



MICROPALEO
CONSULTANTS, INC.

USN/HUSKY - NPRA
WEST FISH CREEK NO. 1

API #50-103-20009

SEC. 11, T11N/R1W UM

NORTH SLOPE, ALASKA

Prepared by:

Michael B. Mickey - Foraminifera

Hideyo Haga - Palynomorphs

BIOSTRATIGRAPHY REPORT

TABLE OF CONTENTS

<u>INTEGRATED SUMMARY</u>	2
<u>FORAMINIFERA REPORT</u>	7
FORAMINIFERA SUMMARY	8
INTRODUCTION	15
Scope	15
Procedures	15
Format	15
RESULTS	17
CONCLUSIONS	28
<u>PALYNOLOGY REPORT</u>	29
PALYNOLOGY SUMMARY	30
INTRODUCTION	34
Purpose and Scope	34
Procedures	34
RESULTS	35
CONCLUSIONS	41
<u>REFERENCE</u>	43

ILLUSTRATIONS

(In pockets at back of report)

Figure B-1	High Resolution Biostratigraphy Plots
Figure F-1	Foraminifera Distribution Chart (500-7250')
Figure F-2	Foraminifera Distribution Chart (7250-11,420')
Figure P-1	Palynomorph Distribution Chart

INTEGRATED SUMMARY

500-1525'

Late Cretaceous
Santonian to Campanian

1525-2680'

Late Cretaceous
Turonian to Coniacian

2680-2920'

Late Cretaceous
Probable Cenomanian

2920-5760'

Early Cretaceous
Middle to Late Albian

5760-7280'

Early Cretaceous
Aptian to Early Albian

7280-7530'

Late Jurassic
Kimmeridgian
JL_K

7530-8895'

Late Jurassic
Oxfordian
JL_O

8895-9120'

Middle Jurassic
Aalenian
JM_A

9120-9265'

Early Jurassic
Toarcian
JE_T

9265-9290'

Early Jurassic
Pliensbachian
JE_P

9290-9370'

Late Triassic
Probable Norian
TL_N

9370-9560'

Late Triassic
Probable Carnian
TL_C

9560-10,440'

Early Triassic
TE

Discussion. Sadlerochit Group. Ivishak Fm. tops at 9560 feet and Kavik Fm. tops at 10,170 feet.

10,440-10,500'

Probable Late Permian
PL

Discussion. Echooka Fm.

10,500-10,520'

Probable Early Permian
PE

Discussion. These strata represent the youngest Lisburne Group. "Wahoo Fm."; Upper Limestone Unit equivalents.

10,520-10,600'

Middle to Late Pennsylvanian
Atokan to Kawvian
Zone M-22 to Zone M-24

Discussion. Lisburne Group. Wahoo Fm.; Upper Limestone Unit.

10,600-10,960'

Early to Middle Pennsylvanian
Morrowan to Atokan
Zone M-21

10,960-11,070'

Early Pennsylvanian
Morrowan
Zone M-20

11,070-11,170'

Late Mississippian
Chesterian
Zone M-18 to Zone M-19

Discussion. Alapah Fm.

11,170-11,310'

Late Mississippian
Chesterian
Zone M-17

Discussion. Dolomite Unit

11,310-11,420'B.E.S.*

Probable Mississippian
Probable Osagean to Chesterian

Discussion. Probable Endicott Group. Itkilyariak Fm.

* Base of Examined Section

FORAMINIFERA REPORT

Interpreted by:

Michael B. Mickey

FORAMINIFERA SUMMARY

500-1550'

<u>Age.</u>	Late Cretaceous Santonian to Campanian
<u>Zones.</u>	F-5 to F-6
<u>Environment.</u>	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)

1550-2870'

<u>Age.</u>	Late Cretaceous Cenomanian to Coniacian
<u>Zones.</u>	F-6 to F-7
<u>Environment.</u>	Bathyal - Distal (Slope to Base of Slope - Starved Basin)

2870-5760'

<u>Age.</u>	Early Cretaceous Middle to Late Albian
<u>Zones.</u>	F-9 to F-10
<u>Environment.</u>	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)

5760-7250'

<u>Age.</u>	Early Cretaceous Aptian to Early Albian
<u>Zone.</u>	F-11
<u>Environment.</u>	Bathyal (Slope)

7250-7520'

<u>Age.</u>	Late Jurassic Kimmeridgian
<u>Zone.</u>	F-16a
<u>Environment.</u>	Outer Neritic to Upper Bathyal (Outer Shelf to Upper Slope)

7520-8880'

<u>Age.</u>	Late Jurassic Oxfordian
<u>Zone.</u>	F-16b
<u>Environment.</u>	Middle? Neritic to Upper Bathyal (Middle? Shelf to Upper Slope)

8880-9120'

<u>Age.</u>	Middle Jurassic Aalenian
<u>Zone.</u>	F-17
<u>Environment.</u>	Middle to Lower Bathyal (Middle to Lower Slope)

9120-9240'

<u>Age.</u>	Early Jurassic Toarcian
<u>Zone.</u>	F-18a
<u>Environment.</u>	Middle Bathyal (Middle Slope)

9240-9270'

<u>Age.</u>	Early Jurassic Pliensbachian
<u>Zone.</u>	F-18b
<u>Environment.</u>	Middle Bathyal (Middle Slope)

9270-9570'

<u>Age.</u>	Late Triassic Carnian to Norian
<u>Zones.</u>	F-19b to F-19c
<u>Environment.</u>	Inner to Outer Neritic (Inner to Outer Shelf)

9570-10,410'

<u>Age.</u>	Early Triassic
<u>Zone.</u>	F-20a
<u>Environment.</u>	Nonmarine to Inner Neritic (Alluvial Plain to Inner Shelf)
<u>Discussion.</u>	Sadlerochit Group. Ivishak Fm. tops at 9570 feet and Kavik Fm. tops at 10,230 feet.

10,410-10,500'

<u>Age.</u>	Probable Late Permian
<u>Zone.</u>	Probable F-20b
<u>Environment.</u>	Marginal Marine (Transitional)
<u>Discussion.</u>	Echooka Fm.

10,500-10,530'

<u>Age.</u>	Probable Early Permian
<u>Zone.</u>	Probable F-21
<u>Environment.</u>	Shoaling Shelf (Bank)
<u>Discussion.</u>	Youngest Lisburne Group. "Wahoo Fm."; Upper Limestone Unit.

10,530-10,620'

<u>Age.</u>	Middle to Late Pennsylvanian Atokan to Kawvian
<u>Zones.</u>	M-22 to M-24
<u>Environment.</u>	Shoaling Shelf (Outer Lagoonal to Bank)
<u>Discussion.</u>	Lisburne Group. Wahoo Fm.; Upper Limestone Unit.

10,620-10,950'

<u>Age.</u>	Early to Middle Pennsylvanian Morrowan to Atokan
<u>Zone.</u>	M-21
<u>Environment.</u>	Shoaling Shelf (Bank)

10,950-11,100'

<u>Age.</u>	Early Pennsylvanian Morrowan
<u>Zone.</u>	M-20
<u>Environment.</u>	Shoaling Shelf (Bank)

11,100-11,160'

<u>Age.</u>	Late Mississippian Chesterian
<u>Zones.</u>	M-18 to M-19
<u>Environment.</u>	Shoaling Shelf (Outer Lagoonal to Bank)
<u>Discussion.</u>	Alapah Fm.

11,160-11,310'

<u>Age.</u>	Late Mississippian Chesterian
<u>Zone.</u>	M-17
<u>Environment.</u>	Supratidal
<u>Discussion.</u>	Dolomite Unit

11,310-11,420'

Age.

Probable Mississippian
Probable Osagean to Chesterian

Environment.

Probable Nonmarine to Inner Neritic
(Probable Alluvial Plain to Inner Shelf)

Discussion.

Probable Endicott Group. Itkilyariak Fm.

INTRODUCTION

Scope

Data from 347 Foraminifera samples from the USN/HUSKY West Fish Creek No. 1 well were incorporated into this report. These samples consisted of 343 ditch and four (4) sidewall core samples covering the interval 500 to 11,420 feet. Thin sections were also prepared on 34 ditch samples from 10,410 to 11,420 feet. This work was done as part of M.C.I. Job Number 99-111.

Procedures

Standard techniques were used to process the material. All samples were boiled in Quaternary-O and washed over 20 and 200 mesh screens. Frequency symbols correspond to the following numerical values: very rare (1), rare (2 - 4), frequent (5 -25), common (26 - 100), abundant (101 - 999) and prolific (1000+). The picked foram slides, prepared thin sections and residues are repositied at the State of Alaska Geological Materials Center in Eagle River, Alaska.

Certain factors such as shelf widths, basin configuration and overall basin depths associated with Arctic Mesozoic basins are not completely understood at present. The paleoenvironments presented in this report reflect relative basinal position only and should not be tied to specific water depths. Generally, neritic corresponds to shelf or deltaic environments, while bathyal corresponds to slope or prodelta environments and bathyal (starved basin) corresponds to distal (far from the source) deposition. As an example, prodelta deposits could represent deposition as shallow as middle neritic or as deep as bathyal (slope) depending on the delta type and shelf width. With a narrow shelf, a river-dominated deltaic system could build across the shelf and the prodelta deposits would be in a bathyal (slope) depth. A tide-dominated deltaic system associated with a wide shelf could result in middle neritic prodelta deposition.

Format

A listing of the age, environment, fauna and occasional lithology comments for each biostratigraphic interval follows. A generalized summary of the well is presented in the Conclusions section at the end of the Foraminifera Report.

Foraminifera Distribution Charts (Figures F-1 and F-2) and a High Resolution Biostratigraphy Plot (Figure B-1) containing foram diversity/abundance plots, a cumulative faunal plot and paleoenvironmental plot(s) are in pockets at the back of this report.

RESULTS

500-1550'

<u>Age.</u>	Late Cretaceous Santonian to Campanian
<u>Zones.</u>	F-5 to F-6
<u>Environment.</u>	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)
<u>Fauna.</u>	<i>Trochammina ribstonensis</i> , <i>T. albertensis</i> , <i>T. whittingtoni</i> , <i>Verneuilioides bearpawensis</i> , <i>V. fischeri</i> , <i>Textularia</i> cf. <i>gravenori</i> , <i>Saccammina lathrami</i> , <i>Anomalinoides pinguis</i> , <i>Quinqueloculina sphaera</i> , <i>Spiroplectammina webberi</i> , <i>Pseudoclavulina hastata</i> , <i>Arenobulimina torula</i> , common to abundant radiolaria, pyrite, pyrite sticks, and frequent to abundant volcanic glass shards above 740 feet.

1550-2870'

<u>Age.</u>	Late Cretaceous Cenomanian to Coniacian
<u>Zones.</u>	F-6 to F-7
<u>Environment.</u>	Bathyal - Distal (Slope to Base of Slope - Starved Basin)
<u>Fauna.</u>	<i>Verneuilioides fischeri</i> , <i>Haplophragmoides</i> spp., <i>Vaginulina</i> <i>schraderensis</i> , <i>Trochammina ribstonensis</i> , <i>T. whittingtoni</i> , <i>Saccammina lathrami</i> , shell fragments, fishbone fragments, megaspores, <i>Inoceramus</i> prisms, diatoms, pyrite, pyrite sticks, pyrite spheres and frequent to common radiolaria.

2870-5760'

<u>Age.</u>	Early Cretaceous Middle to Late Albian
<u>Zones.</u>	F-9 to F-10
<u>Environment.</u>	Middle Neritic to Upper Bathyal (Middle Shelf to Upper Slope)
<u>Fauna.</u>	<i>Trochammina rainwateri</i> , <i>T. umiatensis</i> , <i>Haplophragmoides</i> cf. <i>linki</i> , <i>H. topagorukensis</i> , <i>H. gigas</i> , <i>H. cf. excavatus</i> , <i>Miliammina manitobensis</i> , <i>M. ischnia</i> , <i>Lenticulina macrodisca</i> , <i>L. bayrocki</i> , <i>Ammobaculites wenonahae</i> , <i>A. fragmentarius</i> , <i>Verneuilinoides borealis</i> , <i>Bathysiphon vitta</i> , <i>Psamminopelta bowsheri</i> , <i>Ammodiscus rotalarius</i> , <i>Globorotalites alaskensis</i> , <i>Valvulineria loetterlei</i> , <i>Gavelinella stictata</i> , <i>Gaudryinella irregularis</i> , <i>Gyroidinoides nitidus</i> , <i>Textularia topagorukensis</i> , <i>Marginulinopsis collonsi</i> , <i>Inoceramus</i> prisms, shell fragments, coal, pyrite, pyrite sticks and rare to frequent <i>Ditrupa cornu</i> .

5760-7250'

<u>Age.</u>	Early Cretaceous Aptian to Early Albian
<u>Zone.</u>	F-11
<u>Environment.</u>	Bathyal (Slope)
<u>Fauna.</u>	<i>Haplophragmoides topagorukensis</i> , <i>H. cf. excavatus</i> , <i>H. gigas</i> , <i>Bathysiphon vitta</i> , <i>Ammobaculites wenonahae</i> , <i>Reophax</i> sp., <i>Proteonina</i> sp., <i>Lenticulina bayrocki</i> , <i>Verneuilinoides borealis</i> , pelmatozoan fragments, shell fragments, <i>Inoceramus</i> prisms, pyrite, and common pyritized radiolaria below 7080 feet including <i>Lithocampe</i> cf. sp. N occurring at 7160-7190 feet.

7250-7520'

Age.

Late Jurassic
Kimmeridgian

Zone.

F-16a

Environment.

Outer Neritic to Upper Bathyal
(Outer Shelf to Upper Slope)

Fauna.

Marginulinopsis phragmites, *Lenticulina audax*, *L. prima*, *Conorboides hofkeri*, *Eoguttulina liassica*, *Trochammina gryci*, *T. canningensis*, *T. topagorukensis*, *Gaudryina milleri*, *G. leffingwelli*, *G. topagorukensis*, *G. dyscrita*, *Textularia areoplecta*, *Haplophragmoides canui*, *Ammobaculites alaskensis*, frequent to abundant pyrite, rare to frequent glauconite below 7430 feet, and frequent to common rounded frosted quartz floating sand grains.

7520-8880'

Age.

Late Jurassic
Oxfordian

Zone.

F-16b

Environment.

Middle? Neritic to Upper Bathyal
(Middle? Shelf to Upper Slope)

Fauna.

Glomospira pattoni, arenaceous spp. (large-coarse), *Gaudryina milleri*, *G. leffingwelli*, *G. dyscrita*, *Ammobaculites alaskensis*, *Haplophragmoides canui*, *H. spp.*, *Trochammina canningensis*, *T. topagorukensis*, *T. gryci*, *T. sablei*, *T. instowensis*, *Marginulinopsis phragmites*, *Lenticulina prima*, *L. audax*, *L. toarcense*, *L. wisniowskii*, *L. quenstedti*, *Thuramminoides* sp., *Ammodiscus asperus*, *A. cheradospirus*, *Textularia areoplecta*, *Saracenaria topagorukensis*, *Citharina fallax*, *Astacolus pediacus*, *A. dubius*, *Frondicularia lustrata*, *Trochamminoides* sp. (small-thin), *Inoceramus* prisms, ostracods, pelmatozoan fragments, pyrite, pyrite sticks, frequent to common pyritized radiolaria below 7750 feet, and rare to common rounded frosted quartz floating sand grains.

8880-9120'

<u>Age.</u>	Middle Jurassic Aalenian
<u>Zone.</u>	F-17
<u>Environment.</u>	Middle to Lower Bathyal (Middle to Lower Slope)
<u>Fauna.</u>	<i>Bathysiphon anomalocoelia</i> , <i>Trochamminoides</i> sp. (small-thin), <i>T. cf. proteus</i> , <i>Haplophragmoides canui</i> , <i>H. spp.</i> , <i>Ammodiscus siliceus</i> , <i>A. asperus</i> , <i>Lituotuba irregularis</i> , <i>Trochammina</i> sp. (very small-thin), fish debris, pyrite, frequent to common <i>Tasmanites</i> spp. and common to abundant pyritized radiolaria.

9120-9240'

<u>Age.</u>	Early Jurassic Toarcian
<u>Zone.</u>	F-18a
<u>Environment.</u>	Middle Bathyal (Middle Slope)
<u>Fauna.</u>	<i>Bathysiphon anomalocoelia</i> , <i>Trochamminoides</i> sp. (small-thin), <i>T. sp.</i> (large-thin), <i>Lingulina micida</i> , <i>Vaginulinopsis</i> sp., <i>Astacolus cf. calliopsis</i> , pyrite, and rare glauconite below 9210 feet.

9240-9270'

<u>Age.</u>	Early Jurassic Pliensbachian
<u>Zone.</u>	F-18b
<u>Environment.</u>	Middle Bathyal (Middle Slope)
<u>Fauna.</u>	<i>Trochamminoides</i> sp. (small-thin), <i>T.</i> sp. (large-thin), <i>Ammobaculites</i> sp. (small, bell-shaped chambers) and rare glauconite.

9270-9570'

<u>Age.</u>	Late Triassic Carnian to Norian
<u>Zones.</u>	F-19b to F-19c
<u>Environment.</u>	Inner to Outer Neritic (Inner to Outer Shelf)
<u>Fauna.</u>	<i>Vaginulinopsis acrolus</i> , <i>Astacolus connudatus</i> , <i>Nodosaria larina</i> , <i>N. shublikensis</i> , ostracods (medium-smooth), echinoid spines, <i>Monotis/Halobia</i> fragments, abundant pyritized radiolaria below 9480 feet, and abundant rounded black chert pebbles between 9420 and 9480 feet.

9570-10,410'

<u>Age.</u>	Early Triassic
<u>Zone.</u>	F-20a
<u>Environment.</u>	Nonmarine to Inner Neritic (Alluvial Plain to Inner Shelf)
<u>Fauna.</u>	<i>Ammodiscus</i> sp., <i>A. sp. P.</i> , arenaceous spp., <i>Ammobaculites</i> sp. (small-nodose), echinoid spines and rare fecal pellets.
<u>Discussion.</u>	Sadlerochit Group. Ivishak Fm. tops at 9570 feet and Kavik Fm. tops at 10,230 feet.

10,410-10,500'

<u>Age.</u>	Probable Late Permian
<u>Zone.</u>	Probable F-20b
<u>Environment.</u>	Marginal Marine (Transitional)
<u>Fauna.</u>	<i>Paleocancellus?</i> sp., <i>Protonodosaria</i> sp., <i>Pseudoglomospira</i> sp., <i>Trepeilopsis</i> sp. and <i>Paleoaplysina</i> sp.
<u>Discussion.</u>	Echooka Fm.

10,500-10,530'

<u>Age.</u>	Probable Early Permian
<u>Zone.</u>	Probable F-21
<u>Environment.</u>	Shoaling Shelf (Bank)
<u>Fauna.</u>	<i>Pseudoglomospira</i> sp., <i>Trepeilopsis</i> sp., <i>Biseriella parva</i> , <i>Monotaxinoides multivolatus</i> , <i>Asphaltina</i> sp. and frequent <i>Stylocodium</i> sp.
<u>Discussion.</u>	Youngest Lisburne Group. "Wahoo Fm."; Upper Limestone Unit.

10,530-10,620'

<u>Age.</u>	Middle to Late Pennsylvanian Atokan to Kawvian
<u>Zones.</u>	M-22 to M-24
<u>Environment.</u>	Shoaling Shelf (Outer Lagoonal to Bank)
<u>Fauna.</u>	<i>Trepeilopsis</i> sp., <i>Pseudoglomospira</i> sp., <i>Biseriella parva</i> , <i>Globivalvulina bulloides</i> , <i>Priscella prisca</i> , <i>Endothyra</i> spp., <i>Eostaffella radiata</i> , <i>Pseudostaffella</i> sp., <i>Asphaltina</i> sp. and frequent <i>Stylocodium</i> sp.
<u>Discussion.</u>	Lisburne Group. Wahoo Fm.; Upper Limestone Unit.

10,620-10,950'

<u>Age.</u>	Early to Middle Pennsylvanian Morrowan to Atokan
<u>Zone.</u>	M-21
<u>Environment.</u>	Shoaling Shelf (Bank)
<u>Fauna.</u>	<i>Monotaxinoides multivolutus</i> , <i>Biseriella parva</i> , <i>Trepeilopsis</i> sp., <i>Globivalvulina bulloides</i> , <i>Endothyra</i> spp., <i>Pseudostaffella</i> sp., <i>Pseudoglomospira</i> sp., <i>Eoschubertella yukonensis</i> , <i>Neoarchaediscus incertus</i> , <i>Priscella prisca</i> , <i>Pseudoendothyra</i> spp., <i>Paleotextularia</i> ss., <i>Zellerina</i> sp., <i>Z. designata</i> , <i>Planospirodiscus taimyricus</i> , <i>Millerella carbonica</i> , <i>Stacheoides meandriiformis</i> , <i>Stylocodium</i> sp., <i>Kamaena</i> sp., <i>Calcisphaera laevis</i> , <i>C. pachysphaerica</i> , <i>Girvanella ducii</i> and frequent to common oolites.

10,950-11,100'

<u>Age.</u>	Early Pennsylvanian Morrowan
<u>Zone.</u>	M-20
<u>Environment.</u>	Shoaling Shelf (Bank)
<u>Fauna.</u>	<i>Pseudoglomospira</i> sp., <i>Biseriella parva</i> , <i>Monotaxinoides multivolutus</i> , <i>Globivalvulina bulloides</i> , <i>Neoarchaediscus incertus</i> , <i>N. subbaschkiricus</i> , <i>Zellerina</i> sp., <i>Asteroarchaediscus</i> sp., <i>Brunsia irregularis</i> ?, <i>Eostaffella radiata</i> , <i>Trepeilopsis</i> sp., <i>Endothyra</i> spp., <i>Archaediscus krestovnikovi</i> , <i>Stacheoides meandriiformis</i> , <i>Girvanella ducii</i> and frequent to common oolites.

11,100-11,160'

<u>Age.</u>	Late Mississippian Chesterian
<u>Zones.</u>	M-18 to M-19
<u>Environment.</u>	Shoaling Shelf (Outer Lagoonal to Bank)
<u>Fauna.</u>	<i>Biseriella parva</i> , <i>Trepeilopsis</i> sp., <i>Priscella prisca</i> , <i>Pseudoglomospira</i> sp., <i>Girvanella ducii</i> , rare ostracods and frequent gastropods.
<u>Discussion.</u>	Alapah Fm.

11,160-11,310'

<u>Age.</u>	Late Mississippian Chesterian
<u>Zone.</u>	M-17
<u>Environment.</u>	Supratidal
<u>Fauna.</u>	<i>Pseudoglomospira</i> sp., <i>Trepeilopsis</i> sp., <i>Earlandia elegans</i> , <i>Stacheoides meandriiformis</i> and a single probably sloughed specimen of <i>Eosigmoilina rugosus</i> .
<u>Discussion.</u>	Dolomite Unit

11,310-11,420'

Age.

Probable Mississippian
Probable Osagean to Chesterian

Environment.

Probable Nonmarine to Inner Neritic
(Probable Alluvial Plain to Inner Shelf)

Fauna.

Trepeilopsis sp., *Pseudoglomospira* sp., *Earlandia elegans*,
Calcisphaera pachysphaerica, *Stacheoides meandriiformis*,
Girvanella ducii, and frequent chert between 11,370 and 11,400
feet.

Discussion.

Probable Endicott Group. Itkilyariak Fm.

CONCLUSIONS

The USN/HUSKY West Fish Creek No. 1 well penetrated the following biostratigraphic sequence based on foraminiferal analysis:

- 2370+ feet (500-2870') of Cenomanian to Campanian age (Early Brookian) upward shallowing base of slope bottomsets, slope foresets and middle to outer shelf topsets.
- 4380 feet (2870-7250') of Aptian to Albian age (Early Brookian) upwardly shallowing base of slope bottomsets, slope foresets and middle to outer shelf topsets.
- 2020 feet (7250-9270') of Pliensbachian to probable Kimmeridgian age (Beaufortian - Incipient Rift Sequence) middle to outer shelf and slope to base of slope sedimentation.
- 1230 feet (9270-10,500') of Late Permian to Late Triassic age (Late Ellesmerian) nonmarine, marginal marine and shelf deposition.
- 920+ feet (10,500-11,420') of undifferentiated Mississippian to Early Permian age (Early Ellesmerian) shoaling shelf carbonates and nonmarine to inner shelf clastics.

PALYNOLOGY REPORT

Interpreted by:

Hideyo Haga

PALYNOLOGY SUMMARY

500-1670'

<u>Age.</u>	Late Cretaceous Santonian - Campanian
<u>Zone.</u>	P-M14
<u>Environment.</u>	Marine

1670-2660'

<u>Age.</u>	Late Cretaceous Turonian - Coniacian
<u>Zone.</u>	P-M15
<u>Environment.</u>	Marine

2660-2840'

<u>Age.</u>	Possible Late Cretaceous Possible Cenomanian
<u>Zone.</u>	P-M16?
<u>Environment.</u>	Marine

2840-5030'

Age. Early Cretaceous
Middle - Late Albian

Zone. P-M17

Environment. Marine

5030-7260'

Age. Early Cretaceous
Aptian - Early Albian

Zone. P-M18

Environment. Marine

Remarks. This separation is based on negative evidence.

7260-7290'

Age. Early Cretaceous
Barremian - Aptian

Zone. P-M18a

Environment. Marine

7290-7630'SW

<u>Age.</u>	Late Jurassic Probable Kimmeridgian
<u>Zone.</u>	Probable P-M21
<u>Environment.</u>	Marine

7630SW-8940'

<u>Age.</u>	Late Jurassic Oxfordian
<u>Zone.</u>	P-M22
<u>Environment.</u>	Marine

8940-9210'

<u>Age.</u>	Early - Middle Jurassic Undifferentiated
<u>Zone.</u>	P-M23
<u>Environment.</u>	Marine

9210-9660'

<u>Age.</u>	Late Triassic - Early Jurassic Undifferentiated
<u>Zones.</u>	Probable P-T15 to P-M24
<u>Environment.</u>	Marginal Marine?

9660-10,470'

<u>Age.</u>	Early Triassic Undifferentiated
<u>Zones.</u>	P-T17 to P-T16
<u>Environment.</u>	Nonmarine?
<u>Remarks.</u>	The spore-pollen assemblage below 10,110 feet is characteristic of the Kavik Formation.

10,470-11,420'

<u>Age.</u>	Indeterminate
<u>Environment.</u>	Indeterminate

INTRODUCTION

Purpose and Scope

A total of 130 samples from the USN/HUSKY West Fish Creek No. 1 well were analyzed for palynomorph content. The samples consisted of 121 ditch-cutting composites and (9) nine sidewall core samples taken between 500 feet and 11,420 feet. The original analysis was completed in April of 1977 as part of the U. S. Government's evaluation program of the NPR4 (later designated the NPRA).

This report provides an updated format for the original data. Some of the original taxa designations have been changed to reflect the newer taxonomic assignments that have evolved over the decades since the well was drilled.

Procedures

The samples were processed in San Diego, California, using techniques standard for the time. The chemical treatments involved the use of hydrochloric, hydrofluoric and nitric acids. The resulting kerogen residues were further concentrated by physical separation with heavy liquids and a sieving/panning technique. Permanent slide mounts were made of the residue concentrates. The coverslip mounting medium was a synthetic resin sold under the brand name of "CoverBond".

The original species distribution chart data and additional sidewall core data from U. S. Geological Survey Open-File Report No. 81-1165 were entered in a microcomputer to compile new format charts. The charts are located in the pocket.

The Palynomorph Distribution Chart (Figure P-1) lists the occurrence and abundance of recorded taxa in each sample. Included on this chart are the diversity and abundance curves for the spore-pollen and the microplankton cysts.

High Resolution Biostratigraphy Plots - Foraminifera/Palynomorphs (Figure B-1) are also provided. This chart includes additional palynology parameters in the form of a cumulative plot that illustrates the relative abundance of the nonmarine, marine and miscellaneous palynomorph components.

RESULTS

500-1670'

<u>Age.</u>	Late Cretaceous Santonian - Campanian
<u>Zone.</u>	P-M14
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The Santonian - Campanian interval is marked by a diverse dinocyst assemblage. This assemblage includes numerous species of <i>Chatangiella</i> , <i>Cyclonephelium distinctum</i> , <i>Hystrichosphaeridium difficile</i> , <i>Laciniadinium biconiculum</i> , <i>Odontochitina operculata</i> and <i>Spongodinium delitiense</i> . The species <i>Chatangiella ditissima</i> is the key form for this zonule.

1670-2660'

<u>Age.</u>	Late Cretaceous Turonian - Coniacian
<u>Zone.</u>	P-M15
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	This interval is identified by the appearance of the dinocyst <i>Isabelidinium globosum</i> .
<u>Discussion.</u>	The occurrence of the spore <i>Trilobosporites apiverrucatus</i> in the bottom of this interval suggests some older strata at the base of the interval. This form, if indigenous, may be reflecting the presence of some Cenomanian or possibly Albian age strata.

2660-2840'

<u>Age.</u>	Possible Late Cretaceous Possible Cenomanian
<u>Zone.</u>	P-M16?
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	This narrow interval shows a decrease in spore-pollen diversity and a corresponding increase in dinocyst diversity. The appearance of the dinocyst <i>Ovoidinium verrucosum</i> and the absence of other Albian markers suggest an age at least as old as Early Cenomanian.
<u>Discussion.</u>	This section may be slightly older and more properly included in the interval below. However, at this time a questionable Cenomanian age assignment is proposed for these strata.

2840-5030'

<u>Age.</u>	Early Cretaceous Middle - Late Albian
<u>Zone.</u>	P-M17
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The Albian interval is characterized by an assemblage that includes the distinctive dinocysts <i>Luxadinium propatum</i> , <i>Ovoidinium verrucosum</i> , <i>Spinidinium vestitum</i> and <i>Wigginsella grandstandica</i> .
<u>Discussion.</u>	This section contains numerous rare occurrences of reworked palynomorphs. The reworked forms consist of marine and nonmarine species that range in age from the Mississippian through the Neocomian. This reworked assemblage generally continues through the Aptian - Albian clastic section.

5030-7260'

<u>Age.</u>	Early Cretaceous Aptian - Early Albian
<u>Zone.</u>	P-M18
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The Aptian to Early Albian interval contains most of the same species as the interval above. The distinguishing aspect of this assemblage is the absence of the age restrictive Middle to Late Albian dinocyst markers.

7260-7290'

<u>Age.</u>	Early Cretaceous Barremian - Aptian
<u>Zone.</u>	P-M18a
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The P-M18a zonule is marked by a dramatic increase in dinocyst abundance. Usually this "bloom" is made up of several species; however, in this thin interval only a few species were recorded. The important forms in this well are <i>Gardodinium</i> and <i>Oligosphaeridium</i> .
<u>Discussion.</u>	This interval encompasses one 30 foot ditch sample and consists of amorphous-rich strata which represent a time of little detrital input. Therefore, this environment is one of low energy and probable low oxygen concentrations.

7290-7630'SW

<u>Age.</u>	Late Jurassic Probable Kimmeridgian
<u>Zone.</u>	Probable P-M21
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	A marked change occurs in the palynomorph assemblage across the Jurassic/Cretaceous boundary. In general, relatively few of the marine species continue across the boundary. In the West Fish Creek well the Late Jurassic assemblage is characterized by the appearance of <i>Gonyaulacysta cladophora</i> and <i>G. jurassica</i> .
<u>Discussion.</u>	The absence of <i>Nannoceratopsis pellucida</i> in this interval suggests a post-Oxfordian age.

7630SW-8940'

<u>Age.</u>	Late Jurassic Oxfordian
<u>Zone.</u>	P-M22
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The Oxfordian section is marked by the appearance of <i>Nannoceratopsis pellucida</i> along with occurrences of <i>Endoscrinium galeritum</i> and various species of <i>Pareodinia</i> .
<u>Discussion.</u>	A single questionable specimen of <i>Wanea</i> is an indication that strata possibly as old as Callovian may be present in the lower part of this interval.

8940-9210'

<u>Age.</u>	Early - Middle Jurassic Undifferentiated
<u>Zone.</u>	P-M23
<u>Environment.</u>	Marine
<u>Palynomorphs.</u>	The Early - Middle Jurassic section is a relatively thin interval identified by the appearance of <i>Nannoceratopsis gracilis</i> , <i>Parvocysta cracens</i> and <i>P. nasuta</i> .
<u>Discussion.</u>	The presence of <i>Parvocysta</i> suggests a possible Toarcian to Aalenian age for this short interval.

9210-9660'

<u>Age.</u>	Late Triassic - Early Jurassic Undifferentiated
<u>Zones.</u>	Probable P-T15 to P-M24
<u>Environment.</u>	Marginal Marine?
<u>Palynomorphs.</u>	<p>This interval is sparsely fossiliferous and marked by scattered occurrences of <i>Taeniaesporites</i>.</p> <p>The marine palynomorphs consist only of <i>Micrhystridium</i> species.</p>

9660-10,470'

<u>Age.</u>	Early Triassic Undifferentiated
<u>Zones.</u>	P-T17 to P-T16
<u>Environment.</u>	Nonmarine?
<u>Palynomorphs.</u>	<p>This Triassic interval is characterized by a distinctive spore-pollen assemblage which includes the forms <i>Klausipollenites staplinii</i>, <i>Kraeuselisporites spinulosa</i>, <i>Lueckisporites</i>, <i>?Lundbladispora</i>, <i>Striatites richteri</i> and species of <i>Taeniaesporites</i>.</p> <p>The marine component consists of rare occurrences of <i>Micrhystridium</i> in two samples.</p>
<u>Discussion.</u>	The diverse spore-pollen assemblage, which begins at 10,110 feet, is typical of the Kavik Formation.

10,470-11,420'

<u>Age.</u>	Indeterminate
<u>Environment.</u>	Indeterminate
<u>Discussion.</u>	This interval consists of carbonate lithology. Palynomorph recoveries are sparse. The taxa recorded in this interval are all presumed to be derived from up-hole. No indigenous forms were recovered.

CONCLUSIONS

Palynological analysis of the USN/HUSKY West Fish Creek No. 1 well provides the following generalized palynostratigraphic succession:

- The top interval consists of Santonian - Campanian age marine strata. This interval extends from 500 feet to 1670 feet.
- Marine strata of Turonian - Coniacian age occur from 1670 feet to 2660 feet.
- Marine strata of questionable Cenomanian age occur from 2660 feet to 2840 feet. This section is tentatively assigned to the Cenomanian because the consistent occurrences of Albian marker dinocysts appear below.
- The definite Early Cretaceous section begins at 2840 feet and consists of Middle - Late Albian marine strata that extend down to 5030 feet.
- Aptian - Early Albian age marine strata occur from 5030 feet to 7260 feet. These marine strata are separated on negative evidence, namely the absence of age restrictive Middle to Late Albian dinocysts.
- The dinocyst-rich strata of Barremian - Aptian age are present in the narrow interval from 7260 feet to 7290 feet.
- Late Jurassic strata of probable Kimmeridgian age are identified between 7290 feet and 7630SW feet. This age assignment is based on the absence of the Oxfordian age marker dinocyst species.
- The section from 7630SW feet to 8940 feet consists of a marine unit assigned to the Oxfordian. Weak evidence was recorded to suggest the presence of strata as old as Callovian in this interval.
- Early - Middle Jurassic marine strata, possibly of Toarcian - Aalenian age, are present in the narrow interval from 8940 feet to 9210 feet.
- The interval from 9210 feet to 9660 feet is assigned a Late Triassic to Early Jurassic age. Overall, this section recovered sparse palynomorphs.

- Early Triassic strata extend from 9660 feet to 10,470 feet. These strata are relatively rich in spore-pollen while marine palynomorphs are essentially absent. The assemblage below 10,110 feet is typical of the Kavik Formation.
- The bottom interval from 10,470 feet to 11,420 feet is of indeterminate age. No indigenous palynomorphs were recovered.

REFERENCE

Witmer, R.J., Mickey, M.B. and Haga, H., 1981. Biostratigraphic Correlations of Selected Test Wells of National Petroleum Reserve in Alaska: U. S. Geological Survey Open-File Report No. 81-1165, 89 pages, 6 charts.