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#4

January 17, 1980

TO: Husky/U. S. Geological Survey

RE: Husky/USGS, NPRA
Tunalik #1
Sec. 20, 10N/36W, U.B.M.
North Slope, Alaska
AFE #22-8345-7182

FORAMINIFERA REPORT

The following micropaleontological report is based on the examination and checklisting of 605 washed ditch samples, 115 thin sectioned ditch samples, 17 washed sidewall cores, 121 washed conventional core samples and 28 thin sectioned conventional core samples covering the interval 90 to 20,330 feet. Thin sections were prepared on all samples below about 16,930 feet. Five checklists and two faunal distribution logs are enclosed for your convenience. Four sidewall cores received after the faunal checklists had been completed appear in an appendix at the back of this report.

Standard techniques were employed in processing the material. All samples were boiled in Quaternary-O and washed over 20 and 200 mesh screens.

Frequency symbols used in this report correspond to the following numerical values: R = rare (1-5); F = frequent (6-32); C = common (33-99); A = abundant (100-199); and FL = flood (200+).

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90-3620'

This interval is practically barren of Foraminifera. Rare occurrences of Trochammina mcmurrayensis, T. cf. rainwateri and Verneuilinoides borealis suggest that these strata probably belong in the Early Cretaceous (Middle to Late Albian) F-9 Zonule. Depositional environments for these strata probably ranged from nonmarine to marginal marine.

AGE: Probable Early Cretaceous
Probable Middle to Late Albian
(Probable F-9)

ENVIRONMENT: Nonmarine to Marginal Marine

3620-5950'

Faunal recoveries pick up in this interval. Occurrences of: Miliammina manitobensis, M. awunensis, M. ischnia, Hippocrepina barksdalei, Verneuilinoides borealis, Gavelinella stictata, Haplophragmoides topagorukensis, Saccammina lathrami, Pseudobolivina rayi, Ammobaculites fragmentarius, A. wenonahae, Conorboides umiatensis, Quadrimorphina ruckerae, Textularia topagorukensis, Eurycheilostomella robinsonae, Psamminopelta bowsheri, and rare Ditrupa cornu are indicative of a Middle to Late Albian (F-9) age. The paleodepths represented by these assemblages were probably inner to middle neritic.

AGE: Early Cretaceous
Middle to Late Albian (F-9)

ENVIRONMENT: Inner to Middle Neritic

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5950-7350'

Based on co-occurrences of Gaudryina nanushukensis, Haplophragmoides excavatus, Verneuilinoides borealis, Pseudobolivina rayi, Psamminopelta subcircularis, and Conorboides umiatensis, this interval is believed to represent a Late Aptian to Early Albian (F-10) age. A middle to outer neritic depositional environment is suggested for these strata.

AGE: Early Cretaceous
Late Aptian to Early Albian (F-10)

ENVIRONMENT: Middle to Outer Neritic

7350-10,620'

A weakly developed radiolarian fauna characterizes these strata together with rare occurrences of agglutinated and calcareous Foraminifera. Pyritized radiolaria of the following genera occur: Cenosphaera spp., Dictyomitra sp., and Lithocampe spp. According to Ramsey (1970) this zone of pyritized radiolaria separates the Verneuilinoides borealis Zone from the Gaudryina tailleuri Zone and is probably Aptian to Early Albian in age. We feel that it is probably Aptian in age, but our data is tentative at this time and the unit may indeed be time transgressive. For this reason it cannot be directly correlated between wells since the F-11 strata in one well may be slightly younger or older than the corresponding F-11 strata in another well. Due to the poor quality and preservation of this fauna, all that can be said about the environment of deposition is that it was marine and open to oceanic currents.

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7330-10,620' (con't.)

AGE: Early Cretaceous
Possible Aptian (Possible F-11)

ENVIRONMENT: Open Marine

10,620-12,620'

Occurrences of Lituotuba gallupi, Ammobaculites erectus, A. reophacoides, Ammodiscus elongatus, A. orbis, A., mackenziensis, arenaceous spp. (large, coarse), Citharina cf. acuminata, Glomospirella arctica, Haplophragmoides coronis, H. inflatigrandis, H. duoflatis, H. goodenoughensis, Pseudobolivina spp., Bathysiphon scintillata, Lenticulina sp. (raised sutures), L. audax, Trochammina squamata, Conorboides cf. umiatensis, Candryina tailleuri, Glomospira subarctica, Praebulimina 2, and Quinqueloculina 2 indicate a Neocomian (F-12 to F-13) age for these strata. Cores 8 and 10 contain a similar assemblage. Frequent to abundant rounded frosted quartz floaters can also be found in this interval. Strata between 10,620 feet and about 10,900 feet represent relatively clear water upper to middle bathyal deposition. Faunas below 10,900 feet indicate a relatively turbid middle to outer neritic environment.

AGE: Early Cretaceous
Neocomian (F-12 to F-13)

ENVIRONMENT: 10,620-10,900' = Upper to Middle Bathyal (clearwater)

10,900-12,620' = Middle to Outer Neritic (turbid)

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12,620-13,380'

This interval is considered to be Neocomian (F-13 to F-14) in age based on the following faunal association: arenaceous sp. (large, coarse), Glomospirella arctica, G. S, Haplophragmoides coronis, H. inflatigrandis, H. duoflatis, H. goodenoughensis, Ammobaculites reophacoides, A. cf. alaskensis, Bathysiphon scintillata, Gaudryina milleri, G. tailleuri, G. leffingwelli, G. topagorukensis, Trochammina squamata, T. cf. saplei, and Glomospira subarctica. The upper portion of this interval probably represents turbid middle to outer neritic paleodepths similar to the overlying interval. Faunas below about 12,920 feet suggest outer neritic to bathyal conditions.

AGE:	Early Cretaceous Neocomian (F-13 to F-14)	
ENVIRONMENT:	12,620-12,920'	= Middle to Outer Neritic (turbid)
	12,920-13,380'	= Outer Neritic to Bathyal

13,380-13,590'

Occurrences of Ammomarginulina cf. baryntica, Trochammina cf. topagorukensis, T. instowensis, Ammobaculites cobbani, and Lenticulina cf. quenstedti suggest that these strata are Late Jurassic in age. They could represent any age from Oxfordian to Tithonian though, and so are here reported as Late Jurassic (undifferentiated). This interval probably represents bathyal paleodepths similar to the lower part of the overlying interval.

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13,380-13,590' (con't.)

AGE: Late Jurassic Undifferentiated
ENVIRONMENT: Bathyal

13,590-14,040'

Overlapping occurrences of Gaudryina milleri, G. topagorukensis, G. leffingwelli, G. tailleuri, Ammobaculites alaskensis, Ammodiscus cf. cheradospirus, A. thomsi, Trochammina sablei, Bathysiphon anomalocoelia and Saracenaria topagorukensis indicate that these rocks are Oxfordian in age. A bathyal paleodepth is again suggested for these strata.

AGE: Late Jurassic
Oxfordian (F-16)
ENVIRONMENT: Bathyal

14,040-14,250'

This interval is characterized by a reduction in fauna with only a few newly occurring forms. The new occurrences are: Astacolus dubius, A. cf. connudatus, Vaginulina cf. sherborni, and Ammobaculites cf. vetusta. These forms probably represent an Early Jurassic age, but the faunal data is tenuous. A middle to outer neritic paleodepth is suggested for these rocks.

AGE: Probable Early Jurassic
(F-18)
ENVIRONMENT: Probable Middle to Outer Neritic

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14,250-14,810'

Astacolus connudatus, Nodosaria larina, N. radiata, N. shublikensis, Pseudoglandulina simpsonensis, P. lata, Lingulina borealis, L. alaskensis, Vaginulinopsis acrulus, Frondicularia acmaea, Trochammina contornata, Lithocampe T (pyritized), and Monotis/Halobia fragments occur throughout these beds. These faunas represent open marine middle neritic conditions. A sandstone at 14,730 feet composed of frequent rounded frosted quartz grains and common clear angular quartz grains may be a facies equivalent of the basal pebble sandstone found in other NPRA wells at the base of the F-19 Zonule.

AGE: Triassic (F-19)
ENVIRONMENT: Middle Neritic (Open Marine)

14,810-17,135.5' Core

This interval is characterized by a relatively poor agglutinated fauna. A lithologic change at 14,810 feet followed by the occurrence of Ammodiscus P at 15,080 feet is the basis for placing the top of the Permo-Triassic (F-20). A lithologic change at 16,020 feet may represent the top of the Kavik Shale. Another lithologic change to glauconitic sandstone and siltstone at 16,900 feet suggests that we are probably in the Permian Echooka Fm. at that point. These strata probably represent nonmarine to inner neritic deposition.

AGE: Permo-Triassic (F-20)
ENVIRONMENT: Nonmarine to Inner Neritic

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17,135.5 Core-19,050'

A very thick (1900'+) section of Early Permian strata appears to develop in this well based on occurrences of Protonodosaria sp., Paleoaplysina sp., nodosariids, cornuspirids and porcellaneous Foraminifera. A significant occurrence of amygdaloidal basalt is found in the interval 17,580 feet to 18,050 feet. The age of this basalt is indeterminate since no Foraminifera or algae were found in it. Whether this volcanic rock represents an intrusive (dike, sill) or extrusive (flow) cannot be determined from the paleontological examination of these samples. Depositional environments for this unit appear to be as follows:

17,135.5-18,340' : Nonmarine to Restricted Carbonate Shelf and Lagoonal

18,340-19,050' : Shallow shelf (Carbonate Platform Suite)

Packstones and grainstones predominate below 18,340 feet.

AGE: Early Permian (A.W.A. F-21)

ENVIRONMENT: 17,135.5-18,340' : Nonmarine to Restricted Carbonate Shelf and Lagoonal

18,340-19,050' : Shallow Shelf (Carbonate Platform Suite)

19,050-20,330'

This interval is predominately packstones and grainstones. Strata between 19,050 feet and 19,550 feet are no older than

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19,050-20,330' (con't.)

Zone 21 but could be as young as Zone 24. Occurrences of Pseudostaffella sp. and Kamaena sp. coupled with the presence of Stylocodium sp. at 20,290-20,320 feet, in what appears to be in-situ lithology, suggest that the entire interval 19,050 feet to 20,330 feet is Zone 21 in age. However, if the Stylocodium sp. at 20,290-20,320 feet is caved then the strata below 20,210 feet might be Zone 20 in age.

These strata represent the shoaling shelf facies of a Carbonate Platform Suite.

AGE: Middle to Late Pennsylvanian

ENVIRONMENT: Shoaling Shelf
(Carbonate Platform Suite)

Interpreted by:

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APPENDIX A

10,646'SWC

Arenaceous spp. (R), Lituotuba gallupi (R), Cenosphaera spp. (F) pyritized, Dictyomitra sp. (R) pyritized, rounded frosted quartz floaters (C), pyrite (C), L.C.M. (F). Dark brownish-gray sandy shale.

AGE: Neocomian
(Probable F-12 to F-13)

ENVIRONMENT: Open Marine

10,888'SWC

No Foraminifera found. Pyrite (R), L.C.M. (C). Buff tan very fine-grained sandstone.

AGE: Indeterminate

ENVIRONMENT: Indeterminate

11,196'SWC

No Foraminifera found. Dark brown silty shale.

AGE: Indeterminate

ENVIRONMENT: Indeterminate

11,317'SWC

No Foraminifera found. Inoceramus prisms (R), L.C.M. (A). Dark brown shale.

AGE: Indeterminate

ENVIRONMENT: Indeterminate