

Appendix I: Field notes, in Krass, V.A., and Amoco Oil Co., 1987 Alaska fieldwork, De Long Mountains, Brooks Range, Alaska

Krass, V.A., and Amoco Oil Co.

GMC DATA REPORT 460A

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State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys
GEOLOGIC MATERIALS CENTER



APPENDIX I

1987 Amoco Western Brooks Range, Alaska Field Work

Field Notes: Valerie Krass
Dave Muller

Dates: 7/20/87 - 7/29/87

Personnel: Valerie Krass
Dave Muller
Ned Sterne
Margot Timbel

Accommodations: Lik Camp, GCO Minerals
T32N-R20W, De Long Mountains

Transportation: ERA Helicopters
Pilot - Don May
A-Star 142EH

CF880007

7/20/87: Amoco personnel fogged-in in Kotzebue.
7/21/87: Amoco personnel fogged-in in Kotzebue.
7/22/87: Wednesday - arrive Lik Camp mid-am.

STOP ONE: 87-22-1 NE/4 13-11S-47W
Tingmerkpuuk SS, Valanginian
Plate One

Ridge former, (Kit1)
Black weathered appearance due to lichen cover -
very similar weathering pattern to Ivishak.
Frost heaved rubble covered hills - no good exposure.
Fine-grained, fairly clean, well-sorted quartz sand-
stone. Isoclinal folds, burrows, soft-sediment
deformation seen in some pieces of float. Difficult
to date at this exposure - no interbedded shales, etc.

Sample: 87-22-1 (lithology) scree

STOP TWO: 87-22-2 S/2 7-11S-46W
Etivluk Group, Jurassic-Permian
Plate One

East to next ridge to view (JPel)
Rust to brown and black lighter low ridges. Mostly
rubble. Small stream cut - dominantly chert with
some interbedded dark shales. Section - looks like
Permo-Triassic - dominantly multicolored chert with
siliceous black shale (badly weathered).

Sample: 87-22-2 (Paleo, Source) scree

STOP THREE: 87-22-3 1-11S-46W
?? Ipewik Shale (on map)
Plate One

Ridge area southwest of Tingmerkpuk Mountain.
Looking for Kit-KJi relationship. Shales between
two small ridges of Tingmerkpuk Sandstone. Shales
very weathered, appear to be red and green.

Sample: 87-22-3 (Paleo)

STOP FOUR: 87-22-4 NE/4 36-10S-46W
?? Ipewik Shale (on map)
Plate One

Very poor outcrop. Black siliceous shale mapped
as KJi1. Nearby outcrop of Tingmerkpuk SS (Kit1).

Samples: 87-22-4A Black shale (Paleo, Source)
87-22-4B Ting. ss (Lithology)

7/23/87: Thursday - working Jur-Perm section near Lik/Red Dog.

STOP ONE: 87-23-1 NE/4 3-30N-19W
?? Okpikruak
Plate Two

Soft black weathered shale with nodules and float.
light brown weathering micaceous silt resistant
layers.

Sample: 87-23-1 shale (Paleo, Source)

STOP TWO: 87-23-2 25-31N-19W
Okpikruak Fm
Plate One

Shale- black with light brown/orange weathering
micaceous silty v. fine-grained sand to silt.
Turbidite section. Structurally disrupted.

Sample: 87-23-2 shale (Paleo, Source)

STOP THREE: 87-23-3 S/2 11-30N-19W
Siksikpuk - Permo-Triassic
Plate Two

Chert and siliceous shale. Black chert and light
brown weathering dark grey fresh siliceous shale.
Minor thin interbeds of less siliceous black shale.
Photo - Dave.

Sample: 87-23-3 shale (Paleo, Source)

STOP FOUR: 87-23-4 SE/4 22-31N-19W
Etivluk Group - Jur-Permian
Plate One

Shale - highly weathered and oxidized black shale
with interbeds of medium brown to grey chert. Shale
is slightly siliceous, appears baked. Overall thick-
ness of shale exposed in stream cut about 50-75 feet.
Photos - Valerie Roll 1, 14-16.

Sample: 87-23-4 shale (Paleo, Source)

STOP FIVE: 87-23-5 N/2 11-31N-19W
Kuna Fm - Penn-Miss.
Plate One

Photos - Valerie roll 1, 17-18, with scale.
Kuna Shale - black soft fissle non-siliceous
weathered shale. Near-by markers for mining claims.
Fm of near-by mining activity at Lik, Red Dog.

Sample: 87-23-5 shale (Paleo, Source)

STOP SIX: 87-23-6 NE/4 12-31N-19W
Okpikruak Fm- Cretaceous
Plate One

In valley across stream. Okpikruak shale with
thicker siltstone beds to 2-3 feet. Turbidite
section. No sample.

STOP SEVEN: 87-23-7 SW/4 31-32N-18W
? Siksikpuk Fm - Permo-Triassic
Plate One

Thick weathered altered baked shale section
with interbedded cherts. Shale -dark grey,
weathering rust, blue-purple, grey metallic.
Looks too baked/oxidized for good analysis.
Photo - Valerie Roll 1, 21. From air.

Sample: 87-23-7 shale (Paleo, Source)

STOP EIGHT: 87-23-8 NE/4 33-32N-18W
Etivluk Group - Jur-Permian
Plate One

Thick section of siliceous shale and chert with
altered oxidized softer dark shales. Shales -
black to blue and red weathering, oxidized, baked.
Thickness - very structurally complex. Small-scale
chevron folds and thrusts. Upper section (up creek)
siliceous. Here about 100 feet thick. Photo -
Roll 1, 22, close-up with hammer. Roll 1, 23-24
outcrop taken from air.

LUNCH

STOP NINE: 87-23-9 NE/4 28-32N-18W
?? Mapped as Kuna, looks like Okpikruak
Plate One

Shale - mapped as Kuna, looks like Ko, paper
shales, highly sheared with light brown interlayers
6-8 inches thick of fine silts (grey on fresh
surface). Shale - oxidized, baked- ?K01. Photo -
roll 1, 25, with Ned. Clay "show" in stream stop.

Sample: 87-23-9 shale (Paleo, Source)
87-23-9B shale (Paleo, Source) as above

STOP TEN: 87-23-10 NW/4 22-32N-18W
 Prob. Etivluk (Poss. Okpikruak)
 Plate One

Siliceous oxidized shale. No sample.

STOP ELEVEN: 87-23-11 N/2 4-32N-18W
 Siksikpuk - Permo-Triassic
 Plate Two

Very siliceous green grey shale. Pencil cleavage.
 Steep slope. Looks non-source.

Sample: 87-23-11 shale, 2 bags (Paleo, Source)

STOP TWELVE: 87-23-12 NE/4 35-33N-19W
 Siksikpuk - Permo-Triassic
 Plate One

Siliceous shale. No sample.

STOP THIRTEEN: 87-23-13 NE/4 1-12S-47W
 ? Age. Mapped as Otuk.
 Plate One

Begin traverse through syncline/anticline
 trend of Otuk-Etivluk-Ipewik shale sections.

?Age- mapped as Otuk. Good soft black shale.
 Photos - roll 1, bear prints with hammer and scale.

Sample: black shale (Paleo, Source)

STOP FOURTEEN: 87-23-14 NW/4 6-12S-46W
 ?Age - E. Cretaceous Okpikruak
 Plate One

Large hillside of shale float - dark grey, fairly
 oxidized. Float of grey brown micaceous siltstone
 to very fine-grained sandstone. ? Cretaceous.
 Climb up hillside to try and break through slopewash.
 Photos - valerie - roll 1, hillside outcrop with ned
 in orange, 31-32.

Sample: shale (Paleo, Source)

7/24/87: Friday - start late due to heavy fog.

STOP ONE: 87-24-1 NE/4 6-10S-52W
 Ipewik Type Section- Valanginian

Horseshoe Bend, Ipewik River, KJi
 Overall description - thick section, structurally
 disrupted, of soft black shale with float of medium
 grained sandstone with abundant iron concretion.
 Will look for coquina zone. Not found. However,
 large iron concretions appear to contain recrystallized
 pelecypod fossils. Sample from apparent base to top.
 Skip lowermost oxidized, structurally disrupted zone
 at east end of outcrop.

- Samples: 87-24-1A v. soft dark grey clay
v. weathered (Paleo, Source)
- 87-24-1B dark grey soft shale
(Paleo, Source)
- 87-24-1C dark grey soft shale
(Paleo, Source)
- 87-24-1D interbedded fine to medium
grained non-calcareous medium
grey fresh, orange rind weathered
highly fractured sandstone.
Contains calcareous shell fragments?
(Lithology)
- 87-24-1E shale (Paleo, Source)
- 87-24-1F dark grey shale (Paleo, Source)
near-by siderite nodules and fans
- 87-24-1G dark grey shale (Paleo, Source)
- 87-24-1H iron concretion nodules with ?
recrystallized pelecypod fossils
(Paleo)

STOP TWO: 87-24-2 SW/4 31-9S-52W
Ipewik Shale- Valanginian

Drainage to east, still in Horseshoe Bend of Ipewik
River. Photos - valerie - of drainage, Roll 1, 33-34.

- Samples: 87-24-2A black shale (Paleo, Source)
87-24-2B black shale (Paleo, Source)

STOP THREE: 87-24-3 NE/4 10-9S-55W
?Ipewik Shale- Valanginian

Upper drainage of Thetis Creek. Black shale
with sparse sandstone beds 8 to 12 inches thick.

- Samples: 87-24-3 black shale (Paleo, Source)
87-24-3B black shale (Paleo, Source)

STOP FOUR: 87-24-4 NE/4 9-9S-55W
Ipewik Shale

Downstream on upper drainage of Thetis Creek.
Photos - valerie - roll 2, 1-5. Ipewik shale
and helicopter.

- Samples: 87-24-4A black shale (Paleo, Source)
87-24-4B black shale (Paleo, Source)

STOP FIVE: 87-24-5 NE/4 21-12S-50W
Etivluk Group - Jur-Perm
Plate One

South side of Mt. Kelly. Kukpuk River. Etivluk
to Ipewik overall. Here, Ipewik is high oxidized.
Wonder how we ever got a good sample last year (4% toc).

Sample JPe ? Siksikpuk - siliceous dark to medium grey shale from south side of river.

Sample: 87-24-5 silc. shale (Paleo, Source)

STOP SIX: 87-24-6 NE/4 22-12S-50W
?Ipewik Shale- Valanginian.
Plate One

Up north fork to Ipewik outcrop in saddle between two hill of Cret. Fortress Mountain turbidites.

Sample: 87-24-6 shale (Paleo, Source)

STOP SEVEN: 87-24-7 SW/4 15-12S-50W
??Ipewik Shale - Valanginian
Plate One

Sample: 87-24-7 shale (Paleo, Source)

STOP EIGHT: 87-24-8 SW/4 11-12S-50W
? Ipewik Shale - Valanginian
Plate One

No sample. Too weathered.

Photos - valerie - roll 2, 6-7, etc. Kogruk scenery on way back to camp.

7/25/87: Saturday - weather day. Very bad fog.

7/26/87: Sunday - very bad fog.

STOP ONE: 87-26-1 NW/4 6-33N-22W
??Kfo outcrop - Cretaceous
??JPe outcrop - Jur-Perm.
Plate Two

Spiney Ridge Area. ? Fortress Mountain.

Sample: 87-26-1 shale (Paleo, Source)

Across ravine. ? JPe - Etivluk shale and chert.
NW/4 1-33N-23W.

Sample: 87-26-1A shale (Paleo, Source)

STOP TWO: 87-26-2 SW/4 1-33N-23W
Otuk - Jur-Triassic
Plate Two

Downstream. ?KJi collected last year covered by snow/ice bridge. Otuk - red and green shales interbedded with cherts.

Sample: 87-26-2 gn-gy silc shale (Paleo, Source)
also take sample of radio. chert (Paleo)

STOP THREE: 87-26-3 NW/4 SW/4 SE/4 1-12S-47W

Mapped as Otuk-Jurassic-Triassic
Plate One

NE end of tributary to western fork of Kukpowruk River. Dark gray black bentonitic shales interbedded with gray ribbon cherts .5 to 2 inches thick. Sample of shale and siliceous shale from bed 4' wide. Red and green shales noted 50' or so west of sample location. Black shale sampled is fairly weathered even several feet in from outcrop face. Structure complex. Ned feels that this outcrop is Kuna-like. Photos - Dave

Samples: 87-26-3 dark gray, black bentonitic/siliceous shale (Paleo, Source).
87-26-3B 100 yards downstream (ENE), Black, thinly bedded shale, flaky (Paleo, Source).

STOP FOUR: 87-26-4 SE/4 SE/4 SW/4 1-12S-47W
Mapped as Otuk - Jurassic-Triassic
Plate One

Black to bluish black siliceous shale on the south side of the same tributary as 87-26-3. Still Otuk? Could be Ipewik? Appears to be stratigraphically continuous with with Okpikruak like strata up-section (southwest) along this tributary (87-26-5). This part of the section lacks either the cherts of the Jurassic thru Permian or the interbedded silts of the turbiditic Cretaceous.

Sample: 87-26-4 Black to bluish silicic shale (Paleo, Source).

STOP FIVE: 87-26-5 SW/4 SE/4 SW/4 1-12S-47W
Mapped as Otuk - Jurassic-Triassic
Plate One

Stratigraphically up throw, a fairly continuous shale/siliceous shale outcrop into a section of interbedded silts and sands within a shale section. Appears to be Okpikruak.

Sample: 87-26-5 Dark gray to black shale (Paleo/Source).

STOP SIX: 87-26-6 NW/4 SW/4 NE/4 6-12S-46W
Mapped as Etivluk Jurassic-Pennsylvanian
Plate One

Middle Fork Kukpowruk River. Outcrop appears very similar to 87-26-3 (associated cherts, altered and red, green shales nearby). Dark black shale sampled. Could be Otuk Photo - Dave.

Sample: 87-26-6 Dark black shale (Paleo/Source).

STOP SEVEN: 87-26-7 C SW/4 NE/4 6-12S-46W
Mapped as Ipewik, Jurassic-Cretaceous
Plate One

Middle Fork Kukpowruk River. Black to blue gray siliceous shale. Possible Ipewik according USGS geologic map.

Sample: 87-26-7 Black to blue gray siliceous shale (Pale Source).

STOP EIGHT: 87-26-8 NE/4 NW/4 SE/4 6-12S-46W
Mapped as Kuna, Pennsylvanian-Mississippian
Plate One

Middle Fork Kukpowruk River. Dark shale interbedded with fine siliceous silt. Iron staining prominent.

Sample: 87-26-8 Dark gray shale (Paleo/Source).

7/27/87: Monday - Rainy, foggy, very low ceiling.

STOP ONE: 87-27-1 SE/4 SW/4 NE/4 31-10S-43W
Fortress Mtn., Mapped as Carboniferous Chert
and Otuk.
Plate One? , Mapped as Plate Two.

West Fork Kokolik River. Dark shale interbedded with silts and sands.

No samples.

STOP TWO: 87-27-2 SW/4 SE/4 NW/4 36-10S-44W
Mapped as Otuk - Jurassic - Triassic.
Plate Two.

West Fork Kokolik River. Interbedded black, brown, yellow, red, shales and gray and red shales. Highly deformed.

Sample: 87-27-2 Black shale (Paleo/Source).

STOP THREE: 87-27-3 C SW/4 NW/4 2-11S-44W
Black shale of Triassic or Mississippian age
with dark gray shell bearing limestone. Otuk?
Plate Two

West Fork Kokolik River. Black shale interbedded with dark gray fossiliferous limestones.

Samples: 87-27-3A Black Shale (Paleo/Source).
87-27-3B Shell-bearing Limestone (Paleo).
87-27-3C More Black shale from around the corne
just downstream.

STOP FOUR: 87-27-4 36(?) - 10S-42W
Jurassic-Triassic Otuk
Plate Three

Spike Creek (east side). Dark purple gray blocky shale.

Samples: 87-27-4 Dark purple gray blocky shale (Paleo/Source).

STOP FIVE: 87-27-5 35(?) - 10S-42W
Triassic-Permian Siksikpuk
Plate Three

Across Spike Creek (west side) from 87-27-4.

Purple gray baked looking shale. Several cleavages developed. Numerous high angle reverse faults and occasional concretionary layers. Some chert.

Samples: 87-27-5 Purple gray baked looking shale (Paleo/Source).

STOP SIX: 87-27-6 NE/4 NE/4 SW/4 23-10S-45W
Jurassic-Permian Etivluk
Plate One

Tingmerkpuuk Creek. Dark black shale, looks like Otuk (within a yellow red purple variegated shale and chert sequence).

Samples: 87-27-6 Dark black shale (Paleo/Source)
87-27-6B Black to dark gray chert (Paleo)

STOP SEVEN: 87-27-7 SE/4 NE/4 NW/4 13-11S-45W
Jurassic Triassic Otuk
Plate One

East Fork Tingmerkpuuk Creek. Dark gray Otuk shales. Fissile on outcrop, blockier after excavation.

Samples: 87-27-7 Dark gray shale (Paleo/Source).
87-27-7B Black chert (Paleo).

STOP EIGHT: 87-27-8 S/2 SE/4 SW/4 12-11S-45W
Cretaceous Fortress Mtn.
Plate unspecified, presumed autochthonous?

East Fork Tingmerkpuuk Creek. Black Cretaceous shales.

Sample: 87-27-8 Black shale (Paleo/Source).

7/28/87: Tuesday - Bright, sunny, clear. A marvelous day.

STOP ONE: 87-28-1 SE/4 24-9S-32W
Pennsylvanian to Mississippian Nuka Fm.
Plate Five

Top of Nuka Ridge. Arkosic conglomerates, greenish grainstones, gray and buff limestone and dolomitic limestone.

Samples: Several samples taken for lithology work (87-28-1, 87-28-1A, 87-28-1B).

STOP TWO: 87-28-2 16-9S-32W
Pennsylvanian to Mississippian Nuka Fm.
Plate Five

Singayoak Creek Measured Section - Nuka clastics and carbonates. Coarse arkosic conglomerate, sandstone, silts and carbonates.

Samples: 87-28-2A Conglomerate (Lithology).
87-28-2B Conglomeratic sandstone (Lith).
87-28-2C Conglomerate (Lithology).
87-28-2D Interbedded gray silts and buff weathering conglomerate (Lith).

STOP THREE: 87-28-3 11-10S-32W
Mafic Sills and Dikes, Jurassic-Pennsylvanian
Plate Four

Center Fork, Singayoak Creek, 3000' mountain top.
Diabase sill sample for Schofield.

Sample: 87-28-3 Sample for potential fields group
and radiometric age dating.

STOP FOUR: 87-28-4 11-10S-32W
Mafic Sills and Dikes, Jurassic-Pennsylvanian
Plate Four

Center Fork, Singayoak Creek.
Diabase sill sample for Schofield.

Sample: 87-28-4 Sample for potential fields group
and radiometric age dating.

STOP FIVE: 87-28-5
Jurassic-Pennsylvanian Etivluk
Plate Two

West side of Sphinx Mtn., N. of Kogruk Creek. No shales.

STOP SIX: 87-28-6 17-10S-41W
Jurassic-Triassic Otuk
Plate One

East Fork Spike Ck. Black, baked appearing shales.

Samples: 87-28-6 Black shales (Paleo/Source).
87-28-6A Chert (Paleo).

STOP SEVEN: 87-28-7 20-10S-41W
Pennsylvanian-Mississippian Cherts
Plate One

East Fork Spike Ck. Black Kuna-like siliceous shale
interbedded with black limestone, 1-5" black chert beds.

Samples: 87-28-7A Black siliceous shale (Kuna?) (Paleo/
Source).
87-28-7B Chert black, 1-5" beds (Paleo)

STOP EIGHT: 87-28-8 SE/4 NW/4 SW/4 21-10S-45W
Cretaceous Ipewik, Tingmerkpuuk Sandstone
Plate One

Caribou-encrusted Tingmerkpuuk Mtn.

Samples: 87-28-8A Tingmerkpuuk Sandstone (Lithology)
87-28-8B Interbedded green shales from
within the Tingmerkpuuk (Paleo).

7/29/87: Wednesday - clear, sunny, strong wind.

STOP ONE: 87-29-1 SW/4 20-33N-23W
Etivluk Group - Jur.-Perm
Plate Two

South end drainage cut into JPe2 at south end of

Spiney Ridge. Interbedded chert, siliceous shale, shale and minor black limestone. Thickness of shale on the order of 80 feet. Photo - valerie - roll 3? - 27.

Sample: 87-29-1A Etivluk shale (Paleo, Source)
87-29-1B Etivluk chert (Paleo)

STOP TWO: 87-29-2 SE/4 20-33N-23W
Etivluk - ?Otuk - Jur-Triassic
Plate Two

Cut along main drainage of south stream.
Etivluk group - probably Otuk. Shale, siliceous shale, chert and limestone. Photos 28-29 with Ned digging. Shales generally siliceous, gen. 1 to 2 feet thick.

Samples: 87-29-2A JPe shale (Paleo, Source)
87-29-2B JPe shale (Paleo, Source)
87-29-2C JPe chert (Paleo, radiolarian)

STOP THREE: 87-29-3 SW/4 9-33N-23W
Etivluk Group - Jur-Perm.
Plate Two

North side of Spiney Ridge. JPe2, mostly green bedded chert, with thin interbeds of oxidized black shales 1 to 2 feet thick.

Samples: 87-29-3A shale (Paleo, Source)
87-29-3B radiolarian chert (Paleo)

STOP FOUR: 87-29-4 SE/4 9-33N-23W
??Okpikruak - Cretaceous
Plate Two

next drainage north with mapped Ipewik.
Mapped as Kji - looks like Ko (Okpikruak). Thick shale with interbedded dirty fine grained sandstone.

Sample: 87-29-4A shale (Paleo, Source)
87-29-4B sandstone (Lithology)

STOP FIVE: 87-29-5 SE/4 9-33N-23W
Etivluk Group - Jur-Perm.
Plate Two

north side of Spiney Ridge. Poor side drainage of Etivluk outcrop. Oxidized chert and shale. Highly structurally disrupted. Thin oxidized slabby dark grey shale interbedded with siliceous shale and chert.

Sample: 87-29-5A shale (Paleo, Source)
87-29-5B radiolarian chert (Paleo)

STOP SIX: 87-29-6 NW/4 2-33N-23W
Etivluk Group - ?Otuk - Jur-Triassic
Plate Two

north side of Spiney Ridge. Etivluk Group.

Green and red shales and interbedded chert and siliceous shale. Probably Otuk (Jur-Triassic).

Sample: 87-29-6A green shale (Paleo, Source)
87-29-6B radiolarian chert (Paleo)

STOP SEVEN: 87-29-7 W/2 36-32N-23W
Etiwluk - ?Otuk
Plate Two

Etiwluk, probably Otuk (Jur-Perm). Varicolored shale and chert. Thick interlayered black paper shale and thin cherts.

Samples: 87-29-7A black pp shale (Paleo, Source)
87-29-7B radiolarian chert (Paleo)

STOP EIGHT: 87-29-8 SW/4 29-32N-22W
?? Otuk (or KJi)
Plate Two

No outcrop of KJi Ipewik shale. Go to JPe shales and chert - Etiwluk Group (Jur-Perm). Black shale with minor interbedded siliceous shale and little chert. ?KJi - probably Otuk.

Samples: ??

STOP NINE: 87-29-9 NW/4 32-32N-22W
?? Etiwluk Group (with KJi or Ko)
Plate Two

south side of Spiney Ridge. Mapping confusing. ?JPe or KJi. Black shales and rust weathering chert sections with structural disruption and intervening thrusts. Photo - valerie.

Samples: 9 A, B, C

STOP TEN: 87-29-10 NW/4 6-33N-22W
Plate Two

back to jog in river on south side of Spiney Ridge. No sample. Photos from air of ridge - Ko to JPe.

STOP ELEVEN: 87-29-11 NW/4 5-29N-24W

Plate Six basalts.

STOP TWELVE: 87-29-12 SE/4 17-29N-25W

Plate Six basalts.

STOP THIRTEEN: 87-29-13 SW/4 26-30N-26W

?Lisburne Limestone. ?Plate Three.

STOP FOURTEEN: 87-29-14 SW/4 35-30N-26W

Nuka Formation
Plate Five

Nuka Formation. Medium to coarse grained arkose-quartz with pink k-feldspar and white ? feldspar. Quartz cement, non-calcareous. Very poor exposure. V. well lithified. Some layers of more pebbly conglomeratic ss, interlayered with non-outcropping red silty shale and finer sand. Low ridge with rubble outcrop - low relief "stonehenge". Again weathered surface often lichen-covered.

Samples: 87-29-14 numerous samples of sandstone
(Lithology)