

## **Appendix E: 1970 field notes, in Fehlmann, R.H., and Amoco Oil Co., Data compilation 1970 Amoco field party, western and central Brooks Range, Alaska**

Fehlmann, R.H., and Amoco Oil Co.

GMC DATA REPORT 463E

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2019  
State of Alaska  
Department of Natural Resources  
Division of Geological & Geophysical Surveys  
**GEOLOGIC MATERIALS CENTER**







FIELD BOOK #1

Grab Samples 1001-1119

Grab Samples 4165-4166

Summer 1970

~~Thursday~~ 6/4

Camp 1 Anaktuvuk Pass

Moved in June 2.

1001F Shimo Ch. - phosphate unit  
of Uppermost Lisburne,  
Goniatite - Oncolite ???

1002C Shimo Ch. 1st outcrop  
above phosphate unit

1003C Shimo Ch. 100' above  
1002C Lisburne.



1004 L Shino Ch - float =  
Phosphate unit -  
Miscellaneous Grmk -  
oolites, pisolites, etc.

1005 L Shino Ch <sup>1st unit</sup> below  
Phosphate unit, dolomite  
Weed out -

1006 C Shino Ch - Uppermost  
Lisburne - above phosphate  
unit - Pachstus?

1007 F C Shino Ch - 1 ft below  
contact w/ Stensick pale  
Nugent-productus?

1008 C Shino Ch - Stensick pale  
fissile limestone in  
basal carbonate

1009 C Shino Ch - Top of  
carbonate unit -  
Stensick pale

1010 C Confluence of Ernie Ch  
and North Fork of Koguluk  
Rv. - Hill west of  
Hanging Glacier Mtn.  
Basal Lisburne.

Friday 6/5

1011 C Below phosphate zone  
of Lisburne? at west  
fork of south fork of  
Monotis Ch.

1012 C Top Lisburne Facies  
Toe of slope?

1013 C - 50' below 1012C

1014 C 40' below 1013C  
Possible youngest Lisburne  
in Brooks Range

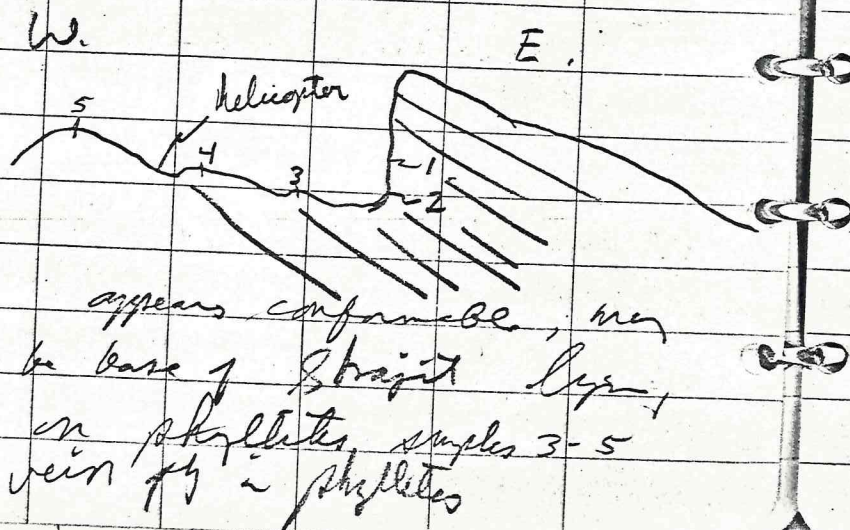


1015L Antimony Ch - 1" thick  
10 ss lenses in (shublike) 7m.

6/6 Saturday - T-4

1016L Near mouth of Enatai Ch  
Canyon, South of Ear Peak  
Pics 1 & 2, md gy limestone  
w/ chert nodules.

1017L (1-4) south of Chimney Pass



Wiseran - ~~En~~ Charlie Breck

1018L Glacier Riv.

1019L Sleepy Ch - thinly  
interbedded laminated  
6-9. ss (1-2") and  
silt. dk gy to blk.

1020L North Fork Koyukuk between  
2 east flowing creeks just  
north of Bonanza Ch.

1021L Redstar Mtn. very red  
weather, schist w/ abndt  
qty veins

1022L Mt. Woomerak

1023L Annigetch Peak  
Granite



Crevice Ck - Bill Fickus

wife Lil

Timmy - Linda

6/7 Sunday - Down day

6/8 Monday Down day

6/9 Bill - Dave A Shagrit types

Bob & Dave M. - Antenna. Ck

1023L Minute Arizotel Peak

6/10 Wednesday - Bad day

Snow, Everyone in -

6/11 Thursday - 1/2 day Dave M. & Bob at

Antenna Ck - Bill, Dave A, & Ed traversed

Palestine, Tinaguk - Dookerick

Bob & Dave M. at Skimo Ck

6/12 - Bill - Dave A. & Monotis

1/2 day Ck. Ed & I checked Lake Ullinik -

Ullinik - back to Monotis

6/13 Saturday

1024L Horace Mtn.  
Gneiss Geochron

6/14 Sunday

1025L Lisburne From Fire Creek  
(4 bags) Porous Dolomite & chert

1026L Gradational contact

interval between marine

5/14/41 1026L Hunt Fork Shale (w/ Atrypa) and beach sands of lower Kanayut.

Sample is a reverse graded beach edgewise conglomerate.

1027L Boreal Mtn.  
Geochron



6/15 Monday

Atigun Gorge

1028A - 3 bags, 2 fossil, 1 lith.

Torok? *Quella cognina*  
lagoonel?

lith. Inpl. - dead oil  
- fractures.

1028A - Shublik

2 - fossils, 1 geochem

1029L - Shublik

SS, Proben - shal  
sand locally derived  
from associated shales  
or indication of distal  
drift.

1030L - Shublik

geochem, near mouth

1031L - Shublik

Barite associated  
with faulting in  
Shublik.

6/16 Tuesday (T+)  
RAIN Squalls

1032P & Geochem 1 bag

Irishak Ru. - shale  
below Lisburne

1033L, P, F Smoke Ch.

slate/SS unit.

1034C SKAJIT

Ottertail Ch



1035 Geochem  
Flood Ck.  
various bryozoans Rv

6/17 Wednesday  
Day of Rest  
Ed and Ross moved  
Wankins to Taktu Bluff.

6/18 Thursday  
Attempted East Galbraith  
Pike - too windy.  
1036 L - Geochem Dead oil

6/19 Friday  
Weather

6/20 Saturday

6/21 Sunday  
Check Etivlik Lake

1037 L Lisburne in

River bottom of  
Ekokpuk Ck. thin bed  
blk chert and black  
shaly limestone

6/25 Wednesday  
Spike Camp - Etivlik Lake  
Lisburne Ridge

1038 L & Fos Miss.

Raples Dolomite and

Silicified algal mats

few mounds (small)

Abundant crinoid debris

- a few beds increasing  
upward w/ bryozoa  
fossils.



Believe Lisburne Ridge  
liths represent low  
intertidal to high  
subtidal environment,  
based on absence of  
mud cracks

6/26 T=9 morning

Mostly Dev. ss/sh, H.F.  
with becoming more massive  
to North east.

1037 P Dev. interbed ss, silt  
and cong., shales w/  
abundant plant fragments:

1040 P low hill N of  
Likhluk Mtn. Siltstone  
silt and shales

1041 C Lisburne? mediat.  
sublithographic  
Eastern end of low hills  
north of Fauna Cr.

1042 P, 1043 P.G.L., Amuk Ru.  
Utukuk Fm.

1044 P S. west of Likhluk Mtn

1045 F, P NW Isikut Mtn  
Supposed Permian-Carb. SANDS  
Looks like Hunt Fork

6/27 Friday Saturday

1046 P, Geochron, Nig  
BLUFF

No sample 1047



6/28 Sunday

Killik Rv.

1048 Upper Akmalik Ck. - P. C.  
and Geschen Kayak  
Sh.

1049 Geochron  
Headwaters Alatak Rv

1050 Geochron  
Headwaters Kogoluktuk Rv.  
Boulder - but valley not  
Glaciated

Bill took picture of Kobuk

6/29 Monday

1051 Geochron  
low hills immediately  
north of Kikkluk Mtn.

1052 L & P Lower  
L & P Upper  
Utukok - low circular  
hill east of south end  
of Akulak Lake  
Intbed. & bdd, thin bed (1")  
ss and shales of  
Utukok - characterized by  
small patches of limonite  
on fresh surface

1053 Geochron  
Meta Cong w/ 2" red  
to Ang pebbles - north vein  
West side Imelyak Rv.



1054 Geochron

headwaters Akillik Rv.

Greenschist bedded dips

to south

7/4 T-17

1055 L Avingyak Hills

Lms Skagit?

1056 Geochron check feldspar

for date of intrusion

other minerals for date  
of metamorphism

1057 L

Skagit? intertidal

cyclic; barrowed lagoon

grade up to algal mats

w/ birdseye

2/5 T-18

1058 L Picture

Metamorphosed Intbed ss?

(orange weath. w/ limestone  
blebs), silts and limestone

1059

Gy Lms, TAN weath. Lms

X-Ray, Cond., Lith.

1060 Head of Agashashok Rv.

Correlates w/ AINS Hills  
Pic

1061 C Lisburne inlier 4 miles

NW of Tututalak Mtn

1062 P NW BASIN Mtns

4 mi SE of SEKUIAK

Bluff on Noatak Rv.



7/6 Monday

Up Kelly Rv.  
Weathered out,  
heavy overcast, w/  
snow showers.

Dave & Bob @ new Utukok locality  
(head of trail Ch)

7/7 Tuesday

Locality @ head of Agashashok  
Rv. 1060 collected samples

Locality at head of Omar  
Rv. Checked section of  
Utukok, very good, long  
appears complete but  
may be faulted over Shagat  
(or Pishburne), Pishburne on  
top - Believed to be  
distal facies of Utukok  
Went to Kogebue, mail  
saw Nelson.

7/8 Wednesday

Day off - R & R. Got  
dormie nuts

7/9 Thursday

Attempt Nanaiviksh.

Aborted - Winds + squally  
storms

7/10 Friday

Weather - windy, stormy

7/11 Saturday

Weather - windy, stormy

7/12 Sunday

Dave M, Bob, John at head  
of Omar Rv.  
Bill & Dave A. to Port  
Hope



7/13 Monday

Dave M. Bob R. head of  
Omur Ru.

Ed & I to Kiana -  
Attempt traverse but  
wind very gusty  
Finished upper part of Omur  
Ru. Sect. appears Shagrit-like  
all the way through, may  
be repeated by fault in  
upper part.

7/14 Tuesday - Warm, Broken cloud  
Dave M. Bob R. John E.  
at Nanavikrak Ridge.

1064L Noatak ss

1065 P, Geschem,  
Noatak ss, sh.

1066 C, Geschem, P Wulik Ru.  
Thinly bedded blk shales

And yellow weathering fss.  
Lms. Kayak?? adjacent  
hills are composed of Dk  
or Utukol-Lisburne. Which  
is out of place?

2 Pictures

2 Pictures west of Wulik Ru.  
of good Kayak-Lisburne  
Sect.

1067 P Kapowruk ss.  
Picture of floor bottom Wulik  
X - Strike ~~to~~ S 60 E

Dip South Top to  
Fold steep to North South



7/15 Floyd in Eve.

1068 L, Geochron. Copter

Peak west side of

N. NAVIKSAK Ck

1069 P, Mouth of Numanikak Ck

looks like Kalyonak ss.

use same for Geochron?

Dips irregular. In valley bottom

1070 P Geochron

Shublik, sooty blk shales

w/ iridescent stain and

poss oil seep holes with has

been burned out.

1071 P Kelly Rv.

Poss. Dev.

1072 Geochron

1st Igneous Intr. on

East side Kelly Rv.

1073 A, B, - Paly Kelly Rv.

A. Siksikpak? Folded

B. ~~Shublik~~ Shublik? dips N-S  
st. Generally E.W.

7/16 Thursday

Weathered out - Thunder-  
storms

7/17 Friday

Dave M., Bob R., John E. on

Agnashok Rv. Sect. (pre-  
Skagit reef exuvient)

Floyd & A to recon.

1074 L Strom bed western

most Baird Mts.



1075 P, L, Geochron Kelly

Siksikyak? or Kukpowruk

Intbed sh. / silts (laminated)

1075A-P Intbed blk chert and

shale Shublik?

Strike E-W

1076 P, L Kelly Rv.

Intbed silts / sh.

Kukpowruk? Strike variable

Saturday 7/18

Dave M, Bob P, John E. at  
Agashashok Rv. Sect. for  
4 hrs.

Bud, Ross, Leonard Darrow  
in w/ Nelson at 10:30 AM

Visit Mt Bupto and Nuka

Ridge w/ Bud & Ross

Clord & John E. to Beaufort

Billy - Dave return from Mt. Hope

7/19 Sunday

76y Baird Mtns DeLong Mtns

w/ Bud, Ross - Ross impressed

w/ folds in western Baird  
Mtns (Used Helio) - Bud & Ross

Leonard leave 11:AM for

Kotzebue - Ross enjoyed visit.

#

Jet Ranger on 100 hr.

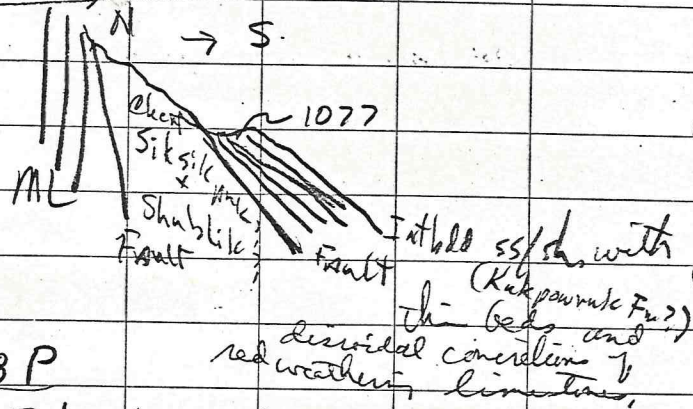
Dave Mikesch leave at 3:30 PM

for Anchorage w/ Nelson who  
came back w/ oil tank.



Monday 7/20

1077 P



1078 P

Siksikpuk Fu

Kukpuk Ru

1079 P, L Geochron, Foran

Tailleux's Black Facies of

Lisburne Faulted Lms

Blk chert, shale and  
silt

Kukpuk Ru.

Dips vertical to  
erratic

1080 P

East Trib. Kivallina Ru.

Shublike? in valley w/

Lisburne on top

Dips Vertical, twisted to  
Horizontal

1081 C

Mt. Jarvis

Skeat?

Impossible to determine

Dips

1082 Geochron

North Igikvok Mtn

Iq. rk like that in Kelly  
Ru.



1083 L-Geschvorr

Tyikvok Mtn.

Layered qtz rich igneous  
rock

1084 L

Tyichoruk Mtn

1085 P, C

Valley Tkalukvok Ck

Fatbedd lms, shale, silt

Miss.

1086 L Kikmik sot Mtn

Nortak ss

1087 P, C, L West of Kikmik sot Mtn

Fatbedd chert (blk)

lms. (Ass) shale

Miss. Kayak?

7/21 Tuesday

Bill & Dave A. to section

in Udalik, Bob and I  
in camp

7/22 Bob R. to Ave.

3 pieces of structure

HF at top, sill at  
base Head of Sea Gall  
Ck.

1088 P, L

Cs. ss, Nuka? w/ laminated  
gn gn chert underlying.  
Lith. single ss, lam chert

1089 P

Fatbedd blk chert, blk shale  
beds 1"-2" thick w/  
large lim concretions  
Wign. eratin



1090 P, L. Hingorak Ridge

SS w/ Trochurus, shalle

Lms w/ clams, K?

1091 P

Kakporak? K? or Dev?  
shale / ss

Various pieces of Pisidium along  
from W. Long Mtn shale  
to North, vertical Pisidium  
to South.

1092 P Northern white where

Trains East at Front of  
Range

Intbed silts, sh, sand

Dev? or K?

Look over

1073 P, L Pitmegea Rv.

1074 P Pitmegea Rv.  
shales below 1073

intbed shales and  
lenticular bar sands,  
massive at base becoming  
thinner bedded and rippled  
near top

1075 P Up. Kakporak Rv.

Tartlen's 'black faces'  
down stream from 1079



Friday July 24

Pics of Northwestern Baird  
Mtn before entering  
Noatak valley.

Across valley west to  
Kikriukrot Mtn.

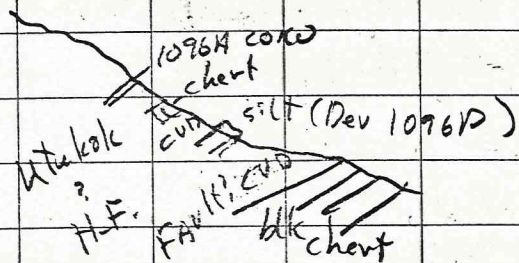
Slid down valley from  
Noatak River  
Deichuk Hills, south  
edge of Noatak valley.

Across valley to  
Malgrain Hills

Up Kell River, To body  
to st. Wagon to left,  
Utukok center.



1076 P, 1096 A - Conco



Walked section in south flowing  
drainage south of our  
East Kelly River section.  
Section consists of black  
calcareous shales and  
argillaceous lens (mudst.) at  
base. This part of section  
is cyclic with influx of  
shale detritus marking the  
beginning of a depositional  
event in a carbonate  
environment. As detritus  
influx waned, carbonate  
and predominated.

This unit is gradationally  
overlain by 1000 to 1500  
feet of laminated calcareous  
mudstones (lamin  $\frac{1}{8}$ " thick)  
with zones of more massive  
(3-5') mudst. in which the  
laminar are contorted and  
even concretionary. Also  
fossil horst is erratically  
distributed. <sup>but fossils are rare.</sup> Possibly slump  
deposits or turbidity flow?

This unit is then gradationally  
overlain by interbedded lt.  
tan weathering mudst and  
blk chert 200-300' thick  
with fossils more abundant and  
pebbles and grainstones  
increase in abundance upward.



This unit is gradually  
overlain by typical grey weathering  
limestone with interbedded  
blk chert. Fossils are common  
Brachiopods, crinoid stems, colonial  
corals.

Conformably overlying this  
unit is a red-weathering  
limestone unit with interbedded  
grey weathering (w/ blk chert beds)  
unit.

109



Saturday 7/25

Lisburne in Baird Mtn  
may be ~~southern~~ <sup>southern</sup> belt  
of Mississippi similar to  
that in central Brooks  
Range, but due to SW  
structural alignment, it  
has been displaced eastward.

Also <sup>major</sup> faults in western  
De Long Mtn may represent  
a stacking of facies so  
that west of Wulih rocks  
below Lisburne are fossiliferous  
and nearer shore than those  
east of the Wulih where  
laminated muds dominate.  
However southeast of the  
laminated muds are  
the silts of the Utukuk?



How does this fit??  
Assume Utukuk S. Lts. in  
place and right lateral  
faults have juxtaposed  
Mississippi facies. Mechanisms  
for right lateral movement  
and bending would be  
Alaska sliding toward  
Siberia or vice versa.

1097P SINGOALIK Rv.

Kretaceous Intbed shale,  
ss, thin lenticular ls.  
as at West Fork of Wulib Rv.  
Section

Strike E-W Dip Vertical

1098L West Takhiaic chok Mt  
Noatak ss, w/ HF phyllite  
HF grades up into massive  
sands of Noatak

Pick look, north over  
Kotzebue Sound into Iglooduk  
Hills

1099 Geochron

South of Mount Noak



1100 L Kakaruk Mtn

strom facies dk.

dolomite

Get porosity,

Tuyakalik Mtn. SW side

Dolomites w/ algal mats  
like Arino Mtn but  
without supratidal features  
more high subtidal or  
low intertidal

pics looking north from  
Agichuk Hill (Katchu Rv.) toward  
Kelly Rv.

pics of village of Neotak

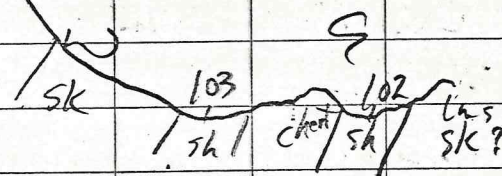
Sunday July 26

Elk Rv. Section

1101 L ss below Lisburne  
porosity - perm.

1102 P, 1103 P

103 above 102



1104 C shaly ls

1105 C shaly ls.

1106 Geochron. Asik. Mtn.

107 Geochron. Maiguinevak Mtn



1108 P

South-flowing trib of Eli  
R. just East of Maigunauk  
Mtn.

Hind Fork Str. N 40 E

Dips vertical.

1109 P, C, L

North of Eli R. Sect on  
East side of Mtn.

Interbedded shales and lns,  
some laminated (1109 L)

appears conformable below  
Calovites measured today.  
also algal mats in float  
from above sh/las unit  
beds 1"-3" thick.

pics Eli R. Sect. looking  
North.

Monday July 21

Mt. Bastille

1110 Geochron - Sill at  
top of ~~the~~ Mt Bastille,  
North end

1111 L 3 different ss at  
top Mt. Bastille, north  
end.

1112 L. very micaceous dolos.  
wt dead oil?

1113 F stroms, corals, snail

1114 -

pics of Mt Bastille. and  
distorted fracture.



Bastille Mt.

1110 G. - Igneous at top

1111 L - Top of Bastille

1112 L - Gray zone 1/2 way down

1113 C, 1113 F - Fossils - corals 1113 AF - Strom, purple zone

1114 C - Just above shaley, calc. silts

1115 P - Shaley, silty zone

1116 F - float sample - brachs?

1117 L - float

1118 C - top unit 6

1119 P - valley, blk dolomite

Monday July 27



# Bastille Mt.

Units top-down 11106. 822

1) Dolomite f.s. (11112) sands, x bdl, w/ sand laminae

some gray layers Dolomite increasing in lower part of unit.

Burrowed (vertical) layers common in lower part - Unfoss. grades down into

2) Purple - yellow grey mottled dolomite. - with corals and stones and gastropods grades down into

3) very shaly siltstone with occasional thin limestone. shaly & paper thin bed even w/ some pencil interpenetrations slump

Bedding plane burrows

? Unconformity?

4. Pinestone congl. 30' w/ carbonate crinoid sands pebbles and composed of laminated (algal) sediments underlying conglomerate ? Unconformity!

5. 500' + laminated dolomite mudstone. Possible algal mats subtilized, foss. suggested with burrowed layers alternating w/ finger stone in lower part.

6. Thin bedded, dk grey, blk lms, laminated. Some even. f. gr. abrupt contact 50' with above. Grades up into thick bedded dolomite. Gradational

contact with above.



4166F - *Atrypa* - *Lingula*  
from section south of  
East Kelly Rv. Sect.

4165L - *Mitremorphus* ss

FIELD BOOK #2

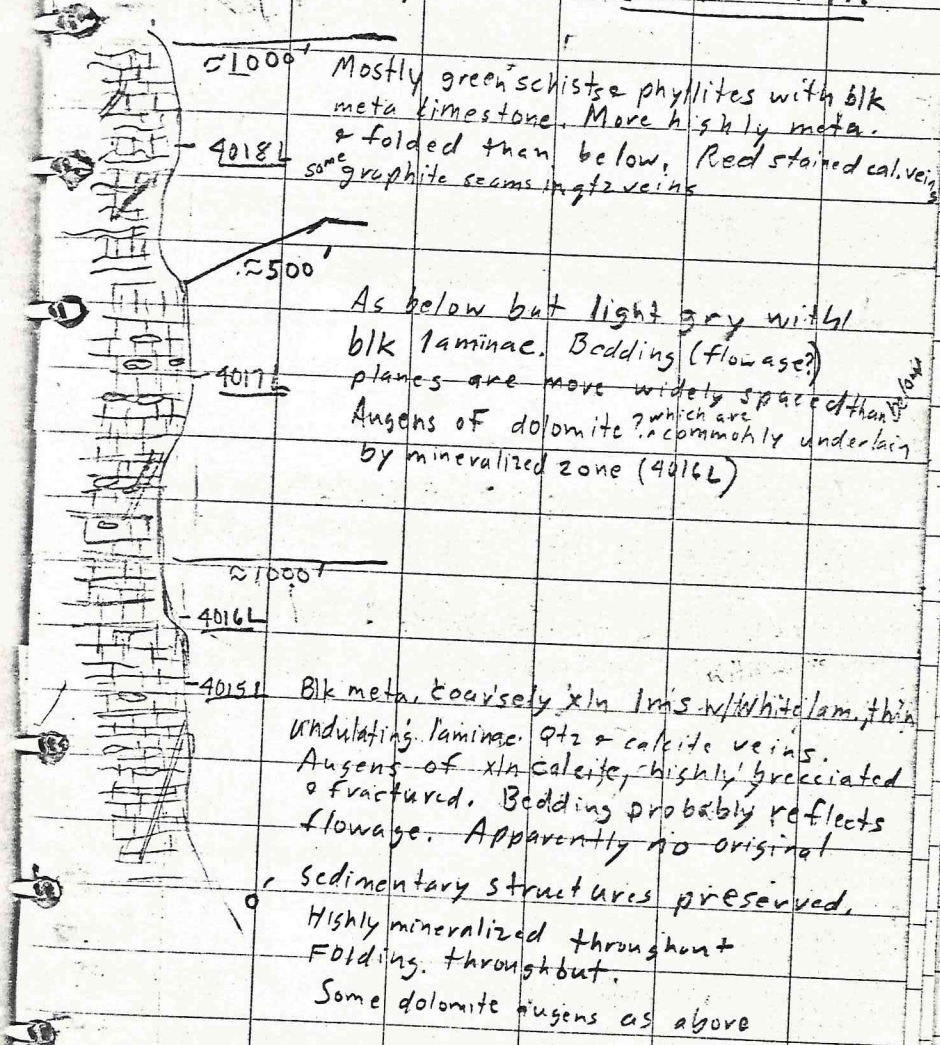
Sections: Monotis Creek  
Hanging Glacier Mtn.  
Mt. Bupto  
Cape Dyer  
Cape Thompson  
Nasorak Creek  
Imikrak Creek  
Upper West Fork Wulik River  
Lower West Fork Wulik River  
East Wulik River  
Lower East Kelly River  
Lower Eli River

4000 Numbered Grab Samples  
2000 Numbered Grab Samples

Field Book #2



June 9, 1970 Dalness & Abrahamson  
Overcast, cold Gunsite Mt.





June 11, 1970

Knapp, Abrahamson,  
Dalness

Spot Samples 2001-6

Peak SW of Ekokpuk Cr.  
John River confluence

Kayak- Lisburne sequence:

Lisburne consists of inter-  
bedded cherts & limy dolomite.

Chert very abundant - perhaps  
75-90% of unit. Dol.

consists of rhombs & is

porous. Dol. mostly

packstone or v. ext. w/ texture

destroyed. Grainstone in

Kayak <sup>shale</sup> sequence. Near

top of <sup>Lisburne</sup> section It has lenses

of mostly grainstone lack  
chert.



June 11, 1970 cont 4

2002 L Top Dolo, lt gry.  
w/ blk chert

2001 L 25-30' below 2002 "

2003 C 500' ± below 2001 Dol.  
grainstone

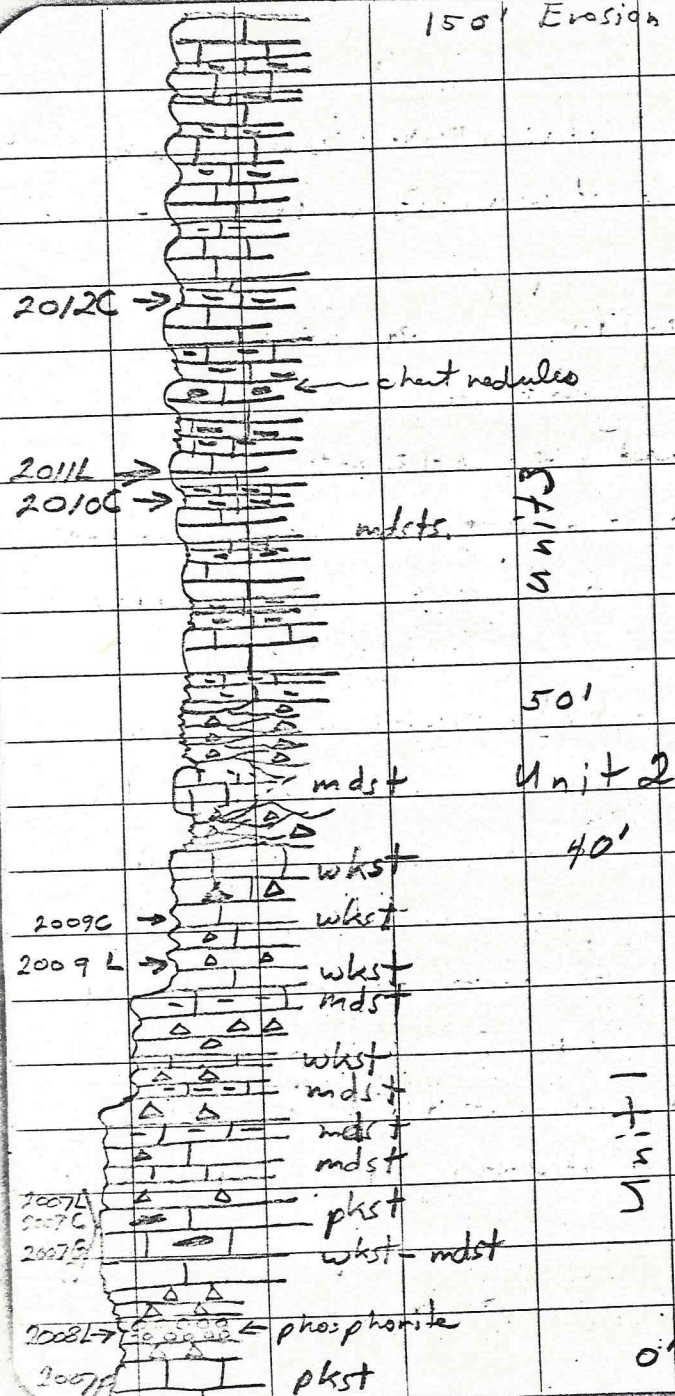
2004 C just below 2003 argil grainstone

2005 C 200' ± below 2004

2006 P & Gochon 200' ± below 2005 Kayak



150' Erosion Surface



June 12, 1970

Dalness + Abrahamson

Cool + overcast by thin fog

Monotis Creek Section ✓

Lisbarne?; Sikotysk?

Measured from base up section.

Unit 1: Interbedded limestone  
40' and chert beds; Lst. - dk gray  
fresh + yellowish gray weathered;  
Chert - black fresh + black weathered;  
Lst. consists of very minor 1-2' bed  
pksts and more common whsts and  
mdsts. pksts are composed of  
fossil remains of horn corals,  
crinoid columns and  
brachs, and many indeterminate  
grains. whsts - mdsts are thinly  
laminated to paper thin. No fossils  
were seen in the mdsts.

Bedding is dominantly planar, but  
(continued after phosphorite) 4



Phosphorites also occur in Unit 1 below the pkst beds. They are "oolitic" and appears to contain common faunal debris. Fluorite occurs in them along fractures. Faunal debris appears to be mostly brach shells.

some undulating bedding occurs in the pksts.

Entire Unit has a very fetid + phosphatic odor. Solid black bitumen was <sup>commonly</sup> seen along some fractures and vugs.

Chert beds have minor pinch + swell structures.

Sample 2008L is of the

described phosphorite.

2007L	is	of	the	described	pkst.
2007C	"	"	"	"	"
2007G	"	"	"	"	"
2007F	"	"	"	"	"

Chert beds range in thickness from 1" to 1'. Chert has replaced fine grained carbonate. Fossil remains are often found in the chert beds.

Argillaceous or chaly lst. (mst+s) are commonly burrowed parallel or nearly parallel to bdg planes.

Large gastropods were seen in one chert bed. They were  $\approx$  1" in diameter at largest cross-section.



Some wkst intervals were also highly bioturbated.

2009L - chert bed with large gastropods + other faunal remains.

2009C - wkst just above 2009L.

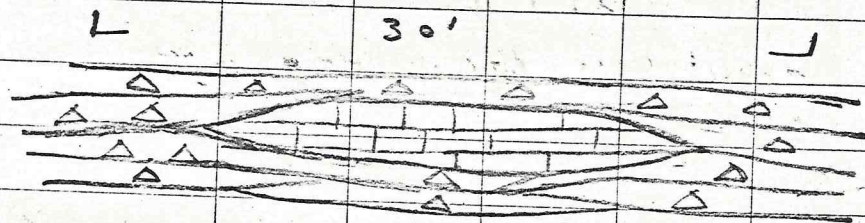
2009F - Grab bag of mega fossils.

Crinoid columns were seen in one chert near top of Unit 1.

Unit 2. 10'

Medium gray chert which weathers rusty colored. is lensoid in shape. beds from 1" to 1' thick. In

this unit a lense of Lst. (mdst) occurs which is dropped over by the gray chert. It is about 20' long and 3' thick at its max. extent.



Unit 3. 100'

Interbedded argillaceous Lst. (mdst) and massive <sup>medium</sup> gray Lst. (mdst) which weathers a whitish yellow. Argillaceous mdst is dark gray fresh and <sup>medium gray</sup> ~~blue~~ <sup>weathered</sup>; paper thin to thinly bedded. Massive mdst.



has bedding 1-2' thick.

Bedding is planar.

Has a slight fetid odor.

Some mdsts may actually be wksts. But fossils are very few. Fossil remains are crinoid columns, horn corals, and brachiopods.

Most massive mdst beds are burrowed vertical to bedding. These burrows were filled with FeS which weathers to a dark rusty color. Also present in these beds are isolated individual pyrite cubes.

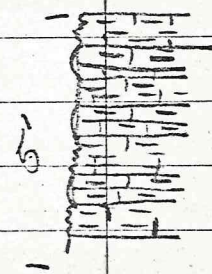
Burrows are approx. an  $\frac{1}{8}$ " in diameter.

2010C. Sample from argillaceous Lst.

2011L. sample from 1-2' thick bedded mdst.

minor 2" chert nodules in one bed.

Argillaceous mdst grades from fissile at the base to more thickly bedded ( $\approx 1'$ ). Then grades back to more fissile.



Unit 3 becomes less argillaceous up section.



2012C. Sample of argillaceous,  
dark gray, fissile mdst.

Upper 40' of Unit 3  
consists of dark <sup>and med. gray</sup> gray <sup>and med. gray</sup> mds.  
1-2' thick with thin interbeds  
of Bssile, dark gray, argillaceous  
mds. Both weather a yellowish  
buff color. Argillaceous beds up  
to 6" thick.


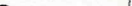

June 13, 1970

Abrahamson's Dalmess

V Hanging Glacier Mt. = Kayak - Lisburne



High Scattered clouds. Warmish

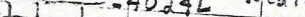
Note: There is lateral variation in bed thicknesses throughout section. Some beds are lenses. Fetid odor (next page) throughout


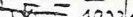
100'  Lime grainstone, dk grey. weath. lt grey. lense  
95'  Lime  argill. congl. lense


90' 10' 20' 30' 40' 50' 60' 70' 80' 90' 100' 110' 120' 130' 140' 150' 160' 170' 180' 190' 200' 210' 220' 230' 240' 250' 260' 270' 280' 290' 300' 310' 320' 330' 340' 350' 360' 370' 380' 390' 400' 410' 420' 430' 440' 450' 460' 470' 480' 490' 500' 510' 520' 530' 540' 550' 560' 570' 580' 590' 600' 610' 620' 630' 640' 650' 660' 670' 680' 690' 700' 710' 720' 730' 740' 750' 760' 770' 780' 790' 800' 810' 820' 830' 840' 850' 860' 870' 880' 890' 900' 910' 920' 930' 940' 950' 960' 970' 980' 990' 1000'

Time Wackeston, m. gry w. lt gry th. lam und. w/ 20% chert nod. (blk) ll bedding

85'  Grainstone as below undulating 4"-2' th.  
75'  Covered (poss limestone & shales)



15  possible silicified  
2' massive unit.  
4024L  
Lime crinoidal grainstone, beds 1'-6'  
Weathers lt. gray

55'  1023 c Int. dk gry - m. gry shale <sup>a fissile, carbon.</sup> pack.  
1024 w/ chert nod. Rugose corals, argill. dol. wackestone  
45'  1025

45.  Lime wackestone, dk gry, w. <sup>base corals</sup>  
bedded, und. beds 1-3" <sup>brachs, spinol</sup> 6" - 1 1/4". undulating  
lt. gry & Blk chert.

40 Dolomite & lime packstone - grainstone; coarse  
- 4021L col. bryozoa, unident. grains. Ok gry, weath  
30 lt. gry, 1-2" thick beds; well indurated

Shale & Slightly dolomitic  
Lms, as below, w/ chert nod elongate ||  
bed. Slightly

15'  bed. Slightly melted? Non elongate 11  
beds. Intr. shale 11-6" undulating  
5'  covered (mostly shale)

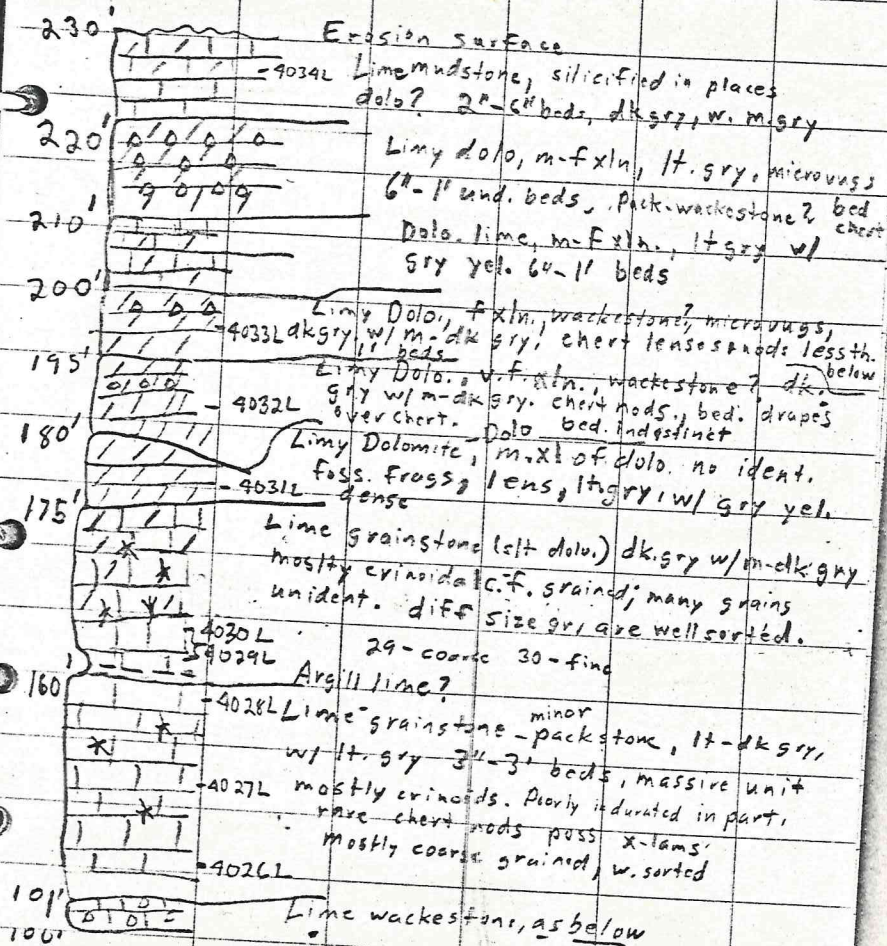
Shale, bl. st. meta. w/ int. line  
weakened

not measured  
wackestone, mid. dk. gray, weath. yellowish brown. State is fissile, this is undulating 4" to 6" thick. calc. st. veins, faulted.



June 13, 1970

Abrahamson - Dalness (cont)





July 1970 Traverse

No 2033

2034 G west side of valley north of  
Fenjak Lk. - igneous sills? 3 types

distinguished by color from

air. Reddish yel brn

light gry

drk gry to blk

2035 L - hill  
west of Iphavik River

& south of Memorial Creek.

Utukok? ss

2036 L (float)

2037 P, F, L

2038 L

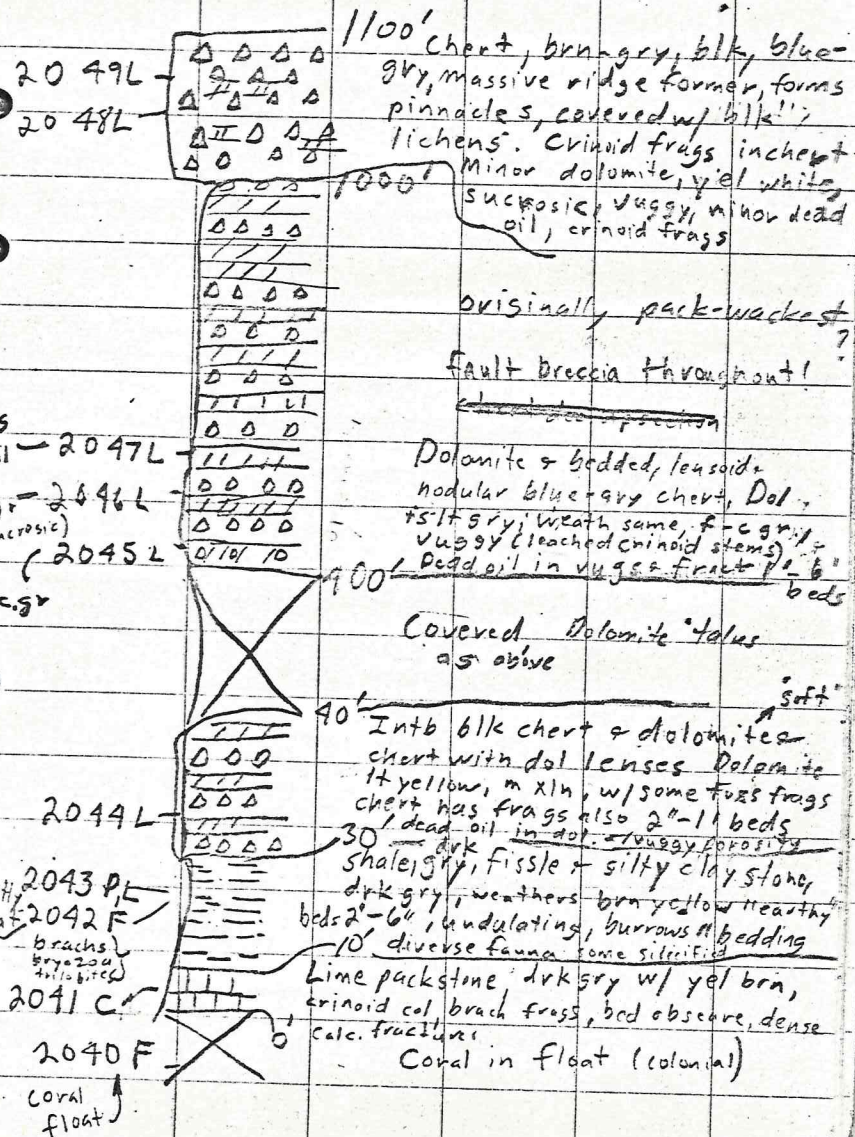
2039 L (2)

{ Mt. Bupto grab  
samples (see Armstrong's  
Figure 9 in file for  
location of samples in section)



3 July 1970 Mt Bupto  
Abrahamson, Dalness, Mikesch

Warm & clear





3 July 1970 cont

2050 L <sup>(1)</sup> chert, <sup>(2)</sup> lms

2050 P shale

Rim Butte "tow of slope" into  
chert & lime mudstn & min. blk shale.

Grab samples of each



5 July Traverse Dalness

2051 F Lisburne lime pksth }  
2052 L Utukok Ss }

5 miles north Seagull -

Nimiuktuk confluence  
spotty out crops of both units

2053 L Shale & Ss Hunt. Flk - Noatak

2054 G Igneous Sill. Hunt. Flk

Headwaters Seagull Creek

Sills intrude Shale - Ss = section complex

6 miles East of Bastille

Base of mt is evenly bedded

gryish green <sup>red</sup> chert with shale

partings between beds (beds 2" - 1'

thick). Looks like base of Bastille.

Sample: 2055 P & L

overlain by: 2056 L

Dolomite, lt-m <sup>bluish</sup> gry, v-f-g, dead oil in frags, no obscure bedding

with lt gry - yel gry. beds not cont laterally -

included by? or covered by? overlying sills



also! 2057L

Dolomite as above with scattered,  
angular, poorly sorted qtz grains.

overlain by igneous sill? 2058L

---

2059L

Utukok? =  
Noatak? Ss = divide  
at headwaters of Seagull Cr.

---

2060G

Igneous Rock on  
Hogback Mt SW of Puntik Mt.  
which includes Skagit inclusions

---

2061G

Light colored igneous  
rock in vicinity of Mishegak Mt

---

2062L, P

Ss, m-g, greenish gray  
qtz, ang blk chert, glauconite?, pyrite.  
± Claystone, m gray. Hunt Fork  
headwaters Imikheyak Cr.



July 13, 1970

Cape Dyer Section



1.

253'  
 240' med gray, dense lime mdt, carbonaceous  
 235'  
 dk gray claystone as below  
 195'  
 disturbed - poss. fault  
 170'  
 160'  
 135' dk gray, dense, claystone.  
 130'  
 interbedded claystone + shale. claystone  
 slightly calcareous  
 93' claystone as below but more calcareous.  
 90'  
 75' dk gray carbonaceous claystone  
 med. bedded claystone  
 claystone with beds up to 4' thick  
 common pyrite blebs; slightly calcareous  
 lower beds are up to 2' thick  
 30' dk gray, argillaceous calcic mdt  
 45' slightly calc. med gray claystone w/ pyrite  
 41' dk gray claystone w/ pyrite (fully disseminated)  
 18' black carbonaceous soft shale  
 15' calcareous dark gray claystone  
 7' black carbonaceous shale + claystone  
 5' lime mdt, f-dk gray w. dk. gray  
 3' black, carbonaceous claystone + shale

2.

July 13, 1970

# Cape Dyer Section Dalness + Abrahamson

Windy + partly cloudy.

Start section at first  
 outcrop north of Angalik  
 Creek. Section is  
 measured up stratigraphically  
 from South to North along  
 beach.



3.

Amended strat. & struc. displacement  
Highly disturbed bedg. above.  
4064P 330'  
thin bedded dk gray claystone + interbedded  
black carbonaceous shale. slightly  
calcareous  
280'  
4065P 265' black v. carbonaceous shale. sooty soft  
260'  
Interbedded by carbonaceous black  
shale + med gray to dk gray fine medst  
255'

4.

270'  
sand with silty struc. a basal sandstone common  
by thin interbedded black carb. shale  
245' 3" interval of coal  
sands as below - mainly quartz; well  
dev. oscillation ripple. Sed. struc.  
215' basal sands  
covered  
4071L 195' med. gr. quartzose sand. weardich brown  
f. med. gr. well sorted. minor mica  
1-2' thick beds with interbedded silt +  
silty shale  
170' sand as below but less lensoid + not  
x-lam, is planar bedded  
Some loose sandstone concretions (upholster)  
in silty shale.  
4070L 130' f. med. gr. sand + silt + silty shale as below  
ad by plant frags - some silty  
shale no. of Gracilioriparis  
100' sand as below + silty shale as below  
90'  
covered  
4069P 70' by f. med. gr. sand + silt + plant frags - large stone  
med. to dark gray, indistinct bedg.  
4068L 60' thin lensoid bed sand + interbedded  
silt + silty shale as below but by  
common mica flakes (muscovite?)  
covered minor plant burrows in sand  
40' plant frags. in spl 4068L.  
4067P 20'  
Sandstone interbedded with silt +  
silty shale. Sr. Humidity fresh, weathers  
8' reddish gray med. grained med. med.  
4066P 5' sorted. g. to grs + unknown black mineral, sec  
4065L 0' a each. current x-lam, sec med. silt  
as oscillation ripples, large common plant  
frags in float. Fair porosity. See 4067P 17'  
Sand lensoid  
in shape



5.

2301

Sand as below with thin interbeds of shale. A bed of lat. frags in sand

7001

Interbedded sande, siltst			
silty shales			

Same as just below

530

shale + silty shale with a lot  
plant frags. dk gray

451

mainly s./m sand as below. minor  
shale in beds.

301

4074P 3481

40756 340' col. 18" thick, pebbles pea size to 1 1/2"  
pebbles are silty tan + wh. v. fine gr. + z.  
common plant frags also. matrix med.  
co. gr. quartz + mica sand. med. well sorted  
bed is homogeneous. pebbles over and over  
and are rounded.

3201 ~~the stems in sand~~

cos / 2011

4521-3151

290

6.

1100'

3 inches with minor shale partings  
at 1000-1025'

10471

1045 11 + 5 shale + silt

1025

1/2" hole for interlocking interference  
w/riped ends

sand med. gr. to grayish orange, med. gr.  
x-l on, sec. & fill, well sorted

1000'

interbedded sand & silt; sand as below

Page 1

933

40798	138'	139'	140'	141'	142'	143'	144'	145'	146'	147'	148'	149'	150'	151'	152'	153'	154'	155'	156'	157'	158'	159'	160'	161'	162'	163'	164'	165'	166'	167'	168'	169'	170'	171'	172'	173'	174'	175'	176'	177'	178'	179'	180'	181'	182'	183'	184'	185'	186'	187'	188'	189'	190'	191'	192'	193'	194'	195'	196'	197'	198'	199'	200'	201'	202'	203'	204'	205'	206'	207'	208'	209'	210'	211'	212'	213'	214'	215'	216'	217'	218'	219'	220'	221'	222'	223'	224'	225'	226'	227'	228'	229'	230'	231'	232'	233'	234'	235'	236'	237'	238'	239'	240'	241'	242'	243'	244'	245'	246'	247'	248'	249'	250'	251'	252'	253'	254'	255'	256'	257'	258'	259'	260'	261'	262'	263'	264'	265'	266'	267'	268'	269'	270'	271'	272'	273'	274'	275'	276'	277'	278'	279'	280'	281'	282'	283'	284'	285'	286'	287'	288'	289'	290'	291'	292'	293'	294'	295'	296'	297'	298'	299'	300'	301'	302'	303'	304'	305'	306'	307'	308'	309'	310'	311'	312'	313'	314'	315'	316'	317'	318'	319'	320'	321'	322'	323'	324'	325'	326'	327'	328'	329'	330'	331'	332'	333'	334'	335'	336'	337'	338'	339'	340'	341'	342'	343'	344'	345'	346'	347'	348'	349'	350'	351'	352'	353'	354'	355'	356'	357'	358'	359'	360'	361'	362'	363'	364'	365'	366'	367'	368'	369'	370'	371'	372'	373'	374'	375'	376'	377'	378'	379'	380'	381'	382'	383'	384'	385'	386'	387'	388'	389'	390'	391'	392'	393'	394'	395'	396'	397'	398'	399'	400'	401'	402'	403'	404'	405'	406'	407'	408'	409'	410'	411'	412'	413'	414'	415'	416'	417'	418'	419'	420'	421'	422'	423'	424'	425'	426'	427'	428'	429'	430'	431'	432'	433'	434'	435'	436'	437'	438'	439'	440'	441'	442'	443'	444'	445'	446'	447'	448'	449'	450'	451'	452'	453'	454'	455'	456'	457'	458'	459'	460'	461'	462'	463'	464'	465'	466'	467'	468'	469'	470'	471'	472'	473'	474'	475'	476'	477'	478'	479'	480'	481'	482'	483'	484'	485'	486'	487'	488'	489'	490'	491'	492'	493'	494'	495'	496'	497'	498'	499'	500'	501'	502'	503'	504'	505'	506'	507'	508'	509'	510'	511'	512'	513'	514'	515'	516'	517'	518'	519'	520'	521'	522'	523'	524'	525'	526'	527'	528'	529'	530'	531'	532'	533'	534'	535'	536'	537'	538'	539'	540'	541'	542'	543'	544'	545'	546'	547'	548'	549'	550'	551'	552'	553'	554'	555'	556'	557'	558'	559'	560'	561'	562'	563'	564'	565'	566'	567'	568'	569'	570'	571'	572'	573'	574'	575'	576'	577'	578'	579'	580'	581'	582'	583'	584'	585'	586'	587'	588'	589'	590'
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930

4078L 915 into (rocky canyon, gray - 10' - 15', 5 Count  
 815 fill; oscillation, ripples; den. quartz, mud  
 sand with abt large plant frags.

५५

24)

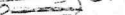
850  
90772 Sandstone, very fine grained & highly carbonaceous,  
abdt plant frags

interbedded coals, silts, silty shales  
and plant fragments

825'

Sand as below w/ minor silt & silty shale  
interbeds

823

40750  Interbedded sandy silt/shales + minor thin coal seams

50

Schannel

730

101

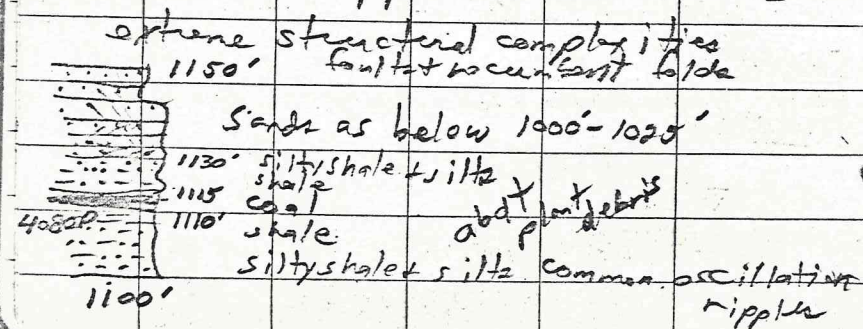


7.

Recon samples

4081 P+G Shublik shale at  
4081 L Noyalik Pk.

Stopped Section Here



1. Cape Thompson July 14, 1970

Dalness &amp; Abrahamson ✓

Clear &amp; warm - nice day

Traverse northward along beach in unnamed Miss. south of Cape

- Section structurally complex & could not be measured accurately.

up section? Base of section Unnamed Miss unit

↓ 4082 P/G Blk shale intb with blk argillaceous lime

4083 C Argil lime wackestone, drk gry, weath drk gry to yel-orange gry. mostly colloid col. few rugose corals & brachs

4084 P & F Brn. silty shale with scattered rugose corals. Plant stems. Calcareous

4085 L ss, quartzose, v.f. gr., slightly metamorphosed. mostly g + z. m. gry, weath. drk yel orange



2. intb with blk shales, w/ corals

4086 C, F, L Lime wackestone, drk gry,  
yel. orange in beds & nodules  
intb w/ blk shale; crinoid frags,  
brachiopods. Some coally frags  
in lms. Shale

4087 P Shale; blk

no sample - noted burrows in blk shale

4088 P - Shale, blk silty intb with  
sand lenses

4089 L - ss, quartzose, md gry, weath

overthrust  
fault

yel. orange, f.v.g., some

blk grains, silt. meta

overth.  
fault

4090 P, F, L Lime <sup>wacke-</sup> packstone, m. dk. gry,

whit. gry, silt. rexlized, brachi;

corals, crinoid stems, In

lenses & beds; intb with

blk, silt. calc. claystone

4091 C, F Lime wacke-packstone, m. dk. gry,  
wh. m. gry.

intb calc blk shale. Silt & calc. corals,

brachs, crinoid frags in lms 20



3.

4092 F Lms as above w/ corals<sup>rugose</sup>  
and intb chert<sup>shale</sup> Lms is  
siliceous

4093 P, G Shale as above

— structurally complex —

4094 F, P Silty shale with lms nodules  
some nod. pyritized. Well  
preserved brachs, few pelecypods,  
many crinoid stems; brachs  
in nodules

base of Lower Nasora k

next page →



4.

Cape Thompson, cont  
 Start section north of unnamed creek  
 north of thrust - in Lower Nasarak  
 unit.

4104PFF

160'

- see next page -

4103FC

145'

lenses of abnt brachs

in shale

lenses

4102P

130'

(shale is silty - lms nod, brachs

lime pack-wackestone, argill,  
 m-dk gry, with lt gry, crinoid  
 frags 1/2 beds up to 1' thick

4101P

115'

Intb shale, blk, calc.

4100L

95'

Shale has nodules &amp; lenses of lms in up

lime packstone, mostly crinoidal

intb. blk chert some w/ crinoid

lms beds up 1' chert beds up to

1 1/2' thick; each former unit

(2) 4099L

65'

up to 10' thick; units are intb.

4098C

60'

blk chert nodules &amp; lenses

4097C

40'

Intb. lms, ab. g. argill, silc, calc

which is downward into shale

below. undulating bedding, lenses

nodules. Scattered corals in both liths

4096L

20'

Intb Shales, a.b. and lms, wkst

m-dk gry, argill., crinoidal mostly

with. yel gry. lms

4095C

10'

Sh. fissile; lms → 2' thick

beds &amp; lenses

Silty shale, calc, drk. gry, with

brn gry, lms wackestone

nodules up to 2' di

4094F,P

0'

Some w/ brachs, crinoid stems, some

sol. corals in pyrite conc. throughout

one pelec.

Nodules, m drk gry, with. lt gry



5 Cape Thompson → Cp Thompson mem - Upper Member

No. along beach No. of Cape Thompson

4106 C

Cape Thompson Lms. ~~1/2~~  
just below contact  
contact, sedimentary?

4107 C, P

Drk gry lime mud-wacke stone  
+ interbedded sooty shales  
chert. planar bedding, chert  
lenses & beds

4108 G, F, P

Silty shale, v. much like  
lower unit in lower Nasarak  
intb w/ dense lms a.a.

4109 P, C

a.a.

? ↓ 4110 C

Lime pack-wkst, lt gry &  
intb like shales

4107 C, P

4105

Unknown  
fossils

end of section  
beach

4105 L, C

185'

177'

Lime pack-grain stone, m. gry.  
with yel orange-lt gry.  
beds up to 3', massive  
appearing, crinoid stems, sol.  
corals & intb, nod, & lensoid  
m. gry chert undulating  
bedding. Fetid odor

Nasarak-Cp Thompson

Nasarak L Member

interfingering of liths



July 15, 1970 1.

Dalness + Abrahamson

✓ Nasorak Creek Section

Cloudy, showers

Start North of Nasorak Creek

Measure up section from  
south to north along beach.

41154 185'

41170 175'

41180 150'

spl. from lt gray photogr. has  
colonial corals within the beds.  
med. grad

41170 125'

spl. from lt. gray phot. sand

41170 120'

crs. grained, large mud content,  
lies on top of coral (colonial)

41165 110'

sample of litters + corals? forming  
bivalve / bddg - continuous 11/2

41150 100'

sample from pkst

41140 75'

sample from siliceous wkst

41130 35'

colonial corals only at base  
same argillaceous lime interbeds

41130 30'

same lime as highly siliceous

41120 30'

Coral heads parallel to bedding + gy in  
color. Almost black + gray.  
Colonial corals + abd. only

41110 30'

limestone, packstoned, wackestones.

41110 30'

med dk gray - f, wdk gray, black nodules  
lenticular, about 1" thick, highly  
undulating, fossils include corals, brachiopods, etc.



370	400'	
355'	4130C	phst + w/ colonial corals
385'	4130F	une. grained phst; sand deposit.
365'		
355'		
350'		
360'	4129C	Gast; banded, well sorted + sorted; unidentifiable frags.
300'		
330'	4128C	wkst (very fine grained) w/ nodular lenticles bedded chert w/ gray unulating beds tabularish thin beds up to 6" thick
275'		
305'		
255'	4127L	Gst
285'		
255'	4126L	wkst w/ nodular lenticles bedded chert w/ gray unulating beds tabularish thin beds up to 6" thick
235'	4125C	Gst; w/ gray unulating beds tabularish thin beds up to 6" thick
225'	4124C	Gst; w/ gray unulating beds tabularish thin beds up to 6" thick
215'	4124C	Gst; w/ gray unulating beds tabularish thin beds up to 6" thick
205'	4123F	colonial coral + phst-gst
195'	4122F	colonial horn corals + phst
185'		

370	400'	
650'	4137C	Brk phst-wkst with colonial coral biostromes. Chert med gy to mostly black. minor crinoid frags.
680'		
665'	4136L	minor colonial corals, rare ech. nodular + tabular black chert
635'		
645'		
615'		
600'	4135C	med. grained, med. gy. phst? siliceous
630'		
605'		
575'		
565'	4134C	beds becoming thinner + lith new mainly phst-wkst w/ small med gy
595'		
		As below but phst-gst It to med gy.
515'		
545'		As below phst-gst, chert
495'		
465'	4133C	phst-gst w/ nodular + lenticles It gy to black chert. sim. to 4131C
455'	4132C	phst-gst; sim. to 4131C
455'		
390'	4131C	Gst? w/ It gray-f, med gy, beds up to 3' thick. chert It gy to black
420'		
370	400'	



880' 910'

875' 4146L Bry wkst - <sup>rust</sup> / vy irr. black  
 870' 4146L chert nodules. line is brownish  
 865' 4146L gray. Irr. bedded. Beds 2-4"  
 4145C at 865' Gsst; highly x-lon

815 846' 4144L

beds 6"-3', slightly undulating; x-lon  
 800' Gsst; color as below; fossil trace  
 785' from from underlying beds; still  
 805' chert nodules from und. lith.

Chert sp. - dolomite  
 Dolomitized, bry wkst - phst + gsst?  
 4143L only x-lon. It gy. - c. w. it. yellow  
 795' white bedded g. + bry phst-wkst  
 4142C

780' Breccia composed of 1"-black  
 4141L chert + mostly bry phst-wkst.  
 Blocks up to 3' x 1' - probably tectonic  
 775' 765' 4140L

Gsst; 1"-med gy, med. cr. green  
 760' crinoid debris  
 massive

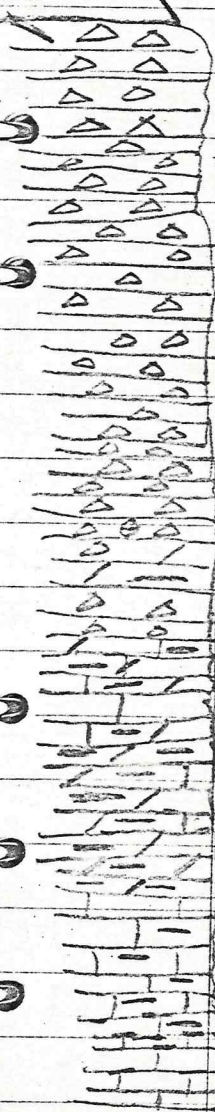
715' 745'

bry phst-wkst

715' beds 1-4' slightly undulating  
 680' Gsst; med gy, cr. green.  
 4139L sub-bedded frags.  
 705' As 4137C unident. grs.

4138L Breccia - possible sed.  
 breccia, but probably  
 tectonic.  
 650' 685'  
 680'

large fault, but chert silicified all lith. below  
 chert w/ abducting & topped  
 section.



1200' 1230' chert as below

1150' 1085' 4151L chert

1075' 1105' 4150L chert

chert as below  
 chert silicified all liths.

black chert

1025' chert hor. dep. top lines as below  
 graded bry phst-wkst. blocks to  
 1" gray.

980' 955' 4149C Gsst; cr. green

dolomitic bry wkst - phst w/  
 black chert nodules + lenses

960' dolomite (vy. ly. x-lon) phst-wkst.  
 4148L med gy. Bry + common horn  
 corals. Intentional nodular black  
 chert.

Silly, rusty weathering, partly chert  
 4147L the lime beds. (to be X-rayed)  
 930' Gsst. beds interbedded with bry  
 910' phst-wkst as below

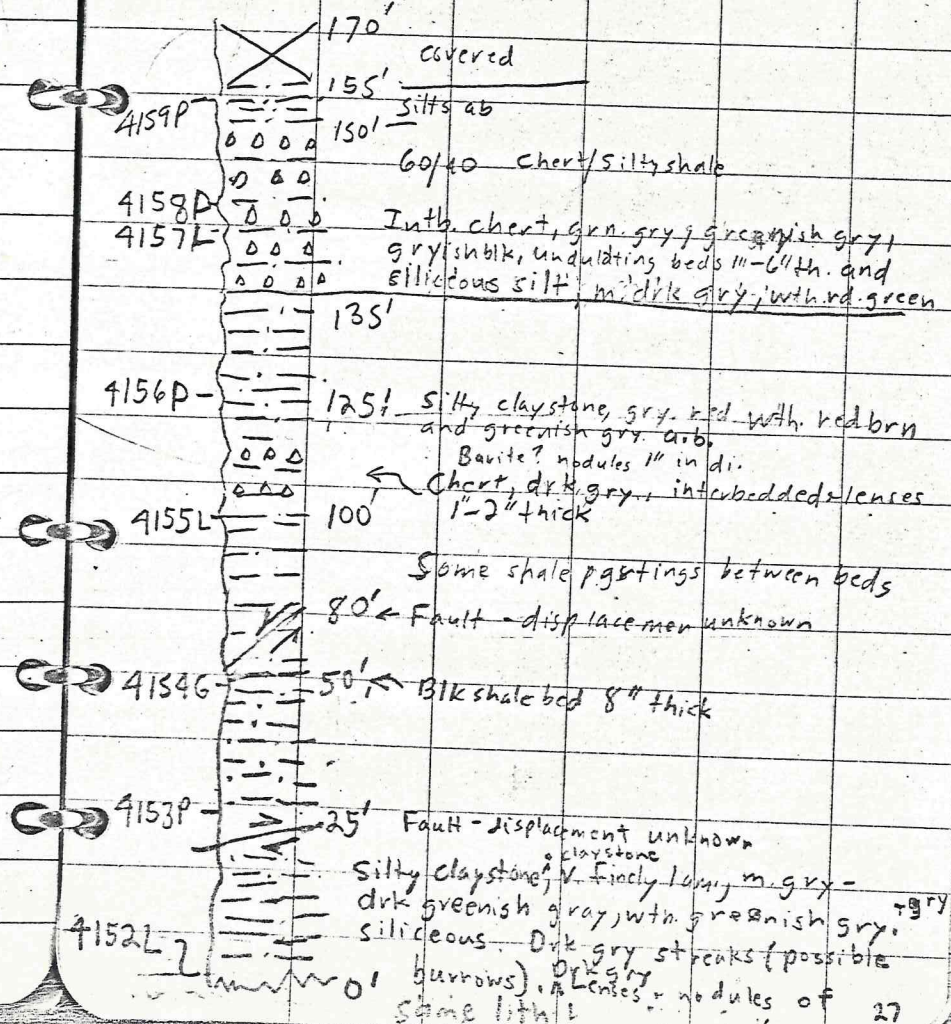


1. 17 July 1976

✓ Imikrak Creek Abrahamson  
Dalness

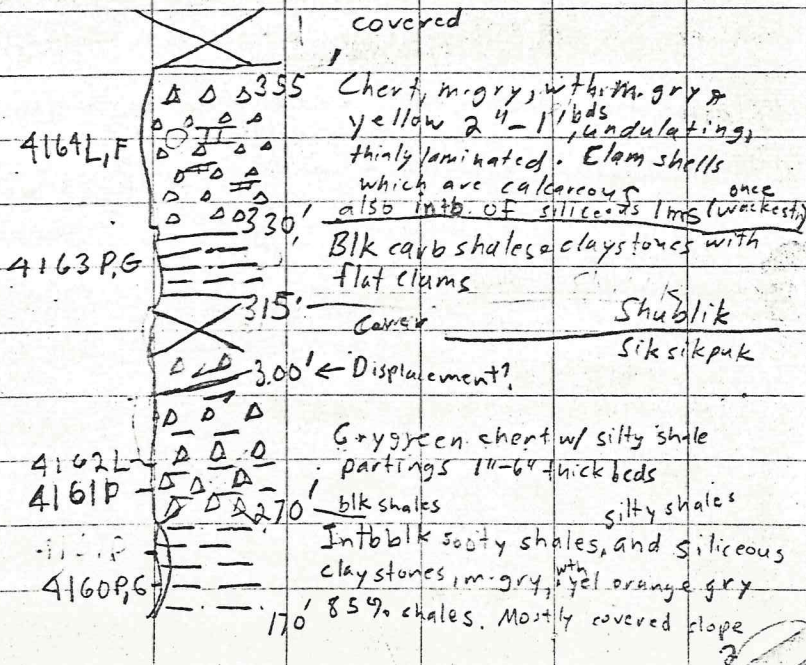
Cool & Windy - High waves

Start section north of Imikrak Creek - measured  
north along beach.





2. 17 July cont  
Imikrak Creek

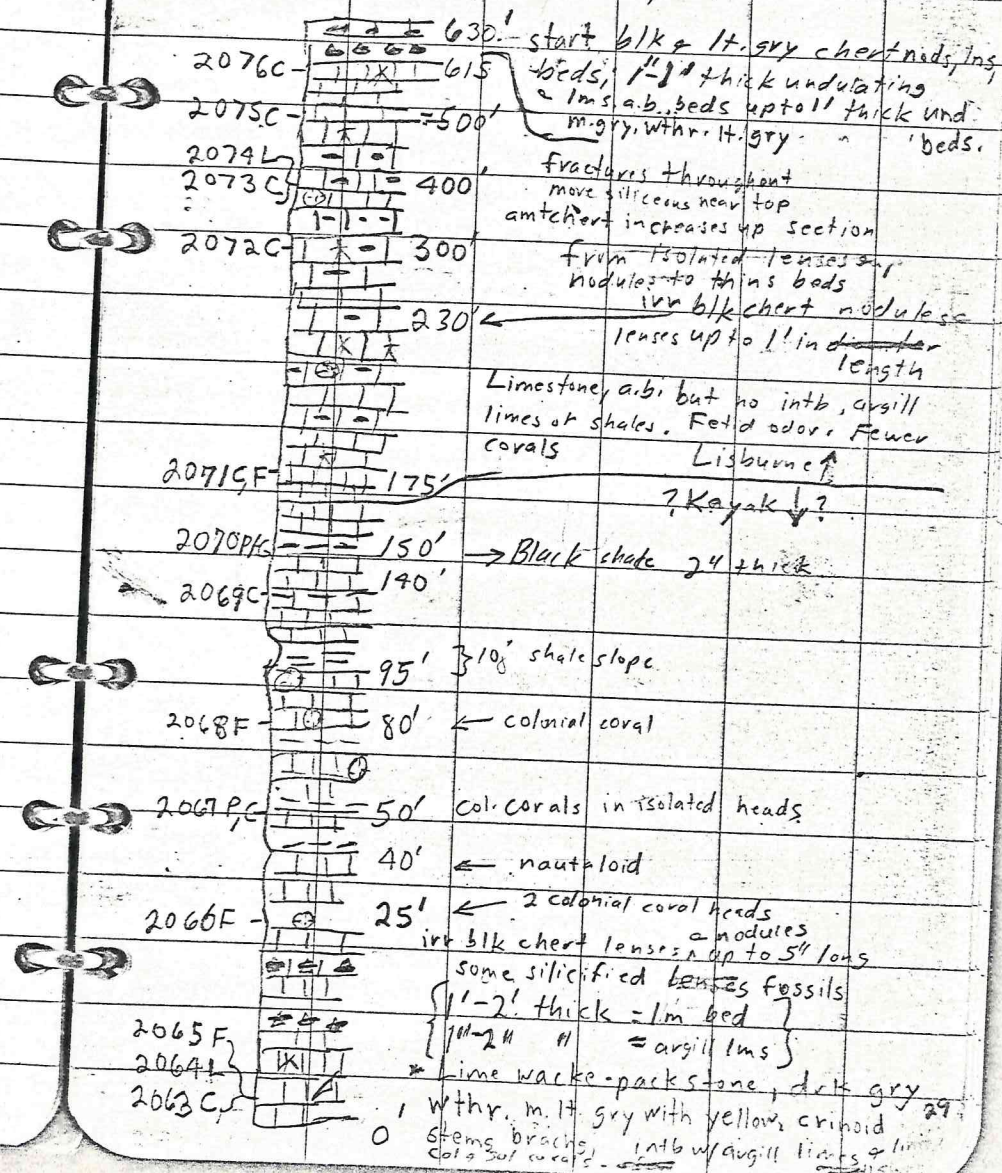




20 July 1970 (1)

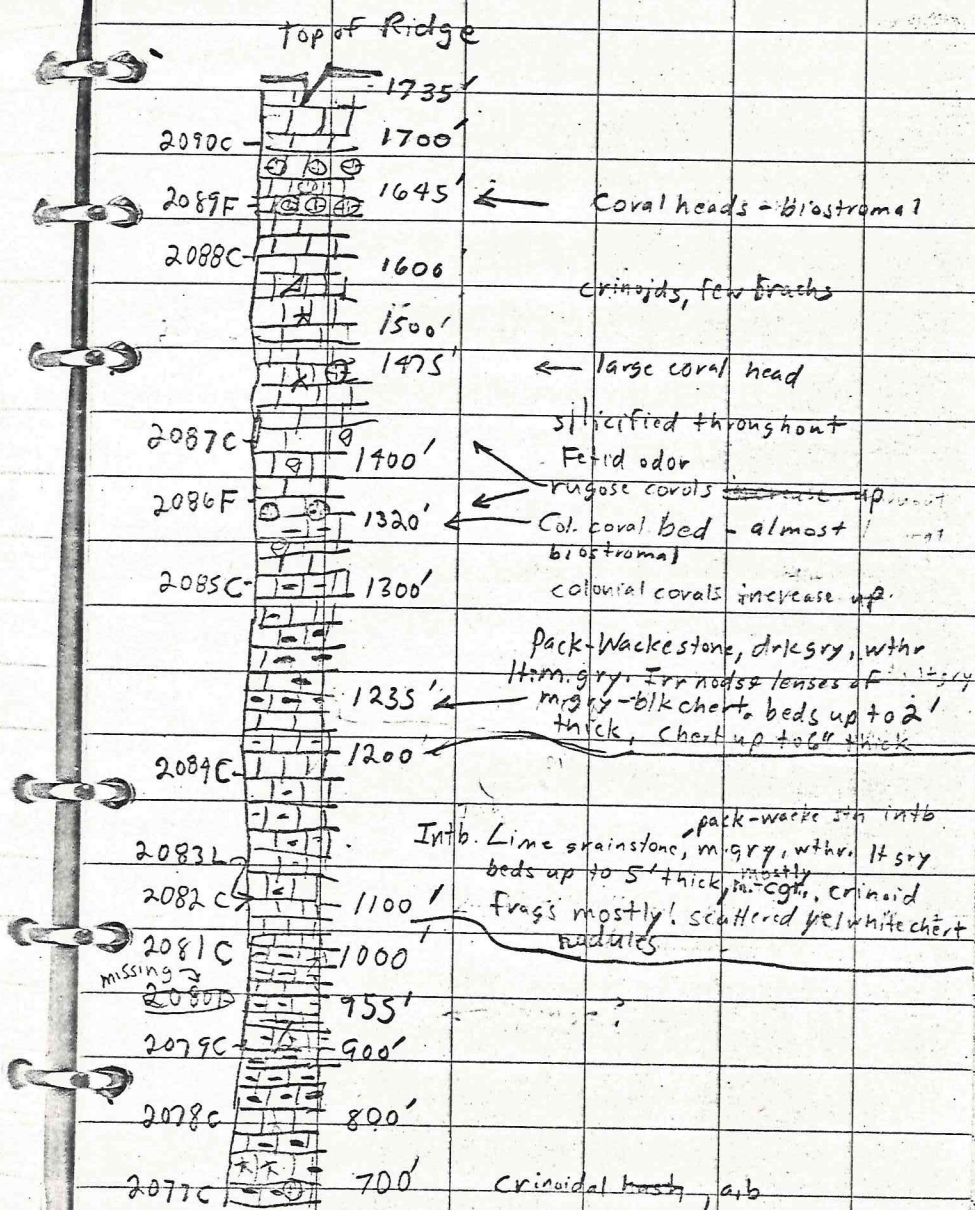
U. West Fork Wadika Section; Clear - sunny ✓

Abrahamson, Dalness, Rossiter





(2)





(3) 2 July 1970

Abrahamson + Dalness

Lisburne - Siksikput

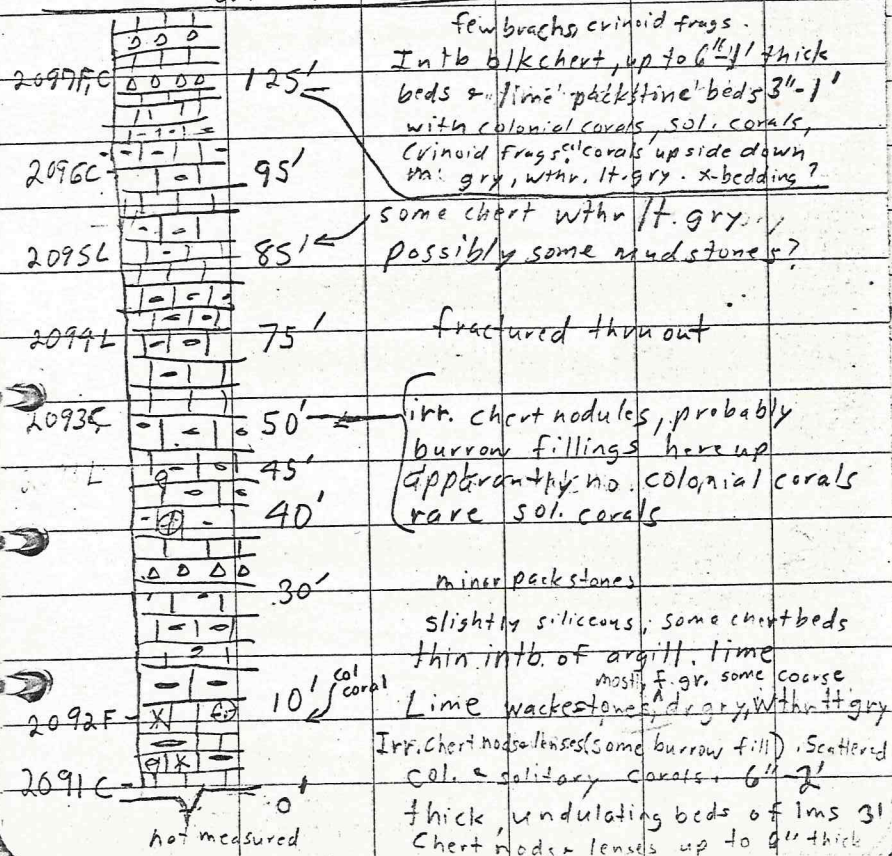
Lower W. Fork. Wulik Section

clear & warm

Strike/Dip of Lisburne unit is:

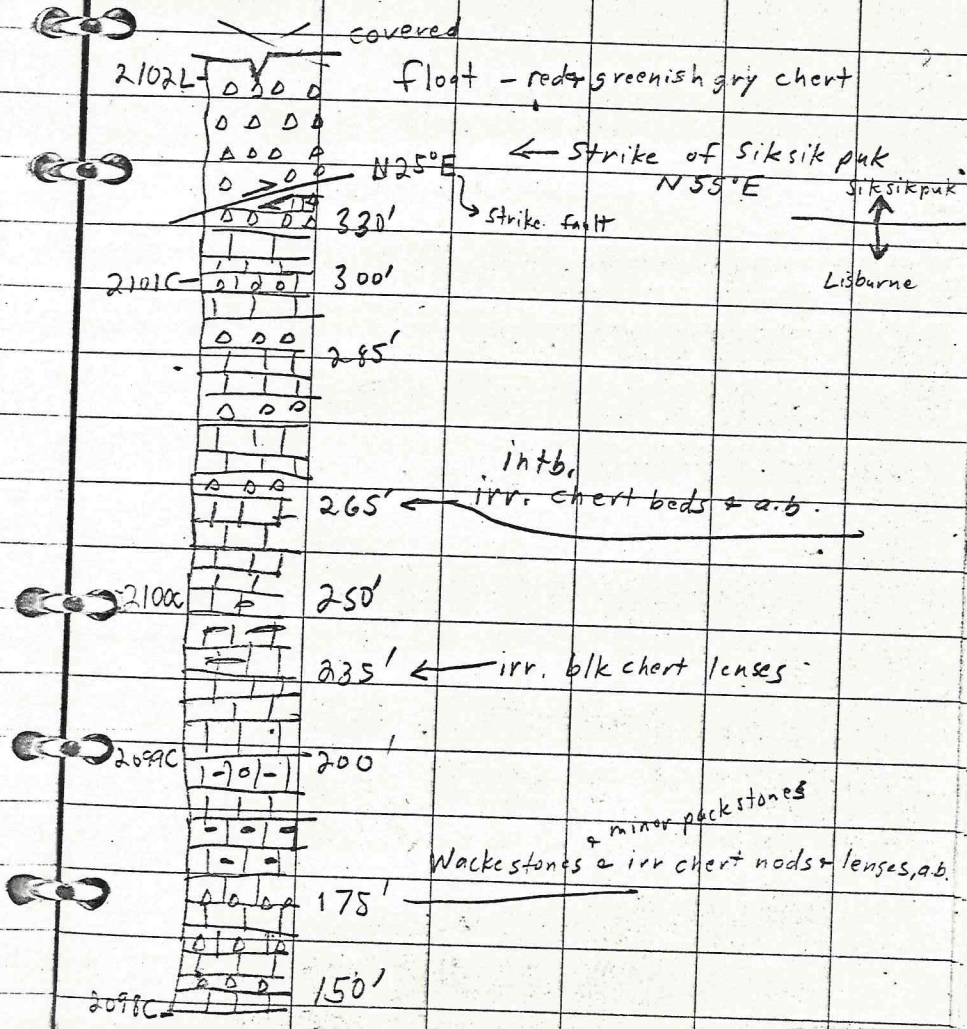
N80W - N80E

27° - 28° S





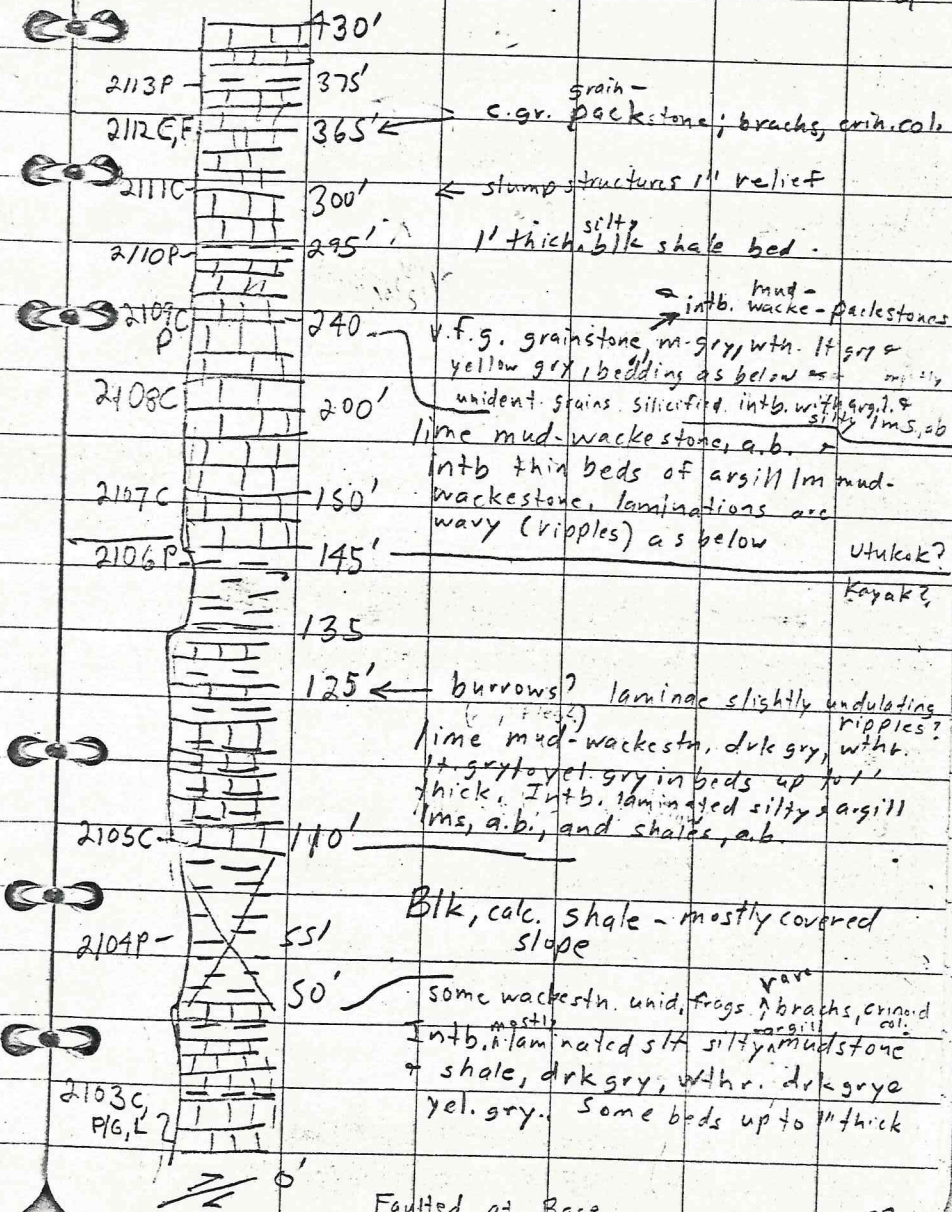
(4)





(5) 21 July Cont.

✓ Kayak? Utukok? E. Wulik R. Section





(6) 21 July cont

2116 P - Siksikpak in Valley of  
Upper Wulik River

TOP OF RIDGE  
2115C 520' ← bed plane burrows

folded fret lost? Intb m-wk stng argill  
470' lms., a.b.

2114C 450' Thinner bedded & x-laminated  
in part



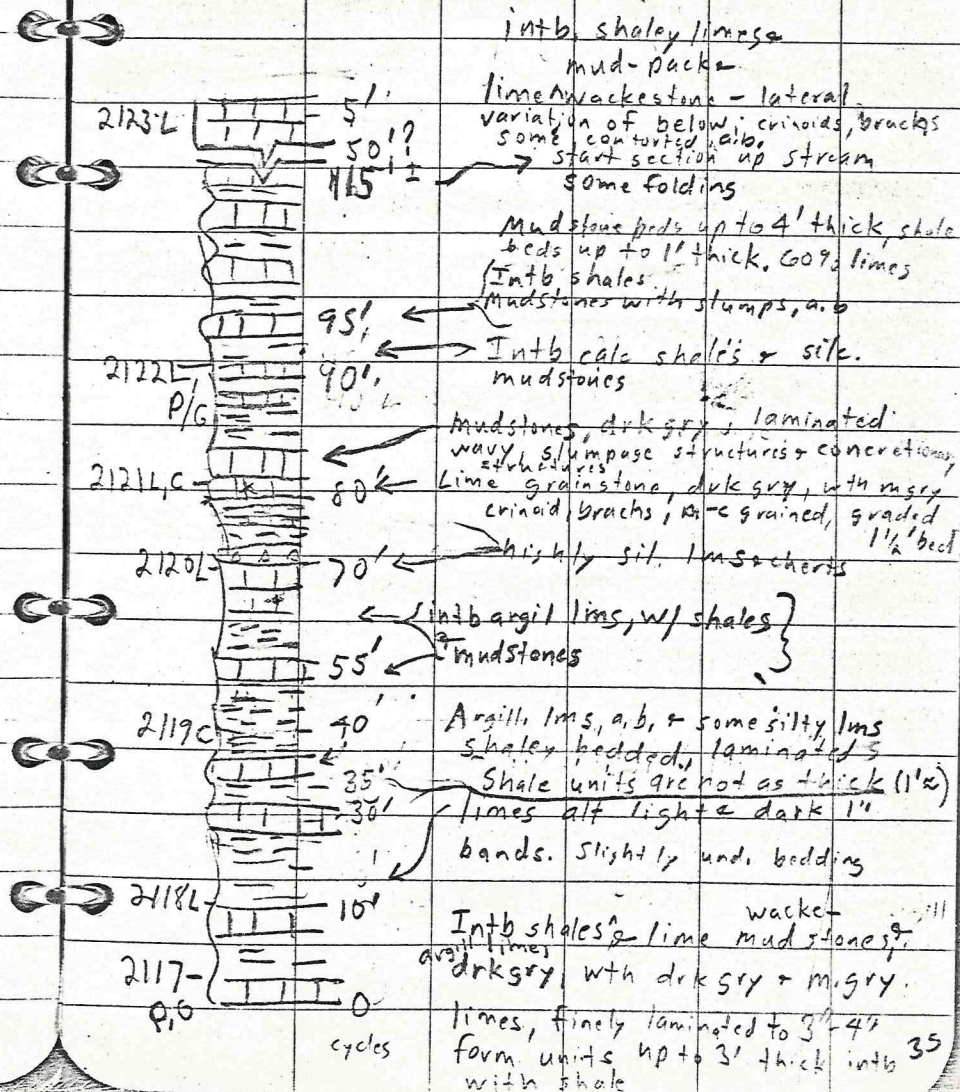
24 July 1970

Knapp, Abrahamson, Dalness

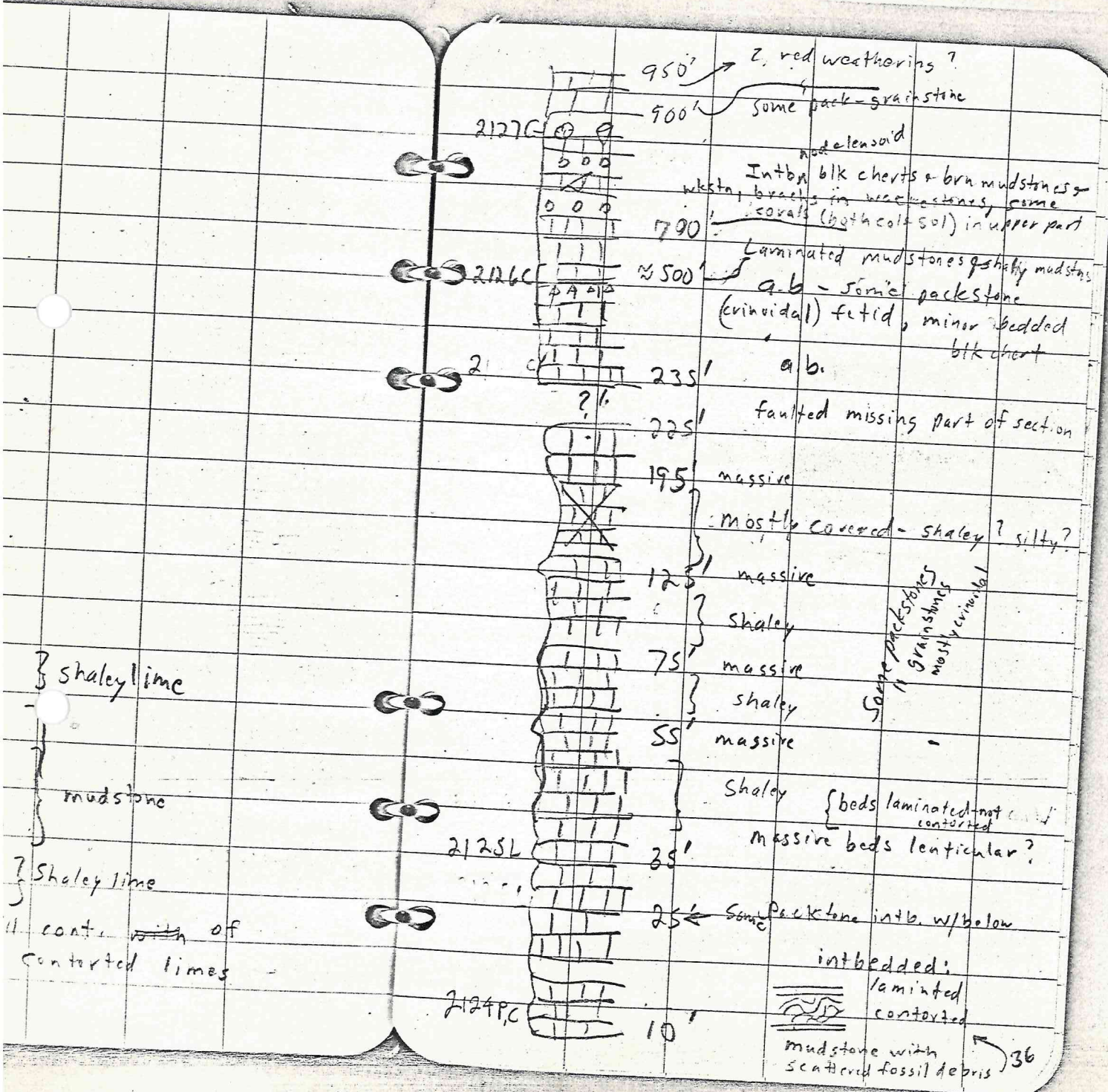
Kayak

Section

clear, warmish Lower EAST  
Kelley







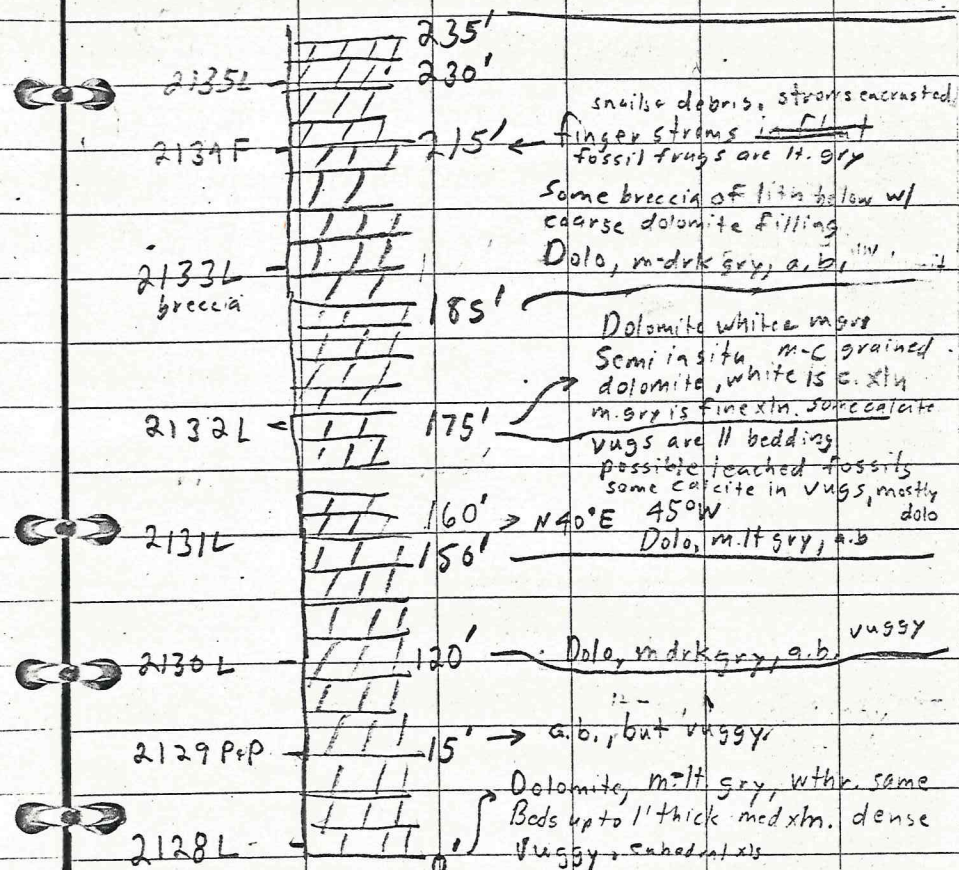


#20 last roll  
26 July 1970 SW/4 T28N R14W

Eli River Section - lower part

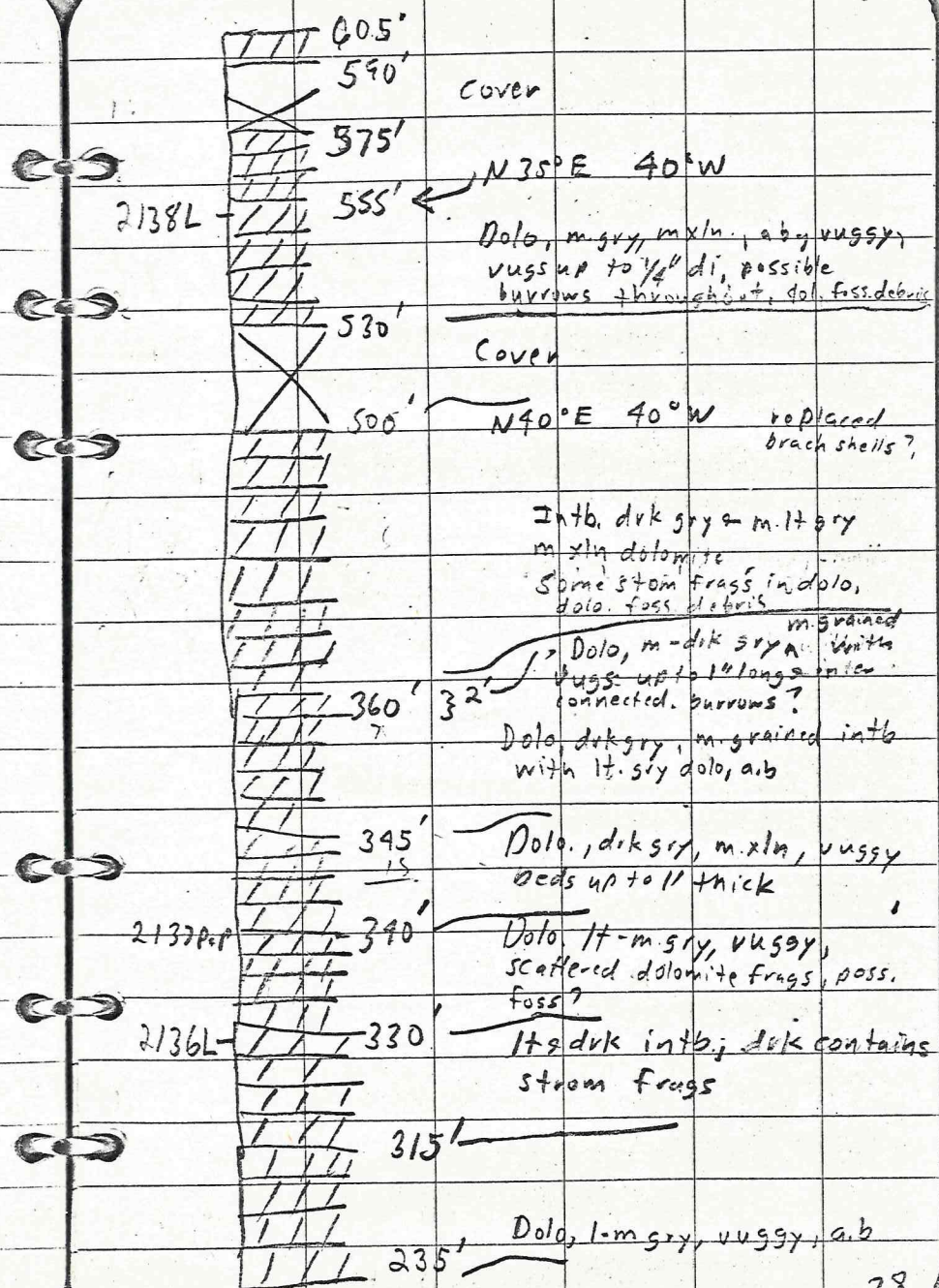
Abrahamsen, Dalness & Knapp  
Skagit Fm.

Clear, slightly windy, warmish  
mostly talus but most outcrops  
semi in situ

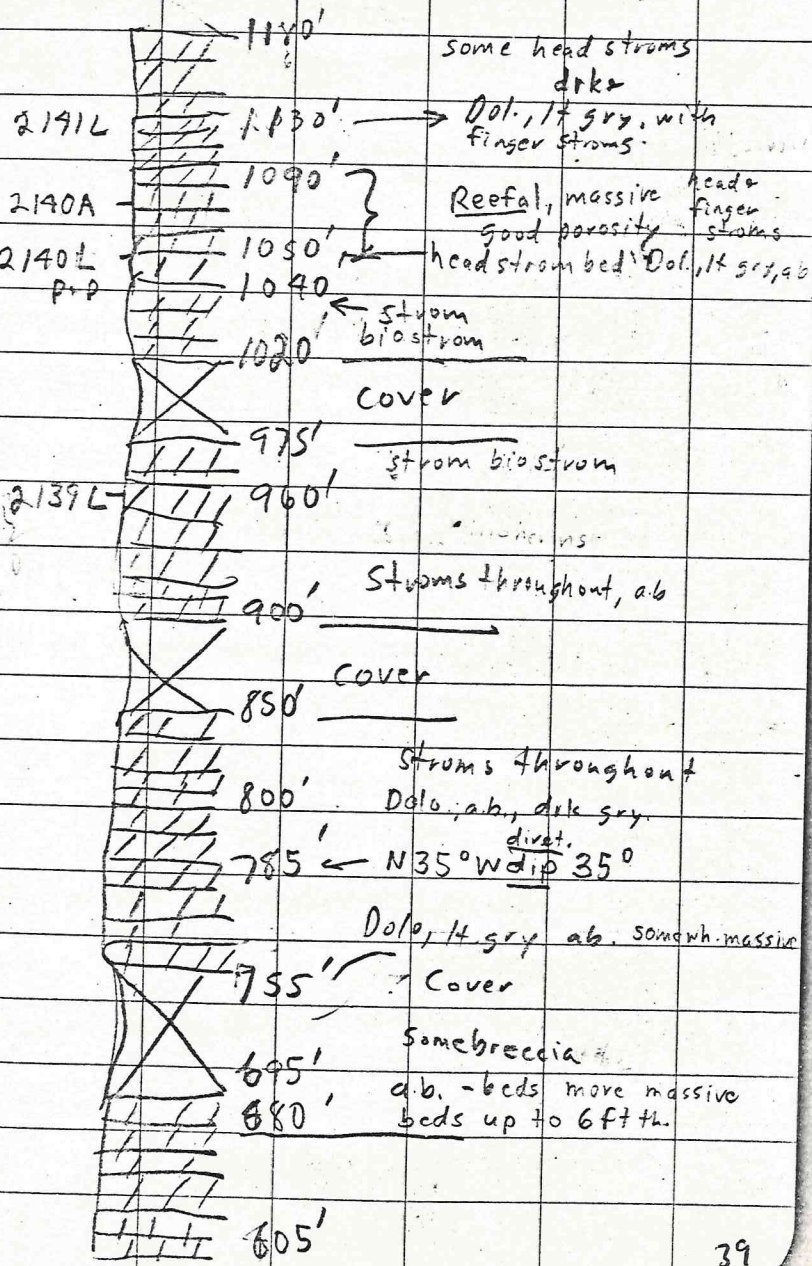


N 50° E St 40° W

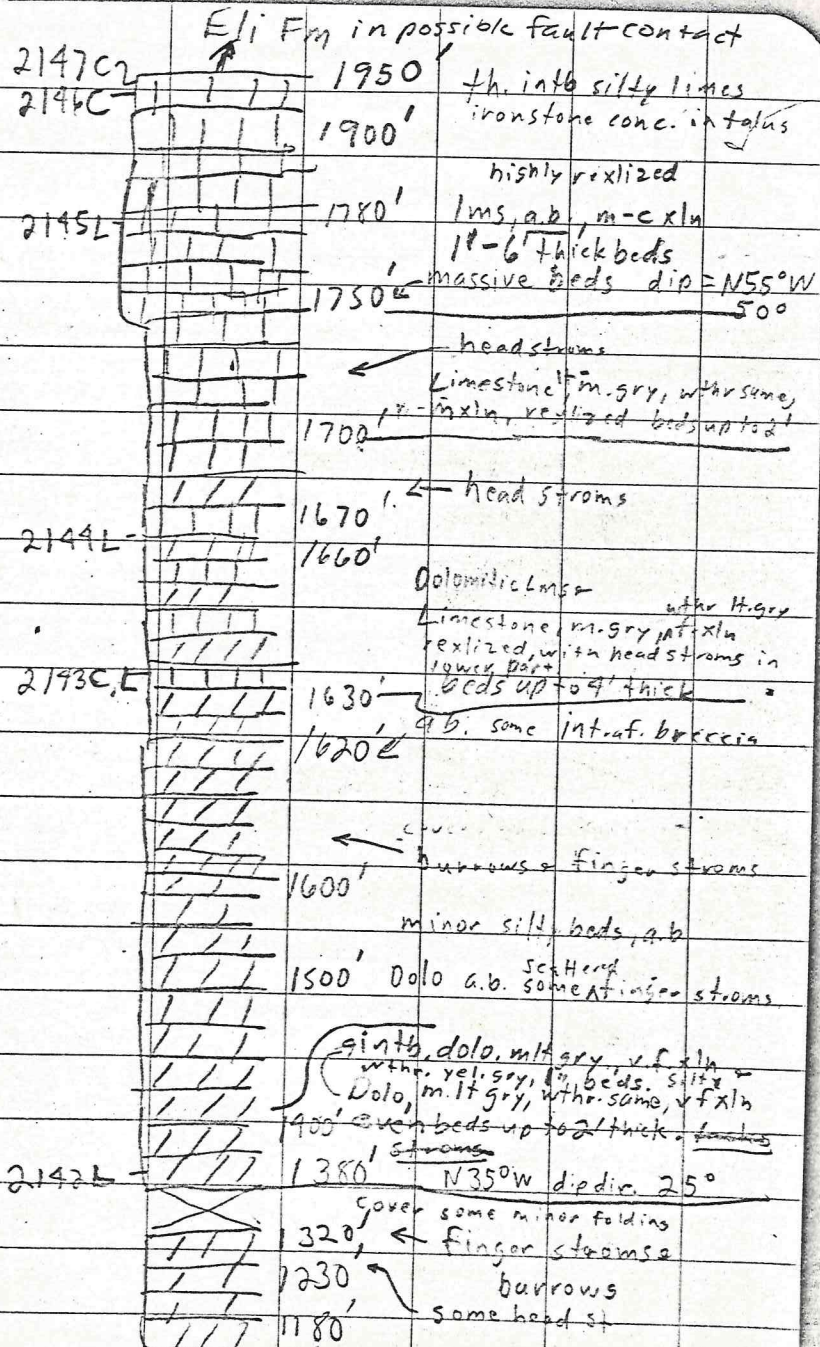














FIELD BOOK #3

Section: Nachramkunga Mtn.  
Autumn Creek  
Tiglukupuk Creek  
Marshmallow Mtn.  
Upper Alapah Creek  
Nuka Ridge  
Nimiuktuk River  
Ains Mtn.  
Nucleus Mtn.  
Upper Omar River  
Nuniviksak River  
Upper Agashashak River  
3000 Numbered Grab Samples  
5000 Numbered Grab Samples

Field Book #3

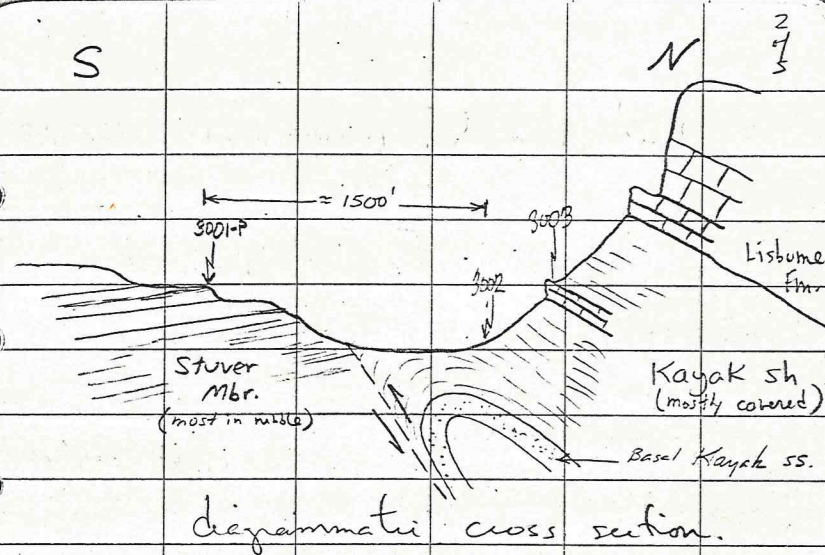


6-4/5/6-70 Nachramkunga Mbr <sup>d</sup>/<sub>s</sub>NE  $\frac{1}{4}$  T.15S. R.1E.: Stuver -Kagak Sh - Lisburne exposures  
along ridge crest: Chandler  
Lake Quad. Measured & described  
bottom  $\rightarrow$  top.Section  
Down3001-P: Collected from upper part  
of Stuver Mbr on south  
ridge (knoll) of Nachramkunga;  
in place but good exposures  
rare; rubble-covered w/ platy  
weathering + lichens; interbedsN 82 E of fine siltstone w/ carbona-  
ceous frags + occasional plant  
7 S impressions and black  
shale w/ tubes + trails on  
surfaces; siltstones are  
variably ferruginous; thickness  
impossible to accurately determine  
due to structure + poor exposures.



Contact of Stuver Mbr of Kanayut Cong. w/ the overlying younger Kayak Sh. is not sharp - is obscured by folding, faulting, & compression of the incompetent Kayak Sh. Probable location of contact is covered w/ loose rubble. There is general lithologic similarity of upper Stuver sh. & ss w/ lower Kayak sh & ss so that the actual position of a contact is difficult to pick. Lower ss of Kayak not present & presumably missing due to folding/faulting.

3002-P from lower Kayak sh. exposure north of saddle separating Stuver Mbr to the south and the Kayak on the north.



[Kayak Sh]

base:

≈ 300'

Cored; slump "blocks"; exposures rare; basal contact inferred - not exposed; takes & occas. <sup>thin</sup> exposed beds indicate black silty paper thin sh w/ <sup>uv</sup> minor interbeds of fine gr. gb. ss.



10' (incomplete) Gray, highly fossilif.,  
 3003-L slightly dolomitic lmst.  
 (+7) pkst; fossil debris includes  
 crinoid frags, bryozoa +  
 occas. brachiopods; feldspar;  
 resistant  
 ledge former; possible  
 mega-ripples.

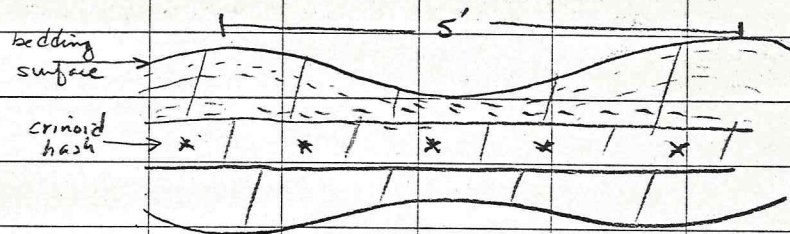
≈ 300' Covered interval - shale  
 slope; upper contact w/ Lisburne  
 not exposed.

C<sub>k</sub>  
 C<sub>L</sub>

90' Gray, thick bedded, "clean",  
 3004-L lmst grst; med grained  
 (6) becoming coarse upward;  
 complete  
 no fossils observed; mega-ripples  
 w/ = 5' w.l.  $\xi$  = 4"-6" amplitude  
 appear on weathered vertical  
 section and on visible horz.  
 bedding surfaces; occas. minor

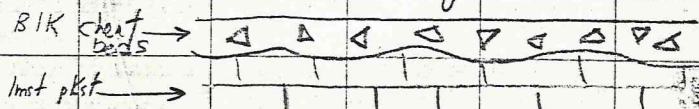
(4)

intercalated, thin (6"-8")  
 crinoid hash beds; some  
 few indiv grst layers  
 are slightly dolomitic.



30' Covered

110' Gray, thin bedded crinoid  
 3005-L hash lmst pkst w/ minor  
 (+10) amount of randomly  
 distributed black chert  
 nodules; upper contact  
 w/ bedded cherts is sharp  
 and irregular.



(5)



125' Interbedded, <sup>or thin bedded</sup> gray ~~crinoid~~  
hash lmst pkst; - and  
thin bedded black chert;  
chert former; chert is domin-  
ant and more bedded in  
lower part, becoming more  
nodular + sporadic upward.

15' Interbedded, black, fine  
3006-L gr. lmst wkst; fetid  
(+10) odor - and thin ( $\approx 6''$ )  
black chert lenses.

300' Monotonous sequence of  
alternating bedded/lenses  
of black chert and gray,  
thin/med beds of crinoidal  
hash lmst wkst/pkst.  
Occas. widely spaced beds

4  
1  
5  
w/ abundant crinoid stems,  
solitary corals, bryozoa,  
+ occas. brachiopods;  
becoming more of a dolomite  
pkst near upper 50-70'.

3.80' Gray, med bedded, homogen.  
dolomite lmst pkst/wkst  
w/ interbedded 6-12" black  
chert layers (40-50%);  
sparsely fossiliferous.

4' Gray, massive dolomite  
lmst pkst w/ faint  
color banding on weather  
surf (? broad x-lams).



110' Interbedded, thin bedded

<sup>to black,</sup>  
gray lmsl mdst/wkst

and dolomitic lmsl pkst

(med gr.) - and thin

black chert beds/lenses.

Bedding by wavy w/ black

lmsl mdst + chert beds

pinching + swelling thru the

wkst layers. Some few

crinoid hash beds w/

occas solitary corals

appear sporadically in the section

80' Gray/black, med bedded

dolomitic lmsl wkst

alternating w/ med bedded

black lmsl pkst + chert

lenses.

5  
Section incomplete: folding  
+ possible faulting combined  
with inaccessibility of exposures  
preclude further measurement



6-9/11-70

Headwaters of Autumn Creek

Shublik For. exposed on

S. facing stream cut  
through hill: E cont.

T. 11 S. R. 2 W. Chandler  
Lake Quad.

Section  
down

Partial section exposed at  
downstream end of cut:  
base to top

6' Covered - float indicates  
black sh but none  
found definitely in situ.

23' Greenish gray, blocky,  
silty, phosphatic sh, very  
thin bedded - variable within  
these limits; interbedded  
paper thin black sh -  
occas. indiv beds are

3011-P  
(+5)

(A)

3008-P  
(+22)

(11)

(10)



quite ferruginous and weather  
typical limonite yellow brown;  
thin (1"-3") yellow ? bentonite  
layers occur sporadically in  
vertical distribution.

1' Black phosphatic sh w/  
3009-F ammonoid-bearing phosphatic  
3010-L nodules; <sup>(≈ 60% w/ ammonoids)</sup> nodules are generally  
~~even~~ perfectly round and  
vary in size from 1/2" to 2"  
in diameter - the contained  
ammonoids are crushed but  
general shape & suture patterns  
are recognizable in 50%.

8' Varicolored paper thin sh w/  
intercalated ? yellow bentonite  
layers & blocky silty sh -  
nodules absent

(12)

2' Black phos. sh w/ ammonoid  
3009-F bearing phos. nodules;  
3010-L ferruginous red brown staining  
on weather surf.

≈ 34' - incomplete; same as (A)

A more complete (thicker) section  
is exposed further upstream  
to the east (≈ 350'). This  
latter section measured from  
base (at stream bed) → upward.

6' Black, very thin / thin bedded  
3012-L <sup>(5)</sup> lmst mdst / pkst w/ gilsonite  
(dead oil) in small vugs and

3013-P <sup>(shale)</sup> in thin seams; thin-shelled  
planktonic pelagic fossils; fetid

3014-F <sup>(+5)</sup> odor; 1"-2" subordinate interbeds of  
black, paper thin, calcareous sh.

(13)



7' Black, thin bedded, siliceous  
mdst w/ wavy laminae; tite  
(cherty); <sup>thin</sup> interbeds of ~~thin~~  
black paper thin sh.

7' Same as (B)

3015-L  
(+1)

7' Vg thin bedded, gray lms  
mdst; weath yellow brown;  
occas thin-shelled pelecypods;  
interbedded subordinate paper  
thin black sh w/ thin ( $\frac{1}{4}$ ");  
? bentonite layers; moder. ferrugin  
sh; - marks the beginning of  
ferrugin characteristics - top  
2' extremely <sup>iron</sup> stained <sup>layers</sup> due to  
strongly ferrugin. oxidizing sh.

(14)

53' Paper thin, varicolored sh,  
w/ intercalated ? bentonite

3016-P layers; numerous highly  
(+2) ferrugin. sh beds which

3017-P aver.  $\approx$  4"-8" thick; phosp.  
(+50) nodule bed ( $\approx$  1'-2' thick)

located at +31' (to base for  
nodule bed); bluish gray  
to black mdst (aver  $\approx$   
4"-6") dominate above  
the nodule-bearing bed  
w/ interbeds of black ferrug  
sh  $> 50\%$ ; A more-or-less  
gradational change from  
dominantly paper thin sh  
to shaley mdst to  
mdst w/ shale - going from  
bottom of unit to the top.

(15)



60' Vg thin bedded, greenish gray,  
well indurated mdst w/  
wavy lamms (prob deposited  
& due to grain size diff);  
weath lt. yellowish brown;  
interbeds of paper thin,  
black sh. — percentage of  
sh increases upwards and  
upper 40' dominantly sh.  
At +27'-encountered a 2'  
thick, v. wavy laminated,  
black calcar. mdst containing  
numerous large, thin-shelled

3018-F pelecypod valves on lamellar  
(+27) surfaces — the lamms are in

3019-P fact the pelecypod valves  
(+7) are veined from the side.

65' Black, v. thin bedded,  
calcar. mdst w/ numerous

3020-L interbeds of black, paper  
(b) thin sh; occas randomly

3021-F distinct nodules (2"-4" dia.  
grab (+16-20) some up to 6") containing

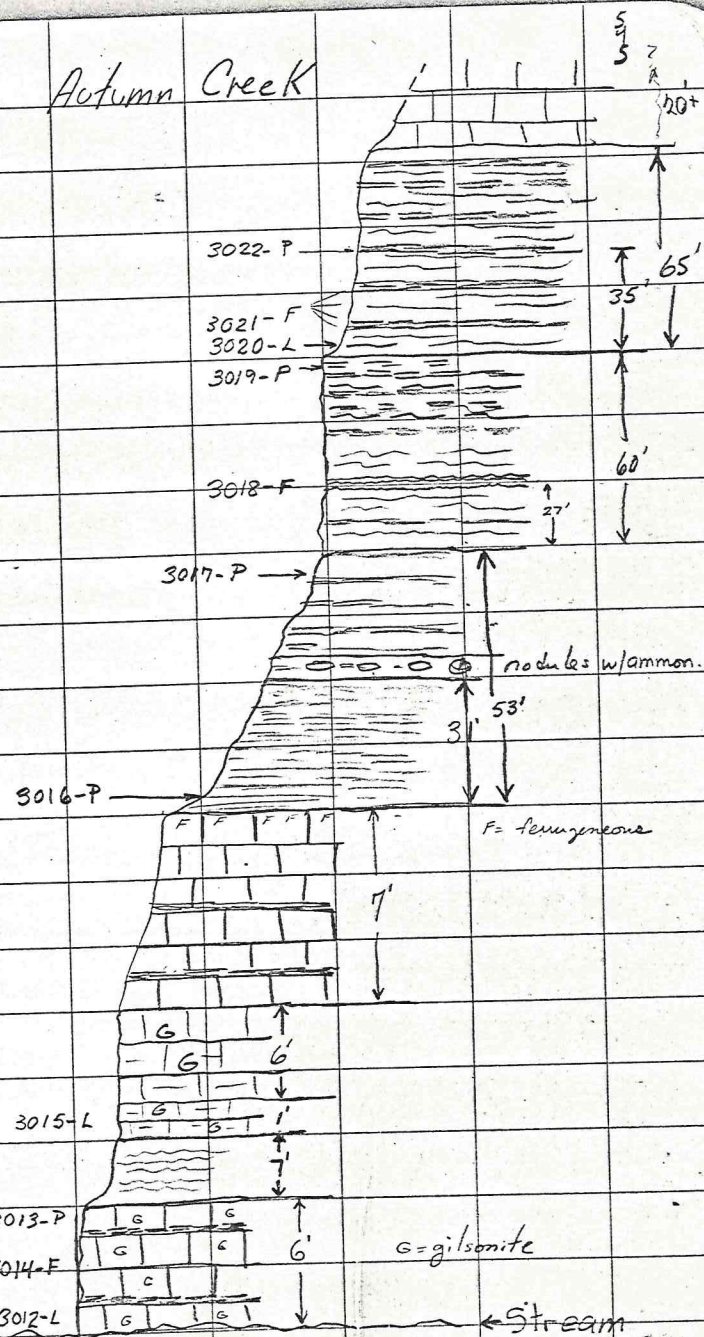
3022-P fossils (mostly pelecypods);  
(+35) fetid odor on fresh surf  
of mdst.

± 20' + lt. greenish gray, v. thin/  
(incomplete) thin bedded lms mdst  
w/ large thin-shelled  
pelecypod valves; minor  
interbedded blk sh; mostly  
rubble.

Top of exposure rubble-cased  
& grained over; strat. control  
diff. to sustain.



# Autumn Creek





6-12/13-70

Shublik Fm. at

1  
of  
6

Tiglukpuk Creek, <sup>exposed in</sup> west &  
east banks: S  $\frac{1}{2}$  T. 12S.

Section  
Drawn

R. 1 E. Chandler Lake,  
Alaska Quadrangle.

Base  $\rightarrow$  top

[Base] [west bank] [lower contact covered]

44'

3023-P  
(+7)

Alternating interbeds  
of — "paper thin black  
shale; indiv. units approx  
3' thick at base of the  
interval; intercalated by  
thin seams of yellow  
clay (? bentonite);  
yellow reddish brown weath  
ferruginous zones present  
but variable in occurrence  
within indiv sh. units, —  
and, 2.) 6"-12" beds of tile,  
dk gray, homogeneous,



fine grained, <sup>siliceous</sup> siltstone; some  
indiv beds weather into thin  
plates, while others are more  
"massive"; no visible fossils;  
regular bedding; weath mottled  
brown-reddish brown.

Siltstones virtually absent in  
upper 20' - shales concentrated  
here.

3024-P  
(+42)

62' Black, paper thin siliceous  
sh w/ same characteristics  
as shales in underlying  
unit - interbeds of 2"-5"  
thick layers of H. gray  
lmst mdst, faint laminations  
visible on fresh surface;  
weath buff, regular bedding,

2 of 6  
contact w/ shale is distinct;  
well indurated (tite); no  
visible fossils; fetid odor  
on fresh surface.

Shales dominate from 0-32'  
at about 95% of total lith.

(30') From 32'-62' the lmst mdst  
units increase to  $\approx 40\%$  of  
total lith (shale  $\approx 60\%$ ); the  
mdst units are beds 2"-8"  
thick; sh is primarily black  
w/ weath ferrug. zones of  
yellow & yellow brown.

46' Same as (A); sh  $\approx 60$  to  $70\%$ ;  
3025-P siltstones  $\approx 30$  to  $40\%$ .  
(+10)



1' Black, fine gr. lmst midst  
3026-F w/ numerous thin-shelled  
pelecypods visible on  
bedding surfaces. This  
unit is more of a lense  
than a continuous layer.

10' Same as (A); sh  $\approx$  50%.

1/2' Ferrugin. <sup>black</sup> fissile sh w/  
small (> 1 1/2" dia) phosphatic  
nodules; no fossils recovered  
from shale or nodules

10' Same as (A); sh  $\approx$  75%

1' Black, ferrugin. fissile sh. containing  
3027-F small (1-2" dia) phosp. nodules;  
spatic thin (1") homogeneous,

3  
1  
6  
well indurated, very fine gr.,  
talc, siliceous siltstone/  
mudstone layers

6' Same as (A); sh.  $\approx$  75-80%.

8' Black, very thin / thin bedded,  
3028-L homogeneous, well indurated  
(+1) (talc) siliceous mudstone  
(chert); conchoidal

(B) fractures but not the  
smooth surface texture  
of "good" cherts; 3'  
bed at base - then  
interbeds (1'-3' thick) of  
(A)-type sh. at approx  
50-50 ratio.



5' Same as (B); w/occas. thin  
interbeds (3"-4") of greenish  
gray lmst mdst; unfossilif;  
alternating dk & lt <sup>color</sup> banding  
visible parallel to bedding  
on fresh surface.

30' Same as (A)-type shales  
3029-L at  $\approx 40\%$  of total lith;  
(+4) individual sh. units  
range from 1"-4" thick —  
interbeds of gray, v. thin  
bedded (2"-6" thick),  
well indurated chert w/  
sporadic black, elongate  
streaks parallel to bedding.  
(Looks like a 'good' replacement  
chert); thin beds of black  
siliceous mudstone take the

<sup>4</sup>/<sub>6</sub>  
place of the gray chert  
in the upper 15-20'.

= 8" Gray, wavy laminated,  
3030-F fine gr. lmst mdst  
w/numerous large,  
thin shelled, heavily  
richeled? planktonic  
pelecypods on bedding  
(lamellar) surfaces.  
Should be able to tie this  
into similar unit at  
Autumn Creek.

15' Interbeds of black, siliceous  
mudstone (chert) (4"-8" thick)  
and black, ferruginous, fossil  
shales (6"-18" thick).



70' 3031-P (+40) Black, fissile, slightly silty shale w/ large thin-shelled ? planktonic pelecypod valves on shale partings; slope former; — occas. interbeds of thin (2"-4") detrital mudstone beds, at  $\approx$  25-30% wth.

10' Black 2"-4" siliceous mudstone layers ( $\approx$  60%) w/ subordinate interbedded thin shale layers.

6" 3032F Black fine gr. lmst mdst w/ fetid odor; numerous thin-shelled pelecypod valves parallel to bedding.\*

\* Faulted above; continued on east bank about 100-300' upstream.

[East bank exposure: going upward stratigraphically]

25' Same as (D)

50' 3035F (+35) Dense, thin bedded, lt. gray lmst mdst w/ fossil pelecypod valves on bedding surfaces; weath yellow brown; very well indurated w/ concoidal fractures; minor interbeds (> 5%) of 1" black fissile shale layers.

The previous lmst mdst unit can be considered the uppermost unit of the Shuslik. Overlying that unit is a black shale

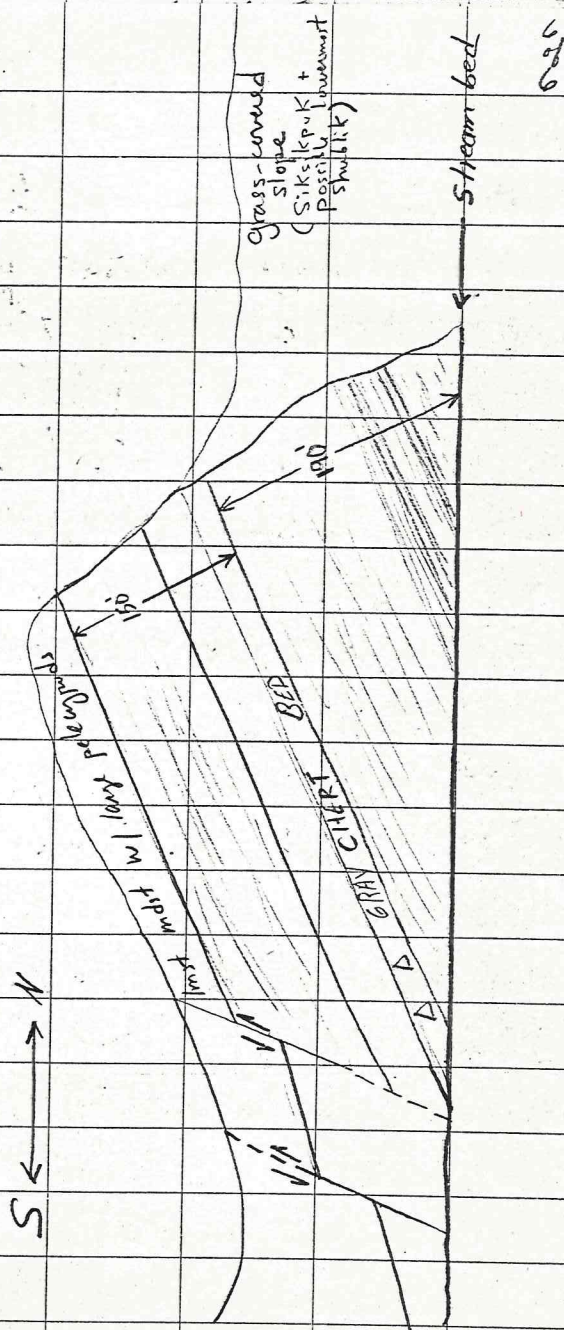


unit 20' thick in which  
the U.S.G.S. considers to be  
the upper contact of the  
Shublik Fm. w/ the super-  
jacent and lithologically  
unseparable Tigulpuuk Fm.  
This U.S.G.S. contact is neither  
realistic nor practical and  
is herein considered unacceptable.

Tig lukput Fm. immediately above  
Shuslik just west of pebbles.

20'	Black to brownish gray, paper
3033-P	thin shale; fossils rare;
(+ 10)	slope former; minor interbeds
	of thin (1"-2") black, tte,
	met indst.

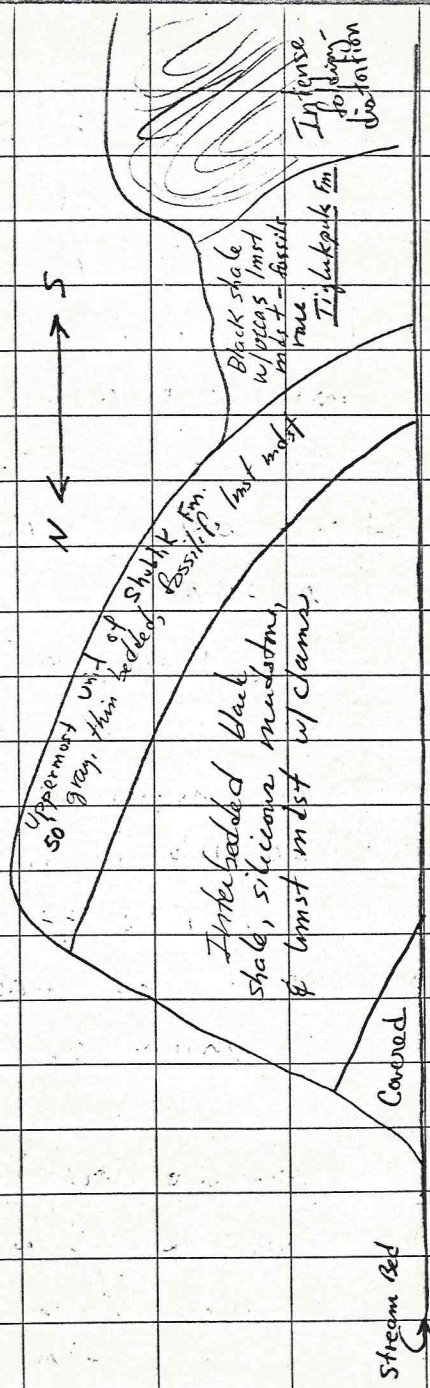
West side of Tiglukuk Creek; Shrublike exposure





(32)

Upper  
East side of Tiglukpak Creek / Shuslik exposure.



6-14/15-70

Marshmallow Mbr.

1/3

Section  
drawn

Marshmallow Mbr.  
Kamayut / section; exposed along  
ridges + sides of upper Alapah  
Creek: E T. 14 S. R. 5 E.  
Chandler Lake, Alaska Quad.  
Exposures fair to good;  
base to top.

[Base] - Contact w/ middle cong. mbr is  
shale exposed.

N 90 E

75'

27'S  
getting steeper  
to the north

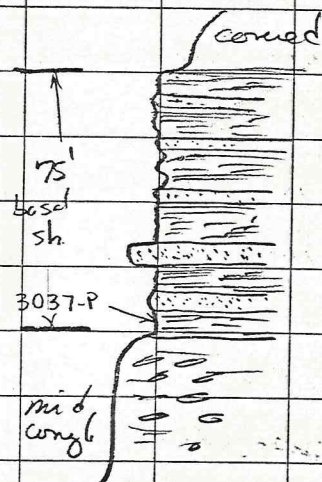
3037-P  
(49)

Black, carbonaceous sh  
containing many plant  
fossil frags. Interbedded fine  
gr. g.z. ss up to 6" thick;  
well indurated; ferruginous  
stains; no structures; well  
sorted, subangular/subround;  
dk gray to brownish gray.  
Contact w/ underlying mid.  
cong. mbr. is gradational  
upward from massive cong.

(33)



(w) clasts up to 6" and containing  
 ≈ 60% chert) in thin sh  
 + ss interbeds — to the Stines  
 black sh w/ thin ss + coarse  
 cong. units.



≈ 700' DK grey, v. thin / thin bedded  
 w/ fine gr. gtz. ss / fine  
 siltstone; abundant well  
 preserved plant remains (com-  
 pressions) + frags; interbedded

(34)

paper thin, black carbonaceous  
 silty sh. The ss / siltstn unit are  
 virtually structureless except for  
 bedding intersecting w/  
 weathered surface — questionable  
 ripple marks (maybe

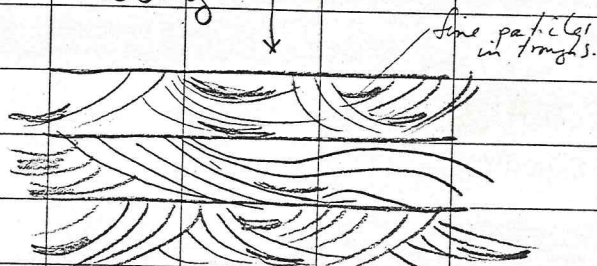
many ss units are highly ferruginous + some contain small limestone concretions) (weathering); grain size appears  
 stable, plant fossils consistent  
 throughout interval. No  
 conclusive cycles observed  
 other than generalized  
 sh-ss-sh-ss. Appears  
 to represent a coastal  
 marsh / tidal flat deposit —  
 source of clean sands needing  
 little high energy sorting —  
 possibly numerous sand  
 laden streams furnished  
 the gtz. sand — currents  
 and sporadic wave activity

(35)



could have distributed the  
sands over an extensive  
area

≈ 350' Thin (≈ 1'), <sup>gray</sup> fine gr. / gtz.  
ss, ferruginous, w/ thin  
x-lams visible which alternate  
w/ sand + silt/clay sized  
particles - truncated - flaser  
bedding



750' Lt/dk gray <sup>med/thk</sup> Cong. in  
matrix of coarse <sup>subgrading, med sorted,</sup> gtz.  
SS; <sup>clay</sup> pebbles from 1/2" - 2" dia;  
no sed structures.

(36)

≈ 80' Black sh, some ool.  
3036-P ferrugin. zones  
(T)

Contact w/ basal ss. of  
Kazek sh is sharp +  
regular.

Contact of middle cong. w/ lower  
cong. mbr.:

mid cong - primarily well rounded  
green, black, gray chert  
pebbles ~~up to~~ up to 6" dia in  
med/coarse gr. gtz. ss; no  
sed structures; homogen. m  
a massive scale; <sup>with dk brown</sup>

lower cong: <sup>massive</sup> ferruginous, poorly  
sorted fine/coarse ss w/ smaller  
varicolored chert pebbles <sup>dia</sup> ≈ 1/2" dia;

ss ≈ 75%-80% <sup>smaller</sup> ~~smaller~~  
dk red brown weathering.

(37)



6-16/18/80 Upper Alapah Creek  
Marshmallow Mtn; Lisburne <sup>if</sup>

section: exposed along upper  
Alapah Creek: NE  $\frac{1}{4}$  T.15S.  
R. S. E., Chandler Lake, Alaska  
Quad. Measured + described  
bottom  $\rightarrow$  top: mostly along stream  
bed in narrow gorge; upper  
 $\approx 300'$  measured along SW facing  
ridge just north ( $\approx \frac{1}{2}$  mi) of  
glacial field on northwest  
flank of Alapah Mtn.

100' Lt. gray, thin/med bedded,  
3038-L coarse gr. lsst grst,  
(+2) weath dk gray to yellowish

3039-F brown; occas. frags of  
(talus +25) erinoid stems; megaripples  
w/ 4'-5' wavelength + 3"-6"  
amplitude; bedding irregular-  
largely due to influence of  
megaripples; slight fretted



odor on fresh surf; lower contact w/ Kayak Sh. buried under rubble slope but easy to estimate by usually following the Lisburne uphill to ridge-side exposures (not accessible). Occas. paper thin layers of very coarse crinoidal debris are <sup>randomly</sup> scattered throughout this unit. Colonial coral (*Syringopora*) found on talus at +25'. From +20 to +30 feet: almost a coquina of lmst grst w/ numerous flattened crinoid calyxes, stem & other frags, sd. & colon corals, brachs, bryozoa.

125' Lt. gray, thin/med bedded, very coarse gr. crinoidal hash lmst grst/pkst; megacrystals not distinct but may be present; slight fetid odor; weath gray; covered from  $\approx 75'$  to  $100'$ .

15' Interbedded, v. thin bedded, gray, coarse grn. lmst grst/pkst; weath lt gray & black irregular chert lenses ( $\approx 4''$ - $6''$  thick).

15' Gray, thin bedded lmst crinoidal hash pkst - w/o chert, weath gray; homogen; crinoidal debris is finely comminuted ( $> \frac{1}{8}''$ ).



145' DK gray, thin bedded lms  
3040-L pkst w/ much finely  
(+37) comminuted crinoidal debris;  
faded color; weath gray —  
subordinate 5' thick  
interbeds of clean, very  
coarse gr. lms grst; lt.  
gray weath gray; relatively  
little crinoidal debris.  
Occasional 2"-4" beds of fossil  
hash lms wkst — some indiv  
layers are slightly dolomitic,  
dk gray weath gray.

5' Gray, thin bedded, very coarse  
3041-L gr. lms pkst w/ abundant  
(+2) crinoidal debris; even bedding;  
weath lt. yellowish brown.

# Discussion

3/7

Lower 225' of lms grst w/  
megacrystals appears to have been  
deposited in a shallow carbonate  
platform, near shore, high energy  
environment — the unit is well  
sorted, "clean", few complete fossils  
but fairly complete crinoids appear  
in upper portion — unit is  
transitional upward into a <sup>5' to 7'</sup> deeper,  
lower energy environment.

The overlying 180' of carbonates is  
dominated by gray, very coarse gr.  
thin bedded crinoidal hash lms  
pkst w/ subordinate ( $\geq 25\%$ ) beds  
of clean, coarse gr. lms grst.  
w/ some indiv beds slightly dolo.  
Black, irregular chert lenses occur  
at widely spaced intervals in the  
pkst/grst, + may constitute up to 30%



The depositional environment for this latter 180' may be that of a broad, flat, moderately shallow shelf where crinoids, bryozoa, corals, and brachiopods existed but where a constant energy was available to comminute the shells after death. Occasional quiet builds preserved indiv. crinoid "colonies" as layers. Storms which agitated finer particles into suspension could be responsible for the thin crinoidal/bryozoan hash lmst wkst.

- 200' Beginning of chert mbr of 3042-G USGS<sup>(?)</sup>. Black, irregular, w/ thin bedded lmst mdst w/ interbedded (>40 <60%) black nodular chert lenses.

(44)

(@ 1" T x 2" 6" L). Subordinate interbedded beds of lt. brown, thin bedded, v. coarse gr. lmst grst; weath gray; indiv units from 1'-3' thick & may be lense-like with flanking thin chert lenses. Some of the black lmst mdst layers contain crinoid hash (= wkst).

- 165' Black, coarse gr., thin/m  
3043-G thin bedded lmst pkst,  
(+55) petid odor, weath gray.

- 30' Gray, thin bedded, v. coarse gr. lmst grst; weath lt gray; crinoidal hash interspersed.

(45)

1  
1  
1



✓ 60' Black, thin bedded, well  
3044-L indurated lmst pkst;  
(+3) sporadic wavy lams in  
1" layers; bit-d odor;  
crinoidal hash zones near  
top; sharp contact w/  
overlying cherty/carbonate  
strata.

✓ 50' Black, irreg chert lenses/  
beds w/ equal amount of  
very thin bedded, dk gray/black  
lmst wkst; some <sup>fine</sup> crinoidal  
hash.

✓ 250' Black, thin bedded lmst wkst  
3045-F w/ <sup>fine</sup> crinoidal hash, bit-d odor.  
(+50) weath gray; fossil brachs  
+ occas. sol. corals.

✓ 100' Gray, thin bedded, finely  
xtall lmst; well indurated;  
fossils rare; weath lt. gray;  
no chert.

✓ 375' Sequence of interbedded irreg.  
black chert lenses/beds  
(3"-6" thick) in dk gray,  
very fine xtall lmst;  
very thin bedded; weath  
gray.

100' Mostly covered - occas.  
3046-L exposure of dk gray, thy  
3047-L thin bedded lmst pkst  
(+80) w/ interbedded irreg. black  
chert lenses; carbonates  
contain fine crinoidal hash.



≈ 500' Covered slope

20' DK gray/black siliceous  
wkst; v. thin bedded +  
ineg. Interbeds (40%) of  
(A) lmst wkst, thin bedded;  
dk gray weath lt. gray,  
fine crinoid hash; strong  
fetid odor.

5' V. irreg. bedded, black  
chert nodules (≈ 50%)  
w/ interbedded dk gray,  
highly siliceous, fine gr.  
lmst wkst, weath gray,  
fetid odor.

60' Same as (A); sporadic  
3048-L thin (4"-10") layers of  
(+40)

(48)

crinoid hash granistone;  
fetid odor decreases  
upward; color lighter upward.

≈ 80' Covered - talus suggests  
gray, siliceous pkst  
w/ crinoid hash w/  
2"-4" <sup>ineg.</sup> black chert lenses;

3052-L - From possibly in place  
(+75) clean lmst cyst; thin  
bedded; colonial corals -  
at top 10'.

30' Black, <sup>to thin</sup> v. thin bedded,  
3049-L irreg. siliceous lmst  
(+10) pkst/wkst; fetid odor,  
weath lt. gray; subordinate  
ineg. black chert beds.

(49)



5' Black, thin bedded, fine/coarse  
 3050-L gr. slightly siliceous  
 3051-F (+3) lmst pkst; regular bedding;  
 fetid odor; bryozoan &  
 crinoidal hash (fine);  
 occas large (6"-12" across)  
 colonial coral heads (cf.  
Lithothamnella), scattered  
 thin beds (3"-6") of lmst  
 wkst.

25' Core d

150' Bedded, very thin wavy  
 3052-L black chert w/ calcite-  
 (+5) filled fractures (chert  $\approx$  75%).  
 [duplicate sample] 25% lt gray brown, finely  
 xtall dolomite mdst/wkst;  
 thin bedded, even.

3  
4  
7

100' Black, thin bedded, lmst  
 pkst; weath gray; fetid  
 odor ( $\approx$  60%) - interbeds  
 of blocky, irreg. black  
 chert nodules ( $\approx$  40%).  
 Silica replacement noted  
 in carbonates; some of  
Syringopora corals.

Drag folding and ~~fault~~  
 breccias indicate a major  
 fault above last unit.

Kayah Sh. can be seen  
 about 500' up, faulted  
 over the Lisburne.

(50)

(51)



SW T. 9 S. R. 30 W. & SE T. 9 S. R. 31 W.  
Misheguk Mtn  
Alaska Quad.

6-27/28/29-70 Nuka Ridge

①  
3

Thicknesses as determined by Tailleux &  
Sable appear reliable as do <sup>most of</sup> their  
lith descriptions and associated intervals.

Section  
Drawn / Corred intervals, poor exposures, and  
extreme dip angles make estimates  
of thicknesses and contacts difficult.

Section described & collected bottom to top.

10' [BOSE]

(f)

Interbedded black shale/mudstone,  
3057-B v. thin bedded, weathers brownish

3056-L gray; no fossils; and black,

3062-F fine/med. grained lsst. pkst;

3063-C in irregular layers 1-3 ft. thick;

strong fetid odor; dead oil

coating vugs and calcite veins;

crinoidal hash



≈ 100' V<sub>y</sub> thin/paper thin, black  
(f) silty sh. & fine siltstone,  
weathers brownish gray; weathers  
3061-C to platy blocks; ? inarticulate  
(+ 90) brachs rare on bedding surfaces.

≈ 20' (projected) Gray, v<sub>y</sub> thin bedded,  
(f) coarse grained, lnst pkst;  
3055-C fetid odor; fossiliferous in  
3058-F part (brachs, gastropods, cephalopods,  
3059-F crinoidal hash).  
3060-C

Top & bottom contacts not exposed

250' Chert, v<sub>y</sub> thin bedded; some  
(9) banded; varicolored gray,  
green, red; some w/ healed  
fractures; forms slight ridge;  
all but top of ridge covered  
w/ rubble.

(54)

≈ 350' Mostly covered; v<sub>y</sub> thin bedded/  
(h) paper thin sh/silty sh; black;  
upper-lower contacts not visible.

175'  
(i) V<sub>y</sub> thick bedded, light brown,  
v<sub>y</sub> coarse grained, poorly  
3053-L sorted, gtz ss; v<sub>y</sub> permeable;  
[≈ 75' from top] subangular grains; <sup>pink</sup> feldspar  
(prob. orthoclase) frags. scattered  
throughout—relatively concentrated  
in some layers (arkosic) ≈ 20%;  
bedding structures absent  
as are sedimentary structures;  
size range of gtz grains from  
1/2 mm. — 5 mm.; <sup>prominent</sup> resistant ridge  
former; porosity ≈ 5-10%; weathers  
light grayish brown; upper-  
bottom contacts not visible

(55)



≈ 300' Covered interval  
(j) T. & S. desiccate shale w/  
minor chert & ss; slope former

≈ 500' Varicolored (primarily dusky  
(k) red, but some layers may be  
gray-blue-greenish), v. thin  
bedded, chert; faint banding  
3054-F in some indiv. layers; weathers  
(≈ 300') dark brownish red; bedding  
irregular; - some interbeds  
(1"-4") of siliceous siltstone,  
v. fine grained; v. well  
indurated; some lenses of  
fossil debris; cross-lams  
indicate beds not overturned  
here.

(56)

③  
5  
≈ 400' Mostly covered; Black, paper  
(l) thin silty shale, weathers  
dark gray, slightly calcareous;  
3080-C fossils on bedding surfaces  
3081-F include trilobite pygidia,  
3064-L pelacypods, gastropods, &  
(≈ 200' from top) occasional brachiopods; -  
talus indicates subordinate  
fine grained ss; slope former

≈ 450' Med/thk bedded <sup>med to</sup> coarse grained,  
(m) med. gray, calcareous gtz.  
3082-F ss, grains subang-subround;  
3083-L coarse pink feldspar (orthoclase)  
(50-100' from top) frags in upper 150'; some  
3084-L crinoidal hash zones;  
(≈ 20' from top) red (jasperoid) relicified  
productid brach. w/ beebite  
rings numerous in upper  
exposed 150' - some "layers" 131

(57)



w/ higher concentration of brachia  
than others. orientation of brach  
shells is variable; mostly  
pedicle valves ( $\approx 90\%$ ); possible  
base (t. like cuts upper 50' (3084-L  
from here); brachia rings obscure  
details of brachiopod shells,  
upper-lower contacts obscure;  
major ridge former.

$\approx 400'$  covered interval; major slope-  
(n) grass/rubble cover; sh & chert

$\approx 1400'$  covered interval; T. & S. described  
(o) limest. wkst. & sh.

$\approx 800'$   $\Sigma$  thickness  
(P)

(p-2) Gray, thick bedded limest/dolo. pkst,  
3094-F crinoidal hash; weathers dark  
( $\approx +200$ ) gray. [Isolated exposure about  
15 ft. thick]

(p-3)  $\approx 40'$  Thin/med. bedded, gray,  
fine/med. grained qtz. ss,  
3085-F } lower calcareous in lower part;  
3086-C } silicified productid brachia  
throughout but more

3087-L } upper numerous in upper 20';  
3088-F } some indiv. beds more  
3089-L } calcareous (?dolomitic)

than others and weather  
dark yellowish orange;  
lower contact obscured.



± 350'  
(p-4)

3090-F (± 50-75' from base)

3091-L

3092-L } (± 300' from base)

3093-L }

Thin<sup>med</sup> bedded, med. gray, med/coarse  
grained limest. pkst; crinoidal  
flask; some layers slightly  
dolomitic; - 3 to 4 zones of dark  
green glauconite, argillaceous  
ss (each approx. 1'-5' thick) are  
interbedded w/ the carbonates -  
3090-F from lowermost zone  
of thin bedded, dark green,  
fine/med grained glauconite/gtz:  
ss w/ numerous low spiraled

5  
1/2  
gastropods; a single brachiopod  
found (probably Neospirifer) in  
this fossil zone which is only  
about 6" thick.



211 6-30-70

Mikesk & Rosseter

①  
of  
②

Samples of mafic rock for  
geochron analyses. Misheguk  
Mtn. Quad; N $\frac{1}{2}$  T.34. N. R.8W.

3095-G

3096-G

3097-G

3098-G



7-1-70

Nimiutuk River  
Type Section of Noatak Fm.

1/3

Section  
Drawn

Misheguk Mtn. Quad, East central  
T. 32 N. R. 6 W., about 4.5 mi. NNW  
of jct. of Noatak & Nimiutuk Rivers.

Section measured & described bottom to top.  
N45W 30°S orientation

[Base]

≈ 160'

Covered (grass, rubble)

① 55'

ly thin/thin bedded, lt. gray,  
med/fine grained qtz. ss. w/  
numerous limonite specks (avg.

3099-L  
(20' from base)

≈ 30%); very well indurated, fine-  
indiv. grain boundaries obscured  
by silica <sup>pressure</sup>/solution welds; weathers  
gray; faint to pronounced cross  
laminations w/ parallel jointing -  
indiv. laminae ≈ 1" thick;

3-D orientation of laminae: N55E 18°N  
N20W 9°N

64

65

137



5' Thin bedded, lt. gray, med. grained, qtz. ss; v. little limonite as specks, cross-lams virtually absent, grain boundaries

3100-L obscured by pressure solution welds - tite; small (2-10 mm) elongate ironstone blebs occur in occasional 1" reddish brown layers parallel to bedding.

10' Same as (A)

5' Lt. gray, v. thin bedded, well indurated - tite - qtz. ss, med.

3101-L grained w/ black specks; no structures

(66)

50' Same as (A); occasional, widely spaced 4-6" ferruginous fine grained qtz. ss; upper 20' increasingly ferruginous & goes from thin bedded to paper thin bedding.

~ 40' Covered interval

15' Same as (A)

15' Covered interval

10' Lt. gray, med/thin bedded qtz. ss; grain boundaries visible; fine grained w/ black specks (? magnetite) sed. structures indeterminate.

10' Same as (A)

(67)

2  
of  
3

(68)



≈ 10' Dark gray, paper thin, (?micaceous)  
shale; silky sheen on bedding  
3103-C surfaces; occasional lenticular  
(+4) (1" x 5") lenses of limonite  
concentrations.

35' Same as (A)

≈ 15' Covered interval

25' Same as (A)

≈ 20' Covered interval

35' Same as (A)

≈ 20' Covered interval

(68)

≈ 55' Same as (A); w/ tabular  
3104-L 2-4 mm. thick limonitic  
(+10) "pebbles."

≈ 150' Covered interval

15' Same as (A); thin bedded

10' Same as (A); paper thin

≈ 75' Covered w/shale talus

Higher exposures alternate w/  
numerous rubble covered slopes  
which contain large blocks of  
ss. w/ calcite <sup>coated</sup> slickensides, and  
occasional mafic rocks are  
also present. A fault is  
suggested in accordance w/  
Duto's interpretation

(69)

(14/8)



7-1-70

Partial Utukok section as  
described by Dutro 1953;

N 7.32 N. R. 6 W., Misheguk  
Mtn Quad. Recon. & grab  
samples; units are  
referable to Dutro's described  
units on pp. 151-152

3105-L Lisburne block - faulted  
& out of place; about  
15 ft. of thin bedded,  
gray, coarse gr. crinoid  
hard lsst pkst, weath  
gray; numerous calcite filled  
fractures; minor interbeds  
of black chert.

3106-L Unit 3 (63' thick)  
(+ 60)

3107-L Unit 8 (50')  
(+ 40)



3108-L Unit 11 (55')  
(+ 20)

3109-L Unit 11 <sup>quartzoid</sup> host zone  
(+ 30)

3110-L Unit 9 (3')

3111-L Noatak ss. - ~~bulb~~  
black <sup>clay</sup> below contact  
w/ Utukuk

72

7-2-70

<sup>partial</sup> / Utukuk exposures across  
<sup>immediately</sup> drainage / south of 7-1-70.  
Grab samples.

3112-L Black, fine gr. qtz  
ss. - Top of Noatak

3113-P Near contact of Noatak  
& Utukuk; contact position  
indefinite.

3114-P Unit 11 (Dutra) - <sup>near</sup> base  
3115-L of Utukuk; argill ss  
w/ carbonaceous debris;  
calcareous.

3116-L Unit 8

3117 Geoschem; exposure of basalt igneous  
on peak  $\approx$  8 mi NW of Nimiuktok  
- Noatak <sup>river</sup> junction,  $\approx$  NW corner  
T. 32 N. R. 6 W.

73



3118-L Gcb; headwater of  
Imiknegeck Creek  
(Lisburne or Skagit?)  
NW T.32 N. R. 7 W.

(74)

Jul 7-5-70

Ains Mtn Section

198

Mikesh, Abrahamson, Rosseter, Erikson

?Skagit Fm. - new section;

Section  
Drawn

Baird Mountains Quad SW NE

T. 27 N. R. 4. W. in small  
drainage exposed along <sup>flanks of</sup> steep talus  
ridge. Section measured bottom  $\rightarrow$  top

[Base]

$\approx 2'$

(incomplete-  
base not  
exposed)

5001-L

Dolo, v. finely xtal, grayish blk  
weathers med dk gray; thin bedded,  
resist ledge-former, homogeneous;  
upper contact distinct & irregular  
no recognizable structures; true  
thickness indeterminable; orientation  
of strata: N20E 45°W

3'

5002-L

Dolo, v. finely xtal, med dk gray  
weathers lt. gray; resistant; homogeneous,  
thin bedded, orig. with probably mdt,  
unfossiliferous; upper contact distinct  
and slightly irreg.

(75)



521

3' Same as (A); upper contact obscured.

1' Dolo, v. finely xtall w/ calcite  
5003-L birdseye (b.e.); med gray weathers  
med lt. gray; v. faint lams; upper  
cont. distinct & irreg.

6" Dolo, v. finely xtall w/ numerous  
calcite b.e., med gray weat. med  
lt. gray in 1" layers; upper  
surface v. irreg.

3' Same as (A); upper contact  
5004-L virtually planar; possible  
burrows; thin (1/4") shale  
beds are between some of  
the bedding planes.

(76)

h21

2 1/8

6' Dolo, v. finely xtall, good algal  
5005-L struc. on fresh surf. of upper  
5" - the rest is similar to (A)

1 1/2' Same as (A)

6' Dolo, v. finely xtall, numerous  
5006-L algal lams which increase  
upward; lighter color upward;  
indiv. beds 8"-12" thick; top of  
beds slightly irreg.; med dk gray  
weat. med gray;

5007-L upper 1' med gray w/ numerous b.e.,  
fewer lams, possible mudcracks;  
prob. gradational between supratidal  
& intertidal; weat. lt. gray

(77)



4' Dolo., lt. gray weat vy lt  
5008-L gray; vy finely xtall, no  
b.e., many algal mat structures;  
flat pebble breccias (displaced  
mats); mud cracks between convex  
downward mats; occasional stylolites

3' Highly fractured; slope forma;  
5009-L similar to (A); indiv. beds  
1/2"-6"; burrowed; upper contact  
distinct & irreg.

3' Dolo., mottled weat surf  
5010-L indicates burrows; med dk  
gray, <sup>burrows</sup> weat lt. gray; finely  
xtall; burrows 1/6" diameter,  
some 1/2"; randomly dist;  
small burrows are round, larger  
ones ellipsoidal; burrow walls may  
be finer grained than enclosing rk.

2' Dolo, finely xtall, grayish black  
5011-L weat lt. gray; grades from  
(base) burrowed at base upward  
into laminated algal mats  
at top.

5012-L  
(top)

1' Similar to (A)

2 1/2" Dolo, finely xtall, algal mats;  
5013-L dk at base grading to lt. at top

4 1/2" Dolo., finely xtall, vy lt. gray  
5014-L weat yellowish orange; upper  
(upper 1') cont. even; burrowed except for  
upper 1 1/2" which is homogeneous  
and lighter in color.

1 1/2" Supratidal; much b.e. parallel to  
5015-L bedding; med gray weat lt. gray;  
(middle) many laminae - no breccias



3' Similar to (A) but burrowed;  
5016-L top slightly irreg.

6' Dolo, v. finely xfall, basal 6"  
5017-L v. thinly lamin. w/ algal mats;  
( $\approx 6''$  from base) med gray weat same; remaining  
5 1/2 ft. finely xfall dolo, med  
5018-L gray weat med lt. gray; abundant  
(top) b.e. parallel to lams.

1' Planar lamin. algal mats, dolo,  
5019-L finely xfall; med dk gray weat  
lt. olive gray; v. thinly lamin  
algal struct.; no b.e.

2' Alternating wavy algal mats &  
5020-L b.e.; numerous mud cracks; med lt. gray  
weath med dk gray/v. lt. gray; color  
variations vary w/ lams (i.e. banded);  
upper contact irreg.

6' Dolo, finely xfall, highly bioturbated;  
5021-L dk gray weath yellowish orange/  
med lt. gray

5' Dolo, finely xfall, med dk gray  
5022-L weath med gray; lower part of  
(mid) unit w/ numerous burrows  $\approx 1/2''$   
dia. - possible branching & lighter  
in color than matrix.

5' Dolo, algal mats w/ minor b.e.;  
5023-L some brecciation; gray blk  
(base) weath med gray

2' Supratidal w/ b.e.  
5024-L

5' Covered



3' Dolomite mdst., v. fine  
5025-L grained w/ algal mats;  
some breccias; occasional  
lmst mdst layers (rare)

4' Algal mat even lams;  
5026-L no b.e. or breccias

9' Covered

2' Lmst. wkst/lmdst. containing  
5027-L poorly preserved fossils  
5027-C

5028-L convex downward frags  
w/ mudcracks between;  
contact slightly irreg.  
[photograph]

10" Lmst mdst/wkst; v. faintly  
5029-L lamin., med gray weathers  
5029-C med lt. gray; upper cont.  
distinct + irreg.

6' Lmst mdst, highly burrowed;  
5030-L burrows  $\approx 1/2"$  dia +  
5030-C parallel to bedding; dk  
gray weath med lt. gray;  
indiv beds 3"-24" thick;  
preferential parting along  
burrowed zones.

3' Dolomitic lmst; algal  
5031-L mats w/ continuous  
color banding.

2' Dolo., burrowed; fillings more  
5032-L coarsely xtal than surrounding  
rock; upper cont. obscured;



7' Dolo w/ b.e. struc. sporadic;  
5033-L algal mat, no breccias +  
(mid) no color bands; small  
breccias in dolo randomly  
dist., upper cont. even

6' Dolo, finely x'tall; dk gray  
5034-L weath mottled dk gray / lt. gray;  
highly burrowed - lt. gray  
is burrow filling.

1' Algal mat w/ b.e.; dolo,  
5035-L finely x'tall; med dk gray  
weath. med gray.

6' Dolo., massive, homogeneous;  
5036-L w/ numerous lt. thin,  
discontin. caliche seams  
in random orient., dk gray.

7' Interbeds of highly burrowed  
bioturbated units & lighter  
colored algal mat, brecciated  
b.e. unit.

2' Dolo, dk gray burrowed zone

1' Grades from burrow into  
algal mats upward;  
upper contact slightly  
irreg; dolo.

4' Same as underlying unit; upper  
5037-L 3' algal; no breccias, just  
(at contact of burrow + algal)  
b.e. & mat w/ some  
mudcracks; planar lams;  
upper cont. slightly irreg.



3' Dolo; finely x tall, burrowed,  
dk gray; upper cont. irreg.

2½' Burrows grading upward  
5038-L into algal mats; burrows  
(lams) filled w/ calcite & ± ¼" dia.

20' Covered

20' Dolo, finely x tall, burrowed;  
5039-L variable sized burrows - most  
(base) parallel to bedding; dk gray  
weath lt. gray mottled;

5040-L indiv. beds from 4"-24" thick.  
(top)

200± Float (covered)  
5041-F from float

15' Dolo., fine/med x tall, lt  
5042-L gray weath same; burrows;  
(mid) calcite replacing ? fossils;  
possib. algal struc., interbeds  
of pkst & wkst/mdst;  
5043-L beds 1'-2' thick & even.  
(base 4")

8' Dolo., fine/med. x tall, med  
5044-L gray weath by lt. gray;  
beds 4"-8" thick & even;

5045-L fossil breccia inst pkst.

≈ 200' Covered

4' Dolo., finely x tall, beds  
5046-L 1' thick; interbeds of fine  
grained carbonate sand  
lenses (≈ 2" thick × 1' long).



1' Supratidal w/b.e.  
5047-L overlain by algal  
mats (ca 4").

5048-F float

5049-F float (reefoid)  
(ridge top)

Upper  $\frac{1}{3}$  of section is covered  
+ poorly exposed; talus +  
in situ material at ridge top  
show numerous algal/coral  
associations, porous, dolomite -  
suggestive of core reef rock;  
some voids filled w/calcite spar.

5050-G Gneiss of igneous  
rocks in fault contact  
w/ Skagit on western  
part of ridge.

5051-L through 5059-L represent  
oriented samples through  
a cycle of subtidal-intertidal  
supratidal deposition. These  
samples are progressive upward  
and represent an unbroken  
sequence.



7-6-70

Milesk, Rossetti

4  
5

Lisburne - Utukok Fms.

near Nucleus Mtn. Misheguk

Mtn. Quad, NE 1/4 T. 11 S. R. 36 W

Section described, collected, &  
measured top → bottom.

[Lisburne Fm.] Top.

- ① 15' Lmst pkst, abundant crinoidal  
5060-L hash, coarse grained, lt gray  
(bottom 1') weathers gray; massive bedding;  
no chert; lower contact w/ blk  
chert bed distinct but wavy;  
bottom 4" w/ coarser crinoidal  
hash than remainder - some  
stems up to 3/4"-1" dia.



(B)

30' Alternating layers of blk  
irreg. bedded chert ( $\approx 3"-6"$   
thick) and gray lmst. pkst,  
med grained w/ fetid odor  
from 6"-12" thick, much crinoidal  
hash but finer than overlying  
unit; occas. solitary corals  
& brachs.

5061-L  
(5' from top)

30' Same as (B); only w/ lmst.  
wkst / pkst, blk weath gray,  
fetid odor.

75'

Lmst pkst w/ vy minor blk  
chert ( $\leq 5\%$ ) lenses; med gray,  
med bedded; much crinoidal  
hash (med-coarse); weath  
lt. gray.

5062-L  
(+40)

(92)

10' Covered (contact of Lisburne  
& Utukuk)

[Utukuk Fm.]

Contact w/ Lisburne probably  
a fault as suggested by numerous  
vein fillings, fractures, slickensides,  
and change in dip direction.

5063-F

Taeniosus on float near  
top of Utukuk

$\approx 10'$

(C)

5064-L

Vy argill., med gray weathers  
blackish brown mottled, vy thin

5064-C

(mid)

bedded lmst wkst w/ scattered  
crinoidal hash zones ( $\leq 5\%$ );

no visible red strus.; occas.  
solit. corals  $\approx \frac{1}{2}"$  dia; entire unit  
highly bioturbated in horizontal  
plane.

(93)

104



50' Covered

15' Same as (C); bedding is slightly thicker (1'-4").  
5065-C (10' from top)

115' Lmst mdst/wkst, med gray weath brown to yellowish brown; v. thin bedded; w/

5066-L (5' from top)  
5067-L (10' from top)  
comminuted fossil frags < 30-40% of total (frags < 2 mm); faint laminae on some weathered layers suggest

v. fine low angle x-lams in 3-dimension; no visible bioturbation; fine x-lams could be result of tidal currents on settling of fine + coarser particles alternating due to slack water-high velocity tidal reversals;

(94)

occas. widely spaced siliceous layers w/ x-lams above - dk gray black 2"-3" thick.

5068-L (50' from top) - well devel. x-lams

5069-L  
5069-C (75' from top)

30' Same as (C); numerous horiz. trails (bioturbated); fossils more abundant (brachs, corals); x-lams in many indiv layers.

5071-F "Grab on talus"

85' v. thin bedded, gray blk weath yellowish brown; fossiliferous  
5072-F  
5072-C (top 3') Lmst wkst/pkst; fossils include brachs, pelecypods;

(95)

106



bioturbated in horiz. plane (much  
*Taonurus*; minor x-lams.

≈ 100' Covered; talus suggests  
unit similar to (C) only  
more argill.; many *Taonurus*  
traces.

10' Argill. limest. w/ *Taonurus*;  
v. thin bedded.

70' Limest. w/ thin bedded  
5078-L w/ thin x-lams; crinoidal  
(top) hash layers sporadic; burrows  
moderately numerous.

2' Qtz ss., homogeneous, dk gray  
5076-L weathers purplish brown; tite  
(quartzite), lams in top 6"; some  
hint of burrows.

(96)

50' Gray, thin bedded, v.

5077-L fine grained, strongly  
(top) calcareous ss., fine shallow  
5075-L angle x-lams showing  
(base) vertical tubular burrows

(P) as distortions of x-lams;  
tubular horiz. burrows (1/4"  
dia) visible on weathered  
surf.; occas. (<10%) beds  
of calcareous limest. w/ st.

10-20' Med gray, v. thin bedded,  
5073-L calc. siltstone; bedding lams  
(top 5') pronounced on weath. surf.  
(X) as alternating irreg. bands  
of black & yellow brown; few  
fossil frags, much more  
argillaceous than overlying  
units.

(97)

98



5074-L talus grab: med grained  
banded, calc. ss, well  
sorted w/ numerous  
vertical burrows  $\approx \frac{1}{4}$  -  $\frac{1}{2}$ " dia  
disturbing laminae; source  
probably unit (P)

50' Covered

1' Black, thin bedded siliceous  
5079-L siltstone; homogeneous; no  
(M) structures; lite; weath gray.

35' Fissile (largely due to  
5079-P fracturing) black clay  
(top) sh., noncalc., w/ some  
(N) silt particles; weath dk  
5080-P gray; interbeds of (M)  
(25' down)  $\approx 6$ " thick.

(98)

10' covered

35' Same as (N).

5081-L = highly micaceous sh (2' bed)  
(20' down)

5082-P  
(base)

80' Covered

45' DK gray, ry thin bedded,  
5083-L ry argill. Inst pkst w/  
(top) fossil brachs, crinoid stems;  
5083-P weath yellowish brown  
(base)

Section strongly folded + faulted  
in the lower sh. section +  
covered w/ grass + rubble  
to base of ridge.

(99)

110



The environment suggested by the Utukuk is that of a tidal flat progressing upward as a transgressive sequence to marginal tidal flat, sandy platform, inner shelf, then outer shelf. The Lestienne carbonates end the sequence w/ clean carbonates of an outer shelf open marine "clean" environment.

981

7-7-70 Miles

①  
of  
1

3119 - L.G.

Phyllite

N16E 21°N  
foliation

3120 - Geochron

Phyllite

N65W 12S  
foliation

Traverses of about 50 miles up stream and down stream from camp along course of Noatak River.

Phyllites and <sup>sporadically</sup> gravels exposed on banks. Greater number of phyllite exposures going downstream westward. Strongly metamorphosed and probable igneous rocks exposed along steep walls of Noatak Canyon - these are strongly contorted.



7-12/13-70

Upper Omar River

$\frac{1}{2}$   
11

meta sediments;

C. T. 24 N. R. 9 W., Baird

Mtn. Alaska Quadrangle

Probable units represented are

SKajit & Utukok.

Section measured + described

base → top.

Bedding orientation:

0-300'	{	N45E	38N	} Highly recrystallized + contacted SKajit
		N25E	63N	
		N15E	46N	
		N52E	28N	

300-500'	{	N51W	32S	} SKajit
		N65W	32S	



10' Lt gray, massive, calc,  
3121-L recrystall pressure welds,  
(+3) qtz. ss; strong bedding  
plane foliation; weath  
grayish brown; x-lams in  
relief on weath surf; numerous  
limonite specks + occas  
flat limonite "pebbles";

[OUT OF PLACE: FROM ABOVE]

Contact of recrystall. Skagit  
carbonates w/ metamorphosed  
detrital sediments above is  
marked-in part- by a distinct  
color change from ylt. gray  
weathering Skagit. to limonite gray  
brown weath ? Utukok. Highly  
variable bedding orientation and  
abundant vein calcite (most  
probably fracture fillings)

(104)

near color contact strongly  
suggests a fault contact  
of Skagit against ? Utukok.

3122-L <sup>strongly</sup> Metamorphosed, foliated  
(+50) gray to brown, calcareous  
qtz. ss; fine med gr  
N58W although grain boundaries  
335 difficult to pick; weath  
(+100) yellowish brown to gray;  
limonite specks; sediment  
structures obscured by  
metamorphic effects; some  
"argon"-like structures  
present on foliation  
surfaces ( $\approx \frac{1}{2}$ -1" dia); this  
interval is  $\approx 70\%$  covered;  
talus & exposures indicate  
uniformity - prob. due largely to  
metamorphism.

(105)



10'  
3123-L DK gray, ry thin bedded,  
(b) coarsely rextall argill  
lmst; possib burrows,  
ripple mx, & x-lams  
(variable orient); beds from  
1"-3" thick and irregular  
due mainly to distortion from  
metamorphism; weath lt. gray.

5'  
3124-L DK gray, massive, argill/  
silty, coarsely rextall lmst;  
discontinuous argill bands  
≈ 2mm thick appear brownish  
yellow on weath surf; possib  
dolomitic, lt yellow brown  
"means" on <sup>upper part</sup> bedding surface.

3/6/11  
= 20' Vy thin bedded (contorted),  
med gray, rextall lmst;

3125-L weath gray; w/ thin  
(+3) (1-4mm) ? silty lams that

3126-L weath yellow brown - lam,  
(+10) may be parallel or <sup>small</sup> wavy  
to bedding planes; vertical

3127-L burrows suggested; grades  
(+19) from ry thin bedded at  
base (≈ 1/2") to thin

(A) bedded at top (4-6"); slope-  
former; basal 2-4' weathers  
orange brown & is more  
ferruginous.

15' Massive, dk gray, coarsely  
3128-L rextall lmst.; occas 1" layers  
(b) of thin <sup>well cemented</sup> lamin, fine silt;  
virtually homogeneous

N73W  
37°S  
(b)



6' Paper thin, dk gray, strongly  
3129-P calc (recrystall), <sup>fine</sup> siltstone;  
3129-L highly argill; weath mottled  
(+3)

Ⓒ dk gray / orange brown in  
parallel alternations; occas.  
fine lams parallel to bedding.  
orange brown argill layers  
(1-4 mm thick) are highly  
variable in orientation.

8' Same as Ⓑ - massive

5' Same as Ⓐ, only bedding  
is all very thin.

7' Same as Ⓒ, numerous  
3130-L laminations (reg + incline).  
(+1)

20' Same as Ⓑ; med / thick  
bedded w / occas <sup>thin</sup> argill  
bands.

25' Same as Ⓑ; very thin  
bedded

20' Same as Ⓐ; slope  
former; <sup>weath</sup> orange brown  
at base.

6' Same as Ⓑ - massive

12' Same as Ⓑ; very thin  
bedded w / numerous very  
thin argill bands  
(1/4" thick).

2' Same as Ⓑ - massive



15' DK gray, v. thin bedded,  
3131-L coarsely rextall argill  
(+13) lms, slightly silty;  
suggestions of burrows and  
x-lams; irregular bedding;  
weath lt. gray.

6' Thin bedded, gray, coarsely  
rextall lms, weath lt. gray;  
moderately argill (yellow brown  
streaks); bedding irreg; no  
sed features recognized.

12' Same as (A); saddle/slope

4' Same as (B) - massive

3' Same as (B) - v. thin bedded w/  
numerous <sup>thin</sup> irreg argill bands.

(110)

5  
11  
4' Same as (B) - massive;  
<sup>most</sup> top bedding surface w/  
large (1'-2' diameter), very  
roughly circular domal  
features separated by  
deep (1"±), wide (1"±)  
channels - these appear  
to represent either large  
mudcracks or megainter-  
ference ripples



bedding  
surface

25' Thin bedded, dk gray,  
3132-L rextall, ~~calcareous~~, med gr,  
(+5) silty lms or calc. siltstone  
thin x-lams distinct, mottled  
weath gray (lms) and

(111)



orange brown argill bands; occas.  
thin vertical burrows; top 20'  
becoming  
less argill and more thinly  
bedded.

15' Same as (B) - massive

10' Same as (A)

2' Same as (B) - massive

30' Mostly covered; thin bedded  
textall lmst; variable  
dips here.

15' Same as (A) - slope former  
3133-1 at orange brown base  
(+6)

2' Same as (B) - massive

(112)

15' Same as (A) - saddle/slope  
former at orange brown  
base; more resistant  
upward.

20' Same as (B) - very thin  
bedded w/ thin argill  
bands.

5' Same as (B) - massive;  
roughly circular/polygonal  
mounds in relief on topmost  
surface - looks like  
mega interference ripples.

10' 1/2 thin/thin bedded, lt. gray, very fine  
3134-1 gr calc. ? siltstn; weath bright  
(+4) orange brown; forms slope; faint  
parallel lams suggested

(113)



5' Same as (B) - massive

25' Paper thin, coarsely rextall, gray lmst w/ minor yellow argill streaks; becoming less argill upward.

dup # !!

25' 3134-L (+10) Vg thin bedded, dk gray coarsely rextall, lmst w/ numerous limonite specks; irregular beds; no visible sed struct.

7' 3135-P (+4) Paper thin, green gray, ry fine gr. calcareous siltstn; weath orange yellow; forms saddle

(114)

5' 3136-L (6) Med bedded, lt gray, slightly calc. siltstn; bedding lams distinct on weath surf; weath orange brown & blocky; in saddle.

12' Same as (B) - paper thin w/ argill streaks.

10' Same as (B) - massive

15' Paper thin, dk gray, coarsely rextall lmst w/ argill lams more or less parallel to bedding; irregular; no sed. struct.

5' Same as (B) - massive; megainterfer ripples on top-most surface.

(115)



20' Same as (A) :

15' Same as (B) - massive

18' Paper thin, greenish gray, ry

3137-P fine gr. calcar. siltstn;

3138-L weath. orange yellow;  
(+5) forms slope; sed struct

cycle samples { 3139-L  
(+10) indistinct.

3140-L  
(+15)

7' Lt gray, ry coarsely xtal

cycle sample { 3141-L inst (marble); slightly argill;  
(+3) weath gray; no sed struct.

20' Same as (A) - saddle/slope  
former at orange brown  
weath base; more resistant  
upward.

(116)

5' Same as (B) - paper thin  
w/ thin argill bands.

30' Same as (B) - most is  
rubble covered; top 2-3'  
massive and uppermost  
surface undulating from  
megainterference ripples.

20' Same as (A)

25' Same as (B) - massive;  
argill, mottled brown/  
yellow-orange brown weath;  
forms cliff; becomes progressively  
thin bedded upward

(117)



15' Paper thin, highly argill,  
coarsely recrystall. limest., dk  
① gray weath. lt. gray w/orange  
brown argill streaks (arg.);  
no sed. struct., forms small  
bedges.

10' Same as ①

15' Same as ③ - mostly  
(dip slope) rubble covered.

15' Same as ① - forms slope;  
highly variable orientation of  
beds suggests a fault  
within the unit.

≈ 25' Same as ③ - massive

(118)

15' Same as ①

5' Same as ③ - massive

10' Same as ①

15' Same as ③ - massive

10' Same as ① - saddle

10' Same as ① - less argill  
at base; beds highly  
irreg.

5' Same as ③ - massive

15' Same as ①

20' Same as ③ - massive

(119)

9  
11



15' Same as (A)

30' Same as (B) - paper thin

5' Same as (B) - massive, w/ large megainterference ripples on uppermost surface.

15' Same as (A) - highly bioturbated in horing plane.  
3142-P (+7)

cycle samples { 3143-L (6)

3144-L (7)

15' Same as (B) - massive

cycle sample - 3145-L (6)

(120)

20' Same as (B) - paper thin ~~and~~ and argill.

3' Same as (B) - massive

10' Same as (B) - paper thin & argill.

45' Same as (B) - massive

15' Same as (B) - paper thin & argill.

2' Same as (B) - massive w/ megainterference ripples on uppermost surface

5' Same as (A) - slope

(121)



8' Same as (B) - paper thin,  
highly argill; contorted  
bedding

2' Same as (B) - massive

4' Same as (B) - paper thin,  
argill.

≈ 50' Mostly covered; talus  
indicates same as (D)

3' Same as (A)

3' Same as (B)

25' Same as (D)

275' <sup>mostly</sup> Covered - paper thin exposed; orient-  
ation variable; strongly fractured

[N80W]  
53S

3146-L From 14 gray, strongly  
textall linst; coarse;  
looks like SKajit beneath  
the detrital metasediments;  
sample from exposure  
ca. 55' up from ~~base~~  
top of covered interval.

Structurally messed up! Beds  
are not overturned; faulting  
suggested - as accounting for  
upper and lower contact of  
detrital  
metasediment sequence w/  
textall? SKajit carbonates.



7-14/15-70

Nunaviksak Ridge

$\frac{1}{12}$

Utukok Fm.; Wcent. T.10S.

R.39 W, Misheguk Mtn.

Alaska Qued. section  
measured & described base  
to top (north to south).

Basal contact w/ Noatak ss  
may be faulted.

First low ridge in saddle  
on north side of main  
ridge and  $\approx \frac{1}{4}$  mi. away  
from change-in-slope base.  
Isolated exposure of ? basal  
Utukok. Orientation:  
N 68 E 53 S

Base to top.

Section  
Drawn



3' Black, thin bedded, tite,  
3152-L qtz ss, vry fine gr,  
(mid) moderately ferruginous, no  
visib sed struct; weath  
mottled rusty/black;  
grains fused.

(A)

1' DK gray, homogeneous, qtz.  
3153-L ss w/ faint, thin x-lams  
visible as yellow brown  
limonite bands on weath  
surf; vry fine gr, tite; occas  
small vertical burrows.

(B)

1' Lt gray, homog, strongly  
3154-L calcar, vry fine gr. qtz. ss,  
moderately ferrugen; x-lams;  
weath yellow brown/buff; tite;  
occas well preserved brachs.

(126)

4' Same as (A)

5' Lt. gray, homog, vry fine  
3155-L gr, slightly calcar. qtz.  
3155-F ss; w/ thin shallow  
(b) angle x-lams; weath  
yellow brown; tite, well  
preserved brachs in  
occas. layers.

2' Same as (A)

2' Same as (B)

~ 15' Covered interval

15' Mostly covered; talus suggests  
alternating dk & lt calc.  
x-laminated, tite, qtz. ss.

(127)

$\frac{3}{12}$



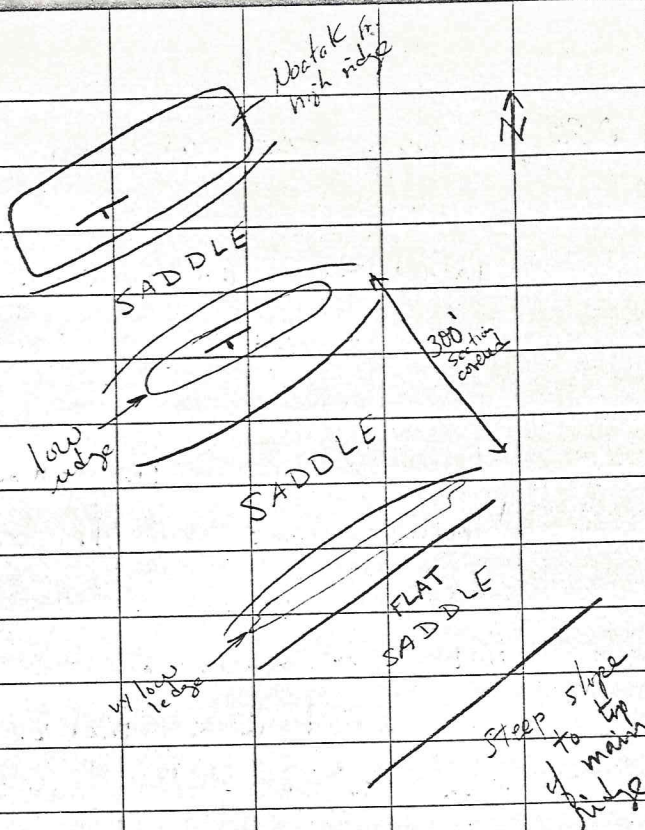
~ 300' Entirely covered w/ tundra  
 & small rubble scree and  
 represented topographically  
 as a saddle.

First low ledge at base  
 of major ridge; detached from  
 main ridge; mostly covered;  
 bordered on south by flat  
 grass/c<sup>rubble</sup> covered area before  
 main ridge.

= 2' (incomplete)

3150-L Lt gray, thin bedded limest wkst/

3151-F pkst; med gr., weath yellowish  
 brown; shallow angle x-lams  
 visible on weath surf; numerous  
 brachiopods on sporadic indiv.  
 bedding planes.



3  
1  
12



175

150-200'

Covered - no exposures

25'

3156-P  
(b)

Interbeds of dk gray, v. fine gr., tite, calcar. qtz. ss; some beds w/ x-lams; thin bedded; weath yellow brown — and: v. thin bedded/paper thin argill, calcar, fine siltstn w/ x-lams & numerous horiz. + vertical burrows; black, weath mottled yellowish brown / dk gray; numerous shaley layers intercalated + @ 1" thick.

4½'

3157-1

Gray, thin bedded, highly argill, <sup>silty</sup> / v. fine gr. lms + mdst or calc. siltstone; numerous fine x-lams w/ vertical burrows; weath: yellow brown.

①

130

4  
12

3'

DK gray, thin bedded, tite, noncalcar. qtz. ss; x-lams & parallel lams darker in color; weath ferrugin lt. brown.

10'

Same as ①; bedding becomes thinner upward and more argill w/ thin 1" sh layers appearing in top 5'.

35'

Covered - talus suggests continuation of underlying unit; highly disturbed in horiz. plane; more ferrugin. upwards.

3'

Same as ①

131



46" Gray, fossiliferous limst  
3158-C pkst; ? lenses between  
x-lam ss.

14' Alternating 1'-2' beds of  
3159-L gray, homogen., calcar.,  
3159-F highly bioturbated (burrowed),  
(T) v. fine gr., x-laminated,  
tite, qtz. ss — and less  
abundant 6" layers of  
fossiliferous argill. limst  
pkst w/ numerous spiniferid  
brachs (e.g. Mucrospinifer)

≈ 250' Talus covered — slope w/  
numerous slabs of v. argill  
calcar siltstn w/ densely  
packed Lebenspuren of  
Taormina.

(132)

5  
1  
12

8' Lt. gray, v. thin bedded,  
v. argill, calcar., v. fine  
siltstone w/ parallel and  
x-lams; weath yellowish  
brown; highly burrowed  
horiz. + vert., occas. fossil  
brachs — some pyritized.

60' Covered

60' V. thin bedded ( $\frac{1}{2}$ "-5"), lt  
3160-L gray, v. fine grn, argill,  
(+12) calcar. qtz. ss or coarse  
siltstone; highly burrowed,  
parallel + x-lams; thin  
(1") layers of fine,  
coarse siltstone; occas.  
ferruginous zones.

(E)

(133)



10' Lt. gray, thin bedded,  
3161-L humogen, tite, calcar., fine  
(b) siltstn w/ x-lams & burrows;  
(F) slightly argill; some beds  
w/ vy irreg. upper & lower  
contacts; weath H. brown

12' Covered - talus suggests  
Same as (E)

12' Same as (F); occas. brachiopod  
rich layers; thin bedded.

10' DK gray, vy thin bedded,  
calcar., argill, siltstn w/  
(G) numerous densely packed  
Taonurus on bedding planes;  
x-lams numerous; occas 1/4"-2"  
dia. vert. burrows distort lams.

(134)

40' Covered

50' Same as (G) - thin  
bedded w/ numerous platy  
weathering, 1"-2" silty  
layers; slope former.

120' Same as (G) - thin  
3162-L bedded w/ sporadic  
(+5) brachiopod-rich zones; <sup>lower 15'</sup> cliff  
3163-L former; 40' slope; 10' cliff;  
(+60) 55' slope - mostly  
covered.

± 25' DK gray, thin bedded, tite,  
3164-L calcar., vy fine grn. qtz. ss  
(+10) w/ minor argill bands;  
calc. lens intercalated <sup>thick</sup> 6" lenses of  
gray, med gr. fossilif.  
most pkst.

(135)

6  
1  
12



2' Black, crinoidal hash lmst

3165-L wkst, med gm. frags; (b)

(H) numerous brachs; weakly resistant slope former:

35' Same as (H) - highly

3166-F fossiliferous; slope former. (+20)

8' DK gray, thin bedded, highly

3167-L calcar. siltstn; slightly (5) micaceous; faint parallel lame; fossils rare; tite.

445' Mostly covered slope;

3168-F talus indicates same as (75-105')

(G) - extremely bioturbated

3169-L & argill; burrow tubes (125)

3169-F & *Taonurus* trails; occas.

1'-3' beds of (H); small ledge formers are argill., crinoidal

(136)

3170-L lmst wkst / siltstone.

(+275) This interval is essentially

3171-L one continuous sequence of (390) alternating *Taonurus*-bearing,

3172-L argill., calcar. siltstone w/ (445) dk gray, argill., crinoidal, brachiopod bearing lmst

Wkst / pkst as ledge formers; exposures are evative.

N65W Top of north ridge:  
33 S

± 20' Lt. gray, fine gr., calcar,

3173-L qtz. siltstn; parallel + (b) x-lame, thin bedded;

strongly fractured, contorted - may be faulted (minor).

(137)

7  
12



≈ 20' Mostly covered: v. argill.  
calcar. siltstone; paper thin  
N 78 W to v. thin bedded; weath  
31 S orange brown.

6' V. thin bedded, dk gray  
3174-C calcar. siltstn; fine gr.,  
(+3) slightly argill; x-lams;  
brachiopods; - an isolated  
exposure.

15' Same as (D) - most in  
slope & talus covered.

40' Covered interval

7/15

90' Lt. gray, v. thin bedded,  
3175-C argill, strongly calcar,  
(b) v. fine gr. siltstone,  
lts, strongly laminated  
(x & parallel) - extremely  
bioturbated; <sup>intercalated</sup> dense brach-  
rioped layers in apparently  
(J) more highly calcar. rock  
(prob. silty lmst pkst -  
conodont sample from here);  
burrows represented as trails  
& tubes on horiz. plane;  
vertical burrows disturb  
lams; weath. yellow brown;  
dominant cliff former.

10' Gray, v. thin bedded (1/2"-4"),  
3176-C highly argill. v. fine gr.  
3176-P lmst wkst/mdst; highly  
(+5) bioturbated.

8  
1/2



can't vertically parallel lams - some  
x-lams; forms slope; weath  
limonitic mottled w/ gray; more  
argill upwards; upper 5'  
is crinoidal hash & occas  
planispiral  
gastropods.

133' Same as (J) - highly  
3177-L bioturbated; occas. dense  
(+6) brachiopod / lmst zones  
3178-L (1'-2' + very sporadic).  
(+130)

5' Same as (K)

45' Same as (J)

(L) 36' DK gray, thin bedded, fine  
3179-L gr., slightly argill lmst  
3179-C wkst; crinoidal hash;  
(+10) x-lams rare; homogeneous;

1  
12

weath gray; slight ledge  
former; top 10' more argill  
and w/ brachiopod debris -  
also very thin bedded and  
forms slope.

40' Same as (K) - paper thin;  
numerous Tamurus; upper  
20' is resistant ledge former.

30' Same as (L) - more argill.  
3180-C at top 10' and bioturbated.  
(T)

65' Gray, very thin bedded, very argill,  
3181-L highly calcareous, very fine gr.  
(T) siltstn w/ numerous Tamurus,  
(M) parallel lams; slope former;  
crinoidal hash lmst units in  
lower 40' + more argill  
upward.

(141)



44' Same as (M) - few  
crinoidal hash zones.

6' Med gray, thin bedded, silty  
3182-L lmst wkst, fine gr., fossilif.  
3182-C (b) (pelecypods + brachs); lams;  
slightly argill; weath yellowish  
brown.

75' Same as (M) - upper 20' more  
3183-L structureless w/ fossil zones  
(T) (brachs).

N85W  
31°S

≈ 200' 95% talus covered slope;  
occasional 1-2 exposures indicate  
same as (L), upper 75' ±  
is extremely argill (saddle)  
+ weath orangish brown in  
contrast to gray weath lower part.

(142)

130' DK gray, thin bedded,  
3184-L argill, calcar, fine gr.  
(+10) siltstn; numerous x-lams;  
bioturbated moderately;  
(P) minor interbeds of fossilif.  
lt gray lmst pkst - some  
are lense-like (>10%); top  
70' more argill + very thin  
bedded + weath orangish  
brown.

90' Same as (P) - thin bedded,  
3185-L more homogen., but w/  
(b) numerous parallel lams;  
bioturbations not abundant;  
tite.

30' Same as (M) - slope former;  
w/ some crinoidal debris.

(143)

10  
4  
12

(141)



90' Same as (P) - more  
3186-C argill., ridge former  
(+80)

120' Same as (M) - slope;  
3187-L numerous Taenurus, argill.  
(+50)

15' Same as (L) - ledge

12' Gray, paper thin, calcareous, very  
fine gr. siltstn; tub; some  
(Q) fossiliferous crinoidal hash beds;  
weath orange brown; argill;  
burrowed; slope.

45' Same as (P) - mostly  
3188-L covered; occas. coarse crinoidal  
(b) hash layers; occas. 5'  
3189-C interbeds of (Q); rare Taenurus  
(+20) but numerous tubular long burrows

(144)

14' Same as (M) - slope;  
numerous Taenurus

8' Same as (P)

28' Same as (M) - slope

15' Same as (J) - ledge.

3190-L  
(b)

11' DK gray, very thin bedded,  
argill., crinoidal hash most  
(R) pkst; bioturbated; weath  
gray brown; slope

20' DK gray, thin bedded, <sup>highly</sup> argill  
most pkst w/ sparse crinoidal  
(S) hash; highly bioturbated but  
no Taenurus; ridge;  
weath gray brown.

(145)

11  
12



4' Same as (R) - slope

15' Same as (S) - ledge

11' Same as (R) - slope

≈ 135' Gray, thin bedded, w/ fine

3191-L op. lmst mdst/wkst; parallel

3191-C laminae; slightly argill; vertical  
(+5) burrows; burrow tubes (1/4-3/4")

3192-L on bedding surfaces; mostly  
(+70) in orange in covered slope alternating

w/ orange brown weath,

(V) argill, calcar. siltstn - no  
Taronurus in any of this seq-  
uence; ≈ 25 cycles in  
5' thicknesses.

9' Same as (M)

(146)

70' Gray, thin bedded, silty

3193-C lmst wkst/mdst w/ numerous

(b) 3193-L well developed x-lams;  
(b) highly bioturbated vertically;  
weath lt. gray; ridge;  
homogen.; tite; fossils rare.

25' Same as (L)

180' Mostly covered slope -  
value suggests same as  
(V) in 3-5' alternations  
of ≈ 30-35 cycles; no  
Taronurus.

✓ 186' Same as (Q) - thin 6"-12"

3194-L layers of paper thin silty

3195-P sh at ≈ 80' (2-3 layers).

(shale)  
+80

(147)

12  
12  
12



20' DK gray, silty, thin bedded  
3196-C limest mdst, <sup>in thin beds,</sup> homogenizing  
(6) crinoidal hash in oolites.

(W) zones; sporadic brach  
lugs; Taenurus trails on  
some argill bedding surfaces.

155' Interbedded (W) (≈ i) and  
3197-P sh beds (6"); sampled sh  
3197-C beds are paper thin, slightly  
(+65) calcareous; some bryozoan on  
bedding planes. 3198-L  
(+70) from carbonate; 3201-C  
(top 3") from thin clay shale,  
directly beneath Lisburne.

Cu

C<sub>2</sub>

3199-L Lisburne Fm - Gray, med bedded  
(5) 3200-L limest mdst w/ coarse (large) crinoid  
+50 stems + frags; fetid odor; black,  
bedded, 4" chert layers at +45

N 84 E  
(148) 36 S

7-17/18-70 Upper Agashashok River 1/3

Section: ? Skagit Fm.

Baird Mtns Quad, SE 1/4 T.26N. R.12W.  
Exposed in tributary valley and on ridge.

A distinct fault contact was  
observed between massive, highly  
recrystallized (typical Skagit) carbonate  
dipping south and the bedded less  
recrystallized, fossiliferous <sup>northward dipping</sup> carbonates  
above - relationship is evident at  
the lower portion of the tributary  
and its west flanking ridge slope.  
Measurements + description begun  
at fault contact = bottom → top.

section  
drawn

[BOSE] 70' Massive, highly recrystallized

3202-L limest mdst/wkst w/ cross  
(base) cutting, thin calcite veins;  
med gray weath gray; no  
sed struc.

(149)



40' Med gray, thin/med bedded,  
3203-L med xtall lmsst wkst,  
(base) weath lt. gray; homogeneous.

Strike & Dip here:

N82E 22°N

3' Med gray, thin bedded,  
3204-L fine xtall lmsst mst w/  
algal lam structures parallel  
to bedding; weath lt.  
gray; w/ cross cutting calcite  
veins.

75' Med gray, thin/med bedded,  
3205-L med. xtall lmsst wkst,  
(base) weath lt gray; indeterminate  
tubular fossils at base  
( $\approx 1-2$  mm. dia) - possibly they  
are fragments of branching

(150)

3  
13  
stromatopoids; sporadic finely  
3206-L xtall lmsst mst; upper half  
(+55) med bedded to massive; upper  
6' contains numerous plate-  
like, tabular, thin, tapered  
calcite structures, most but not  
all of which are parallel to  
bedding ("megapotatochip structures")



These appear to be almost entirely  
crystalline calcite w/ no visible  
structures.

2'  
3207-L DK gray, v. thin bedded lmsst  
mst w/ thin ( $\frac{1}{2}$ -2") banded  
layers of white weathering  
densely packed parallel algal  
lams; weath lt/med gray.

(151)



15' Med gray, v. thick bedded,  
3208-L v. fine x tall lmst mdst  
w/ scattered, various-sized  
colonial <sup>tabulate</sup> coral heads, dome  
shaped algal struct, and small  
branching stromes; appears  
to represent a biostrome -  
most of the coral & algal  
fossils are in growth position;  
v. faint fetid odor.

1/2' DK gray, v. thin bedded  
3209-L lmst mdst matrix w/ densely  
packed, thin bands of white  
weathering algal laminae  
parallel to bedding

(152)

14' Med gray, v. thin bedded,  
3210-FL v. fine x tall lmst mdst  
(+8) w/ scattered, moderately  
dense, varisized (3"-12" across)  
coral heads (genus  
Favosites?) - definitely  
in growth position; some  
definitely have been  
broken and transported.

4' Consistent, v. thin bedded  
alternation between dk gray  
lmst mdst w/ dense white  
weath parallel algal laminae  
- and med gray, v. fine  
grained lmst mdst w/  
sporadic colon coral heads,  
algal dome struct. &  
branching stromes.

(153)

147



5' Med gray, thick bedded  
w/ fine x tall lmst mdst  
w/ scattered dense coral  
heads, algal "domes", and  
branching stromes; faintly  
faded

2' Gray, w/ thin bedded, lmst  
mdst w/ thin, densely spaced  
bands of white weath parallel  
algal lams.

3½' Med gray, homogeneous, w/  
fine x tall lmst mdst w/  
scattered dense coral  
heads, algal "domes", &  
branching stromes

(154)

4/13  
3' Gray, w/ thin bedded, lmst  
3211-L mdst w/ thin densely  
(top) spaced bands of white  
weath parallel algal lams.

2' DK gray, homogen., w/ fine  
3212-L x tall lmst mdst w/ uniformly  
spaced parallel algal lams  
throughout.

11' Med gray, thick bedded, w/  
fine x tall. lmst mdst w/  
scattered dense coral heads,  
algal "domes", & branching  
stromes.

2' Gray, w/ thin bedded lmst  
mdst w/ thin densely spaced  
bands of white weath parallel  
algal lams.

(155)

2.149



8' Med gray, thick bedded,  
vy fine xtall lnst mdst  
w/ scattered colon. coral  
heads (Favosites), algal "dunes",  
and branching stromes.

4' DK gray, homogen., vy finely  
xtall lnst mdst w/ uniformly  
spaced parallel algal lams  
throughout

55' Med gray, thick bedded, vy  
3213-L fine xtall lnst mdst w/  
(top) densely packed colon. coral  
heads (growth posi.), algal  
"dunes", & branching stromes.

(156)

5  
of  
13  
1' DK gray, homogen., vy finely  
xtall lnst mdst w/  
unif. spaced parallel algal  
lams throughout

1/2' Mixed: dk gray, lnst mdst  
w/ thin bands of white  
weath parallel algal lams -  
and dk gray, homogen., vy  
finely xtall lnst mdst w/  
uniformly spaced parallel  
algal lams.

12' Med gray, thick bedded, vy  
fine xtall lnst mdst w/  
densely packed coral heads  
(Favosites in growth posi.),  
algal "dunes" and scattered  
branching stromes; top 8' w/  
"megaprotachip stromes".

(157)



1' Same as previous unit, only  
 3214-L concentrated almost  
 3214-F exclusively w/ small  
 branching stromae frags.

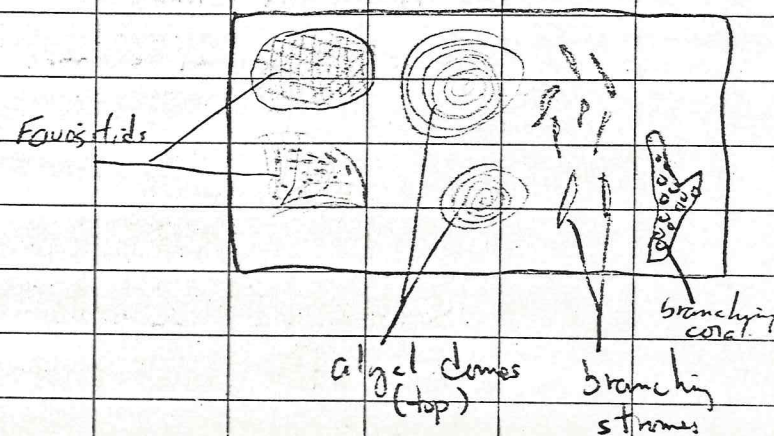
3' Med gray, unbedded, very  
 3215-L finely xtall limest. med  
 w/ densely packed coral  
 heads, algal "domes" and  
 scattered branching stromes;  
 "megapotaotchip" stromae throughout.

2' DK gray, homogen, very  
 3216-L finely xtall limest. med w/  
 uniform spaced parallel  
 algal lams throughout; top  
 6" is white death dense  
 parallel algal lams.

(158)

31' Med gray, very thick bedded,  
 very fine grained limest  
 med w/ densely packed  
 favosites coral heads  
 and algal "domes" - both  
 in growth position - and  
 scattered branching stromes.

Bedding surface:



(159)

153



1/2' DK gray, very thin bedded,  
recryst. lmst mdst w/  
thin densely packed parallel  
algal lams which weath  
out white.

11' Med gray, nonbedded, very  
3217-C finely xtl lmst mdst  
(+6) w/ densely packed coral  
heads, algal "domes," &  
scattered branching stromes;  
"megapota chip" stromes  
throughout

1/2' DK gray, very thin bedded,  
finely xtl. lmst mdst  
w/ thin densely spaced  
parallel algal lams, which  
weath out white.

(160)

7/13

6' Med gray, med/thick  
bedded, very fine grained  
lmst mdst w/ scattered  
colonial coral heads, algal  
domes, & occas branching  
stromes; top 1' w/ numerous

3218-LF thin branching stromes  
(top 1') frags parallel to bedding

5' Same as previous unit

3' DK gray, homogeneous, very  
3219-L fine xtl lmst mdst w/  
(+1) uniformly spaced parallel  
algal lams throughout, weath  
gray - & minor, thin  
white weath algal lam bases.

(161)

7/13



35' Med gray, very thick bedded, very fine x tall <sup>lms</sup> w/ <sup>packed</sup> mod st w/ very densely <sup>packed</sup> fossiliferous coral heads, algal "dunes", & scattered branching stromes; occas. branching corals.

12' Dk gray, fine x tall, massive  
3220-L lms w/ mod st, weath med gray, w/ numerous, irregular, black siliceous, very fine gr. siltstone blobs uniformly distributed - these generally trend elongate roughly parallel to bedding, slightly fossiliferous w/ coral heads, algal "dunes", & stromes.



162

3  
13

3' Gray black, thin bedded, 3221-L siliceous mudstone (chert)-bedded; weath yellowish gray mottled

25' Med gray, very thick bedded/massive, very fine 3222-F (+8) x tall lms w/ mod. densely packed coral heads, algal dunes, & branching stromes.

35' Same as (A)

2' Gray black, thin bedded, siliceous mod st - irreg.

163

157



6' Med gray, homogen., very fine  
xtall lmst mdst w/ coral  
heads, algal domes, & branching  
stroma frags.

135' Same as (A); siliceous  
3223-L blobs not as dense;  
(+115) extremely fossiliferous  
w/ large colon. coral  
heads.

140' Massive, med gray,  
3224-L recrystall lmst mdst/wkst;  
(top 5') no cross cutting caliche veins;  
weath. gray; sparsely fossilif  
w/ favositid coral heads

9  
13  
50' Med gray, very thick bedded/  
3225-L,F massive, very fine xtall. lmst  
(+35) mdst w/ med. densely  
distri. favositid coral  
heads, algal "domes", &  
branching stroma frags.

18' Med. gray, thick bedded,  
3226-L finely xtall lmst mdst;  
(+17) slightly argill.; w/ occas.  
coral heads & algal  
(B) "domes", but largely consisting  
of dense accum. of  
branching stromes.

3' DK gray black, very fine  
xtall lmst mdst, thin  
bedded; weath. dk gray;  
very sparsely fossilif.



12' Same as (B); some 1'-2'  
intervals of less  
concentrated stromes.

1' Same as (B)

4' Same as (C)

7' Same as (B)

5' Same as (C)

3227-L

± 215' Covered interval; talus  
suggests alternating beds  
of fine x-tall, fossilif, lmst  
mdst (corals, algae, stromes);  
- algal layers, - and  
concentrated strome layers.

(166)

15' Same as (B); w/  
"megapotato chip" structures.

18' Same as (A); w/ branching  
3228-L strome frags & "mega-  
(+10) potato chip" struct, massive

20' Massive, dk gray black, ry  
fine x-tall lmst mdst  
w/ numerous branching  
stromes; weath lt. gray

12' DK gray black, thin bedded,  
3229-L ry fine x-tall lmst mdst,  
(+11) weath dk gray; sparsely  
fossilif w/ algal "domes"  
& occas favorited coral  
heads.

(167)

19  
13



55' Same as (B)

3230-L  
(+11)

≈ 125' Covered interval

31'

3231-G  
(base)

(E)

DK gray, v. thin bedded,  
fine x tall lmst mdst;  
homogeneous; weath med gray;  
v. sparsely fossiliferous;  
faint petio odor in  
sporadic layers.

≈ 58' Covered

10'

3232-L  
(+5)

Same as (E)

(168)

5'

3233-L  
(base)

(G)

V. thin bedded, black,  
calcar, fine gr. siltstone;  
some layers w/ thin  
algal lams; weath mottled  
gray & black; irreg.  
bedding; some indiv.  
beds are calc. enough to  
be called silty lmst mdst.

70'

bracte interbeds of (E)  
& (G) in approx equal  
numbers of beds 3-10'  
thick; sparsely fossilif  
w/ favosited coral heads,  
gastropods; ridge former.

85'

3234-L  
(base)

3235-L  
(+35)

Same as previous unit, but  
lmst is coarsely recrystall-  
typical Skagit; ridge.

(169)

1/13



± 6.75'

3236-L  
(base)

Vy thin/thin bedded, med  
gray, med x tall lmst  
w/ kst (x tall); weath lt.

3237-L  
(+42)

gray; fossils sporadic in  
distribution - by few dense

3238-L  
(+205)

accumulations; no visible  
sed. structures; random

3239-L  
(+335)

interbeds of (G) (1'-5' thick);  
occas. coral heads

3240-L  
(+500)

- at 285': slight increase in  
density of fossils (colon corals,  
branching stromes, algal  
lams, + gastropods).

- at 360': increase in  
percentage of type (G) beds  
w/ lams (algal, but may be  
depositional) + fossil frags.

(170)

- at 370': obvious increase in  
fracture density; some bedding  
distortion; attitude of bedding  
planes difficult to follow;  
slight increase in type (G)  
beds.

- 390' to 675': Attitude of  
strata variable; fracture  
density high; evidence points  
to diag folding effects.

Oriental 450': N-S  
22° E

(171)



Overlying massive carbonate is  
in obvious fault contact w/  
underlying bedded units

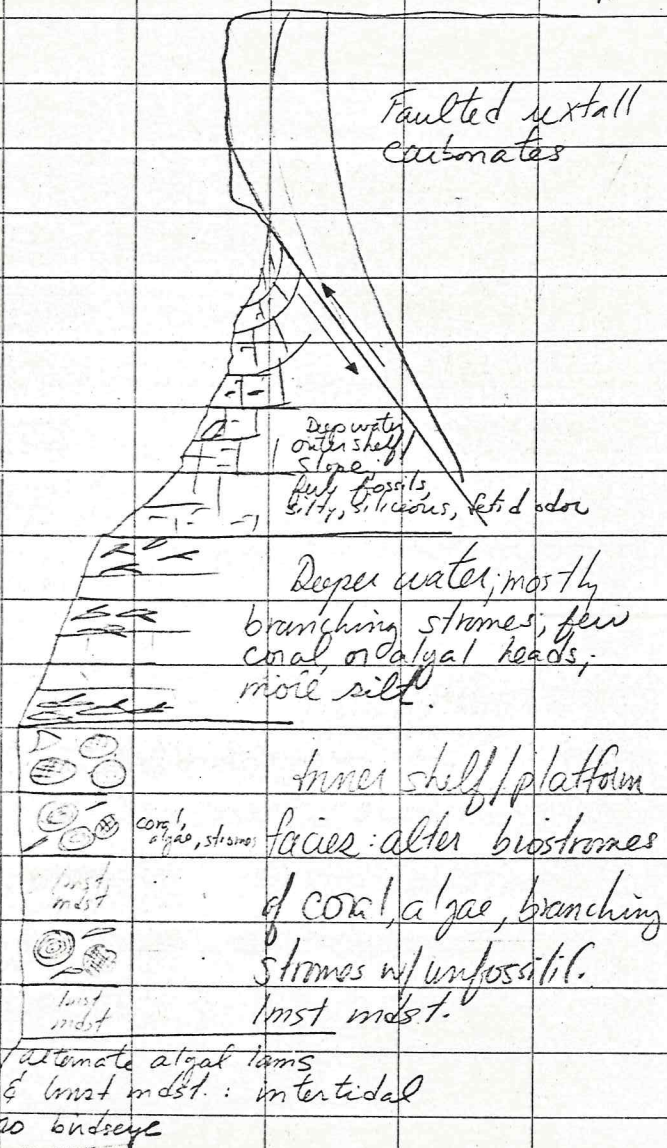
(e.g. bedding attitudes <sup>almost 90°</sup> changed  
increase in density + severity  
of fractures below fault; drag  
folding near contact, reddish  
brown fault breccia zone  
w/ thickness up to 3'

3241-L: base of massive

stream  
bed

173

13  
13





FIELD BOOK #4

D. Abrahamson's Field Book (Union Oil)

Sections: Slatipile Mtn.

General notes & section summaries

Field Book #4



12.5. shot

Lisburne / Kayah

both have phosphate

1970. Field Season

Pan Am / Union

June 4, 1970

Air Recon starting at 11:00 A.M.

Flew from Anaktuvuk Pass  
to Skimo Creek <sup>Anticline</sup> Landed and  
walked thru Lisburne and  
Siksikpuuk. Started in Lisburne  
just below the phosphate unit.  
Collected 9 samples in Lisburne  
and Siksikpuuk, most of them  
for conodonts.

Flew from Skimo Creek  
Anticline to Tiglukpuuk Creek  
Anticline. Then East along  
mountain front to Shainin Lake  
and to Nanushuk Lake. Turned  
around at St Nanushuk Lake and  
flew back to Mt. Wachsmonth -  
too much snow to land and  
recon section. Flew south

up Alapah Creek and discovered  
well exposed section west of  
Alapah Mt. and east of Alapah  
Creek. Section includes from  
shale with a Stuver member  
of heavy at cgl. thru much of  
Lisburne fm. All contacts  
appear to be well exposed.  
Fly by section appears  
thus



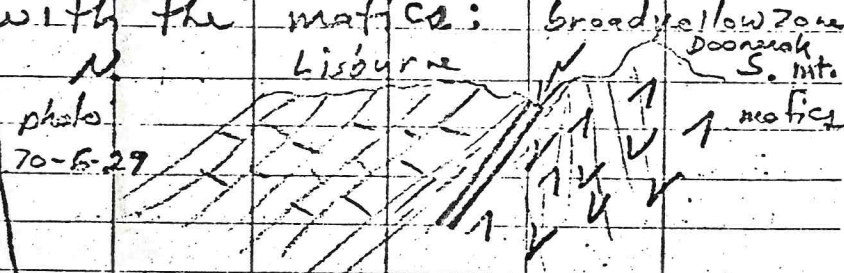
photo  
70-6-24

Continued flying south +  
west thru Range until direction  
changed to southerly direction.

Flew toward Slate Pile Mt.  
and noticed much Lisburne in  
area preserved in synclines  
at the top of the mt. peaks.



Lower parts of the mts. were  
a shale (Hunt Fork) with  
Kayak + Lisburne between.  
Flew toward Doonarak Mt.  
which Briggs reports is a mafic  
intrusion (Devonian by radiometric  
means). The northern part of  
the mt. is Lisburne + Kayak. The  
Lisburne + Kayak are in fault contact  
with the mafics: broad yellow zone



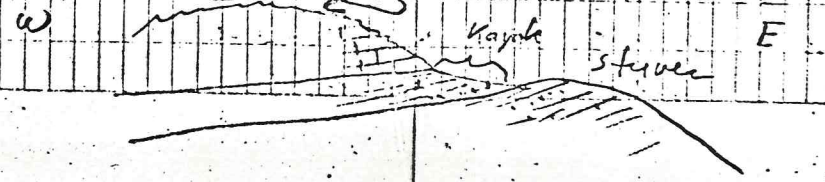
Made a stop at peak just  
east of the confluence of Ernie  
Creek and the N fork of the Kayukuk  
River and just west of Hanging  
Glacier Mt. The Lisburne/Kayak  
ctk. was well exposed. At  
least we (Bill Kropp, Bill Dalton +  
I) think it was Lisburne +  
Kayak. The Kayak is a

black  
slate with interbedded  
limestone and the Lisburne  
has the appearance of Lisburne  
anywhere else - complete with  
nodular black chert. Both the  
Kayak and basal beds of  
the Lisburne were cross cut  
by quartz veins.

Flew along ? River  
and saw a very thick  
monotone section of greenish  
gray slaty looking rock. Then  
flew north up the Anaktuvuk  
Valley back to the camp.

June 5, 1970

Took off in Jet Ranger with  
Bill K. + Bill D. we flew up to  
Nanushuk Mt. and walked thru  
the upper part of the Stuvia, Kayak  
Shale, and lower most unit of the  
Lisburne - Nanushuk Mt?





The Stiver is a sandy + shaly unit. The Kayak basal sand overlies the Stiver and the Kayak the grades upward from sand interbedded with shale to limestone interbedded with shale to shale interbedded with limestone. The Lisburne overlies the Kayak and is probably gradational with it. The limestones in the Kayak are packstones which are current-deposited. In fact on limestone unit appeared to contain Fe-banded bedding.

Flew from Nanushuk Mt. to well exposed section including Stiver thru Lisburne south of Marshmallow Mt. Section was too high and foggy for copter to land safely. Went on to Shainin Lake and refueled copter. Then flew west to Monotis Creek. Along the West fork of the South fork of Monotis Creek an  $\approx 300'$  foot section of Lisburne was seen. It appeared to me to be a basinal facies and a few phosphorites were seen in the blue. The entire

(10)  
thickness had a waxy pale yellowish green odor. The limestones were all very, very, thinly laminated mudstones except for some massive layers of mudstone <sup>weathered</sup> which appeared to be possible turbidites. Black chert beds were also common in the lower part of this section. The weathered layers were rare. photos 70-6-39-38 + 70-7-1 were taken at this local.

Flew from here West, north, and then east to Autumn Creek. Along Autumn Creek an  $\approx 300'$  section of Shublik was seen. The formation was Shublik as evidenced by abundant Halobia. It consisted of basinal mudstone + Halobia packstones. Some of the beds were replaced by black chert. A 1" lense of well rounded + sorted quartz sandstone was seen. Other fossil heads were also seen. The Shublik also had common thin inter-

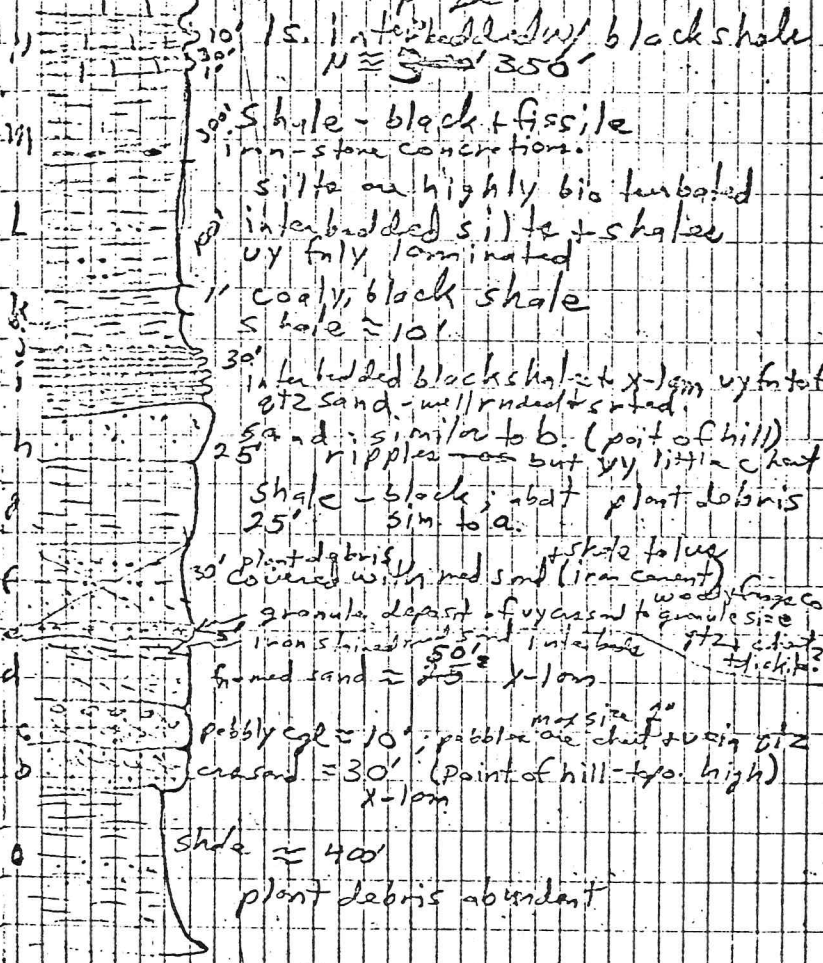


The beds of black <sup>sooty</sup> shale between the  
 P. member. Also thin unit of  
 and phosphatic were seen. The phosphatic  
 are consisted of oolitic type pellets  
 in with the bluish weathered efflorescence  
 with 6 ft. here and there south  
 up the Chandler River and  
 with them east and then north to  
 are Nanushuk mt. Almost everything  
 deep south of the Nanushuk mt. is  
 off. Dan Kanayut cgl.

June 6, 1920  
 Lis Marshmallow Mt. Section  
 Se started at approx. 8:00 AM.  
 cop Abrahamson & Dalness

5' Walked thru several hundred  
 feet of interbedded quartzose -  
 A. chert rich sands and dark  
 colored (mainly black) shale. Shale  
 is about 90% of section. Shales  
 contain abundant plant remains -  
 stems, leaves, etc. and common  
 wavy thin coaly layers. Unit is

probably Stuver Member of  
 Kanayut Conglomerate. Shales are  
 fissile + sands have much blo-  
 cation. O on page 13.



Marshmallow Mt. Section



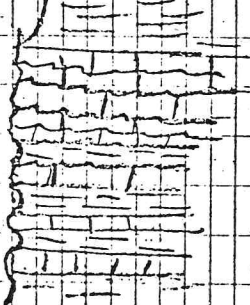
Unit H is probably the basal Kayak sandstone! It appears very similar to basal Kayak at Skainin Lake; Ripples (oscillation) & very well sorted & rounded, well cemented w/ silica. Unit I is interbedded of sands & black shales. All sands are finely laminated, well rounded & well sorted. Also the sands are highly bioturbated and are ferruginous. Oscillation ripples common in sand. Sand interbeds are 1" to 4" in thickness. Shale interbeds appear to be < 6" in thickness.

Contact between Kayak & Staver appears to be depositional & thus conformable!

Kayak grades upward from basal sand to sand w/ shale interbeds to siltstone with shale interbeds to shale to shale w/ limestone interbeds to limestone with shale interbeds to Lisburne carbonates.

Unit N Ls. interbedded w/ black shale. Ls. is a chert gas packstone. Abundant faunal variety of faunal types. Only faunal grains seen. Limestone is ferruginous giving it a reddish weathered color. Fresh color is very dark gray to black. Wavy, thin laminae characterize the beds which are up to 1-2' thick. Fauna includes, echinoderm frags, bryozoan frags, brachiopods. Many different types of bryozoan & brachiopods are present. Rugose horn corals.

N. 10' Ls. beds

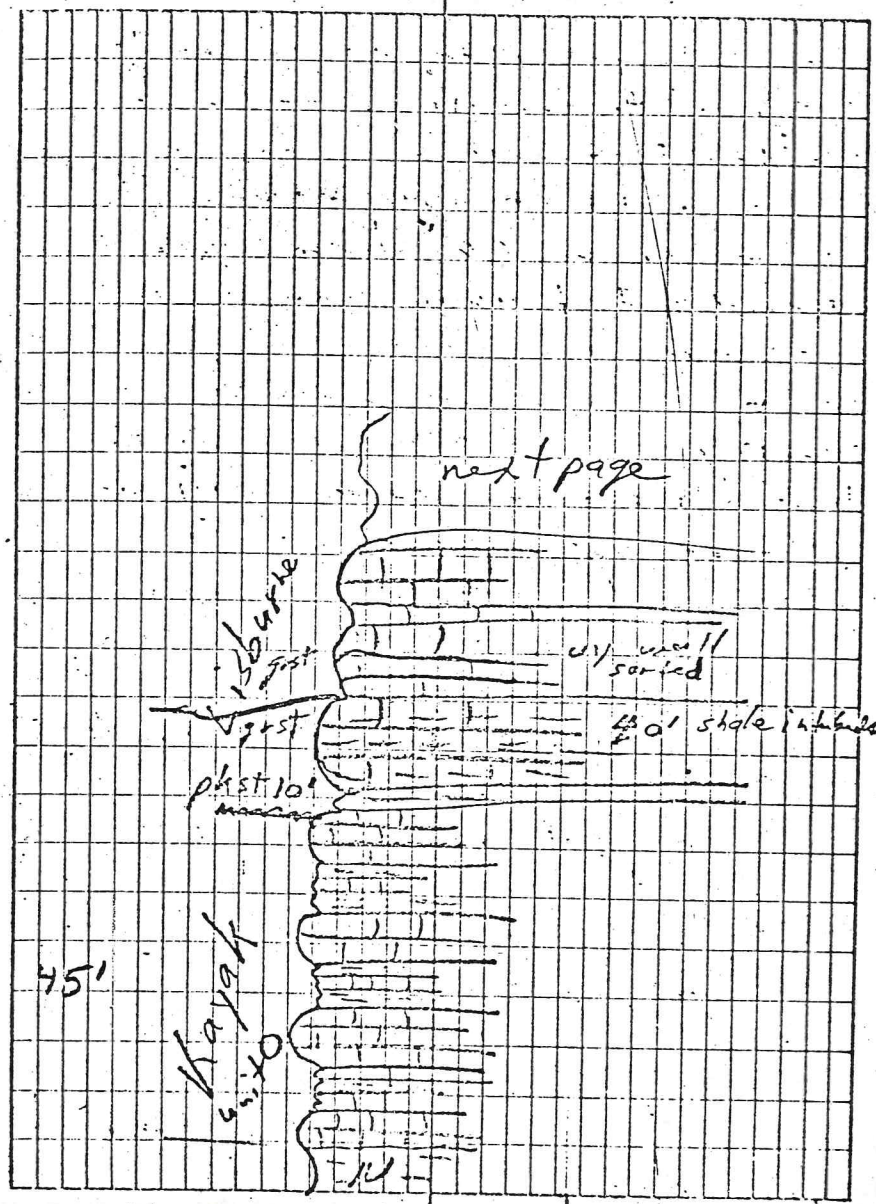


Unit N  $\approx 350'$   
 $\approx 1/30'$  Shale  $\approx 60\%$   
 Limestone  $\approx 40\%$



As go up section thru unit N the shale becomes very calcareous + lightens in color to a medium to dark gray. The limestones get less wavy bedded and turn into more massive beds that appear to be almost grainstone. At least some of the beds have had the faunal remains oriented by currents. Many of the lime beds are highly bioturbated. Some grainstones definitely appear about the middle of the unit. They are composed of well sorted faunal remains + the beds are x-laminated + part along oscillation ripple beds.

Unit O is a sequence of limestone interbedded with shale. Some chert appears in the limestone of this sequence. The shale is medium gray and highly calcareous. Nodular chert.



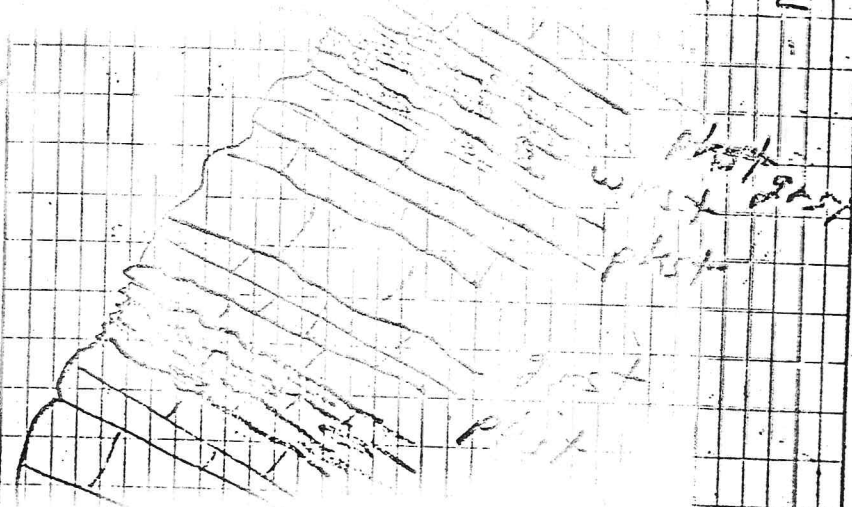


Some of the limestone are  
very intimately interbedded.  
In fact many of the limestones  
are highly argillaceous. The  
limestones are wackestones with  
abundant faunal remains. 10'  
shale is highly argillaceous  
and is  
clayey.

There is interbedded shale which  
may look about the same as the  
interbedded shales but look like  
the shales below. But the fossils here  
are massive or they are in  
the limestone. In other words  
the limestone is a contact

limestone. You will see  
graptolites also have abundant  
limestone coarse layers but  
each layer is well sorted  
which indicates current  
deposition by differing energy  
indexes.

Base of Lisbon:  
Grainstone - well rounded sorted  
faunal debris - corals, bryozoans, horn corals  
W



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Stopped section due to bad  
weather at 3:00 P.M. - High  
winds, fog, & rain at camp



June 7, 1970

Today the morning temperature was  $29^{\circ}\text{F}$  and snowing hard from the north at 8:00 A.M.

This weather continued without letup to 10:30 P.M.

at which time the temperature had dropped to below  $23^{\circ}\text{F}$ .

Also there was 3" of snow on the camp grounds at this time. Propane is also running low.

No one left camp today!

June 8, 1970

Another down-day due to snow. Started to clear in the morning & by afternoon was melting, but mountains have more snow now than when we arrived. Below freezing again tonight.

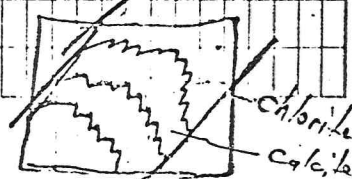
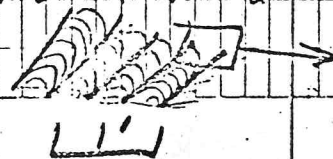
June 9, 1970

Flew south to Gunsight Mt. East of the John River to

15

measure a section of Skagit Fm. The fm. is a marble interlayered with talc + chloritic schists. The marble is calcite with some what appears to be relict dolomite surrounded by flowage structures. This dolomite is in oogen shaped lenses; is black; highly fractured; and at times is underlain by mineralized layers which include talc, chlorite & large pyrite cubes. The marble is coarsely xln, friable, and has been mineral differentiated into white and black layers which are bounded by slicken sided planes. The marble has a phyllitic structure.

The schist + layers are highly faulted + folded:





All semblance to original depositional textures have been destroyed by metamorphism. Many calcite + quartz veins cut randomly across the metamorphosed limestone. Some of these veins have been "stretched" into eigen shaped lenses:

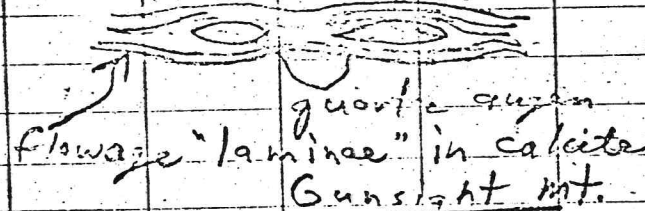
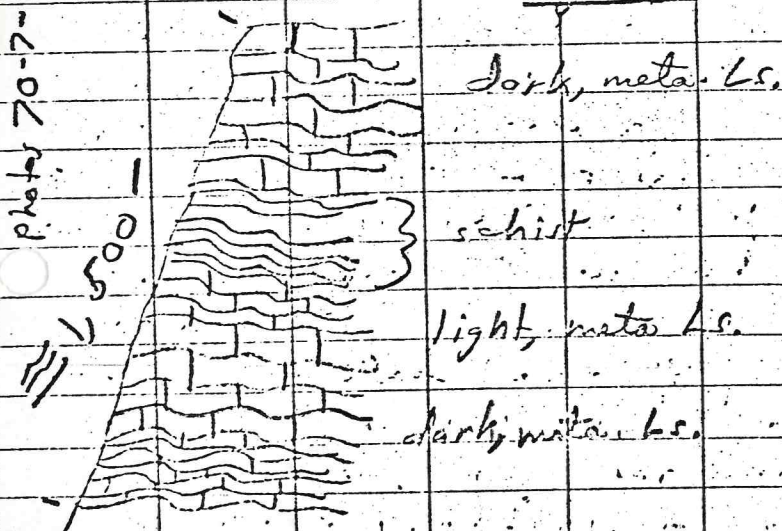


photo 70-7-17 June 21



Epidote? fracture fillings

are found randomly thru out the section.

June 10, 1970

Down day due to snow + low clouds. Snow slackened by noon but was still cold + windy from the north. Clouds were hanging over the mts. + shrouding them all day.

June 11, 1970

Left for Shainin Lake about 10:00 to fuel the Jet Ranger. Bill Knapp, Dalmer, and myself were passengers. Left Shainin Lake in the low fog + clouds and flew back to Anaktuvuk Pass, south down the John River, and up Publittuk Creek east over a divide into Tinayguk River. We were looking for a good, accessible Liburn section but didn't find one. The Hunt Fork Shale and



Kanayut Cgl. in this area is extremely folded & faulted - many of the folds are recumbent in the Kanayut. Flew east up the Tinayyak River to Slate pile mt. which is composed mainly of Kanayut & Hunt Fork but one arete is composed of Lisburne/Kayak in a syncline which appears to have been down faulted into the other sediments. The Lisburne here is thinly bedded and appears to be composed of at least 40% black chert nodules & beds. Had lunch near Haring Glacier mt. and then flew east past Mt. Doone-rak up the North Fork of the Koyukuk River. Flew past Amawik Mtn. looking for a Lisburne section, but no good accessible ones. All best Lisburne was too high & steep for working. Flew back to Shainin Lake for fuel via Dolah Pass and

ASW T, 195

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down the Itkillik River, west in front of the range to Shainin Lake. The Kanayut Cgl. along the Itkillik River is also highly folded and faulted. The Kanayut also appears to get less conglomeratic, more sandy, silty and chalybeate as go south. The structural complexity also heightens as one goes in a southerly direction. The bedding also gets thinner to south. S. Kanayut Cgl. N.



Highly Generalized!!

After refueling at Shainin Lake we again flew south thru Anaktuvuk Pass to Marsh Creek, up Marsh Creek to over a divide to Agiak Lake, down Agiak Creek, up Loon Creek, past Loon Lake, over the

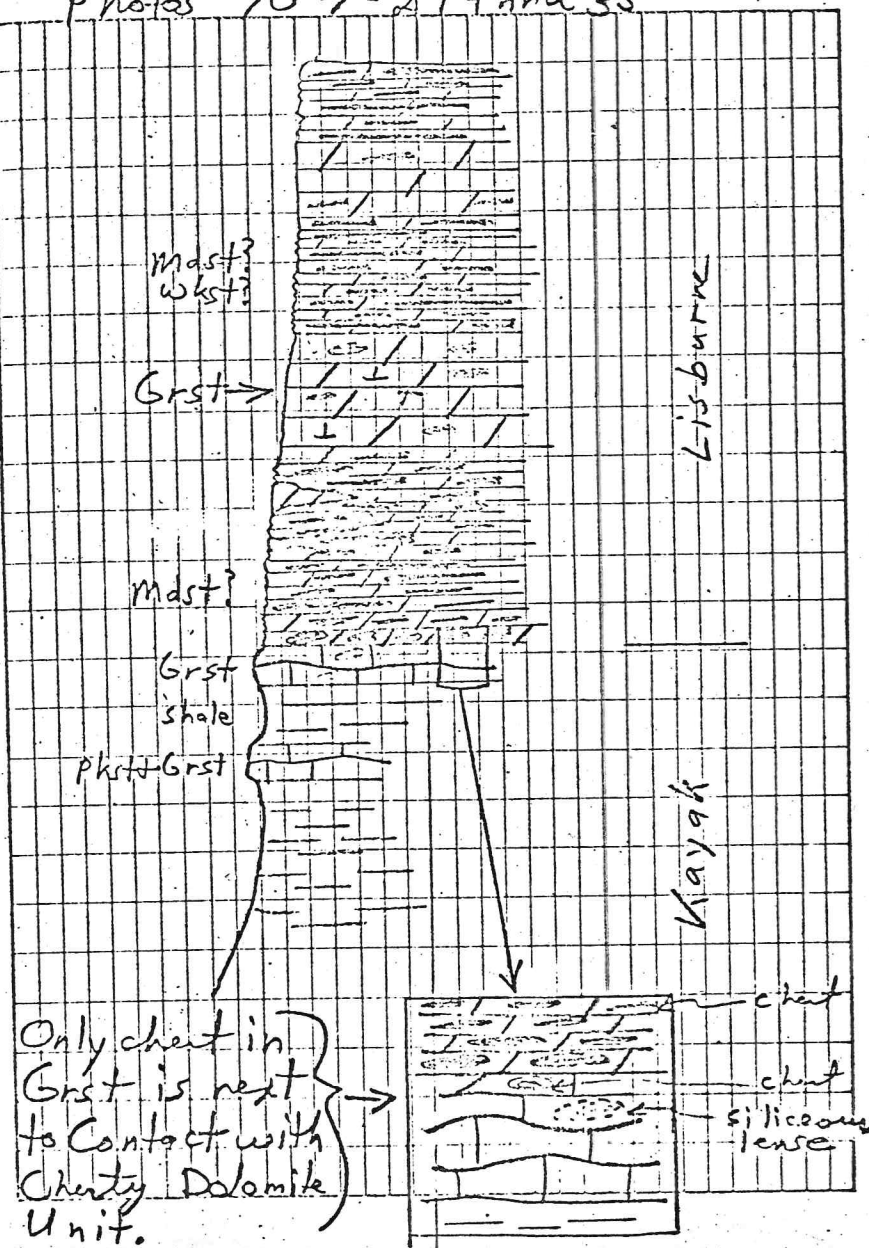


divide into Yenituk Creek, and finally to approx. the N.E. corner of R. 2W. and T. 17S. on the Chander Lake Quad. Here is a well exposed section of Lisburne/Kayak. The Lisburne is over 50% black chert. The chert occurs in finely laminated + finely xln dolomite. This composes the greatest amount of the section. But lenses and wedges of limy dolomite do occur. These wedges are vuggy + crsly xln with abundant crinoid remains. These <sup>coarse</sup> deposits were either grainstones or packstones which had a low mud content - They were definitely current deposits. Very rarely were fossil remains seen in the finely xln + cherty dolomite units. The crsly xln dolomite units are thickly bedded.

Generalized section occurs on next page leaf.

Flew back to camp up the John River. Arrived at about 5:30 PM.

Photos 70-7-29 thru 33





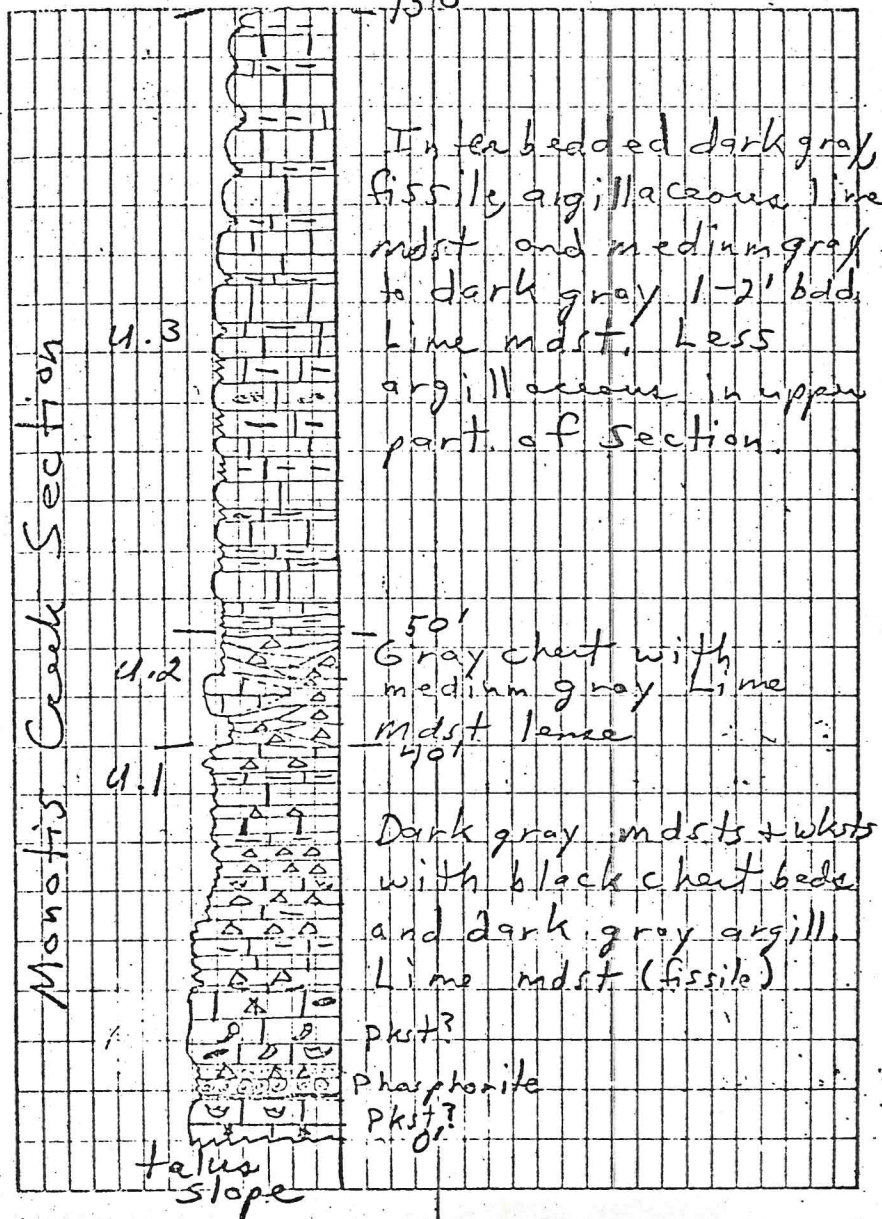
June 12, 1970

Flew to Monotis Creek to measure a section of Lisburne. Arrived about 12:00, ate lunch, and then measured section till about 4:30. Total section is about 150' thick of interbedded mdst + whts, and black cherts; and argillaceous mdsts. Rare pkst<sup>?</sup> beds were encountered. A 1' bed of phosphorite was seen near the base of the section.

The entire interval is a noncurrent deposited sequence. Entire section has a fetid + phosphatic odor, but this fetidness decreases up section. Heavy snow last night. But today a general warming trend up to 42° and some rain about 5:00 PM. Most of low elevation snow has melted.

Recent Erosion Surface

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June 13, 1970

Flew to Hanging Glacier Mt. via Slatepile Mt. Bill Dalness and I measured a  $\approx$  230' thick section of upper Kayak and lower Lirburne Fm. Started about 10:30 and finished about 2:00.

Flew back to camp. Dr. Jim Watkins (Mesozoic foram expert - Pan Am Petro. Corp.) and his asst. John Ericson (Pan Am summer hire) had just arrived on a Wien's flight. They left after supper for Schrader

Bluff to sample the Cretaceous rocks there for forams. Will be in that spike camp for 3 days.

Weather was foggy this morning and warm (46°). Warmer in the afternoon and high, scattered clouds. Same later in the evening.

20

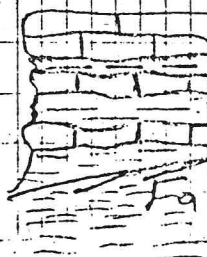
# Hanging Mt. Glacier Section (Recent Erosion Surface)



230' mdt + silicified

Dolomite

Limestone



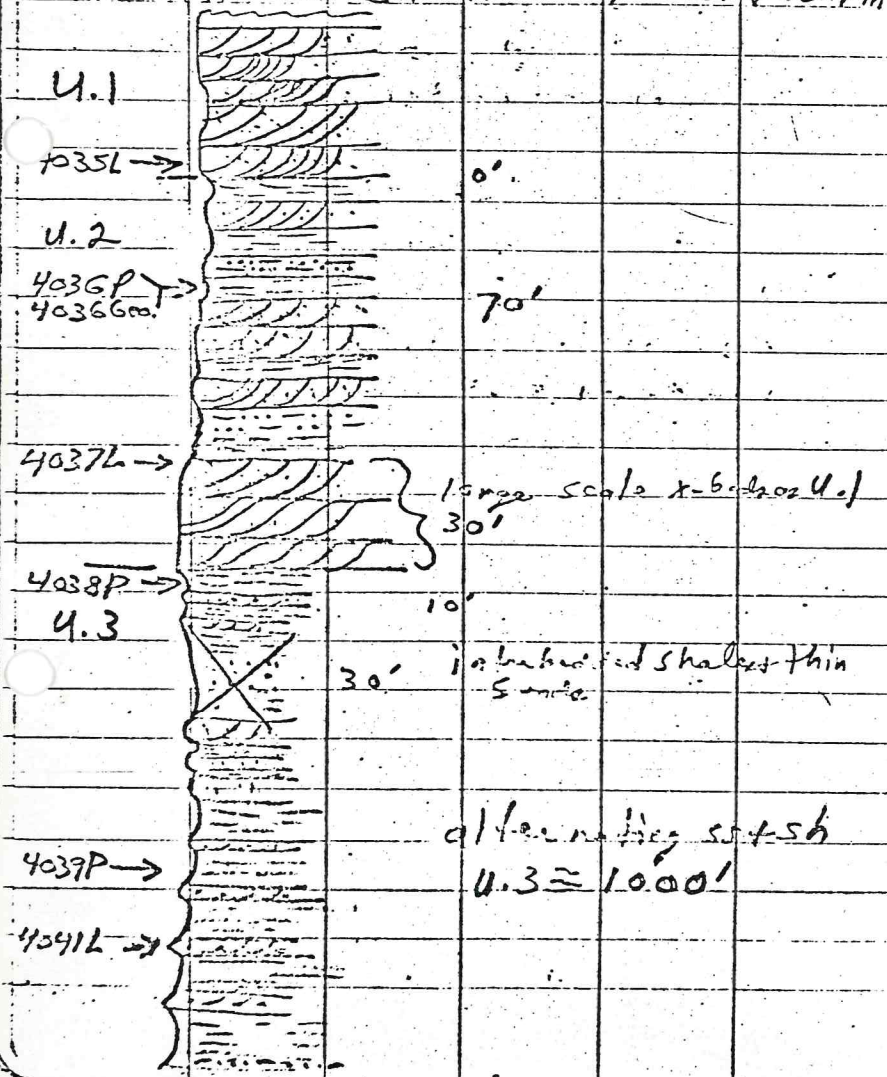
Fault in Kayak



June 14, 1970

Dalnes + Abrahamson

Slipile Mt. Section  
Scattered cumulus clouds + warm



Unit 1. Not measured Cliff face

Base of unit described.

Sandstone; weathers reddish brown,  
fresh - med. gray; medium grained,  
well rnd + sorted; dominantly quartz  
with minor chert (black); bedg  
1' - 4' thick; massive appearing.

Unit is x-bedded facies with  
x-beds varying in thickness from 1/2" to 2".

Directional features:

strike & dip of cross beds

All measured within 10' of base

N 75 W 30° S

N 35 W 18° S

N 70 W 32° S

N 45 W 20° S

N 60 W 18° S

N 70 W 24° S

N 90 W 26° S

N 25 W 15° S

Sands are micaceous on bedg  
planes (incipient metamorphism)

Sands are tight w/ siliceous cement.



Unit 2. 100' Slope + Cliff  
Sandstone interbedded with shale.  
Sandstone as Unit 1. but some  
is slightly calcareous.

Shale, black, fissile; shale  
contains carbonaceous plant  
fragments.

4036 P - Shale in mid of U.2

4036 Geochem - "

Sandstone 1-2' beds. x-lami.  
are abundant. Scour + fill channels  
common. Oscillation ripples common.  
Siltstone occur in part of U.2.  
They are dark med. gray fresh, &  
weather a reddish brown; are finely  
laminated and have mica flakes  
11 to bly. Siltstone are highly  
burrowed.

The Lower 30' interval is a  
sand similar to those comprising  
U.1.

Lower sands + silts of U.2

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have an abundance of quartz veins  
some up to 3" across.  
(mud clasts)

Clay chips were seen in the lower  
part of the unit.

Entire U.2 is tight with  
siliceous cement. Silt + Sand +  
Shale are micaceous on bdg.  
planes.

Unit 3. Slope former = 1000'  
Shale interbedded with Sandstone.  
Shale are black, fissile + at  
times slightly silty; thinly  
laminated + planar.

Sands: fine to med. grained; light  
gray + weather yellow brown;  
x-laminated, interference ripples;  
mostly quartz w/ minor chert; mica on  
bdg. planes; ridged + sorted; tight  
with silica cement.

Oscillation ripples are also  
common in sand. Scour + fill in



Some sand beds.

Shales in some parts of U.3  
are highly burrowed.

In float were seen:  
plant stems in shale  
groove + load casts  
mud cracks

burrowed sand + shales  
well developed burrows  
" " oscillation ripples

U.3 grades downward from  
shales interbedded with sand-  
stone to strictly black,  
fissile shales.

One bed of reverse graded  
flat pebble cgl. was seen in  
U.3. The bed was about  
8" thick. Knapp Sample  
no. 1026 L. About 300' below  
top of U.3.

Many of sands contain

rounded shale clasts.

40404 - pebble conglomeratic sand  
in float. Presumed to underlie  
U.1. Mostly quartz with minor  
chert <sup>sand</sup> chert pebbles up to  $\frac{1}{4}$ " in  
dia.

Cross laminations become rare  
in lower half of U.3 in the sands.  
Sands are only slightly wavy.

Sands become fine grained in  
lower half of U.3.

40414 - fine grad sand from  
lower half of U.3.

Last out crop in U.3 is  
predominantly a siltstone; weathers  
rusty brown; fresh med. gray; fissile  
wavy laminae with beds up to 6"  
thick. Mostly quartz silt.  
micaceous on bedding planes.  
burrows; small oscillation ripples

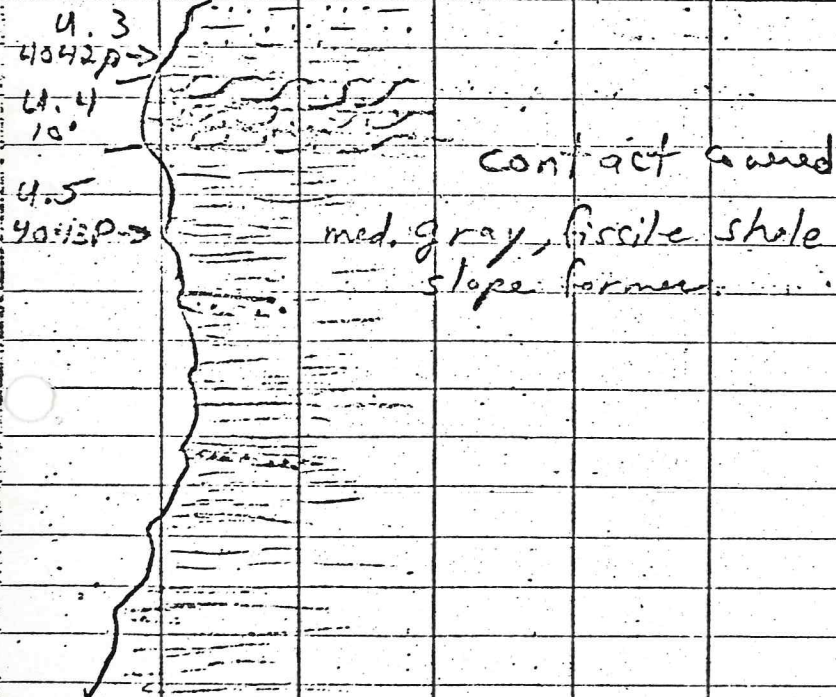


amplitude  $\approx 1/16"$ .

Unit 3 has common large glauconite.

Unit 4. 10'

Sandstone; med. gray fresh, med.  
gray weathered; med. grained,  
quartz well sorted; quartzitic;  
bdg 6" to 1'; x-bedding up to 1" thick  
as well as laminations.



### Directional Features in U. 4

x-bedding

N. 60° E 25° S

### U. 5. Hunt Fork Shale

Shale; med. gray fresh & weathered;  
fissile; slope former; slightly  
calcareous; some weather a  
yellowish white.

Total thickness appears to be  
greater than 2,000'  
Has waxy feel.

Minor thin quartz siltstone  
lenses occur in the Unit



June 15, 1970

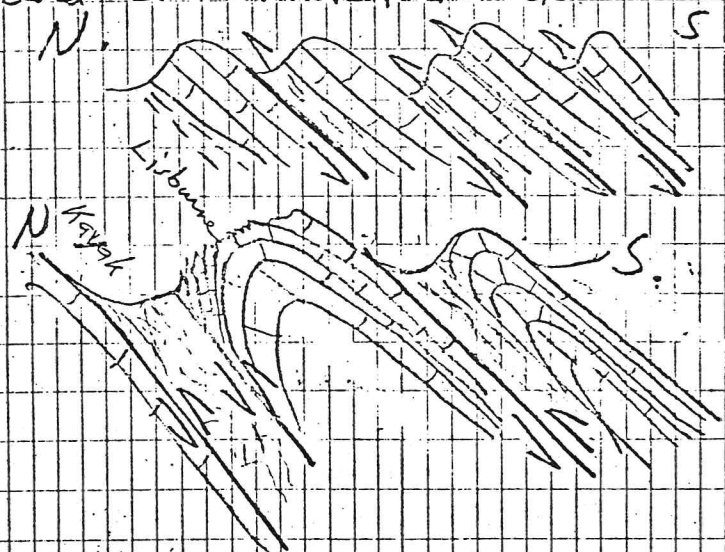
Left for Shainin Lake about 7:30 AM. Clear + warm in mts. + on the slope.

Flew to Atigun Gorge to measure Shablik. Found the outcrop on the east side of the gorge just east of section E-4 of Union Oil Co. Eastern Brooks Range Field Party - 1969. Structurally complex and didn't measure section. Did take a few grab samples for dating by fossils + a lith sample of a thin sand lense. Left for Sag Lake to fuel up for recon of Sag Lake vicinity.

Ribbon River, and Accomplishment Creek. Area composed of highly reverse faulted Lisburne which used Kayak as a glide plane. Reverse faults strike roughly W-E and dip both to the south and north. In the

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Central part of the range the Kanayut and Hunt Fork are exposed. The Kanayut is extremely folded and faulted and may have used the Hunt Fork as a glide plane. Both the Lisburne and Kayak in certain areas are extremely crumpled and chevron folded.



Returned to camp about 5:30 P.M.  
In some spots today the



temp. got up to  $72^{\circ}\text{F}$ .  
Cumulus clouds started to  
build-up in the early afternoon.  
Rain sprinkles started in mts.  
about 5 PM. Rain sprinkles  
in camp till after midnight.  
Snow melting fast.

June 16

Flew to Flood Creek where  
Bill Dalness & I sampled Union  
Oil Co.'s 1969 Section E-9.  
Collected megafossil, palynology,  
conodont, and lith samples.  
Left for camp about 4:00 PM.  
Rain in camp when we  
arrived. Continued off and on  
till about midnight.

June 17

Moved Watkins today to  
We didn't go out because  
Jet Ranger grounded due to  
mechanical problems. Fixed

now since new part arrived  
from Anchorage this afternoon.  
The weather has been squally  
all day.

June 18

Bill Knapp, Bill Dalness, and I  
left in the morning for the  
Atigun Gorge area to measure  
a Lisburne section. The  
weather was cloudy, rainy, and  
windy so decided not to  
measure the section. Instead  
we reconed the Chandler  
Lake area for a good Lisburne  
section - we didn't find one  
which was considered long  
enough to measure. The Lisburne  
was all folded and faulted.

June 19

No work.

Gas shortage (Jet B).



June 20, 1970

Dave Mikesch & I finished a Lisburne section at Marshmallow Mt.

Back to Anaktuvuk by 2:00 P.M.

Larry Grigsby, a mechanic for the G-2, arrives from Anchorage. He will be with us the rest of the field season.

Walker and Ericson back from Kstudy.

June 21

Low on fuel for Ranger and the G-2. Another Down Day.

Packed for move to Noatak <sup>on Noatak R.</sup> camp. Camp located approximately 10 miles upstream from Nimiuktuk River entrance into Noatak.

June 22

Watkins, Bill Knapp & I went to Sagwon. "Union" met Watkins there. He will

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work some Cretaceous from their camp at the Kavik site.

Bob Feldman met us at Sagwon. We ate dinner at the restaurant in Sagwon. I charged Union for the meal.

June 23

Camp move from Anaktuvuk Pass to Noatak site. Camp move took all day and will take part of tomorrow. Took 2 otter (twin otter) trips today and will take 1 tomorrow.

Also the otter will ferry some Jet B for us to various specified locations.

Ate dinner at Bettles - cost \$5.00. He is set up camp at Noatak. Most tents set up by the time Bill Dalness and I arrived from Anaktuvuk.



+400k.

June 24, 1970

Finished setting up the Noatak camp - raddies, etc. A spike camp was moved to Etivluk Lake. Bill Dalness, Bill Knapp, Nial, Ed, and I make the crew at the spike camp. We will be here for about a week. We have 3 tents - 2 12x12's + 1 9x9.

June 25

B. Knapp, B. Dalness, I flew to Lisburne Ridge and ridges just to the south of Lisburne Ridge.

Walked through Armstrong's Lisburne Ridge section and took some samples, but didn't measure the section. Cherty part of section (base) probably intertidal but may be supra-

28

tidal. No definite supratidal evidence was seen. Many cherty bed algal mats were present. Upper part of section was composed of wackestone - packstones. All of section was dolomite.

Black ridges south of the Lisburne Ridge section are black chert. May be Lisburne but no definite criteria were seen.

Exposures on Lisburne Ridge were poor. Better exposures were found of the Lisburne east of Lisburne Ridge, east of the Nigu River. These appear to be quite similar to the liths at Lisburne Ridge, and are along structural strike with the Lisburne Ridge exposures.

Windy + squally in the afternoon.



June 26, 1970

Recon Day.

Flew from Etivluk Lake north to front of range, east to Killik River and back to Etivluk Lake. Few exposures of Lisburne and thin due to faulting. Very little folding - all seems to be connected with faulting. Kanayut is sandier in this area than in the Anaktuvuk area - less conglomerate and thinner bedded.

In afternoon flew from Etivluk Lake west to Fenik Lake. Then along Aniak River and Howard Pass. Common red weathering mafic igneous rocks in this area. Kayak is sandy in this area and may be more rightly called the Utukok Formation. Permian-Carboniferous sands of Tailleur in this area may actually

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be Hunt Fork equivalent (Deb). Those sands and shales look very similar to the Hunt Fork and they are in the correct stratigraphic location for them to be Hunt Fork equivalents.

Most of the area reconed consists of Devonian aged rocks, except for the Lisburne in the frontal part of the range.

June 27

Reconed Killik River for Lisburne/Kayak section or contact. No structurally simple contact or section was found. Flew toward Mt.

B up to to recon section of Lisburne. Weather was bad (rainy and low clouds) so returned to Etivluk Lake for lunch.

Early in the afternoon all 5.



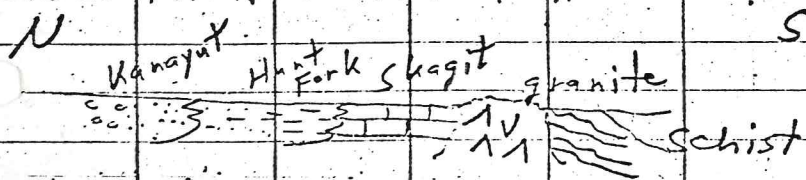
of us returned to the Nootak camp. Nial had to run the Jet Ranger thru a 600 hr. check. The rest of us came to have dinner with the crew at the Nootak camp.

Returned to the Etivluk Lake spike camp by 9:30 P.M.

June 28, 1970

Recon day south thru the Swatcha Mts. Went to Kobuk and then Dall Creek for fuel.

A general cross-section from north to south follows:



The Hunt Fork shale grades from shale to the north to phyllite and slate to the south. Then is interbedded with Skagit (marble).

Including the Skagit limestone is a granite complex. The granite is very acidic - abundant quartz crystals. South of the granite is a metamorphic belt composed mostly of schist. The Skagit does occur, though, all the way south to Kobuk.

June 29

Recon day. South again to Swatcha Mts. (western part) and eastern part of Baird Mts.

Metamorphic complex as described on June 28<sup>th</sup>.

Much Skagit Limestone, slate, phyllite and schist.

Refueled at Dall Creek.

June 30

Moved spike camp at Etivluk Lake back to



## The Noatak River

July 1, 1970

Recon day with Bill Dalness and Bob Rossatter. Reconed area from Noatak camp to Feniak Lake to Mt. Bupto area.

Stopped at the Humble camp on Feniak Lake. Refueled at Feniak also.

Took geochron samples of the igneous complex north and west of Feniak Lake. The igneous complex (ultrabasics - pyroxenites) forms a very distinctive greenish gray and reddish orange mountains which trend in a westerly direction from Feniak Lake. Basaltic dikes <sup>or sills</sup> were associated with this igneous rock near Feniak Lake but were not associated with it everywhere. The rocks

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surrounding the igneous intrusion where mainly Devonian Hunt Fork and Devonian Noatak fm. Walked through lower Mt. Bupto section. Lisburne/Utukuk contact was "seen"; actual contact was covered and may have been a fault but not able to tell due to cover. Utukuk at Bupto is fossiliferous siltstones, fossiliferous limestones, and interbedded silty shales. The Lisburne (in the lower part of the section) is coarsely xln dolomite and finely xln dolomite. Dead oil was commonly found in the wuggy dolomite. Vugs from dissolving of crinoid stems during dolomitization. Chert common in these units. Original lithotypes probably wackestones and packstones. Structure north of Mt. Bupto



extremely complex - much folding and faulting of Lisburne and Siksikpuk? Also mafic sills and dikes intruding the area north of Mt. Bupto.

July 2, 1970

Day off for myself.

Dave Mikesh and Bill Dalness measured type Noatak.

Bill Knapp and Bob Taylor (Pan Am supervisor who arrived yesterday) took a recon day and "fish" day.

July 3

Dave Mikesh, Bill Dalness, and I measured Mt. Bupto Lisburne/Utuksuk section. Upper part of section consists of black chert. Depositional environment unknown. Armstrong calls it supratidal. No evidence for this conclusion seen in

32

the outcrop.

Found Armstrong's Rim Butte "Toe of slope" facies north of Mt. Bupto. Interbedded finely laminated black cherts and dark limestones with paper thin interbeds of sooty, black shale. I agree with Armstrong's interpretation.

The total section appears to be greater than 500' thick.

No upper or lower contacts were exposed, but most likely fault contacts. Section in structurally complex terrain.

July 4

Reconed Central Baird Mts. with Bill Knapp and Dalness. Flew to Kiana and back. The mountains consist of Skagit, slates and phyllites.

Found excellent Skagit(?) section about 30 miles south



of the Noatak camp. Lower part of section consists of repetitive units of dolomite. These units are classical examples of subtidal thru supratidal carbonate facies.

4-6'  
All Dolomite

SWNS	subtidal
SWNS	Supratidal - calc. birdseye, flat Pebble stromatolite succession, dessicated algal mats, light gray.
SWNS	intertidal - med. gray, thinly laminated, crumpled algal mat.
SWNS	subtidal - dark gray + med. gray, mottled due to burrowing, no primary sed. structures.
SWNS	supratidal

Much covered above this interval but in float were seen: 1) finger-like stromatoperooids, 2) head-like stromatoperooids (reefal?), and 3) tabulate coral reef rock. All float was dolomite.

This Skagit(?) was in fault contact with more "typical" Skagit. The "typical" Skagit was metamorphic - coarsely recrystallized calcite similar to Gunsight Mt.

July 5, 1970

Measured Skagit(?) section which occurs 30 miles south of the Noatak camp. Crew consisted of Dave Mikesch, Bob Rosseter, John Ericson, and myself.

Basal part of section as described yesterday. Poor exposure above base but section grades upward from subtidal-supratidal burrowing and algal mats into wackestones and packstones composed of unknown types of fossil debris. These wackestones and packstones grade into stromatoperooid biostromes. These biostromes consist of finger and head-like stromatoperooids. Much fossil debris above these biostromes. Possibly the debris is reef flank deposits. The debris consists of tabulate corals. The top of the section is reef



rock composed of tabulate coral heads. Much coral debris is scattered between the coral heads.

The entire section appears to have <sup>been</sup> continuous deposition. This would indicate a transgressive sequence.

July 6, 1970

Reconed Kelley River area with Knapp and Dallness. Many long faults parallel to mountain trend. Silikpuk and Cretaceous liths in the valley floors.

Appears to have been significant movement of the Carboniferous age rocks. Lisburne and Utukok well exposed in the headwaters of the Kelly River, but these are always in fault blocks.

Returned to camp by noon due to poor weather - low cloudy

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rain, and snow.

July 7

Reconed Western Baird Mts. with Knapp and Dallness. Found excellent sections of Skagit limestone and Utukok(?).

Skagit section near Agagashuk? River and Utukok(?) section south of there.

Skagit (upper part of section) consists of stromatoperoïd (finger-like) biostromes overlain by a massive, coral reef facies. The section is limestone. The coral reef facies may be in fault contact with the underlying "stone" biostromes.

The Utukok section consists of limestone (very fine grained) mixed with a small amount of quartz silt or very fine grained quartz sand. Highly burrowed limestone units alternate with cross-bedded



lime sands. These sands appear to be offshore bar deposits. They have low angle to medium angle multidirectional crossbeds, and some units have common scour and fill channels. The cross-beds aren't really multidirectional but more correctly bidirectional - back and forth movement of tidal? and wave? currents. The section appears to be structurally simple and over 2000' thick of the same liths.

July 8, 1970

Day off -

Waited for Walker to take Bill Dalness and myself to Point Hope.

July 9-11<sup>th</sup> 1970

Waited for Walker. Didn't come because the laundry

still hadn't arrived in Kotzebue. No field work done by Dalness or myself.

July 12

Moved to Point Hope.

Bill Dalness and I and food for about a week left the Noatak camp at noon. Nelson Walker (out of Kotzebue) took us over in his Helio Courier. We arrived in Point Hope by 1:30. Ross Scott and Larry Grigsby arrived in the G-2 by 4:00.

We are staying in Anne Frankson's "Polar Bear Hunting" lodge on the east side of town.

Cost per man is \$7/night.

July 13

Dalness and I measured a section near Cape Dyer. Nice weather except for



Morning showers.

Section was about 1500' thick but structurally complex. No liths were repeated as we went up section. Much of the section was calcareous.

The section consisted of interbedded sands, shales, silts, and coal, with minor lime mudst in the base of the section. Sands and silts looked as if they were deposited in the distributary system of a river. Sands were moderately rounded and sorted and often contained abundant plant fragments from small pieces to 3' long "stems". Shales were usually highly carbonaceous and in places graded into coal deposits. Most coals were less than 1' thick but some were up to 5' thick. Sands were cross-bedded; some contained oscillation ripples. Upright

tree trunks were seen in some sands.

July 14, 1970

Nice weather - warm and clear.

Measured Cape Thompson section and sampled unnamed Mississippian unit to the south of the Cape Thompson section.

Unnamed Miss. Unit consists of sands and shales near the top(?) and crinoidal pkts and shales near the bottom(?). The limes are all highly argillaceous. Entire unit is marine - all liths contain marine faunas. Some shales contain abundant rugose, solitary corals. Shallow tidal flat or shallow subtidal mud flat with occasional sand and lime influxes? Near shore deposits?



Cape Thompson Section is composed of two carbonate facies. The upper facies is Lisburne (open marine, crinoidal pksts and grsts) and <sup>the</sup> lower facies is also Lisburne? (black shales interbedded with restricted marine carbonates). The total section measured is about 200' thick. Didn't measure the upper facies due to the steepness of the Cape Thompson sea cliffs. The contact between the two facies is intertonguing. The lower facies <sup>is</sup> dark waterstone-packstone beds and lenses. Common crinoidal debris and brachs, some nodular and bedded chert.

July 15, 1970

Cloudy + showers.

Measured Nasorah Creek section. Lisburne lithologies with common colonial corals

(mainly Lithothamnion) thru out section. Some formed bioherms or possibly even small, low "patch" reefs. Relief on these bioherms was generally less than 1' and most were less than 2' thick. Some were extensive for tens of feet laterally, though. Most units were wkst-pksts composed of crinoidal and bryozoan debris. Some units were composed of only bryozoan wksts-pksts. These were bryozoan "meadows". Rare grst units which were probably tidal channel fills. Many scour + fill channels + sedimentary breccias in these grsts. These grsts contained many crinoidal fragments even though the pkst-wkst units had a low percentage of crinoidal debris. Crinoidal



debris was apparently washed in by tidal currents which cut across the lower energy bryozoan deposits.

Section mainly med. energy, restricted marine, shelf deposits.

Upper part of Section all tectonic? chert.

July 16, 1970

Down Day

G-2 had mechanical problems. Bearing on drive shaft to tail rotor was worn out. Larry changed it and will be able to fly tomorrow.

Foggy and cool all day.

July 17, 1970

Rainy and windy (20 knots from the south + steady).

Measured Shublik/Siksikpuk south of Agaterak Creek.

Siksikpuk greenish + reddish

(minor) claystone in lower part of section. Upper part of Siksikpuk is greenish and grayish bedded chert interbedded with silty shale.

Shublik is black, and sooty shale, and chert. The chert is grayish and reddish. Cherts interbedded with siliceous wackestone and packstone that contain Monotis.

Contact of Shublik/Siksikpuk is covered. Shublik is structurally complex.

July 18

Move back to Noatak Camp. Bill and I flew back to the Noatak with Walker. Ross and Larry flew to Cape Beaufort to Western Geo's Camp. Lloyd Fisher? and John Ericson continue with Walker to Cape Beaufort.



They will do a Cretaceous study of the area and stay at Western Geo's camp.

Ross and Bud (Pan Am Supervisors) and Leonard (Pan Am Engineer) arrived at the Nootka camp this morning via Walker before he flew to Point Hope to get Billy + myself.

July 19, 1970

Down day.

Ross, Bud, and Larry flew back to Kotzebue this morning with Walker.

Jet Ranger had a cracked oil case, but has been fixed.

Will fly tomorrow.

Was a nice day.

Dave Mikesch left for points south this afternoon with Walker.

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July 20

Bob Rosseter, Bill Dalness, and I measured a Lisburne/Utukok (Kayak?) section in the DeLong Mts. Total thickness is approximately 1750' and the Utukok is 170'. Base of slope covered and Lisburne/Utukok contact is gradational.

Lisburne is open marine wackestone-packstones with minor colonial coral isolated heads and minor colonial coral biostromes. Common nodular + lensoid dark gray to black chert thru out Lisburne.

Utukok is interbedded pkts argillaceous lime, and black shales. Rare colonial coral heads in Utukok.

Section is Upper West Fork of the Wulik section.



July 21, 1970

Bill Dalness and I measured two sections — a Siksikpuk/  
 Lisburne section <sup>(Lower west fork Wulik section)</sup> and a Utkuk/  
 Kayak section (North Wulik section).

Siksikpuk is red + green chert, is all talus, and is in fault contact with the underlying Lisburne. The Lisburne is similar to that measured on July 20.

Kayak is black calcareous shale and grades upward into thin <sup>planar</sup> bedded, dark limestones with occasional thin interbeds of calcareous black shale. These limestones grade upward into limestones that have minor cross bedding and rare recognizable fossil debris. Some medium grained grainstones near top of section. Total thickness about 500'.

July 22

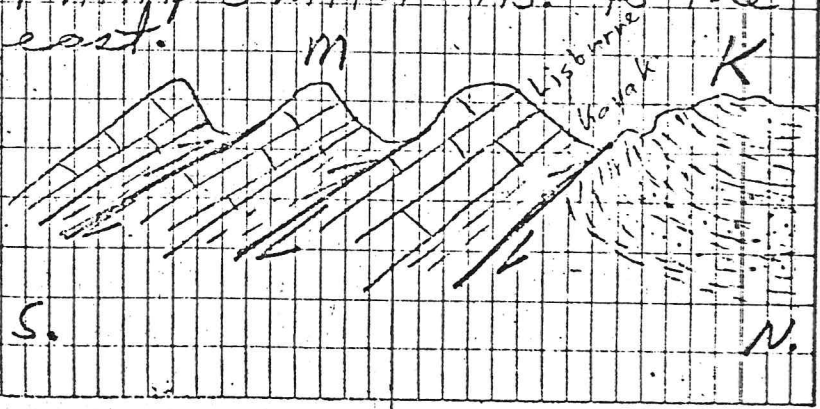
Recond day with Knapp and

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Dalness.

Flew to Driftwood strip, to Cape Beaufort (Western Gea's camp) and back to the Noatak camp. Reached a good deal in the DeLong mts. on the last leg of the flight.

Long, linear reverse (or thrust?) faults have juxtaposed Lisburne/Kayak with the Cretaceous (Kogruk?) in the northern flanks of the range. Lisburne/Kayak Lisburne/Kayak reverse faults as in the Phillip Smith mts. to the east.





A hand-drawn geological sketch map on a grid background. The map shows several geological features and labels:

- Top Left:** "Kaya" written above a wavy line representing a boundary or road.
- Top Center:** "Lis." written above a series of parallel diagonal lines representing a geological formation.
- Top Right:** "Lis." written above another series of parallel diagonal lines.
- Center:** A large, irregular shape with internal patterns of dots and lines, possibly representing a specific geological unit or a body of water.
- Bottom Left:** "N." written below the grid.
- Bottom Right:** "S." written below the grid.

Also common igneous intrusives forming mountains are exposed in the central and southern parts of the Delong Mt. range.

Down day due to bad weather - rain + low clouds.

July 24

Bob Ross et al left for points south this morning with Walker.

Knapp, Dalness and I measured a  
Lisburne / Kayak? contact west  
of the Kelley River.



Lisburne (low energy) abdt  
char-as beds, lenticles  
nodules; w/ste + phosphate

limestone; very finely lam-  
inated; rare fossils, brachi-

distorted bedding (slump or  
turbidite?) - mdsst  
black shale + interbeds  
of dark gray mdsst



July 25, 1970

Recon day.

Kelley River to Kivilina, to  
Kotzebue, up Noatak River to  
Noatak camp.

Most carbonate west of Noatak  
River is Skagit (supratidal  
facies and finger stromatoporeoid  
facies). Several different types  
of mafic intrusions between the  
Noatak and Kivilina. Last  
exposures of red weathering pyrox-  
enites occur in the mountain  
just east of Jarvis mts, north  
of the Wulik River.

Some outcrops of Hunt Fork  
Shale.

Mountain + hill belts are on  
structural strike with the Delong  
mts. Northern most belt we reached  
was Lisburne with vertical dip.  
A mafic intrusive belt occurred  
just to the south of the Lisburne  
belt. South of these belts were

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(mainly dolomite)

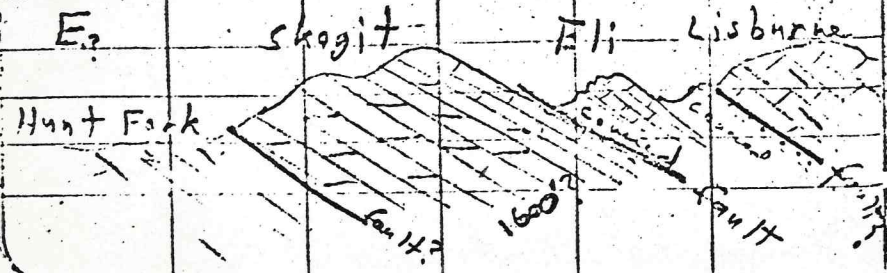
the Skagit and the Hunt Fork  
Shale. In the valleys in the  
valleys of the Lisburne belt are  
Cretaceous shales and interbedded  
sands.

July 26

Bill Knapp and I measured  
a Skagit section below Tallien's  
type Eli section. The lower  
contact was covered and possibly  
faulted. The upper contact  
with the overlying Eli  
Fm. was a fault. The dis-  
placement along this fault is  
unknown. The lower part of  
the Skagit is dolomite and  
consists of biotrites of "finger"  
like stromatoporeoids. The central  
(and thickest) part of the  
section, <sup>is dolomite but</sup> consists of inter-  
bedded burrowed and "finger"  
stromatoporeoid layers with  
interspersed massive "head"



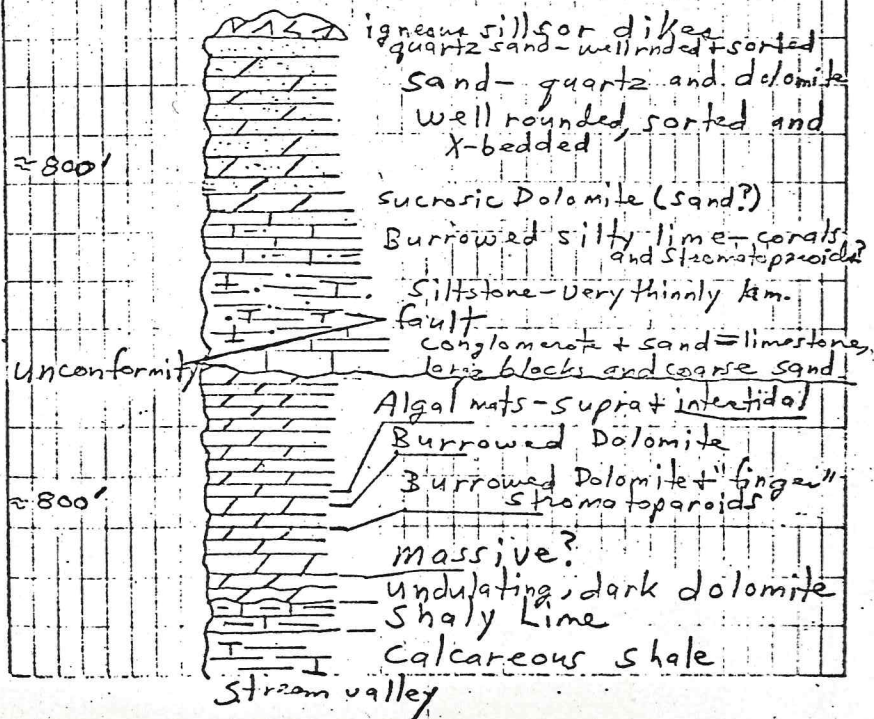
stromatoloid reefs. Some reefs were over 30' thick and appeared to be extensive laterally; but exact lateral extent is unknown due to poor exposures. The upper part of the section is limestone. The limestone is finely to coarsely crystalline and no depositional structures or fossils were seen in this part of the section. This part of the section appears to have been altered, which destroyed the original textures of the rock. The alteration is most severe just below the contact with the overlying Eli Fm. This alteration and the change in bed attitudes from Skagit to Eli indicate the contact is a fault. W.?



July 27, 1970

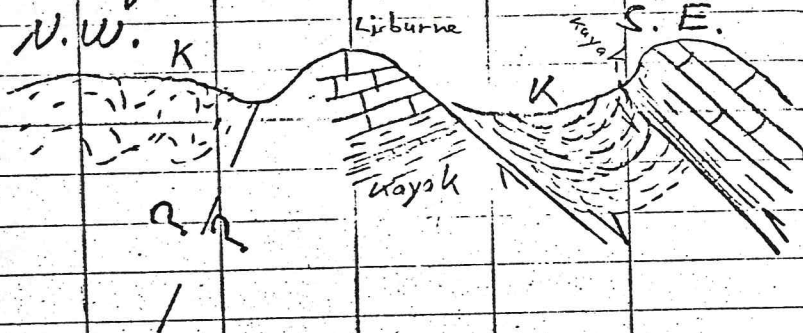
Knapp Dalnert and I walked down section from the top of Mt. Bastille to the stream valley on the west side of the mountain. We spot sampled certain intervals, but didn't measure or describe the section.

### Mt. Bastille





Mapped some long faults on  
the northern flanks of the  
DeLong Mts.



July 28, 1970

Bad weather - Rain in morning.  
Packed for camp move to  
Anchorage.

About 3:00 PM attempted  
to recon Salmon River area  
in the Baird Mts. but too  
rainy. Returned to the Noa-  
tak and continued to pack.

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July 29  
Camped on DC-3 by 10 A.M.  
and on the way to Anchorage.  
Flight stopped in Kotzebue  
to refuel. John Ericson,  
Mark, and the cook (John)  
rode the DC-3 to Anchorage.  
Knapp Ed, and Nial flew  
Jet Ranger to Kotzebue.

Dalness and I flew with  
Walker to Kotzebue.

Saw Benny and Gene in  
Kotzebue before they were  
to leave for the Bairds.

Dalness, Furer, and I took  
a Wien flight to Anch-  
orage. DC-3 there when  
we arrived.

End of 1970 Field  
Season