NATIONAL PETROLEUM RESERVE IN ALASKA

GEOLOGICAL REPORT

U. S. NAVY

W. T. FORAN NO. 1

HUSKY OIL NPR OPERATIONS, INC.
Prepared by: Gordon W. Legg

For the

U. S. GEOLOGICAL SURVEY
Office of the National Petroleum Reserve in Alaska
Department of the Interior
JULY 1983

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COMPOSITE LITHOLOGY LOG (in pocket)

GEOLOGIC SUMMARY

INTRODUCTION

The W. T. Foran No. 1 well is located in the NW 1/4 of protracted Section 13, T17N, R2W, Umiat Meridian, North Slope Borough, Alaska. The surveyor's plat located the well 671' FNL, 564' FWL of the section (see Figures 1 & 2). The well was drilled by Husky Oil for the U. S. Navy before Naval Petroleum Reserve No. 4 was transferred to the Department of the Interior and was designated the National Petroleum Reserve in Alaska.

Drilling operations commenced at midnight on March 6, 1977. The well was plugged and abandoned as a dry hole after reaching a total depth of 8,864 feet (driller). The date of abandonment and subsequent rig release was April 24, 1977.

Good shows of oil were encountered in the Kuparuk Sandstone, the Ivishak Formation of the Sadlerochit Group and in the upper portion of the Lisburne Group. Drill-stem tests of these intervals recovered significant amounts of formation water. Log calculations revealed very high water saturations in each of these zones. No other shows in the well merited any further evaluation.

PRE-DRILLING PROGNOSIS

The primary objectives of the W. T. Foran No. 1 well were the Sadlerochit sandstones and the Lisburne carbonates, which were interpreted to have stratigraphic closure based on seismic mapping. This closure was believed to exist as a result of the basal Cretaceous unconformity having truncated all, or nearly all, of the Lisburne rocks, allowing rocks of the lower Cretaceous "Pebble Shale" to provide both an updip seal and an available source rock. These geological conditions are similar to those found at the Prudhoe Bay Oil Field. Most of the closure was interpreted to lie offshore (and, therefore, off the Naval Petroleum Reserve). Additionally, it was believed that the quality of the sandstones in the Sadlerochit would be improved over that encountered by the U. S. Navy, Cape Halkett No. 1 well, located six miles to the southwest.

A secondary objective of the well was the possible development of sandstone at or near the base of the "Pebble Shale", commonly believed to be the equivalent of the Kuparuk Sandstone, which produces in the western part of the Prudhoe Bay Field. The Cape Halkett well to the south had 33 feet of this sandstone and there was reason to believe that the unit might thicken to the north.

POST-DRILLING SUMMARY

The Sadlerochit and Lisburne objectives were found to be present in the W. T. Foran well in much the same relationship as they had been interpreted from seismic data. The basal Cretaceous unconformity was

encountered only 82 feet above the Sadlerochit, and had removed all of the Kingak Formation, as well as the Sag River Sandstone and much of the Shublik. The presence of the interpreted "stratigraphic closure", of course, could not be confirmed because the objective horizons were all "water wet", although exhibiting good reservoir characteristics (fair to good porosity and permeability as evidenced by drill-stem tests and log analysis). If a closure exists, it likely is offshore, to the north of the W. T. Foran well. The fact that the original seismic interpretation located most of the closure offshore and to the north of the W. T. Foran No. 1 well, may be of significance to future exploration.

The secondary objective, the Kuparuk Sandstone, was also present, but was not as thick as was postulated (an actual thickness of 33 feet was penetrated, which was the same as that in the Cape Halkett well). The Kuparuk also contained good oil shows and good reservoir characteristics, evidenced by drill-stem test data and log analysis. There is a possibility that the Kuparuk Sandstone could be productive at some updip location.

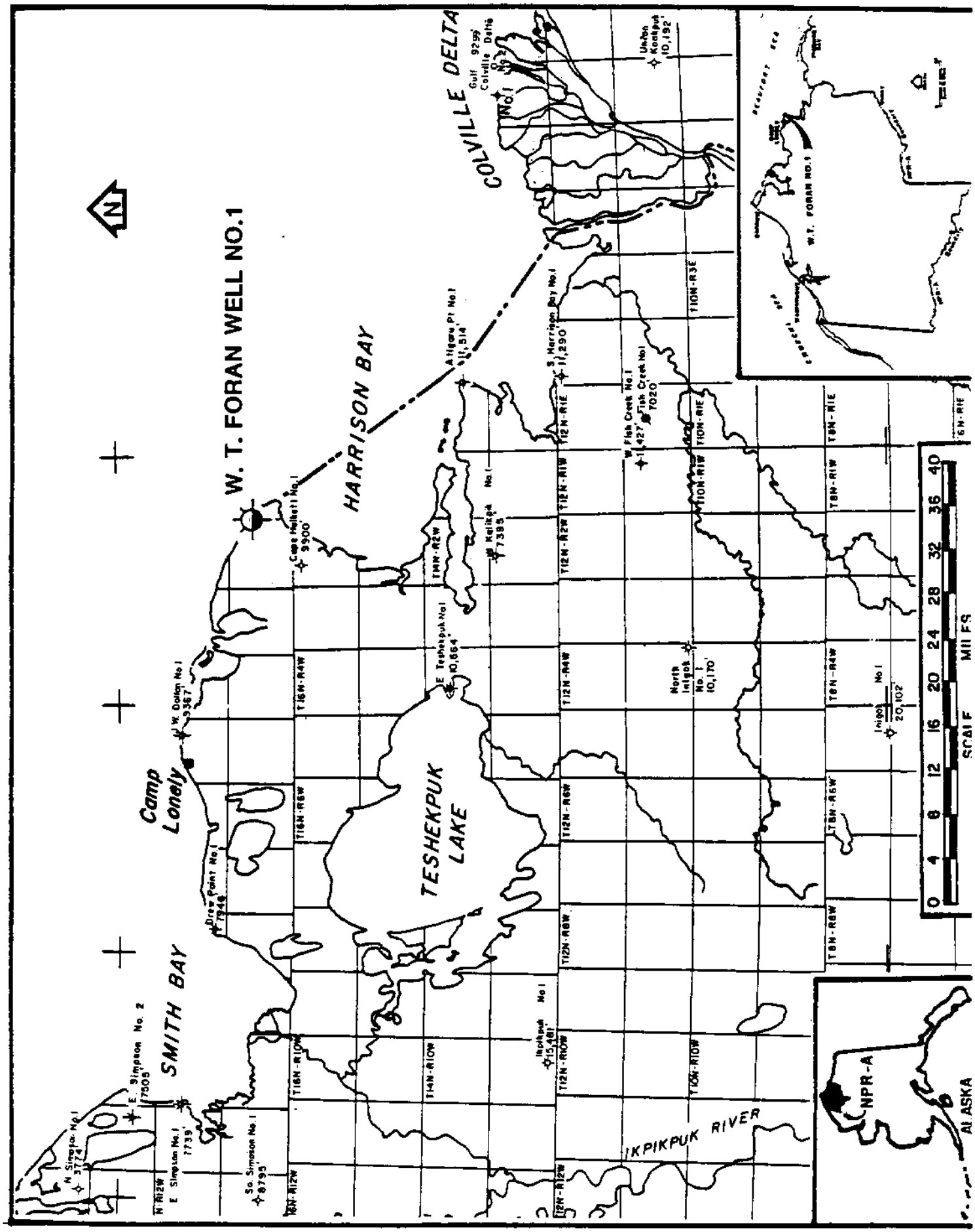
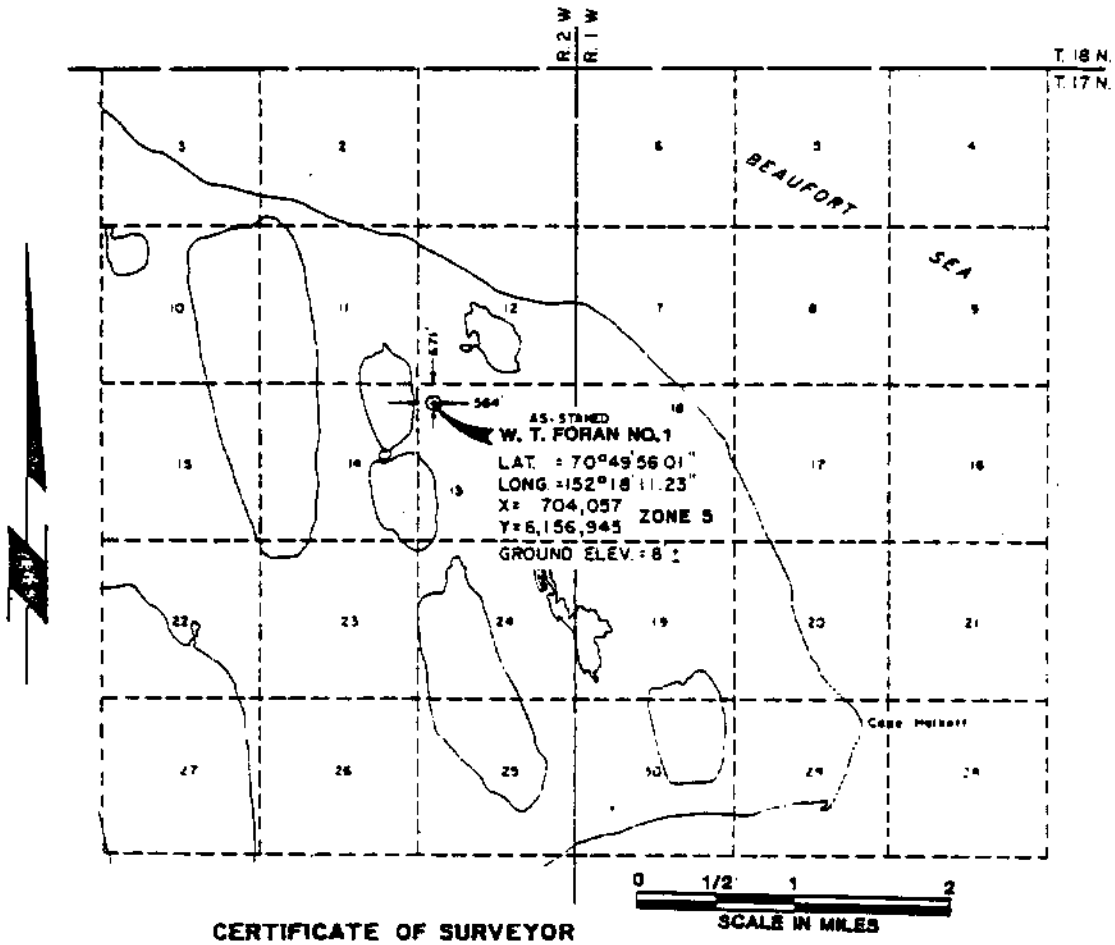


FIGURE 1 - LOCATION MAP - W. T. FORAN NO. 1



CERTIFICATE OF SURVEYOR

I hereby certify that I am properly registered and licensed to practice land surveying in the State of Alaska and that this plat represents a location survey made by me or under my supervision, and that all dimensions and other details are correct.

7-22-76
Date

SURVEYOR

AS STAKED

W. T. FORAN NO. 1

Located in
NW 1/4 PROTRACTED SEC. 3, T17N, R 2W, UMIAT MERIDIAN, AK

Surveyed for

HUSKY OIL
N. P. R. OPERATIONS INC.

Surveyed by

F. M. LINDSEY & ASSOC.

LAND & HYDROGRAPHIC SURVEYORS
2502 West Northern Lights Boulevard Box 4-0
Anchorage Alaska

FIGURE 2 - SURVEYOR'S CERTIFICATE - W. T. FORAN NO. 1

WELLSITE GEOLOGIST'S REPORT
BY: D. O. BOSSORT
EDITED BY: GORDON W. LEGG

INTRODUCTION

The W. T. Foran No. 1 well was drilled in order to test a seismically interpreted, stratigraphic closure. The particular location was also chosen on the basis that it was the closest location, with demonstrated closure, to the updip erosional truncation of the Sadlerochit Group sandstones and the Lisburne Group carbonates. Additionally, the location was updip from the U. S. Navy, Cape Halkett No. 1 well, with fair reservoirs in both the Sadlerochit sandstones and the Lisburne carbonates.

Reservoir quality sandstones were encountered in both the Kuparuk Sandstone and in the Ivishak Formation of the Sadlerochit Group. Each of these sandstones had good, observed oil staining and porosity, and each of the sandstones was tested. The Kuparuk Sandstone was also cored. Drill-stem tests, by flowing water to the surface, proved that the sands were "water wet", but good potential reservoirs.

Fair porosities and shows were observed in the top of the Lisburne. Core analysis porosities were similar to those calculated from the logs, and a drill-stem test confirmed that the Lisburne was "water wet" by the recovery of formation water.

Log analysis of the Kuparuk Sandstone, the Sadlerochit sandstones and the Lisburne carbonates also confirmed that these zones had water saturations too high to be oil and/or gas productive.

WIRELINE TOPS

CRETACEOUS-TERTIARY (undifferentiated)	500-1580'
CRETACEOUS	
Colville Group	
Shrader Bluff Formation	1580-2450'
Seabee and Prince Creek Formations	2450-3650'
Nanushuk Group	3650-4396'
Torok Formation	4396-7336'
"Pebble Shale"	7336-7509'
Kuparuk Sandstone	7509-7542'
TRIASSIC	
Shublik Formation	7542-7624'
TRIASSIC-PERMIAN	
Sadlerochit Group	
Ivishak Formation	7624-8131'
Kavik Shale Member	8131-8196'

PENNSYLVANIAN	
Lisburne Group	8196-8562'
"Probable" Endicott Group	8562-8794'
INDETERMINATE	
Argillite "basement"	8794-8864'

STRATIGRAPHY

There were no samples caught from the surface down to a depth of 500 feet.

CRETACEOUS-TERTIARY

Undifferentiated: 500-1580'

The W. T. Foran No. 1 drilled from the first sample-catching point of 500' where the sediments were undifferentiated Tertiary age. According to the Anderson, Warren & Associates, Inc., paleontology report, the rocks down to 1580' were assigned an age ranging from Tertiary to Latest Cretaceous. No attempt was made to further subdivide this interval.

The rocks in this interval consisted of unconsolidated conglomerate and fine to coarse grained sandstones. Wood fragments and lignite beds were common.

CRETACEOUS

Colville Group

Shrader Bluff Formation: 1580-2450'

Sedimentary rocks in the interval from 1580-2450' have been assigned to the Shrader Bluff Formation of Late Cretaceous (Senonian) age, by Anderson, Warren & Associates, Inc.

The lithology of this interval is predominantly a silty to very fine grained, sandy sequence, with a soft shale and clay matrix.

Seabee and Prince Creek Formations (undifferentiated): 2450-3650'

The interval from 2450' to 3650' is Late Cretaceous, and comprises sedimentary rocks of the Seabee and Prince Creek Formations (Anderson, Warren & Associates, Inc.).

Sample quality in the interval was very poor due to both rapid penetration rate and the incompetent nature of the sediments. The upper part of the interval consists of shales and white, bentonitic claystones, which are generally very light gray to white, soft, and waxy. The shales and claystones contain finely disseminated carbonaceous grains. There is a gradual gradation from these shales and claystones to a darker gray, silty shale with depth.

There is an occurrence of abundant white, crystalline calcite at 2930' to 2960'. This calcite could be derived from one or more large concretions, which are known to occur in the Seabee Formation. The occurrence of the crystalline calcite in the samples is coincident with a sharp deviation of the borehole from the vertical, and lends weight to the theory that the harder calcite nodules have caused the bit to "kick-off" slightly.

Nanushuk Group: 3650-4396'

Anderson, Warren & Associates, Inc. identifies the interval from 3650' down to 3770' as "probable Nanushuk Group", and further identifies the interval from 3770' down to 5950' as Nanushuk Group and Upper Torok. Log correlations demonstrate that the top of the Torok can be picked at 4396', so the log top is used in this report.

Lithologically, the Nanushuk Group sedimentary rocks were predominantly shale, which was dark gray, silty, calcareous, and having an irregular fracture. The shales are interbedded with thin, medium gray, calcareous siltstones, and rare dolomitic mudstones. Calcified worm-tubes, and pyritized worm-tube fillings were occasionally noted. The lowermost 88' contained gray, very fine grained, calcareous sandstones. The sandstones were well cemented, and tight. There were no shows of hydrocarbons.

Torok Formation: 4396-7336'

The interval from 4396' to 7336' is correlated with the interval 4235-7160' in the U. S. Navy, Cape Halkett No. 1 well. This interval has been identified as Torok Formation by Anderson, Warren & Associates, Inc. although the base of the interval on the electric log (7336') varies slightly from the paleontological pick at 7380'.

The Torok Formation, in the upper portion, consisted of thick beds of soft, bentonitic shales and claystones. The samples, however, were of very poor quality and large amounts of up-hole cavings were evident. From a depth of 5070' to 5860', the Torok shales grade to a medium to dark gray shale, which is fissile and micaceous; interbedded with the shales are medium gray, sandy, calcareous siltstones, grading to very fine grained, quartz and chert, sandstones. Minor gas shows were recorded in this zone.

The lower Torok consists of very dark gray, fissile, micaceous shale, with interbedded medium gray siltstone. The lowermost 200' of the Torok (7131-7336') correlates with the interval 7160-7278' in the U. S. Navy, Cape Halkett No. 1 well. The lithology is composed of very dark gray shales, fissile to splintery, "papery", micaceous, and slightly silty in part.

"Pebble Shale": 7336-7542'

The "Pebble Shale" consists of very dark gray to very dark brownish-gray, to black, fissile to "papery", soft shale. The shale becomes highly organic in the lower part. Isolated "floating", medium to

coarse grained, frosted quartz grains are common, and rare manganese pellets were observed. The manganese pellets were medium grained, round to ovoid, and are a dark metallic-gray in color. The polished, flattened or ovoid, black pebbles for which the interval is named, were not observed, unless the manganese pellets are, in fact, the "pebbles".

The lower 33' of the "Pebble Shale" consists of a basal Cretaceous unconformity sandstone, which has been designated the Kuparuk Sandstone in this area.

The upper 30' of the Kuparuk Sandstone is a very fine grained chert and quartz sandstone, with a bentonitic clay and silt matrix, containing rare glauconite grains. The sandstone is poorly consolidated, has poor to fair visible porosity, and has good oil staining and odor, with a strong fluorescent cut.

Core No. 1 (7539-7557') was obtained in the lower part of the Kuparuk Sandstone. The upper 3' of the recovered core (cut 18', recovered 18') was a conglomeratic sandstone which graded to a thin (1') conglomerate at the base. The conglomeratic sandstone was medium to coarse grained, subrounded to well rounded chert and quartz, and contained chert pebbles. The basal conglomerate contains pebbles up to 1-1/4" in diameter. The sand grains and pebbles are poorly sorted and moderately well cemented in a matrix of very fine grained to medium grained, argillaceous quartz sandstone. The conglomeratic interval exhibits fair porosity, with good oil staining, and a good fluorescent cut. Gas readings were recorded of 391 units of total gas, which breaks down into 124 units of C_1, 48 units of C_2, 27 units of C_3, and a trace of C_4. Log calculations in this interval, however, revealed the sandstone and conglomerate to be "water wet" in spite of the good observed shows. A drill-stem test through perforated casing later proved the log calculations to be correct, when only salt water was recovered.

The lower 15' of Core No. 1 recovered siltstone, which contained fragile pelecypod shells and is probably the Shublik Formation. The presence of the basal conglomerate above the siltstone lends strong support to the argument that the basal Cretaceous unconformity is present at 7542'.

TRIASSIC

Shublik Formation: 7542-7624'

Although Anderson, Warren & Associates, Inc. picks a "possible" Shublik interval from 7590-7650', data obtained from coring and from log correlations more correctly identifies the Shublik Formation as occurring from 7542-7624'. As previously mentioned, Core No. 1 almost surely penetrated the unconformity between the Basal Cretaceous and the Triassic (Shublik) at 7542'. The erosion accompanying the unconformity at this location has removed the Kingak Formation, the Sag River Sandstone, and the upper beds of the Shublik. Only 82' of the Shublik remains.

The lithology of the Shublik consists of shaly, calcareous, argillaceous, medium to very dark brownish-gray siltstone. The siltstone was oil-impregnated and gave weak, fluorescent cuts throughout. The siltstones in Core No. 1 were thinly laminated with black shale partings, and contained thin layers of highly calcareous pelecypod shell imprints. Traces of fragmental limestone were noted in the lower portion of the Shublik. A few phosphate pellets were found in the lowermost 10' of the Shublik.

TRIASSIC-PERMIAN

Sadlerochit Group

Ivishak Formation: 7624-8131'

The W. T. Foran No. 1 well penetrated 507' of sandstones which have been classified as the Ivishak Formation by Anderson, Warren & Associates, Inc. (actually, AWA classified the interval 7650' to 8200' as merely Permo-Triassic; the more precise identifications are from log correlations, utilizing paleo).

The sandstones of the Ivishak Formation are medium brown to gray, with mottling from weathered, white chert grains. The grain sizes range from fine to medium grained in the upper 387' of the interval and grade to fine to very fine grained in the bottom 120'. Generally, the grains are subangular to subrounded quartz, with some subrounded, coarse grained quartz and chert common. The sandstones grade to conglomeratic in the upper portion. Secondary quartz overgrowths and crystal faces are plentiful and conspicuous, and pyrite is common, with a few scattered grains of glauconite being noted in the lower part of the sequence. The sandstones are moderately well-sorted and moderately consolidated, with minor amounts of dolomite matrix in the upper 387'. Good visible porosity was observed in the cuttings, which also exhibited good oil staining and yielded strong fluorescent cuts in the upper 413' of the Ivishak. In the lower part of the Ivishak, the sandstones are well consolidated and have a dolomitic clay matrix in part; the porosity becomes very poor and the oil staining disappears.

Interbedded with the sandstones are minor thin beds of red shale, which are mottled gray in part. Traces of dense, buff dolomite were also noted. Traces of gray, fissile shale occur in the lower part of the interval.

A drill-stem test of the top 36' of the Ivishak Formation recovered 125 barrels of very slightly gas-cut water (12,500 ppm chloride) in two hours.

The thickness of the oil-stained, but "water wet", sand section in the Ivishak Formation is of considerable interest, suggesting structural readjustments after initial migration, with subsequent "flushing".

Kavik Shale Member: 8131-8196'

The Kavik Shale is somewhat gradational with the overlying Ivishak sandstone. The shales are medium light gray to medium dark gray in color, micaceous, silty in part, and slightly dolomitic in part, with traces of dense, buff dolomite.

PENNSYLVANIAN

Lisburne Group: 8196-8562'

The interval from 8196' to 8562' has been assigned to the Lisburne Group by Anderson, Warren & Associates, Inc. The actual paleo depths were 8200-8590'. The depths 8196-8562' are the electric log picks for the Lisburne.

Primarily a fragmental or bioclastic limestone, the Lisburne is white to light gray in color, and is composed of fragments, subrounded grains, pellets and oolites, which are cemented in a very fine grained, calcareous, and sometimes dolomitic, matrix. Porosities are generally fair in the top 40' of the Lisburne. Good oil staining, accompanied by good fluorescent cuts, occurs in the upper 115' of the Lisburne. Fracturing was suspected from an examination of the cuttings, and was confirmed in a core taken in the interval 8253-8283'. Live oil was noted on the fracture planes.

A drill-stem test taken in the top of the Lisburne, 8205-8283', recovered 11.2 barrels of very slightly oil-cut salt water. Recovery in the sample chamber was 2.17 cubic feet of gas, 76 cc of oil and 1,691 cc of water (11,000 ppm chloride).

The bioclastic limestones of the Lisburne are interbedded with very fine to fine, granular to crystalline, calcareous dolomite. The dolomite is often silty. Minor amounts of siltstone and shale were observed in Core No. 2.

"Probable" Endicott Group: 8562-8794'

Anderson, Warren & Associates, Inc. classified the interval from 8590-8770' as Indeterminate age, "Probable Endicott Group". From electric log characteristics and correlations, lithology, and superposition, this interval, adjusted to 8562-8794', has been assigned to the Endicott Group.

Lithologically, the interval is predominantly a varicolored shale; the colors ranging from reds, maroons and lavenders, through medium greenish-gray to gray-green. The shales are fissile to splintery and smooth-textured to silty in part. Minor beds of sandstone and conglomeratic sandstones occur within the shale sequence. The basal interval, 8760' to 8794', is a sandstone, which is medium gray, mottled with maroon, very fine grained to medium grained, subangular to subrounded quartz and chert grains, with occasional coarse grains and pebbles; these grains are well cemented in an argillaceous, siliceous matrix, and speckled with irregular inclusions of white chert. Some workers have assigned this sequence of rocks to "basement".

INDETERMINATE

Argillite "basement": 8794-8864'

The W. T. Foran No. 1 well bottomed in a sequence of low-grade metamorphosed black shales and very dark gray siltstones, collectively called "argillite" in the area, and representing "economic basement". The black shales have a sub-metallic luster, are carbonaceous and micaceous, and are schistose in appearance. The siltstones are highly siliceous and sandy in part, and are very well indurated.

CONCLUSIONS

The W. T. Foran has been completely evaluated in its objective zones. Cores and drill-stem tests, plus log calculations, have proved that the good shows which were noted in the samples in the Kuparuk Sandstone, the Sadlerochit sandstones, and the Lisburne carbonates, were all "water wet", and have apparently been "flushed". No other zones merited further evaluation.

The good oil-staining and fair to good porosities observed in the objective zones, suggests that other locations, possibly located to the north and northwest in the Beaufort Sea, may be of interest as future exploration targets.

PERTINENT DATA AND APPENDICES

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SUMMARY OF PERTINENT DATA *

WELL NAME:	W. T. Foran No. 1
API NO.:	50-103-20010
OPERATOR:	Husky Oil NPR Operations, Inc.
LOCATION:	671' FNL, 564' FWL, NW 1/4, protracted Section 13, T17N, R2W, Umiat Meridian, North Slope Borough, Alaska
COORDINATES:	Latitude: 70°49'56.01"N Longitude: 152°18'11.23"W X = 704,057 Y = 6,156,945 Zone 5
ELEVATION:	39', Kelly Bushing; 13', Pad; 8', Ground
DATE SPUDDED:	March 6, 1977
TOTAL DEPTH:	8864' Driller; 8864' Schlumberger
DATE REACHED TOTAL DEPTH:	April 15, 1977
RIG RELEASED:	April 24, 1977
STATUS:	Plugged and abandoned
CASING:	20" @ 102' 16" @ 1454' 10-3/4" @ 7587'

LOGGING RECORD:

DIL/SP	116-2450'
	1460-7562'
	7585-8856'
BHC/GR	1050-2370'
	1452-7557'
	7585-8854'
CNL/FDC/GR/CAL	1626-7566'
	7585-8861'
HDT	2350-7567'
	7585-8863'
HDT Arrow Plot	2355-7542'
	7601-8860'
CBL/VDL	5500-7583'
Saraband	1600-8150'
Coriband	8150-8832'

LOGGING RECORD (Continued)

Mudlog	500-8864'
Geologist's Lithology Log	500-8864'
Birdwell Velocity Survey	1000-8864'

SIDEWALL CORES: ** Run No. 1, 20 shot, 18 recovered
Run No. 2, 24 shot, 21 recovered.

CONVENTIONAL CORES:

No.	Interval	Recovery	Rock Unit
1	7539-7557'	18'	Kuparuk Sandstone
2	8253-8283'	30'	Lisburne

WELLSITE GEOLOGIST: D. O. Bossort

WELL LOG ANALYST: Armour Kane

DRILLING CONTRACTOR: Nabors Alaska Drilling, Inc., Rig 25

MUDLOGGERS: GeoServices

BIOSTRATIGRAPHIC ANALYSIS: Anderson, Warren & Associates, Inc.

* Copies and/or reproducibles of all geologic data are available from:

National Oceanic and Atmospheric Administration
EDIS/NGSDC (D62)
325 Broadway
Boulder, CO 80303

** Sidewall cores were utilized for various analyses including: lithology, paleontology and geochemistry.

W. T. FORAN NO. 1
DRILL CUTTINGS AND CORE DESCRIPTIONS

DRILLED DEPTH (FEET BELOW KELLY BUSHING)	
0- 500	No recovery.
500- 680	Conglomerate: loose, fine to coarse grained, subrounded to rounded quartz grains with minor chert grains and fragments of dark gray, rounded, polished dark argillite and chert pebbles; wood fragments and pyrite are abundant.
680- 950	Sandstone: loose, fine grained, subangular to subrounded quartz and chert grains, moderately well sorted; secondary quartz crystal faces, wood fragments and pyrite are abundant.
950- 980	Conglomerate: loose, very coarse grains and fractured pebbles of quartz, chert, limestone and argillite; well rounded and polished; Sandstone: as above.
980-1040	Sandstone: loose, fine grained, as above, rare glauconite; secondary quartz crystals on sandstone grains are common; some wood fragments, and with Conglomerate: as above.
1040-1070	Lignite: dark brownish-gray to black, mixed with wood fragments, and with Conglomerate and Sandstone: as above.
1070-1100	Sandstone: mostly as above, but becoming poorly sorted, and with a trace of pyrite; some Conglomerate: as above.
1100-1340	Conglomerate: as above, but poorly sorted, minor carbonate grains; Sandstone: as above.
1340-1400	Lignite: as above, with Conglomerate and Sandstone: as above.
1400-1680	Conglomerate and Sandstone: as above, with traces of glauconite and lignite.
1680-1830	Siltstone: loose to poorly consolidated quartz, silt and very fine grained sand grains, inferred matrix of light colored clay.
1830-1890	Siltstone: as above, with some Sandstone: white, silty, weakly cemented with white clay.

1890-2250	Siltstone: as above, with a trace of Shale: very light gray to white, waxy, bentonitic, trace of very fine sand grains.
2250-2430	Siltstone: as above, with Sandstone: loose, very fine grained to silt, quartz and chert grains, with occasional carbonaceous grains, moderately sorted, secondary quartz crystal overgrowths common; trace of pyrite; trace of white, chalky limestone.
2430-2490	Siltstone: medium light gray to medium gray, very finely sandy in part, occasional carbonaceous grains and pyrite, poorly consolidated, rare plant fragments, with Sandstone: loose, fine to medium grained, subangular to subrounded quartz and chert.
2490-2520	Sandstone: light gray, salt and pepper, very fine grained quartz, chert and carbonaceous grains, poorly cemented with very fine silt matrix, poorly sorted; trace of glauconite and mica; Shale: medium gray, silty.
2520-2590	Shale: very light gray to white, soft, waxy, bentonitic, silty, finely disseminated, black, carbonaceous grains, slightly micaceous, with a trace of Sandstone: as above.
2590-2670	Shale: as above, but becoming less bentonitic and better consolidated.
2670-2740	Shale: as above, but becoming well consolidated; sharp, irregular fracture.
2740-2820	Shale: as above, with a trace of Sandstone: light gray, salt and pepper, very fine grained to fine grained quartz, chert and carbonaceous grains, moderately cemented, moderately sorted, poor porosity.
2820-2850	Shale: as above, with a trace of Shale: medium gray and buff, silty, and with minor Sandstone: as above.
2850-2880	Shale: as above, with Shale: medium gray to medium light gray, silty, micaceous, chunky to splintery fracture.
2880-2940	Shale: as above, with Shale: light gray to white, and with some loose, very fine grained quartz grains.
2940-3010	Shale and minor sand grains: as above, with Limestone: white, crystalline calcite; in part, coarse fragments of calcite.
3010-3060	Shale: medium dark gray to medium dark brownish-gray, carbonaceous, micaceous, fissile to flaky, with Shale: as above.

3060-3180	Shale: as above, with Sandstone, grading to Siltstone: light gray to gray, salt and pepper, very fine grained, quartz, chert and carbonaceous grains, poorly cemented and poorly sorted.
3180-3300	Claystone: white, bentonitic; minor, finely disseminated carbonaceous grains.
3300-3400	Claystone: as above, but becomes silty, moderately consolidated in part.
3400-3480	Shale: dark gray, silty, and Shale: dark brownish-gray, carbonaceous, irregular fracture, and with Claystone: as above.
3480-3540	Shale and Claystone: as above, with some Shale: dark gray, becoming very silty in part.
3540-3690	Shale: medium dark gray, silty, calcareous, with Siltstone: medium light gray to gray, very finely sandy, calcareous, well cemented.
3690-3790	Shale and Siltstone: as above, with traces of Mudstone: buff, dolomitic.
3790-3810	Shale, Siltstone and Mudstone: as above, with worm remains.
3810-3850	Shale, Siltstone, Mudstone: as above, with Sandstone: medium gray, very fine grained to silt, quartz and Chert grains: calcareous, well cemented.
3850-3940	Shale and Siltstone: as above, with rare worm remains.
3940-4106	Shale and Siltstone: as above, with rare crinoids.
4106-4114	Siltstone: brown, very dolomitic, well cemented, poor porosity, oil saturated, streaming brown visual cut, bright yellow fluorescent cut, with Shale and Mudstone: as above.
4114-4320	Shale and Mudstone: as above, with minor Siltstone: as above, but no show.
4320-4490	Sandstone: gray, very fine grained, subangular to subrounded quartz grains, with minor chert and carbonaceous grains, well sorted, calcareous, well cemented, tight, with Shale, Siltstone and Mudstone: as above.
4490-4680	Claystone: very light to medium gray, soft, bentonitic, micaceous, sparsely and finely disseminated carbonaceous grains, with Shale: as above.

4680-4870	Claystone: as above, with traces of Shale: medium gray, soft, micaceous.
4870-5020	Clay: as above, with traces of Shale: medium to very dark gray, micaceous, fissile.
	NOTE: Samples 4400-5074' are of very poor quality.
5020-5350	Siltstone: medium gray, sandy, calcareous, well cemented, pyrite abundant, worm remains common, and with Shale: medium to dark gray, silty, calcareous.
5350-5440	Siltstone and Shale: as above, with Sandstone: very fine grained, loose quartz grains, subangular to subrounded, calcareous in part, well cemented.
5440-5540	Shale: medium to dark gray, silty, calcareous, with Siltstone: medium gray, sandy, calcareous, well cemented, with Sandstone: gray, very fine grained to silt, calcareous, moderately well cemented.
5540-5610	Shale, Siltstone and Sandstone: as above, with a trace of Sandstone: gray, very fine grained, slightly calcareous, poorly cemented, trace of glauconite, poor porosity.
5610-5630	Sandstone: light gray, very fine grained to silt, quartz and chert grains, slightly calcareous, very poorly cemented to unconsolidated, poor porosity, no show.
5630-5710	Sandstone: light gray, very fine grained to silt, with some fine to coarse carbonaceous grains, calcareous and fine silt matrix, moderately consolidated, rare glauconite grains, very poor porosity, no show.
5710-5900	Sandstone: as above, with Shale: dark gray to very dark gray, micaceous, fissile.
5900-5950	Sandstone: gray, very fine grained, with fine to medium grained carbonaceous grains, slightly calcareous in part, poor to moderately consolidated, poor porosity, with a trace of Siltstone: poorly consolidated, pyritic.
5950-6010	Sandstone and minor Siltstone: as above, with Shale: very dark brownish-gray, silty.
6010-6170	Sandstone, Siltstone and Shale: as above, with some Siltstone: brownish-gray, sandy in part.
6170-6280	Shale: as above, becoming very dark gray, micaceous, silty in part, pyrite common; some worm-tubes.

6280-6430	Shale: very dark gray, micaceous, silty in part, fissile, pyritic, rare worm-tubes.
6430-6490	Shale: as above, becoming silty in part, with Siltstone: medium gray, shaly in part.
6490-6630	Shale: very dark gray, micaceous, fissile, silty in part.
6630-6680	Shale: as above, with a trace of Siltstone: as above.
6680-6710	Shale: as above, with Siltstone: medium gray to light gray, poorly sorted, poorly consolidated.
6710-6750	Shale: as above, with Siltstone: as above, with some Sandstone: medium light gray, very fine grained to silt, quartz, chert, and carbonaceous grains, rare glauconite, slightly calcareous, poorly consolidated, very poor porosity; trace of pyrite.
6750-6840	Shale: as above, with increase in Siltstone: as above, and with traces of Sandstone: as above.
6840-6880	Sandstone and Siltstone: as above, but large increase to approximately one-half of samples, with Shale: as above.
6880-7180	Shale, Siltstone and Sandstone: as above, but alternating and interbedded; trace of pyrite.
7180-7230	Shale and Siltstone: as above, with Sandstone: light medium gray, very fine grained quartz, chert and carbonaceous grains, very slightly dolomitic, silt matrix, moderately sorted, well consolidated, very poor porosity, no show.
7230-7270	Shale: very dark gray, fissile, micaceous, silty in part.
7270-7300	Shale: as above, with some Siltstone and Sandstone: as above.
7300-7390	Shale: as above, becoming splintery to papery in part.
7390-7460	Shale: as above, with isolated medium to coarse, well rounded, frosted quartz grains and rare manganese pellets.
7460-7509	Shale: as above, becoming very dark brownish-gray and highly organic.
7509-7539	Sandstone: very fine quartz and chert grains, with clay and silt matrix, rare glauconite, poorly consolidated, poor to fair porosity, heavily oil stained, strong fluorescent cut.

7539-7557 Core No. 1 - Cut 18', Recovered 18'

7539.0-7541.0' (2.0')	Sandstone; conglomeratic: medium to coarse grained quartz and chert grains and small pebbles, subrounded to well rounded in matrix of very fine grained to medium grained, subangular to subrounded quartz grains; carbonaceous grains common; glauconite rare; secondary quartz faces common as overgrowths on grains; poor sorting, well consolidated, fair porosity, good oil stain, good fluorescence and cut; vertical fractures, with secondary calcite along fracture planes.
7541.0-7542.0' (1.0')	Conglomerate: chert pebbles to 1-1/4" in long dimension, in poorly sorted matrix of sandstone, as above; good oil stain, good fluorescence and cut, fair porosity.
7542.0-7546.0' (4.0')	Siltstone: medium dark brownish-gray, very fine grained quartz, with abundant carbonaceous grains, medium well consolidated, good oil stain, with good fluorescence and cut; interbedded with, and grading to, Shale: medium gray, very silty, petroliferous, in part thinly laminated; vertical fractures filled with secondary calcite.
7546.0-7557.0' (11.0')	Siltstone: medium dark gray quartz grains, calcite cemented, well consolidated, poor porosity, good oil stain, with fair fluorescence and cut; very thinly laminated, with black shale partings and highly calcareous, thin layers of Pelecypod imprints; grading downward to Shale: very dark gray, very silty, slightly calcareous, petroliferous, abundant bedding planes of Pelecypod shell imprints; vertical fractures, with secondary calcite.

7557-7590 Siltstone: dark brownish-gray, calcareous to dolomitic, argillaceous to shaly, moderately well cemented, tight, oil stained, weak fluorescent cut.

7590-7624 Siltstone: as above, calcareous, and with traces of fragmental limestone and rare phosphate pellets.

7624-7670	Sandstone: fine to medium grained, subangular to subrounded quartz grains; glauconitic, moderately to well sorted, moderately to moderately well consolidated; interbedded with conglomerates of chert, quartz, and argillite pebbles; fair to good porosity, good oil stain, good visual cut, good fluorescent cut.
7670-7690	Shale: red, fissile, soft, and Clay: white, soft; abundant, very finely disseminated pyrite.
7690-7715	Sandstone: fine to medium grained, subangular to subrounded quartz grains, abundant white, angular, weathered chert grains, siderite grains common, moderately to well sorted, moderately consolidated, good porosity, spotty oil stain, good fluorescent cut.
7715-7725	Shale: red, fissile.
7725-7800	Sandstone: fine to medium grained, subangular to subrounded quartz grains, white, angular, weathered chert grains, moderately well sorted, moderately consolidated, good porosity, spotty to good oil staining, good fluorescent cut.
7800-7820	Sandstone: as above, with pebble fragments.
7820-7830	Sandstone: as above, with abundant siderite, iron oxide stains, and traces of red shale.
7830-7890	Sandstone: as above.
7890-7930	Sandstone: conglomeratic, medium to coarse grained, subangular to subrounded quartz and chert grains, with abundant fragments of chert and quartz pebbles, moderately well consolidated, poorly sorted, fair porosity, spotty oil staining, good fluorescent cut.
7930-7950	Shale: red, fissile, with Sandstone: fine to medium grained, subangular to subrounded quartz grains, abundant, angular, white, weathered chert grains, moderately well sorted, moderately consolidated, good porosity, very light, spotty oil staining, weak fluorescent cut.
7950-7990	Sandstone: medium grained, and medium to coarse grained, subangular to subrounded quartz grains, with angular, white weathered chert grains, moderately well sorted, moderately well to poorly consolidated, good porosity, spotty oil staining, fair fluorescent cut.
7990-8010	Sandstone: as above, with red and gray fissile shale.

8010-8060	Sandstone: fine grained, subangular to subrounded quartz grains, angular, white, weathered chert grains, well sorted, well cemented with dolomitic cement, poor porosity, spotty oil staining, fair fluorescent cut.
8060-8131	Sandstone: light gray, very fine to fine grained quartz grains, finely disseminated carbonaceous grains common, well consolidated, dolomitic clay matrix in part, moderately well sorted, very poor porosity, no staining, no cut.
8131-8194	Shale: medium light gray to medium dark gray, red, and with red mottled with gray, fissile, slightly silty in part.
8194-8231	Dolomite; sandy and calcareous: light gray to medium brownish-gray, fine to medium crystalline, with silt to fine grained quartz grains in calcareous, dolomitic matrix; glauconite common, abundant, secondary dolomite, dark chert grains common, well cemented, very poor porosity, good oil staining, good fluorescent cut.
8231-8234	Dolomite; sandy and calcareous: as above, with abundant fragments of white chert; chert shows relict structures of grains.
8234-8240	Dolomite; sandy and calcareous: medium dark brown, very fine grains and rhombs, slightly calcareous, slightly silty, poorly consolidated, fair porosity, good oil stain, good fluorescent cut, with abundant fragments of white chert.
8240-8253	Limestone: light buff, fine to medium grained fragments in very fine granular matrix, moderately well consolidated, poor porosity, oil stained, good fluorescent cut.
8253-8283	<u>Core No. 2 - Cut 30', Recovered 30'</u>

8253.0-8254.0' (1.0')	Dolomite; sandy and calcareous: medium dark gray, fine to medium grains and crystalline rhombs, with very fine to fine grained quartz inclusions.
8254.0-8255.0' (1.0')	Limestone; bio-clastic, sandy, dolomitic: medium dark gray, fine to coarse fragments, grains and rhombs, with very fine to fine grained quartz inclusions; abundant, black bituminous pellets, some glauconite, well cemented, very poor porosity, spotty oil stain, bleeding gas

	and dark brown oil on fracture and bedding planes, weak visible fluorescence, streaming yellow fluorescence when cut.
8255.0-8257.0' (2.0')	Limestone; intra-clastic, sandy, dolomitic: medium dark gray, very fine to fine grains and rhombs, with fine to very fine quartz grains, glauconitic, well cemented, very poor porosity, trace of oil stain, trace of bleeding oil on bedding and fracture planes, weak, yellow, visible fluorescence, strong yellow fluorescence on cut; some interbedded, light gray, medium to coarse crystalline, secondary calcite near base.
8257.0-8260.0' (3.0')	Limestone; intra-clastic, sandy, dolomitic: medium dark gray, very fine to fine grains and rhombs, with very fine to fine quartz grains, glauconitic, well cemented, tight, oil-stained, light amber, visible cut, dull orange fluorescence, milky-yellow fluorescence on cut; bleeding dark brown oil on fracture and bedding planes.
8260.0-8261.5' (1.5')	Limestone; intra-clastic, silty: medium dark gray, very fine grains and rhombs, silty, rare glauconite, well cemented, tight, oil-stained, light amber, visible cut, dull orange fluorescence, milky-yellow fluorescence on cut; bleeding dark brown oil on fracture and bedding plans.
8261.5-8262.0' (0.5')	Dolomite; intra-clastic, sandy: medium dark gray, fine grains and rhombs, fine to medium grained quartz and chert, rare glauconite, well cemented, tight, very poor porosity in part, oil-stained, with patchy oil-saturated cut and fluorescence, as above.
8262.0-8265.5' (3.5')	Siltstone: medium dark gray, sandy, argillaceous, very well consolidated, tight, oil-stained, cut and fluorescence, as above.
8265.5-8266.0' (0.5')	Limestone; intra-clastic, silty, dolomitic: dark gray, silty, chert grains common, inclusions of light, gray-green clay, very

	well consolidated, tight, very lightly spotted oil-stain; cut and fluorescence, as above.
8266.0-8268.0' (2.0')	Shale: gray, waxy, irregular, subconchoidal fracture.
8268.0-8270.5' (2.5')	Shale: very dark gray, sharp, irregular, blocky fracture, silty.
8270.5-8271.0' (0.5')	Limestone; intra-clastic: dark gray, very fine crystalline, silty; very well consolidated, tight, cut and fluorescence, as above; inclusions and laminations of medium light gray-green clay.
8271.0-8272.0' (1.0')	Siltstone: dark gray, dolomitic, trace of glauconite, very well consolidated, trace of spotty, very light oil-stain, cut and fluorescence, as above.
8272.0-8278.5' (6.5')	Limestone; intra-clastic: dark gray, very finely granular, silty, very well consolidated, sharp, irregular fracture, tight, oil-stained, cut and fluorescence, as above, dark brown, live oil on fracture planes; interbedded with light gray, finely crystalline, secondary calcite.
8278.5-8279.0' (0.5')	Siltstone: dark brown-gray, sandy, slightly dolomitic, very well consolidated, tight, cut and fluorescence, as above; live oil on fractures.
8279.0-8283.0' (4.0')	Limestone; intra-clastic: dark gray, very finely granular, silty, very well consolidated, sharp, irregular fracture, tight, oil-stained, cut and fluorescence, as above; dark brown live oil on fracture planes; interbeddings of white chert at 8281.5'.

8283-8420 Limestone: white to light brownish-gray, very fine to medium fragments, grains, pellets, and Oolites: slightly dolomitic, moderately well consolidated, tight, spotty oil stain, good fluorescent cut; in part grades to white, very fine crystalline to dense, dolomitic limestone; abundant chert.

8420-8562 Limestone: white to light gray, very fine to medium fragments, grains, pellets, and Oolites: moderately well

consolidated; tight; in part grades to white, very fine crystalline to dense limestone; traces of chert.

8562-8760 Shale: varicolored, red, maroon, and lavender through greenish-gray to gray-green, smooth textured to silty in part, fissile.

8760-8794 Sandstone: medium gray, mottled with maroon in upper part, very fine to medium grained, subangular to subrounded quartz and chert grains, with occasional coarse grains and fragments of pebbles, poorly sorted, argillaceous, slightly calcareous, very siliceous; very well cemented, tight; in part speckled with white irregular chert inclusions.

8794-8864 Shale: black, submetallic luster, carbonaceous, micaceous, schistose, interbedded with Siltstone: very dark gray to black, sandy, very slightly calcareous, very slightly dolomitic, very siliceous, very well consolidated to argillite.

Log Analysis

ARMOUR KANE

Formation Evaluation

Well Log Analyst
18360-6 Cantara St.
Reseda, Ca. 91335
(213) 993-0586

April 13, 1977

Mr. Gordon Legg
Husky Oil/NPR Operations, Inc.
Suite 600
3201 C Street
Anchorage, Alaska 99503

Dear Mr. Legg:

The second log runs were made on W. T. Foran #1 on March 30 and 31, 1977, consisting of Dual Induction, Sonic, Neutron-Density, Dipmeter and sidewall cores. All the logs were of acceptable quality with the exception of the Sonic-Gamma Ray and 18 of 20 selected cores were recovered. No other cores were selected due to the enlarged hole size - over 20".

Formation tops which could be definitely identified by correlation with the Cape Halkett well were Torok, 4395; Opikruak, 7130 and Kuparuk River Sand at 7512. The Kuparuk River showed definite indications of hydrocarbon accumulation in the top 15 or 16 feet although quantitative analysis of the logs results in prohibitively high water saturations in the high 60% range and the bottom 10 to 12 feet were 100% water-bearing. Water resistivity computed from the SP was .15 ohms which compares very favorably with the Rwa of .14 from the sonic log. This represents a salinity of about 23,000 ppm. Porosities range from 15% to 21%. Gamma ray analysis shows the top 10 feet to be fairly clean, then 6 to 7 feet of shaly sand, about 5 feet of fairly clean sand and then increasing shaliness to the base of the sand. Sonic porosity based on matrix velocity of 19,500 ft/sec compares quite favorably with density porosity using a grain density of 2.65 gm/cc. The widest divergence, of course, is in the shalier sections of the sand. The detailed analysis is attached.

Very truly yours,

Armour Kane

Armour Kane

HUSKY OIL - W.T. FORAN #1

SSP = 65 MV R_{MF} = 2.3 @ 56° = 1.0 @ 140° R_{MF}/R_w = 6.5 R_w = 0.15 = 23,000 ppm

1	2	3	4		5		6		7
							GR_{min} = 45, GR_{max} = 120		$V = \frac{GR_{log} - GR_{min}}{GR_{max} - GR_{min}}$
	R_T	ϕ_D	ϕ_N	ΔT	ϕ_S (19,500)	R_{wa_S}	S_{w_S}	R_{wa_D}	S_{w_D}	GR	V_{SH} (%)
7512	10.5	15	20	76	15.5	.3	68	.29	64	49	5
14	9	15.5	19	76	15.5	.25	75	.29	70	52	9
16	6	18	23	79	20	.3	68	.25	70	52	9
18	6	20	24	80	21	.31	67	.3	63	45	0
7520	6.5	15.5	22	80	21	.35	63	.18	81	60	20
22	7.5	15	22.5	79	20	.38	61	.2	77	67	29
24	5	18	24	81	21.5	.27	72	.2	77	60	20
26	3.5	21	25	82	22	.21	81	.19	79	60	20
28	3.2	18	27	80	21	.18	88	.14	92	46	1
7530	3	18	22.5	80	21	.16	94	.12	100	52	9
32	3	21	23.5	80	21	.16	94	.16	87	52	9
34	3	21	23	79	20	.15	97	.16	87	60	20
36	3	20	24	78	19	.14	100	.15	87	75	40
38	4.5	11	34	79	20	.22	SHALE			105	80
7540	5	18	33							90	60
Av.		17.6	24		19.8		79		79.6		

Log Analysis

ARMOUR KANE

Formation Evaluation

Well Log Analyst
18360-6 Cantara St.
Reseda, Ca. 91335
(213) 993-0586

April 28, 1977

Mr. Gordon Legg
Husky Oil/NPR Operations, Inc.
3201 C. Street
Anchorage, Alaska 99503

Dear Mr. Legg:

Final log runs consisting of Dual-Induction, Neutron/Density, Sonic, Dipmeter and sidewall cores were run at W. T. Foran #1 on April 15 and 16, 1977. Log quality was good with the exception of depth control - the sonic is six feet shallow to the Induction while the neutron/density is two feet shallow. 24 sidewall cores were shot and recovery was 100% although one gun misfired after three shots. Neutron/density matrix was changed from limestone to sandstone at 8150.

Correlative formation tops are: Sadlerochit 7622, Echooka 8194, Lisburne 8230, Kayak 8565 and Argillite 8795.

Quantitative analysis figures are attached. Water resistivity in the Sadlerochit computed from the SP was 0.16 while that from the sonic Rwa was 0.19. Average porosity from the Density was 14% and from the sonic 19% which confirms the shaliness indicated by the Gamma Ray. Water saturation computed from Rwa values ranges from 80% to 100% indicating no significant hydrocarbon accumulation which confirms the drill stem tests regardless of the oil shows on the mud log.

Cross-plots of Neutron-Density in the Echooka and top of the Lisburne indicate a corrected porosity of about 14.5% and indicate a high dolomite to limestone ratio in the Echooka with the percentages reversing at about 8230 which suggests that depth is the Lisburne top. These dolomite-limestone ratios are confirmed by the geologist's strip log. Rw from the SP was again 0.16 but this could be in error due to the somewhat erratic nature of the SP. This figure was used in Sw calculations and resulted in a range of 60% to 97%, again confirming drill stem test results. Below 8262 porosities are prohibitively low.

Very truly yours,

Armour Kane

Armour Kane

HUSKY OIL/NPR OPERATIONS INC. - W.T. FORAN #1

SP = 48 MV @ 7900-10 BHT = 195° = 185° @ 7900 R_{mf} = 1.5 @ 63° = .53 @ 185° R_{mf}/R_w = 3.4 R_w = .16 = 15,000 ppm
R_{wz} = .19

	FCT	ϕ_D	ϕ_N	ΔT	ϕ_S (118 SPOT)	GR	R_{wa}	S_w	R_{wa}	S_{wa}
			SPOLEROCHIT							
7628	11	11	14	70	14	45	.25	87	.14	84
7658	4	12	22	84	24	63	SHALY			
7148	3.8	15	23	81	22	30	.21	95	.11	95
7745	6	13	23	76	18	47	.24	89	.10	100
7802	4.5	15	23	80	21	50	.24	87	.12	91
7820	5	14	21	77	19	50	.22	93	.11	95
7827	3.7	15	23	80	21	40	.19	100	.10	100
7841	4	17	22	84	21	40	.22	93	.14	84
7902	6	14	18	79	20	32	.30	80	.14	84
7916	4	16	21	80	21	40	.22	93	.12	91
7982	10.5	11	18	73	16	45	.34	75	.14	84
	AV. 14			AV. 19.7						
	ECHOOKA - LISBURNE						R_w FROM SP = 0.16			

					(21,000)	X-PLOT N/D	ϕ	MATRIX LS/DOLO	S_w	
8200	20	7	18	65	12	13		40/60	69	
8222	10	9	17	70	16	13		50/50	97	
8235	9	21	24	75	20	22.5		80/20	60	— PROBABLE TOP OF LISBURNE
8262	30	8	12	64	12	10		80/20	73	
8285	20	7	9	65	12	8		90/10	100	
8322	20	7	5	60	9	6		100 LS	100	
8348	70	3	3	53	4	3		100 LS	100	
8376	60	0	1.5	51	2	1		90/10	100	

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HUSKY

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

DRILL STEM TEST REPORT FORM

WELL NAME W. T. Foran No. 1 DST. NO. 1* DATE 4/5/77

Formation Tested Ivishak

Test Interval 7587-7676'

Total Depth 7676'

Choke Size: Surface 28/64" Bottom Hole 3/4"

Hole Size 8-1/2"

Drill Collar Length not available I.D

Drill Pipe Length 7355' I.D 4.28

Packer Depth(s) 7395 (in 10-3/4" casing) ft

Depth Tester Valve not available ft

Cushion Type water Amount 1000'

TEST DATA

Tool open at 11:15 a.m. hrs.
Initial flow period 15 min.
Initial shut-in period 30 min.
Final flow period 120 min.
Final shut-in period 240+ min.
Unseated packer at not available hrs.

RESISTIVITY/CHLORIDE DATA

	Resistivity	Chloride Content
Recovery Water	@ °F.	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F.	ppm
Mud Pit Sample	@ °F.	ppm
Mud Pit Sample Filtrate	@ °F.	ppm
Mud Weight	vis	cp

Description of initial flow period Opened with medium blow for one minute, increased to strong blow and remained throughout test.

Description of final flow period Strong blow.

PRESSURE DATA

TEMPERATURE	Gauge No. J192 Depth: 7379 ft.		Gauge No. T882 Depth: 7414 ft.		Gauge No. T219 Depth: 7424 ft.		TIME	
	-- Hour Clock		-- Hour Clock		-- Hour Clock		Tool Opened	A.M. P.M.
Est °F.	Blanked Off		Blanked Off		Blanked Off			
Actual 196 °F.	Pressures		Pressures		Pressures		Opened Bypass	A.M. P.M
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3893		3957		3942			
First Flow Period FLOW Initial							—	—
Final								
Closed In	3726		3744		3763			
Second Flow Period FLOW Initial	1805		1876		1892		—	—
Final	3346		3386		3415			
Closed In	3735		3773		3791			
Third Flow Period FLOW Initial							—	—
Final								
Closed In								
Final Hydrostatic	3819		3806		3867		—	—

RECOVERY DATA

Cushion water	Type	Amount 11.2 bbls.	Depth Back Pres. Valve	Surface Choke	Bottom Choke	Min. from Tester Valve
Recovered 369		Feet/bbl of water cushion (reversed out)		--	--	
Recovered 1107		Feet/bbl of rat-hole mud (reversed out)				
Recovered 5784		Feet/bbl of form water (reversed out)				
Recovered		Feet/bbl of				

Remarks Flowed water cushion to surface (11.2 bbls). Shut-in; reversed out 369' of water cushion, 1107' of rat-hole mud and 5784' of formation water (12,500 ppm chloride).

Sample Chamber had 0.25 cubic feet of gas and 2,400 cc of water (12,500 ppm chloride)

* DST report was reconstructed on 2/16/83 from information in files.

G. W. Legg
Prepared by

11/78

HUSKY

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

DRILL STEM TEST REPORT FORM

WELL NAME W. T. Foran No. 1 DST. NO. 2* DATE 4/8/77

Formation Tested Lisburne

Hole Size 8-1/2"

Test Interval 8205-8253'

Drill Collar Length _____ I.D. _____

Total Depth 8253'

Drill Pipe Length _____ I.D. _____

Choke Size
Surface -- Bottom Hole --

Packer Depth(s) _____ Ft.

Depth Tester Valve _____ Ft.

Cushion Type _____ Amount _____

TEST DATA

Tool open at _____ hrs.
Initial flow period _____ min.
Initial shut-in period _____ min.
Final flow period _____ min.
Final shut-in period _____ min.
Unseated packer at _____ hrs.

RESISTIVITY/CHLORIDE DATA

	Resistivity	Chloride Content
Recovery Water	@ °F.	ppm
Recovery Mud	@ °F.	ppm
Recovery Mud Filtrate	@ °F.	ppm
Mud Pit Sample	@ °F.	ppm
Mud Pit Sample Filtrate	@ °F.	ppm
Mud Weight	vis	cp

Description of initial flow period Misrun.

Description of final flow period

PRESSURE DATA

TEMPERATURE	Gauge No. Depth: ft. Hour Clock		Gauge No. Depth: ft. Hour Clock		Gauge No. Depth: ft. Hour Clock		TIME	
Est. °F.	Blanked Off		Blanked Off		Blanked Off		Tool Opened	A.M. P.M.
Actual °F.	Pressures		Pressures		Pressures		Opened Bypass	A.M. P.M.
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic								
First Period FLOW Initial							—	—
First Period FLOW Final								
First Period Closed In								
Second Period FLOW Initial							—	—
Second Period FLOW Final								
Second Period Closed In								
Third Period FLOW Initial							—	—
Third Period FLOW Final								
Third Period Closed In								
Final Hydrostatic							—	—

RECOVERY DATA

Cushion	Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke
Recovered		Feet/bbl of			
Recovered		Feet/bbl of			
Recovered		Feet/bbl of			
Recovered		Feet/bbl of			

Show Leaks Tester Valve

Remarks

* DST report was reconstructed on 2/16/83 from information in files.

G. W. Legg
Prepared by

11/78

U.S. GEOLOGICAL SURVEY/ONPRA

DRILL STEM TEST REPORT FORM

NAME W. T. Foran No. 1 DST. NO. 3* DATE 4/11/77

Lisburne — Hole Size 8-1/2"

8206-8283' — Drill Collar Length -- I.D. --

8283' — Drill Pipe Length 8154' I.D. 4.28"

Packer Depth(s) 8198 and 8206

28/64" Bottom Hole 3/4" — Depth Tester Valve not available

Cushion Type water Amount 3313'

TEST DATA

Tool opened	3:10 a.m.	hrs.
Initial flow period	15	min.
Initial shut-in period	30	min.
Final flow period	120	min.
Final shut-in period	120	min.
Tool unseated at	7:57 a.m.	hrs.

RESISTIVITY CHLORIDE DATA

	Resistivity			Chloride Content
Recovery Water	--	@	°F	
Recovery Mud	--	@	°F	
Recovery Mud Filtrate	--	@	°F	
Mud Pit Sample	--	@	°F	
Mud Pit Sample Filtrate	--	@	°F	
Mud Weight		pis		

Description of initial flow period: Tool opened with a slight blow, steadily building to a medium blow.

Description of final flow period: Strong blow from bottom of 5-gallon bucket ("0" p.s.i.)

PRESSURE DATA

TEMPERATURE	Gauge No. J392 Depth 8176 ft.		Gauge No. J300 Depth 8271 ft.		Gauge No. J301 Depth 8277 ft.		TIME
	Hour Clock		Hour Clock		Hour Clock		Tool Opened
	Blanked Off		Blanked Off		Blanked Off		Opened Bypass
201 °F	Pressures		Pressures		Pressures		Reported Minutes
	Field	Office	Field	Office	Field	Office	
Initial Hydrostatic	4329		4390		4423		
Initial Flow							
Final Flow							
Shut-in	4042		4076		4092		
Initial Flow	1424		1480		1481		
Final Flow	1545		1585		1594		
Shut-in	2260		2310		2310		
Initial Flow							
Final Flow							
Shut-in							
Final Hydrostatic	4348		4362		4385		
Temp.	201°F		188°F		185°F		

RECOVERY DATA

	Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke
water		3313			
2044	Feet	xxxxx rat-hole mud			
628	Feet bbl of	formation water			
	Feet bbl of				
	Feet bbl of				

Reversed out 3313' (55.7 bbls.) of water cushion, 2044' (36.3 bbls.) of rat-hole mud and 628' (11.2 bbls.) of formation water (12,150 ppm chloride).

Recovered 2.17 cubic feet of gas in sample chamber with 1,900 cc of fluid, which was 4% oil, 7% drilling mud and 89% water (11,100 ppm chloride).

Fluid recovered from knock-out sub at 7846'.

* DST report was reconstructed on 2/16/83 from information in files.

G. W. Legg
Prepared by

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

HUSKY

DRILL STEM TEST REPORT FORM

WELL NAME W. T. Foran No. 1 DST. NO. 4* DATE 4/20/77

Formation Tested: Kuparuk River sandstone

Interval Tested: 7512-7520 (perfs)

Total Depth: 8864' PBTD 7565'

Choke Size: 16/64" Bottom Hole 5/8"

Hole Size 10-3/4"

Drill Collar Length -- I.D.

Drill Pipe Length 7407' I.D. 3.75

Packer Depth(s): 7428 ft.

Depth Tester Valve not available ft.

Cushion Type water Amount 500'

TEST DATA

Tool opened at 0609 hrs

Initial flow period 15 min

Initial shut-in period 30 min.

Second flow period 120 min

Final shut-in period 240 min

Estimated packer at hrs.

RESISTIVITY CHLORIDE DATA

	Resistivity	Chloride Content
Recovery Water	@ °F	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F	ppm
Mud Pit Sample	@ °F	ppm
Mud Pit Sample Filtrate	@ °F	ppm
Mud Weight	vis	cp

Description of initial flow period Fair to good blow throughout.

Description of final flow period Good to strong blow, with water to surface in 48 minutes on final flow; salt water to surface in 117 minutes at rate of 4 bbls./hr.

PRESSURE DATA

TEMPERATURE	Gauge No. J192 Depth 7408 ft.		Gauge No. J300 Depth 7414 ft.		Gauge No. T219 Depth 7461 ft.		TIME	
	Hour Clock		Hour Clock		Hour Clock		Tool Opened	
°F	Blanked Off		Blanked Off		Blanked Off		Opened Bypass	
190 °F	Pressures		Pressures		Pressures		Reported Minutes	Computed Minutes
	Field	Office	Field	Office	Field	Office		
Initial Hydrostatic	3791		3885		4027			
Initial Flow								
Final Flow								
Closed In	3754		3741		3829			
Initial Flow	1703		1709		1779			
Final Flow	3726		3579		3641			
Closed In	3912		3780		3838			
Final Hydrostatic	3763		3827		3778			

RECOVERY DATA

	Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke
water		500'			
8.88		~~xxx~~/bbl of water cushion (500')			
131		~~xxx~~/bbl. of formation water (14,000 ppm chloride)			
		Feet/bbl of			
		Feet/bbl of			

Remarks: Recovered 0.25 cubic feet of gas, a slight trace of oil and 2,360 cc of water from sample chamber.

* DST report was reconstructed on 2/16/83 from information in files.

G. W. Legg
Prepared by

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
TELEPHONE (907) 279-4014 P.O.BOX 4-1276 ANCHORAGE, ALASKA 99509 4649 BUSINESS PARK BLVD.

WATER ANALYSIS REPORT

OPERATOR Husky Oil Company **DATE** May 4, 1977 **LAB NO.** 5754-1
WELL NO. W.T. Foran No.1 **LOCATION**
FIELD NPR No. 4 **FORMATION**
COUNTY **INTERVAL** DST No. 1
STATE Alaska **SAMPLE FROM** Top of test tools

REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	6947	302.21	Sulfate	420	8.74
Potassium	5	0.13	Chloride	9900	279.18
Calcium	100	4.99	Carbonate	120	4.00
Magnesium	12	0.99	Bicarbonate	1000	16.40
Iron	--	---	Hydroxide	---	---
Total Cations		308.32	Total Anions		308.32

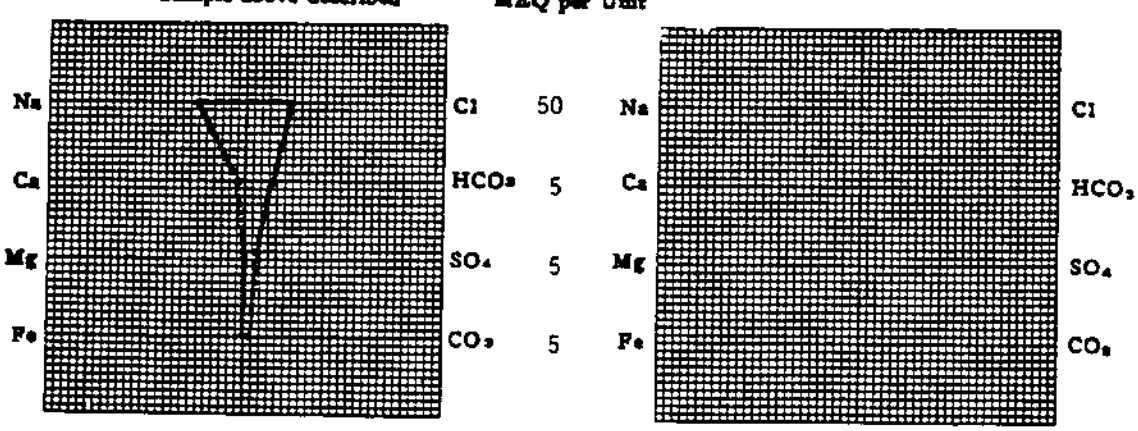
Total dissolved solids, mg/l 17997
NaCl equivalent, mg/l 17602
Observed pH 8.7

Specific resistance @ 68°F.:
Observed 0.38 ohm-meters
Calculated 0.38 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligrams equivalent per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

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WATER ANALYSIS REPORT

OPERATOR: Husky Oil Company
WELL NO.: W.T. Foran No. 1
FIELD: NPR #4
COUNTY:
STATE: Alaska

DATE: May 4, 1977 LAB NO. 5754-2
LOCATION:
FORMATION:
INTERVAL: DST No. 1
SAMPLE FROM: Bottom of rat hole mud

REMARKS & CONCLUSIONS: Drum #1, 300 strokes

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	7387	321.34	Sulfate	190	3.95
Potassium	28	0.72	Chloride	10300	290.46
Calcium	170	8.48	Carbonate	96	3.20
Magnesium	23	1.89	Bicarbonate	2123	34.82
Iron	---	---	Hydroxide	---	---
Total Cations		332.43	Total Anions		332.43

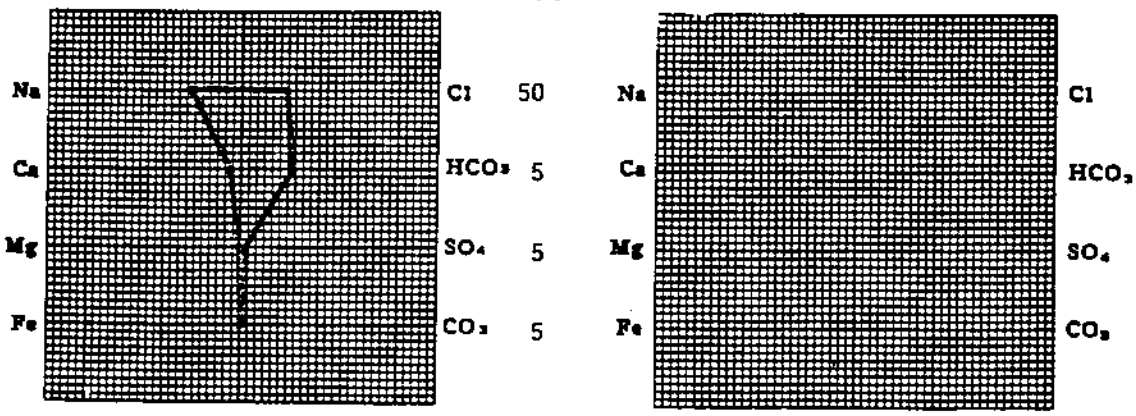
Total dissolved solids, mg/l: 19239
NaCl equivalent, mg/l: 18712
Observed pH: 8.6

Specific resistance @ 68°F.:
Observed: 0.37 ohm-meters
Calculated: 0.37 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(No value is shown graphs include Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligrams equivalent per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

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WATER ANALYSIS REPORT

OPERATOR: Husky Oil Company
WELL NO. W.T. Foran No. 1
FIELD NPR #4
COUNTY
STATE Alaska

DATE May 4, 1977 **LAB NO.** 5754-3
LOCATION
FORMATION
INTERVAL DST No. 1
SAMPLE FROM Middle of recovery

REMARKS & CONCLUSIONS: Drum No. 2, 800 strokes

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	8749	380.62	Sulfate	180	3.74
Potassium	32	0.82	Chloride	12500	352.50
Calcium	220	10.98	Carbonate	108	3.60
Magnesium	27	2.22	Bicarbonate	2122	34.80
Iron	---	---	Hydroxide	---	--
Total Cations		394.64	Total Anions		394.64

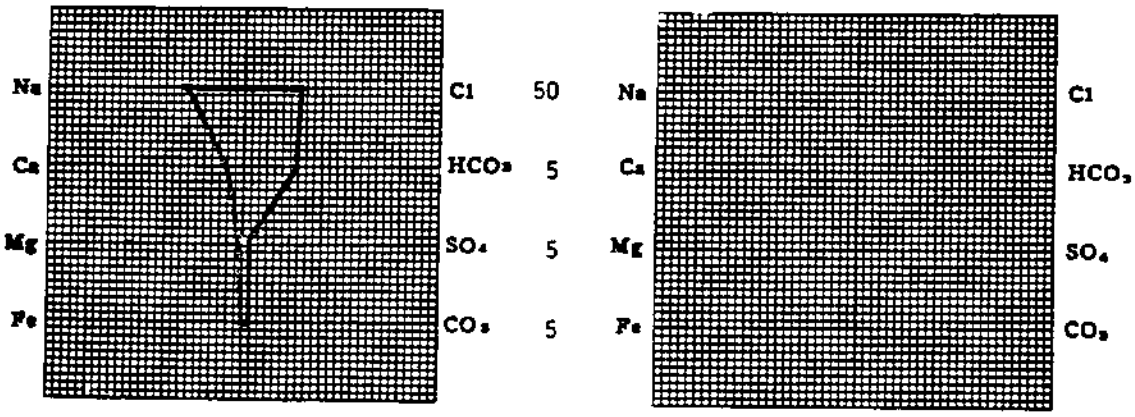
Total dissolved solids, mg/l 22862
NaCl equivalent, mg/l 22344
Observed pH 8.5

Specific resistance @ 68°F.:
Observed 0.31 ohm-meters
Calculated 0.30 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(No value is shown greater includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligrams equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

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WATER ANALYSIS REPORT

OPERATOR Husky Oil Company **DATE** May 4, 1977 **LAB NO.** 5754-4
WELL NO. W.T. Foran No. 1 **LOCATION**
FIELD NPR No. 4 **FORMATION**
COUNTY **INTERVAL** DST No. 1
STATE Alaska **SAMPLE FROM** End of recovery

REMARKS & CONCLUSIONS: 1450 strokes

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	8575	373.01	Sulfate	2	0.04
Potassium	30	0.78	Chloride	2500	352.50
Calcium	184	9.18	Carbonate	120	4.00
Magnesium	24	1.97	Bicarbonate	1732	28.40
Iron	---	---	Hydroxide	---	---
Total Cations		384.94	Total Anions		384.94

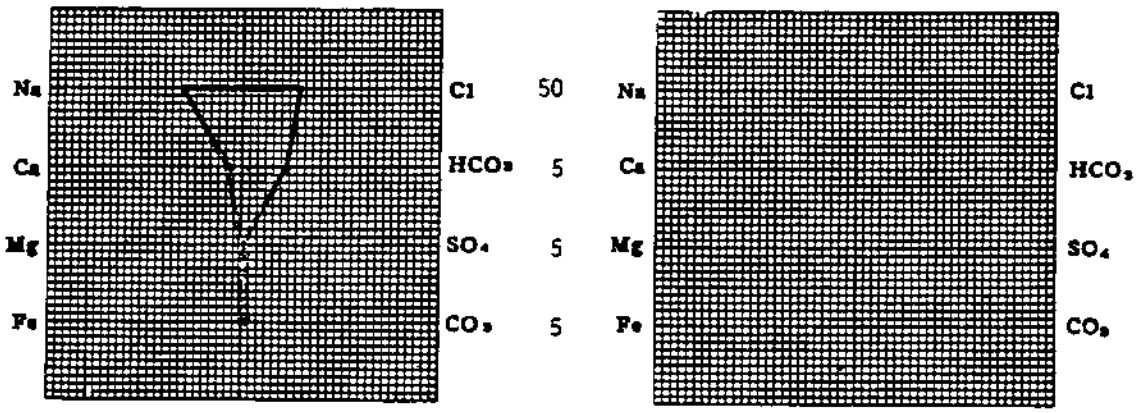
Total dissolved solids, mg/l 22288
NaCl equivalent, mg/l 21948
Observed pH 8.2

Specific resistance @ 44°F.:
Observed 0.31 ohm-meters
Calculated 0.31 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(No value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

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ANCHORAGE, ALASKA 99509

WATER ANALYSIS REPORT

OPERATOR Husky Oil Company **DATE** May 4, 1977 **LAB NO.** 5754-5
WELL NO. W.T. Foran No. 1 **LOCATION**
FIELD NPR No. 4 **FORMATION**
COUNTY **INTERVAL** DST No. 3
STATE Alaska **SAMPLE FROM** Fluid recovery

REMARKS & CONCLUSIONS: April 11, 1977; recovered 2.17 cubic feet gas at 1100psi, 1900cc fluid

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	8166	355.20	Sulfate	28	0.58
Potassium	32	0.82	Chloride	12000	338.40
Calcium	182	9.08	Carbonate	144	4.80
Magnesium	23	1.89	Bicarbonate	1415	23.21
Iron	---	---	Hydroxide	---	---
Total Cations		366.99	Total Anions		366.99

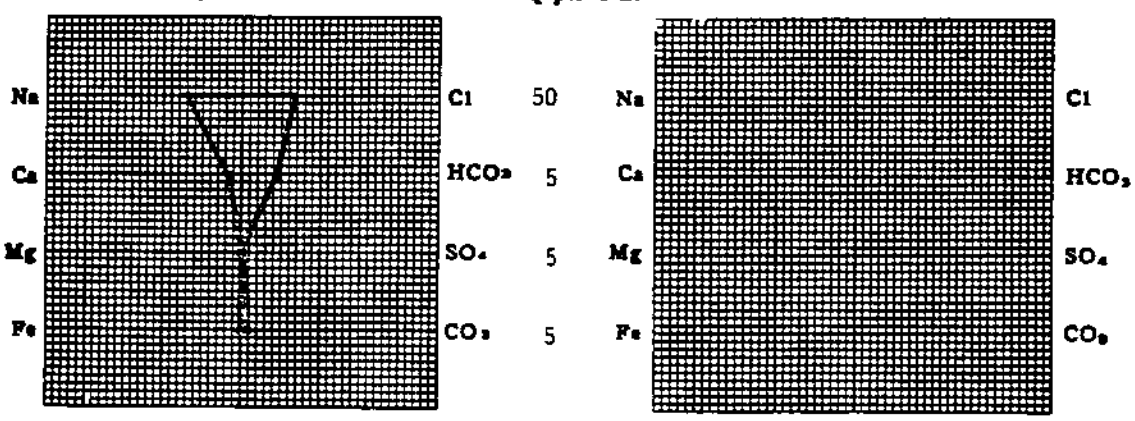
Total dissolved solids, mg/l 21271
NaCl equivalent, mg/l 20994
Observed pH 8.2

Specific resistance @ 66°F.:
Observed 0.32 ohm-meters
Calculated 0.32 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(No value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

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WATER ANALYSIS REPORT

OPERATOR Husky Oil Company
WELL NO. W.T. Foran No. 1
FIELD NPR No. 4
COUNTY
STATE Alaska

DATE May 4, 1977 **LAB NO.** 5754-6
LOCATION
FORMATION
INTERVAL DST No. 4(Perfs at 7512-20)
SAMPLE FROM first water to surface

REMARKS & CONCLUSIONS: Sample taken 4-20-77 at 7:42 am

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	1337	58.17	Sulfate	600	12.48
Potassium	5	0.13	Chloride	200	5.64
Calcium	140	6.99	Carbonate	360	11.99
Magnesium	11	0.90	Bicarbonate	2200	36.08
Iron	---	---	Hydroxide	---	---
Total Cations		66.19	Total Anions		66.19

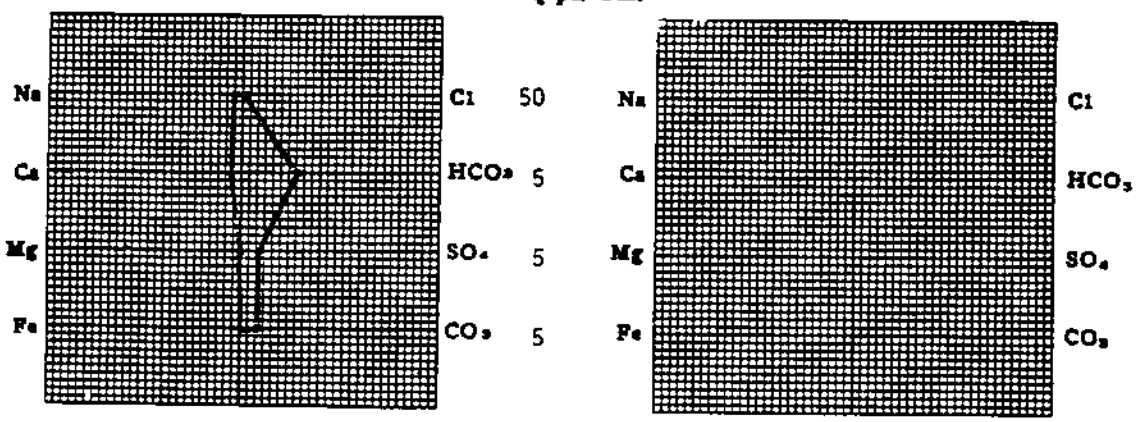
Total dissolved solids, mg/l	3737
NaCl equivalent, mg/l	3045
Observed pH	9.5

Specific resistance @ 66°F.:
Observed 1.82 ohm-meters
Calculated 2.0 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(No value in above graph includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

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WATER ANALYSIS REPORT

OPERATOR: Husky Oil Company
WELL NO.: W.T. Foran No. 1
FIELD: NPR No. 4
COUNTY:
STATE: Alaska

DATE: May 4, 1977 LAB NO. 5754-7
LOCATION:
FORMATION:
INTERVAL: DST No. 4(Perfs at 7512-20)
SAMPLE FROM: 8:35 am fluid

REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	2637	114.70	Sulfate	1080	22.46
Potassium	7	0.18	Chloride	1500	42.30
Calcium	13	0.65	Carbonate	936	31.17
Magnesium	1	0.08	Bicarbonate	1200	19.68
Iron	---	---	Hydroxide	---	---
Total Cations		115.61	Total Anions		115.61

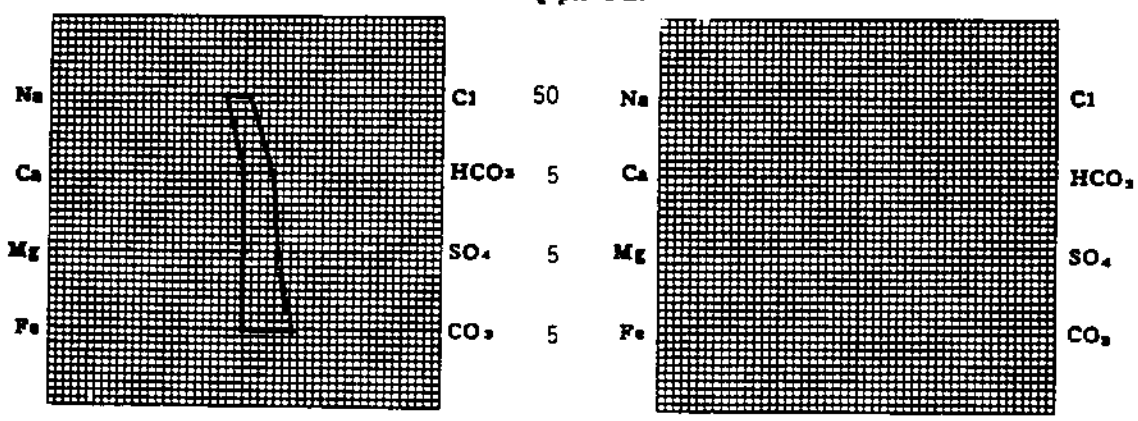
Total dissolved solids, mg/l: 6765
NaCl equivalent, mg/l: 6201
Observed pH: 11.5

Specific resistance @ 66°F.:
Observed: 0.98 ohm-meters
Calculated: 1.0 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(No value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Hawthorne calculation from components

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WATER ANALYSIS REPORT

OPERATOR Husky Oil Company
WELL NO. W.T. Foran No. 1
FIELD NPR No. 4
COUNTY
STATE Alaska

DATE May 4, 1977 **LAB NO.** 5754-8
LOCATION
FORMATION
INTERVAL DST No.4(Perfs at 7512-20)
SAMPLE FROM 4-20-77 at 8:55 am fluid

REMARKS & CONCLUSIONS: Sample taken 2 minutes before cycling for final shutin

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	7944	345.58	Sulfate	550	11.44
Potassium	69	1.77	Chloride	10600	298.92
Calcium	20	1.00	Carbonate	204	6.79
Magnesium	0.1	0.01	Bicarbonate	1903	31.21
Iron	--	---	Hydroxide	---	---
Total Cations		348.36	Total Anions		348.36

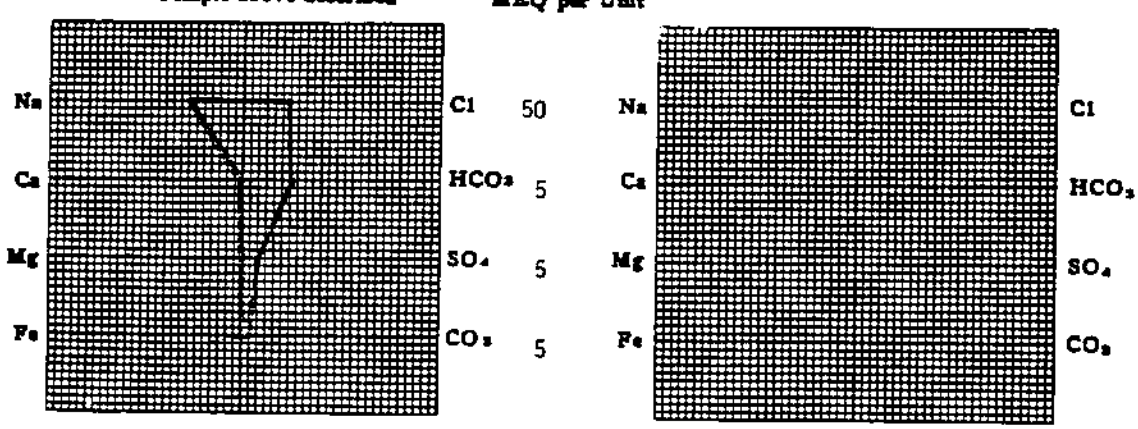
Total dissolved solids, mg/l 20325
NaCl equivalent, mg/l 19678
Observed pH 9.5

Specific resistance @ 66°F.:
Observed 0.35 ohm-meters
Calculated 0.35 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
TELEPHONE (907) 279-4014 P.O.BOX 4-1276 ANCHORAGE, ALASKA 99509 4649 BUSINESS PARK BLVD.

WATER ANALYSIS REPORT

OPERATOR Husky Oil Company
WELL NO. W.T. Foran No. 1
FIELD NPR No. 4
COUNTY
STATE Alaska

DATE May 4, 1977 **LAB NO.** 5754-9
LOCATION
FORMATION
INTERVAL DST No. 4(Perfs at 7512-20)
SAMPLE FROM 4-20-77 at 8:57 am fluid

REMARKS & CONCLUSIONS: Sample taken at final shutin

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	7635	332.12	Sulfate	530	11.02
Potassium	71	1.82	Chloride	10500	296.10
Calcium	50	2.50	Carbonate	144	4.80
Magnesium	1	0.08	Bicarbonate	1500	24.60
Iron	---	---	Hydroxide	---	---
Total Cations		336.52	Total Anions		336.52

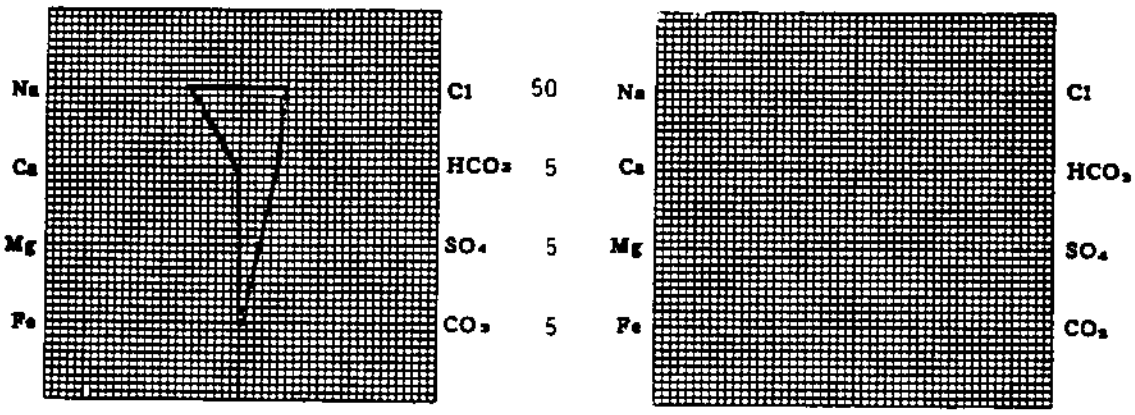
Total dissolved solids, mg/l 19670
NaCl equivalent, mg/l 19107
Observed pH 9.5

Specific resistance @ 68°F.:
Observed 0.38 ohm-meters
Calculated 0.36 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
TELEPHONE (907) 279-4014 P.O.BOX 4-1276 ANCHORAGE, ALASKA 99509 4649 BUSINESS PARK BLVD.

WATER ANALYSIS REPORT

OPERATOR Husky Oil Company **DATE** May 4, 1977 **LAB NO.** 5754-10
WELL NO. W.T. Foran No. 1 **LOCATION**
FIELD NPR No. 4 **FORMATION**
COUNTY **INTERVAL** DST No. 4(Perfs at 7512-20)
STATE Alaska **SAMPLE FROM** Sample No. 1 after reversing

REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	7226	314.33	Sulfate	350	7.28
Potassium	70	1.79	Chloride	10000	282.00
Calcium	61	3.04	Carbonate	60	2.00
Magnesium	20	1.64	Bicarbonate	1800	29.52
Iron	--	---	Hydroxide	---	---
Total Cations		320.80	Total Anions		320.80

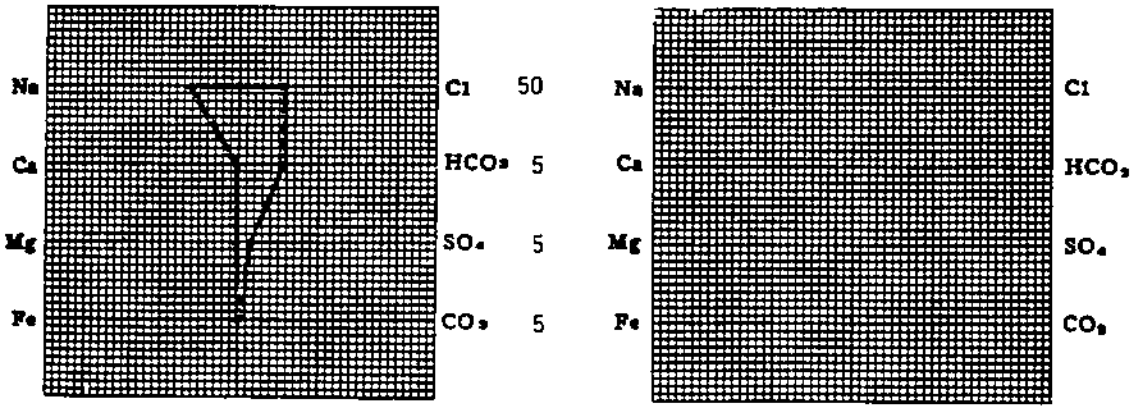
Total dissolved solids, mg/l 18673
NaCl equivalent, mg/l 18130
Observed pH 8.3

Specific resistance @ 64°F.:
Observed 0.38 ohm-meters
Calculated 0.38 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(Na value is above graph includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
TELEPHONE (907) 279-4014 P.O.BOX 4-1276 ANCHORAGE, ALASKA 99509 4649 BUSINESS PARK BLVD.

WATER ANALYSIS REPORT

OPERATOR: Husky Oil Company
DATE: May 4, 1977
LAB NO. 5754-11
WELL NO. W.T. Foran No. 1
LOCATION:
FIELD: NPR No.4
FORMATION:
COUNTY:
INTERVAL: DST No. 4(Perfs at 7512-20)
STATE: Alaska
SAMPLE FROM: Sample No. 2

REMARKS & CONCLUSIONS: Sample taken halfway reversing out, 729 strokes

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	9809	426.70	Sulfate	40	0.83
Potassium	50	1.28	Chloride	14500	408.90
Calcium	263	13.12	Carbonate	90	3.00
Magnesium	34	2.79	Bicarbonate	1900	31.16
Iron	---	---	Hydroxide	---	---
Total Cations		443.89	Total Anions		443.89

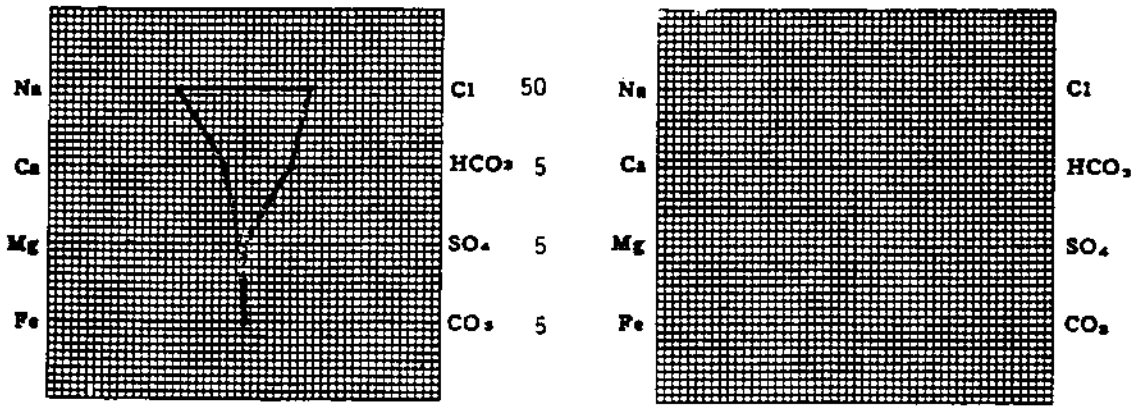
Total dissolved solids, mg/l: 25722
NaCl equivalent, mg/l: 25323
Observed pH: 8.3

Specific resistance @ 66°F.:
Observed: 0.27 ohm-meters
Calculated: 0.27 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(No value is shown (traces included Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent by Dunlap & Hawthorne calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
TELEPHONE (907) 279-4014 P.O.BOX 4-1276 ANCHORAGE, ALASKA 99509 4649 BUSINESS PARK BLVD.

WATER ANALYSIS REPORT

OPERATOR Husky Oil Company
WELL NO. W.T. Foran No. 1
FIELD NPR No. 4
COUNTY
STATE Alaska

DATE May 4, 1977 LAB NO. 5754-12
LOCATION
FORMATION
INTERVAL DST No. 4(Perfs at7512-20)
SAMPLE FROM Sample No. 3

REMARKS & CONCLUSIONS: Sample taken after reversing out, 1458 strokes

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	10013	435.56	Sulfate	10	0.21
Potassium	52	1.33	Chloride	14800	417.36
Calcium	255	12.72	Carbonate	120	4.00
Magnesium	38	3.12	Bicarbonate	1900	31.16
Iron	---	---	Hydroxide	---	---
Total Cations		452.73	Total Anions		452.73

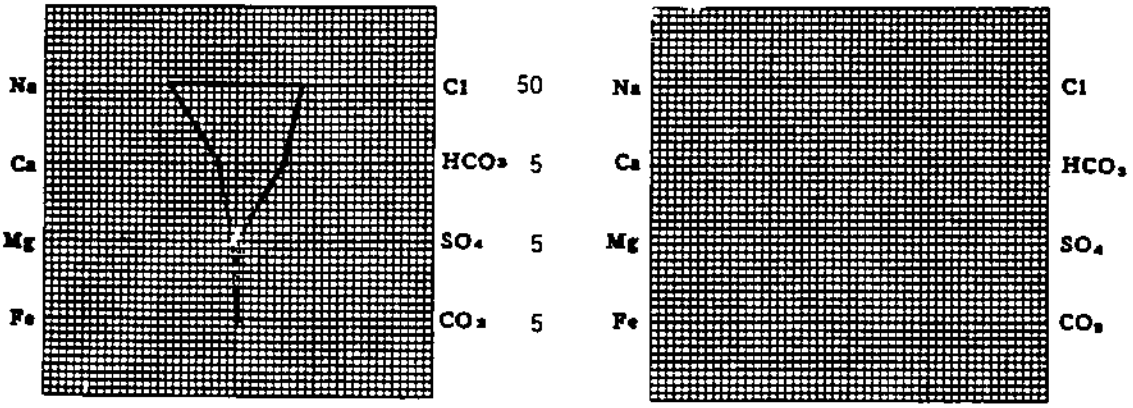
Total dissolved solids, mg/l 26224
NaCl equivalent, mg/l 25852
Observed pH 8.3

Specific resistance @ 66°F.:
Observed 0.26 ohm-meters
Calculated 0.26 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Dunlap & Kennedy calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
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WATER ANALYSIS REPORT

OPERATOR Husky Oil Company
WELL NO. W.T. Foran No. 1
FIELD NPR No. 4
COUNTY
STATE Alaska

DATE May 4, 1977 LAB NO. 5754-13
LOCATION
FORMATION
INTERVAL DST No. 4(Perfs at 7512-20)
SAMPLE FROM Sample chamber

REMARKS & CONCLUSIONS:

Cations	mg/l	meq/l
Sodium	8810	382.23
Potassium	86	2.20
Calcium	173	8.63
Magnesium	31	2.55
Iron	---	---
Total Cations		396.61

Anions	mg/l	meq/l
Sulfate	<1	0.00
Chloride	13000	366.60
Carbonate	0	0.00
Bicarbonate	1830	30.01
Hydroxide	---	---
Total Anions		396.61

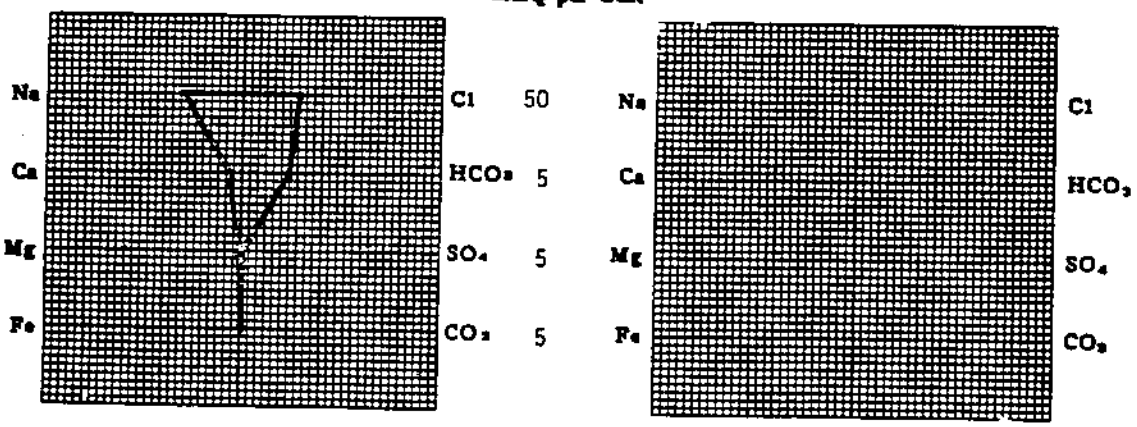
Total dissolved solids, mg/l 23001
NaCl equivalent, mg/l 22616
Observed pH 6.1

Specific resistance @ 68°F.:
Observed 0.34 ohm-meters
Calculated 0.31 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale MEQ per Unit



(Na value is above graph includes Na, K, and Li)
NOTE: Mg/l = Milligrams per liter Meq/l = Milligram equivalents per liter
Sodium chloride equivalent = by Doming & Nordstrom calculation from components

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
TELEPHONE (907) 279-4014 P.O. BOX 4-1276 2603 ARCTIC BLVD.
ANCHORAGE, ALASKA 99509

CORE ANALYSIS REPORT

Company: Husky Oil Company — Date: May 4, 1977 — Lab. No. 5648
Well No.: WT Foran No. 1 — Location:
Field: NPR No. 4 — Formation:
County: — Depths:
State: Alaska — Drilling Fluid:

LEGEND
C—Crack
F—Fracture
H—Horizontal
O—Open
NF—No Fracture
IS—Insufficient Sample
S—Slight
Sv—Scale
V—Vertical
Vs—Vugs

SAMPLE NO.	LEGEND	DEPTH, FEET	EFFECTIVE POROSITY PERCENT	PERMEABILITY MILLIDARCIES HORIZONTAL	PERMEABILITY MILLIDARCIES VERTICAL	SATURATIONS % PORE SPACE RESIDUAL OIL	SATURATIONS % PORE SPACE TOTAL WATER	CONNATE WATER	SOLUBILITY MUD ACID	SOLUBILITY 10 % ACID
				CORE NUMBER 1 (7539-7557)						
1		7539-40	20.3	107	3.74	2.0	61.9			
2		7540-41	20.7	92	33	1.7	44.0			
3	Congl	7541-42	8.3	200	5.44	1.0	70.1			
4		7542-43	11.1	0.26	0.01	3.6	76.0			
5		7543-44	17.8	0.86	0.83	3.9	49.9			
6		7544-45	23.6	93	100	5.7	57.0			
7		7545-46	16.0	1.40	0.10	Trace	68.4			
8		7546-47	6.9	0.11	0.09	Trace	78.0			
9		7547-48	10.0	0.28	0.06	Trace	61.1			
10		7548-49	4.2	0.12	0.05	0	52.9			
11		7549-50	1.5	0.05	0.07	0	90.3			
12		7550-51	3.8	0.13	0.03	0	82.6			
13		7551-52	3.6	0.13	0.04	0	90.6			
14		7552-53	8.0	0.06	0.05	0	91.5			
15		7553-54	8.9	0.05	0.06	0	89.8			
16		7554-55	10.3	0.07	0.02	0	88.0			
17		7555-56	5.3	0.02	0.02	0	92.6			
18		7556-57	7.7	0.6	0.03	0	87.7			

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ANCHORAGE, ALASKA 99509

CORE ANALYSIS REPORT

Company: Husky Oil Company
Date: May 4, 1977
Lab. No. 5648
Well No. WT Foran No. 1
Location
Field: NPR No. 4
Formation
County
Depths
State: Alaska
Drilling Fluid

LEGEND
C—Crack
F—Fracture
H—Horizontal
O—Open
NP—No Pressure
IS—Insufficient Sample
S—Slight
St—Static
V—Vertical
Vu—Vugs

SAMPLE NO.	LEGEND	DEPTH, FEET	EFFECTIVE POROSITY PERCENT	PERMEABILITY MILLIDARCIES HORIZONTAL	PERMEABILITY MILLIDARCIES VERTICAL	SATURATIONS % PORE SPACE RESIDUAL OIL	SATURATIONS % PORE SPACE TOTAL WATER	CONNATE WATER	SOLUBILITY MUD ACID	SOLUBILITY 10 % ACID
			CORE NUMBER 2 (8253-83)							
19		8253-54	4.1	0.03	0.02	Trace	92.1			
20		8254-55	6.0	0.12	0.08	Trace	90.3			
21		8255-56	3.1	0.18	0.05	Trace	80.6			
22		8256-57	6.7	0.13	0.06	Trace	93.1			
23		8257-58	6.3	0.12	0.08	Trace	90.6			
24		8258-59	10.4	1.46	0.89	Trace	89.4			
25		8259-60	14.3	3.00	0.26	Trace	90.3			
26		8260-61	9.0	4.32	0.23	Trace	89.6			
27		8261-62	13.6	0.81	0.27	1.1	76.8			
28		8262-63	8.1	0.80	0.34	0.3	86.5			
29		8263-64	11.7	1.01	0.04	1.6	89.0			
30		8264-65	10.7	0.61	0.16	1.4	91.2			
31		8265-66	2.4	0.04	0.01	Trace	94.3			
32		8266-67	1.1	0.01	0.01	0	94.8			
33		8267-68	1.3	0.01	0.01	0	99.2			
34		8268-69	1.0	0.01	0.01	0	96.8			
35		8269-70	1.5	0.01	0.01	0	95.7			
36		8270-71	9.7	6.68	0.29	Trace	86.8			
37		8271-72	0.8	0.02	0.01	Trace	95.7			
38		8272-73	5.2	0.02	0.01	0	93.0			
39		8273-74	1.2	0.01	<0.01	0	97.0			
40		8274-75	8.7	0.35	0.07	Trace	96.8			
41		8275-76	2.8	<0.01	0.01	0	95.4			
42		8276-77	6.4	0.05	0.04	Trace	93.1			
43		8277-78	9.1	0.14	0.08	0	82.8			
44		8278-79	8.9	0.36	0.04	0	83.6			
45		8279-80	6.2	0.09	0.05	0	84.6			
46		8280-81	7.2	0.02	0.03	0	91.2			
47		8281-82	10.6	3.78	0.02	0	94.4			
48		8282-83	6.0	0.04	0.06	0	96.8			