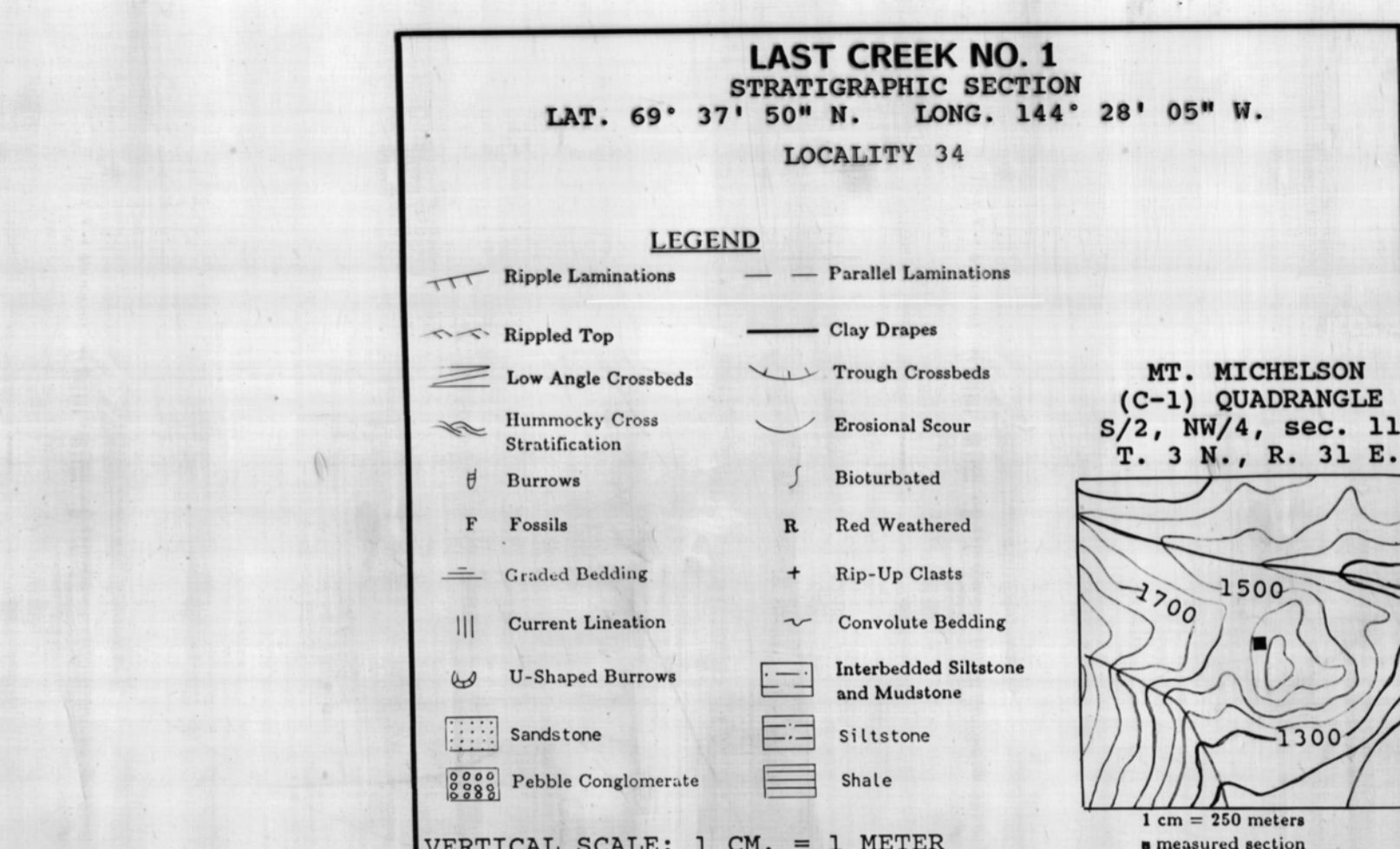
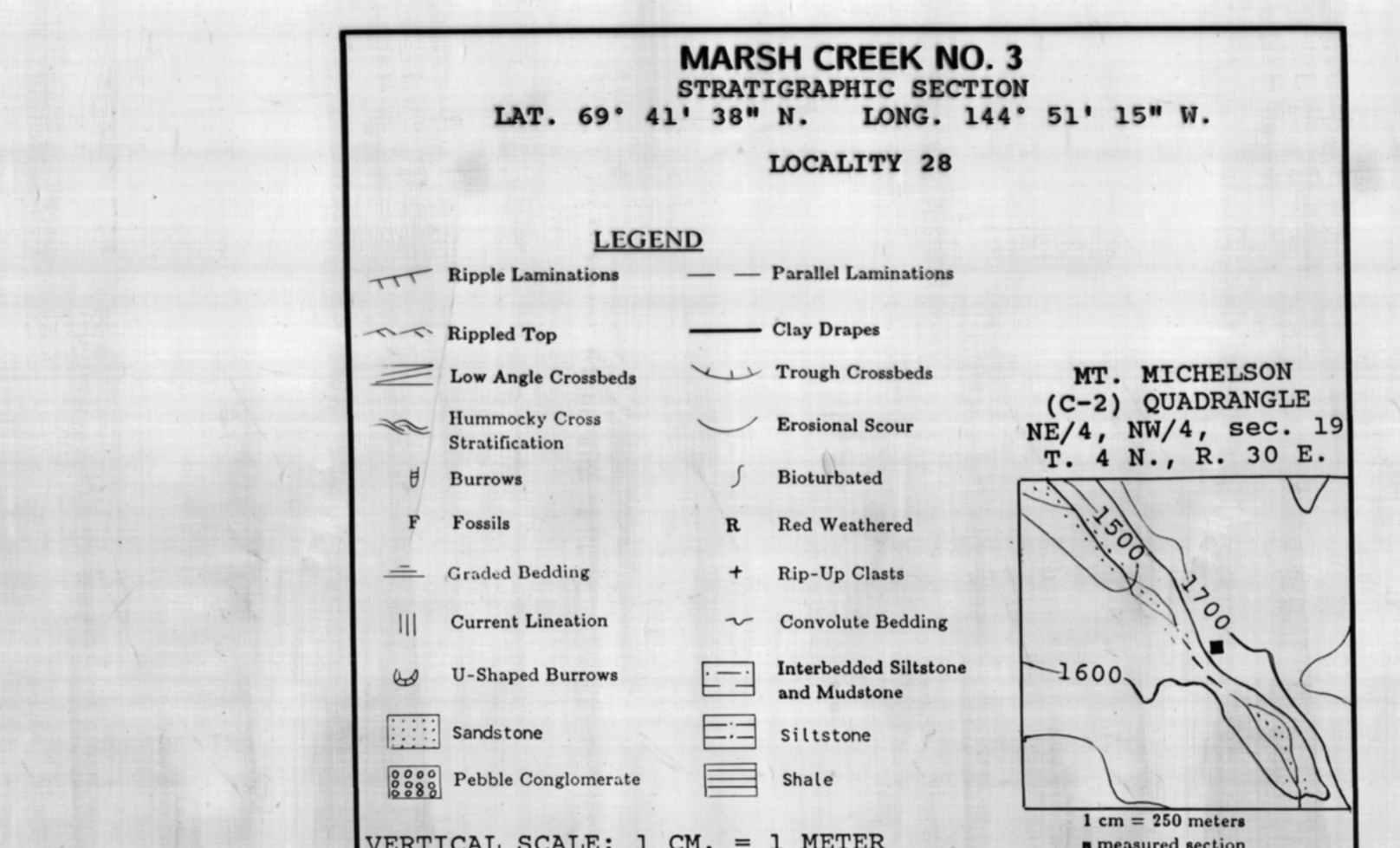
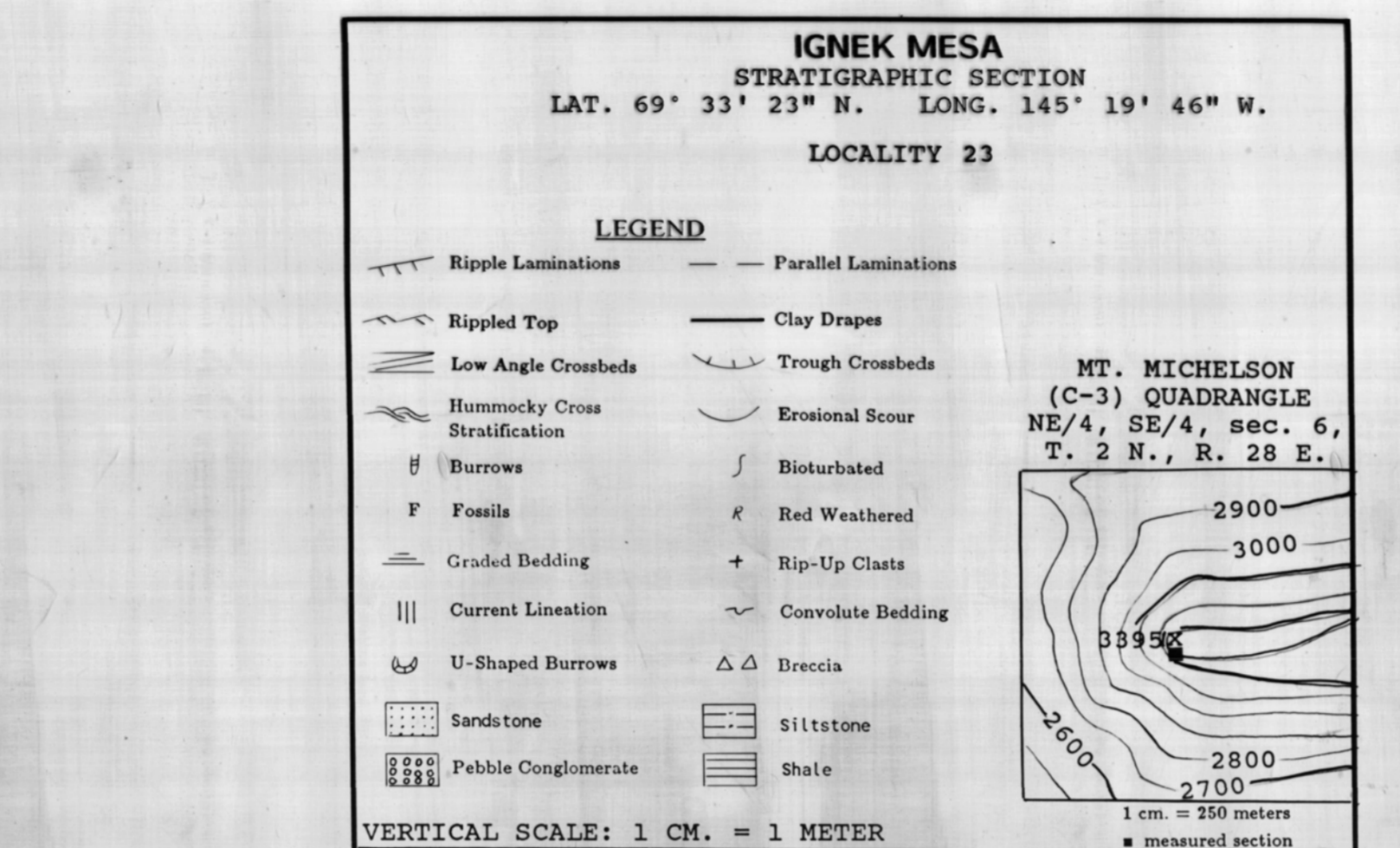
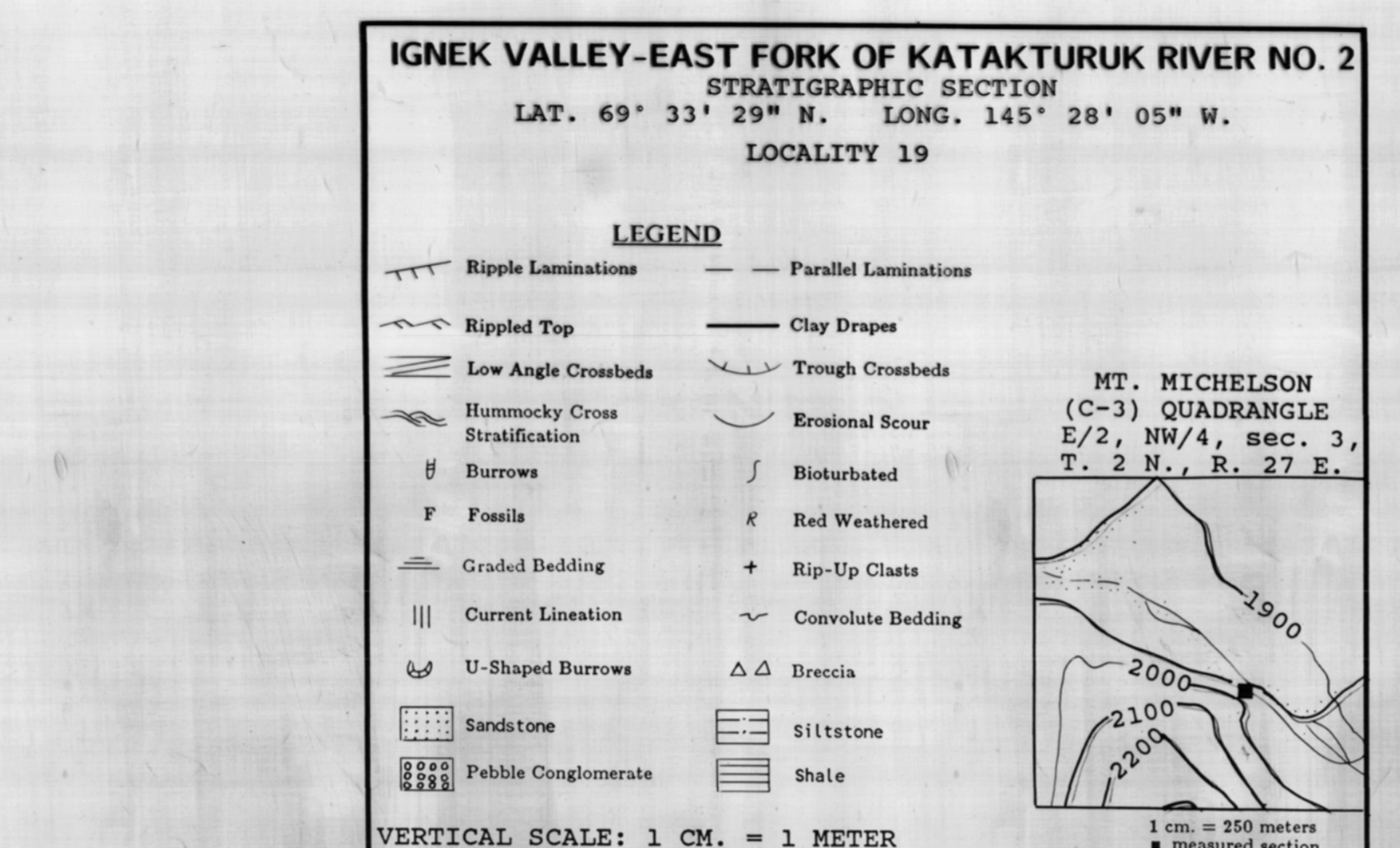
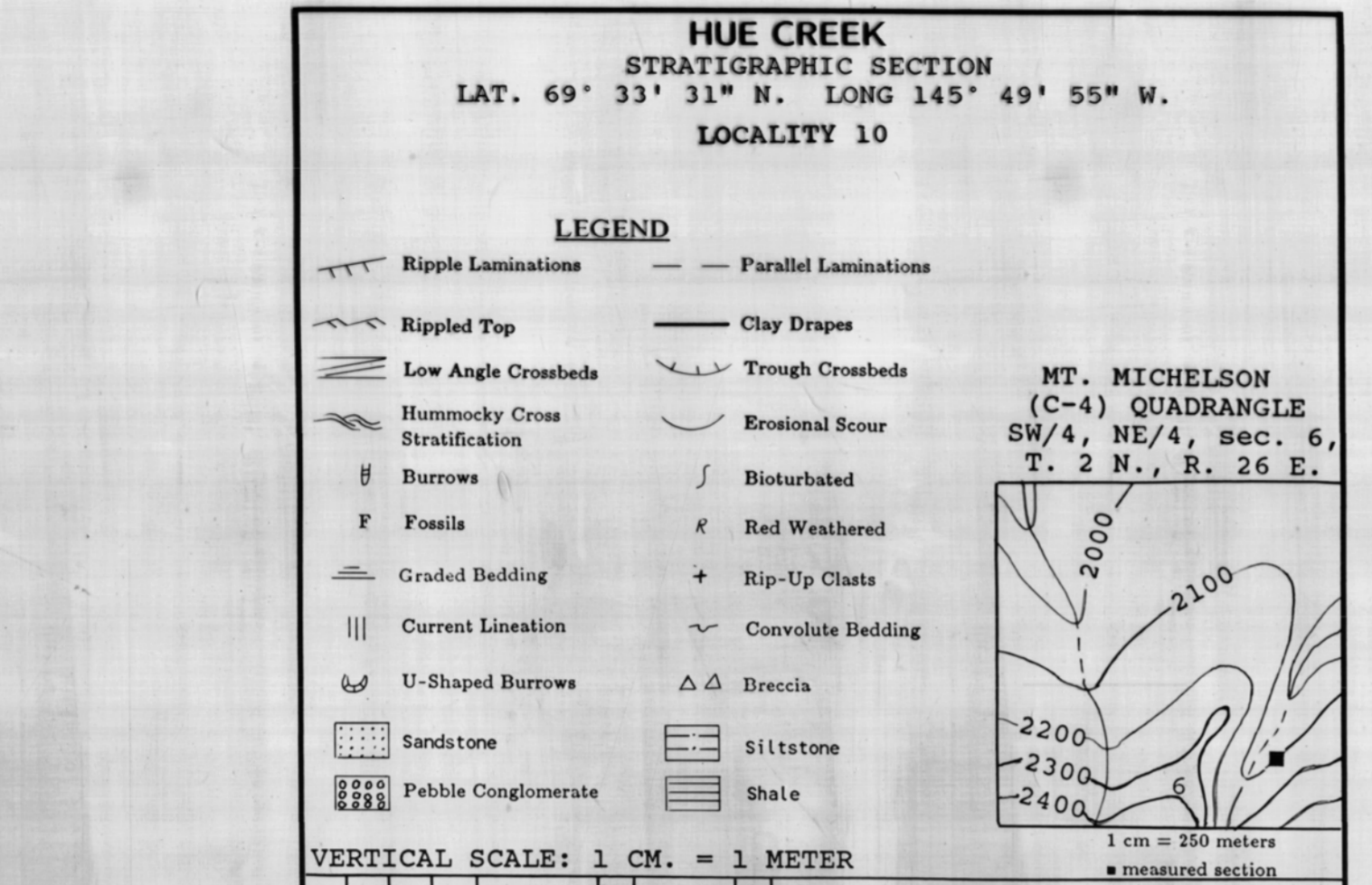
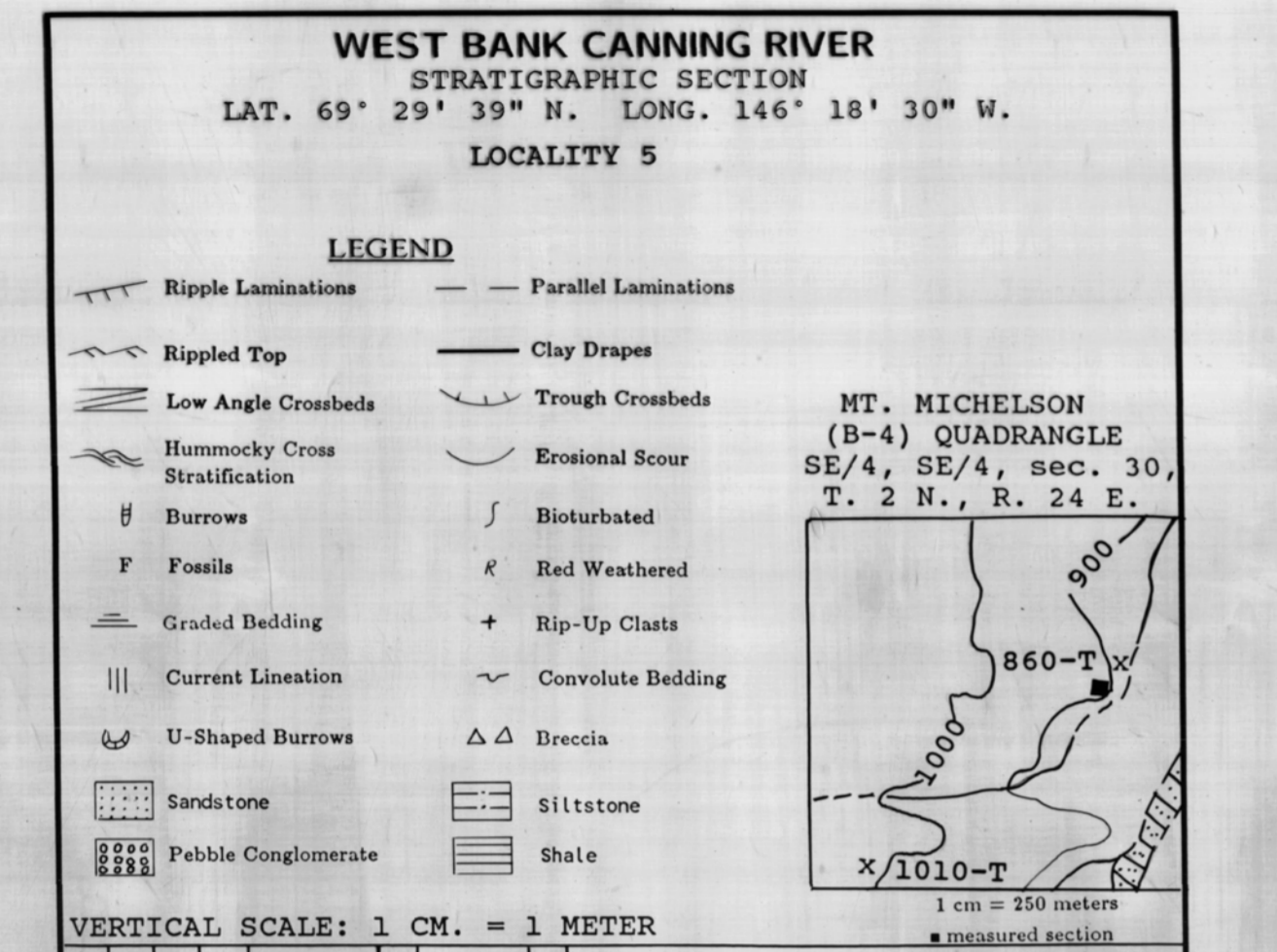


KEMIK SANDSTONE MEASURED SECTIONS
ARCTIC NATIONAL WILDLIFE REFUGE, NORTHEASTERN ALASKA
CANNING RIVER - IGNEK VALLEY TRANSECT

BY
DOUGLAS G. KNOCK



SERIES	STAGE	FORMATION	Thickness (m)	GRAPHIC COLUMN	PALEOCURRENT	SAMPLE NO.	LITHOLOGY DESCRIPTION	INTERPRETATION
LOWER CRETACEOUS	HAUTERIVIAN	KEMIK SANDSTONE	20	85DK16G		5	Bioturbated, argillaceous, VF sandstone. Rare floating chert pebbles. Clay drapes present. A chert pebble conglomerate marks the top. Low energy deposition below fairweather wave base.	
			18	85DK16F		3	Moderately vertically burrowed (Skolithos), medium to massive bedded, dark gray, VF-F sandstone. Common low angle (5-10°) cross bedding and parallel lamination. Rare clay drapes. Moderate-high energy deposition above fairweather wave base. Decreased energy relative to underlying siltstone.	
			16	85DK16E		4	Clean, massive bedded, medium to dark gray, VF-F sandstone. Common low angle (5-10°) cross bedding and parallel lamination. Sharp bedding contacts. One discontinuous chert pebble conglomerate layer. High energy deposition above fairweather wave base.	
			14	85DK16D		2	Bioturbated, silty, medium-gray, VF sandstone. A few clay drapes present. Low energy shallow marine shelf deposition. Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport. Absence of clay drapes and bioturbation suggests higher energy conditions.	
			12	85DK16C		2	Bioturbated, silty, medium-gray, VF sandstone. A few clay drapes present. Low energy shallow marine shelf deposition. Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport. Congl. may be from reworked transgressive lag deposit.	
			10	85DK16B		1	Unconsolidated, light gray clay, 2-3 cm thick. Unconformity.	
			8	85DK16A		1	Silty, dark-gray shale. Ironstone concretions and rare floating quartz grains.	
			6	85DK16A		1	Unconformity.	
			4	85DK16A		1	Unconformity.	
			2	85DK16A		1	Unconformity.	
UPPER JURASSIC	OXFORDIAN	KINGAK SHALE						

SERIES	STAGE	FORMATION	Thickness (m)	GRAPHIC COLUMN	PALEOCURRENT	SAMPLE NO.	LITHOLOGY DESCRIPTION	INTERPRETATION
LOWER CRETACEOUS	HAUTERIVIAN	KEMIK SANDSTONE	20	85DK16G		5	Covered.	
			18	85DK16F		3	Clean, massive bedded, light-gray, VF-F sandstone. Common parallel lamination and low angle (5-10°) crossbeds. Chert pebble congl. stringers pinch and swell at the base of a few beds. Rare clam lenses at the base of beds. Sharp bedding contacts. High energy deposition above fairweather wave base.	
			16	85DK16E		4	Moderately burrowed, massive bedded, light-gray, VF sandstone. Common parallel lamination. Sharp bedding contacts. Clay drapes present. Moderate energy deposition above fairweather wave base.	
			14	85DK16D		3	Bioturbated, dark-gray, VF sandstone interbedded with parallel and ripple laminated, VF sandstone. Common ripples tops and clay drapes. A chert pebble congl. stringer defines the base of one bed. Rare clay rip-up. Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport. Increasing energy upsection.	
			12	85DK16C		2	Bioturbated, silty, medium-gray, VF sandstone interbedded with ripple and parallel laminated, VF sandstone. Erosional based congl. bed pinches and swells (10-20 cm thick). Clay drapes common. Rare crawling traces along bedding planes. Rare wood fragments. Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport. Congl. may be from reworked transgressive lag deposit.	
			10	85DK16B		1	Unconformity.	
			8	85DK16A		1	Dark-gray, silty shale with ironstone concretions.	
			6	85DK16A		1	Unconformity.	
			4	85DK16A		1	Unconformity.	
			2	85DK16A		1	Unconformity.	
UPPER JURASSIC	OXFORDIAN	KINGAK SHALE						

SERIES	STAGE	FORMATION	Thickness (m)	GRAPHIC COLUMN	PALEOCURRENT	SAMPLE NO.	LITHOLOGY DESCRIPTION	INTERPRETATION
LOWER CRETACEOUS	HAUTERIVIAN	KEMIK SANDSTONE	24	85DK18E		5	Bioturbated, argillaceous, VF sandstone and sandy siltstone. Vertical (Skolithos) and horizontal burrows, some floating chert pebbles. Low energy deposition below fairweather wave base.	
			22	85DK18D		3	Moderately vertically burrowed (Skolithos), medium-gray, VF-F sandstone. Sharp upper contact. Moderate energy deposition above fairweather wave base.	
			20	85DK18C		4	Clean, massive bedded, light-gray, VF-F sandstone. Common parallel lamination and low angle (5-10°) crossbeds. Sharp bedding contacts. Rare clay drapes and rippled tops. Basal chert pebble congl. stringer. High energy deposition above fairweather wave base.	
			18	85DK18B		3	Moderately burrowed, massive bedded, light-gray, VF sandstone. Common parallel lamination. Sharp bedding contacts. Clay drapes present. Moderate energy deposition above fairweather wave base.	
			16	85DK18A		2	Bioturbated, dark-gray, VF sandstone interbedded with parallel and ripple laminated, VF sandstone. Common ripples tops and clay drapes. A chert pebble congl. stringer defines the base of one bed. Rare clay rip-up. Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport. Increasing energy upsection.	
			14	85DK18A		1	Unconformity.	
			12	85DK18A		1	Dark-gray, silty shale. Rare ironstone concretions.	
			10	85DK18A		1	Unconformity.	
			8	85DK18A		1	Unconformity.	
			6	85DK18A		1	Unconformity.	
UPPER JURASSIC	OXFORDIAN	KINGAK SHALE						

SERIES	STAGE	FORMATION	Thickness (m)	GRAPHIC COLUMN	PALEOCURRENT	SAMPLE NO.	LITHOLOGY DESCRIPTION	INTERPRETATION
LOWER CRETACEOUS	HAUTERIVIAN	KEMIK SANDSTONE	26	85DK20E		5	Bioturbated, argillaceous, light-gray, VF sandstone and sandy siltstone. Vertical (Skolithos) and horizontal burrows, some floating chert pebbles. Low energy deposition below fairweather wave base.	
			24	85DK20D		3	Moderately burrowed, massive bedded, light-gray, VF-F sandstone. Rare parallel lamination and current lamination associated with trough trough crossbeds (20 cm thick). Chert pebble congl. stringers are discontinuous. Skolithos burrows at top, possible Ammonoites near base. Moderate energy deposition above fairweather wave base. High energy storm events are preserved.	
			22	85DK20C		4	Clean, medium to massive bedded, medium-gray, VF-F sandstone. Rare parallel lamination and low-angle (5-10°) crossbeds. Sharp bedding contacts. Basal chert pebble congl. stringer. High energy deposition above fairweather wave base.	
			20	85DK20B		3	Moderately burrowed, medium to massive bedded, light-gray, VF-F sandstone. Sharp bedding contacts. Moderate energy deposition above fairweather wave base.	
			18	85DK20A		2	Bioturbated, medium-gray, VF sandstone interbedded with ripple and parallel laminated, VF sandstone. Bioturbation decreases upsection. Rare clay rip-up. Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport. Increasing energy upsection.	
			16	85DK20A		1	Unconformity.	
			14	85DK20A		1	Dark-gray, silty shale. Irregular fracture.	
			12	85DK20A		1	Unconformity.	
			10	85DK20A		1	Unconformity.	
			8	85DK20A		1	Unconformity.	
UPPER JURASSIC	OXFORDIAN	KINGAK SHALE						

SERIES	STAGE	FORMATION	Thickness (m)	GRAPHIC COLUMN	PALEOCURRENT	SAMPLE NO.	LITHOLOGY DESCRIPTION	INTERPRETATION
LOWER CRETACEOUS	HAUTERIVIAN	KEMIK SANDSTONE	20	85DK22E		5	Bioturbated, argillaceous, light-gray, VF sandstone. Rare parallel lamination. Low energy deposition below fairweather wave base.	
			18	85DK22D		3	Clean, light-gray, VF sandstone. Common parallel lamination and chert pebble congl. lenses, rare parallel lamination and convolute bedding. Moderate energy deposition above fairweather wave base.	
			16	85DK22C		4	Clean, light-gray, VF sandstone. Common parallel lamination, rare ripple lamination and graded beds. Two chert pebble congl. beds (0-20 cm thick). Vertical Skolithos present. Sharp bedding contacts. Moderate energy deposition above fairweather wave base. High energy events preserved.	
			14	85DK22B		2	Bioturbated, argillaceous, light-gray, VF sandstone interbedded with parallel to wavy laminated, VF sandstone. Rare ripples tops. Chert pebble congl. bed (20 cm thick). Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport.	
			12	85DK22A		1	Matrix supported, chert pebble congl. bed (20-30 cm thick). Storm reworked transgressive lag deposit.	
			10	85DK22A		1	Unconformity.	
			8	85DK22A		1	Dark-gray, silty shale. Some clay ironstone concretions.	
			6	85DK22A		1	Unconformity.	
			4	85DK22A		1	Unconformity.	
			2	85DK22A		1	Unconformity.	
UPPER JURASSIC	OXFORDIAN	KINGAK SHALE						

SERIES	STAGE	FORMATION	Thickness (m)	GRAPHIC COLUMN	PALEOCURRENT	SAMPLE NO.	LITHOLOGY DESCRIPTION	INTERPRETATION
LOWER CRETACEOUS	HAUTERIVIAN	KEMIK SANDSTONE	18	85DK24E		5	Covered.	
			16	85DK24D		3	Clean, light-gray, VF sandstone. Bioturbated tops of beds. Common parallel lamination, rare ripple lamination and convolute bedding. Sharp bedding contacts. Moderate energy deposition above fairweather wave base.	
			14	85DK24C		4	Clean, light-gray, VF sandstone. Common parallel lamination, rare ripple lamination and graded beds. Two chert pebble congl. beds (0-20 cm thick). Vertical Skolithos present. Sharp bedding contacts. Moderate energy deposition above fairweather wave base. High energy events preserved.	
			12	85DK24B		2	Bioturbated, argillaceous, light-gray, VF sandstone interbedded with parallel to wavy laminated, VF sandstone. Rare ripples tops. Chert pebble congl. bed (20 cm thick). Fairweather shallow marine shelf deposition punctuated by intermittent storm wave sand transport.	
			10	85DK24A		1	Matrix supported, chert pebble congl. bed (20-30 cm thick). Storm reworked transgressive lag deposit.	
			8	85DK24A		1	Unconformity.	
			6	85DK24A		1	Dark-gray, silty shale. Some clay ironstone concretions.	
			4	85DK24A		1	Unconformity.	
			2	85DK24A		1	Unconformity.	
			0	85DK24A		1	Unconformity.	
UPPER JURASSIC	OXFORDIAN	KINGAK SHALE						

* From Keller and others (1961)

* From Reiser and others (1970)

* From Inlay and Dettman (1973)

STRIKE N. 46° W. DIP 24° SW.

* From Reiser and others (1970)

STRIKE N. 73° W. DIP 65° SW.

STRIKE N. 80° E. DIP 36° SE.

* From Reiser and others (1970)

STRIKE N. 80° E. DIP 36° SE.

STRIKE N. 87° W. DIP 4° SW.

* From Dettman and others (1973)

STRIKE N. 65° W. DIP 06° SW.

STRIKE N. 65° E. DIP 06° SE.