

# APPENDIX. FIELD DATA ON DEPOSITIONAL UNITS AT EPIGURUK, NORTHWESTERN ALASKA

## A. BASAL SAND AND SILT (unit 1)

<u>Position along base line (m)</u>	<u>Thickness (m)</u>	<u>Description</u>
1940	1.0+	Very dark olive gray (5Y 3/1.5) humic slightly silty very fine sand. Faint subhorizontal bedding, w/ <u>Chara</u> (?) streaks along some bedding planes. White fine sand 0-13 cm thick along upper contact; penetrates downward as deep as 34 cm into frost cracks.
1900	3.2	Gray to very light gray fine sand. Bedding faint to indistinct; disrupted in highest 45 cm. Thin horizontal oxide zone at 45 cm depth, with beds massive to wavy-laminated below and fragmented above. Wedgelike structures w/silty fillings also penetrate 15 cm down from oxide zone.
1250	0.3+	Greenish gray medium sand.
1190	0.5+	Dark gray silty fine sand.
1036	0.9+	Organic silt w/molluscs. Black (5Y 2.5/2) humic very fine sand w/ some silt and clay. Subhorizontal oxide beds.

## B. LOWER PALEOSOL (unit 2)

<u>Interval along base line (m)</u>	<u>Paleosol character</u>
1960-1500	Structureless, humic, fine to very fine sand above bryophytic peat. Locally (at 1600 m) varies to horizontally laminated, black (7.5YR 2/0) organic silty fine sand that contains gastropods. Upper surface forms regular series of mounds 10-18 m wide with intervening trenches about 3 m wide.
1475-1240	Very dark gray to black (10YR 3/1 to 21) humic to peaty, silty, fine to very fine sand with some bryophytic peat. Generally covered, and visible only in deep trenches.
1165-1000	Black, compact, bryophytic peat, generally transitional upward into gray, loesslike, very fine sand. Locally (1180-1110 m) has sharp erosional upper contact overlain by probable channel filling of organic silty fine sand.

### C. STRUCTURELESS SAND (subunit 3a)

<u>Position or interval along base line (m)</u>	<u>Thickness (m)</u>	<u>Description</u>
1350	0.7	Compact gray silty very fine sand.
1250	2.0	Olive gray (5Y 5/2), massive, silty very fine sand, with in situ rootlets. Upper part contains olive brown (2.5Y 4/4) oxide streaks and mottles. Lower contact transitional.
1200-1070	2.0-7.7	Compact, massive, gray, fine sand to silty very fine sand. Base covered.
1630	3.6	Olive gray (5Y 4.5/2) to olive (5Y 5/1) very fine sand; oxidized yellowish red (5YR 5/8) along near-horizontal planes, root zones, and diffuse irregular fronts. Weakly defined near-horizontal bedding. Contains mottled root zones and small-displacement thrust faults with ca. 10 cm offset. Abundant gastropods and ostracodes. Transitional to dark olive gray (5Y 4/1.5) slightly sticky very fine sand that lacks apparent bedding.
1575	3.7	Faintly bedded, gray, very fine sand w/oxide mottles. Becomes more compact and humic downward. Fills depressions between blocks of lower paleosol. Local pond filling; contains gastropods near axis of depression.
1036	3.2+	Gray loess, transitional downward into brown organic loess. Top covered.
1000	3.5	Silty very fine sand; laminated; cryoturbated. Grades downward into humic silt.

#### D. ALLUVIAL SAND (subunit 3b)

Interval along base line (m)	Description
2600-2550	Cross-bedded medium to fine sand, grading upward into slightly silty fine sand and organic fine sand. Medium sand beds are uncolored; fine sand is gray to dark grayish brown (10YR 4/2), with some beds oxidized brownish yellow (10YR 6/6). Shallow cross-beds in lower parts of the unit contain detrital wood and peat fragments; thick ( $\leq 15$ cm) beds higher in section have slightly deformed cross-bedding.
2450-2220	Light olive gray (5Y 6/2) medium to fine sand with some darker laminations rich in heavy minerals. Rippled cross-bedding near top grades downward into deformed cross-beds with fine organic detritus along bedding planes. The cross-beds indicate paleocurrent directions of $270^{\circ}$ to $300^{\circ}$ .
1735-1320	Colorless to light gray, well sorted, medium to fine sand that fines upward. Generally parallel-bedded, but cross-bedding increases toward base. The sand ravel freely on bluff face, indicating that cohesive fine particles are virtually absent. Upper 0.5-1.0 m appears eolian in places; elsewhere it is locally oxidized, humic stained, and frost cracked. Ripples near top of unit indicate paleocurrent directions of $010$ and $300$ degrees. Lower contact locally is irregular, protruding downward into the gray loess of subunit 3a.
1320-790	At 1320, unit is slumped, folded, and highly contorted. North of this point, free-running fine to medium sand grades upward into gray to brown silty fine sand containing rootlets in growth position and some frost cracks. Farther north, fine sand becomes dominant, bedding generally is parallel, and stems and rootlets in growth position become more widespread. Upper 0.5-1.0 m is commonly oxidized or humic, and is cut locally by frost cracks.
450-330	Unit is near river level; only upper 1.3-1.8 m is exposed, and base is covered. Gray medium to fine sand forms subparallel rippled and graded beds with pods of detrital wood along bedding planes. Less commonly, sand is fine to very fine, dark gray to strong brown (5Y 4/1 to 7.5YR 5.8), and is interbedded with dark gray organic silty fine sand. Upper parts have been deformed by frost churning, frost cracking, and ice-wedge growth that originated within overlying upper paleosol.

## E. LATE WISCONSINAN SAND DEPOSITS

Interval along base line (m)	Observations	Interpretations
2585-2550	Diffuse beds of yellowish to light brownish gray medium to fine sand alternate with more sharply defined beds of white to gray medium to very fine sand. Bedding generally horizontal, with some cut-and-fill structures and some shallow cross-beds present.	The diffuse beds appear to be eolian; the sharper beds are water-laid.
2490-2125	White to gray, horizontally bedded to cross-bedded, medium to fine sand, with thin organic mats along some bedding planes. Basal contact commonly erosional, with rip-up clasts near basal contact and opposite eroded end of upper paleosol. Paleocurrent directions are 250° to 290°.	Fluvial channel deposits.
2125-1960	Rhythmically bedded medium to very fine sand with parallel, crenulated beds 0.3 to 3 cm thick. White medium sand to gray to light olive gray (5Y 5/1 to 6/2) fine sand alternate with gray to dark gray (5Y 5/1 to 4/1 slightly humic fine to very fine sand. Unconformably overlies medium to fine sand unit described for interval 2490-2125 m.	Flood-plain deposits above fluvial channel deposits
1660-925	Alternating light and dark beds 1-6 cm thick of medium to very fine sand with horizontal, parallel bedding. Light beds are colorless to light gray (5Y 6/1) well sorted fine to medium sand; dark beds are dark gray (5Y 4/1) to brown fine sand and humic fine sand. Contains erosional channels filled with: (A) colorless, freely raveling, well sorted, shallowly cross-bedded medium to fine sand, varying to ripple-bedded very fine sand with organic lenses, and (B) light gray to gray (5Y 6.5/1 to 5/1), well sorted, fine to very fine sand with some peat beds. Locally grades upward into lenticular deposit of white to light gray, fine to very fine sand with subparallel, shallow-dipping beds and abundant willow stems and roots.	Flood-plain deposits with local channel fillings that range from predominantly fluvial (type A) to predominantly eolian (type B). Locally grades upward into thick mound of eolian sand.
550-330	Light to dark gray fine to very fine sand in rhythmically laminated subhorizontal sets 2.5 to 3.5 cm thick. Beds gently undulating, with diffuse contacts.	Flood-plain deposits.
330-030	Ripple-bedded light gray (5Y 6/1) fine sand. Transitional upward into gray, olive gray, and light olive brown (5Y 4.5/1, 5Y 5/2, and 2.5Y 5/5), well sorted, fine sand in beds 1-5 cm thick with thin drapes of dark gray (5Y 4/1) clayey to silty very fine sand; beds subparallel, wavy to slightly undulating, and locally rippled; frost structures common. Transitional upward into olive to yellow (5Y 5/4 to 10YR 7/8) fine sand that alternates with gray to olive gray (5Y 5/1 to 5/2) very fine sand in subparallel wavy beds 0.5 to 2 cm thick.	Channel deposits, transitional upward through flood-plain deposits to eolian sand.

F. LOESS (subunit 5c)

Interval along base line (m)	Observations
1500-1025	Gray, well sorted, silty very fine sand, locally mottled yellowish brown (10YR 5/8). Commonly faintly laminated; thickness generally about 5 m. Interbeds of white to light gray fine sand are present at 1500-1475 and 1190-1100 m; they perhaps indicate nearby channels or other unvegetated sand sources. Basal portions locally are gleyed, humic, or finely laminated, probably owing to deposition in local ponds or marshes.
1025-700	Loess is draped over low hill that stood above alluviating river system. Up to 9.5 m thick, and commonly organic at base. Upper parts are gray to brown, silty, fine to very fine sand that is structureless to faintly laminated and locally mottled yellowish brown. Frost cracks and animal burrows are present locally. Basal 1-3 m is more variable, showing solifluction structures on slope and organic silt where ponds or marshes occupied depressions on underlying paleosol. Beds of fine sand 10-15 cm thick may have been derived from adjacent small dune.
685-540	Redeposited by solifluction through this interval, and thickens to maximum of 11.5 m. Consists of well sorted, structureless to faintly bedded, very dark gray to grayish brown (10YR 5/2), humic, silty very fine sand in which asymmetric folds, inclined shear planes, and rollovers indicate downslope flowage to the north. Reddish-yellow mottles occur locally along the traces of former rootlets. Bedding is inclined steeply northward down the former slope, and becomes more gentle on the debris apron at its base.
500-030	Gray to light brownish gray (10YR 6/2), structureless, silty very fine sand with light olive brown to brownish yellow (2.5Y 5/4 to 10YR 6/6) mottles. It is up to 5 m thick south of 330 m, but thins abruptly to about 3 m north of this point.

# G. OBSERVATIONS ON PERIGLACIAL FEATURES AT EPIGURUK, 1981-1982

Unit	Base Line Position (m)	Feature (With Comments)
1	1940	Narrow sand wedges 35 cm deep (fill frost cracks)
↓	1900	Disrupted bedding above oxide zone at 45 cm depth; small silt-filled wedges below oxide zone (permafrost table)
2	1960-1500	Moundlike upper surface with relief of $\pm 3$ m (cores of former ice-wedge polygons)
3a	1000	Cryoturbation structures
3b	790	Narrow wedge 90 cm deep (frost crack)
	620	Secondary oxide concentrations and cryoturbation in upper 1 m (active layer above permafrost?)
	450	Ice-wedge casts up to 2.8 m deep
	410	Cryoturbation; frost cracks
	330	Cryoturbation structures (grade upward into overlying paleosol)
	790	Frost cracks
	350	Ice-wedge cast (originates in overlying paleosol)
	2300	Slump blocks of unconsolidated sediments (slumped while frozen)
	2250	Frost cracks and involutions
	1660-1630	Cryoturbation features; ice-wedge casts; solifluction structures
	1540	Sag and collapse features (fill underlying ice-wedge voids)
	1250	Ice-wedge casts
	1050-570	Solifluction structures (rollovers, asymmetric folds)
↓	550	Collapse into ice-wedge voids
5b/a	1960	Involution structures; thermo-erosional niche
	1500	Cryoturbation structures
	1030	Sand wedges 2-3 cm wide (in eolian facies)

	955	Syngenetic sand wedge more than 2.3 m deep; thermo-erosional niche
	250	Cast of syngenetic ice wedge 4 m deep and up to 0.6 m wide
	200	Ice-wedge cast 1.8 m deep by 0.35 m wide
↓	150	Bedding distorted by frost action (eolian facies)
5c	1190	Frost cracks
	900	Frost cracks
	790	Solifluction structures (rollovers, asymmetric folds)
	600	Solifluction structures (lobes)
	700-200	Thaw lakes
↓	150	Wedge cast 1.1 m deep by 0.35 m wide
6a		None
	2585	Frost mixing through upper 60 cm (permafrost table at 60 cm?)
	2420	Crenulated bedding; wedge cast 40 cm deep by 20 cm wide
	2300	Involutions; sand wedge 16 cm wide and more than 1.9 m deep
	2100	Bedding distorted by frost action
↓	2250-1960	Sand wedges 2-5 cm wide and 1.5 m deep
6c	-----	None
6d	-----	None
7	2435	Frost-mixed sand
↓	2300	Frost-churned organic sand