

PRELIMINARY INTERPRETIVE REPORT 2008-3a Reger and others (2008)

SHEET 2 of 2 Explanatory text accompanies map

SCRIPTION OF SURFICIAL-GEOLOGIC MAP UNITS (All map units may not appear on this sheet)		
tribution of unconsolidated deposits and undifferentiated bedrock exposed at the surface in the dling the Alaska Highway through the Big Delta and Mt. Hayes quadrangles. Deposits were or infrared 1:65,000-scale aerial photographs taken in July 1978, August 1980, and August	QTgdp	PRE-DELTA GLACIATION(S) 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
2006 and 2007. UNCONSOLIDATED DEPOSITS ¹		m) in diameter deposited directly from melting glacial ice and reworked by meltwater streams; includes drift of Darling Creek 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
ALLUVIAL DEPOSITS OODPLAIN ALLUVIUM—Chiefly well-sorted and well-stratified polymictic pebble gravel,		mass-movement processes; unfrozen to discontinuously frozen with low to moderate ice contents (Péwé and Reger, 1983a; Weber, 1986; Duk-Rodkin and others, 2004) GLACIOFLUVIAL DEPOSITS
annel and overbank deposits of generally small streams; unfrozen to discontinuously frozen networks and the stratified layers and lenses of polymictic pebble and well-stratified layers and lenses and lenses of polymictic pebble and lenses and l		DONNELLY GLACIATION ESKER-KAME COMPLEX OF DONNELLY GLACIATION—Complex mixtures of sand, pebble gravel with some
re to scattered cobbles comprising river bars subject to recurrent inundation by streams every ers, 2006); mapped extent is a function of river level (stage) and reflects the transitory extent e time the photographs were taken; in braided and anastomosing reaches, active channels m year to year and present channel locations may differ from locations on the August 1980	<u>9999</u>	sand and silt, and diamicton deposited in holes, tunnels, and narrow ice-walled valleys in stagnant glacial ice by sediment-charged meltwater streams and by debris flows generated by melting glacial ice; subangular to rounded cobbles and boulders range from rare to numerous; well to poorly sorted; thin to massive bedded; locally crossbedded; surface has
eposits were mapped; active alluvium underlies upper stream bank and active stream channels neander-scroll deposits (Brakenridge, 1988); composed dominantly of gravel and sand where pomosing (Emmett and others, 1978; Burrows and others, 1979; Burrows and Harrold, 1983)	Contu	high relief and is characterized by discontinuous, sinuous, anastomosing and bifurcating, steep-sided ridges (eskers) typically associated with small, steep-sided hills (kames); unfrozen OUTWASH OF DONNELLY GLACIATION—Massive to well-sorted, polymictic pebble gravel with some sand and
over deposits where meandering; prone to earthquake-induced liquefaction where fine grained d, subject to formation of extensive, thick seasonal-stream icings (aufeis); generally unfrozen, depth of frost penetration; shallow water table		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
ALLUVIUM—Chiefly 2 to 20 ft (0.6 to 6 m) of overbank silty sand and sandy silt overlying ed sand and sandy gravel beneath surfaces subject to flooding at least once or twice every 1991; Chapin and others, 2006); may include more than one terrace level; overbank sequences		fragments and granitic clasts are reduced to crumbly remnants by the growth of calcite (caliche) in the upper 3–4 ft $(0.9-1.2 \text{ m})$ of the outwash deposit; silt caps 0.08 to 0.12 in (2 to 3 mm) and discontinuous; cover sands discontinuous and up to ~10 ft (~3 m) thick; average loess cover ~0.4 ft (~12 cm) thick and generally weathered light yellowish brown
tes, like natural levees, crevasse splays near channels, and fine-grained back-levee swale nels (Brakenridge, 1988; Mann and others, 1995); surface peat generally absent; generally and discontinuously frozen in older areas with low to moderate ice contents; active channels (1.5 to 6 m) of generally unfrozen sand and silty sand; fills of inactive channels may include		(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
AIN ALLUVIUM Chiefly 10 to 20 ft (3 to 6 m) of overbank sandy silt and silty sand		cobbles; unfrozen to discontinuously frozen with low ice contents DELTA GLACIATION
riverbed gravel beneath surfaces with widespread cover of lowland loess and local sand dunes ing about once every 500 to 1,000 yr (Mann and others, 1995); may include several terrace include flood-related features, like natural levees and crevasse splays near channels and	Qgéo	ESKER-KAME COMPLEX OF DELTA GLACIATION—Complex mixture of sand, pebble gravel with some sand and silt, and diamicton deposited in holes, tunnels, and narrow ice-walled valleys in stagnant glacial ice by sediment-charged meltwater streams and by debris flows generated by melting glacial ice; well modified with subdued relief compared to
ree swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); may fills 7 to 20 ft (2.1 to 6 m) thick; surface peat generally discontinuous to widespread in channels; generally frozen with low to moderate ice contents	Qgfo	esker–kame complexes of Donnelly age but distinctive sinuous, bifurcated morphology clearly recognizable; unfrozen OUTWASH OF DELTA GLACIATION— Massive to well-sorted, polymictic pebble gravel with some sand and numerous subrounded to subangular cobbles and boulders \leq 3.5 ft (\leq 1.1 m) in diameter; coarser in proximal zones and
TS—Fan-shaped deposits of nonsorted to well-sorted gravel, sand, and silt with numerous ximal zone; lithologies reflect bedrock of source area; in general, size of clasts decreases and downfan; typically mixed with debris-flow deposits in proximal part of fans; unfrozen to write fine gravity where permeters are a hellow and continuous iso		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
UVIUM—Chiefly 4 to >20 ft (1.2 to >6 m) of organic sandy silt and silty sand overlying		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 contents
and gravel beneath stream terrace treads no longer subject to inundations by the stream that is and Reger, 1982); may include several levels and incorporate outwash alluvium of Donnelly ly covered by ≤ 15 ft (≤ 4.5 m) of lowland loess and eolian-sand blanket and dunes complexes, sediment sources; other surface features, like expansion fans and bars, crevasse splays, and		LACUSTRINE DEPOSITS LAKE-BOTTOM DEPOSITS—Chiefly silt and clay with some sand and organic material deposited in ephemeral lakes
es, relate to deposition and erosion during jökulhlaups of probable Delta and Donnelly ages; ders enclosed in pebble–cobble gravels on strath terraces of Donnelly age; locally subject to re buildup of aufeis in stream channels diverts subsequent drainage and spreads aufeis and	Qlb	in backwater areas of inactive floodplains and behind ice-shoved ramparts in large lakes; discontinuously to continuously frozen with moderate to high ice contents DELTA DEPOSITS—Chiefly sand and silt with some organic material deposited in a lake basin by a stream entering the
ads that would not otherwise be flooded (Springer and others, 1976; Sloan and others, 1976); usly frozen with low to moderate ice contents S—Large expansion fans, crevasse-splay complexes, pendant bars, and linear bars fanning	Qld	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; discontinuously frozen with moderate to high ice contents
dplain of Tanana River on terraces along the southern margin of the Yukon–Tanana Upland; m from bedrock ridges that trend transverse to the Tanana River; include streamlined terrace ream from bedrock ridges and knobs and a lengthy longitudinal bar on the concave, southern m Greek area: partially fill some lakes along the porthern margin of the Tanana Lowland;	Q	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 tephras; built by shoreward transport of lake-bottom sediments by wind-driven, drifting lake ice (Péwé and
a coarse to medium pebbly sand overlying cobble gravel with scattered large granitic 'flood' grained backswamp deposits between expansion fans and crevasse splays and bedrock hills; kimal outwash alluvium of Donnelly age in the vicinity of Johnson River include >10 to 12 ft		Reger, 1983b, figs. 22A and B); unfrozen to discontinuously frozen with low to moderate ice contents PALUDAL DEPOSITS
brownish gray (10YR6/2), very fine to medium sands with thin pebble layers and trace silt rated by thin silt drapes (Birch, 1976) that were probably laid down as a slackwater deposit more outburst floods of early Donnelly age down the nearby Tanana River; unfrozen to	Qp	SWAMP DEPOSIT—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 contents
EPOSITS—Chiefly organic sandy and silty backswamp sediments deposited during floods in from source streams by expansion fans and natural-levee and crevasse-splay complexes;	QTr O	RESIDUAL DEPOSITS 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 and bedrock slopes, or as large left by winnowing
by water between flood events; surface vegetation is water-tolerant shrubs and peat bogs; may tem pingos, numerous thaw ponds and lakes, and thermokarst pits; inferred to be continuously		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
COLLUVIAL DEPOSITS OLLUVIUM—Blankets, aprons, cones, and fans of heterogeneously mixed angular to gravel, sand, and silt formed by complex, gravity-driven mass movements involving sliding,	¹ Estim	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 contents
ost creep of weathered bedrock and modified glacial drift; cobbles and boulders are scattered dwalls of cirques and upper walls of glaciated valleys includes talus aprons, incipient rock s, as well as steep fans built by snow avalanches and debris flows; may include thin residual	genera percer 'scatte	I composition of 4 to 12 percent. 'Some' implies a general composition of 12 to 30 percent. Estimated compositions <4 t are not recorded in the field. Terms used to describe the estimated percentages of cobbles and boulders are 'numerous,' red,' and 'rare'. 'Numerous' implies that drilling through the deposit would encounter two cobbles or boulders in an interval (0.6 m) : 'scattered' implies that drilling would encounter two cobbles or boulders in an interval (0.6 m) : 'scattered' implies that drilling would encounter two cobbles or boulders in an interval (0.6 m) :
r Tertiary sedimentary rock and highly modified drift of ancient glaciations on high-level nts; morphologies of colluvial sheets generally reflect morphologies of underlying materials; usly frozen with low to moderate ice contents	for 2 ft frare' estima	timplies that drilling would encounter two cobbles of boulders in an interval of >15 ft (>4.5 m). These numbers are field tes only, based on surface observations, and may vary widely.
POSIT—Steep fans of heterogeneous rubbly debris with some gravel, sand, and silt deposited downslope of couloirs in steep alpine terrain; surface covered with scattered, angular rock sorted by grain size with the largest fragments farther downslope; typically associated with entipode with low to moderate ice contents.	b	BEDROCK 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
-Chiefly tongues of angular rock fragments and coarse gravel with a sandy matrix deposited d fans and in rock-walled upper stream valleys by flowing slurries of mud, sand, rock debris,	b'	THINLY COVERED BEDROCK—Subcrops with <3 ft (<0.9 m) of loess cover; bedrock structures visible through thin veneer of surficial debris
nd lobes, some with natural levees of cobbles and boulders up to 7 ft (2.1 m) high bounding gular to U-shaped cross profiles measuring 10 to 70 ft (3 to 21.3 m) across and 10 to 60 ft (3 to 2000 cobbles) and scattered cobbles on upper surfaces;		Bedrock outcrops and thinly buried subcrops that cannot be mapped separately REFERENCES CITED
ntinuously frozen with low ice contents D ALLUVIAL DEPOSITS—Primarily fan-shaped or elongate, massive to poorly stratified, ed with sandy angular to subangular pebble gravels derived from weathered granitic uplands	Bi	rch, C.J., 1976, Centerline and material site investigations, Alaska Highway alignment MP 1378 to 1376.5, Project No. HHS, 062-2(11): Alaska Department of Transportation and Public Facilities Engineering Geology and Soils report, 26 p.
vs and hyperconcentrated flows produced during brief, intense summer storms; also formed in olluvial processes exceed fluvial processes; surface slightly irregular; contains numerous and angular to subangular, fresh to weathered rock fragments and grüs in weathered granitic	Br	 akenridge, G.R., 1988, River flood regime and floodplain stratigraphy, <i>in</i> Baker, V.R., Kochel, R.C., and Patton, P.C., eds., Flood geomorphology: New York, John Wiley & Sons, p. 139–156.
T—Tongue-shaped heterogeneous surface blanket of angular to subangular blocks of local d ice with trace to some gravel, sand, and silt at depth; where active, blocky surface layer is	Bu	Survey Water-Resources Investigations Report 83-4064, 116 p. Irrows, R.L., Parks, Bruce, and Emmett, W.W., 1979, Sediment transport in the Tanana River in the vicinity of Fairbanks, Alaska,
I slopes and core debris is exposed; accumulated on floors and lower walls of cirques and f rock glaciers derived from shrinking of former glaciers (ice cored) or from deposition and on of precipitation-derived ground ice (ice cemented); surface typically has furrows, nested yexly downvalley, and pits and may have prominent lateral ridges; perennially frozen where	Ca	rter, L.D., and Galloway, J.P., 1978, Preliminary engineering geologic maps of the proposed natural gas pipeline route in the Tanana River valley, Alaska: U.S. Geological Survey Open File Report 78-794, 26 p., 3 map sheets, scale 1:125,000.
n ice contents Lunate to triangular or fan shaped, heterogeneous mixtures of large fractured bedrock blocks	Ca	rver, G.A., Bemis, S.P., Solie, D.N., and Obermiller, K.E., 2008, Active and potentially active faults in or near the Alaska Highway corridor, Delta Junction to Dot Lake, Alaska: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 2008-3d, 32 p.
ing, flowing, and sliding of failed bedrock and unconsolidated surficial deposites; surface and cracks where active, slight irregularities, hummocks, low longitudinal ridges, and terminal pusly frozen with low to moderate ice contents	Cł	hapin, F.S., III, Viereck, L.A., Adams, P.C., Van Cleve, Keith, Fastie, C.L., Ott, R.A., Mann, Daniel, and Johnson, J.F., 2006, Successional processes in the Alaskan boreal forest, <i>in</i> Chapin, F.S., III, Oswood, M.W., Van Cleve, Keith, Viereck, L.A., and Verbyla, D.L., eds., Alaska's changing boreal forest: New York, Oxford University Press, p. 100–120.
Rubble blanket or apron of large, angular rock fragments of local bedrock formed by collapse n to discontinuously frozen with low ice contents	Co	sta, J.E., 1988, Rheologic, geomorphic, and sedimentologic differentiation of water floods, hyperconcentrated flows, and debris flows, <i>in</i> Baker, V.R., Kochel, R.C., and Patton, P.C., eds., Flood geomorphology: New York, John Wiley & Sons, p. 113–122.
shaped heterogeneous mixtures of frost-rived, angular rock fragments downslope of bedrock gravel, sand, and silt deposited on steep bedrock slopes and at the mouths of steep bedrock s profiles by snow avalanches, free fall, tumbling, rolling, and sliding; surface steep, slightly numerous rock fragments, particularly in distal zones; includes debris-flow tongues; blocks	Dı	k-Rodkin, Alejandra, Barendregt, R.W., Froese, D.G., Weber, Florence, Enkin, Randy, Smith, I.R., Zazula, G.D., Waters, Pamela, and Klassen, Rudy, 2004, Timing and extent of Plio-Pleistocene glaciations in north-western Canada and east-central Alaska, <i>in</i> Ehlers, J., and Gibbard, P.L., eds., Quaternary glaciations—extent and chronology, part II: North America: New
crustose lichens where stable, and lichen free where freshly displaced; unfrozen to low ice contents	Er	York, Elsevier, Developments in Quaternary Sciences, v. 2, p. 313–345. nmett, W.W., Burrows, R.L, and Parks, Bruce, 1978, Sediment transport in the Tanana River in the vicinity of Fairbanks, Alaska, 1977: U.S. Geological Survey Open File Report 78-290, 28 p.
percent very fine sand carried by winds and deposited as a blanket over downwind topography with eolian sand on lower slopes and on lowland surfaces close to floodplain sources; may	He	 Survey Bulletin 1181-H, 19 p., 1 map sheet, scale 1:125,000. B.A. and Baser, B.D. 1082. Air photo analysis and summary of landform soil properties along the route of the
Ith retransported silt; thickness ranges from >20 ft (>6 m) close to active sediment sources to indholm and others, 1959); typically rilled where >3 ft (>0.9 m) thick on steep upper slopes, hould be considered minimal because of dense tree canopy; organic rich on lower slopes and high moisture content (>15 percent) in lowland sites (Kreig and Reger, 1982); generally	Li	 Trans-Alaska Pipeline System: Alaska Division of Geological & Geophysical Surveys Geologic Report 66, 149 p. addolm, G.F., Thomas, L.A., Davidson, D.T., Handy, R.L., and Roy, C.J., 1959, Silts near Big Delta and Fairbanks, <i>in</i> Davidson,
iously frozen with moderate to high ice contents on some lower south-facing slopes and rich on some lower north-facing slopes and lowland sites	Μ	 Station Bulletin 186, p. 33–70. Iann, 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.
house of locally derived gravel and scattered to numerous angular rock fragments (particularly hemeral streams) in loess areas and organic fine sand in sand dune areas; deposited primarily (Costa, 1988) draining weathered bedrock slopes thinly covered by upland silt (loess) and	Μ	Iason, O.K., and Begét, 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.
y thawing of ice-rich permafrost or brief, intense summer rainstorms; complexly mixed with r stream drainages, primary airfall loess and eolian fine sand in lowland sites, and fine-grained n slackwater flood basins; fluvial processes exceed colluvial processes; surface fairly smooth pingos and local thermokarst pits, ponds, and lakes; may be subject to seasonal stream and	Р — Р	wé, T.L., 1951, An observation of wind-blown silt: Journal of Geology, v. 59, p. 399–401. ——1955, Origin of the upland silt near Fairbanks, Alaska: Geological Society of America Bulletin, v. 66, no. 6, p. 699–724.
y to continuously frozen with moderate to high ice contents vegetated blankets and dunes of fine to medium, massive to cross-bedded eolian sand with	P	Geologic Investigations Map I-394, scale 1:63,360, 2 map sheets. śwé, T.L., and Reger, R.D., 1983a, Delta River area, Alaska Range, <i>in</i> Péwé, T.L., and Reger, R.D., eds., Guidebook to permafrost
rection of past dominant summer winds; mapped extents, based on the presence of dune forms, num; cliffhead dunes locally crown steep slopes that are the sand sources; discontinuous with .6 m) (Schoephorster, 1973); unweathered color grayish brown (2.5Y5/2); generally covered	_	 Division of Geological & Geophysical Surveys Guidebook 1, p. 47–135. ——1983b, Middle Tanana River valley, <i>in Péwé</i>, T.L., and Reger, R.D., eds., Guidebook to permafrost and Quaternary geology along the Richardson and Glann highways between Esistence and Archardson and Glann highways between the second and the second a
of loess (Lindholm and others, 1959); locally being deposited along the margins of braided re content ~8 percent (Kreig and Reger, 1982); discontinuously frozen with low ice contents GLACIAL DEPOSITS	Р	 Geophysical Surveys Guidebook 1, p. 5–45. ng, C.L., Boone, R.D., Clark, M.H., Packee, E.C., and Swanson, D.K., 2006, State factor control of soil formation in interior Alaska in Chapin F.S., III, Orwead, M.W., Ver, Chap. Keith, W., and Kathara and Kathara
DONNELLY GLACIATION MORAINAL DEPOSITS OF DONNELLY GLACIATION—Heterogeneous, nonstratified.	S	 Alaska, <i>in</i> Chapin, F.S., III, Oswood, M.W., Van Cleve, Keith, Viereck, L.A., and Verbyla, D.L., eds., Alaska's changing boreal forest: New York, Oxford University Press, p. 21–38. choephorster, D.B., 1973, Soil survey of Salcha–Big Delta area, Alaska: U.S. Department of Agriculture Soil Conservation
gravel with some sand and silt and few to numerous subangular to subrounded boulders d locally reworked by meltwater washing and associated mass-movement processes; may osits (Qgey); morainal relief 50–175 ft (15.2–53 m); kettle frequency $\sim 16/mi^2$ (50/km ²); kettle	S	Service, 51 p., scare 1:51,080, 20 map sneets. oan, C.E., Zenone, Chester, and Mayo, L.R., 1976, Icings along the trans-Alaska pipeline route: U.S. Geological Survey Professional Paper 979, 31 p.
y convium generally thin but may be several feet (meters) thick close to active sources of ll thickness ~300 ft (~91 m); surface weathering profiles 1.5–2.5 ft (0.5–0.8 m) thick; friable; rown (10YR5/3); intact schist clasts in weathering profiles 25–35 percent and granitic clasts discontinuous cover of loess generally \leq 3 ft (<0.9 m) thick and weathered vellowish brown	S	pringer, W.J., George, T.H., and Bell, R.M., 1976, Identification of flood hazard resulting from aufeis formation in an interior Alaskan stream: Unpublished University of Alaska Geophysical Institute report for U.S. Department of Agriculture Soil Conservation Service, 12 p.
h brown (10YR6/4) but eolian sand and silt mantle may be >20 ft (>6 m) thick close to active obscure primary surface morphology; ventifacts exhibit slight to moderate surface polish and ets and keels in lags developed beneath loess covers; ice-wedge casts generally rare and up to	W	Veber, F.R., 1986, Glacial geology of the Yukon-Tanana Upland, in Hamilton, T.D., Reed, K.M., and Thorson, R.M., eds., Glaciation in Alaska: The geologic record: Anchorage, Alaska Geological Society, p.79–98.
o discontinuously frozen with low to moderate ice contents (Péwé and Holmes, 1964; Holmes, 1978; Péwé and Reger, 1983a, table 3) DELTA GLACIATION	T	he State of Alaska makes no express or implied warranties (including warranties for merchantability and these) with respect to the observator functions, or comphilities of the electronic life.
D MORAINAL DEPOSITS OF DELTA GLACIATION—Heterogeneous, nonstratified, gravel with some sand and silt and few to numerous subangular to subrounded boulders massive, sandy pebble gravel with rare cobbles denosited by glacial meltwater and associated	fi a ir fi	popropriateness for any user's purposes. In no event will the State of Alaska be liable for any incidental, idirect, special, consequential, or other damages suffered by the user or any other person or entity whether om the use of the electronic services or products, or any failure thereof or otherwise. In no event will the State
may include esker and kame complexes (Qgeo); morainal relief 25–225 ft (7.6–68.6 m); kettle kettle fillings of silt, peat, and silty colluvium may be several feet (meters) thick; maximum i); surface weathering profiles generally 3–7 ft (0.9–2.1 m) deep, on high-level surfaces may	0	f Alaska's liability to the Requestor or anyone else exceed the fee paid for the electronic service or product.
to brownish yellow (10YR6/6); intact schist clasts in weathered profiles 1–10 percent and \leq are crumbly; discontinuously mantled by thin eolian sand and loess; loess cover weathered to 4) (rubification); well-formed faceted and keeled ventifacts common in surface lags beneath	E A	laska Division of Geological & Geophysical Surveys
	3 F	354 College Road airbanks, AK 99709-3707
s scattered to numerous and up to \sim 5 ft (\sim 1.5 m) wide; wedge fillings include deformed eolian nfrozen to discontinuously frozen with low to moderate ice contents (Péwé and Holmes, 1964; alloway, 1978; Péwé and Reger, 1983a, table 3)	3 F 4 4	354 College Road airbanks, AK 99709-3707 51-5000 (phone) dggspubs@alaska.gov 51-5050 (fax) http://www.dggs.dnr.state.ak.us