of foliated and granitic clasts in weathered profile are rotten; silt caps on clasts in weathered profile ≤0.08 in (≤2 mm) thick; cover sands discontinuous and up to ~10 ft (~3 m) thick; loess cover typically 1 to 2 ft (0.3 to 0.6 m) thick; well formed faceted and keeled ventifacts common in surface lags beneath loess covers; quartz pebbles in lags stained yellowish brown (10YR5/4) to very pale brown (10YR7/4); ice-wedge casts scattered to numerous and ≤3.5 ft (≤1.1 m) wide; deformed wedge fillings are typically eolian sand with trace to some silt and pebble gravel and may include scattered pebble ventifacts; unfrozen to discontinuously frozen with low ice content

LACUSTRINE DEPOSITS

Qlb LAKE-BOTTOM DEPOSITS—Chiefly silt and clay with some sand and organic material deposited in ephemeral lakes in backwater areas of inactive floodplains and behind ice-shoved ramparts in large lakes; discontinuously to continuously frozen with moderate to high ice content

Qld DELTA DEPOSITS—Chiefly sand and silt with some organic material deposited in a lake basin by a stream entering the lake; during floods of the Tanana River, streams normally draining the lake into the river reverse directions and carry floodwaters and sediments into the lake basin; sporadically frozen with moderate to high ice content

Qlr DEPOSITS OF ICE-SHOVED RIDGES—Single or multiple 3- to 5-ft-high (0.9- to 1.5-m-high) ridges parallel to and 2 to 15 ft (0.6 to 4.5 m) above modern lake shorelines; composed of overturned and severely and complexly deformed deposits of adjacent lake bottoms, including fine to coarse clastic lake-bottom sediments and peat with thin interlayered light gray lacustrine sands; built by shoreward transport of lake-bottom sediments by wind-driven, drifting lake ice (Péwé and Reger, 1983b, figs. 22A and B); unfrozen to discontinuously frozen with low to moderate ice content

PALUDAL DEPOSITS

Qp SWAMP DEPOSITS—Primarily fibrous and locally woody, autochthonous peat with organic silt and sand deposited in lowland sites (Kreig and Reger, 1982); ≤8 ft (≤2.4 m) thick; discontinuously to continuously frozen with moderate to high ice content

RESIDUAL DEPOSITS

QTr BLOCK RUBBLE—Nests and blankets of angular to subangular blocks derived by frost wedging and jacking of underlying bedrock (autochthonous block fields) on high-level surfaces (felsenmeer of Carrara, 2004a and b) or as lags left by winnowing of sandy matrix from gelifluction deposits or thin till by subterranean piping (allochthonous block fields); locally may be included in units of thinly covered bedrock (b') and in shallow strath terraces; sizes of blocks are function of joint spacing in local bedrock; associated microrelief features formed by frost action and mass movement include stone polygons, stone nets and circles, stone stripes, nonsorted circles and hummocks, and soil lobes and benches; frost jacking locally active; discontinuously frozen with low to moderate ice content

BEDROCK

b UNDIFFERENTIATED BEDROCK—Outcrops of igneous, metamorphic, and sedimentary rocks; linear and curvilinear shallow troughs and linear changes of surface vegetation indicate the presence of planar bedrock structures

b' THINLY COVERED BEDROCK—Subcrops with <3 ft (<0.9 m) of loess cover; bedrock structures recognizable through thin veneer of surficial debris

b+b' Complex map unit consisting of bedrock outcrops and thinly buried subcrops that cannot be mapped separately

[4] Estimated contents of sand and silt, based on field observations, are indicated by the terms 'trace' and 'some.' 'Trace' implies a general composition of 4 to 12 percent. 'Some' implies a general composition of 12 to 30 percent. Estimated compositions <4 percent are not recorded in the field. Terms used to describe the estimated percentages of cobbles and boulders are 'numerous,' 'scattered,' and 'rare.' 'Numerous' implies that drilling through the deposit would encounter two cobbles or boulders in an interval of 2 ft (0.6 m); 'scattered' implies that drilling would encounter two cobbles or boulders in an interval of 10 to 15 ft (3 to 4.5 m); 'rare' implies that drilling would encounter two cobbles or boulders in an interval of >15 ft (>4.5 m).

MAP SYMBOLS

(Map symbols might not all appear on this sheet)

PHOTOINTERPRETED CONTACT— Dashed where approximately located

? QUESTIONABLE IDENTIFICATION

U / D ACTIVE HIGH ANGLE FAULT— Dashed where approximately located, dotted where concealed
Arrows indicate apparent direction of relative movement
U, upthrown block; D, downthrown block (Carver and others, 2010)

ACTIVE THRUST FAULT— Dashed where approximately located, dotted where concealed; barbs on upper plate (Carver and others, 2010)

ANTIFORM - Dashed where approximately located, dotted where concealed (Carver and others, 2010)

RC-1 ● LOCATION OF RADIOCARBON SAMPLE DISCUSSED IN TEXT

SP-1 ▲ LOCATION OF SOIL PIT DISCUSSED IN TEXT

V-1 ■ LOCATION OF VENTIFACT SITE DISCUSSED IN TEXT

A ✕ MAP LOCALITY DISCUSSED IN TEXT

A——*A'* GEOLOGIC PROFILE DISCUSSED IN TEXT

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