TABLE OF CONTENTS

# INTRODUCTION

The South Barrow No. 16 North Area well is located north-northeast of the South Barrow Gas Field and southeast of Barrow, Alaska, on the National Petroleum Reserve in Alaska. The well is situated 150' from the east line and 450' from the south line in the southeast quarter of Section 1, Township 22 North, Range 18 West, Umiat Meridian. Drilling related operations commenced on December 15, 1977, with the mobilization of construction crews and equipment for the building of the drilling location. Rig up operations commenced January 8, 1977. The rig, Brinkerhoff Rig 31, was moved from Anchorage to the location prior to start of rig up. Operations at South Barrow No. 16 ended on February 22, 1978, with the final movement of rig components to South Barrow No. 17 and a general location cleanup.

The well was drilled to a total depth of 2400'. The primary objective was the basal Jurassic Barrow Gas Sand, with secondary interests in several sand stringers above and the "Argillite" basement below. At the conclusion of the drilling evaluation operations, the well was plugged with cement and mechanical plugs and temporarily abandoned.

Husky Oil NPR Operations, Inc., supervised and directed the drilling and support operations as prime contractor to the Department of the Interior, U. S. Geological Survey, Office of National Petroleum Reserve in Alaska. Brinkerhoff Drilling Company was the drilling contractor and Brinkerhoff Rig 31, a National T-20, was the drilling rig used.

## DISCUSSION

Field operations at the South Barrow No. 16 North Area location commenced on December 15, 1977, with the mobilization of construction crews required to build the drilling pad. Rig up began on January 8, 1978, and was completed in 20 days. The well was spudded at 11:00 AM, January 28, 1978.

The rig was moved from Anchorage to Fairbanks by truck and from Fairbanks to Barrow by air. Also, a drilling camp was flown from Fairbanks to Barrow along with a sewer plant and a water plant. In addition, all rig support equipment was flown to Barrow from Deadhorse. The movement of rig and camp from Fairbanks was begun December 17, 1977, and completed on December 26, 1977. Several loads were taken to the Naval Arctic Research Laboratory (NARL) due to problems with the airstrip at the well. Due to high tides, the Elson Lagoon airstrip was badly damaged. A second strip was built on West Twin Lake and was operational on January 15, 1978. Construction of the pad was delayed several days pending discussions with Ukpugvik Inupiat Corporation officials in regard to gravel availability. The location was completed on January 8, 1978, at which time rig up operations began.

Rig up operations were hampered somewhat due to the rig being rigged up to drill for the first time since being remodeled and rig crews being unfamiliar with the rig. Also, the camp was new and electrical, water, and sewer systems had to be tied in. Approximately one day was lost in thawing the 13 3/8" conductor which had frozen prior to cementing. The conductor was then cemented to surface with 250 sacks of Permafrost cement.

A 12" annular BOP and diverter lines were installed on the 13 3/8" conductor. A 12 1/4" hole was drilled from 80' to 1510'. The hole was logged from 1510' to the bottom of the 13 3/8" conductor with Dual Induction Laterolog-SP and the BHC Sonic/Gamma Ray log. After logging, 9 5/8", 53.5#, S-95, buttress casing was run to 1487'. The casing was cemented to surface with 1020 sacks of Permafrost cement on February 4, 1978.

A 12", 3000 psi BOP stack was installed on the 9 5/8" casing. The BOP rams, choke manifold, and kill lines were tested to 3000 psi. The Hydril was tested to 1500 psi. The 9 5/8" casing was tested to 1500 psi. To minimize formation damage, an inhibitive mud system of Calcium Chloride-Lignosulfonate mud was mixed and the system changed over. The casing was drilled out with an 8 1/2" bit and the formation tested to a 0.62 psi/ft equivalent gradient. An 8 1/2" hole was drilled to 1851' where approximately 30 bbls of mud were lost. After regaining circulation and conditioning mud, drilling was resumed to 1923' where another 30 bbls of mud were lost. After conditioning, drilling was resumed to 1992'. While tripping for a bit at six stands off bottom, the well kicked through the drill pipe. The safety valve was installed and the pipe run back to bottom. Gas was circulated out with partial returns. After stabilizing the well, the mud weight was built to 10.5 ppg and LCM added to the system. After pulling five stands, the well swabbed on the sixth stand. Four stands were rerun and the hole conditioned. Pipe was tripped out and the well circulated each stand. Seven stands out, the bit plugged. Pipe

was worked and the bit unplugged. The trip out was resumed, circulating each stand. The stabilizers were layed down. After tripping in, the hole was conditioned. After washing 20' to bottom, drilling was resumed to 2397' with minor mud loss. Core No. 1 was cut from 2397' to 2400' when the core barrel jammed. The hole was conditioned to 2400'. A slow pit gain of 75 bbls was taken while circulating. The well did not flow with the pump shut off and had no pressure when shut in. The hole was stabilized and conditioned for logging. The well was logged from 2392', logger's TD, to the shoe of the 9 5/8" casing with a Temperature Survey, DIL/SP, SNL/FDC/GR/Caliper, BHC Sonic/GR/Caliper, HRD, Velocity Survey, and Temperature Survey (second run). Attempted 86 sidewall cores and recovered 77, one empty and eight misfires.

After evaluation of the logs, open-end drill pipe was run to 2300' and Plug No. 1 set with 175 sacks of Class "G" cement with 2% calcium chloride added to the mix water. The cement was in place at 10:00 PM, February 15, 1978. Plug No. 2 consisted of a 9 5/8" Halliburton cement retainer run and set at 1426'. Sixty sacks of Permafrost cement were mixed, 55 sacks squeezed below and five sacks spotted on top of the retainer. The cement was in place at 12:30 PM, February 16, 1978. Mud was displaced to water and water to diesel at 1208' to the surface. BOPE was nippled down and the abandonment marker installed. The rig was released at 8:00 PM, February 17, 1978. Rig down commenced and the equipment was moved to South Barrow Well No. 17 East Area.

All logs from the South Barrow No. 16 North Area Well were recorded on magnetic tape for ease in computer interpretation. The hole was straight. The maximum deviation of 1 1/2° occurred at 1510' in the 12 1/4" hole. The 8 1/2" hole was drilled at 1° deviation.

Detailed drilling information in the form of bit records, mud summary, time analysis, and casing and cementing reports, as well as geologic descriptions, is included in the body of this report.

Form 9-331 C
(May 1963)

SUBMIT TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R14

# UNITED STATES
# DEPARTMENT OF THE INTERIOR
## GEOLOGICAL SURVEY

## NOTICE OF INTENT TO DRILL, DEEPEN, OR PLUG BACK

5. LEASE DESIGNATION AND SERIAL NO.: N/A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A

1a. TYPE OF WORK: DRILL [X] DEEPEN [ ] PLUG BACK [ ]

b. TYPE OF WELL: OIL WELL [ ] GAS WELL [X] OTHER — SINGLE ZONE [ ] MULTIPLE ZONE [ ]

7. UNIT AGREEMENT NAME: N/A

8. FARM OR LEASE NAME: Nation- Petroleum Reserve in

2. NAME OF OPERATOR: National Petroleum Reserve in Alaska (through Husky Oil NPR Operations, Inc.)

9. WELL NO.: So. Barrow Well No. 16 (North Ar

3. ADDRESS OF OPERATOR: 2525 C Street, Suite 400, Anchorage, AK 99503

10. FIELD AND POOL, OR WILDCAT: South Barrow Gas Fiel

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.*)
At surface: 150' FEL; 450' FSL
At proposed prod. zone: Same (straight hole)

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec 1, T22N, R18W, UM

14. DISTANCE IN MILES AND DIRECTION FROM NEAREST TOWN OR POST OFFICE*: 4.2 miles southeast of Barrow, Alaska

12. COUNTY OR PARISH: North Slope Borough, 13. STATE: A

| 15. DISTANCE FROM PROPOSED* LOCATION TO NEAREST PROPERTY OR LEASE LINE, FT. (Also to nearest drlg. unit line, if any) | 16. NO. OF ACRES IN LEASE | 17. NO. OF ACRES ASSIGNED TO THIS WELL |
|---|---|---|
| 23,000' | 23,680,000 | N/A |
| **18. DISTANCE FROM PROPOSED LOCATION* TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR, ON THIS LEASE, FT.** | **19. PROPOSED DEPTH** | **20. ROTARY OR CABLE TOOLS** |
| 7390' | 2575' | Rotary |

21. ELEVATIONS (Show whether DF, RT, GR, etc.): Ground = 8'; Pad = 12'; KB = 30'

22. APPROX. DATE WORK WILL START: January 5, 1978

23. PROPOSED CASING AND CEMENTING PROGRAM

| SIZE OF HOLE | SIZE OF CASING | WEIGHT PER FOOT | SETTING DEPTH | QUANTITY OF CEMENT |
|---|---|---|---|---|
| 17 1/2" | 13 3/8" (Cond.) | 72# (S-95) | 110' KB | ± 100 Sx Permafrost to Surfac |
| 12 1/4" | 9 5/8" | 53.5# (S-95) | 1500' | ± 1020 Sx Permafrost to Surfa |
| 8 1/2" | 7" | 38# (S-95) | 2575' | ± 100 Sx Class "G" w/additive from TD to ± 1600'. Second stage: Down squeeze through FO @ ± 1300' w/± 60 sx Permafrost. Arctic Pack 9 5/8" 7" annulus through FO @ 122 w/± 60 bbls Arctic Pack. |

Blowout Preventer Program-

From ± 110' KB to ± 1500':
12", 3000 psi, SA Diverter Assembly

From ± 1500' to TD:
12", 3000 psi, SRRA BOP Assembly
w/3000 psi Choke Manifold and Kill Line.

See Drilling Program for details.

RECEIVED
OFFICE OF
OIL & GAS SUPERVISOR
JAN 3 1978
CONSERVATION DIVISION
U.S. GEOLOGICAL SURVEY
ANCHORAGE, ALASKA

IN ABOVE SPACE DESCRIBE PROPOSED PROGRAM: If proposal is to deepen or plug back, give data on present productive zone and proposed new productive zone. If proposal is to drill or deepen directionally, give pertinent data on subsurface locations and measured and true vertical depths. Give blowout preventer program, if any.

24.

SIGNED Max Brewer TITLE Chief of Operations DATE December 15, 19

(This space for Federal or State office use)

APPROVED
CONFORMS WITH PERTINENT PROVISIONS 30 CFR 221 OIL & GAS SUPERVISOR
ALASKA AREA
TITLE DATE JAN 17 1978

CONDITIONS OF CONCURRENCE ATTACHED

AREA

*See Instructions On Reverse Side

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

# SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use Form 9-331-C for such proposals.)

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR National Petroleum Reserve in Alaska (through Husky Oil NPR Operations, Inc.)

3. ADDRESS OF OPERATOR
2525 C Street, Suite 400, Anchorage, AK 99503

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 150' FEL, 450' FSL
AT TOP PROD. INTERVAL:
AT TOTAL DEPTH:

5. LEASE
N/A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME
N/A

7. UNIT AGREEMENT NAME
N/A

8. FARM OR LEASE NAME National Petroleum Reserve in Alaska

9. WELL NO. South Barrow Well No. 16 (North Area)

10. FIELD OR WILDCAT NAME
South Barrow Gas Field

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
Sec 1, T22N, R18W, UM

12. COUNTY OR PARISH: North Slope | 13. STATE: Alaska

14. API NO.

15. ELEVATIONS (SHOW DF, KDB, AND WD)
KDB = 30'

16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

| NOTICE OF INTENT TO: | | SUBSEQUENT REPORT OF: | |
|---|---|---|---|
| TEST WATER SHUT-OFF | ☐ | | ☐ |
| FRACTURE TREAT | ☐ | | ☐ |
| SHOOT OR ACIDIZE | ☐ | | ☐ |
| REPAIR WELL | ☐ | | ☐ |
| PULL OR ALTER CASING | ☐ | | ☐ |
| MULTIPLE COMPLETE | ☐ | | ☐ |
| CHANGE ZONES | ☐ | | ☐ |
| ABANDON* | ☐ | | ☐ |
| (other) Subsequent report of spud date. | | | |

(NOTE: Report results of multiple completion or zone change on Form 9-330.)

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

This well was spudded at 11 AM, January 28, 1978. Operations began with drilling a 12 1/4" hole below 13 3/8" conductor pipe set at 110' KB. The 12", 3000 psi Hydril on the 13 3/8" conductor pipe was tested to 250 psi prior to spud. A diverter system is installed.

RECEIVED
OFFICE OF
OIL & GAS SUPERVISOR

FEB [illegible] 1978

[illegible]
ANCHORAGE, ALASKA

Subsurface Safety Valve: Manu. and Type _____ Set @ _____ Ft.

18. I hereby certify that the foregoing is true and correct

SIGNED J Max Brewer TITLE Chief of Operations DATE 30 January 78

(This space for Federal or State office use)

conforms with pertinent ovisions of CFR 221.

APPROVED
OIL AND GAS SUPERVISOR
TITLE

DATE 2 FEB 1978

AREA

*See Instructions on Reverse Side

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

RECEIVED
OFFICE OF
OIL & GAS SUPERVISOR
FEB 10 1978
U.S. GEOLOGICAL SURVEY
ANCHORAGE, ALASKA

# SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use Form 9-331-C for such proposals.)

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR: National Petroleum Reserve in Alaska (through Husky Oil NPR Operations, Inc.)

3. ADDRESS OF OPERATOR: 2525 C Street, Suite 400, Anchorage, AK 99503

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 150' FEL, 450' FSL
AT TOP PROD. INTERVAL:
AT TOTAL DEPTH:

5. LEASE: N/A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A

7. UNIT AGREEMENT NAME: N/A

8. FARM OR LEASE NAME: National Petroleum Reserve in Alaska

9. WELL NO.: South Barrow Well No. 16 (North Area

10. FIELD OR WILDCAT NAME: South Barrow Gas Field

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec 1, T22N, R18W, UM

12. COUNTY OR PARISH: North Slope

13. STATE: Alaska

14. API NO.:

15. ELEVATIONS (SHOW DF, KDB, AND WD): 30' KDB

16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

| NOTICE OF INTENT TO: | | SUBSEQUENT REPORT OF: | |
|---|---|---|---|
| TEST WATER SHUT-OFF | ☐ | | ☐ |
| FRACTURE TREAT | ☐ | | ☐ |
| SHOOT OR ACIDIZE | ☐ | | ☐ |
| REPAIR WELL | ☐ | | ☐ |
| PULL OR ALTER CASING | ☐ | | ☐ |
| MULTIPLE COMPLETE | ☐ | | ☐ |
| CHANGE ZONES | ☐ | | ☐ |
| ABANDON* | ☐ | | ☐ |

(NOTE: Report results of multiple completion or zone change on Form 9-330.)

(other) Subsequent report of running and cementing 9 5/8" surface casing.

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

A 12 1/4" hole was drilled to 1510' and logged. Conditioned hole and ran 36 joints of 9 5/8", 53.5 lb/ft, S-95, Buttress casing and landed at 1487' KB with the duplex float collar at 1444'. Centralizers were located 10' above shoe, one every other collar (No's 1, 3, 5, 7, and 9) and one on last three collars. Ran duplex stinger. Conditioned mud and pumped 20 bbls water, 1020 sacks Permafrost II (14.6 ppg), and displaced with 10.7 bbls water. Full returns throughout cement job with good cement returns at surface. Cement in place at 3:30 AM, 2/4/78. Unsting from duplex collar. Floats held. Landed casing and set slips. Nipple up wellhead and SRRA BOP stack. Tested rams and choke manifold to 3000 psi. Tested Hydril to 1500 psi. Tested 9 5/8" casing to 1500 psi. Drill out float collar and shoe to 1520'. Pressure tested formation and shoe bond to equivalent gradient of 0.62 psi/ft with no indicated leak-off. Total WOC time: ± 84 hours.

Subsurface Safety Valve: Manu. and Type _____ Set @ _____ Ft.

18. I hereby certify that the foregoing is true and correct

SIGNED Max S. Brewer TITLE Chief of Operations DATE 9 February 78

(This space for Federal or State office use)

APPROVED BY _____ TITLE OIL AND GAS SUPERVISOR DATE 2-13-78

forms with
tinent
visions of
CFR 221.

*See Instructions on Reverse Side

RECEIVED
ONSHORE DIST. OFFICE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

# SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use Form 9-331-C for such proposals.)

1. oil well ☐ gas well ☒ other

2. NAME OF OPERATOR: National Petroleum Reserve in Alaska (through Husky Oil NPR Operations, Inc.)

3. ADDRESS OF OPERATOR: 2525 C Street, Suite 400, Anchorage, AK 99503

4. LOCATION OF WELL (REPORT LOCATION CLEARLY. See space 17 below.)
AT SURFACE: 150' FEL, 450' FSL
AT TOP PROD. INTERVAL:
AT TOTAL DEPTH:

5. LEASE: N/A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A

7. UNIT AGREEMENT NAME: N/A

8. FARM OR LEASE NAME: National Petroleum Reserve in Alaska

9. WELL NO.: South Barrow Well No. 16

10. FIELD OR WILDCAT NAME: South Barrow Gas Field

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec 1, T22N, R18W, UM

12. COUNTY OR PARISH: North Slope

13. STATE: Alaska

14. API NO.:

15. ELEVATIONS (SHOW DF, KDB, AND WD): 30' KB

16. CHECK APPROPRIATE BOX TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

| NOTICE OF INTENT TO: | | SUBSEQUENT REPORT OF: | |
|---|---|---|---|
| TEST WATER SHUT-OFF | ☐ | | ☐ |
| FRACTURE TREAT | ☐ | | ☐ |
| SHOOT OR ACIDIZE | ☐ | | ☐ |
| REPAIR WELL | ☐ | | ☐ |
| PULL OR ALTER CASING | ☐ | | ☐ |
| MULTIPLE COMPLETE | ☐ | | ☐ |
| CHANGE ZONES | ☐ | | ☐ |
| ABANDON* | ☐ | | ☒ |
| (other) | | | |

(NOTE: Report results of multiple completion or zone change on Form 9-330.)

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

This well has been plugged and abandoned. The well was drilled to a total depth of 2400' KB. The necessary logs for evaluation were run and the well plugged and abandoned as follows. Conditioned mud at 2300' through open-ended drill pipe. Spotted 175 sacks Class "G" cement with 2% $CaCl_2$ from 2300' to 1850' in open hole. Cement in place at 10:00 PM, 2/15/78. Pick up to 1450' and circulate. WOC 12 hours. Ran 9 5/8" cement retainer on drill pipe and set at 1426' KB. Establish injection rate below retainer of 4.6 BPM at 700 psi. Squeeze 55 sacks of Permafrost II cement below retainer and spot 5 sacks on top of retainer. Cement in place at 12:30 PM, 2/16/78. Pick up to 1208'. Reverse out mud with water and reverse out water with diesel. Nippled down and set abandonment marker.

Subsurface Safety Valve: Manu. and Type _____ Set @ _____ Ft.

18. I hereby certify that the foregoing is true and correct

SIGNED Max S. Brewer TITLE Chief of Operations DATE 21 February 78

(This space for Federal or State office use)

APPROVED BY James A. Gibbs TITLE DISTRICT SUPERVISOR DATE FEB 1978

) forms with
tinent
ovisions of
) CFR 221.

*See Instructions on Reverse Side

4

AREA

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN DUPLICATE* (See other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R355.5.

# WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

RECEIVED
FEB 27 1978
CONSERVATION DIVISION
U.S. GEOLOGICAL SURVEY
ANCHORAGE, ALASKA

1a. TYPE OF WELL: OIL WELL ☐ GAS WELL ☐ DRY ☒ Other ONSHORE DIST. OFFICE

b. TYPE OF COMPLETION: NEW WELL ☒ WORK OVER ☐ DEEP-EN ☐ PLUG BACK ☐ DIFF. RESVR. ☐ Other

2. NAME OF OPERATOR: National Petroleum Reserve in Alaska (through Husky Oil NPR Operations, Inc.)

3. ADDRESS OF OPERATOR: 2525 C Street, Suite 400, Anchorage, AK 99503

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements)*
At surface: 150' FEL, 450' FSL
At top prod. interval reported below: (Straight Hole)
At total depth: (Straight Hole)

5. LEASE DESIGNATION AND SERIAL NO.: N/A
6. IF INDIAN, ALLOTTEE OR TRIBE NAME: N/A
7. UNIT AGREEMENT NAME: N/A
8. FARM OR LEASE NAME: National Petroleum Reserve in Alask
9. WELL NO.: South Barrow Well No. 16
10. FIELD AND POOL, OR WILDCAT: South Barrow Gas Field
11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: Sec 1, T22N, R18W, UM
12. COUNTY OR PARISH: North Slope
13. STATE: Alaska

14. PERMIT NO.: N/A
DATE ISSUED: N/A

| 15. DATE SPUDDED | 16. DATE T.D. REACHED | 17. DATE COMPL. (Ready to prod.) | 18. ELEVATIONS (DF, RKB, RT, GR, ETC.)* | 19. ELEV. CASINGHEAD |
|---|---|---|---|---|
| 1/28/78 | 2/13/78 | 2/16/78 P & A | 30' KB | 12' |

| 20. TOTAL DEPTH, MD & TVD | 21. PLUG, BACK T.D., MD & TVD | 22. IF MULTIPLE COMPL., HOW MANY* | 23. INTERVALS DRILLED BY | ROTARY TOOLS | CABLE TOOLS |
|---|---|---|---|---|---|
| 2400' MD & TVD | 1414' MD & TVD | None | → | Rotary | |

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*: None

25. WAS DIRECTIONAL SURVEY MADE: No

26. TYPE ELECTRIC AND OTHER LOGS RUN: DLL-SP, BHC Sonic-GR, FDC-CNL, HRT, HRD, Velocity

27. WAS WELL CORED: Yes

28. CASING RECORD (Report all strings set in well)

| CASING SIZE | WEIGHT, LB./FT. | DEPTH SET (MD) | HOLE SIZE | CEMENTING RECORD | AMOUNT PULLED |
|---|---|---|---|---|---|
| 13 3/8" | 72 | 99' MD | 18" | 250 Sx Permafrost II | None |
| 9 5/8" | 53.5 | 1487' MD | 12 1/4" | 1000 Sx Permafrost II | None |

29. LINER RECORD

| SIZE | TOP (MD) | BOTTOM (MD) | SACKS CEMENT* | SCREEN (MD) |
|---|---|---|---|---|
| None | | | | |

30. TUBING RECORD

| SIZE | DEPTH SET (MD) | PACKER SET (MD) |
|---|---|---|
| None | | |

31. PERFORATION RECORD (Interval, size and number): None

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

| DEPTH INTERVAL (MD) | AMOUNT AND KIND OF MATERIAL USED |
|---|---|
| 1850' to 2300' | 175 Sx Cl G w/2% $CaCl_2$ Open Hole Plug |
| 1414' to 1539' | 60 Sx PF II, 55 Sx Squeezed Below Retainer + 5 Sx Spotted on Top |
| Retainer @ 1426' | |

33.* PRODUCTION

| DATE FIRST PRODUCTION | PRODUCTION METHOD (Flowing, gas lift, pumping—size and type of pump) | WELL STATUS (Producing or shut-in) |
|---|---|---|
| None | | Plugged & Abandoned |

| DATE OF TEST | HOURS TESTED | CHOKE SIZE | PROD'N. FOR TEST PERIOD → | OIL—BBL. | GAS—MCF. | WATER—BBL. | GAS-OIL RATIO |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

| FLOW. TUBING PRESS. | CASING PRESSURE | CALCULATED 24-HOUR RATE → | OIL—BBL. | GAS—MCF. | WATER—BBL. | OIL GRAVITY-API (CORR.) |
|---|---|---|---|---|---|---|
| | | | | | | |

34. DISPOSITION OF GAS (Sold, used for fuel, vented, etc.): None

TEST WITNESSED BY:

35. LIST OF ATTACHMENTS: Wellbore Schematic

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED Max C Brewer TITLE Chief, Operations DATE 24 Feb. 78

*(See Instructions and Spaces for Additional Data on Reverse Side)

AREA

# INSTRUCTIONS

**General:** This form is designed for submitting a complete and correct well completion report and log on all types of lands and leases to either a Federal agency or a State agency, or both, pursuant to applicable Federal and/or State laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office. See instructions on items 22 and 24, and 33, below regarding separate reports for separate completions.

If not filed prior to the time this summary record is submitted, copies of all currently available logs (drillers, geologists, sample and core analysis, all types electric, etc.), formation and pressure tests, and directional surveys, should be attached hereto, to the extent required by applicable Federal and/or State laws and regulations. All attachments should be listed on this form, see item 35.

**Item 4:** If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

**Item 18:** Indicate which elevation is used as reference (where not otherwise shown) for depth measurements given in other spaces on this form and in any attachments.

**Items 22 and 24:** If this well is completed for separate production from more than one interval zone (multiple completion), so state in item 22, and in item 24 show the producing interval, or intervals, top(s), bottom(s) and name(s) (if any) for only the interval reported in item 33. Submit a separate report (page) on this form, adequately identified, for each additional interval to be separately produced, showing the additional data pertinent to such interval.

**Item 29:** "*Sacks Cement*": Attached supplemental records for this well should show the details of any multiple stage cementing and the location of the cementing tool.

**Item 33:** Submit a separate completion report on this form for each interval to be separately produced. (See instruction for items 22 and 24 above.)

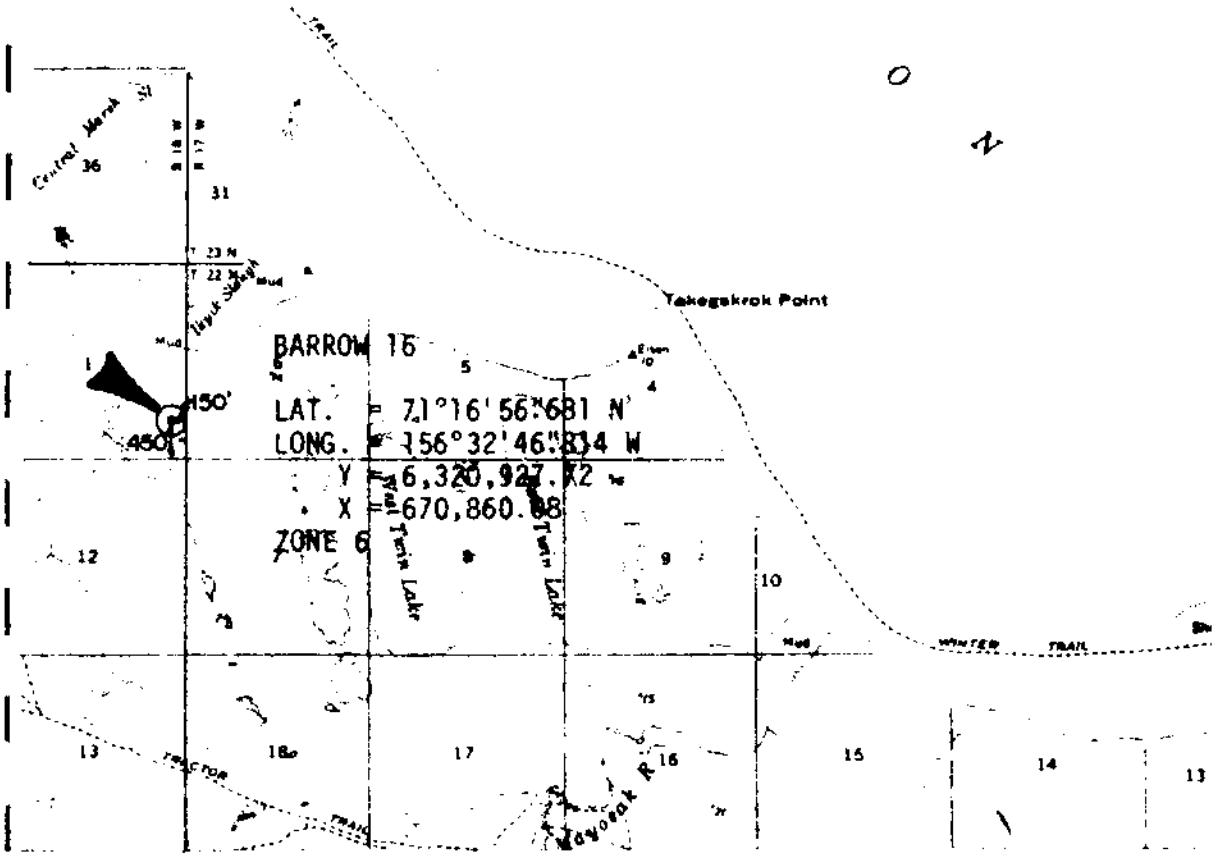
37. SUMMARY OF POROUS ZONES:
SHOW ALL IMPORTANT ZONES OF POROSITY AND CONTENTS THEREOF; CORED INTERVALS; AND ALL DRILL-STEM TESTS, INCLUDING DEPTH INTERVAL TESTED, CUSHION USED, TIME TOOL OPEN, FLOWING AND SHUT-IN PRESSURES, AND RECOVERIES

| FORMATION | TOP | BOTTOM | DESCRIPTION, CONTENTS, ETC. |
|---|---|---|---|
| Cretaceous (Pebble Shale) | 1461' | 1967' | SS: light gray, fine to medium grained, argillaceous, glauconitic, fair porosity, dull yellow fluorescence, fair streaming cut; net sand thickness is 3 feet. |

38. GEOLOGIC MARKERS

| NAME | TOP MEAS. DEPTH | TOP TRUE VERT. DEPTH |
|---|---|---|
| Base of Cretaceous | 2332' | 2332' |
| Top of Argillite | 2332' | 2332' |

U.S. GOVERNMENT PRINTING OFFICE: 1963—O-683636




## 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.

August 17, 1977

STATE OF ALASKA
JOHN H. HERRING
No. 953-S
REGISTERED PROFESSIONAL LAND SURVEYOR

SCALE: 1" = 1 MILE

AS STAKED

# BARROW 16

LOCATED IN

SE 1/4 PROTRACTED SEC. 1 T22 N, R18W UMIAT MERIDIAN, AK

Surveyed for

## HUSKY OIL

N.P.R. OPERATIONS INC.

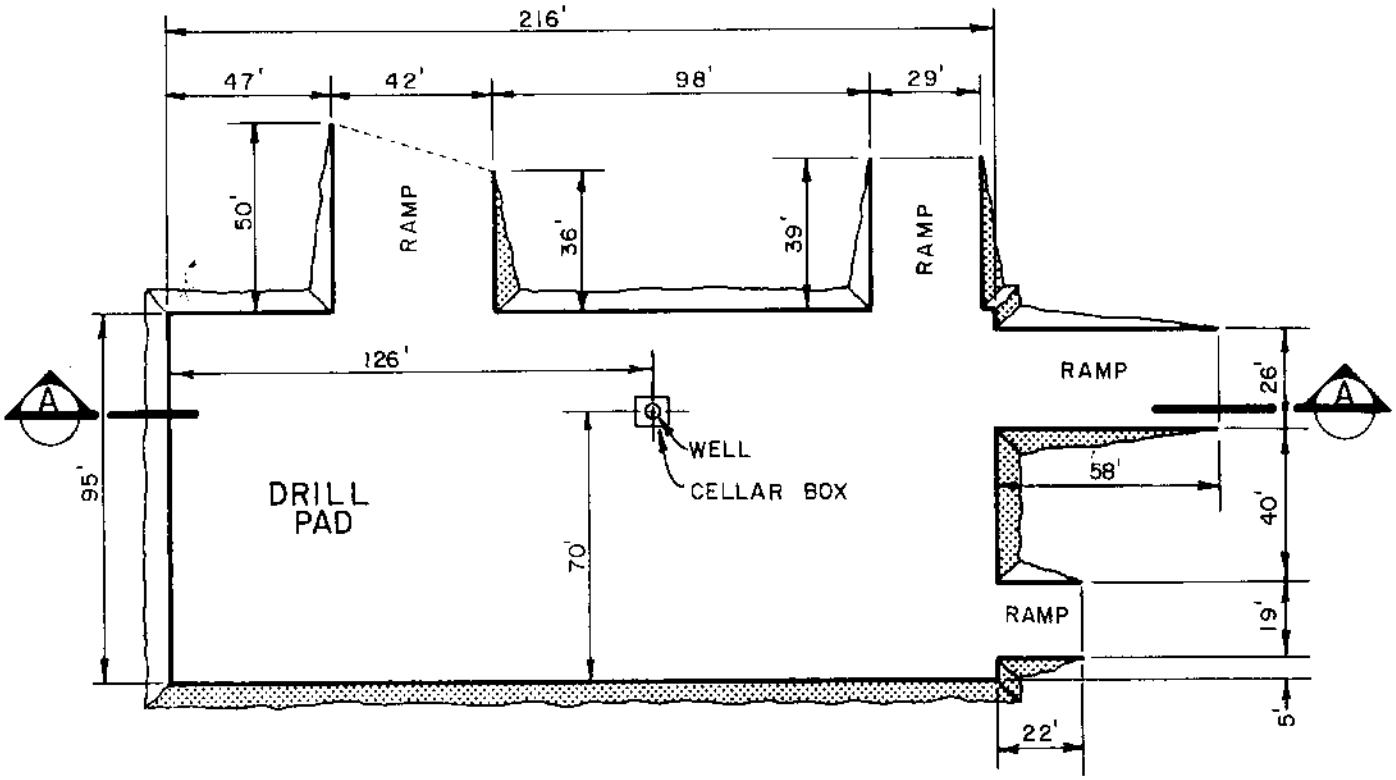
Surveyed by

**Bell, Herring and Associates**

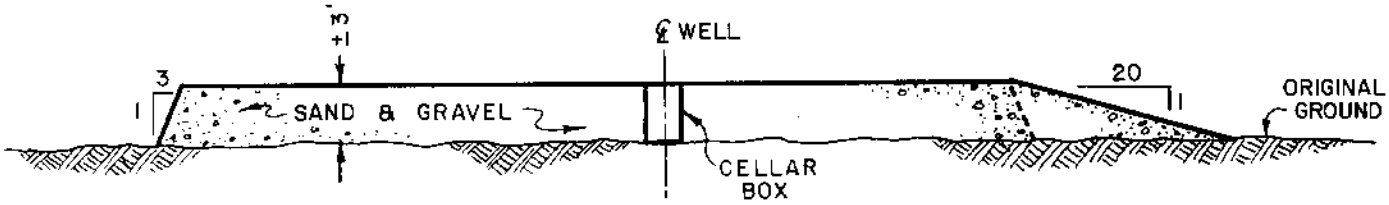
**ENGINEERS AND LAND SURVEYORS**

801 West Fireweed, Suite 102

ANCHORAGE, ALASKA 99503




PLAN VIEW




SECTION A

# SOUTH BARROW No. 16 DRILL PAD

RIG UP AND OPERATIONS HISTORY

1/8/78 Rigging up camp. Accepted pad 1/7/78 at 4:00 PM. Set remaining camp units.

1/9/78 Rigging up. Set mats and lower sub. Built steps for camp. Worked on camp.

1/10/78 Rigging up. Set lower sub-base. Electricity in camp.

1/11/78 Rigging up. Set in top sub-base. Put in false walls. Set in drawworks motors and rotary table. Built steps to camp and worked on camp units.

1/12/78 Rigging up. Set in dog house. Welded hinges on wind walls. Put derrick together. Picked up and laid mats. Set in water treatment and SDU houses. Hooked up sewer lines.

1/13/78 Rigging up. Put derrick on floor. Raised A frame. Set pump houses, generator house, water tank, and boiler house. Built berm for fuel tank. Hooked up sewer and water lines to camp. Worked on camp.

1/14/78 Rigging up. Set mud tank. Set rig fuel tank and hooked up fuel lines. Started rig generator. Started Tioga heater. Worked on camp, SDU unit, and water treatment plant.

1/15/78 Rigging up. Set 20,000 gallon fuel tank. Put up wind wall on rig. Strung up blocks. Set Halliburton house. Hooked up steam, mud, and water lines. Worked on camp. Sewer and water treatment plant running.

1/16/78 Rigging up. Installed monkey board. Worked on Halliburton house. Set cement tanks. Hooking up steam, air, water, and diesel lines. Fired boilers.

1/17/78 Rigging up. Raised derrick. Thawed ice and snow out of mud tanks. Started pump motors. Worked on mud and accumulator lines. Hooked up Halliburton unit.

Took control of Delta Commander 1/16/78 at 6:00 PM.

1/18/78 Rigging up. Completed hooking up Halliburton unit. Hooked up lights to rig. Put in mud lines and stand pipe. Built drip trays for diesel tanks. Repaired drain lines in showers.

1/19/78 Rigging up. Cleaned around location and camp. Wired and started Halliburton unit. Rigged up heaters on rig. Put cement on back side of cellar. Pulled 33,000# on 13 3/8" conductor. Would not move. One-inch pipe beside 13 3/8" stopped at 8 feet. Installed steam lines in mud pit.

1/20/78 Rigging up. Rigged and ran 2" line 77 feet inside conductor. Steamed on 13 3/8". Pulled 13 3/8" loose. Rat hole would not go. Recut hole in upper floor. Trying to get in kelly.

1/21/78 Rigging up. Set rat hole. Steamed conductor; pulled free at 10,000 #. Rebuilt legs on Halliburton tanks. Made top connection to cement 13 3/8" conductor. Cut 210 sacks of cement. Rigged up two cellar pumps. Preparing to cement conductor.

1/22/78 Rigging up. Rigging up to cement. Broke circulation around 13 3/8" conductor. Halliburton cemented with 250 sacks of Permafrost. Circulated 25 sacks. Cement in place 1/21/78 at 3:00 PM. WOC. Cleaned up snow around location.

1/23/78 WOC - 36 1/2 hours. Released pressure; no flow back. Rigging up to cut casing and nipple up. Rigging up logging unit.

1/24/78 Rigging up. Cut off 13 3/8" conductor and welded on 13 3/8" OCT starter head. Mixed mud. Nipple up BOP.

1/25/78 Rigging up. Nipple up mud spool, diverter lines, and Hydril. Worked on rat hole and kelly boot.

1/26/78 Rigging up. Nipple up BOPE. Hooked up kill line, diverter line, and choke manifold. Changed Hydril rubber. Spare element wrong size; waited on new element. Nipple up.

1/27/78 Rigging up. Tested choke manifold. Completed diverter line. Put blower on No. 2 drawworks motor. Put bladder in accumulator.

1/28/78 Rigging up. Installed well identification sign. Repaired Swaco valve in choke manifold. Tested choke manifold and kill lines to 300 psi. O.K. Tested Hydril to 250 psi. O.K. Tested weld on braden head to 250 psi. O.K. Worked on pump controls.

Spudded well 1/28/78 at 11:00 AM.

1/29/78 Total Depth: 160; Mud Weight: 9; Viscosity: 39.
Footage Worked on and cut off rat hole. Worked on crownomatic. Drilling.
80'

1/30/78 TD: 728'; MW: 9.4; Vis: 36. Changed out shaker screens to 20 X
568' 20 . Drilling ahead.

1/31/78 TD: 1151'; MW: 9.9; Vis: 40. Drilled from 728' to 1151'. Tripped
423' for bit. Tight hole. Tripped in with Bit No. 2.

2/1/78 TD: 1409'; MW: 10; Vis: 38. Drilled from 1151' to 1409'. Changed
258' out fuel pump in drawworks engine. Waited on governor for drawworks engine. Circulating.

2/2/78
101'

TD: 1510'; MW: 10.1; Vis: 38. Circulated and waited on part for drawworks engine. Made short trip to wipe hole. Worked on No. 1 engine. Cleaned out to bottom 5 feet of fill. Cooled transfer case and changed oil in same. Tripping out to log.

2/3/78
0'

TD: 1510'; MW: 10.1; Vis: 38. Made short trip to shoe. Circulated and conditioned for logs. Ran DIL/SP/BHC-Sonic GR. Tripped in to condition for casing. Circulated. Tripping out.

2/4/78
0'

TD: 1510'. Cleaned mud pits. Finished trip out. Rigged up and ran 9 5/8", 53.5#, S-95, BTC casing. Set shoe at 1487'; set duplex float collar at 1444'. Tripped in with stinger and conditioned mud. Cemented with 1020 sacks of Permafrost cement at 14.6 ppg. Mixing rate: 5 1/2 BPM. Preceded cement with 20 barrels of water and followed with 2 barrels of water. Received full returns while pumping. Final cement returns: 14.6 ppg. Cement in place at 3:30 AM, 2/4/78. Tripped out with stingers. Flushed BOP stack. Waiting on cement.

2/5/78
0'

TD: 1510'. Cleaned mud pits. Cut off diverter lines. Cut off 13 3/8" head. Cut off 9 5/8" casing. Ground down OD on 9 5/8" casing for slip on casing head. Built berm around rig fuel tank and installed new liner. Put 10 sacks of cement around 9 5/8" casing. Waiting on cement.

2/6/78
0'

TD: 1510'. Welded on 10", 3000 psi X 9 5/8" slip on head. Set in drilling spool. Modified drilling nipple. Hooked up Tioga heater and laid duct to rig. Moved 20,000 gallon fuel tank and hooked up to camp generator. Nipple up.

2/7/78
0'

TD: 1510'; MW: 10.3. Fabricated and hooked up choke and kill lines. Hooked up hydraulic lines. Installed turn buckles on stack. Tested BOPE and rams to 3000 psi, Hydril to 1500 psi, and choke manifold to 3000 psi. Installed bit guide; changed valve on stand pipe. Tripping in hole.

2/8/78
282'

TD: 1792'; MW: 10.2; Vis: 38. Picked up BHA. Took SLM in hole; float at 1444'. Drilled cement to shoe at 1487'. Tested casing to 1500 psi. Tested o.k. Drilled out shoe and 10' of new hole. Tested formation to 0.63 psi/ft equivalent gradient. Tested o.k. Drilling ahead.

2/9/78
200'

TD: 1992'; MW: 10.3; Vis: 42. Lost circulation while drilling at 1851' (30 barrels) and 1923' (30 barrels). Conditioned mud and drilled to 1992'. Tripped for bit. Well kicked through drill pipe. Installed inside BOP and tripped back to bottom. Started pumping down drill pipe; no returns. Closed Hydril and circulated through choke. Pumped 30 strokes w/1000 psi on drill pipe and 0 psi on the casing pressure. Opened Hydril. Closed Hydril and pumped 41 strokes w/700 psi on drill pipe. Opened Hydril and pumped 29 strokes w/100 psi on drill pipe. Regained circulation and condition stabilized. Circulating and conditioning mud.

2/10/78
0'

TD: 1992'; MW: 10.4; Vis: 45. Circulating and conditioning mud. Added LCM and built weight to 10.5 ppg. Pulled out of hole. Swabbed with five stands out. Ran in hole four stands. Circulated and worked pipe. Tripped out, circulating each stand. Bit plugged seven stands out. Worked pipe and unplugged bit. Tripped out, circulating each stand. Laid down stabilizers. Tripped in and circulated. Washed 1950' to 1970'. Circulating out trip gas.

2/11/78
168'

TD: 2260'; MW: 10.8; Vis: 54. Circulated and washed 20' to bottom. Drilling ahead.

2/12/78
88'

TD: 2348'; MW: 10.8; Vis: 48. Drilled to 2309' and tripped for bit. Ran Bit No. 5. Bit plugged; could not unplug. Tripped out and unplugged bit. Installed larger nozzles. Tripping in.

2/13/78
49'

TD: 2397'; MW: 10.8; Vis: 44. Tripped in; bridge at 2280'. Circulated out trip gas. Washed 25' to bottom. Lost mud; added LCM. Drilled to 2397'. Tripped for core barrel. Coring.

2/14/78
Cored 3'

TD: 2400'; MW: 11; Vis: 52. Jammed core barrel No. 1 with 3' core. Circulated and conditioned mud. Added LCM and weight material. Gained 75 barrels fluid in pit. Tripped out to log. Ran log in hole to 2392'. Ran temperature survey, DLL/SP, CNL, and Density. Core No. 1: 2397' to 2400'. Logging.

2/15/78
0'

TD: 2400'; MW: 11; Vis: 49. Ran BHC Sonic/GR and HRD from 2392' to 1487'. Ran velocity and temperature survey from 2392' to 60'. Attempted 86 sidewall cores; recovered 77 (1 empty and 8 misfires). Logging completed at 3:00 AM, 2/15/78.

2/16/78

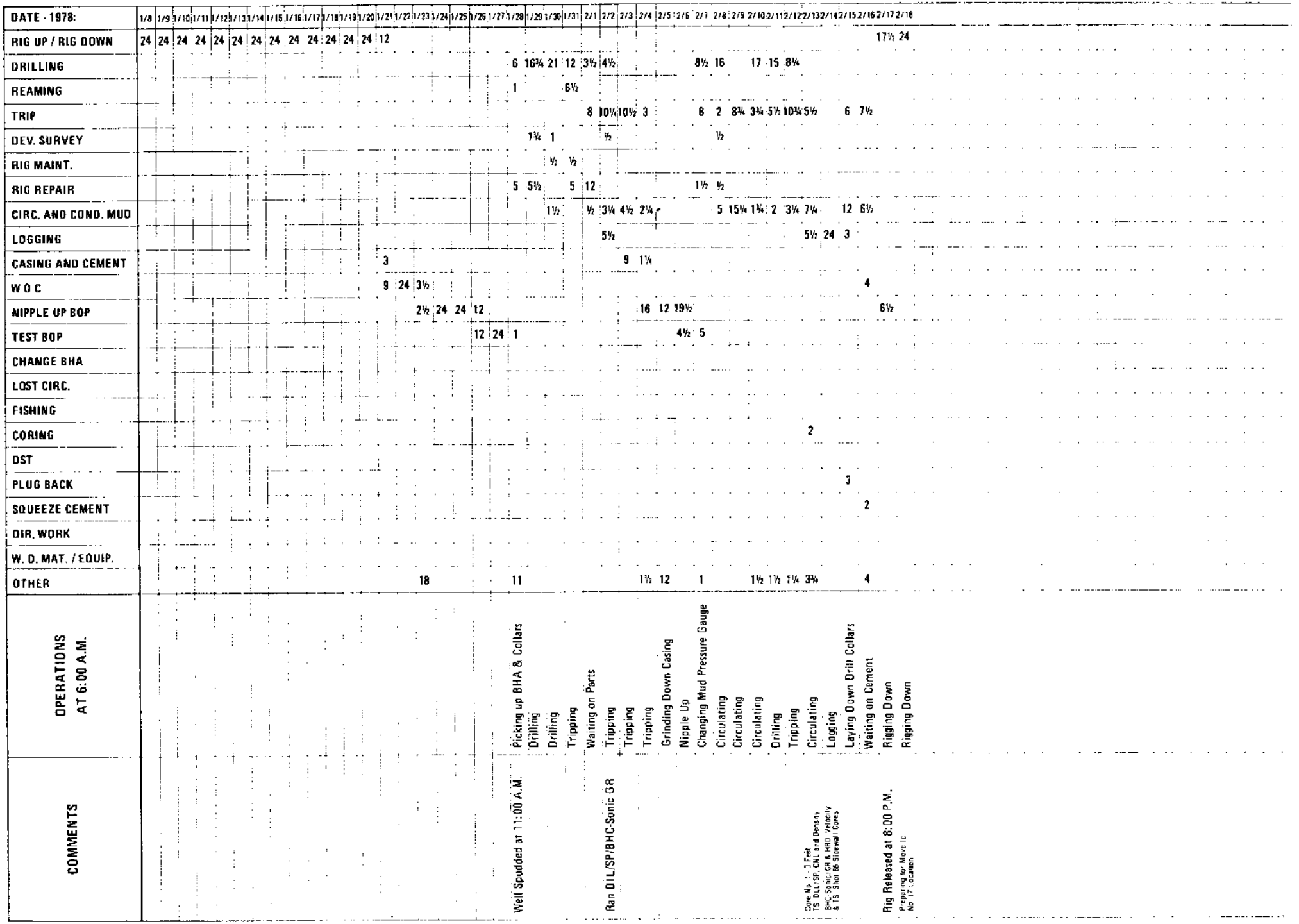
TD: 2400'; PBTD: 1420'; MW: 11; Vis: 47. Laid down drill collars. Tripped in open ended to 2300'. Circulated and conditioned hole. Pumped 175 sacks Class "G". Cemented with 2% $CaCl_2$ in mix water. Cement in place at 10:00 PM, 2/15/78. Picked up to 1450' and circulated. Plug remained in place. Tripped out and picked up 9 5/8" cement retainer and ran to 1420'. Waiting on cement.

2/17/78

TD: 2400'; PBTD: 1426'. Set cement retainer at 1426'. Established injection rate and pressure of 4.6 BPM at 700 psi. Pumped 60 sacks of Permafrost cement--55 sacks below and spotted 5 sacks above retainer. Final pressure: 500 psi. Cement in place at 12:30 PM, 2/16/78. Tripped out to 1208'. Reversed out, displacing mud to water to diesel. Laid down drill pipe, kelly, and rat hole. Thawed mud lines. Nipple down.

2/18/78

TD: 2400'; PBTD: 1412'. Cleaned mud tanks. Set out ramp and cat walk. Hung off BOP. Broke out diverter line. Released rig at 8:00 PM, 2/17/78. Rigging down and moving rig.

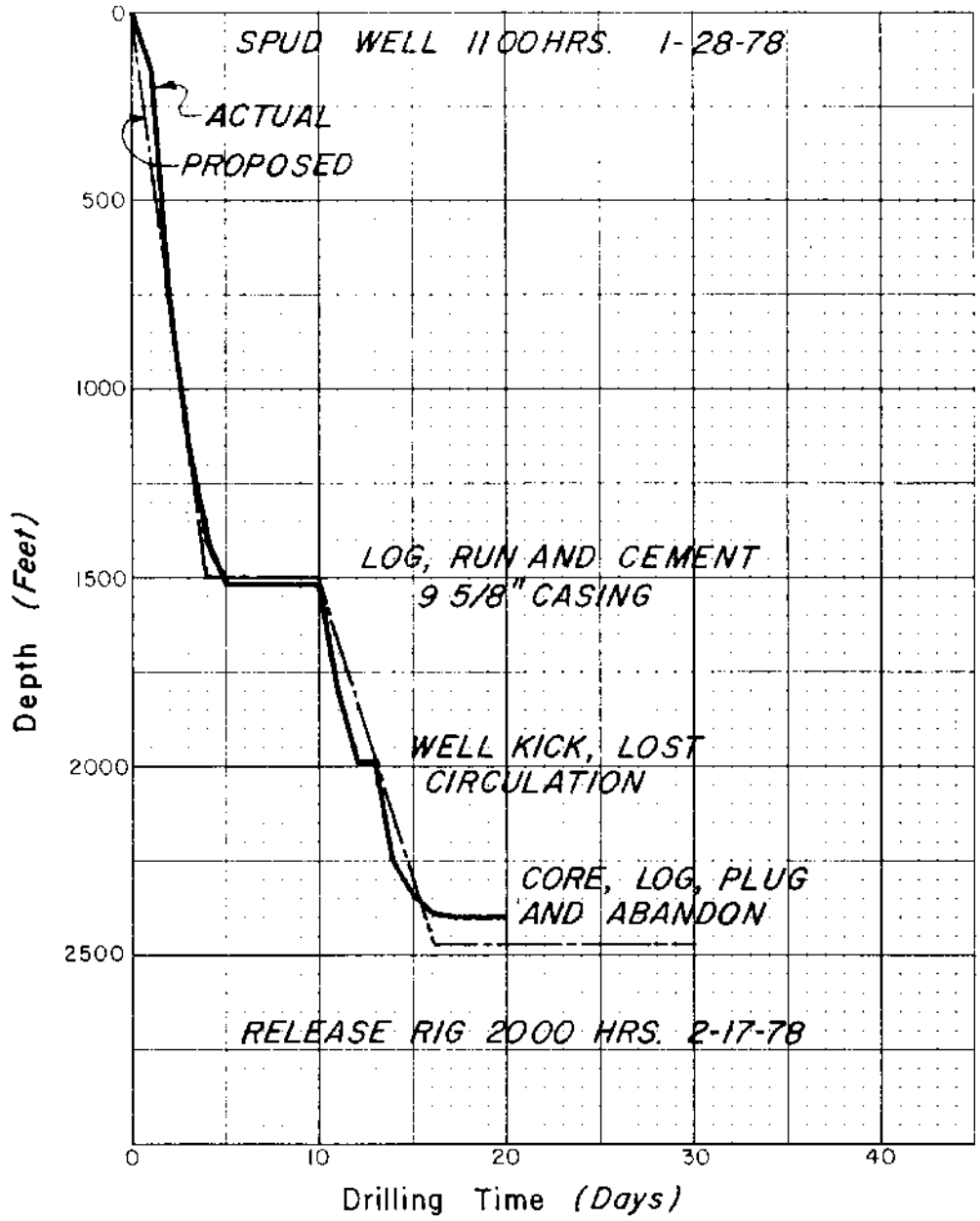



CASING DATA:
13 3/8" CONDUCTOR CASING @ ..... 80'
9 5/8" SURFACE @ ..... 1487'

SPUD DATE ..... JANUARY 28, 1978
RIG RELEASE DATE .... FEBRUARY 17, 1978
TD ..... 2400'
PBD ..... 1412'
SURFACE ELEVATION ..... 12'

WELL NO. ..... SOUTH BARROW NO. 16
LOCATION ..... NATIONAL PETROLEUM RESERVE IN ALASKA
CONTRACTOR ..... BRINKERHOFF DRILLING COMPANY, INC.
RIG ..... NO. 31

# DRILLING TIME CURVE




SOUTH BARROW No. 16
NORTH AREA

150' FEL and 450' FSL
Sec. 1, T.22N., R.18W., U.M.

HUSKY OIL *N.P.R. Operations*
*NATIONAL PETROLEUM RESERVE - ALASKA*

# ARCTIC DRILLING SERVICES

COMPANY Husky Oil NPR Operations, Inc. STATE Alaska CASING PROGRAM: 13 3/8 inch at 80 ft.

WELL South Barrow Well No. 16 COUNTY North Slope 9 5/8 inch at 1487 ft.

CONTRACTOR Brinkerhoff Drilling Company LOCATION NPRA SEC 1 TWP 22N RNG 18W ____ inch at ____ ft.

STOCKPOINT ____ DATE 2/17/78 BAROID ENGINEER Rintoul/Forman TOTAL DEPTH 2400 ft.

| DATE | DEPTH | WEIGHT | VISCOSITY | | Yp | GELS | pH | FILTRATION | | | FILTRATE ANALYSIS | | | | SAND | RETORT | | | CEC | REMARKS AND TREATMENT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978 | feet | lb/gal | Sec API @ ___°F | PV @ ___°F | | 10 sec/10 min | Strip □ Meter □ | ml API | HTHP @ ___°F | Cake 32nds | Pm | Pf/Mf | Cl ppm | Ca ppm | % | Solids % | Oil % | Water % | Mud, me/ml | |
| 1/24 | | 8.5 | 55 | 16 | 10 | 6/10 | 8.0 | 18 | | 2 | | | 2500 | 0 | 0 | 2 | | 98 | | Mixed spud mud |
| 1/25 | | 8.5 | 40 | 12 | 12 | 10/16 | 9,5 | 16 | | 3 | | | 2200 | 0 | 0 | 2 | | 98 | | |
| 1/26 | | 8.5 | 42 | 12 | 12 | 10/16 | 9.5 | 16 | | 3 | | | 2200 | 0 | 0 | 2 | | 98 | | |
| 1/27 | | 8.5 | 42 | 12 | 12 | 10/16 | 9.5 | 16 | | 3 | | | 2200 | 0 | 0 | 2 | | 98 | | |
| 1/28 | | 8.6 | 38 | 12 | 8 | 3/8 | 9.5 | 15 | | 3 | | | 2200 | 40 | 0 | 3 | | 97 | | Spudded well |
| 1/29 | 190 | 9.0 | 39 | 14 | 12 | 2/6 | 9.0 | 12.8 | | 3 | | | 2300 | 25 | 3/4 | 5 | | 95 | | Drilling clay |
| 1/30 | 691 | 9.4 | 36 | 10 | 5 | 1/3 | 9.5 | 13 | | 2 | | | 2100 | 75 | 1/2 | 8 | | 92 | | Drilling |
| 1/31 | 1151 | 9.6 | 37 | 10 | 6 | 2/6 | 9,5 | 12 | | 3 | | | 1600 | 26 | Tr | 9 | | 91 | | Weight and solids climbing |
| 2/1 | 1409 | 10.0 | 38 | 12 | 8 | 2/4 | 9.5 | 14 | | 3 | | | 3500 | 26 | Tr | 12 | | 88 | | Drilling clay - poor samples |
| 2/2 | 1510 | 10.1 | 38 | 12 | 8 | 2/4 | 9.5 | 13 | | 3 | | | 3500 | 30 | Tr | 13 | | 87 | | POH to log |
| 2/3 | 1510 | 10.1 | 38 | 12 | 8 | 2/4 | 9.5 | 13 | | 3 | | | 3500 | 30 | Tr | 13 | | 87 | | Logged - excellent caliper |
| 2/4 | 1487 | 10.1 | 38 | 12 | 8 | 2/4 | 9.5 | 13 | | 3 | | | 3500 | 30 | Tr | 13 | | 87 | | Ran 9 5/8" to 1487 |
| 2/5 | 1487 | | | | | | | | | | | | | | | | | | | Dump and clean pits |
| 2/6 | 1487 | 10.3 | | | | | | | | | | | | | | | | | | Mix $CaCl_2$ mud |
| 2/7 | 1487 | 10.3 | | | | | | | | | | | | | | | | | | Nippling up |
| 2/8 | 1750 | 10.2 | 35 | 9 | 4 | 2/4 | 10.0 | 9 | | 2 | | | 250000 | 100000 | 1/4 | 4 | | 96 | | Drilling ahead |
| 2/9 | 1992 | 10.3 | 60 | 23 | 26 | 6/20 | 8.0 | 12 | | 3 | | | 240000 | 120000 | 0 | 20 | | 80 | | Lost returns at 1850' |
| 2/10 | 1992 | 10.4 | 45 | 20 | 8 | 3/9 | 8.5 | 11 | | 3 | | | 330000 | 115000 | 1/4 | 20 | | 80 | | Swabbed hole at 1992' |
| 2/11 | 2255 | 10.8 | 56 | 20 | 15 | 2/9 | 9.0 | 7.5 | | 3 | | | 230000 | 80000 | Tr | 8 | | 92 | | Drilling ahead |
| 2/12 | 2378 | 10.8 | 60 | 20 | 12 | 2/9 | 9.0 | 7.0 | | 3 | | | 170000 | 80000 | 1/4 | 10 | | 90 | | Drilling ahead |
| 2/13 | 2395 | 10.8 | 44 | 16 | 5 | 1/7 | 8.5 | 7.0 | | 3 | | | 120000 | 75000 | 1/4 | 10 | | 90 | | Lost 100 bbls mud to formation |
| 2/14 | 2399 | 11.0 | 52 | 16 | 16 | 1/7 | 8.5 | 8.0 | | 3 | | | 89000 | 45000 | Tr | 10 | | 90 | | Gained fluid from hole |
| 2/15 | 2400 | 11.0 | 49 | 15 | 14 | 1/6 | 8.5 | 20 | | 3 | | | 90000 | 50000 | Tr | 8 | | 92 | | |
| 2/16 | 2400 | 11.0 | 47 | 15 | 14 | 1/5 | 8.5 | 8 | | 3 | | | 90000 | 50000 | Tr | 8 | | 92 | | Plugged and abandoned |

# BIT RECORD

| BIT NO. | BIT SIZE | BIT MFGR. | BIT TYPE | SER. NO. OF BIT | JET SIZE 1 | 2 | 3 | DEPTH OUT | FTGE. | HRS. RUN | ACC. HRS. | FT. PER. HR. | WEIGHT 1000 LBS | ROTARY R.P.M. | VERT DEV. | PUMP PRESS. | PUMPS LINER | SPM. | MUD WT. | VIS | DULL CODE T | B | G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 12 1/4 | HTC | OSC3J | VH770 | 12 | 12 | 12 | 1151 | 1071 | 43.5 | 24.5 | 24.5 | 25 | 60 | 3/4° | 900 | 110 | 110 | 9.0 | 50 | 2 | 2 | I |
| 2 | 12 1/4 | HTC | OSC3J | TD004 | 12 | 12 | 12 | 1513 | 362 | 18 | 61.5 | 20.1 | 25 | 60 | 1.5° | 800 | 112 | 112 | 10.1 | 38 | 3 | 2 | I |
| 3 | 8 1/2 | HTC | X3J | XZ030 | 9 | 9 | 9 | 1992 | 479 | 24.25 | 85.75 | 19.8 | 25 | 80 | 1° | 1200 | 90 | 90 | 10.4 | 50 | 3 | 2 | I |
| 4 | 8 1/2 | HTC | X16 | RH379 | 16 | 16 | 16 | 2309 | 317 | 29.5 | 115 .25 | 10.5 | 20 | 80 | 1° | 600 | 90 | 90 | 10.5 | 50 | 3 | 3 | I |
| 5 | 8 1/2 | OSC | 3AJ | H2815 | 16 | 16 | 16 | 2395 | 86 | 9.5 | 125 .75 | 9 | 20 | 80 | 1° | 600 | 90 | 90 | 10.8 | 51 | 7 | 2 | I |
| 6 | 8 1/2 | Christenson Dimond | | 7S63715 | | | | 2399 | 3 | 2 | 126 .75 | 1.5 | 18 | 72 | 1° | 1200 | 60 | 60 | 10.8 | 45 | | G O O | D |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

PAGE 1 OF 1 **CASING TALLY** DATE: February 3, 1978

FIELD NPRA LEASE & WELL NO. So. Barrow Well No. 16 TALLY FOR 9 5/8" CASING

| JOINT NO | FIRST MEASUREMENT FEET | FIRST MEASUREMENT 00'S | CHECK MEASUREMENT FEET | CHECK MEASUREMENT 00'S | WT GR |
|---|---|---|---|---|---|
| 1 | 41 | 74 | | | |
| 2 | 41 | 74 | | | |
| 3 | 39 | 43 | | | |
| 4 | 40 | 89 | | | |
| 5 | 38 | 14 | | | |
| 6 | 44 | 02 | | | |
| 7 | 42 | 65 | | | |
| 8 | 42 | 32 | | | |
| 9 | 38 | 90 | | | |
| 0 | 40 | 90 | | | |
| TOTAL A | 410 | 73 | | | |

| JOINT NO | FIRST MEASUREMENT FEET | FIRST MEASUREMENT 00'S | CHECK MEASUREMENT FEET | CHECK MEASUREMENT 00'S | WT GR |
|---|---|---|---|---|---|
| 1 | 41 | 43 | | | |
| 2 | 42 | 56 | | | |
| 3 | 40 | 16 | | | |
| 4 | 41 | 94 | | | |
| 5 | 39 | 43 | | | |
| 6 | 40 | 35 | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 0 | | | | | |
| TOTAL D | 245 | 87 | | | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 41 | 73 | | | |
| 2 | 41 | 27 | | | |
| 3 | 41 | 12 | | | |
| 4 | 39 | 55 | | | |
| 5 | 43 | 80 | | | |
| 6 | 40 | 38 | | | |
| 7 | 40 | 80 | | | |
| 8 | 40 | 88 | | | |
| 9 | 43 | - | | | |
| 0 | 42 | 70 | | | |
| TOTAL B | 415 | 23 | | | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 0 | | | | | |
| TOTAL E | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 1 | 41 | 80 | | | |
| 2 | 41 | 52 | | | |
| 3 | 39 | 62 | | | |
| 4 | 42 | 50 | | | |
| 5 | 40 | 47 | | | |
| 6 | 40 | 76 | | | |
| 7 | 40 | 90 | | | |
| 8 | 40 | 38 | | | |
| 9 | 43 | 60 | | | |
| 0 | 40 | 22 | | | |
| TOTAL C | 411 | 77 | | | |

| | | | | |
|---|---|---|---|---|
| TOTAL A | 410 | 73 | | |
| TOTAL B | 415 | 23 | | |
| TOTAL C | 411 | 77 | | |
| TOTAL D | 245 | 87 | 1483 | 60 |
| TOTAL E | | | 3 | 66 |
| TOTAL PAGE | 1483 | 60 | 1487 | 26 |

## CASING OR LINER CEMENT JOB

Lease South Barrow Gas Field Well So. Barrow Well No. 16 Date January 21, 1978

Size Casing 13 3/8" Setting Depth 80' Top (liner hanger) _____

Hole Size 20" " Mud Gradient Dry Viscosity _____

**Casing Equipment**

_____ shoe, _____ float located _____ feet

above shoe, _____ (DV, FO) collars located at _____ feet

and _____ feet.

_____ centralizers located _____

_____

_____ scratchers located _____

_____

Liner hanger and pack off (describe) _____

_____

Miscellaneous (baskets, etc.) _____

_____

**Cement (around shoe)**

| | No. Sacks | Brand | Type | Additives | Slurry Weight | Slurry Volume |
|---|---|---|---|---|---|---|
| (1) | 210 | Howco | Permafrost | | 13.7 - 14.0 | 195 cu ft |
| (2) | | | | | | 28°F |

**Cement through (DV, FO) Collar at feet**

| | No. Sacks | Brand | Type | Additives | Slurry Weight | Slurry Volume |
|---|---|---|---|---|---|---|
| (3) | | | | | | |
| (4) | | | | | | |

**Cementing Procedure (around shoe)** (cross out where necessary)

Circulated 35 bbls @ .5 BPM, pumped in _____ (cu. ft.), (barrels) _____ _____ prewash, used bottom plug (yes, no), mixed cement (1) above 15 minutes, cement (2) above _____ minutes, top plug (yes, no) displaced with 12 ~~(cu. ft.)~~, (barrels) in _____ minutes at rate of 2.5 BPM, CFM. (Bumped plug) (Did not bump plug). Final Pressure 0 psi. Reciprocated pipe _____ feet while (mixing) and (displacing) cement. Displacing time _____ minutes. Had full circulation (full, ~~partial~~, none, etc.). Completed job at 3:00 ~~a.m.~~, p.m.

**Cementing Procedure (through (DV, FO) at _____ feet)** (cross out where necessary)

Opened (DV, FO) at _____ a.m., p.m., circulated _____ bbls @ _____ BPM, pumped in _____ (cu. ft.), (barrels) _____ prewash, mixed cement (3) above _____ minutes, cement (4) above _____ minutes, dropped closing plug, displaced with _____ (cu. ft.), (barrels) in _____ minutes at rate of _____ _____ BPM, CFM. (Bumped plug) (Did not bump plug). Final Pressure _____. Displacing time _____ minutes. Had _____ circulation (full, partial, none, etc.)

**Remarks** (Third Stage Job, etc.)

_____

_____

_____

_____

_____

McGee/Smith
Foreman

# CASING OR LINER CEMENT JOB

Lease South Barrow Gas Field Well So. Barrow Well No. 16 Date February 4, 1978

Size Casing 9 5/8" Setting Depth 1487' Top (liner hanger) _____

Hole Size 12 1/4" Mud Gradient .525 Viscosity 38

**Casing Equipment**

Howco shoe, 1487 float located 41.74 feet

above shoe, 1444 (DV, FO) collars located at _____ feet

and _____ feet.

_____ centralizers located 10' above shoe 5, on every other collar above float, and on last 3 collars in hole.

_____ scratchers located _____

Liner hanger and pack off (describe) _____

Miscellaneous (baskets, etc.) _____

**Cement (around shoe)**

| | No. Sacks | Brand | Type | Additives | Slurry Weight | Slurry Volume |
|---|---|---|---|---|---|---|
| (1) | 1020 | Permafrost | | None | 14.6 | 939 cu ft |
| (2) | | | | | | |

**Cement through (DV, FO) Collar at _____ feet**

| | No. Sacks | Brand | Type | Additives | Slurry Weight | Slurry Volume |
|---|---|---|---|---|---|---|
| (3) | | | | | | |
| (4) | | | | | | |

**Cementing Procedure (around shoe)** (cross out where necessary)

Circulated 167 bbls @ 5 1/2 BPM, pumped in 20 ~~cu. ft.~~, (barrels) water prewash, used bottom plug ~~(yes,~~ no), mixed cement (1) above 30 minutes, cement (2) above _____ minutes, top plug ~~(yes,~~ no) displaced with 10.7 ~~cu. ft.~~, (barrels) in 2 minutes at rate of 5 BPM, CFM. (Bumped plug) (Did not bump plug). Final Pressure 500. Reciprocated pipe _____ feet while (mixing) and (displacing) cement. Displacing time 2 minutes. Had full circulation (full, partial, none, etc.). Completed job at 3:30 a.m., ~~p.m.~~

**Cementing Procedure (through (DV, FO) at _____ feet)** (cross out where necessary)

Opened (DV, FO) at _____ a.m., p.m., circulated _____ bbls @ _____ BPM, pumped in _____ (cu. ft.), (barrels) _____ prewash, mixed cement (3) above _____ minutes, cement (4) above _____ minutes, dropped closing plug, displaced with _____ (cu. ft.), (barrels) in _____ minutes at rate of _____ BPM, CFM. (Bumped plug) (Did not bump plug). Final Pressure _____. Displacing time _____ minutes. Had _____ circulation (full, partial, none, etc.)

**Remarks** (Third Stage Job, etc.)

Float held.

McGee/Smith
Foreman

GEOLOGICAL REPORT

OF

USGS/NPRA

(HUSKY OIL OPERATOR)

SOUTH BARROW NO. 16 WELL

SEC. 1, T22N, R18W, U. M.

NORTH SLOPE, ALASKA

BY

D. B. YOUNG

## ABSTRACT

The South Barrow No. 16 well was drilled as a new field "Wildcat". Located approximately 1.8 miles northeast of the South Barrow gas field on a separate seismically mapped closure. The well was drilled to a depth of 2399', penetrating sediments of Recent to Early Cretaceous age and terminating in the probable pre-Carboniferous Argillite. Small shows of gas were noted in the Early Cretaceous Torok and "Pebble Shale" Formations. The primary objective "Barrow gas sand" was not encountered. An unconformity is thought to have stripped the "Barrow" at this location. A secondary objective, the "Sag River Sand" of Jurassic age, was also missing and is thought to have been stripped also by an unconformity, possibly the same one that removed the "Barrow". No suitable reservoir rocks were encountered in this well.

## STRATIGRAPHY

QUARTERNARY

RECENT — Surface-120' (Unverified)

The surface sediments (top 30') were looked at in cuttings from seismic shot point holes. The lithology is very fine grained argillaceous sandstone with thin stringers of pebbles orange, brown, black, all in a permafrost matrix. The interval from 30' down to 80' was not looked at as this hole was drilled and surface conductor pipe set prior to commencing with mud logging operations. While circulating for cement placement black lignitic coal was circulated up. Lithology from 80' to 120' is interpreted as sandstone from log analysis.

CRETACEOUS

TOROK FORMATION — 120'-1930' Thickness 1810'

The top of the Torok Formation is placed at 120' based on a change in log character and lithology from sandstone to claystone. The first samples caught for Paleontological examination at 200' indicate an age of Early Cretaceous (Aptian-Albian). Lithology of the interval from 120'-666' is interbedded claystone, siltstone and sandstone commonly carbonaceous, pyritic and with rare microfossils. From 666' down to 1320' the lithology is predominantly soft light gray claystone that hydrates and goes into solution in the drilling mud. Occasional beds of siltstone, sandstone, lignite and coal also occur. From 1320' down to 1550' a marked increase in sandstone and siltstone with common carbonaceous material indicates a higher energy deposition with

close proximity to a distributory stream. From 1550' down to 1782' the lithology is predominantly medium gray soft claystone. An argillaceous light gray silty sand occurs from 1782'-1814' which gave a gas kick of 160 units. Sharp dip reversal indicated by the dipmeter from 1800' down to 1830' is interpreted as a probable thrust fault with approximately 70' of throw. Paleontological evidence does not verify this conclusion. However, the similarity of the zone from 1756'-1784' with the normal "Pebble Shale" (Neocomian Age) top at 1930' to 1960' makes it seem probable. Neocomian fauna were first noted by Anderson and Warren at a depth of 1900'. No disconformity is suggested by dipmeter between the Torok and "Pebble Shale" Formations. Age determinations for the Torok Formation indicate a range from Aptian-Albian (AWA Zonules F-9 to F-11). The suggested environment of deposition ranges from inner to middle Neritic in the upper part to open Marine in the lower part. Bulk lithology make-up for the Torok is: Shale 67%; Siltstone 26%; and Sandstone 7%.

"PEBBLE SHALE" FORMATION 1930'-2332'

The "Pebble Shale" was topped at 1930' by log correlation with the base at 2332'. Total thickness of the "Pebble Shale" is 402'. It is thought to be bounded by unconformities. Paleontological evidence suggests Neocomian fauna as high as 1900'. These are possibly reworked from the "Pebble Shale" or perhaps the base of the Torok is Neocomian in age. The pick used for correlation purposes to determine the top of the Pebble Shale is based on a hot gamma ray zone of 30' thickness which persists throughout the Barrow gas field area. Two sidewall cores from this zone indicate it to be composed of very fine grained argillaceous sandstone. Sample quality through this zone was poor due to lost circulation materials in the mud. A whole core taken off the top of this zone on South Barrow Well No. 19 indicates it to be dark gray, poorly fissile shale with rare frosted quartz grains. A 6' sand bed was penetrated from 1961-1967'. A 300 unit gas "kick" was indicated on penetrating this bed. The sand is very fine to fine grained light gray friable to medium hard, glauconitic, and argillaceous. Yellow fluorescence and yellow cut fluorescence were noted. Log analysis indicated less than 3 feet of net porosity (21%). From 1967' to 2070' the lithology is predominantly dark gray shale grading to siltstone and with occasional sandstone stringers.

At 2070' pebbles of quartz and varicolored chert and medium grained frosted quartz grains become common as floaters in the samples. A sidewall core cut at 2247' contained pyrite filled worm burrowing. A color change from dark gray to dark brown-gray occurs at 2266'. At 2280' a light apple green shale stringer was encountered, associated with a dark green glauconitic siltstone indicating marine deposition.

Correlation was established with the zonation of Gruy in their study of the South Barrow gas field. Points of correlation are as follows:

| | | |
|---|---|---|
| K-2 South Barrow No. 9 | 2104' vs. 2054' | South Barrow No. 16 |
| K-3 | 2153' vs. 2126' | |
| K-8 | 2302' vs. 2266' | |
| Unconformity | 2380' vs. 2331' | |

In the Barrow No. 16 well the Kingak Formation (late Jurassic), including the "Barrow Gas Sand" has been stripped off with the Neocomian unconformity resting directly on the argillite. A sidewall core cut at 2334' (3' correction to 2331') indicates an unconformity sand, white, fine grained kaolinitic with angular chert and reworked argillite fragments interbedded with a brown soft shale of Neocomian age.

The age distribution of the "Pebble Shale" is considered to be Early Cretaceous (Neocomian), possible AWA Zonules F-12 to F-13. Environment of deposition was open Marine-Neritic. Bulk lithology composition is approximately 70% shale; 23% siltstone; and 7% sandstone.

ARGILLITE 2332'-2399' (67')

The argillite was encountered at 2332' by log pick. A total of 67' of argillite was penetrated. The argillite is black, very hard to moderately hard, with quartz filled fractures and lenses of quartz. It contains fine euhedral pyrite and becomes foliated and graphitic from 2350' down to total depth of 2399'. The age and environment of deposition are indeterminate.

## CORE AND SAMPLING DATA

One conventional core was taken at total depth in the argillite to check on fracturing and hydrocarbon occurrence. An inclusion of a soft white puttified anhydrite with bright yellow-white fluorescence and a good gassy odor lends some support to possible gas production from the argillite should it

be found to be highly fractured at other locations. Eighty-six sidewall cores were shot with 76 being recovered. Thirty were shot for potential reservoir analysis, 36 for paleontological analysis, and 20 for geochemical purposes. Drill bit cuttings were continuously collected and analyzed from 200' to total depth. From 200' to 1510' samples were caught in 30' increments. From 1510' to total depth sample interval was 10'.

## STRUCTURE

A Schlumberger 4 arm high resolution diameter was run from 1487' to 2393' total depth to aid in interpreting the structure.

Dipmeter data starts from within the Torok Formation. From a depth of 1500' down to 1630' dips decrease with depth from 15° down to 5° trending south-southeast to south. From 1630' to 1670' dips average 3° in a generally northwesterly direction. From 1670' to 1796' low dips average 4° in a south-southeasterly direction. A thrust fault is postulated at 1800', where a sharp dip reversal occurs with dips changing from 1° to 21° and azimuth changing from south-southeast to north-northwest over the interval 1800'-1830'. Additional supportive evidence lies in the similarity of the gamma ray log between 1756' and 1784', which has similar log characteristics to the normal "Pebble Shale" top occurring from 1930'-1960'. Approximately 70' of throw is postulated on this fault. Dipmeter readings from 1880' down to 1980' are consistently in a south-southeast direction with dips averaging 8°. From 1980' to 2030' data is considered poor. From 2030'-2100' dips indicate an average of 4° with orientation shifting from south-southeast to south-southwest. From 2100' to 2330' dipmeter readings are somewhat random in nature, favoring a northwest orientation. From 2328' down to 2340' dips average 6° in a south-southeasterly direction. From 2340' down to total depth of 2399' dipmeter data suggest a possible fault at 2340'. A core taken at total depth in the argillite exhibited near horizontal dips.

## OIL AND GAS INDICATIONS

A standard ultraviolet lightbox, chlorothene cut and microscope were used for visible hydrocarbon detection. Additionally, a continuous gas in

air hot wire device and gas chromatograph were in operation at all times to record kicks and give a gas component breakdown. As a further back-up, cuttings gas was run on each sample collected for preservation.

The first indications of gas on this well were at 820' in the Torok Formation. It is postulated that this is the base of the permafrost layer which it is thought acts as a barrier to the migration of gas to the surface. A small gas kick of 160 units was recorded at 1800' from a thin argillaceous sand that was without visible hydrocarbons. A zone of lost circulation was encountered at 1850'. Sidewall cores indicated only claystone and the losses must be assumed to be to a zone above possibly at 1800' where the small gas kick was noted. A thin bed of clean to argillaceous sand occurred from 1961'-1967' which gave a methane only kick of 320 U. Sidewall cores of this sand indicate effective porosities ranging from 4.4% to 7.1% with horizontal permeability ranging from 1.6 to 3.4 millidarcies. Yellow sample fluorescence giving a slow streaming cut with a yellow cut fluorescence was observed. From 1967' to total depth only rare stringers of sand 2' to 3' thick occur, giving small kicks of a magnitude of 100 units of total gas. The 3' core taken in the argillite at total depth had a good gassy odor on partings and a white amorphous soft anhydrite or clay mineral had a bright yellow-white fluorescence giving an immediate yellow-white cut fluorescence. The argillite is generally tight, with no open fracturing observed and many quartz filled fractures.

While no significant gas kicks were encountered, it is nevertheless encouraging to find some hydrocarbon indications in the argillite. Should a zone of intense fracturing be found in a structurally favorable position, it may well be productive.

## CONCLUSIONS

1. The hydrocarbon potential of this well was fully evaluated as the complete sedimentary section was penetrated.

2. No potentially economic zones of hydrocarbon were encountered in this well. The best zone encountered was a 6' thick sand stringer with a measured effective porosity of 6% with permeability of 3.4 millidarcies.

APPENDIX "A"

## LOGS RUN AND INTERVALS

| | |
|---|---|
| DIL Run No. 1 | 89' - 1501' |
| DLL-SP Run No. 1 | 1487' - 2392' |
| BHC Sonic/GR Run No. 1 | 89' - 1502' |
| Run No. 2 | 1487' - 2393' |
| FDC/CNL/GR/CAL Run No. 1 | 1487' - 2393' |
| Temp. Survey - Before | TD - Surface |
| Temp. Survey - After | TD - Surface |
| HRD (Dipmeter) | 1487' - 2393' |
| Velocity Survey | 300' - 2399' |
| Geolog | 70' - 2399' |
| Mud Log | 200' - 2399' |
| D Exponent and Dc Exponent | 200' - 2399' |

## DRILL CUTTING DESCRIPTIONS

DESCRIPTIONS BY DAVID B. YOUNG

| | |
|---|---|
| 0 - 80 | No samples collected. |
| 80 - 170 | Claystone: light to medium gray, bentonitic, gummy, in part silty. |
| 170 - 230 | Sandstone: fine to medium grained, compacted, angular quartz, vari-colored, carbonaceous, pyritic; Siltstone: light gray, hard, argillaceous, carbonaceous, calcareous; Claystone stringers. |
| 230 - 380 | Claystone: gray, bentonitic, gummy; Siltstone stringers. |
| 380 - 410 | Siltstone: light gray, carbonaceous; Sandstone: fine grained, white to gray, compacted, angular, sorted, few chert pebbles. |
| 410 - 470 | Claystone: buff, gray, silty, Kaolin, rare fossils. |
| 470 - 530 | Siltstone: light gray, argillaceous, hard, calcareous, carbonaceous, pyritic; Sandstone stringers, fine grained. white to gray, well sorted, tight, micaceous, pyritic, trace of chert. |
| 530 - 560 | Siltstone: as above; Claystone: gray, soft, silty. |
| 560 - 680 | Sandstone: fine to medium grained, white to gray, well sorted quartz, rounded, tight, in part friable, carbonaceous, pyritic; Siltstone: as above, grades to Sandstone. |
| 680 - 830 | Siltstone: light gray, pyritic, slightly calcareous; interbedded Sandstone: fine grained, tight, argillaceous; Claystone: buff, silty, Kaolinitic. |
| 830 - 890 | Siltstone: as above; Claystone: dark gray, gummy, silty; trace of Sandstone with biotite. |
| 890 - 950 | Siltstone: as above; Claystone and Sandstone stringers. |
| 950 - 1010 | Claystone: dark gray, gummy, tan, silty, Kaolinite. |
| 1010 - 1160 | Sandstone: fine grained, light gray, argillaceous, well sorted, rounded hard quartz, tight, carbonaceous, calcareous, pyritic; Siltstone grades to Sandstone: brown fragments of chert, rare pelecypods and micro-fossils. |
| 1160 - 1190 | Siltstone: light gray, hard, pyritic. Poor sample quality. |

| | |
|---|---|
| 1190 - 1220 | Sandstone: fine grained, light gray, clean quartz, sub-angular, well sorted, hard, tight, calcareous, pyritic. |
| 1220 - 1250 | Shale: brown, bitumenous laminae, lignitic; Claystone: light gray, silty, soft; Siltstone as above. |
| 1250 - 1370 | Sandstone: fine grained, light gray to white quartz, well sorted, rounded, calcareous, pyritic, carbonaceous, mafics. |
| 1370 - 1410 | Coal: black, blocky; Siltstone: light gray, pyritic. |
| 1410 - 1460 | Siltstone: light gray, highly argillaceous, pyritic; lignite stringers. |
| 1460 - 1510 | Sandstone: very fine grained, light gray, argillaceous, pyritic, medium hard, slightly calcareous. |
| | NOTE: Samples above 1510 are unreliable due to very poor recoveries. Below 1510, sample recoveries and reliability are fair to good. |
| 1510 - 1560 | Claystone: light gray, silty, carbonaceous, slightly calcareous, up to 10% free well rounded quartz pebbles. |
| 1560 - 1670 | Claystone: as above, becoming medium gray, non calcareous. |
| 1670 - 1690 | No returns. |
| 1690 - 1770 | Claystone: medium gray, soft, non calcareous. |
| 1770 - 1800 | Claystone: as above, in part silty. |
| 1800 - 1840 | Sandstone: light gray, fine grained, friable, argillaceous, very finely carbonaceous; interbedded Claystone as above. |
| 1840 - 1890 | Shale: dark gray, medium hard, flaky; interbedded with and grading to Claystone: medium gray, slightly silty. |
| 1890 - 1910 | Sandstone: fine grained, light gray, well rounded, friable, argillaceous. |
| 1910 - 1930 | Shale: Claystone interbedded. |
| 1930 - 1950 | Sandstone: light gray, fine grained, well rounded, friable, argillaceous. |
| 1950 - 1955 | Shale: dark gray, medium hard, laminated, fissile, micaceous. |
| 1955 - 1970 | Sandstone: fine to medium grained, light gray, medium hard, friable, glauconitic, well rounded, argillaceous, |

in part clean quartz, dull yellow fluorescence, slow streaming cut, fair yellow ring; Limestone: tan, micro-fossiliferous stringers.

1970 - 1980 Shale: medium to dark gray.

1980 - 1990 No sample.

1990 - 2010 Siltstone: dark gray, highly argillaceous, micaceous.

2010 - 2040 Sandstone: very fine to fine grained, light to medium gray, hard, argillaceous, well rounded, well sorted, pyritic in part, clean, friable, fair porosity, 20% dull yellow-gold fluorescence, slow cut.

2040 - 2070 Siltstone: interbedded with Shale, few thin Sandstone stringers, tight with oil odor, spotty yellow fluorescence, fair cut, no visible stain, few vari-colored chert pebbles.

2070 - 2110 Shale: dark to medium gray-brown, soft, silty, fissile, flaky, micaceous.

2110 - 2120 Sandstone: very fine grained, light gray, medium hard, argillaceous, carbonaceous.

2120 - 2140 Siltstone: grading to Shale: dark gray, soft, micaceous.

2140 - 2250 Siltstone: grading to Shale as above; few thin Sandstone stringers.

2250 - 2255 Sandstone: fine grained, clean, rounded, well sorted quartz with common dark mineral grains, in part clay filled; dull yellow, spotty fluorescence, good crush cut, yellow contaminated fluorescence from spersene.

2255 - 2280 Shale: light green with mica, interlaminated with Shale: brown-gray, fissile and Siltstone: green to gray, a few chert pebbles, trace of very hard quartz Sandstone.

2280 - 2300 Sandstone: fine grained, clean, rounded, well sorted, common, dark mineral grains, friable with fair porosity, loose, medium to coarse grained, well rounded quartz, polished.

2300 - 2320 Shale: black, medium hard, graphitic.

2320 - 2330 Argillite: black, hard, sub-conchoidal, blocky with rare large (.5 - 2mm) quartz filled fractures.

2330 - 2360 Argillite: black, becoming foliated, trace of graphite, few pieces with quartz laminae, rare, large (2mm) drusey, vugs.

2360 - 2398 Argillite: as above, horizontal bedding, thin quartz laminae, anhydrite inclusions, good gas odor on core partings, fair yellow to white cut fluorescence.

2395 - 2398 Core No. 1: Cut 4 feet, recovered 3 feet.
Argillite: black, graphitic, hard, blocky, with thin interlaminations of quartz and pyrite; random fractures filled with quartz; occasional anhydrite inclusions below 2397; gassy odor on fresh breaks, occasional oil stain on bedding plane; yellow white cut fluorescence from crushed sample 2397 - 2398.

SIDEWALL CORE DESCRIPTIONS

SAMPLE DESCRIPTIONS BY DAVID B. YOUNG

Run No. 1. Shot 86 sidewall cores; recovered 76.

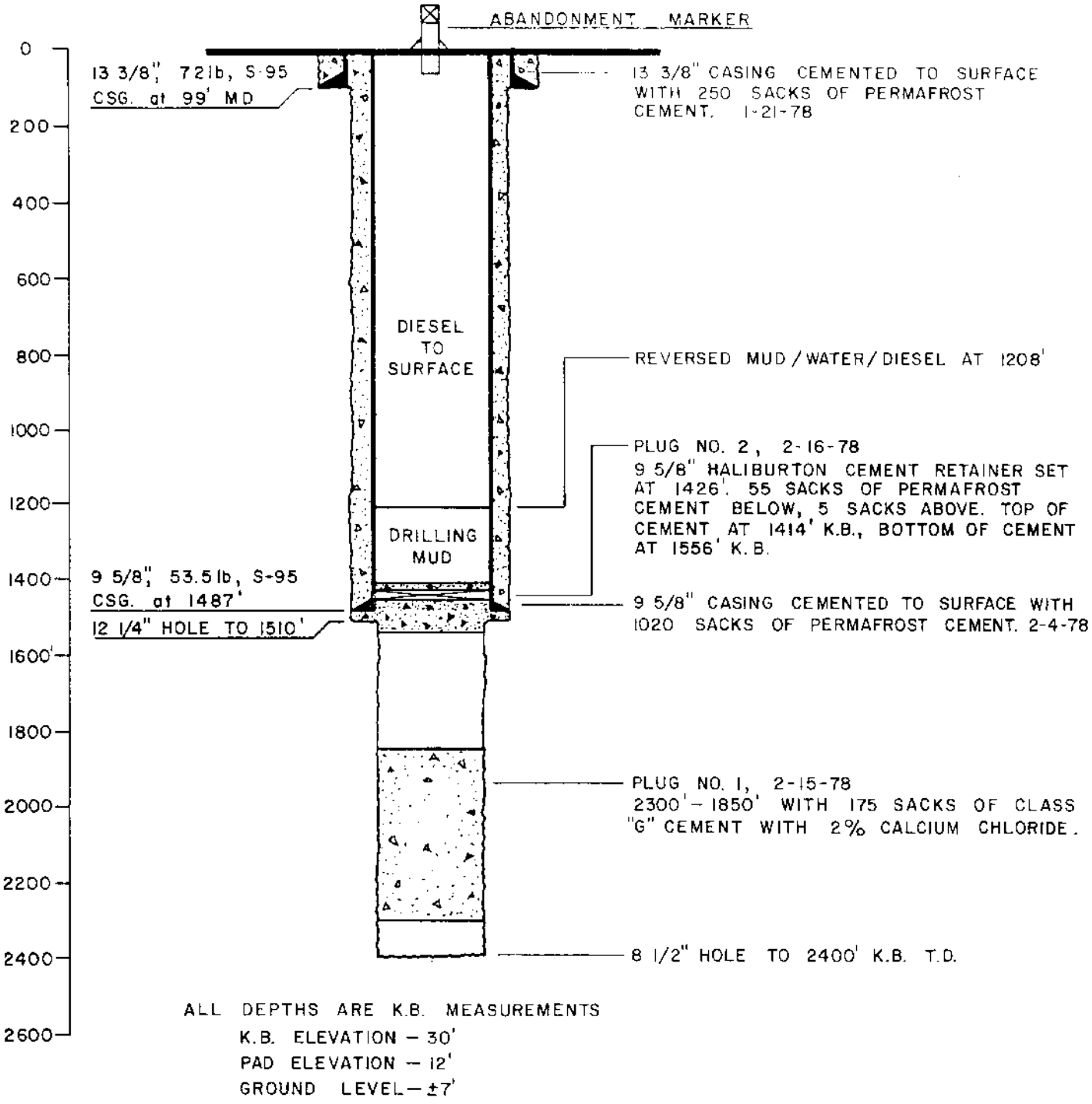
| Depth | Recovery | Description |
|---|---|---|
| 2370 | 1/4" | Argillite: black, foliated, trace of graphite, thin quartz laminae and banded pyrite. |
| 2364 | None | |
| 2356 | 1/8" | Shale: black, soft, crushed. |
| 2350 | 3/8" | Shale: black, laminated. |
| 2350 | 3/8" | Shale: as above. |
| 2346 | 1/2" | Shale: black, laminated, crushed. |
| 2343 | 1" | Shale: black, laminated. |
| 2340 | 3/4" | Shale: black, laminated, large pyrite inclusions. |
| 2338 | 3/4" | Shale: black, laminated. |
| 2334 | 1" | Sandstone: white, fine grained, clayey, possible kaolinite, angular chert and reworked argillite fragements with Shale: dark brown, soft. |
| 2332 | 1" | Shale: dark brown, highly silty. |
| 2330 | 1 1/4" | Shale: dark gray to brown, medium hard. |
| 2328 | 1 1/2" | Shale: dark gray to brown, medium hard. |
| 2326 | 1" | Shale: dark gray to brown, medium hard. |
| 2324 | 1" | Shale: dark gray. |
| 2320 | 1/2" | Siltstone: gray to brown. |
| 2315 | 1" | Shale: slightly silty, gray to brown. |
| 2312 | 1" | Shale: gray to brown. |
| 2312 | 3/4" | Shale: as above. |
| 2310 | 3/4" | Siltstone. |

| Depth | Recovery | Description |
|---|---|---|
| 2310 | 3/4" | Siltstone. |
| 2308 | !/4" | Siltstone. |
| 2305 | 1" | Siltstone: dark gray. |
| 2300 | 3/4" | Siltstone: highly argillaceous, brown to gray. |
| 2300 | 3/4" | Siltstone: as above. |
| 2269 | 1 1/4" | Shale: gray to brown, slightly silty. |
| 2269 | None | |
| 2266 | 1" | Shale: gray to brown. |
| 2265 | 3/4" | Siltstone: dark gray. |
| 2250 | None | |
| 2247 | 1 1/2" | Shale: dark gray, medium hard, silty, pyritic, filled worm tube bioturbation. |
| 2246 | 1" | Siltstone: dark gray, pyritic. |
| 2245 | None | |
| 2240 | None | |
| 2200 | 1 1/4" | Shale: dark gray, gummy. |
| 2200 | None | |
| 2187 | 1 1/4" | Shale: dark gray, soft. |
| 2186 | 1 1/4" | Siltstone: medium hard, dark gray. |
| 2185 | None | |
| 2161 | 1" | Shale: dark gray, slightly silty. |
| 2160 | 1" | Shale: dark gray. |
| 2150 | None | |
| 2150 | 1 1/4" | Shale: dark brown to gray, slightly silty. |
| 2129 | 1 1/4" | Shale: dark gray, slightly silty. |

| Depth | Recovery | Description |
|---|---|---|
| 2128 | None | |
| 2127 | 3/4" | Siltstone: dark gray. |
| 2100 | 1" | Shale: gray. |
| 2100 | 1" | Shale: as above. |
| 2056 | 3/4" | Shale: silty, dark gray. |
| 2055 | 1 1/4" | Shale: dark gray, pyrite inclusions. |
| 2054 | 1" | Shale: dark gray. |
| 2050 | 1" | Shale: dark gray, silty. |
| 2050 | 1 1/4" | Shale: as above. |
| 2033 | 1" | Sandstone: very fine grained, brown, interlaminated with Shale: dark gray, silty, pyrite inclusions. |
| 2032 | 1" | Shale: dark gray, soft, with sandstone lense. |
| 2031 | 1" | Shale: dark gray, soft, gummy. |
| 2000 | None | |
| 2000 | 1 1/2" | Shale: dark gray, soft. |
| 1968 | 1 1/4" | Shale: dark gray, slightly silty. |
| 1967 | 1" | Shale: dark gray, laminated, horizontal, trace of pyrite. |
| 1966 | - | Shale: dark gray, laminated, very soft, bentonitic, gummy. |
| 1965 | - | Shale: light gray with dark gray shale inclusions, horizontal bedding planes. |
| 1964 | 1/2" | Sandstone: fine to medium grained, clean, poorly consolidated with Limestone: tan, fossiliferous with Shale: dark gray, common glauconite. |
| 1963 | 3/4" | Sandstone: very fine to fine grained, light gray, in part clay filled. |
| 1962 | 1" | Sandstone: very fine to fine grained, tight, light gray, friable, partly clay filled. |
| 1961 | - | Sandstone: as above. |

| Depth | Recovery | Description |
|---|---|---|
| 1950 | 1" | Sandstone: very fine grained, silty, friable, partly clay filled, small limestone lenses. |
| 1940 | 3/4" | Sandstone: very fine grained, light gray, argillaceous. |
| 1900 | 1" | Shale: dark gray, gummy. |
| 1894 | 3/4" | Shale: dark gray, laminated, medium hard. |
| 1850 | 1 1/4" | Shale: dark gray, medium hard, slightly laminated. |
| 1850 | 1" | Claystone: medium gray. |
| 1800 | 1" | Siltstone. |
| 1800 | 1" | Siltstone: light gray. |
| 1794 | 1 1/4" | Claystone: soft. |
| 1750 | 1" | Claystone: dark gray, soft. |
| 1700 | 3/4" | Claystone: medium gray, soft, gummy. |
| 1694 | 3/4" | Claystone: dark gray, soft. |
| 1650 | 1" | Claystone: dark gray. |
| 1650 | 1" | Claystone: as above. |
| 1600 | 1" | Shale and very fine grained Sandstone and Siltstone: interlaminated, slightly pyritic, bioturbation. |
| 1600 | 1" | Shale: dark gray, soft, slightly laminated. |
| 1560 | 1" | Claystone: gray. |
| 1550 | 1" | Siltstone: gray. |
| 1517 | 3/4" | Sandstone: light gray, very fine grained, interbedded with Shale: dark gray. |
| 1505 | 1 1/4" | Sandstone: very fine grained, white with fine to medium sized coal flecking. |

# WELLBORE SCHEMATIC



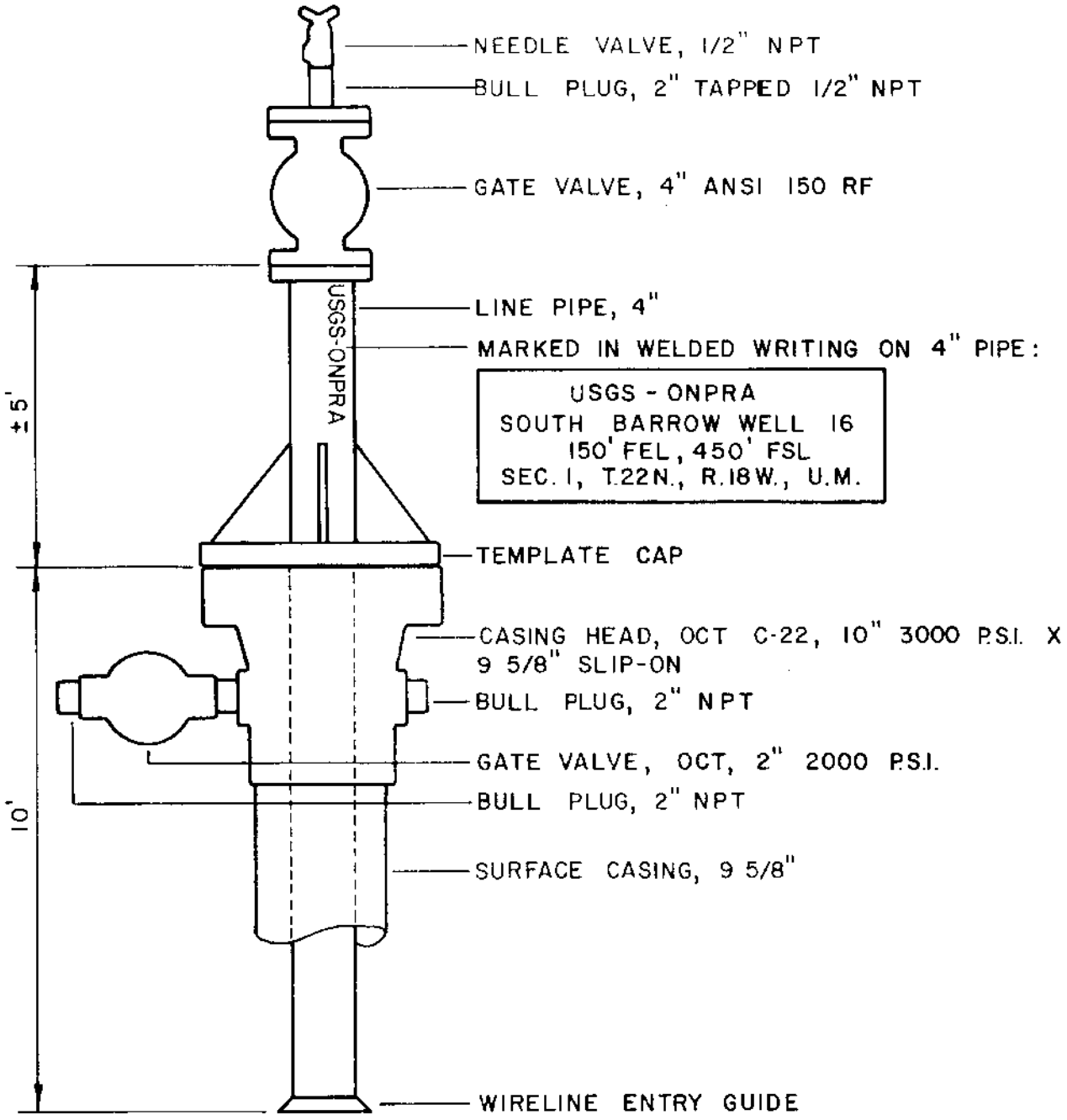

ALL DEPTHS ARE K.B. MEASUREMENTS
K.B. ELEVATION – 30'
PAD ELEVATION – 12'
GROUND LEVEL – ±7'

**SOUTH BARROW No. 16**
**NORTH AREA**

150' FEL and 450' FSL
Sec. 1, T.22 N., R.18 W., U.M.

**HUSKY OIL *N.P.R. Operations***
*NATIONAL PETROLEUM RESERVE in ALASKA*

# ABANDONMENT MARKER




SOUTH BARROW No. 16
NORTH AREA

150' FEL and 450' FSL
Sec. 1, T.22 N., R.18 W., U.M.

HUSKY OIL *N.P.R. Operations*
*NATIONAL PETROLEUM RESERVE in ALASKA*

# RIG INVENTORY

## Drawworks

National T-20, single drum grooved for 1" wireline with 15" double hydromatic brake, automatic breakout and make up catheads, driven by one set GMC diesel twin 671 engines, 300 HP, through Allison torque converter, all mounted on single skid. One Westinghouse 3YC air compressor driven by main PTO.

## Mast

Lee C. Moore, 95' high with 9 foot wide front by spread cantilever. Gross nominal capacity 290,000 lbs with racking board capacity of 130 stands 4 1/2" drill pipe (doubles). Mast crown block capable of stringing eight 1" wire lines.

## Sub Base

Three box sections, two at ground level 8 feet high, 9 feet wide, 37 feet long; center section 8 feet 5 inches high, 9 feet wide and 37 feet long. Clear working space from bottom of rotary beam to bottom of sub base is 14 feet 7 inches. Rotary table to bottom of sub base is 17 feet. (Add four inches for rig matts.)

## Rig Matts

Ten 4" X 16' long X 8' wide; fifteen 4" X 24' long X 8' wide.

## Traveling Blocks

IDECO, 160 ton, four 1" sheave combination block and hook.

## Swivel

EMSCO L-140, 6 5/8" left hand API regular pin, 140 ton capacity.

## Bails

Byron Jackson, 2 1/4" X 108", links 250 ton capacity.

## Rotary Table

Oilwell 17 1/2" split square drive master bushing, 275 ton static load capacity.

## Mud Tank

Three section, insulated tank. Capacity shale tank: 75 barrels; capacity middle tank: 100 barrels; capacity suction tank: 112 barrels. Shale tank equipped with shale jet and 16 barrel trip tank. Total capacity: 303 barrels.

Shaker

Single Brandt tandem separator driven by 3 HP, three-phase, 440 volt, 1750 RPM explosion proof electric motor.

Degasser

Drilco, see-flo, driven by 7 1/2 HP, three-phase, 440 volt, explosion proof motor with 1/2 HP, three-phase, 440 volt explosion proof blower.

Desander

Pioneer model S2-12; capacity: 500 GPM.

Desilter

Pioneer model T8-6; capacity: 500 GPM.

Mud Mixer

One Dreco, driven by 5 HP, three-phase, 440 volt, 1725 RPM explosion proof motor.

Hopper

One low pressure mud mixing hopper.

Generators

One Caterpillar model 3406, 210 KW; one Caterpillar, skid mounted in Hercable house, 8' 5" high X 8' 2" wide X 29' 5" long; one Caterpillar model D-333, 100 KW standby.

Boilers

Two Continental, 40 HP, 120 PSI diesel fired skid mounted in Hercable house, 8' 4" high X 8' wide X 35' long.

Steam Heaters

Seven model 90H Trane steam heaters; three model 96H Trane steam heaters.

Tongs

Byron Jackson, type "C", short lever, with heads.

Indicator

(Weight) Cameron, type "C", up to 400,000 lbs.

Indicator

(Rotary Torque) Martin Decker hydraulic piston wheel type with remote gauge at Driller's position.

Indicator

(Tong Torque) Martin Decker, hydraulic piston type with remote gauge.

Mud Box

OKE mud box with 3 1/2" and 4 1/2" rubbers.

Slips

One set for 3 1/2" drill pipe. One set for 4 1/2" drill pipe.

Elevators

One set for 3 1/2" drill pipe, 18 degrees taper. One set for 4 1/2" drill pipe, 18 degrees taper.

Kelly

One square 4 1/4" drive, 4" FH pin, 6 5/8" API regular left hand box. One square, 3 1/2" drive, 3 1/2" IF pin, 6 5/8" API regular left hand box.

Kelly Bushing

VARCO, square drive, 3 1/2" rollers.

Pumps

(Drilling and Cementing) Two Halliburton, HT-400D, single acting piston pumps with Gist Oil Tool API fluid ends, each driven by GMC diesel 8V-71N, 300 HP engines through an Allis-Chalmers torque converter, model 8FW1801-1 and a twin-disc power shift transmission, model no. T-A-51-2003. Continuous duty with 5 1/2" API pistons at maximum of 75 SPM will produce 185 GPM for each pump with maximum pressure up to 3000 psi. Both pumps can be run simultaneously if desired. The discharge mud line furnished by contractor from pumps to swivel connection is designed for 3000 psi working pressure. Each pump unit mounted on 8' 4" high X 10' wide X 40' long covered skid.

Air Compressors

One LeRoi 34C mounted on drawworks compound. One Ingersoll Rand model 71-T2-T3011 TM, driven by 10 HP, 440 volt, 1725 RPM explosion proof electric motor.

Water Tanks

One 7' high X 9' wide X 20' long, insulated water tank, mounted in the sub base; capacity: 225 barrels. One 17' 4" long X 6' 4" wide; capacity: 120 barrels.

Fuel Tanks

One 20' long X 8' 6" wide; capacity: 6,000 gallons.

BOPE

One ten-inch, 900 dual Shaffer gate LWS with three-inch flanged side outlet one side.

One - ten-inch 900 GK hydril.
One - ten-inch 900 drill spool with two-inch flanged outlets both sides.
One - set 4 1/2" pipe rams.
One - set 3 1/2" pipe rams.
One - set blind rams.
One - upper kelly cock TIW 6 5/8" regular LH box to pin.
Two - TIW 10,000 psi lower kelly cocks, 4 1/2" XH joints.
Two - TIW 10,000 psi lower kelly cocks, 3 1/2" IF joints.
One - inside preventor, 10,000 lb Hydril, 4 1/2" XH.
One - inside preventor, 10,000 lb Hydril, 3 1/2" IF.

Choke Manifold

Three-inch, 3000 lb, with one two-inch OCT adjustable choke; one two-inch OCT positive choke and space for automatic choke.

Closing Unit

One 80-gallon Hydril closing unit with four nitrogen bottle backup. Four-station Koomey control manifold with four-station air operated remote stations.

Drill Pipe

5000 feet, 4 1/2", 16.6 lb, grade E, 4 1/2" XH joints; 5000 feet, 3 1/2", 15.5 lb, grade E, 3 1/2" IF joints.

Drill Collars

Nineteen - 6 1/4" X 2 1/4" X 30' four-inch H90 tool joints.
One - 6 1/4" X 2 1/4" X 30' four-inch H90 X 4 1/2" regular bottom collar.
Nineteen - 4 3/4" X 1 3/4" X 30' X 3 1/2" IF X 3 1/2" regular bottom collar.
One - 4 3/4" X 1 3/4" X 30' X 3 1/2" IF X 3 1/2" regular bottom collar.

Subs

Two - 4 1/2" XH kelly savor subs.
Two - 3 1/2" IF kelly savor subs.
Two - 4 1/2" XH box to 4" H90 pin (DC crossover).
Two - 4" H90 box to 4 1/2" regular box (bit sub).
Two - 3 1/2" IF box to 2 7/8" inch API regular box (bit sub).