

SPERRY-SUN DRILLING SERVICES
LOGGING SYSTEMS
Anchorage, Alaska

FINAL
ADT WELL SUMMARY REPORT
ARCO Alaska, Inc.
OCS-Y-0865 No. 1 & OCS-Y-0866 No. 2
Kuvlum No. 2 & Kuvlum No. 3
Beaufort Sea, Alaska

CONFIDENTIAL



Final Report Summary
October 1993

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MINERALS MANAGEMENT SERVICE
ANCHORAGE, ALASKA

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Logging Systems
Anchorage, Alaska

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INTRODUCTION

Drilling operations for OCS-Y-0865 No. 1, the second well on the Kuvlum Prospect, were initiated 7-19-93 by ARCO Alaska, Inc. The well was drilled by Canmar's CDU Kulluk on a location in NR6-4 Block 672 of the Beaufort Sea, offshore Alaska. Kuvlum No. 2 was drilled to a total depth of 11125' on 8-20-93. The total number of operating days that were required to reach 11125' was 24 days from spud. After logging operations were completed, the well was plugged and abandoned on 8-27-93.

Drilling operations for OCS-Y-0866 No. 2, Kuvlum No. 3, were initiated on 9-9-93 after moving the Kulluk to a new location on NR6-4 block 673. This is the same block that the first Kuvlum well was completed during last years drilling season. Kuvlum No. 3 was drilled to a total depth of 8000' on 9-28-93, requiring a total of 20 operating days to complete. The well was plugged and abandoned on 10-4-93 after successfully evaluating the well with electric logs.

A Sperry-Sun Logging Systems MPT/2000 Unit was in operation from surface to TD providing full mud logging, applied drilling technology, and Mud Pulse-MWD services. The MPT/2000 Unit and crew provided essential assistance in the drilling of Kuvlum No. 2 & No. 3 by monitoring intrinsic drilling parameters and gas levels. Also provided were real-time Gamma Ray and EWR information, directional surveys, fluid hydraulics information, pore pressure vs. necessary mud weight evaluations, and a wide range of geological interpretations and sampling services.

The following pages of this report are designed to supply concise historical data of the events that occurred on both of these wells, along with some analysis and recommendations for specific problems that were experienced during different sections of the hole. All of the information compiled in this report was acquired and recorded by the MPT/2000 Unit at the well site.

The sensors incorporated in this unit are independent from the rig sensors and may differ slightly from those reported by the rig contractor. In addition, any evaluations in this report regarding formation evaluations, pore pressure estimates, or other geologic interpretations are made entirely by Sperry-Sun personnel from on site examination of drill cutting samples and pertinent data supplied solely by the MPT/2000 Unit.

SPERRY-SUN DRILLING SERVICES

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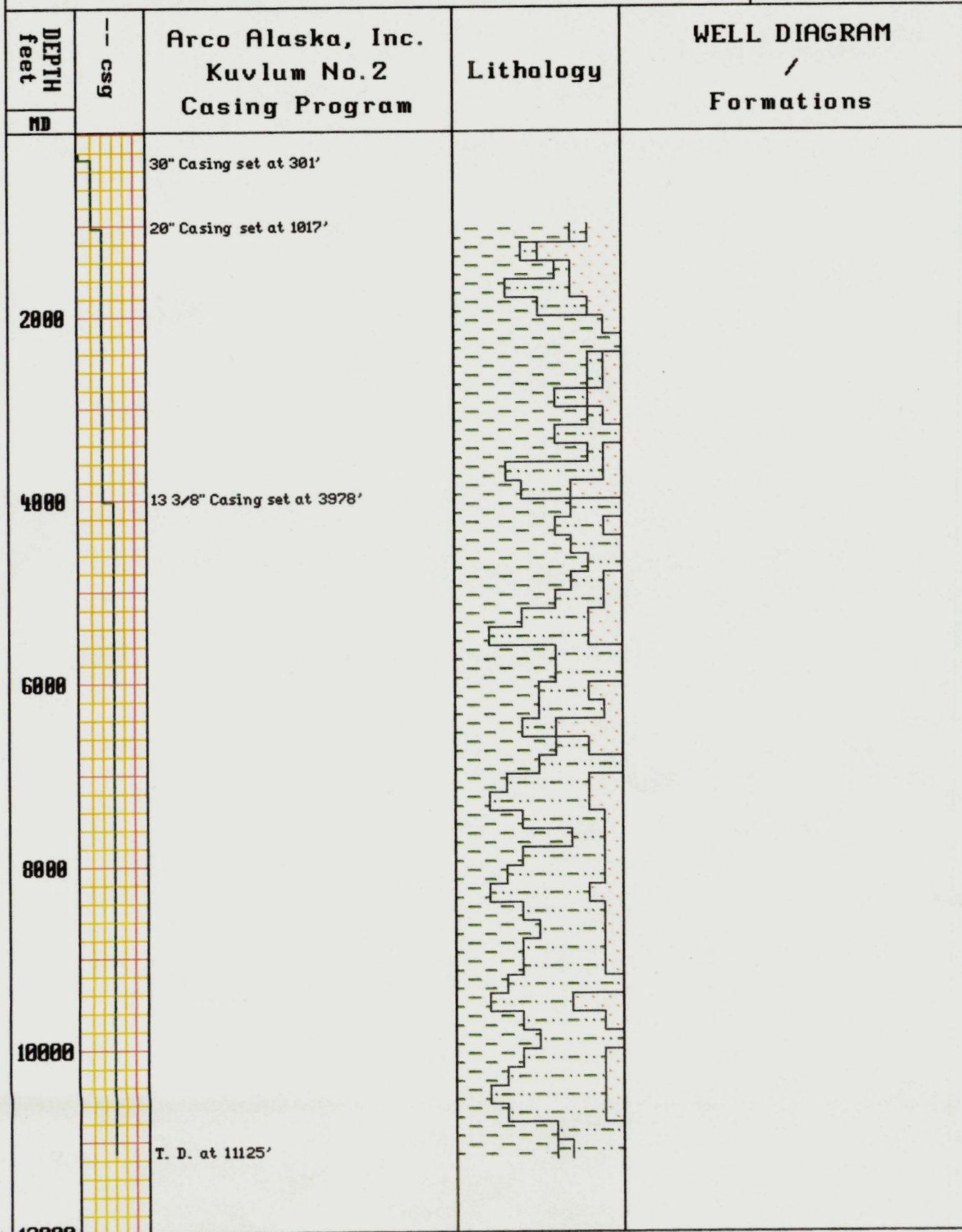
WELL OCS-Y-0865 NO. 1

COMPANY ARCO ALASKA, INC.

LOCATION BLOCK 672, BEAUFORT SEA, AK.

WELL
DIAGRAM

3



SPERRY-SUN DRILLING SERVICES

ALASKA DISTRICT

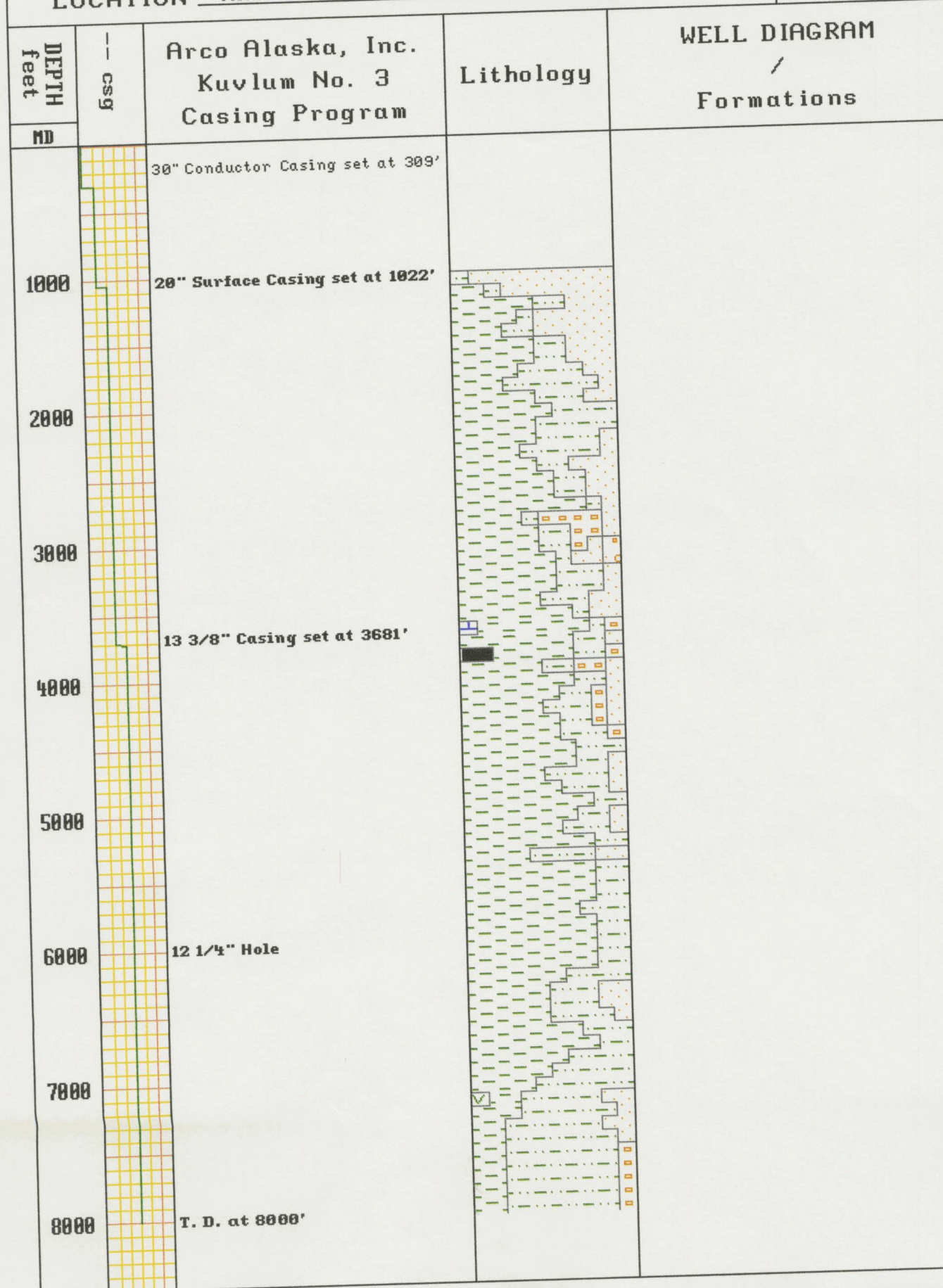
**BAROID
LOGGING
SYSTEMS**

WELL OCS-Y-0866-2 KUVLUM NO. 3

COMPANY ARCO ALASKA, INC.

LOCATION NR6-4 BLK 673, BEAUFORT SEA, AK.

**WELL
DIAGRAM**



WELL SUMMARY BY INTERVALS

KUVLUM NO. 2

4

Interval: 226' to 1030'

| | | | |
|-----------------|---------|--------------|-----------|
| Days: | 6 | Average WOB: | 21 klb |
| Hole Size: | 26" | Average RPM: | 83 |
| No. Bits: | 1 | Average GPM: | 1015 |
| Rotating Hours: | 33.7 | Average SPP: | 1875 psi |
| Deviation: | NA deg | Average ROP: | 23 ft/hr |
| Mud Weight: | 8.5 ppg | Mud Type: | Sea Water |

Discussion:

The Canmar Kulluk was positioned on location prior to the spud in date of 7-28-93. Drilling operations were initiated by drilling a large diameter glory hole from the mud line at 167' to a depth of 211' to allow for the positioning of the blow out preventer stack below the ocean floor. A 24' diameter caisson was washed down with the glory hole bit to provide a barrier from sediments falling back into hole. Penetration rates for this large diameter hole were slow due to mechanical problems with the glory hole bit. Three additional trips were needed to repair this bit before completing the glory hole on 7-27-93.

After landing a temporary guide base, 30" - 310 lb/ft casing was jet drilled to 296' in conjunction with Bit No. 1. With the 30" casing landed on the guide base, drilling was continued with Bit No. 1 using a mud motor and without returns to surface as the riser system had not been connected. An air lift system was then installed at the glory hole to help remove cuttings from this area with some of the returns passed through the shaker box. Formation gasses were monitored during this interval with this system. A maximum gas of 8 units was recorded during this process while the background gas averaged 5 units. The 26" hole was drilled to a depth of 1030' on 7-31-93 occasionally pumping high viscosity sweeps to clean the hole. 20" - 133 lb/ft casing was then run and cemented to a depth of 1017'. No hole problems were encountered while drilling this section of the well.

Interval: 1,030' to 4005'

| | | | |
|-----------------|-------------|--------------|----------|
| Days: | 8 | Average WOB: | 14 klb |
| Hole Size: | 12.25/17.5" | Average RPM: | 122 |
| No. Bits: | 2 | Average GPM: | 720 |
| Rotating Hours: | 37.3 | Average SPP: | 2400 psi |
| Deviation: | .39 deg | Average ROP: | 88 ft/hr |
| Mud Weight: | 9.8 ppg | Mud Type: | PHPA |

Discussion:

The blow out preventer stack was run on the riser assembly and landed on the well head housing allowing for mud returns to surface. The BOP Stack and the 20" casing were pressure tested to 2200 psi prior to drilling ahead with Bit No. 2.

The seawater mud system was replaced with 9.8 ppg seawater-PHPA mud prior to drilling the 20" casing shoe. Bit No. 2, a 17.5" bit, was used to drill out the 20" conductor casing along with 10' of new hole to 1,040' on 8-2-92. A leak off test was performed at this depth yielding a fracture pressure equivalent mud weight of 12.9 ppg.

Bit No. 2 was then pulled out of the hole and replaced with a 12.25" bit. Bit No. 3 was then used to drill ahead through clay and sand at a controlled drilling rate of 100± feet per hour to a depth of 2430' where a short trip was made to clean hole. On the way out, the hole pulled tight at 1766'. The hole was then washed and reamed from 1729' to 1761' and at 2380' on the trip back into the hole. The maximum gas recorded from circulating bottoms up on the trip was 61 units. Bit 3 drilled through clay, siltstone, and sand to 4005'. The estimated pore pressure during this interval was 8.5-8.7 ppg while maintaining the mud weight at 9.8 ppg.

Upon reaching the interval depth of 4005', the hole was conditioned with a short trip to the shoe that experienced drag on the way out that was probably due to swelling clays or possibly drill cuttings adhering to the borehole. Because of the excess drag, the hole was back reamed from 3561' to 1016'. The maximum gas from this short trip gas was 85 units. The hole was then circulated and conditioned in preparation for running electric logs.

Electric logs were successfully run and operations to open the hole were initiated on 8-7-93 with Bit No. 3 was run into the hole ahead of a 17.5" hole opener. Drilling rates were very good during the hole opening process. The hole was then conditioned with a short trip in preparation for running casing. On the trip out, the pipe was back reamed and pumped out of hole due to tight hole conditions and then washed and reamed back to bottom. The maximum short trip gas

was 60 units. $13\frac{3}{8}$ " - 68 lbs/ft casing was landed at a total depth of 3978'. This casing was cemented in place without problems.

Lithologies of this section consisted of sand, clay, and siltstone with traces of limestone, gravel, and coal. No abnormal gas readings or any indication of gas hydrates were encountered. The pore pressure estimate for this section of the hole was 8.5-8.7 ppg, a normal gradient. Hole problems for the interval were attributed to swelling clays-siltstones and some bit balling.

Interval: 4,005' to 11,125'

| | | | |
|-----------------|----------------|--------------|-----------|
| Days: | 10 | Average WOB: | 10-20 klb |
| Hole Size: | 12.25" | Average RPM: | 145 |
| No. Bits: | 5 | Average GPM: | 620/700 |
| Rotating Hours: | 99.4 | Average SPP: | 3000 psi |
| Deviation: | 4.03 deg (max) | Average ROP: | 80 ft/hr |
| Mud Weight: | 9.8-10.7 ppg | Mud Type: | PHPA |

Discussion:

The Blow Out Preventers were tested prior to running in the hole with Bit No. 4. The 13 3/8" casing was tested to 3500 psi. Bit No. 4 was then used to drill the cement, the float collar, and the shoe along with 10' of new formation to 4015'. A leak-off test was performed at this depth and realized a test of 14.9 ppg equivalent mud weight without breaking down. This value differs somewhat from a calculated value of 13.9 ppg at this depth using the Eaton Method for estimating the fracture gradient in shales.

After completing the leak-off test, Bit No. 4 was used to drill to 5525' where a short trip to the shoe was performed to condition the hole. The hole pulled tight and had to be back reamed and pumped out of hole. The trip gas reading from this short trip was 95 units. While drilling ahead, the mud weight was raised to 10.0 ppg to stabilize hole conditions on trips. Drilling continued with this bit to 6593' where Bit No. 4 was pulled out of the hole. Connection gas readings were consistently logged below 4300'. A slightly increasing pore pressure trend noted on pressure plots. The estimated pore pressure was raised to 9.0 ppg in reference to this data.

Bit No. 5, a PDC type bit, was run back in the hole on the same bottom hole assembly. Drilling continued with this bit to 6729'. The decision was made to core this interval due to a potential show indicated from information provided by the MWD tool in addition to previous shows of oil fluorescence in the drill cutting samples. The hole was then circulated out and conditioned for a coring run. Bit No. 5 was pulled without encountering excessive drag.

Core Bit No.1 was then run in the hole. The trip gas from bottom was 246 units. After getting on bottom with the core bit, penetration rates were very slow. Core bit No.1 was pulled at 6732' after attempting to core for only 3 feet. There was no core recovery. The core bit was apparently balling up due to clay.

Bit No. 5RR was run back in hole to continue drilling. The trip gas reading from bottom was 142 units. Penetration rates were good while drilling ahead through clay, siltstone, and sand to 7698' where a short trip to the shoe was made to condition hole. The hole again pulled tight and

was back reamed from 6842' to 6570'. The maximum trip gas was 625 units, a notable increase from the previous trip. Drilling continued with Bit No. 5RR to 9500' where it was pulled out of hole for BOP test. Tight hole conditions again required pumping out of hole from bottom to a depth of 7620'.

A pressure trend was estimated to develop below 7000' using information detailed on the D-Exponent plot and a slight increase in recorded connection gas readings. The estimated pore pressure was raised to 9.4 ppg at 7675'. Additional evidence for a pressure transition zone was indicated by the Condensed Resistivity Plot during this interval. The pore pressure estimate was steadily increased to 9.7 ppg by 9500'. The mud weight was raised in two stages to 10.4 ppg for additional overbalance.

Bit No. 6, also a PDC type bit, was ran back into hole. The maximum trip gas from bottom was 1543 units. Very good penetration rates were achieved with this new bit. Drilling continued to 10551' where a short trip was made to condition hole. The trip gas after short trip was 683 units. Bit No. 6 then drilled ahead through a predominant siltstone/clay formation to the total depth of this well at 11125'. Resistivity and D-exponent data indicated an increasing pore pressure gradient continuous to about 10000'. The estimated formation pressure was raised to 9.9/10.0 ppg by this depth. The mud weight was increased to 10.7 ppg to provide for additional overbalance. The increasing pressure trend appeared to stabilize while drilling below 10000' and required no additional changes in pore pressure estimates or mud weight.

The hole was circulate out prior to running a short trip to shoe. Excess drag was noted while pulling pipe between 10261'-10071' and 9057' - 8767'. The hole was then circulate and condition in preparation for running E-logs. No tight hole problems were experienced while pulling out of hole for logs. Electric logging operations commenced on 8-21-93.

Logging operations were completed on 8-27-93. Operations to plug and abandon Kuvlum No. 2 were initiated on this date.

Lithologies of this section consisted of clay, thin bedded sands, hydrated shale, and siltstone. Minor shows of oil fluorescence were logged in sands below 6000'. Hole problems for the interval were minor and largely included tight hole conditions experienced on trips.

WELL SUMMARY BY INTERVALS

KUVLUM NO. 3

Interval: 230' to 1040'

| | | | |
|-----------------|---------|--------------|------------|
| Days: | 4 | Average WOB: | 2/10 klb |
| Hole Size: | 26" | Average RPM: | 160 |
| No. Bits: | 1 | Average GPM: | 967 |
| Rotating Hours: | 26.7 | Average SPP: | 1375 psi |
| Deviation: | NA deg | Average ROP: | 30.7 ft/hr |
| Mud Weight: | 8.8 ppg | Mud Type: | Sea Water |

Discussion:

The Canmar Kulluk was positioned on location prior to the spud in date of 9-9-93. Drilling operations were initiated by drilling a large diameter glory hole from the mud line at 172' to a depth of 211' to allow for the positioning of the blow out preventer stack below the ocean floor. A 24' diameter caisson was positioned in the glory hole to provide a barrier from sediments falling back into hole. The 24' caisson was washed down with the glory hole bit to 216'. The glory hole was completed on 9-10-93.

After landing a temporary guide base, a string of 30"- 310 lb/ft casing was jet drilled to 309' in conjunction with Bit No. 1. With the 30" casing landed on the guide base, drilling was continued with Bit No. 1 using a mud motor. No mud was returned to surface as the riser system had not been connected. An air lift system was then installed at the moon pool area to help remove cuttings from the base of the glory hole with some returns of sea water coming back through the shaker box. Formation gasses were sometimes monitored during the interval with this system. A maximum gas of 3 units was recorded during this process.

The 26" hole was drilled to a depth of 1040' on 9-11-93 while occasionally pumping high viscosity sweeps to clean the hole and then displaced with 9.6 ppg mud. A string of 20" - 133 lb/ft casing was then run and cemented to a depth of 1022'. The BOP stack was landed and pressure tested; however, the 20" casing failed to test. The casing was then cleaned out with Bit No. 2. A stinger was run inside the casing and a squeeze was made with 83 bbls of cement. The casing then tested to 2200 psi for 30 minutes.

Interval: 1,040' to 3705'

| | | | |
|-----------------|-------------|--------------|-----------|
| Days: | 10 | Average WOB: | 15 klb |
| Hole Size: | 12.25/17.5" | Average RPM: | 118 |
| No. Bits: | 2 | Average GPM: | 633 |
| Rotating Hours: | 28.2 | Average SPP: | 2667 psi |
| Deviation: | .22 deg | Average ROP: | 98 ft/hr |
| Mud Weight: | 9.8 ppg | Mud Type: | PHPA-POLY |

Discussion:

The seawater mud system was replaced with 9.8 ppg PHPA-polymer mud prior to drilling the casing shoe. Bit No. 2, a 17.5" bit, was used to drill out the 20" surface casing along with 10' of new hole to 1050' on 9-14-93. A leak off test was performed at this depth yielding a fracture pressure equivalent mud weight of 14.3 ppg.

Bit No. 2 was then pulled out of the hole and replaced with a 12.25" bit. Bit No. 3 was then used to drill ahead through clay and sand at a controlled drilling rate of 100'/_ feet per hour to a depth of 2336' where a short trip was made to clean the hole. On the way out, the hole pulled tight at 1866' and the drill string was pumped and back reamed to the shoe. The maximum gas recorded from bottoms up from this trip was 153 units. Bit 3 drilled through clay, siltstone, and sand to 3705'. The estimated pore pressure during this interval was 8.7 pp while maintaining the mud weight between 9.7 to 9.9 ppg.

Upon reaching the interval depth of 3705', the hole was conditioned with a short trip to the shoe that experienced drag on the way out that was probably due to swelling clays. The drill string was then pumped and back reamed from a depth of 3235' to the 20" shoe. The maximum gas from this short trip was 313 units. Additional circulating time was applied to the hole in preparation for running electric logs. On this trip out, the drill string pulled tight inside the 20" casing, an indication of clay cuttings balling on the BHA.

After electric logs failed to reach bottom, another clean out run was made. The maximum trip gas reading while circulating at bottom was 214 units. After successfully completing the electric logs, rig operations were then suspended for 12 hours because of weather. Preparations were then made to open the hole.

Bit No. RR 3 was run into the hole ahead of a 17.5" hole opener. Drilling rates were very good during the hole opening process. The hole was then conditioned with a short trip in preparation for running casing. The pipe was back reamed and pumped out of hole from 1304' to the 20"

casing shoe to condition the area around the shoe. After getting back to bottom and circulating, a maximum short trip gas of 114 units was recorded. No excess drag was noted on the trip out of the hole. A string of 13³/₈" - 68 lbs/ft casing was then landed at a total depth of 3681'. This casing was cemented in place without problems.

Lithologies of this section consisted of sand, clay, and siltstone with traces of limestone, gravel, and coal. No abnormal gas readings or any indication of gas hydrates were encountered. The pore pressure estimate for this section of the hole was 8.7 ppg, a normal gradient. Hole problems for the interval were attributed to swelling clays/siltstones and bit/BHA balling.

Interval: 3705' to 8000'

| | | | |
|-----------------|--------------|--------------|----------|
| Days: | 6 | Average WOB: | 8-10 klb |
| Hole Size: | 12.25" | Average RPM: | 160 |
| No. Bits: | 2 | Average GPM: | 700 |
| Rotating Hours: | 45.6 | Average SPP: | 2625 psi |
| Deviation: | 2.18 deg | Average ROP: | 90 ft/hr |
| Mud Weight: | 9.8-10.7 ppg | Mud Type: | PHPA |

Discussion:

The Blow Out Preventers were tested prior to running in the hole with Bit No. 5. The 13 3/8" casing was tested to 3000 psi. Bit No. 5, a PDC type, was run in hole but would not drill the float collar. Bit No. 5 was pulled out of the hole and Bit No. 6, an FDT, was run into the hole in its place. This bit drilled the float collar, the shoe, and 20' of new hole to 3725'. A leak-off test was performed at this depth and yielded a value of 14.8 ppg equivalent mud weight. This value differs somewhat from a calculated value of 13.9 ppg using the Eaton Method for estimating the fracture gradient in shales.

After completing the leak-off test, Bit No. 6 was used to drill to 4584'. The bit was pulled due to slow penetration rates. The hole pulled tight and the drill string had to be back reamed and pumped out of hole from 3937' to the 13 3/8" shoe.

Connection gas readings were consistently logged below 3800'. A slightly increasing pore pressure trend noted on pressure plots. The estimated pore pressure was raised to 8.9 ppg.

Bit No. 7, a PDC type bit, was run back in the hole on the same bottom hole assembly. While drilling ahead, the maximum trip gas reading was 520 units. Drilling continued with this bit to 6658' where a short trip was made to condition the hole. The hole pulled tight on the way out and was back reamed to shoe recording a maximum short trip gas of 365 units.

A pressure trend was estimated to develop below 4500' using information from the Condensed Resistivity Plot in conjunction with an increase in recorded connection gas readings. The estimated pore pressure was raised to 9.4 ppg by 6900'. The pore pressure estimate was steadily increased to 9.7 ppg by 7500' while the average mud weight was raised to 10.7 ppg for additional overbalance.

Bit No. 7 was used to drill to the total depth of this well to 8000'. The hole was circulated out prior to performing a short trip to shoe. Excess drag was noted while pulling pipe between bottom and 6120'. The hole was then circulated and conditioned in preparation for running

electric logs and recorded a short trip gas of 525 units. No tight hole problems were experienced while pulling out of hole for logs. Electric logging commenced on 9-29-93.

On the first logging attempt the logging tool would not penetrate beyond the casing shoe. A clean out run was made to further condition the hole. The maximum gas recorded from this trip was 181 units. Logging operations were completed on 10-4-93 and operations to plug and abandon Kuvlum No. 3 were initiated on this date.

Lithologies of this section consisted of clay, thin bedded sands, hydrated shale, and siltstone. Minor shows of oil fluorescence were logged in siltstones below 6000'. Hole problems for the interval were minor and largely due to tight hole conditions experienced on trips caused by swelling clays and siltstones.

CONCLUSIONS AND RECOMMENDATIONS

5
The drilling program for OCS-Y-0865 No. 1 - Kuvlum No. 2 was designed to penetrate to an estimated depth of 9500' and to evaluate the possible extension of the field discovered on Kuvlum No. 1 during the previous drilling season. After drilling through the targeted area, the decision was made to deepen this well for additional data. Kuvlum No. 2 was successfully drilled to a total depth of 11125' on 8-20-93 requiring 24 operating days after spudding in the well.

The drilling program for OCS-Y-0866 No. 2 - Kuvlum No. 3 was designed to penetrate to an estimated depth of 8000' and to evaluate the same potential zones discovered on Kuvlum No. 1 during the previous drilling season. Kuvlum No. 3 was successfully drilled to a total depth of 8000' on 9-28-93 requiring 20 operating days after spudding in the well.

Minor hole problems were experienced in the upper intervals of both wells in handling the nature and volume of cuttings at the shale shakers of which resulted in some additional mud losses when the shakers were overloaded. Minor fluid losses to the hole were also noted while logging and running casing.

In the bottom intervals of the Kuvlum No. 2 & No. 3, notable amounts of drag were experienced on trips causing swabbing conditions that lead to improper pipe displacement fill. The probable causes for this condition were swelling clays and some buildup of cuttings adhering to the bore hole. Short trips were employed while drilling this section to clean and condition the hole but required some additional rig time; especially when conditions warranted pumping and back reaming out of the hole. We would like to recommend additions of a hole stabilizing product, Resinex, which is often effective in controlling clay swelling problems experienced in other areas on the North Slope for this interval of the well.

Pore pressure estimates were very near a normal gradient for the majority of formations logged on. On Kuvlum No. 2, a modest pore pressure gradient was estimated to develop below 7000' and extend to a depth of 10000' before formation pressure increases appeared to stabilize at an estimated value of 9.9/10.0 ppg. This trend analysis is supported through interpretation of data supplied by the D-Exponent and Condensed Resistivity Plots provided in the Parameters vs Depth section of this report. A slightly less defined gradient was estimated to occur on Kuvlum No. 3 below 4200' and extending to a depth of 7800' where the pore pressure was estimated to reach a value of 9.6/9.7 ppg. No significant hole problems were experienced because of the gradients as the mud weight maintained throughout this section on both wells provided for ample overbalance to safely drill.

On Kuvlum No. 2, shows of fluorescence were noted on the mud logs in sands logged below 6000'. Five show evaluation reports were made while drilling this well beginning at 6470' and extending to a depth of 7115'. Analysis of the reports provide evidence of the presence of hydrocarbons over this zone of interest; however, ratio analysis of the gas readings indicate that this zone is predominantly gas bearing or possibly tight. No porosity estimates could be effectively made from the drill cutting samples as the sand came back unconsolidated. A more detailed description of the individual zones can be found in the Show Report section of this report.

On Kuvlum No. 3, shows of fluorescence were noted on the mud logs in the sand logged at 3785' and the siltstones below 7000'. Porosity estimates for the sand were poor and ranged from 0% - 5%. There were no heavy hydrocarbons (C2-C5) associated with the sand interval although consistent readings of C2-C5 were logged below 4900'. No show reports were completed for this interval on this well.

The following hydraulics and mud property recommendations are based on the drilling program used on Kuvlum No. 2 and No. 3. The recommendations are made using a similar casing design and differ very little from the mud weights observed on each well.

RECOMMENDED MUD PROPERTIES

| Depth | Csg Seat | Mud Weight | Yield Point | Water Loss |
|--------|--------------------------------------|------------|-------------|------------|
| 0-1000 | 20" | Sea Water | Sweeps | N/A |
| -3900 | 13 ³ / ₈ " | 9.6 | 20-30 | <10 |
| -7000 | 8 ¹ / ₂ " Hole | 9.8 | 20-30 | < 6 |
| -TD | 8 ¹ / ₂ " Hole | 10.0/10.7 | 20-30 | < 5 |

RECOMMENDED HYDRAULICS

| | | | | |
|------------------|--------|--------|--------|--------|
| Hole Size: | 26" | 17.5" | 12.25" | 12.25" |
| Depth: | 800 | 2500 | 6000 | 9000 |
| Gallons Per Min: | 1100 | 925 | 650 | 650 |
| Nozzles: | 4-20's | 4-16's | 4-12's | 4-14's |
| Pump Pressure: | 2200 | 3000 | 3000 | 3000 |

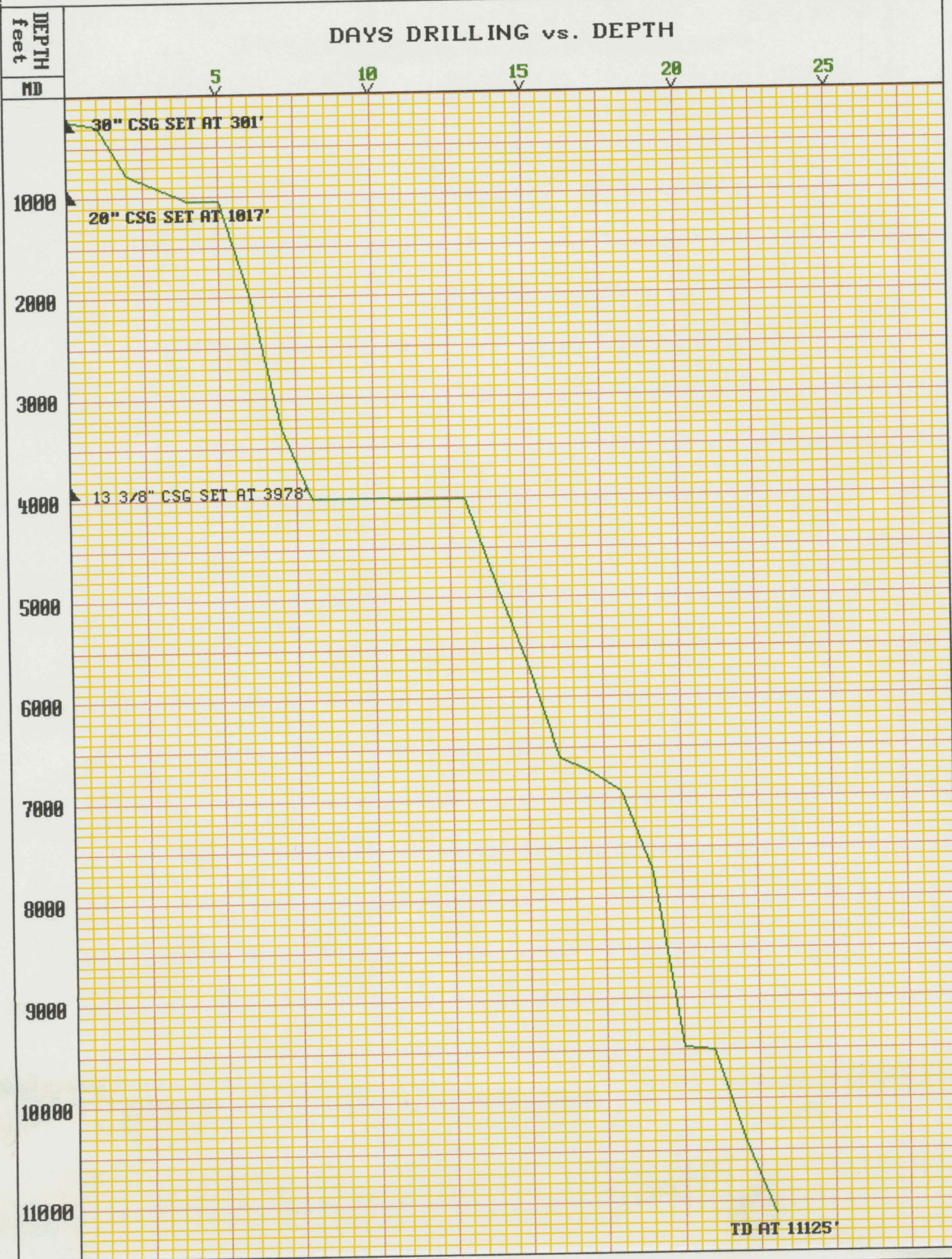
SPERRY SUN DRILLING SERVICES
A BAROID COMPANY

SPERRY SUN
LOGGING
SYSTEMS

WELL OCS-Y-0865 NO. 1
COMPANY ARCO ALASKA, INC.
LOCATION BLOCK 672 BEAUFORT SEA, AK.

DAYS
VS
DEPTH

6

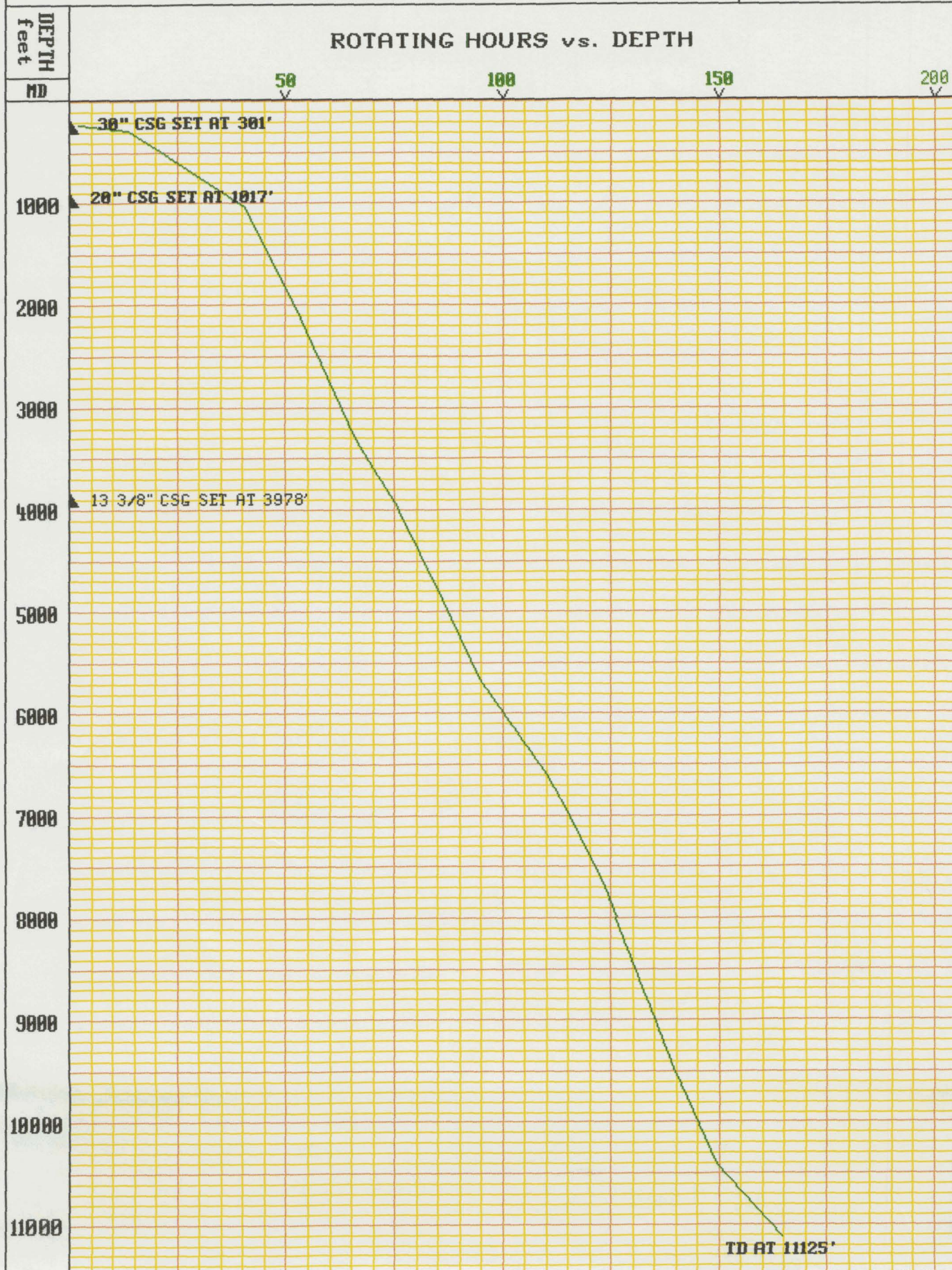


SPERRY SUN DRILLING SERVICES
A BAROID COMPANY

SPERRY SUN
LOGGING
SYSTEMS

WELL OCS-Y-0865 NO. 1
COMPANY ARCO ALASKA INC.
LOCATION BLOCK 672 BEAUFORT SEA, AK.

ROTATING HRS
VS
DEPTH



SPERRY-SUN DRILLING SERVICES

A Baroid Company

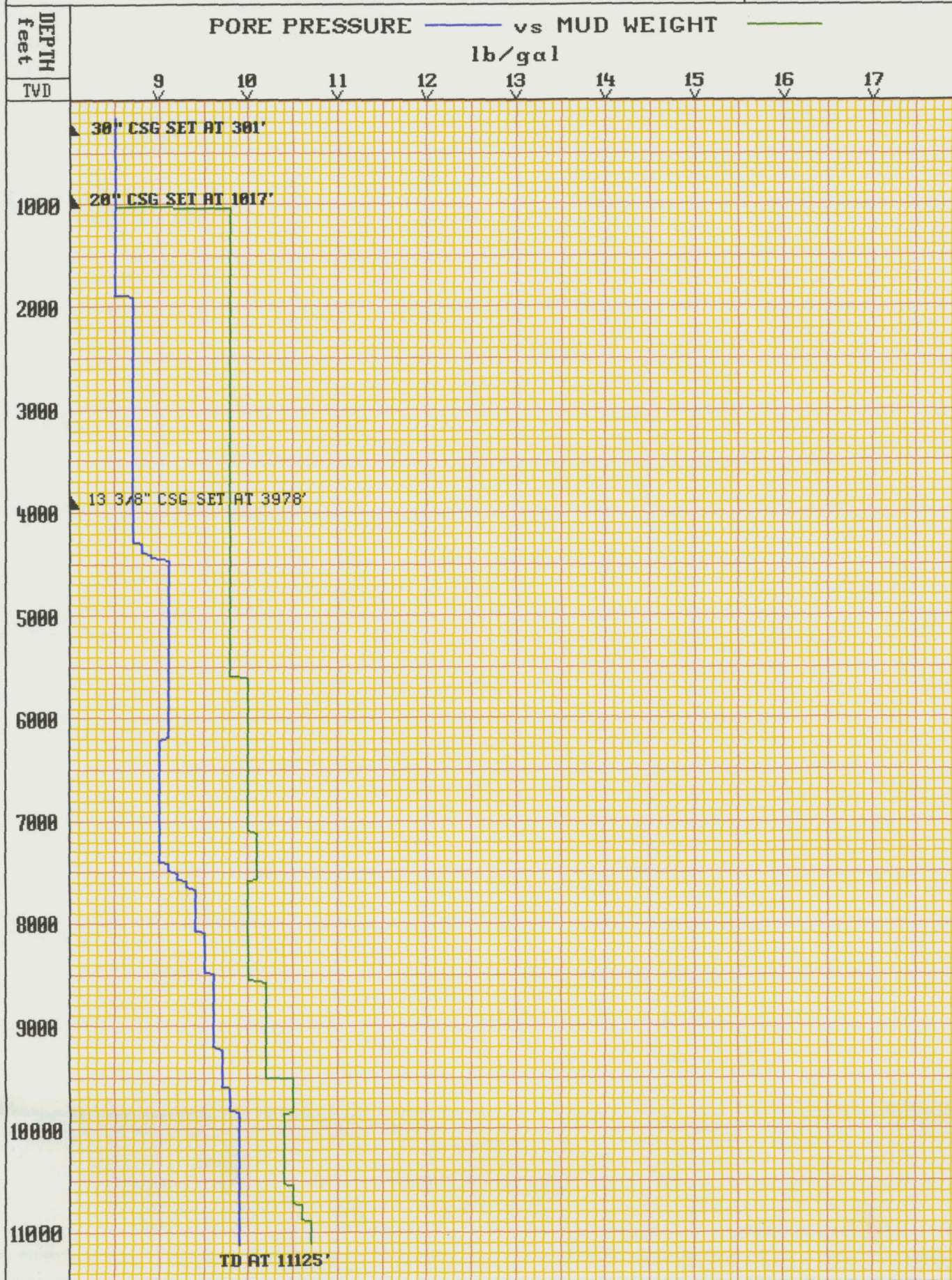
WELL OCS-Y-0865 NO. 1

COMPANY ARCO ALASKA, INC.

LOCATION BLOCK 672 BEAUFORT SEA, AK.

**SPERRY SUN
LOGGING
SYSTEMS**

**PORE
PRESSURE vs
MUD WEIGHT**



SPERRY-SUN LOGGING SYSTEMS

ALASKA DISTRICT

WELL OCS-Y-0665 NO. 1
 COMPANY ARCO ALASKA INC.
 LOCATION BLOCK 672 BEAUFORT SEA, AK.

NB New Bit

NCB New Core Bit

DTG Down Time Gas

NR No Returns

CO Circulate Out

OBG Off Bottom Gas

DC Depth Corr

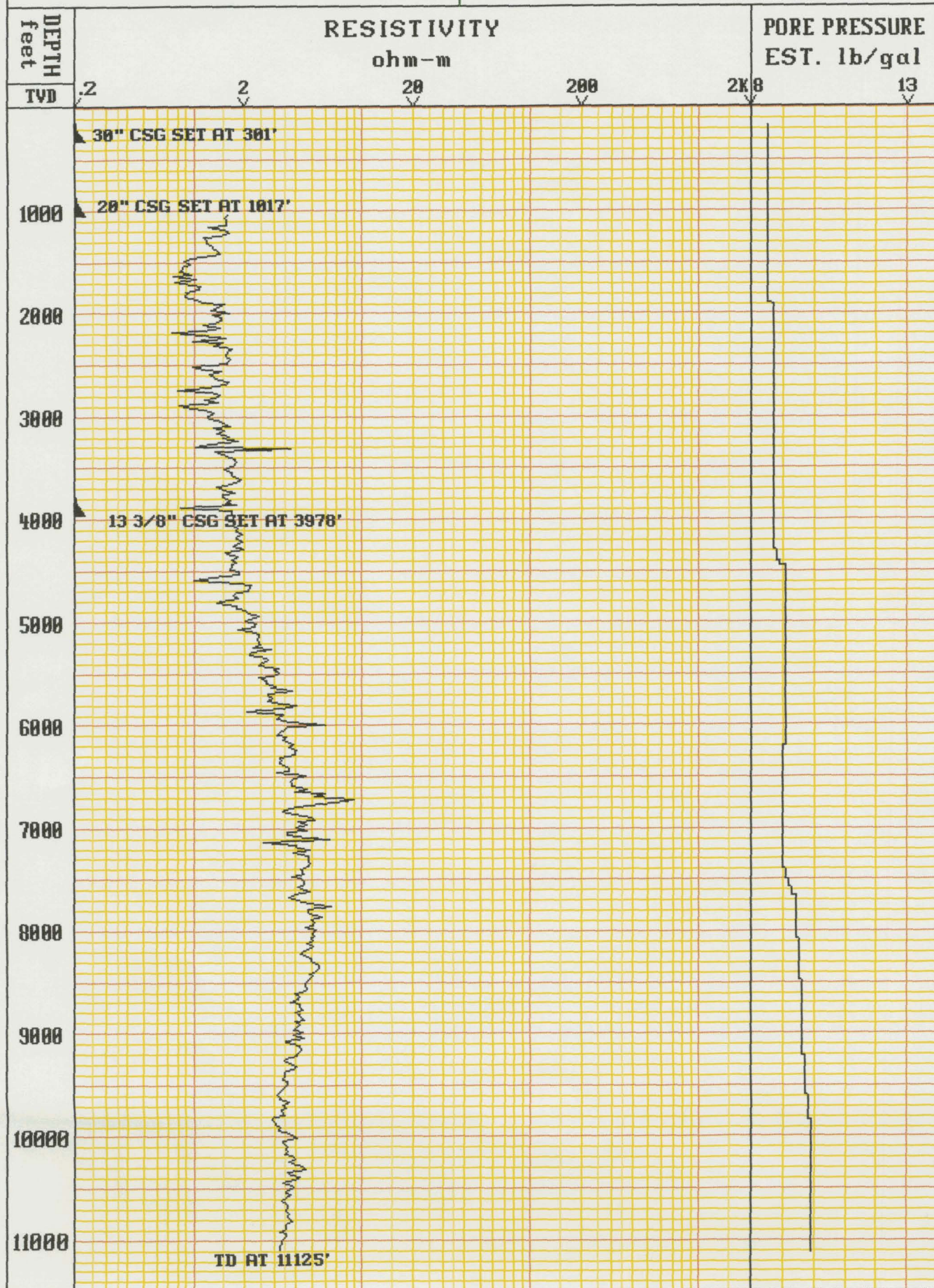
CKF Check for Flow

TG Trip Gas

TCL Trip Chlorides

LAT Log After Trip

CG (Bar Graph)

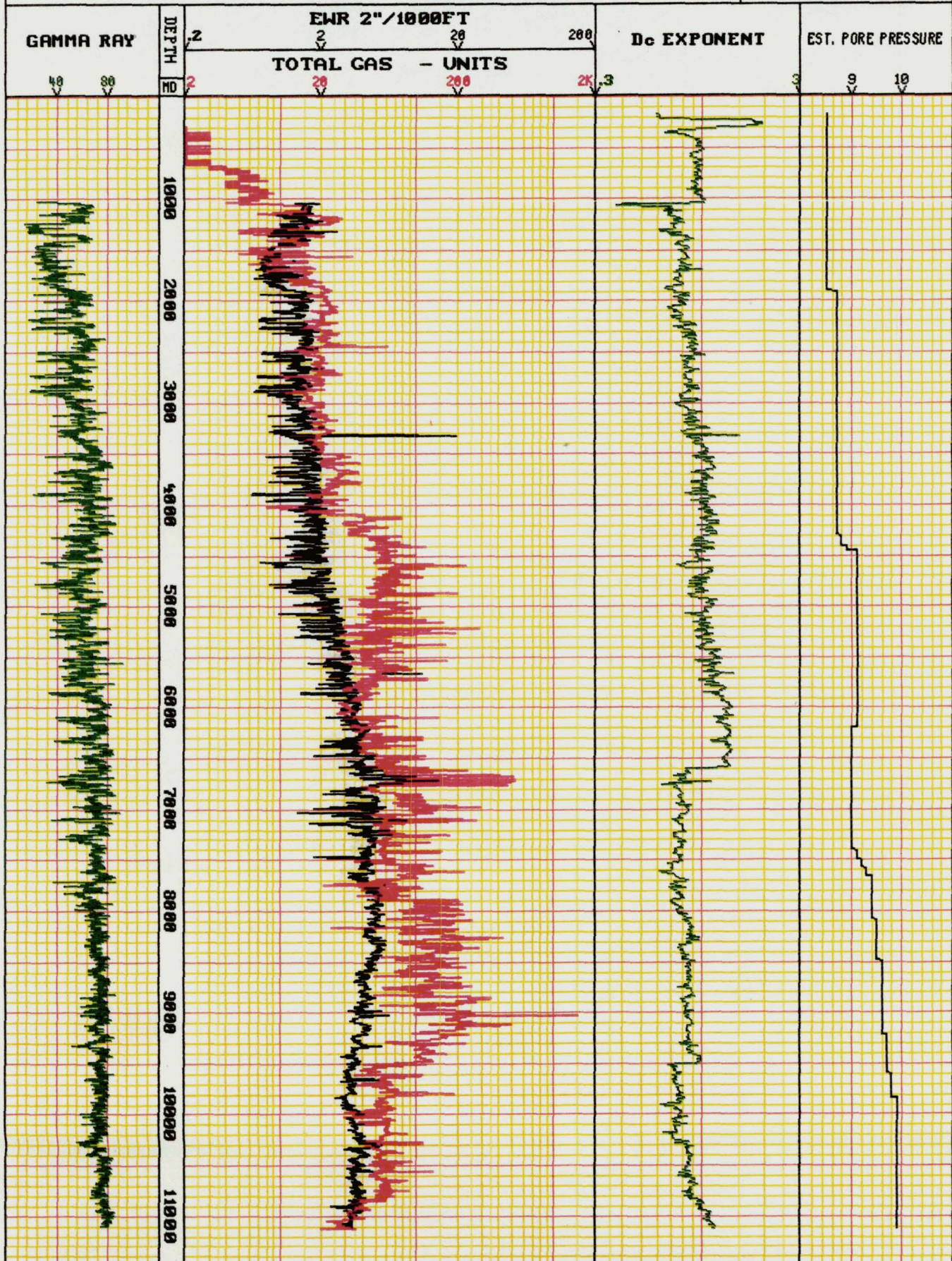


SPERRY-SUN DRILLING SERVICES LOGGING SYSTEMS

WELL OCS-Y-0865 NO. 1 KUVLUM # 2
 COMPANY ARCO ALASKA, INC.
 LOCATION NR6-4 BLK 672, BEAUFORT SEA, AK.

**BAROID
LOGGING
SYSTEMS**

**PRESSURE
PARAMETERS**



SPERRY-SUN LOGGING SYSTEMS

ALASKA DISTRICT

WELL OCS-Y-0865 NO. 1
 COMPANY ARCO ALASKA INC.
 LOCATION BLOCK 672 BEAUFORT SEA, AK.

ALASKA

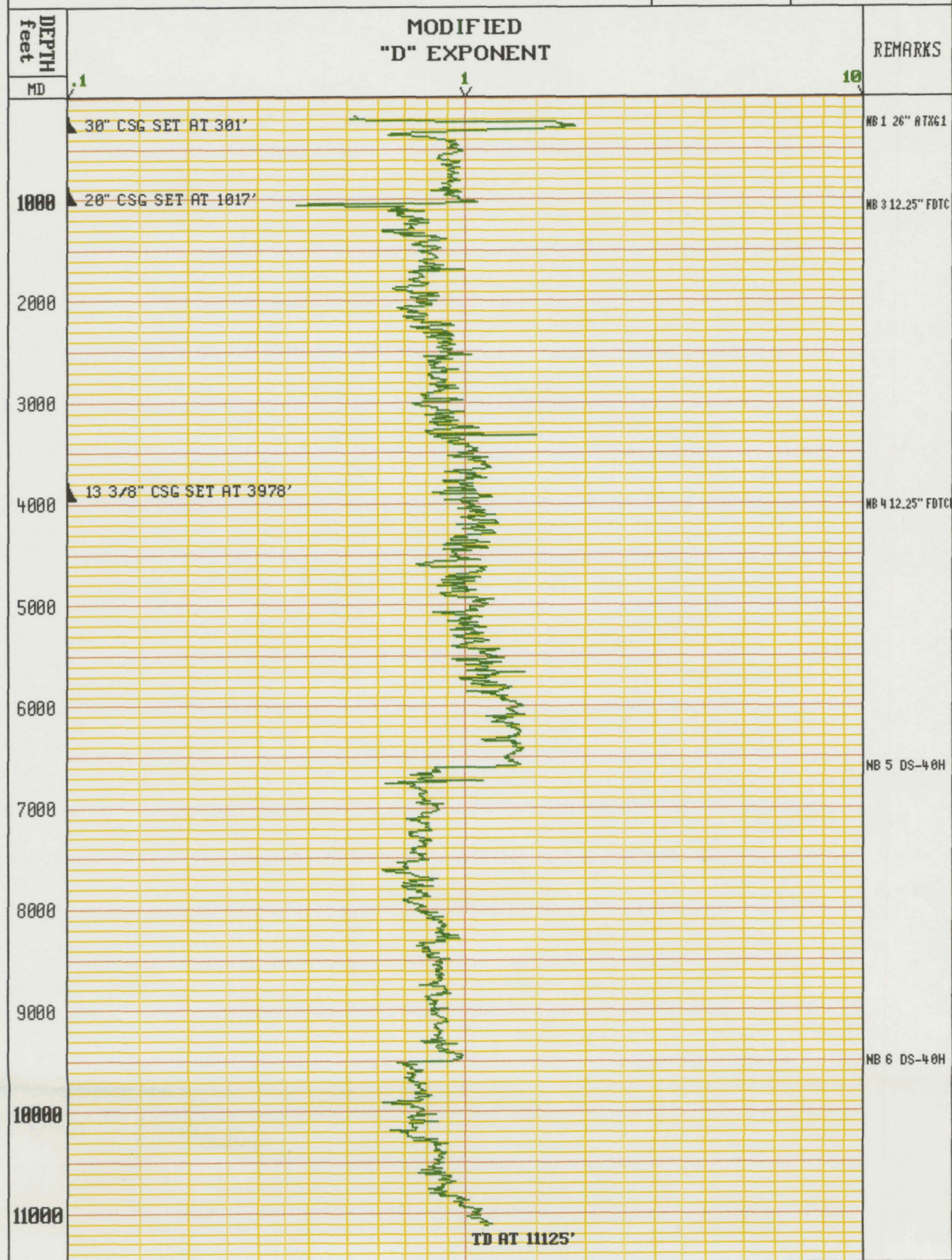
MODIFIED

"D"

EXPONENT

LOGGING
SYSTEMS

"D c"
LOG

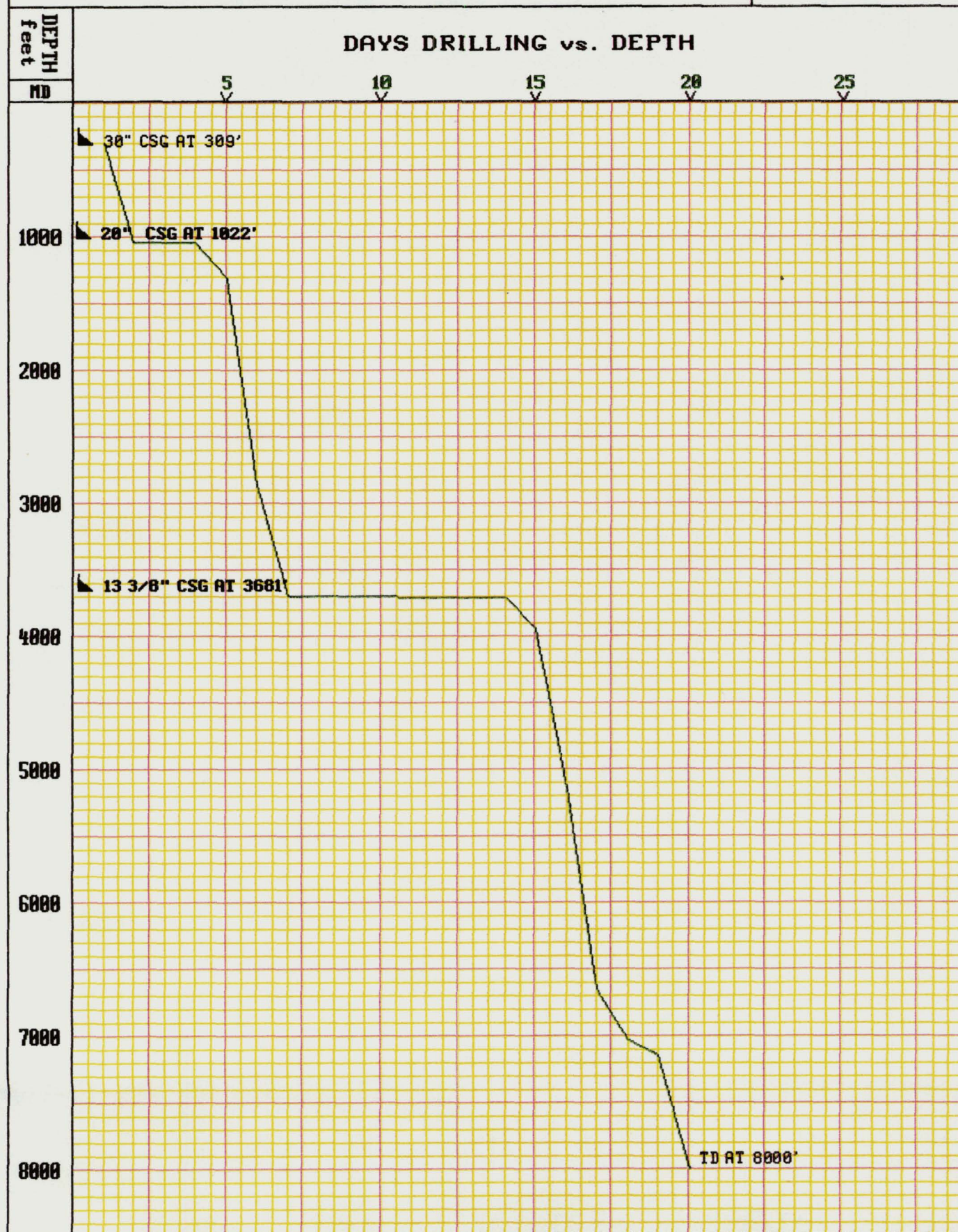


SPERRY SUN DRILLING SERVICES
A BAROID COMPANY

SPERRY SUN
LOGGING
SYSTEMS

WELL OCS-Y-0866-2 KUVLUM NO. 3
COMPANY ARCO ALASKA, INC.
LOCATION NR6-4 BLK 673, BEAUFORT SEA, AK.

DAYS
VS
DEPTH

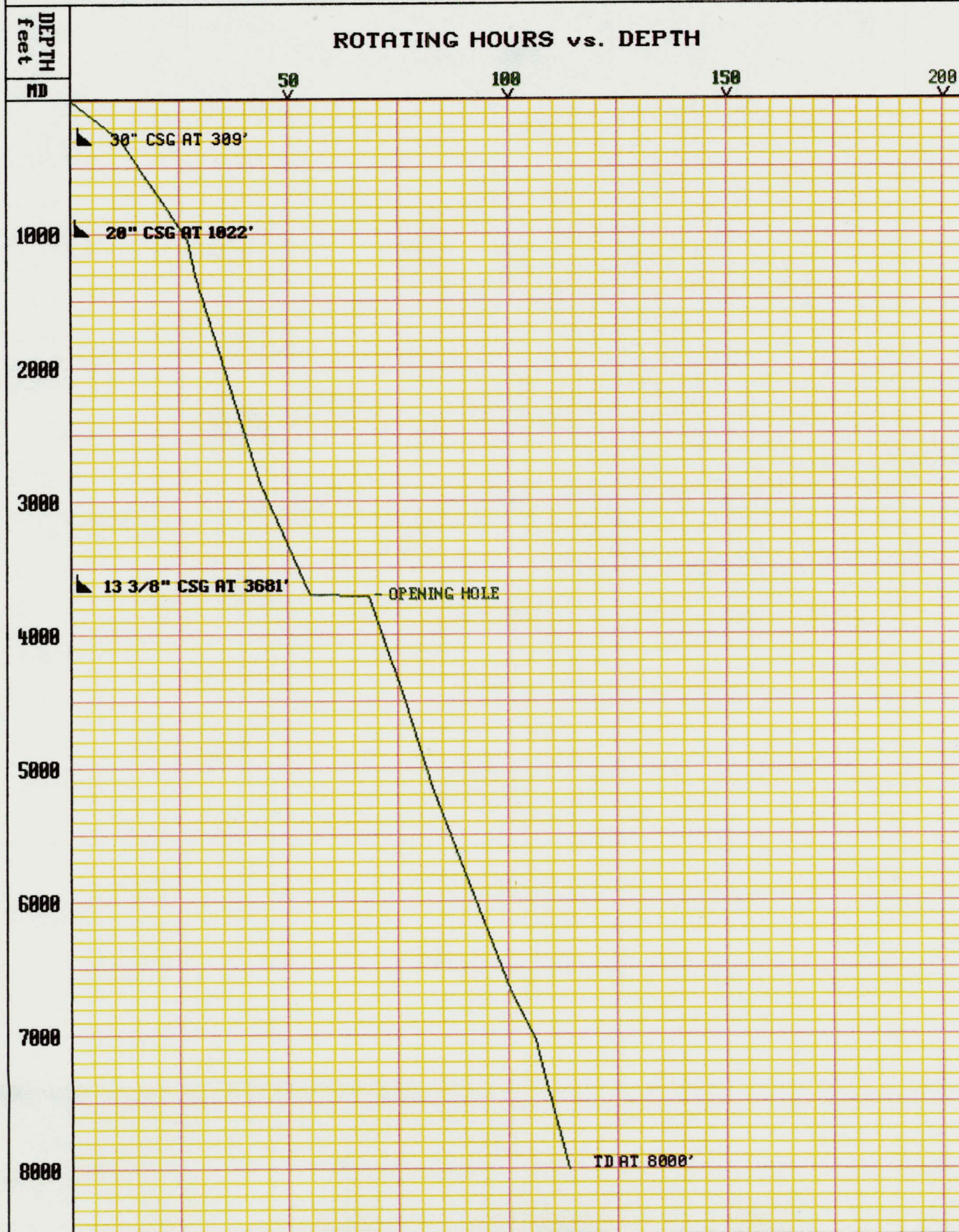


SPERRY SUN DRILLING SERVICES
A BAROID COMPANY

**SPERRY SUN
LOGGING
SYSTEMS**

WELL OCS-Y-0866-2 KUVLUM NO. 3
COMPANY ARCO ALASKA INC.
LOCATION NR6-4 BLK 673, BEAUFORT SEA, AK.

**ROTATING HRS
VS
DEPTH**

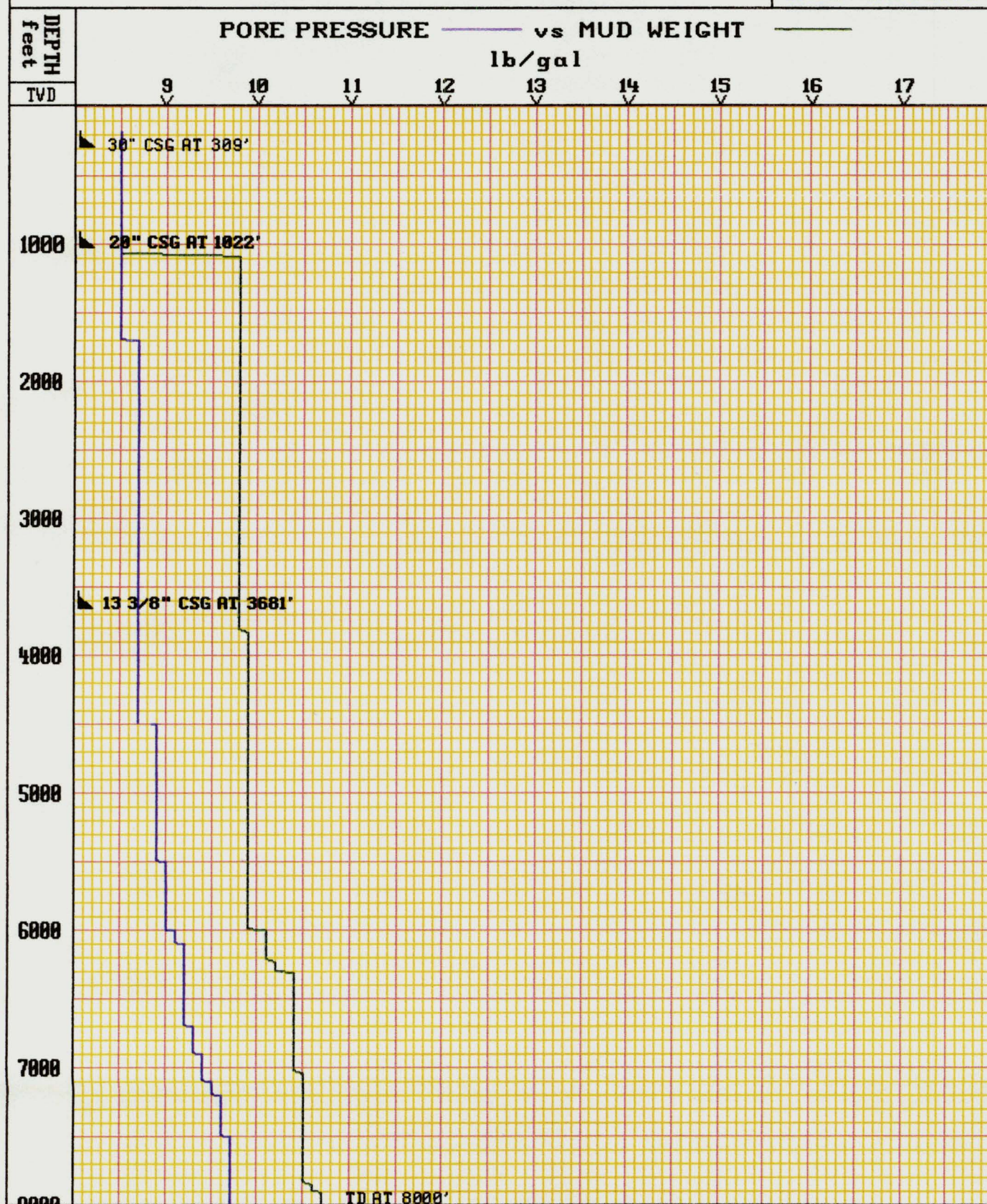


LOGGING SYSTEMS

COMPANY ARCO ALASKA, INC.

LOCATION NR6-4 BLK 673, BEAUFORT SEA, AK.

PORE PRESSURE vs MUD WEIGHT



SPERRY-SUN LOGGING SYSTEMS

ALASKA DISTRICT

WELL OCS-Y-0866 NO.2 KUVLUM NO. 2

COMPANY ARCO ALASKA, INC.

LOCATION NR6-4 BLK 673, BEAUFORT SEA, AK.

NB New Bit

NR No Returns

DC Depth Corr

TCL Trip Chlorides

NCB New Core Bit

CO Circulate Out

CKF Check for Flow

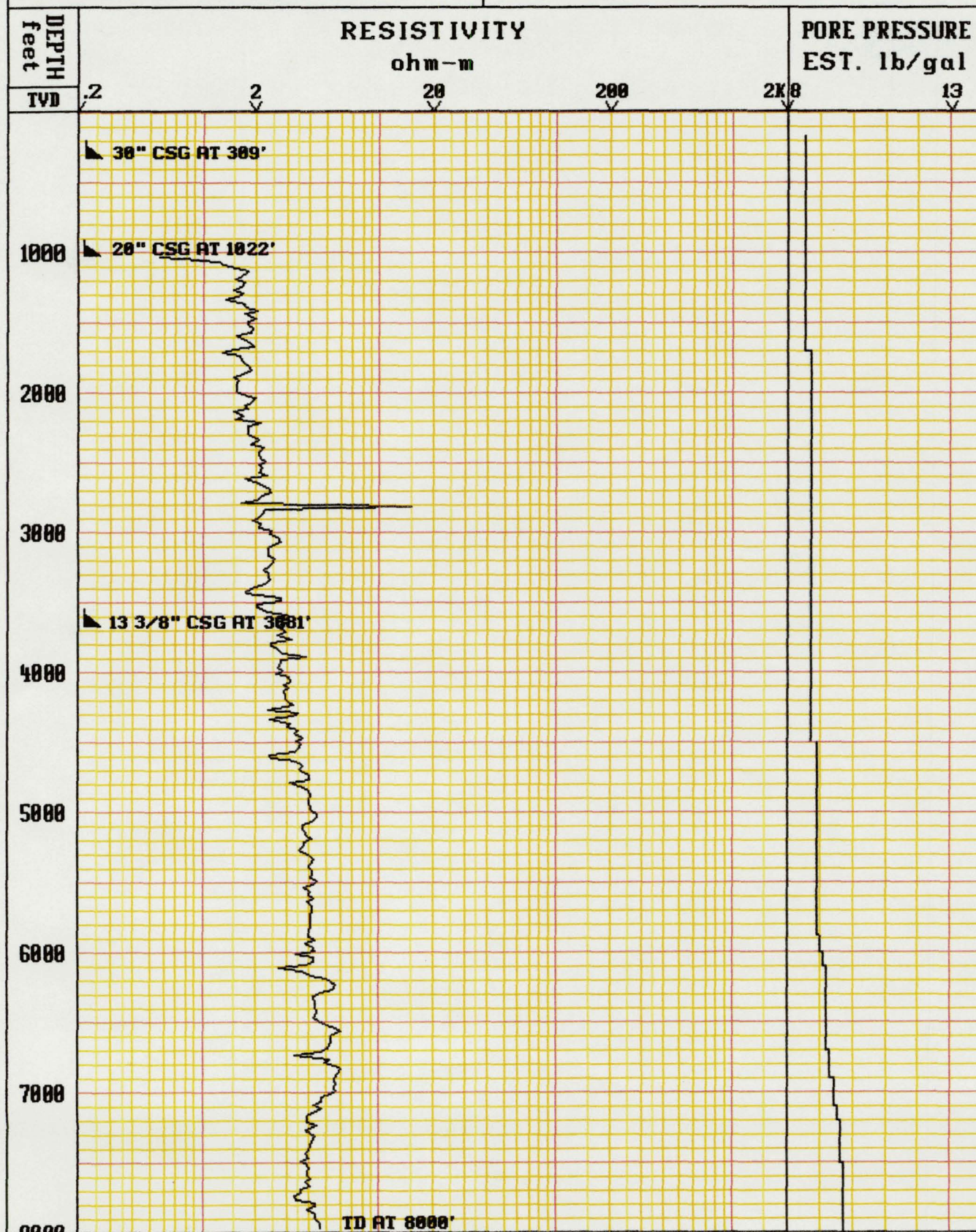
LAT Log After Trip

DTG Down Time Gas

OBG Off Bottom Gas

TG Trip Gas

CG (Bar Graph)

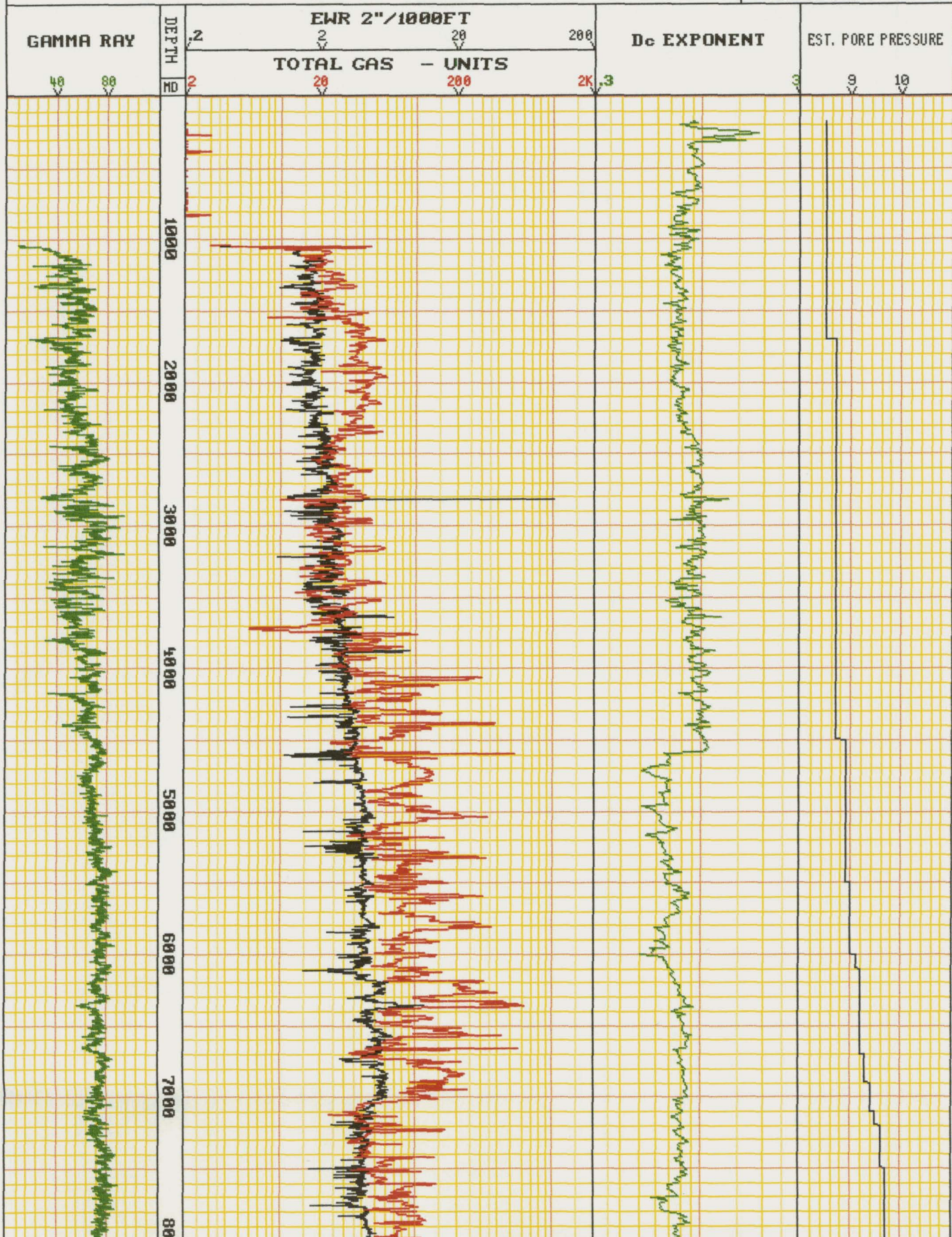


SPERRY-SUN DRILLING SERVICES LOGGING SYSTEMS

WELL OCSY-Y-0866 #2 - KUVLUM NO. 3
 COMPANY ARCO ALASKA, INC.
 LOCATION NR6-4 BLK 674, BEAUFORT SEA, AK.

**BAROID
LOGGING
SYSTEMS**

**PRESSURE
PARAMETERS**



SPERRY-SUN LOGGING SYSTEMS

ALASKA DISTRICT

WELL OCS-Y-0866-2 KUVLUM NO. 3

COMPANY ARCO ALASKA, INC.

LOCATION NR6-4 BLK 673, BEAUFORT SEA, AK.

ALASKA

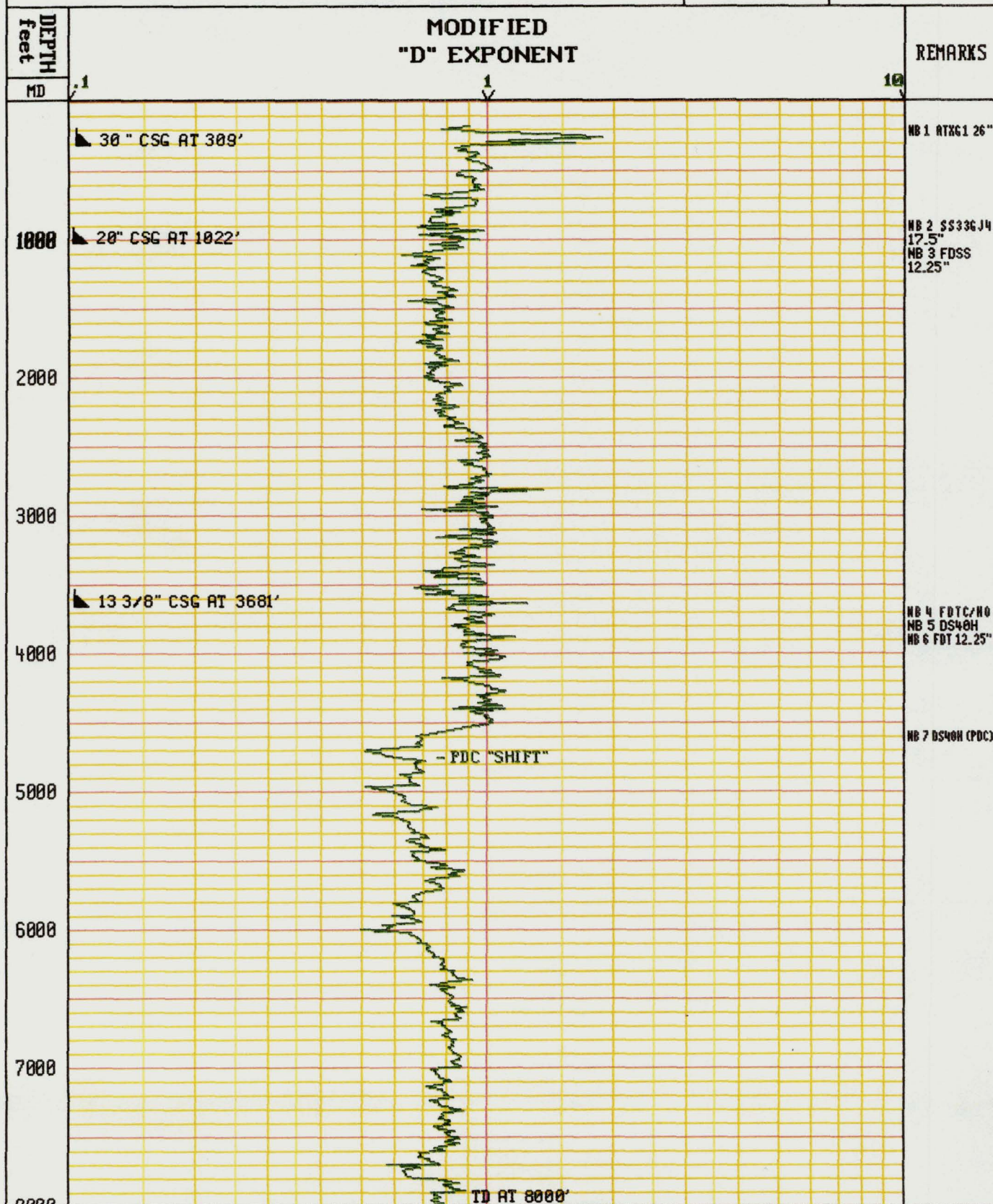
MODIFIED

"D"

EXPONENT

LOGGING
SYSTEMS

"D c"
LOG



SPERRY-SUN
DRILLING SERVICES
LOGGING SYSTEMS

KUVLUM #3
ENGINEERING LOG









COMPANY ARCO ALASKA INC.
WELL KUVLUM #3
FIELD WILDCAT
REGION KUVLUM PROSPECT NR6-4 BLK 873
LOCATION LA TO 19°39.8 LO 145 24°14.7
CO-ORDS
CONTRACTOR CANMAR
RIG/TYPE CDU KULLUK
TOTAL DEPTH 8000' TVD 8000'
SPUD DATE SEP 8 93

ELEVATION AND LOGGING DATA
PERMANENT DATUM MEAN SEA LEVEL
ELEVATIONS: K.B. 87'
D.F. 86'
G.L./S.F. 107' WATER DEPTH
LOG MEASURED FROM KB
LOGGED DEPTHS 172' To 8000'
LOGGED DEPTHS 172' To 8000'
SUPV. ENGINEER J. PATTON UNIT 2215
LOGGING ENGINEERS J. PANTER

HOLE DATA
30.0" To 399' 12.25" To 8000'
28" To 1022' To
17.5" To 3601' To

CASING DATA
30.0" To 399' To
20.0" To 1022' To
13.375" To 3601' To

MUD TYPES
SPUD To 1022'
FWPA-SEA H2O To 8000'
To
To

LITHOLOGY SYMBOLS
 Coal  Sandstone
 Tuff  Sand
 Chert  Gravel
 Limestone  Conglom

ABBREVIATIONS
DRILLING DATA
NB New Bit LAT Logged After Trip
RNB Run Bit U Gas Valve
TB Turbo Drill BG Background Gap
PDCB Polycrystalline TG Trip Gas
Diamond Compensated BTB Short Trip Gas
BIT Connection Gas
CO Core Bit DST Drill Stem Test
DB Depth BS Direction Survey
WOB Weight on Bit SC South Correction
RPM Rev Per Minute C Coriolis Test
CD Circulate Cut CKF Check for Flow
PR Pacific Returns FLT Flowline Temp.
SHT Shotline Temp.
RECEIVED
OCS DISTRICT OFFICE
OCT 19 1993
MINERALS MANAGEMENT SERVICE
ANCHORAGE, ALASKA

MUD DATA
W Mud Weight PV Fluids Visually
V Viscosity VP Viscosity
FL Filtrate Loss S Solids Content
FC Filtrate Cube G Gels
GL Gelability RM Mud Resistivity
PH Hydrogen Ion Content RMF Filtrate Resistivity
ENGINEERING DATA
CI Core No. 1 Gas Traces
recovery
DST 1 Drill Stem Test No. 1
DST 2 Drill Stem Test No. 2
DST 3 Drill Stem Test No. 3
DST 4 Drill Stem Test No. 4
DST 5 Drill Stem Test No. 5
DST 6 Drill Stem Test No. 6
DST 7 Drill Stem Test No. 7
DST 8 Drill Stem Test No. 8
DST 9 Drill Stem Test No. 9
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DST 91 Drill Stem Test No. 91
DST 92 Drill Stem Test No. 92
DST 93 Drill Stem Test No. 93
DST 94 Drill Stem Test No. 94
DST 95 Drill Stem Test No. 95
DST 96 Drill Stem Test No. 96
DST 97 Drill Stem Test No. 97
DST 98 Drill Stem Test No. 98
DST 99 Drill Stem Test No. 99
DST 100 Drill Stem Test No. 100

TRAINING ENGINEER D. WILSON
 OTHER SERVICES:
 FORMED SPERRY-SUN FEMMO 10
 FORMED DELTA 10 1000
 FORMED DELTA 10 1000

Volcanic
 Clay
 Shale
 Siltstone

Sidewall Core
 NPT Interval Tester
 E-LOG Wireline Log Run
 LOT Lockett Test
 PXT Pressure Integrity Test
 Water
 Salt Water
 Fresh Water
 Hydrocarbon well
 H₂O well

SPERRY SUN DRILLING SERVICES

LOGGING SYSTEMS A Baroid Company

WELL OCS-Y-0886 NO. 2 KUVLUM #3

COMPANY ARCO ALASKA, INC.

LOCATION NR8-4 BLK 873 BEAUFORT SEA, AK

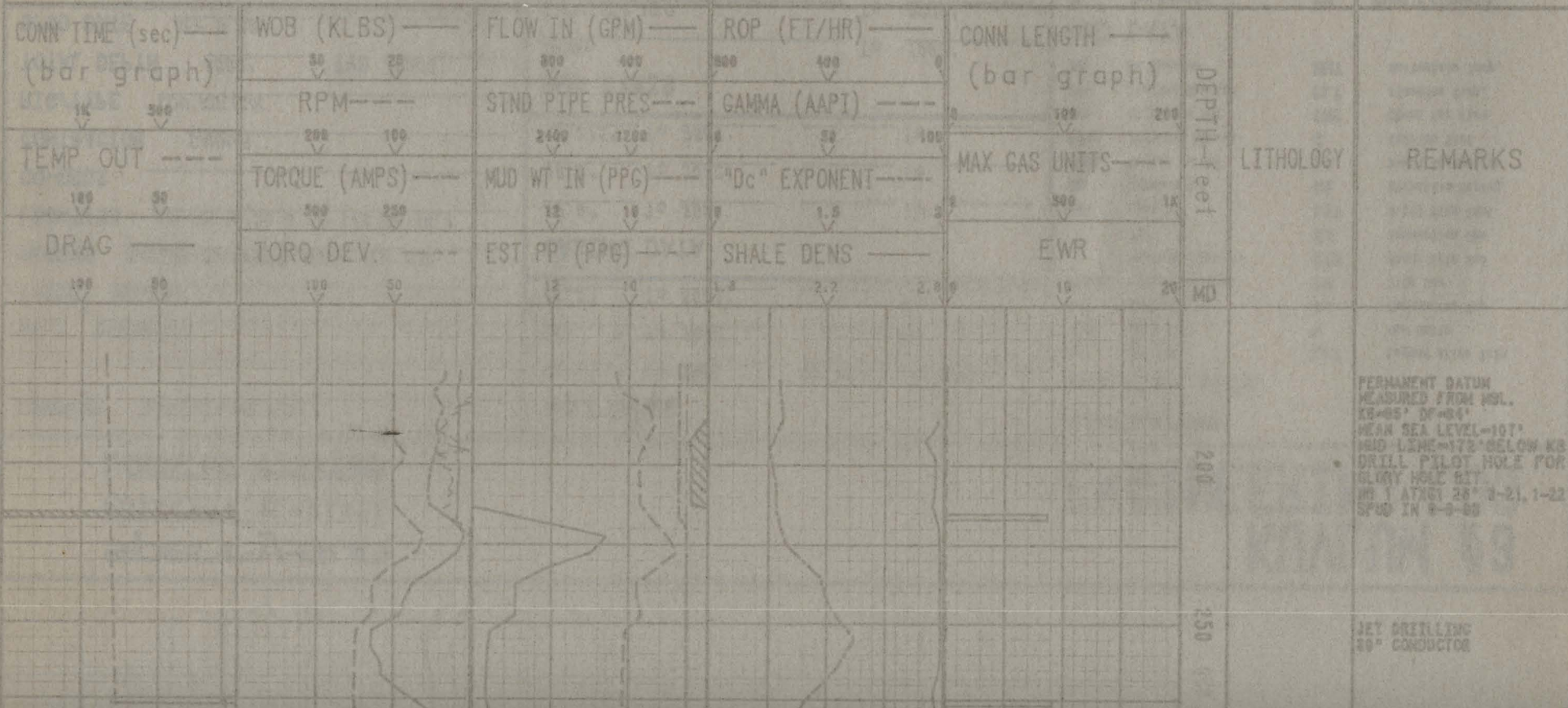
LEGEND

NB New Bit NCB New Core Bit CKT Check for Flow
 NR No Returns CO Circulate Out LAT Log after Trip
 TS Trip Gas CG Connection Gas DST Drill Stem Test
 DC Depth Corr ST Short Trip Gas SVY Direct Survey

Clay Shale Siltstone Sandstone Gravel

LOGGING
 SYSTEMS
 ADT SERVICE

ENGINEERING
 LOG

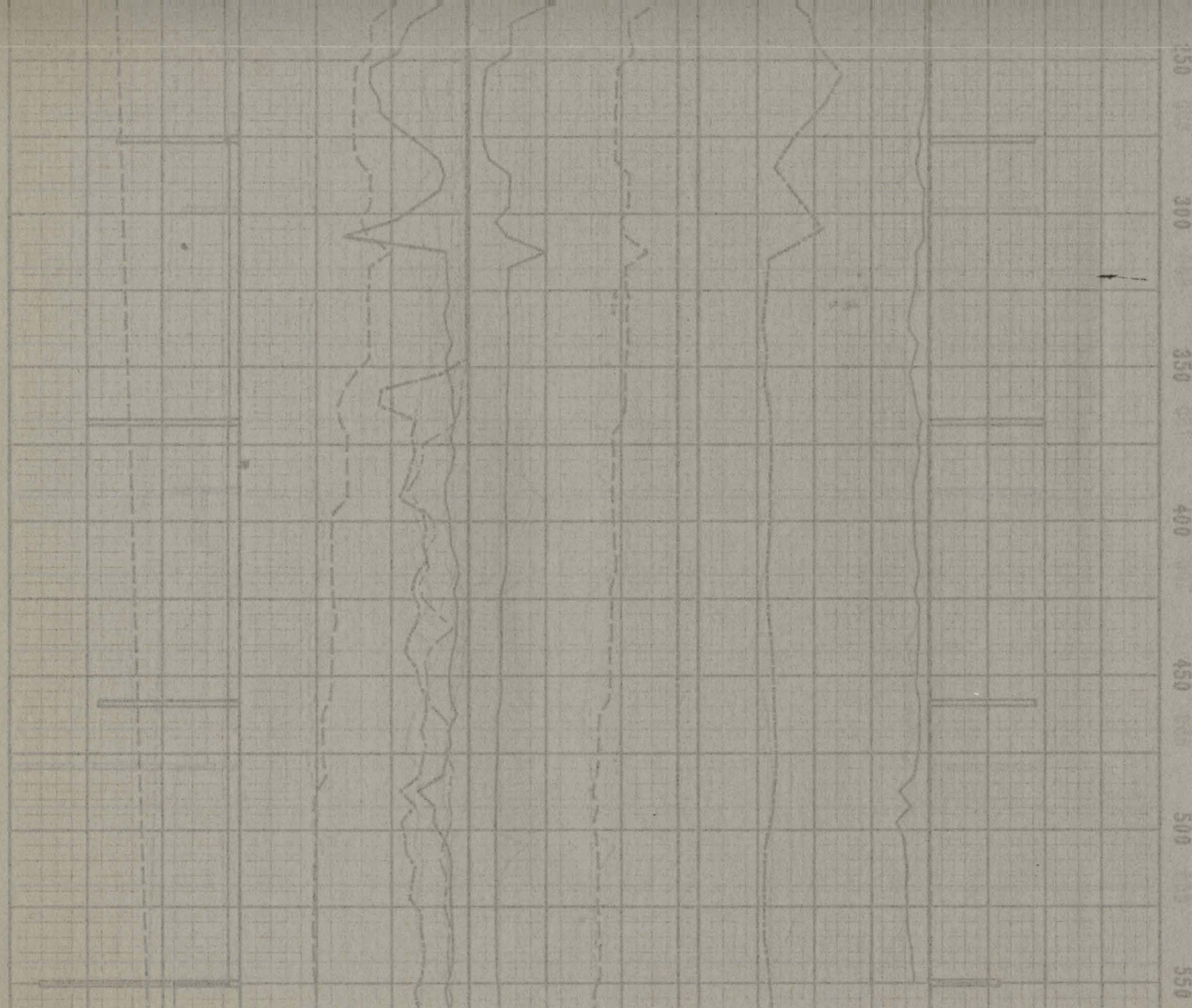


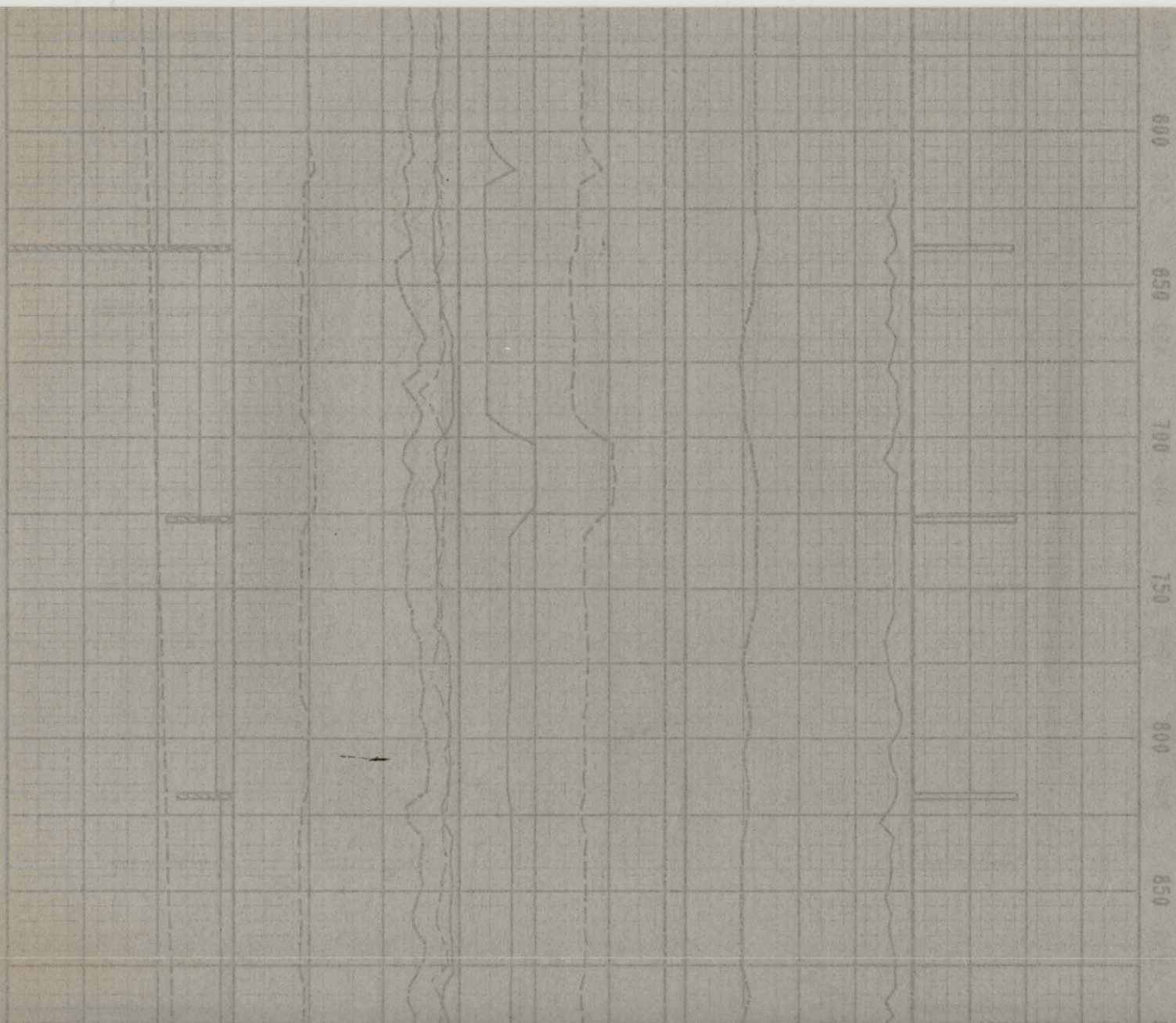
JET DRILLING
30" CONDUCTOR

LAND 30" CSG AT 300'
IN GUIDE BASE
8-10-93

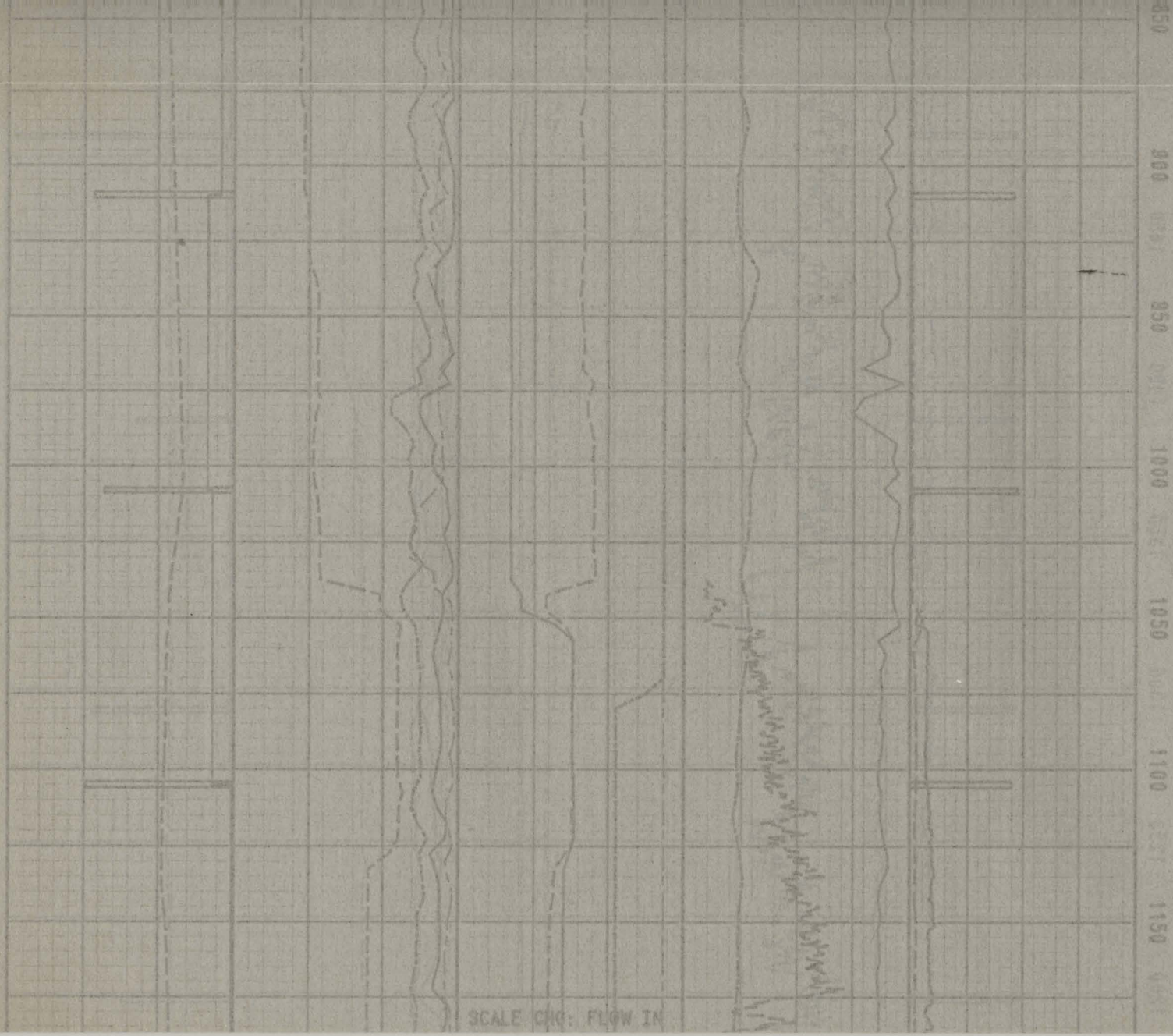
WELL LOG
W-10-93

DRILLING WITH
SEA WATER WITHOUT
RETURNS TO SURFACE





PUMPING HIGH
VIS SWEEPS TO
CLEAN HOLE



DRILLED TO 1040'
SET 20" CSC AT 1022'
LOT = 14.3 ppg CMW
9-11/9-12-93

NO 3 F033
JETS 3x13, 1x12

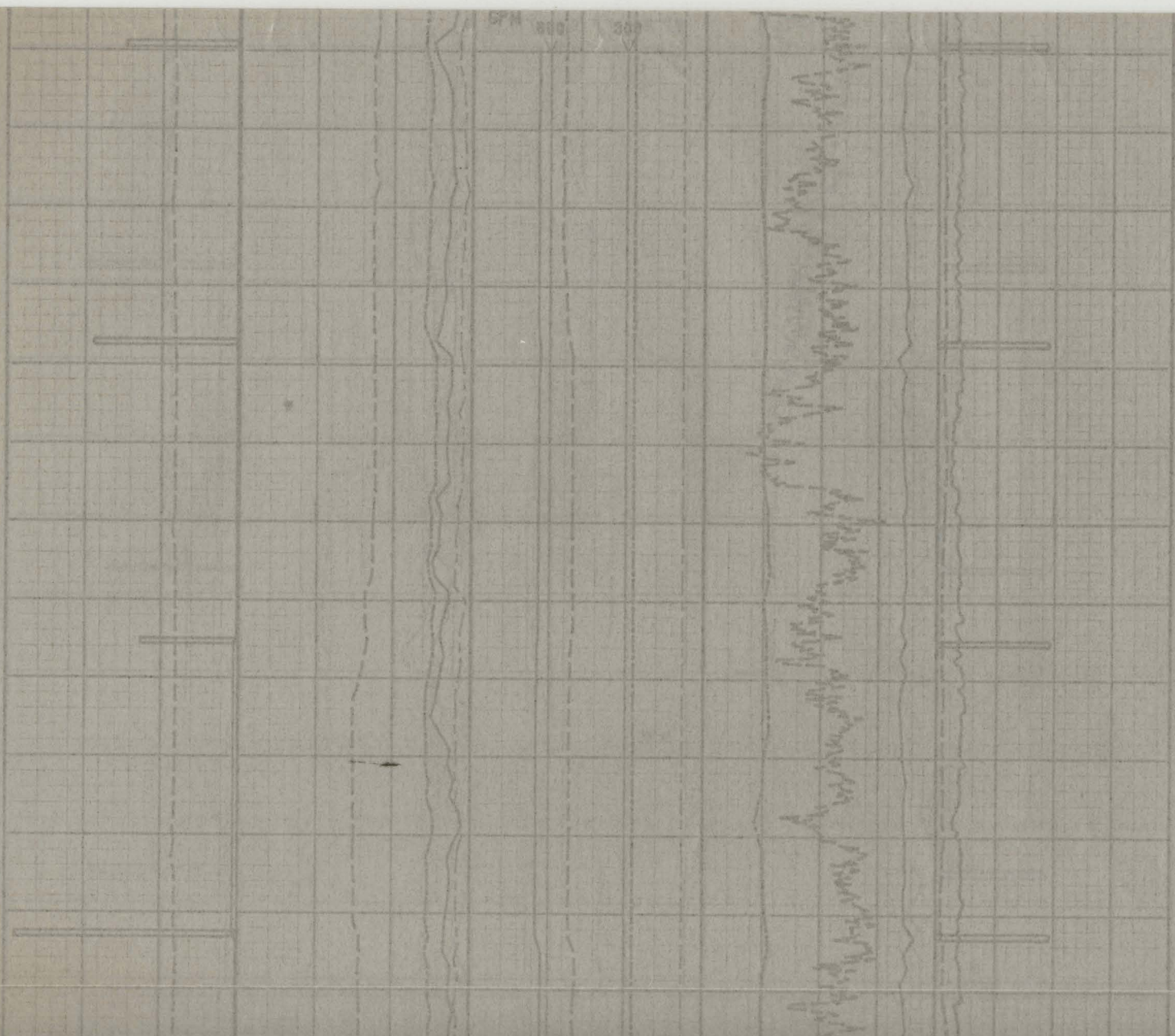
05 .57 DEG

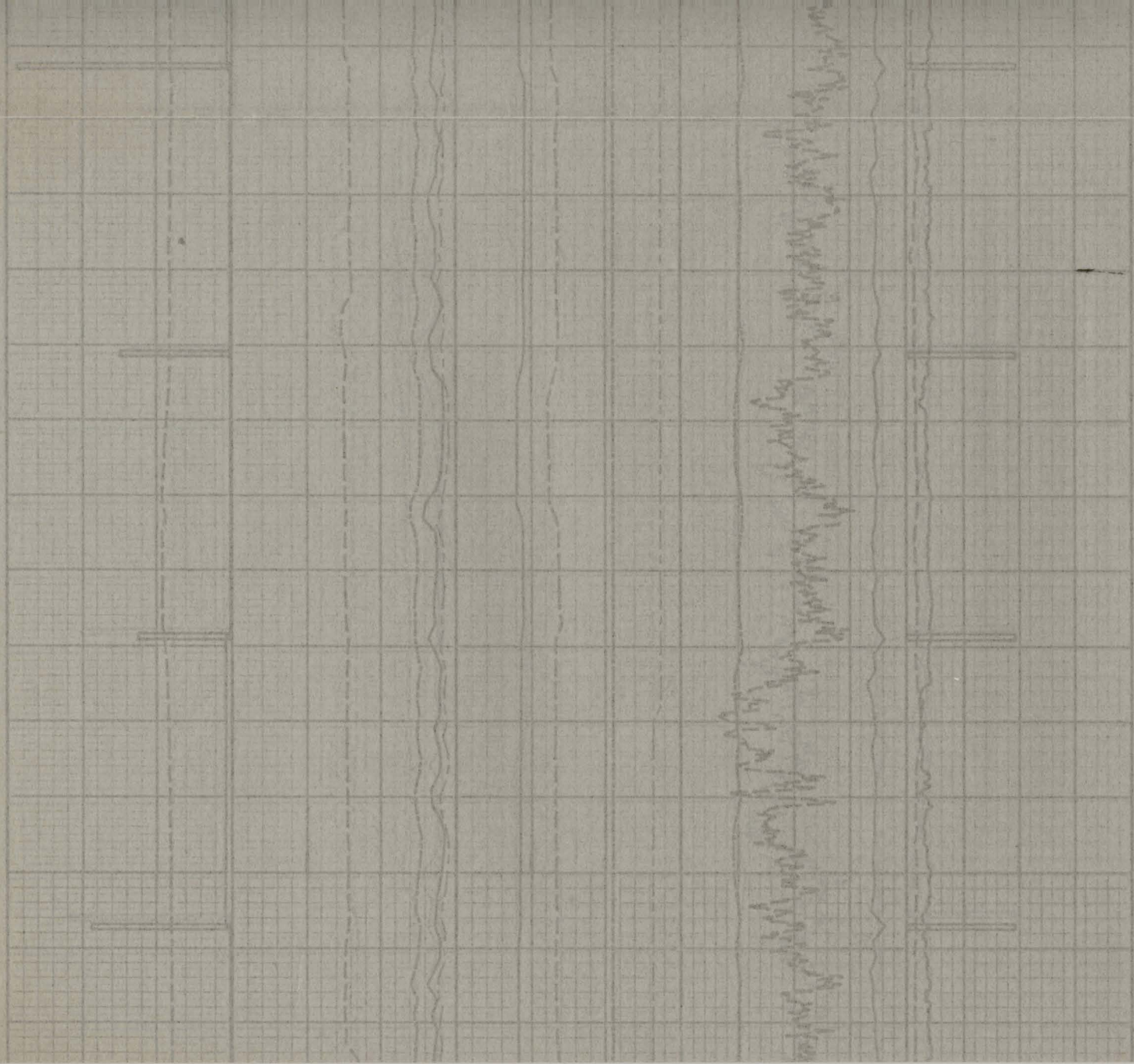
03 12 50

0-14-53

03 08 DEC

1200 1250 1300 1350 1400 1450 1500





1500 1550 1600 1650 1700 1750 1800

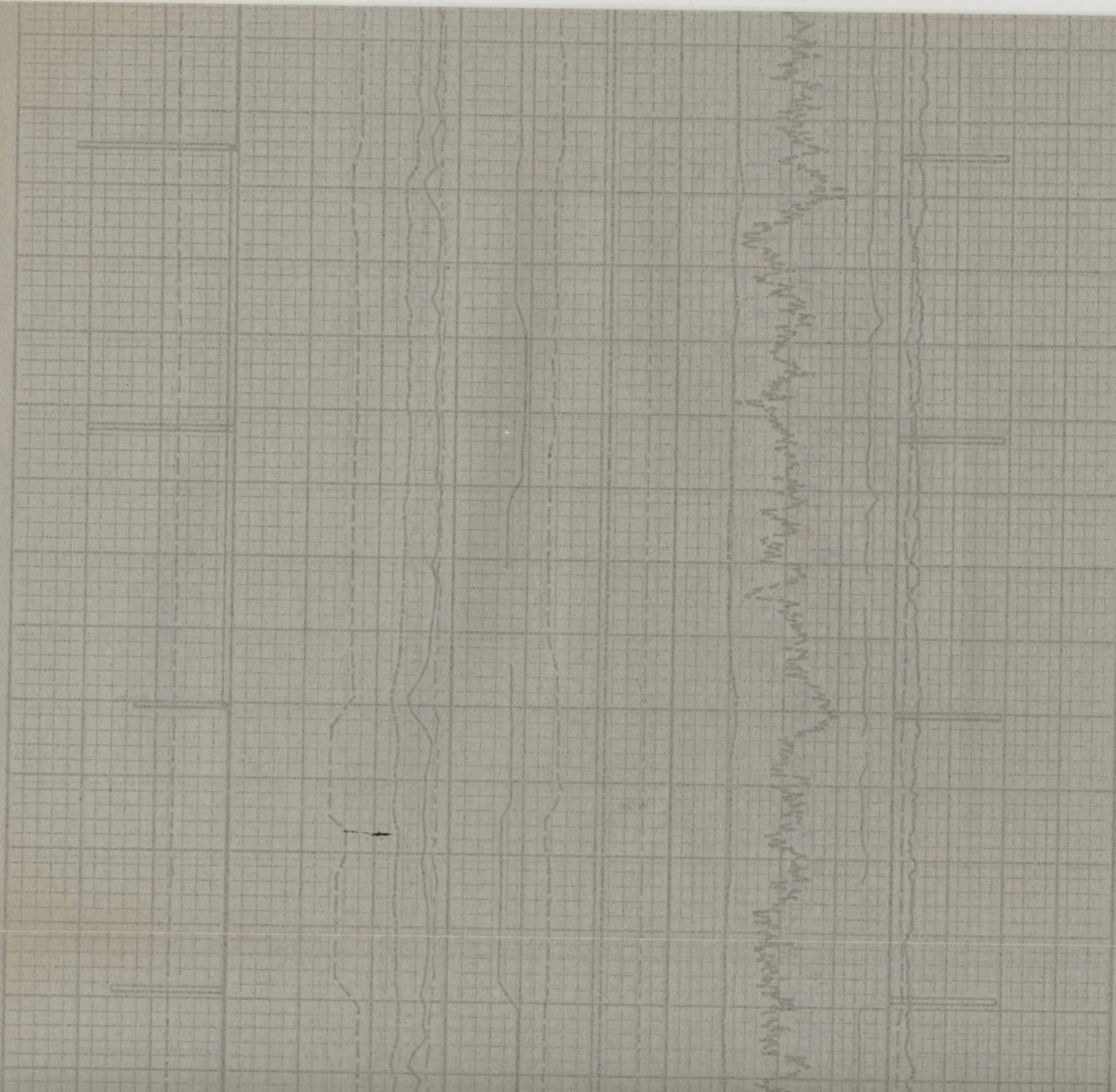
HW 9.8 VIS 43
PV/VP 10/18 PH 10.0
FILT 8.1 CL 17400

50 000

09 .20 DEG

09 .09 DEG

1850 1900 1950 2000 2050 2100 2150





2100 2150 2200 2250 2300 2350 2400

09 .32 DEG

STG 158

03 .32 DEG

MW 3.7+ VTS 72
PV/YF 29/85 FH 10.1
FILT 3.2 CL 17300

03 .55 DEG



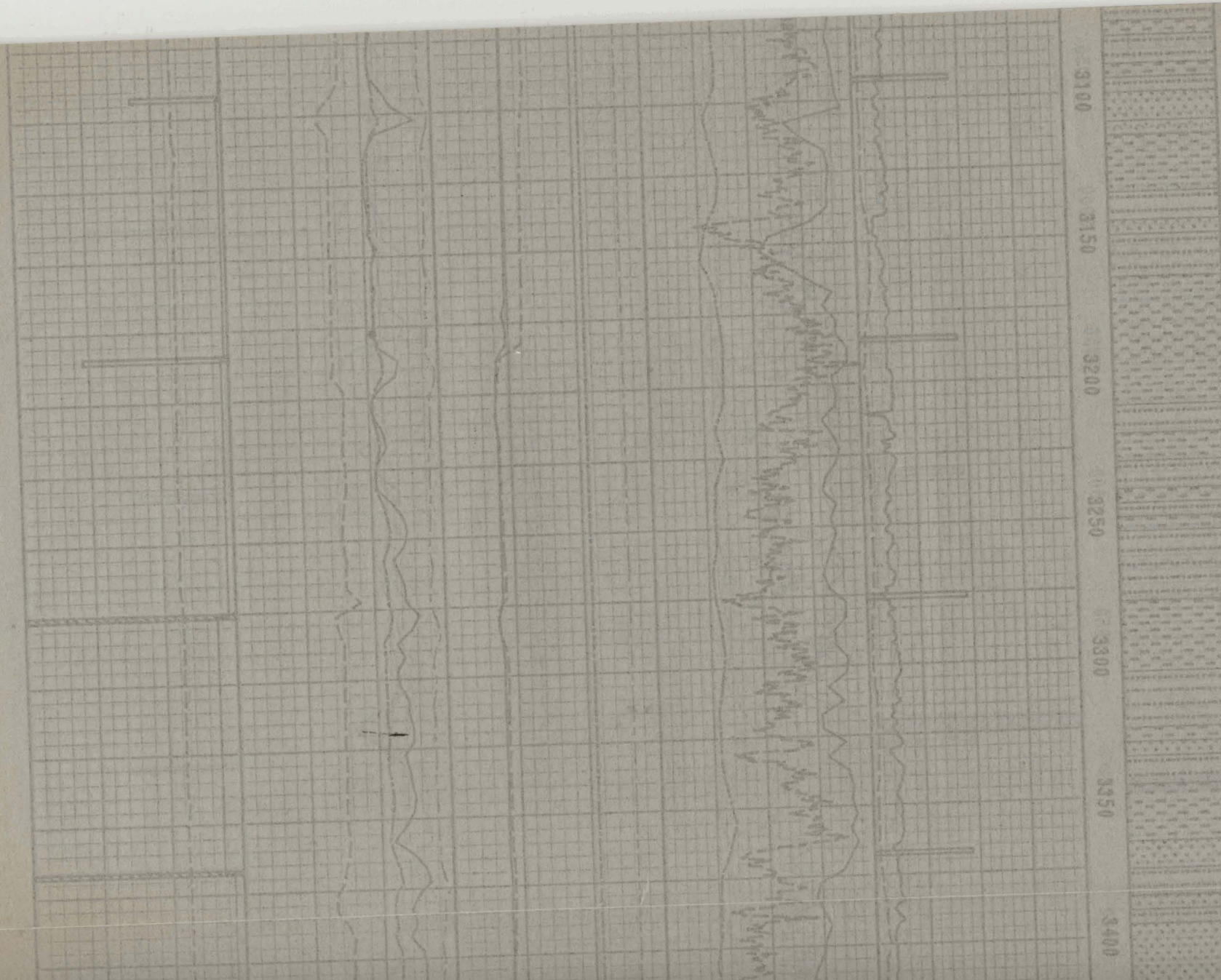
2750
2800
2850
2900
2950
3000
3050



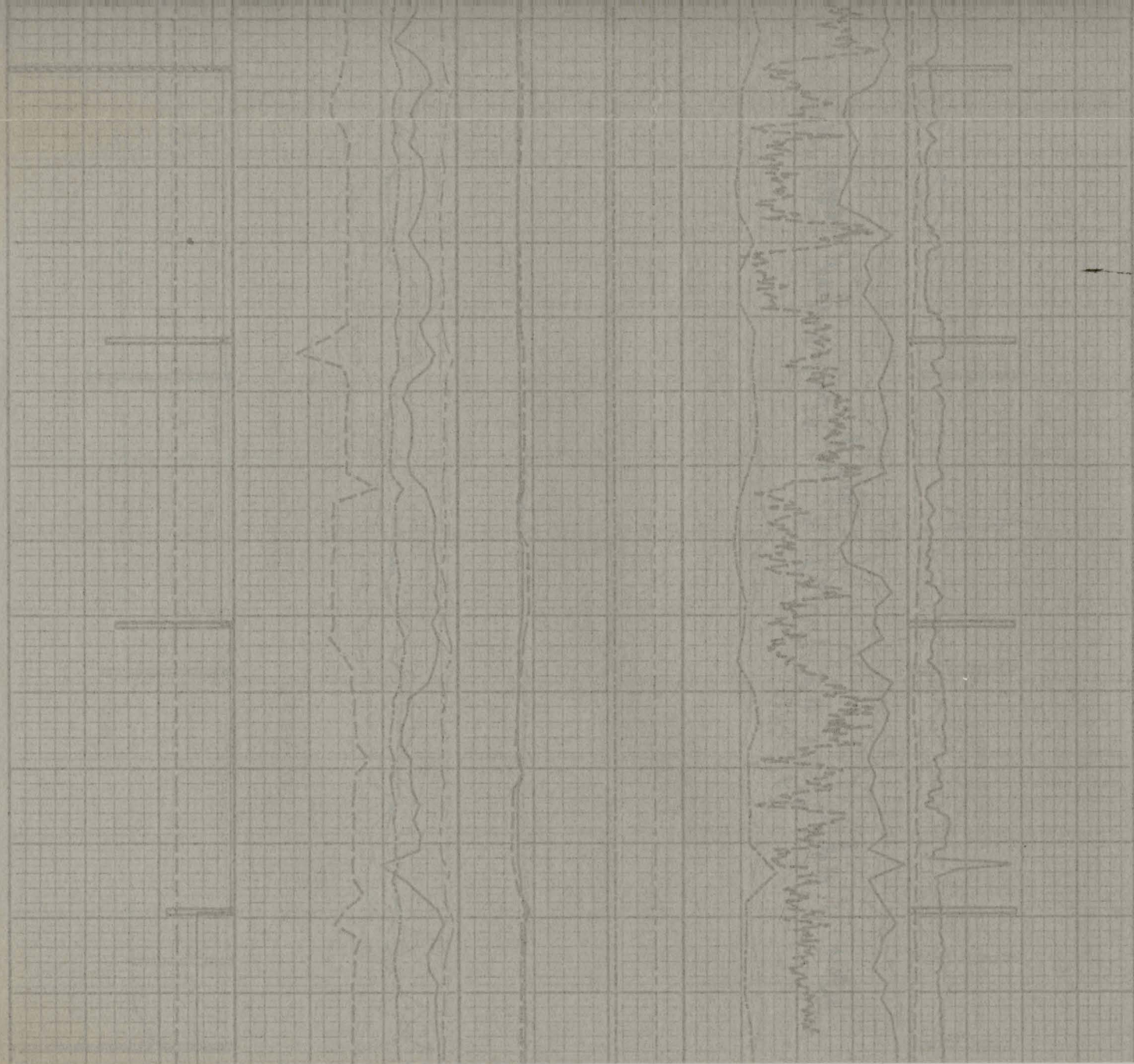
DS .55 DEG

8-15-83

DS .27 DEG



HW 9.8 V15 78
PV/YP 32/88 PH 9.9
2.2 CL 17000



3350
3400
3450
3500
3550
3600
3650
37



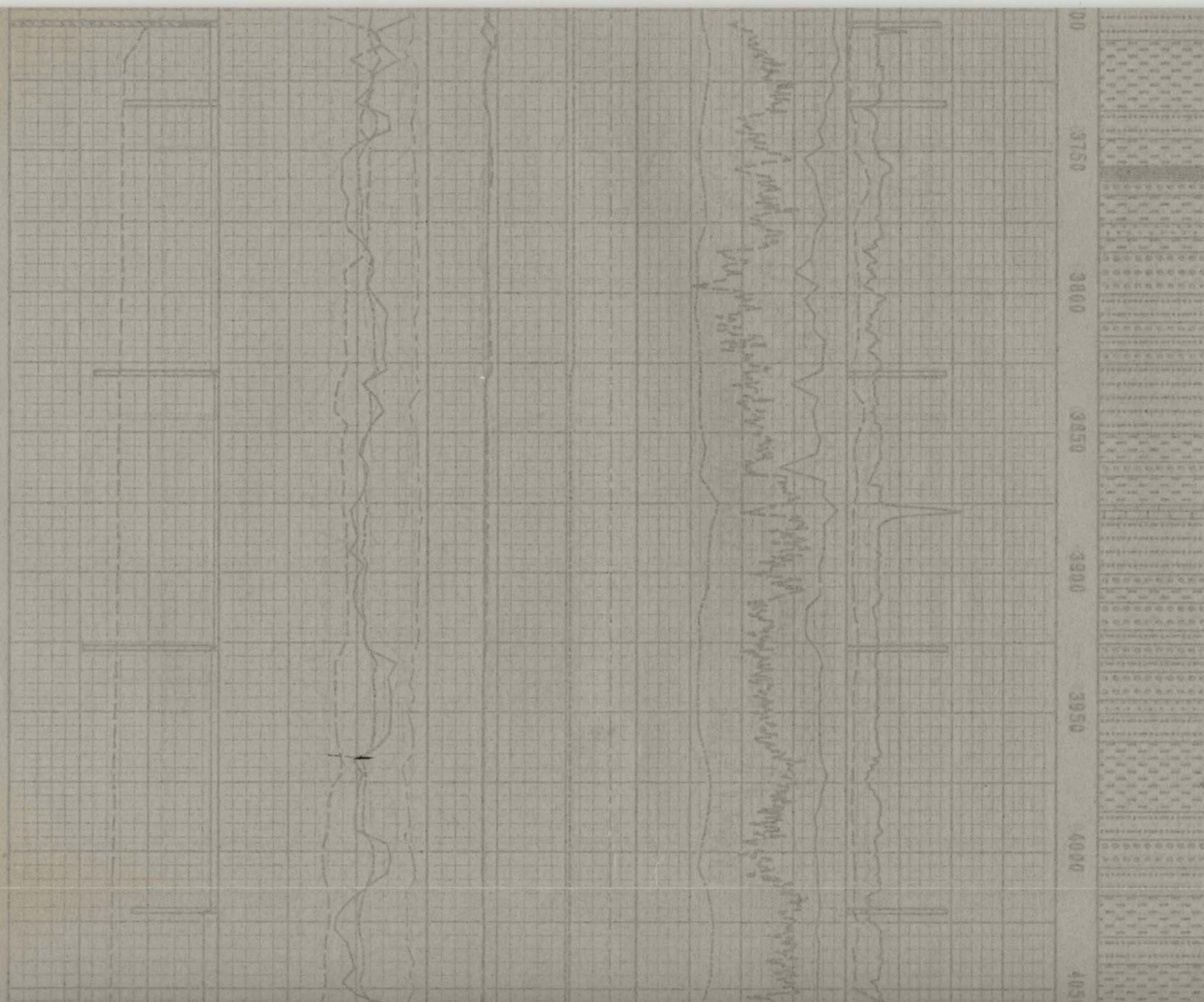
HW 8.8 VIS 78
PV/TP 32/38 PH 8.9
F 2.2 CL 17000

DB .22 DEG

DRILLED TO 3705'
SET 13 2/8" CSC AT 3681'

LOT # 15.0 SPS EMW
3-1879-23-03
NE 5 INCHES (40 DILW 1/2 BIT)
NB 6AR FDT
3x12 1x12 JETS

9/24/93



4000

4050

4100

4150

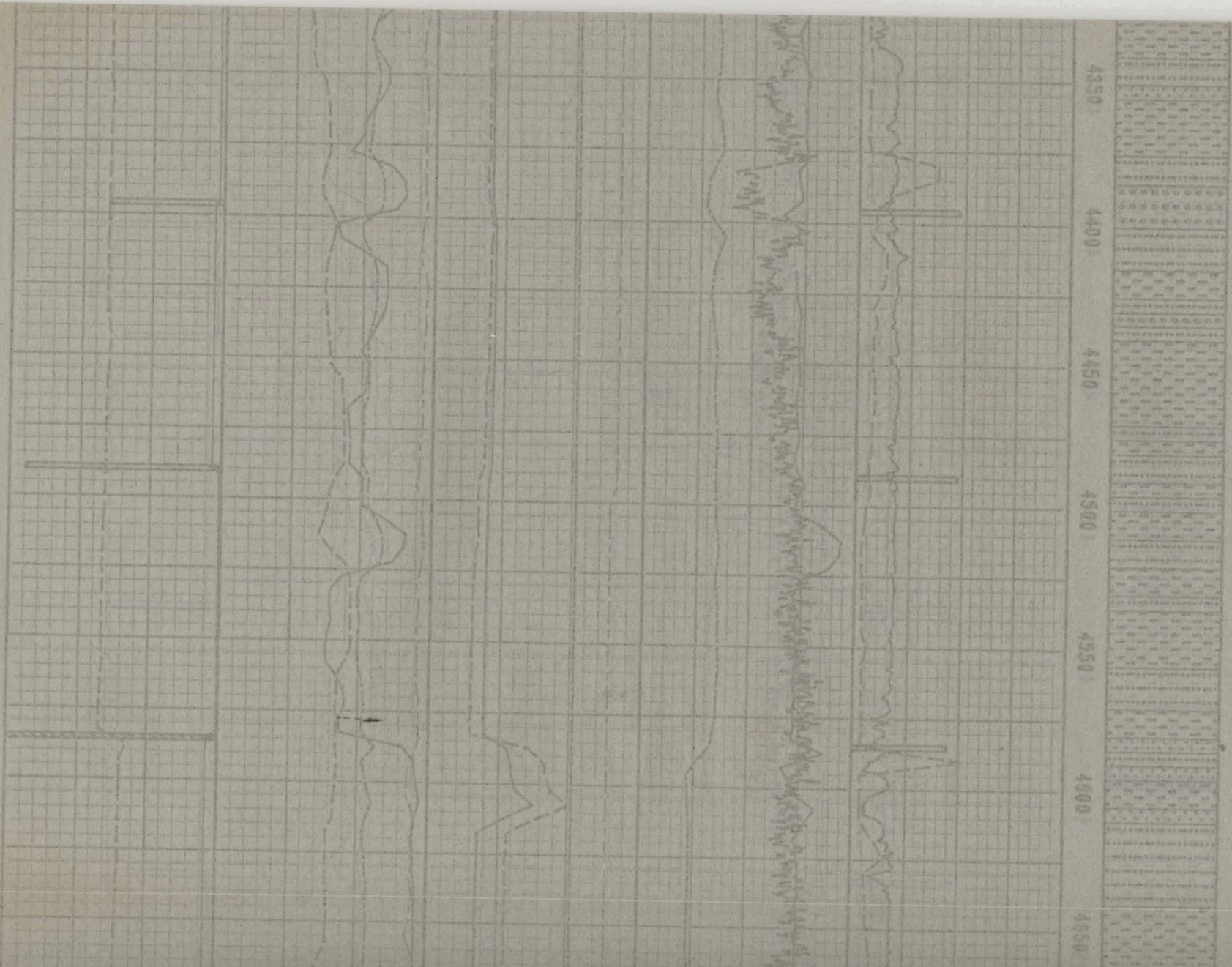
4200

4250

4300

400





4600

4650

4700

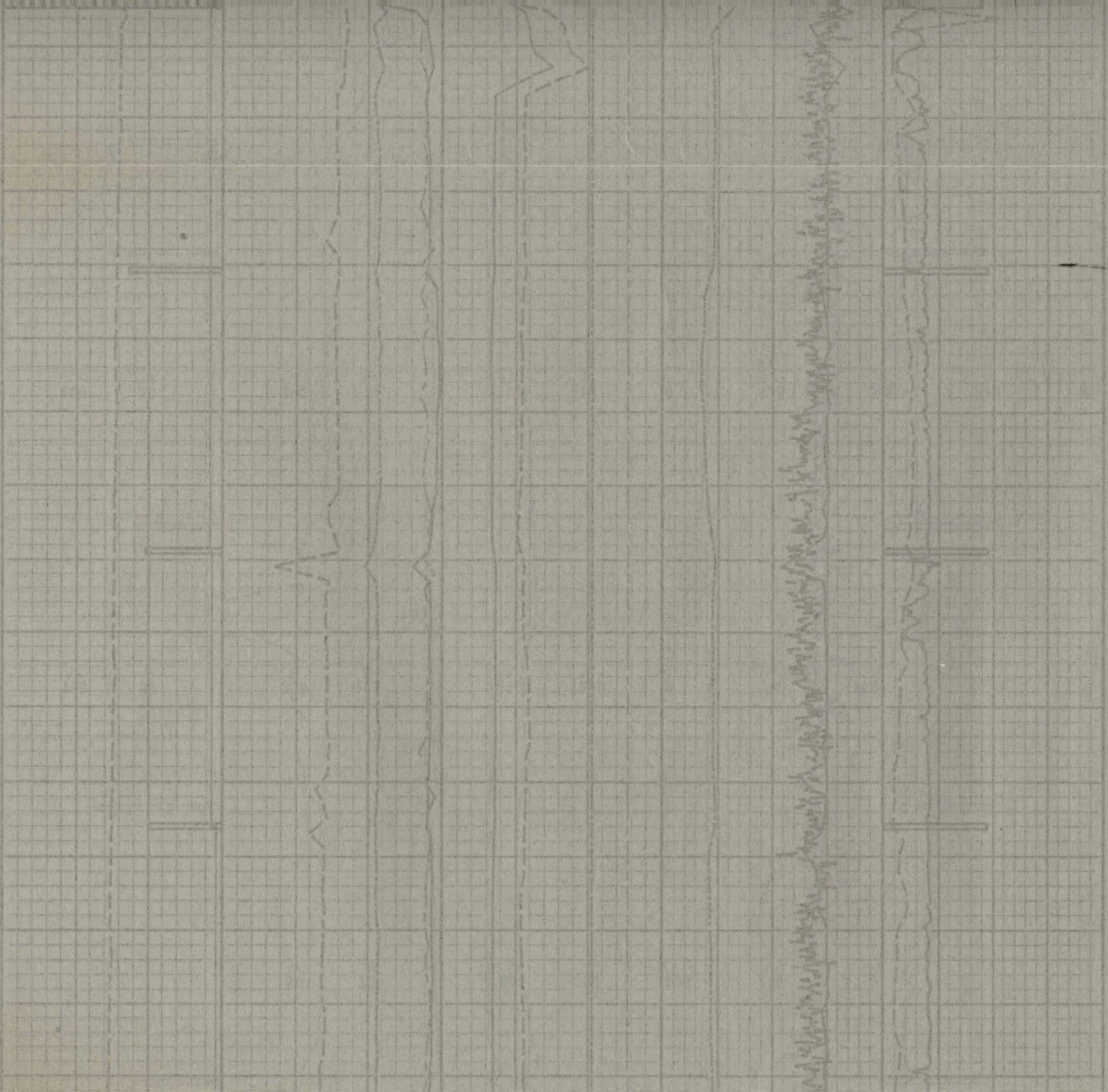
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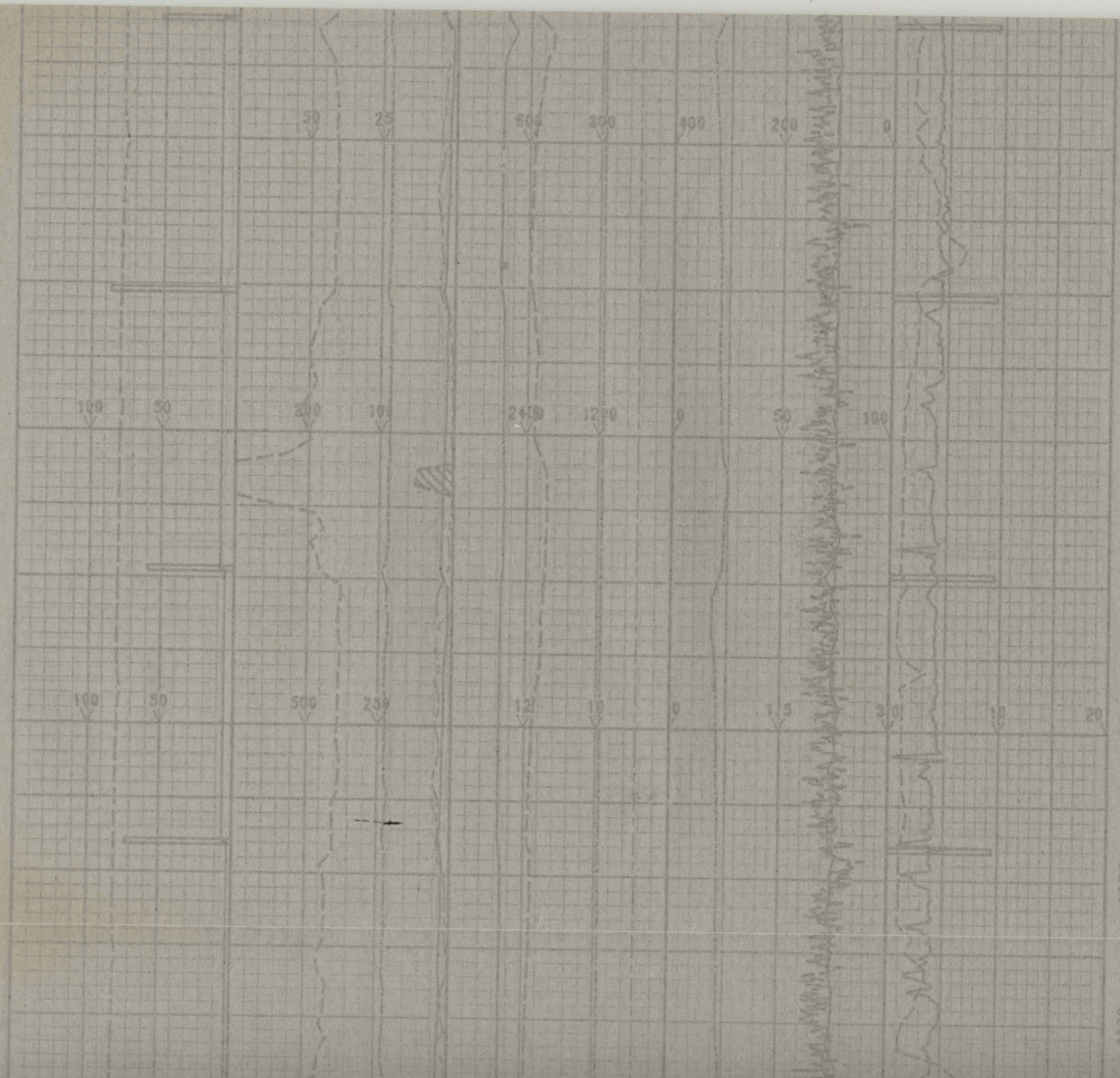
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4850

4900

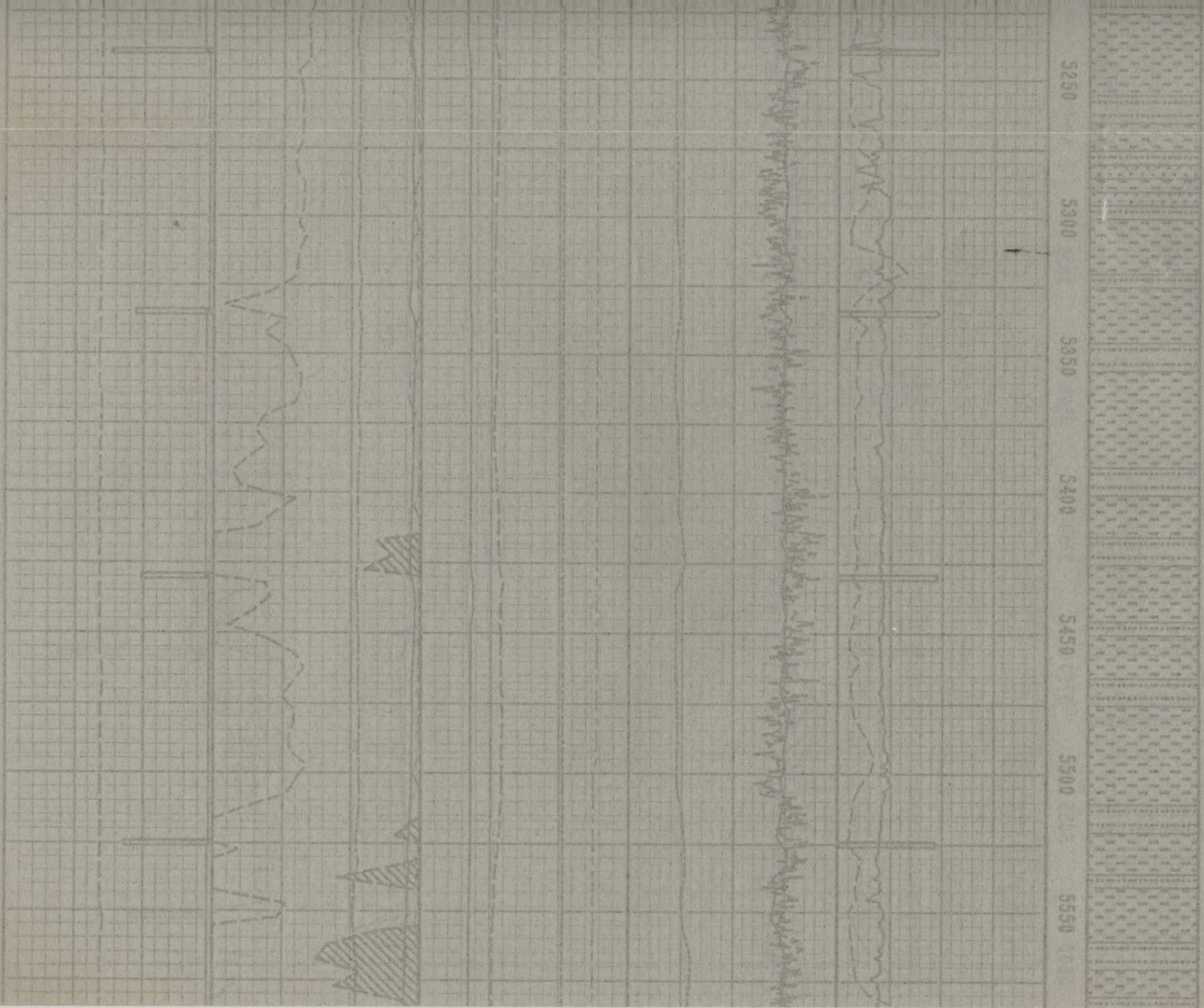
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MW 8.8 VTS 82
PV/YP 28/27 FILT 3.4
PH 8.6 CL 17000

8/23/83



5600

5650

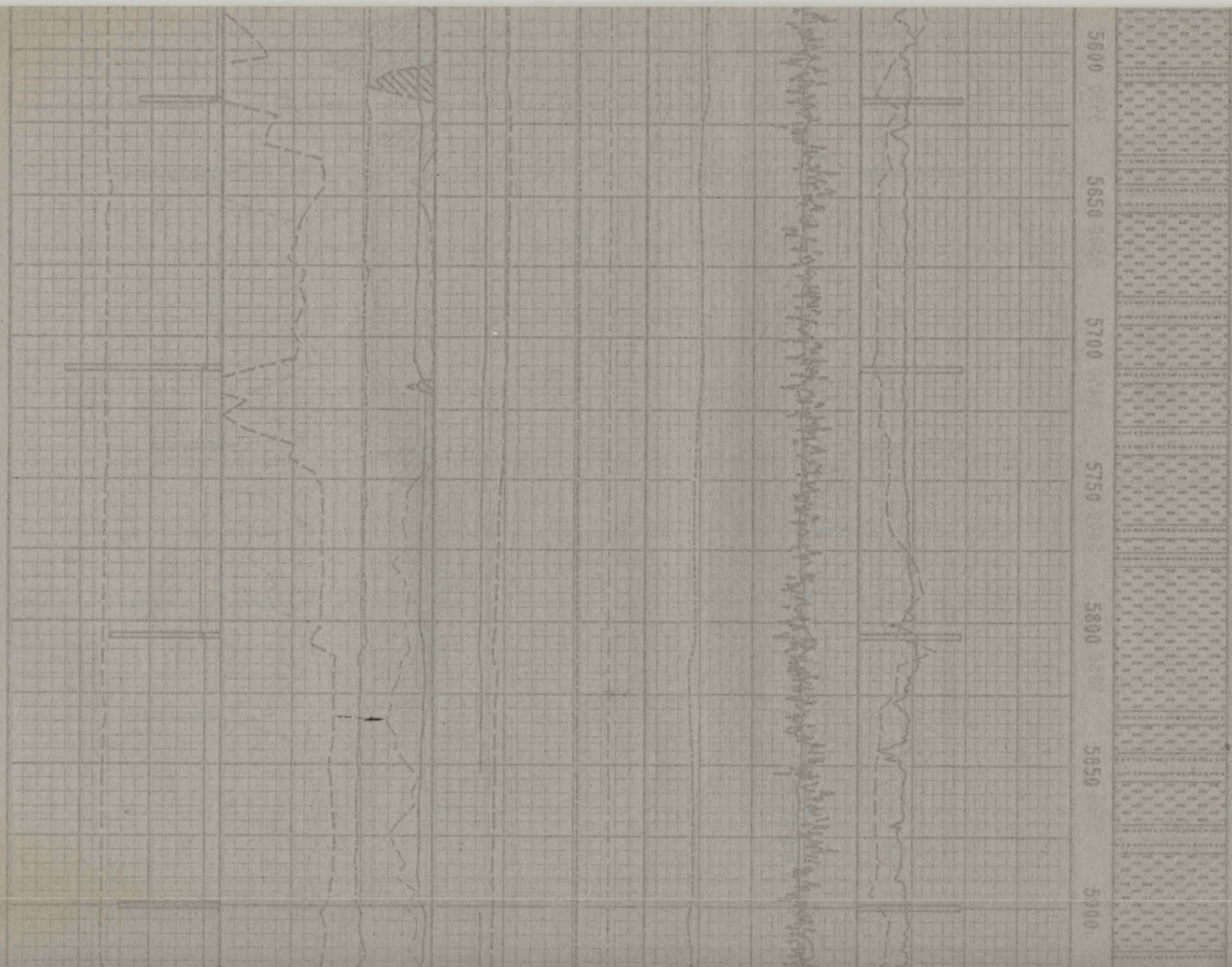
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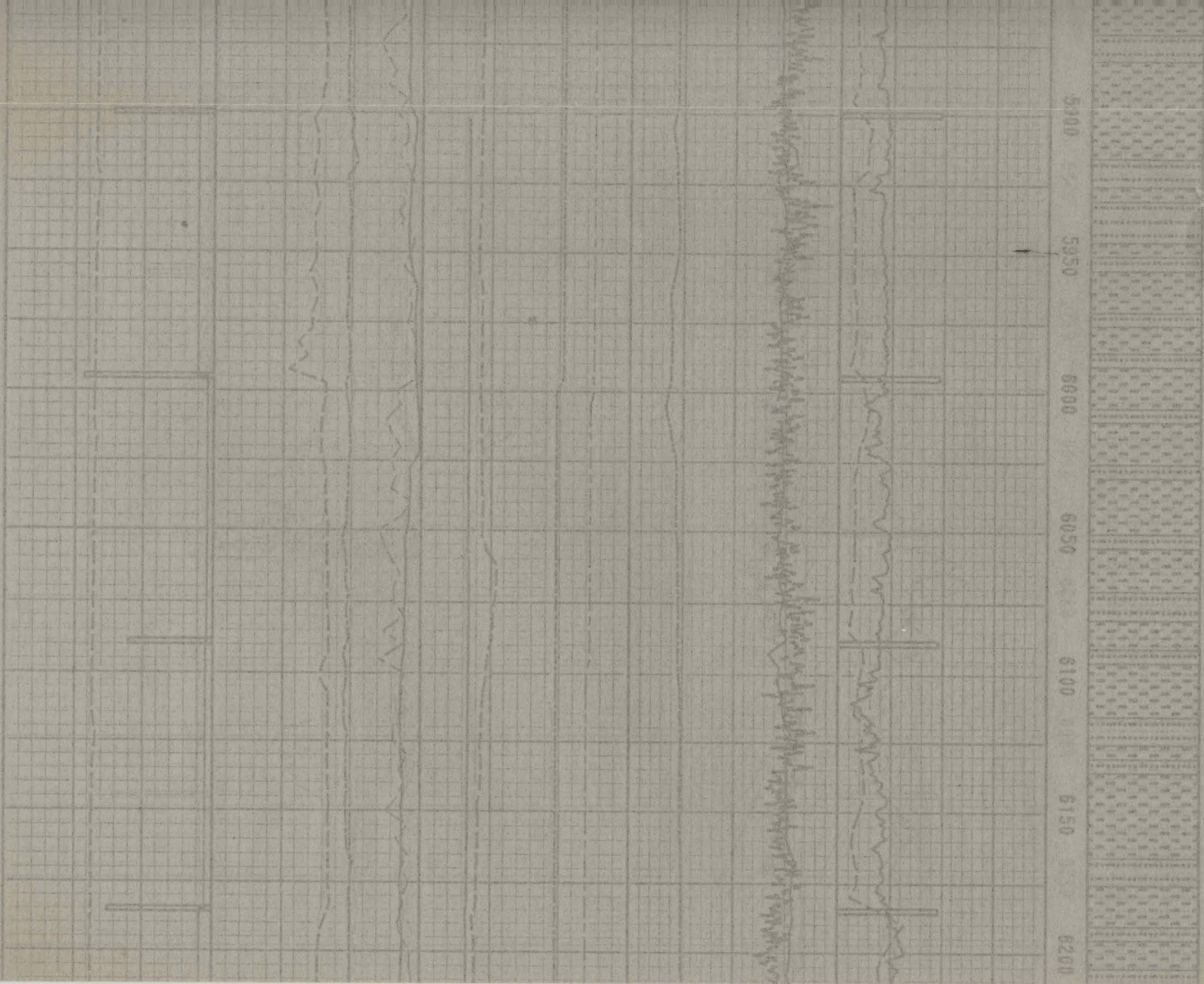
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5800

5850

5900





CBU

6250

6300

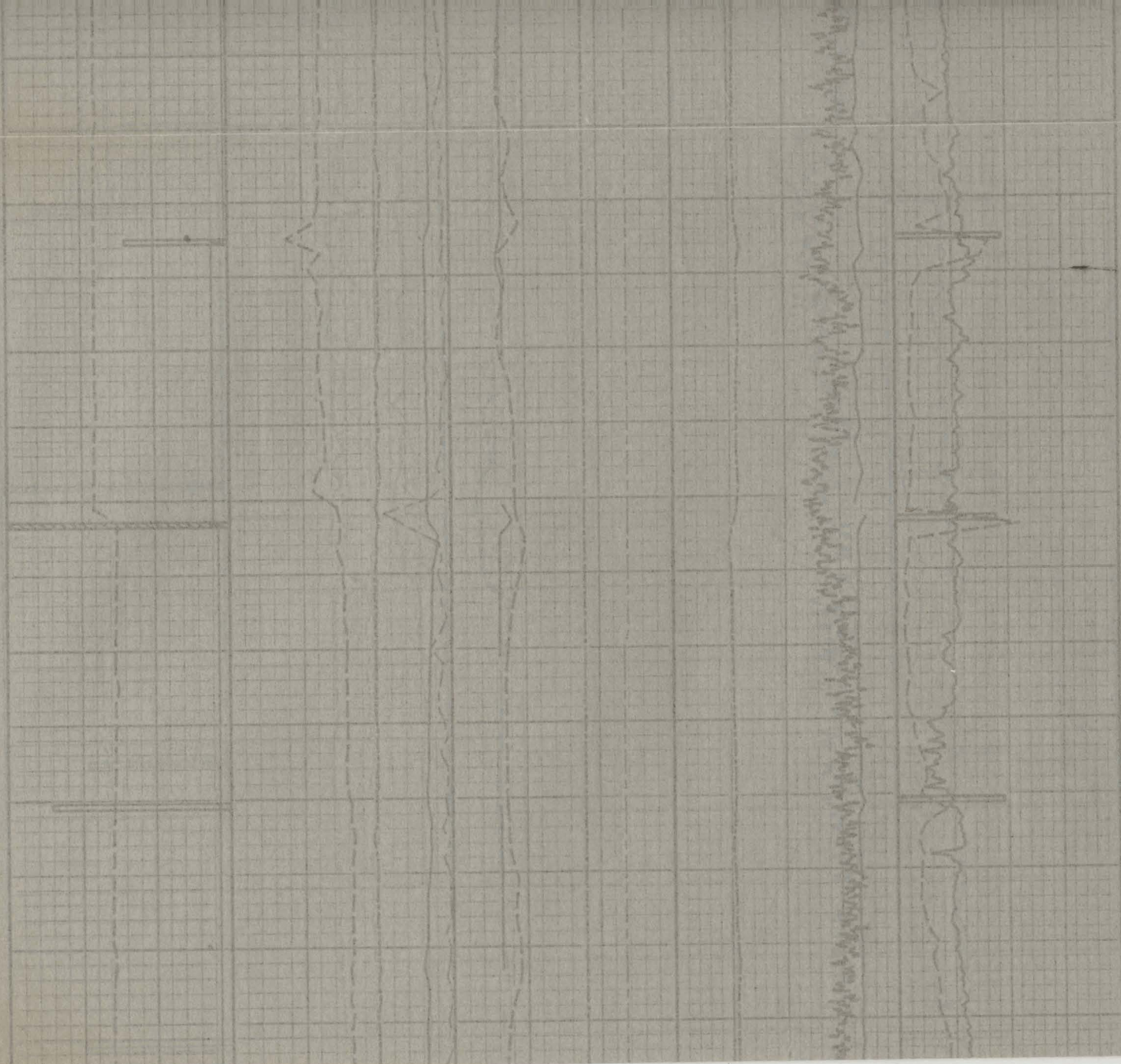
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6400

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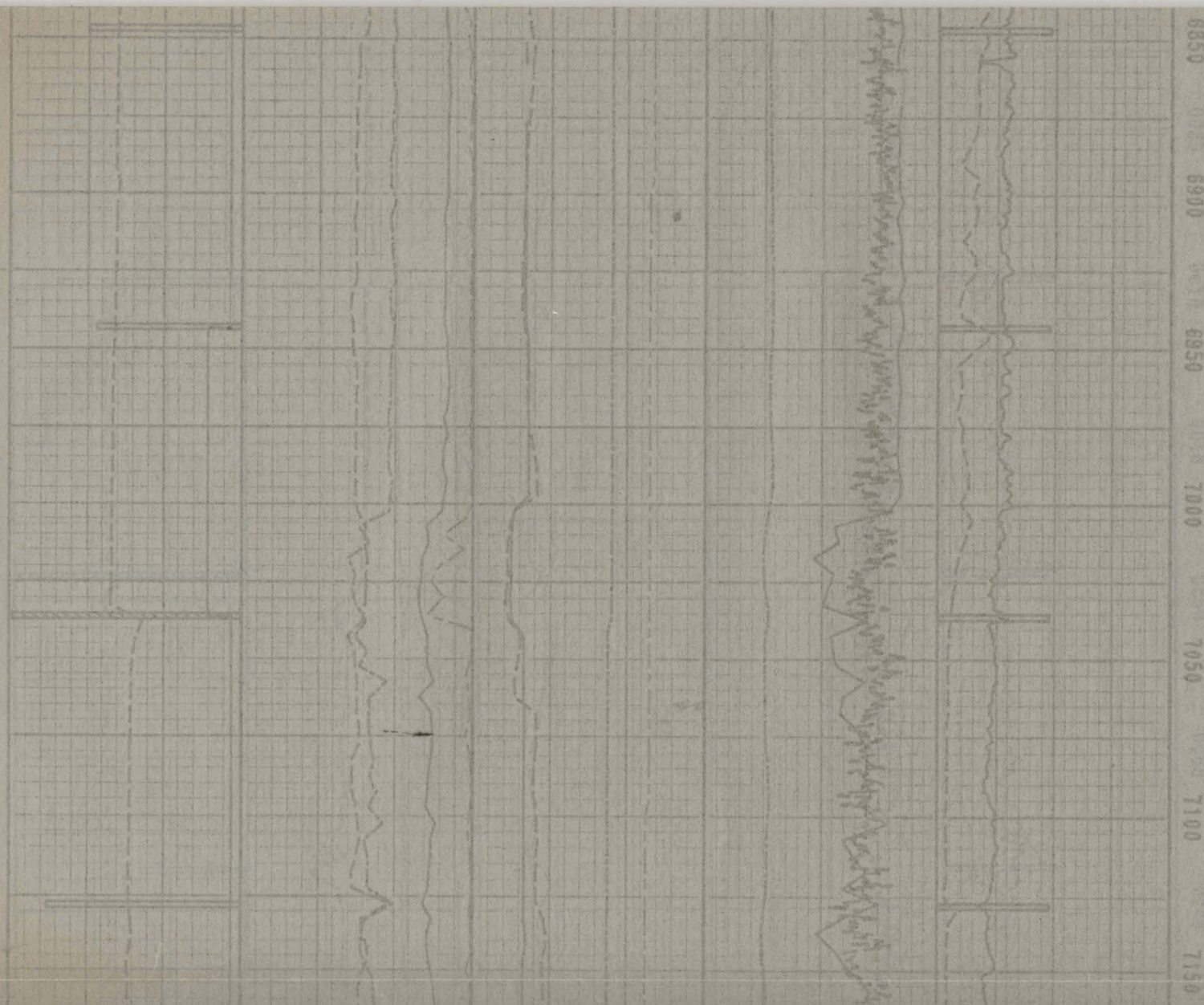
6550



6500
6550
6600
6650
6700
6750
6800

MW 10.4 VIS 84
PV/YF 30/41 FILT 3.0
PH 8.1 CL 17000

8/26/88
5m 557



6850

6900

6950

7000

7050

7100

7150

NW 10.5 VIS 57
PV/TP 25/28 FILT 2.8
PH 9.2 CL 17000

9/27/83
STG 876
9/28/83

MM 10.5 VIS 00
PM/YP 35/30 FILT 2.0
PH 8.2 CL 17800

200 100 0

7150 7200 7250 7300 7350 7400 7450

7500

7550

7600

7650

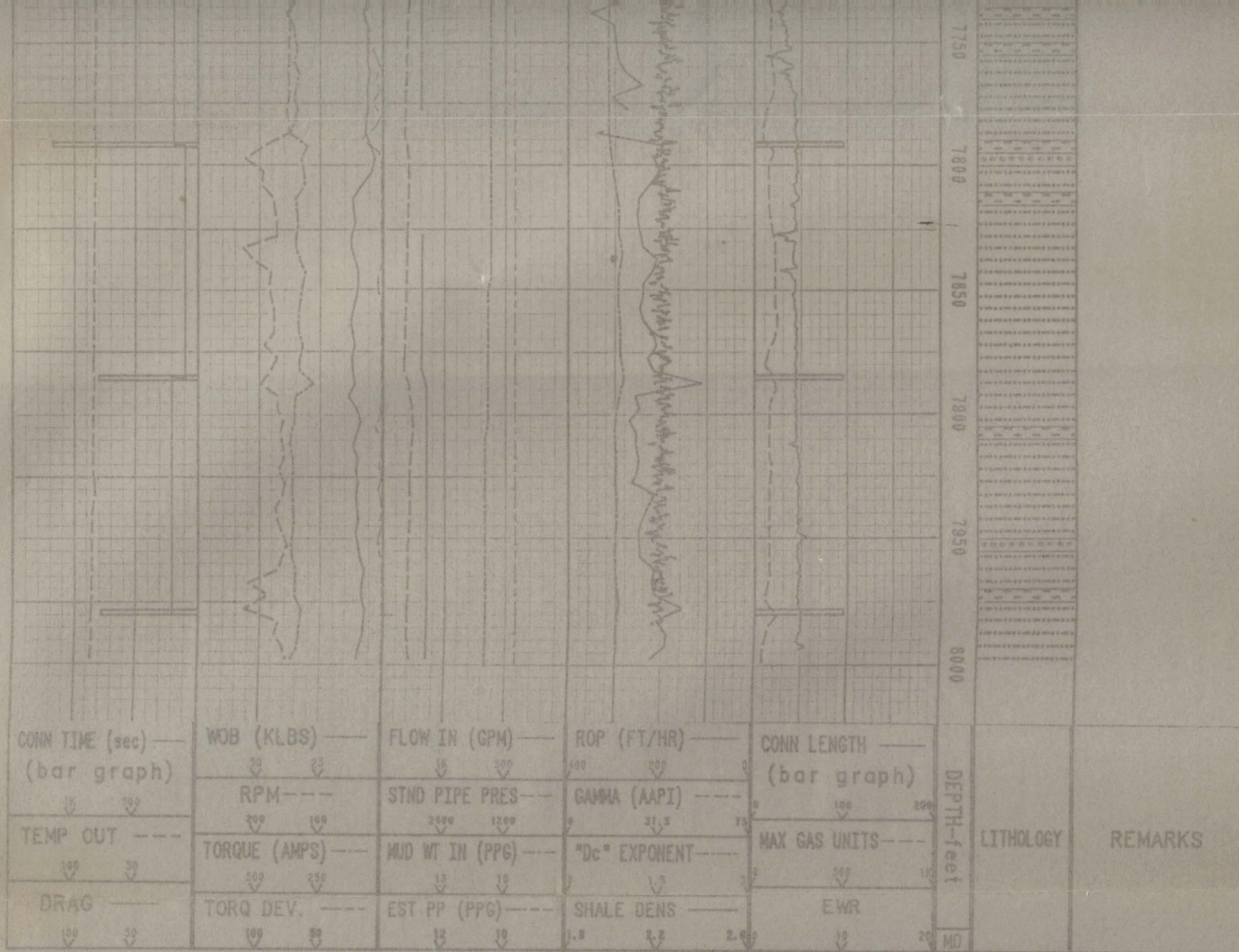
7700

7750

7800

7850

RAISE MW TO 10.1



sperry-sun
DRILLING SERVICES
LOGGING SYSTEMS

KVVLUM #3 MUD LOG

COMPANY **ARGO ALASKA INC.**
WELL **KVVLUM #3**
FIELD **WILDCAT**
REGION **KVVLUM PROSPECT NR0-4 BLK 673**
LOCATION **BEAUFORT SEA, AK**
CO-ORDS **LA 70 19'39.6 LO 145 24'16.7**
CONTRACTOR **CANMAR**
RIG/TYPE **CDR KULLUK**
TOTAL DEPTH **8000'** TVD **8000'**
SPUD DATE **SEP 8 83**

ELEVATION AND LOGGING DATA
PERMANENT DATUM **MEAN SEA LEVEL**
ELEVATIONS: K.B. **67**
D.F. **66**

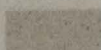
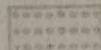
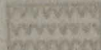


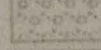

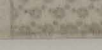
G.L./S.F. **107 WATER DEPTH**
LOG MEASURED FROM **KR**
LOGGED DEPTHS **172'** To **8000'**
LOGGED DEPTHS _____ To _____
SUPV. ENGINEER **L. PATTON** UNIT **2215**

HOLE DATA
30.0" To 309' 12.25" To 8000'
28.0" To 1022' _____ To _____
17.5" To 3681' _____ To _____

CASING DATA
30.0" To 309' _____ To _____
20.0" To 1022' _____ To _____
13.375" To 3681' _____ To _____

MUD TYPES
SPUD _____ To 1022'
CHPA-SEA H2O _____ To 8000'
_____ To _____

LITHOLOGY SYMBOLS

| | |
|---|---|
|  Coal |  Sandstone |
|  Tuff |  Sand |
|  Chert |  Gravel |
|  Limestone |  Conglom |







ABBREVIATIONS
DRILLING DATA

| | | | |
|------|------------------|-----|-------------------|
| MS | Mud Bit | LAT | Logged after Trip |
| MSB | Mud Bit | U | Up Chute |
| TD | Turbine Drill | SC | Shut-in Gas |
| PGCB | Polycrystalline | STB | Shut-in Test |
| | Blended Compound | CS | Connection Gas |
| | Bit | BT | Bottom Hole Test |
| CS | Cut Bit | BS | Direction Survey |
| SB | Stemmed Bit | SC | South Correction |
| WOB | Weight on Bit | SC | Shut-in Test |
| MPH | Rev Per Minute | SC | Shut-in Test |
| CO | Chronicle Cut | SC | Shut-in Test |
| FR | Partial Rotation | FLY | Flowline Temp. |
| NR | No Rotation | DET | Detachable Temp. |

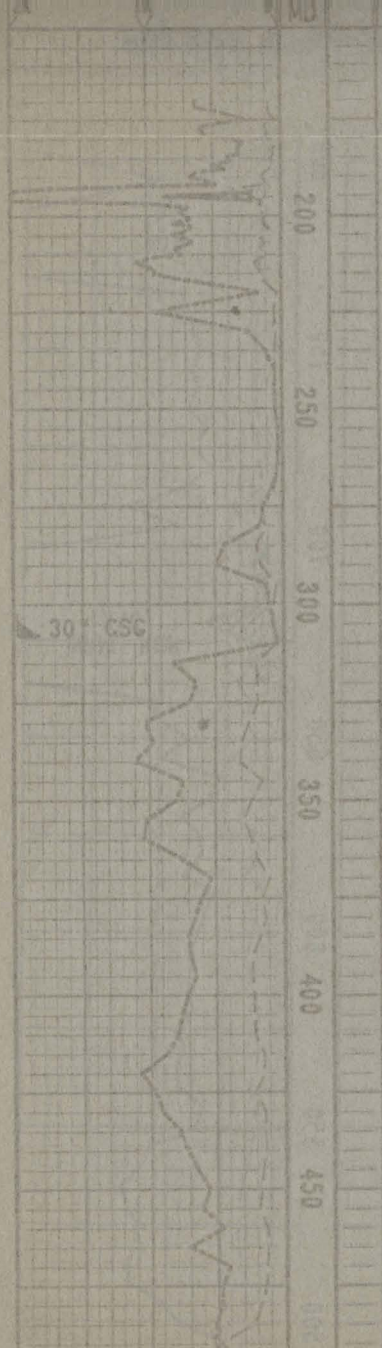
MUD DATA

| | | | |
|----|----------------------|----|----------------------|
| W | Mud Density | PV | Plastic Viscosity |
| V | Funnel Viscosity | YP | Yield Point |
| FL | Filter Loss | S | Slurry Content |
| FS | Filter Cake | S | Slurry |
| CL | Clayity | RM | Mud Reactivity |
| PM | Hydrogen Ion Content | RM | Filterate Reactivity |

ENGINEERING DATA

| | |
|---|---|
|  C1 Core No. 1 |  Gas Trace |
|  C2 Core No. 2 |  Gas Trace |
|  C3 Core No. 3 |  Gas Trace |

RECEIVED
OCS DISTRICT OFFICE
OCT 19 1983
MINERALS MANAGEMENT SERVICE
ANCHORAGE, ALASKA

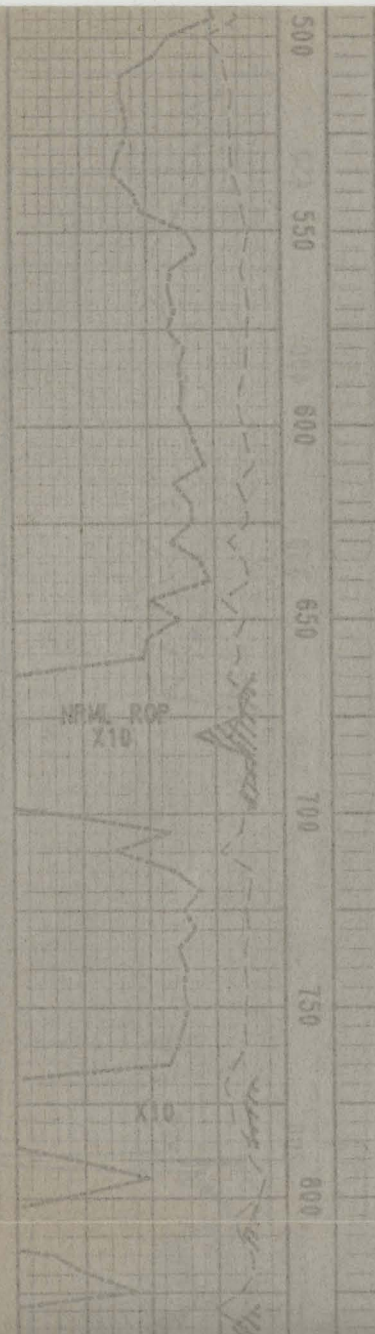


PERMANENT DATUM
MEASURED FROM MSL.
MEAN SEA LEVEL -101'
MUD LINE -172' BELOW KB
DRILL PILOT HOLE FOR GLORY.
HOLE BIT
NO 1 ATXG1 28" 3-21, 1-22 Jct
SPUD IN 8/9/83

JET DRILLING
28" CONDUCTOR

LAND 30" CSG AT 309'
IN GUIDE BASE
8-10-83

DRILLING WITH SEA
WATER WITHOUT RETURNS
TO SURFACE



500

525

550

575

600

625

650

675

700

750

775

800

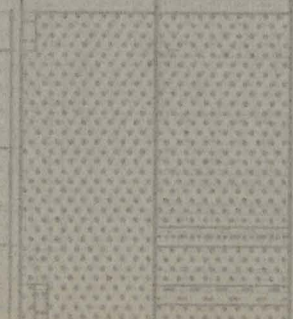
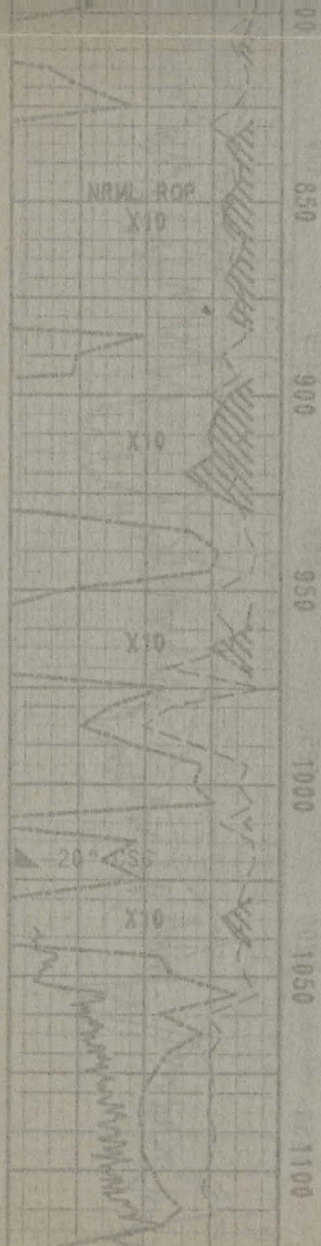
NOM. ROP
X10

X10

DATE: 10/10/2002
TIME: 10:00 AM

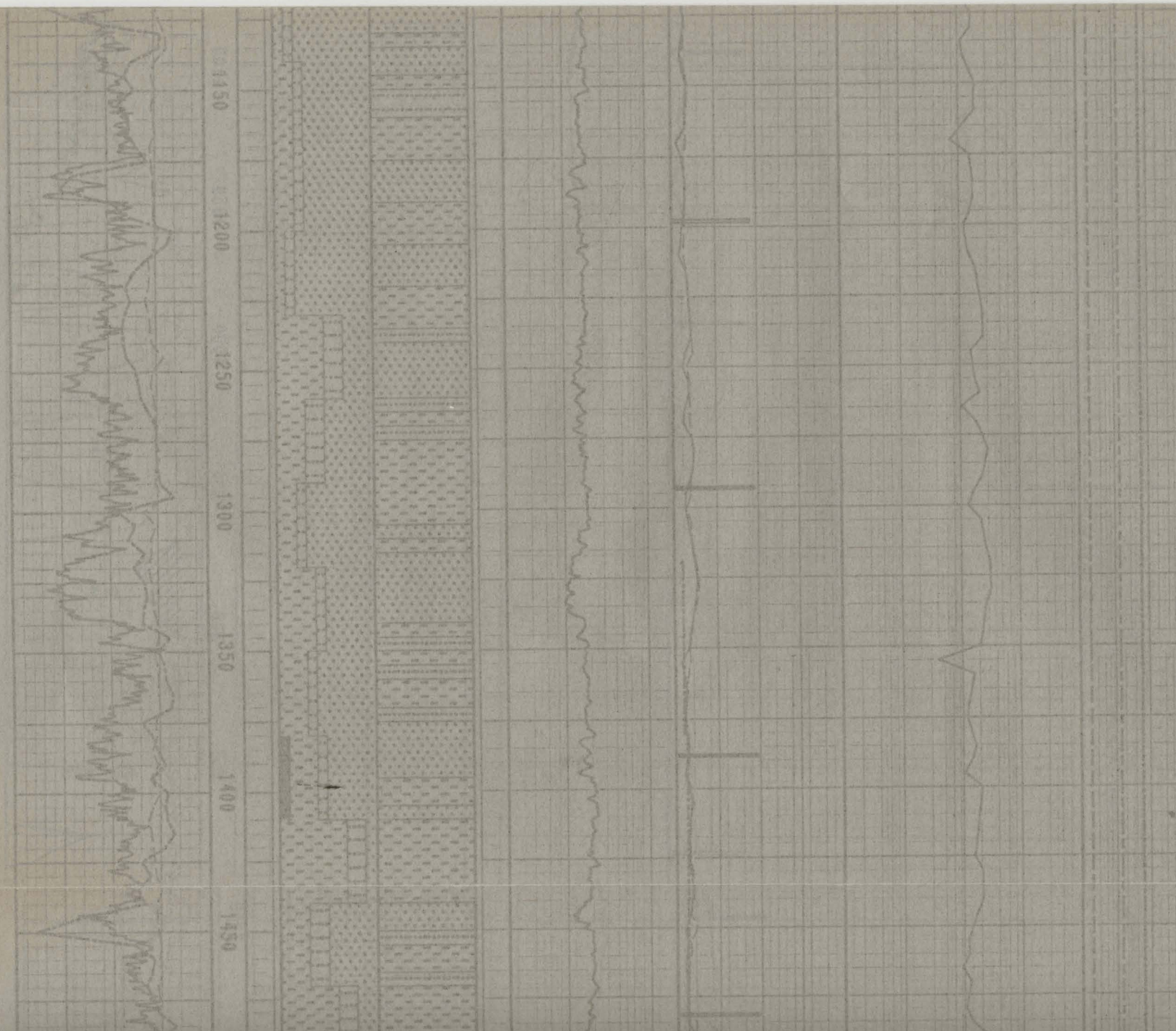
PUMPING HIGH VIS
SWELPS TO CLEAN HOLE

DATE: 10/10/2002
TIME: 10:00 AM



DRILLED TO 1049'
 SET 20" CSC AT 1022'
 LOT = 14.3 BPS CM
 9-11/9-12-82
 HB 2 SS33SC14
 HB 2 (DSS)
 JETS 2x12, 1x12

SD-H DKCY BLK WL BRN CON TR RED
 PRED DKCY W-VGR PRED COR.
 TR FGR ANG-RND PRED SPANG
 VPSRT UNCONS TR RWRKD FGR
 SS 90% DKCY LITH FRACS 10%
 VOL FRACS TR PYR WOOD FRACS
 TR FQSS GAST TR WH SHELL



FRACS. NSUPG

DS .57 DEG

ABNDT WH POSS SHELL FRACS

CLY-TN WH IP. VLTORN. AMORPH.
MIC MICA IP. TR CARB SPECS.
SLTY IP. INTSD W/ SD OR SD
INCL. PYR WOOD FRACS. VSFT +
HYDRD

9-14-88

TR PYR WORM BURROWS

VABNDT CARB WOOD FRACS INTSD
W MGR QTZ SD

TR TUFF-WH. YEL. XLN-MICXLN.
MGR IP. DUL. YELWH. MIN FLOR

COAL-BLK. VOKBRN. BLKY. FLTY.
GRONG TO FIS IP. LIG. NVIT.
VWOODY TR PYR. INTSD W/
MGR QTZ + LITH SD. CAS
BUBBLES LEAKING FROM
CHIFFAGE

DS .08 DEG

SD-LT-DKCY. WH. CLR. PINK. GRN.
TR. RED. PRED. DKCY. VF-YOGR.
PRED. CCR. OCC. SML. PBL. SZ.
AND. VANC. PRED. AND. FRACS.
VSFT. UNCONS. POSS. CLY. MIX.
MAT. BOX. DKCY. LITH. FRACS.
20% CLR. EROD. QTZ + CHL +

COAL. LR. VORBN. BUKY. SLTY.
GR. TO FIS. IF. LIG. NUT.
VWOODY. TR. PYR. INTRO. W/
MCR. QTZ. + LITH. SD. GAS
BUBBLES. LEAKING FROM
OUTFLOWS

DS .08 DEC

SD-LT-DKCY. WH. CLR. PNK. GRN.
TR. RED. PRED. OKCY. VF-VGR.
PRED. CCR. OCC. SM. PBL. SZ.
RND. VANC. PRED. AND. FRACS.
VPSRT. UNCONS. POSS. CLY. MTRX.
MAT. 80% DKCY. LITH. FRACS.
20% CLR. FRSTD. QTZ. + CHT. +
VOL. FRACS. TR. PYR. NSOFC

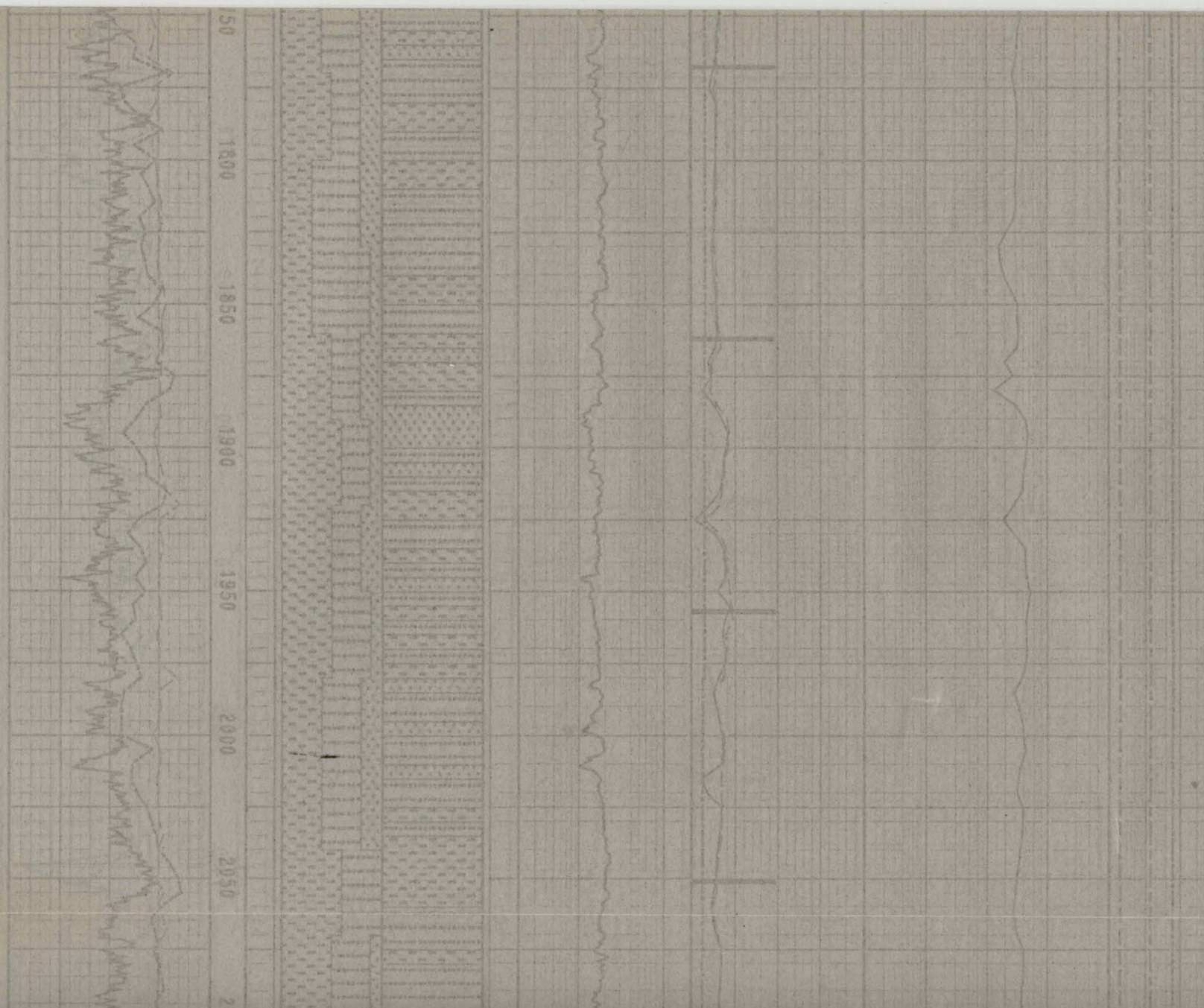
SLY-LTCY. M-LTRN. UNCONS. IN
SMPL. LITH. + QTZ. TR. MIC. MICA.
ARG. INTRO. W/ CLY. + SD. GRDNG
TO CLY. TR. CARB. SPECS. +
FRINGS

HW 8.8 VIS 43
PV/VP 10/13 PH 10.0
FILT 5.1 CL 17400

TR. SM. FOSS. CAST OR COILED
FORAM

CLY-TN. VLTGYBRN. AMORPH. IN
SMPL. SLTY. TR. MIC. MICA.
ABNDT. WOOD. FRACS. ABNDT.
FOSS. VSFT. + HYDRD

SD-M-DKCY. TRNSL. MLKY. OCC.
BLK. TR. GN. M-CCR. SBANG-
RND. MICR. PYR. PRED. LITH.
+ CHT. FRACS. 40% QTZ. TR. COAL



FRAGS. ABNDT. WOODLIGN FRAGS.
UNCONS. NSOFC

CLY-LTGY-LTGYRN.SLT-
VSLTY. MICR. MICA IF. TR
SHELL FRAGS. SFT. HYDRD

DS .20 DEG

SLT-LTGY. PRED ARG. SOY IF.
MICR. MICA IF. TR FOSS
FRAGS. OCC PYR. SFT

SD-GY. TRNSL. OCC BLK. TR GN.
M-GS. OCC VF-FGR. SBANG-
MND. M-WRSTO. SOZLITH. 20Z
CHT. SOZOTZ. MICR. PYR. IF.
TR. HEWRKO. COAL. TR. CALC.
NSOFC

SLT-LTGY. SLT-VARG. PRED SOY.
TR. CALC. ABNDT. WOOD + LTG
FRAGS. MICR. PYR. IF. SFT

DS .08 DEG

CLY-LTGY. SLT-VSLTY ABNDT
WOOD + LTG FRAGS. TR. PYR.
HYDRD. INTRO. W. SD. VSLTY.
GNMT

SLT-LTGY. MICR. MICA. IP. SLT-
VARG. TR. CARB. SPECS. TR. CALC.
SDY. STGRS. SFT

CLY-LTGY-LTGYBRN. SLTY-
MICR. MICA. OCC. SDY. INCR
GMMY. HYDRD. SFT

SLT-LTGY. SLT-VARG. SDY. IP.
OCC. LIG. + WOOD FRAGS. TR.
PYR. SFT

CLY-LTGY-LTGYBRN. SLTY-
VSLTY. SDY. IP. TR. CARB. SPECS.
TR. CALC. MICR. MICA. IP.
HYDRD. GMMY. SFT

03 . 22 DEG

STG 133

CLY-LTGY. SLTY. OCC. CARB
SPECS. TR. CALC. OCC. CHT
PBL. TR. RWK. COAL. TR.
FOSS. HYDRD. GMY. SFT

W. 74 VES 12
 10/11 70/30 PM 10.1
 PLOT 3, 2 CL 17200

ABNDT W/ POSS SHELL FRAGS

CLY-INGY M-LTBRN. AMORPH.
 ABNDT SD INCL. SLTY IP TR
 VCALC SS STRNGRS. VSFT +
 HYDRD

DS .SS DEG

COAL-BLK. VDBRN. FLTY. LIG.
 ABNDT FYR WOOD FRAGS. SLTY
 IP. INTRD W/CALC SS STRNGRS.
 MFRM + BRIT

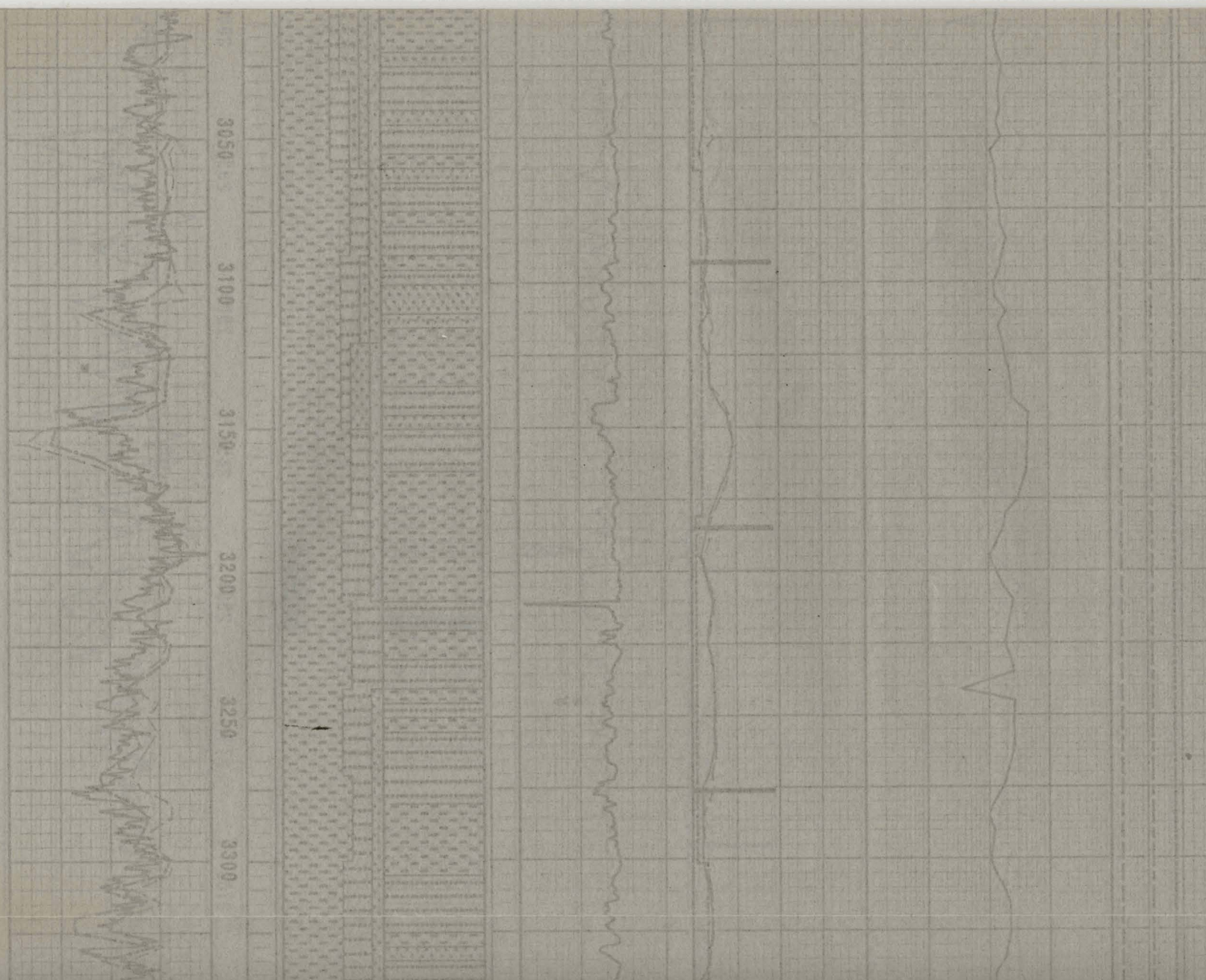
LS-WH. IN. BRN. MOTT. VIT. XLN.
 POSS SPAR. CHKY + MICR IP.
 INTRD W/ F-MGR QTZ SD CRS.
 HD + BRIT

9-15-05
 SS-LT-MGY WH. CLR. TR. VITBRN.
 VF-MGR. FRED. FGR. SPANG.
 SBRND. FRED. SBRND. WSRT.
 VMCMT VCALC CNT. TT. NO VIS
 POR. ABNDT DUL. YELORNG MIN
 FLOR. VTRM-HD + BLKY

SS-A/A. 6CMNG FNR. GR. OCC
 PEA. SZ. PSL. M-MCMT. CALC
 NSOFC

TR FYR WOODS + WORK BURROWS





ABNDT PYR WOOD FRAGS CRDNG
TO LIG COAL

CLY-LT-MGY, LTORN, AMORPH.
CALC. VSLTY. CRDNG TO SLT
IP. SD. INCL. VSFT + HYDRD
DS .27 DEG

GVL-M-DKCY, SM PBL SZ.
SB-WIND, MSRTD. FRED
CHI. FLTG IN. CLY

SB-CLR, LTCY, TR GRN, VF-FGR.
OCC MGR SBANG-RND, MSRTD.
10% OTZ, 20% LITH, 10% CHI.
TR PYR, UNCONS IN SLT/CLY
MTRX, NSOFC

CLY-LT-MGY, OCC DKCY, MOTT.
SLTY, GRDG TO SLT, MICR
MICA IP, OCC FLTG CHI PBL.
GMY, HYDRD + SFT

SLT-LTGY-MGY, AND SLT SDY
IP, MICA, OCC CARB
SPECS, SFT

CLY-LT-MGY, LTORN, OCC
DKCY, MOTT IP, VSLTY
SDY IP, VSFT + HYDRD

DS .25 DEG

3300

3350

3400

3450

3500

3550

3600

CLY-LT-MGY. LTORN. OCC.
DNGY MOTT IP. VSLTY.
SDY IP. VSFT + HYDRTD

DS .25 DEG

SD-CLR. WH. LTGY. VF-FGR.
ANG-SBRND. WSRD. PRED.
QTZ TR PYR. UNCONS IN
SLTY CLY MTX. NSOFC

MW 8.3 VIS 78
PV/YP 32/50 PH 8.9
F 2.2 CL 17000

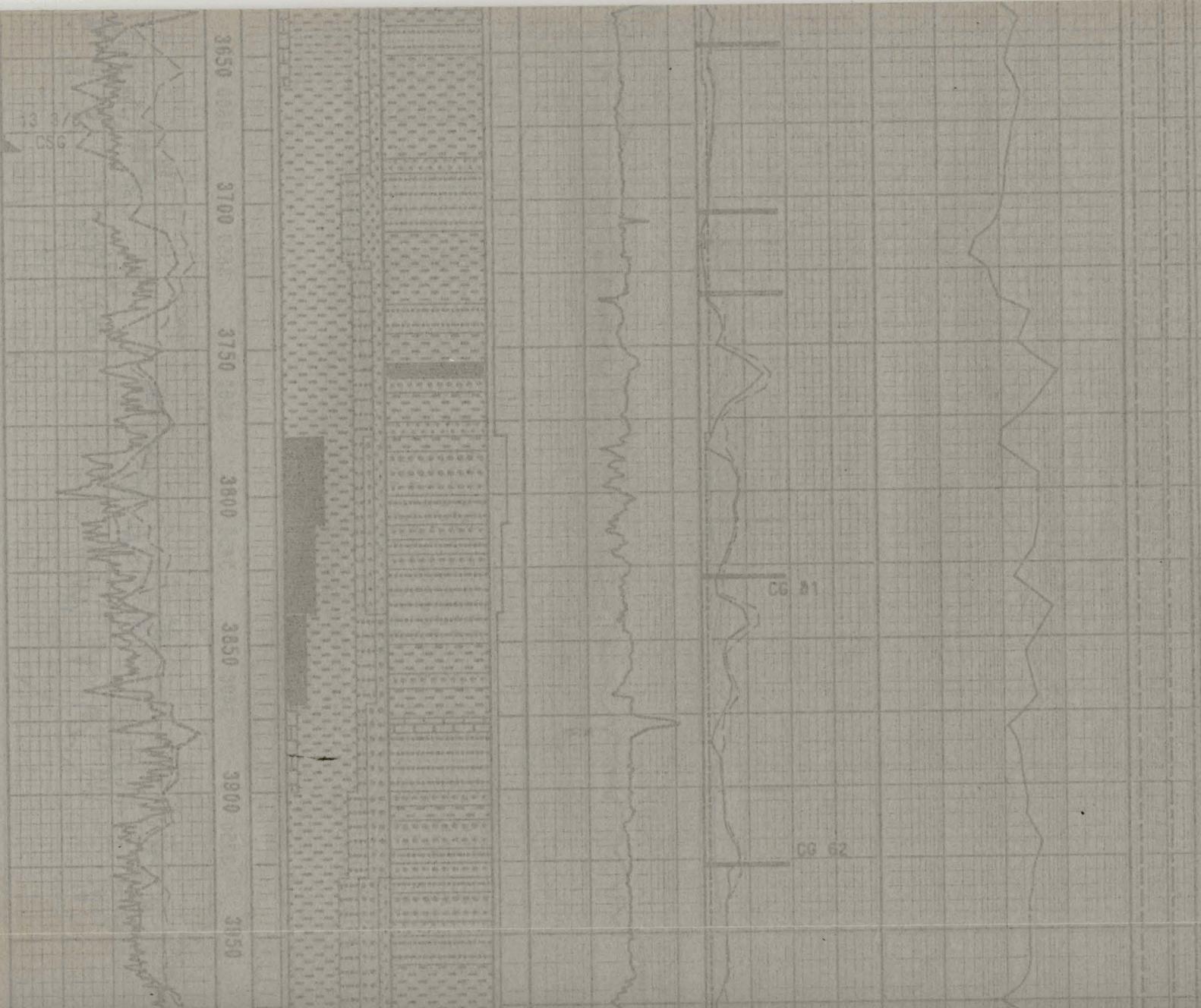
CVL-M-DKGY. BLK. CRS SD-PEA
SZ SBANG-WIND. M-PSRTD.
50% CRT. 50% LITH FRACS.
OCC PYR. OVRGRWTHS. FLTG
IN SLTY CLY MTX

CLY-LT-MGYERN. MGY. SLI-
VSLTY SLI. CALC. SLI-
SDY IP. AMORPH. HYDRTD.
CMY + SFT

SD-CLR. LT-MGY. VFGR. OCC.
FGR. ANG-SBRND. W-WSRTO
UNCONS IN CLY MTX. PRED
QTZ. OCC CRT. NSOFC

CLY-MGY. CYBRN. SLTY. OCC.
SDY STRCS. TR. WOOD FRACS.
SLI. CALC-CALC. IP. HYDRTD.
SFT + STKY

S9-LT-MGY. CYBRN. WH. BLK.
VF-FGR. SBRND-SBRND.
WSRTO. PRED W/ TT. CALC. CRT.
OCC ARG. MTX. NSOFC



CHKY IP. CALC. SFT-PRM

09 .22 DEG

CLY-MGY-CYBRN. SLTY. SLT
SDY IP. SLT CALC-CALC
CHKY. HYDRID. SFT
DRILLED TO 2705'
SET 13 3/8" CSG AT 3881'
LOT = 15.0 PPS EKW
8-10/3-23-88
NO 5 HYCALOG (NO DRILNG W/ SET)
NO BRN FDT
2x13 1x12 JCY8

MW 8.8+ V 82 FW/YF 23/23
F 3.8 PH 8.0 CL 17000

COAL-BLK. VDKERN. FLTY. BKLY. LIG.
WOODY IP. INTSD W/ F-MGR
QTZ SD + SS. HD + BRIT

SS-LT-MGY. WH. CLR. TRANSL. LTBRN.
VF-VCCR. PRED. MGR. OCC. SML. PBL.
FRACS. ANG-MEND. PRED. SBANG.
P-MGR. ONLY IP. W-WENT. CALC.
TR. CALC. FRAC. FILL. SLT +
CLY. CALC. WENT. ABNOT. PYR. SMN.
10% QTL. 30% LITH + CHT. FRACS.
HD. TR. LTBRN. STN. IN. MTRY.
30% BRI-MOUL. YELCLD. SML.
FLOR. CO. WH. FLSH. CT. FLOR.
FR. STRONG. MLKY. MYEL. CT. FLOR.
0-5% VIS. POR. NO. ODR.
NO. HEAVY. CASSES. ASSOC. WITH
THIS. INTERVAL

LS-WH. TN. YEL. BLKY. CHKY. XLN. IP.
SLTY. IP. TR. FOSS. FORAM. SFT-PRM

SS/SLTST-MGY. BLK. CLR. VCCR.
SBANG-RND. W-MGR. WENT. CALC.
SLTY. CRONG. TO. SLTST. IP. TR.
PYR. OVRGTH. HD. NSOFC

9/24/83

HYD. DRNG. TO SLTST IP. TR
HYD. OVRGHT. RD. NSOFC

9/24/83

DS .42 DEG

TR COILED FOSS FORAM

CLY-TN. VLTBRNGY. AMORPH. IN
SWPL. SLTY. CHONG TO SLTST IP.
TR. WGR. QTZ. SD. INCL. TR. SW.
FYR. NOOS. VSFT. + HYDRD.

MAX GAS 303

CG 145

TR OBLONG FOSS. FORAM

COAL-BLK. BLKY. PLTY. RLY. IP.
LTC. SEVIT. IP. CONC. FRACS. IP.
HYD. ON. FRACS. FRM. MD. + BRIT.

CLY-LTGY. BLKY. GMY. SLTY.
SDY. IP. SFT.

SD-DKGY. CLR. BLK. F-MGR. SBANG-
SBAND. WGR. UNCONS. TR. CONC.
NSOFC.

DS .31 DEG

SS-MI. BLK. CLR. SFT. VT-FOR. SBANG-
SBAND. W-MGR. P-MGR. ARG. CLTY.
CARB. MAT. LITH. MFM. NSOFC.

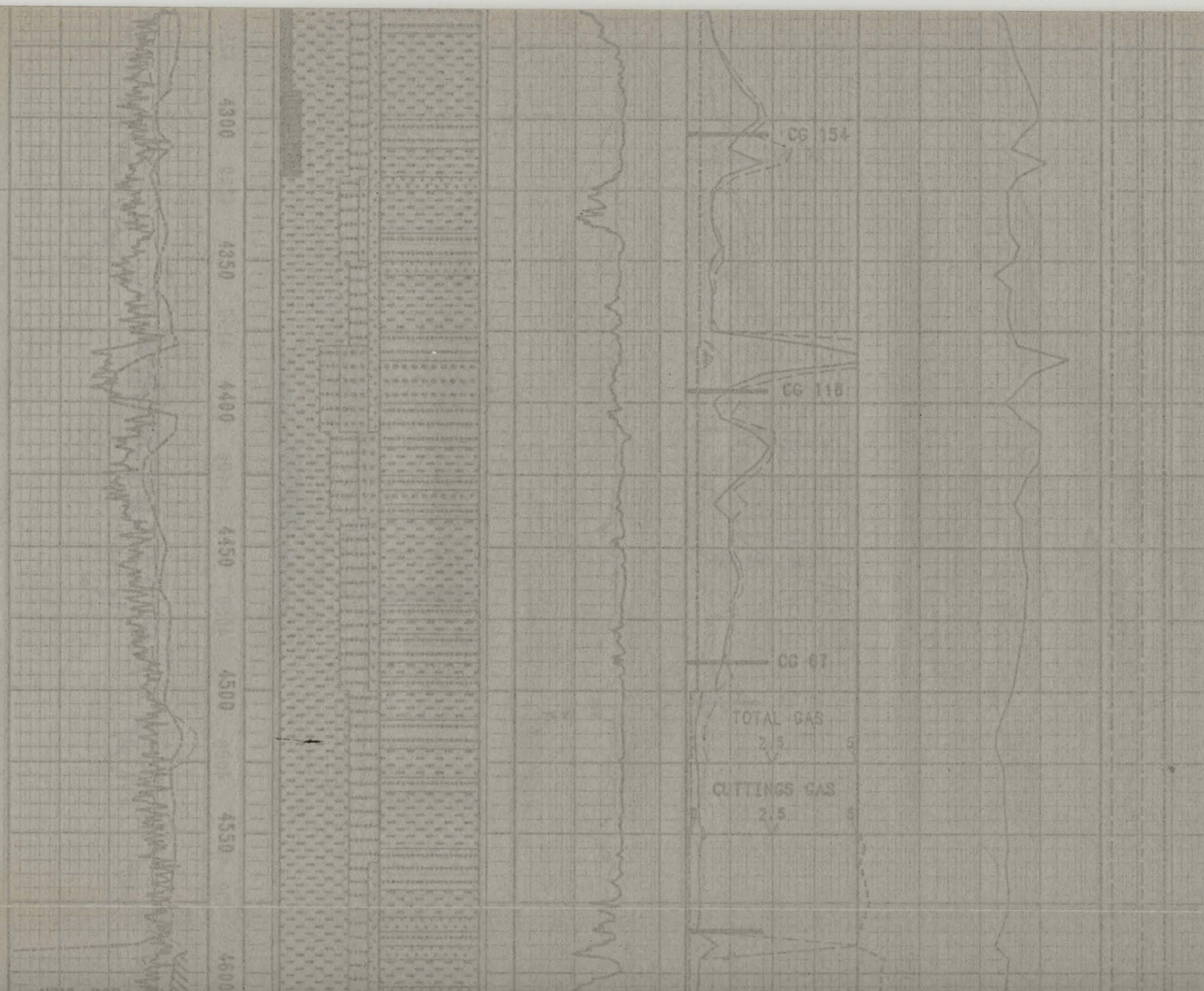
CG 88

SLTST-LT-MGY. BLKY. AREN. SLI
CALC. TR. WICA. CARB. MAT. COAL
IP. SFT-FRM. NSOFC.

CLY-LTGY. BLKY. GMY. SLTY. SDY. IP.
HYDRD. SFT.

SS-MI. DRN. RUST. MGY. VT-MGR. AND-
SBANG. WGR. MGR. SLI. CALC. CONC.

3950
4000
4050
4100
4150
4200
4250



ARG CARB IP LITH. W/FR. NSOFC

COAL-BLK-BLKY-PLY. HKLY IP
LIG. WIT IP. SOY IP. PYR ON FRAC
SURF. VFRM-HD.

FOSS FRACS-WH. CRN. SHELL FRACS
BRKN. CALC. TR. FORAMS. CARB IP

SS-LTCY. WH. W/ FOR. CONG IP. NSRT
H-MNT. CALC IP. ARG. CRT. TR. CARB
TR. PYR. QTZ. TUFF IP. LITH. W/FR.
AND. NSOFC.

CLY-VLTCY. LTCY. HYD. BLKY. CMHY.
VSLI. CALC. VSTT-FRM

SS-LTCY. WH. CLM. BLK IP. W/ FOR.
SBANG-SBRND. NSRT. MCHT. PAED
CLY-SLTY. CRT. TR. CARB. QTZ. TR.
TUFF. INTOD. W/ SLTST-GLYST. TR.
PYR. LITH. SFT-FRM. NSOFC.

SLTST-LT-MCY. BLKY. VAREW IP. SLI
CALC. CARB. MTA. MICA. CLYY. SFT

CLY-LTCY. MCY IP. BLKY. CMHY. VSLTY
GRDC TO SLTST. INTLAN W/ SS. SFT

SS-LTCY. W/ FOR. SBANG. NSRT. PCMT
INTOD. INTLAN W/ CLY. SLTST. SLI
CALC. QTZ. CARB. SFT. NSOFC.

SLTST-LTCY. BLKY. CMHY. SOY IP. SLI
CALC. CARB. MICA. CLYY. SFT. NSOFC

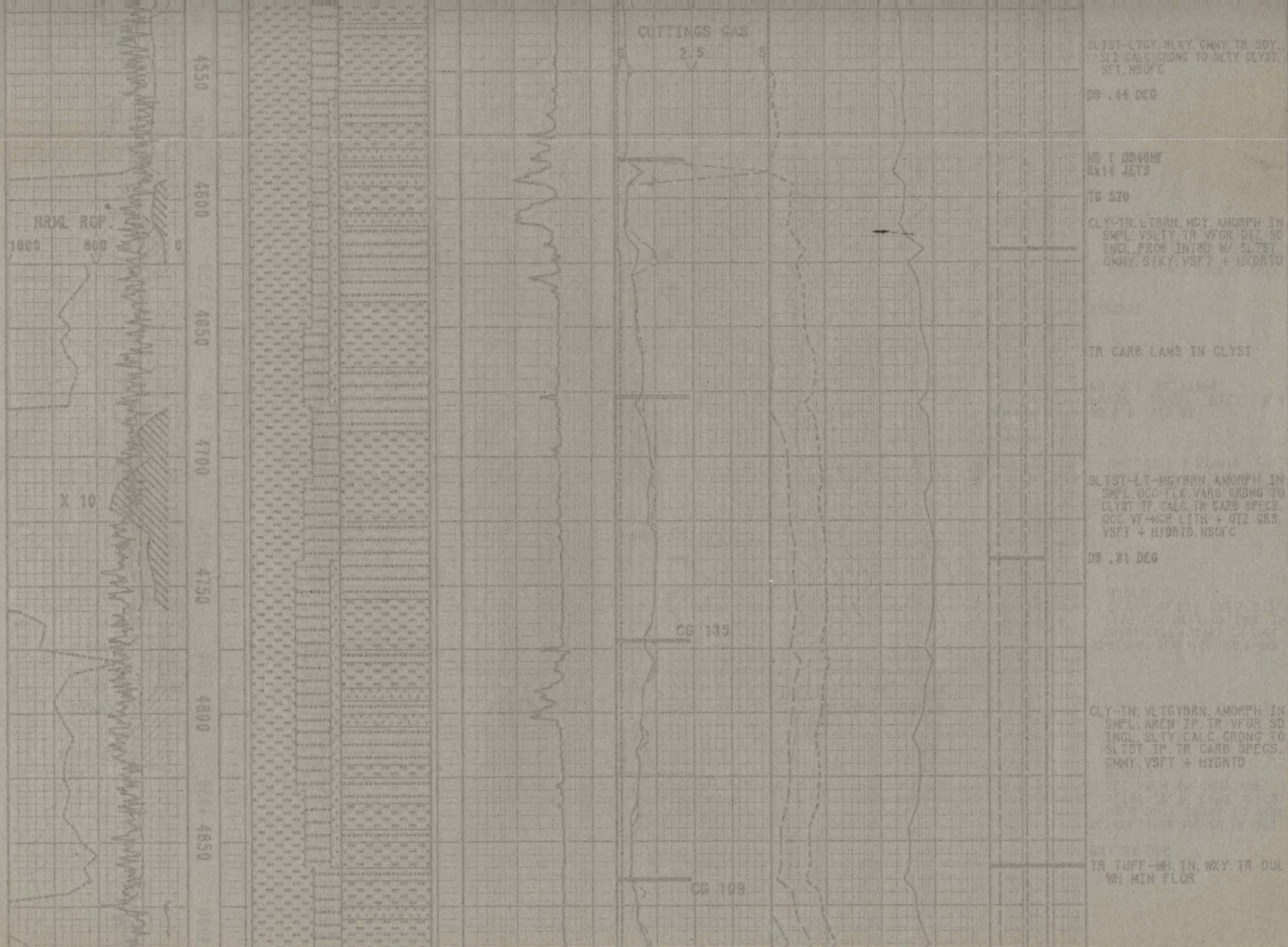
CLY-LTCY. CMHY. SLTY. STKY. TR. SOY.
HYDRD. VSTT-SFT

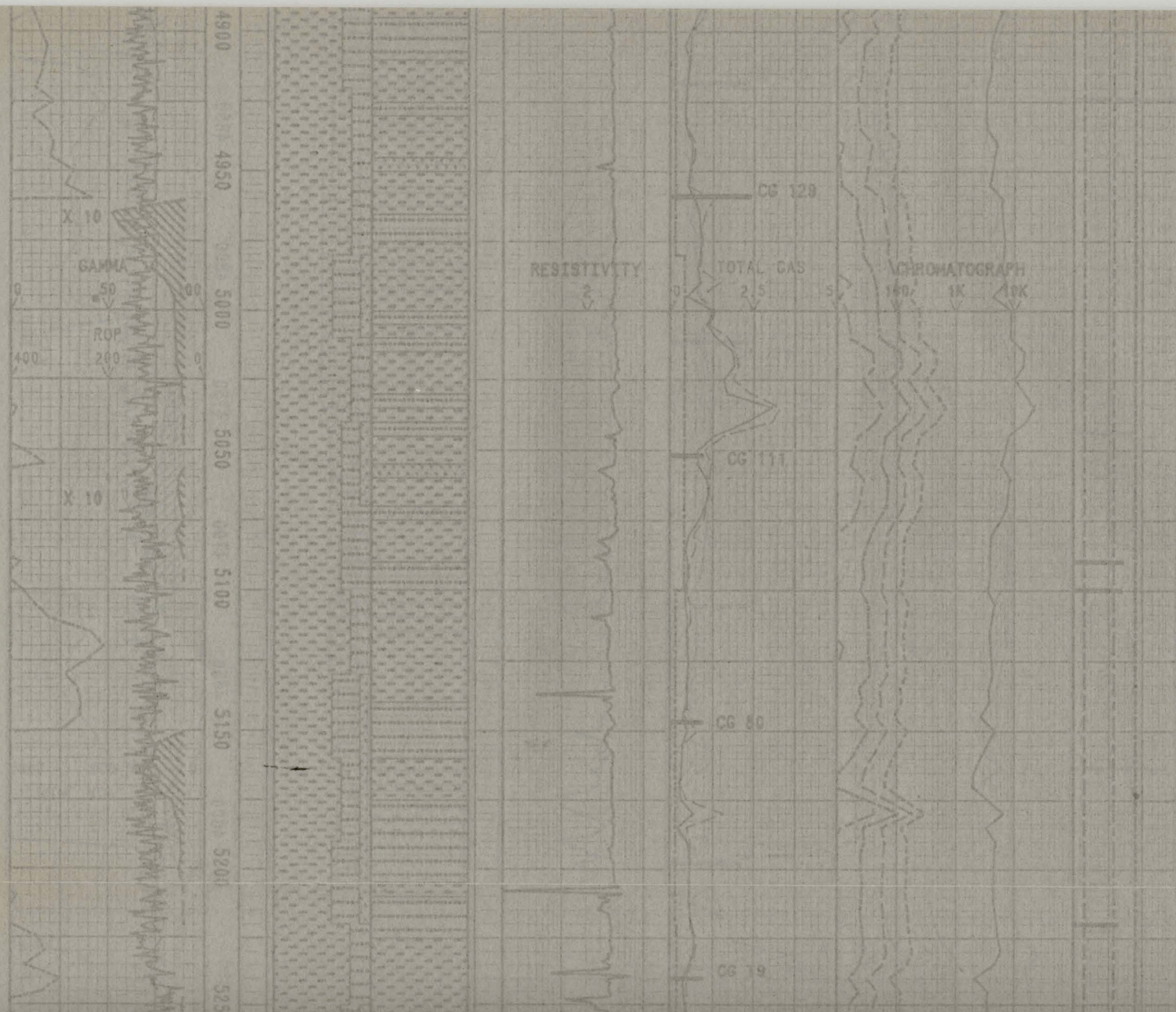
SLTST-LTCY. BLKY. CMHY. TR. SOY.
SLI. CALC. GRDC TO SLTY. CLYST.
SFT. NSOFC

DS .44 DEG

NO 7 DB40HE
RX14 JETS

TS 329





DS .33 DEG

CLY-IN LIBRN AMORPH IN SMPL
CALC SLTY GRDNG TO VARG
SLTST IP TR CARB SPECS
SLT AREN IP GMMY VSFT +
HYDRD

SD-CLR CY BLK VGR OCC F-MGR
SBANG PRT UNCONS IN SMPL
POSS CLY MTRX OR INCL IN
CLY + SLTST PRSD QTZ
NSOFC

SLTST-IN VLTGYBRN MOTT IP
AMORPH OCC FLK VARG GRDNG
TO CLY SLT TR VGR QTZ SD
INCL VSFT + HYDRD

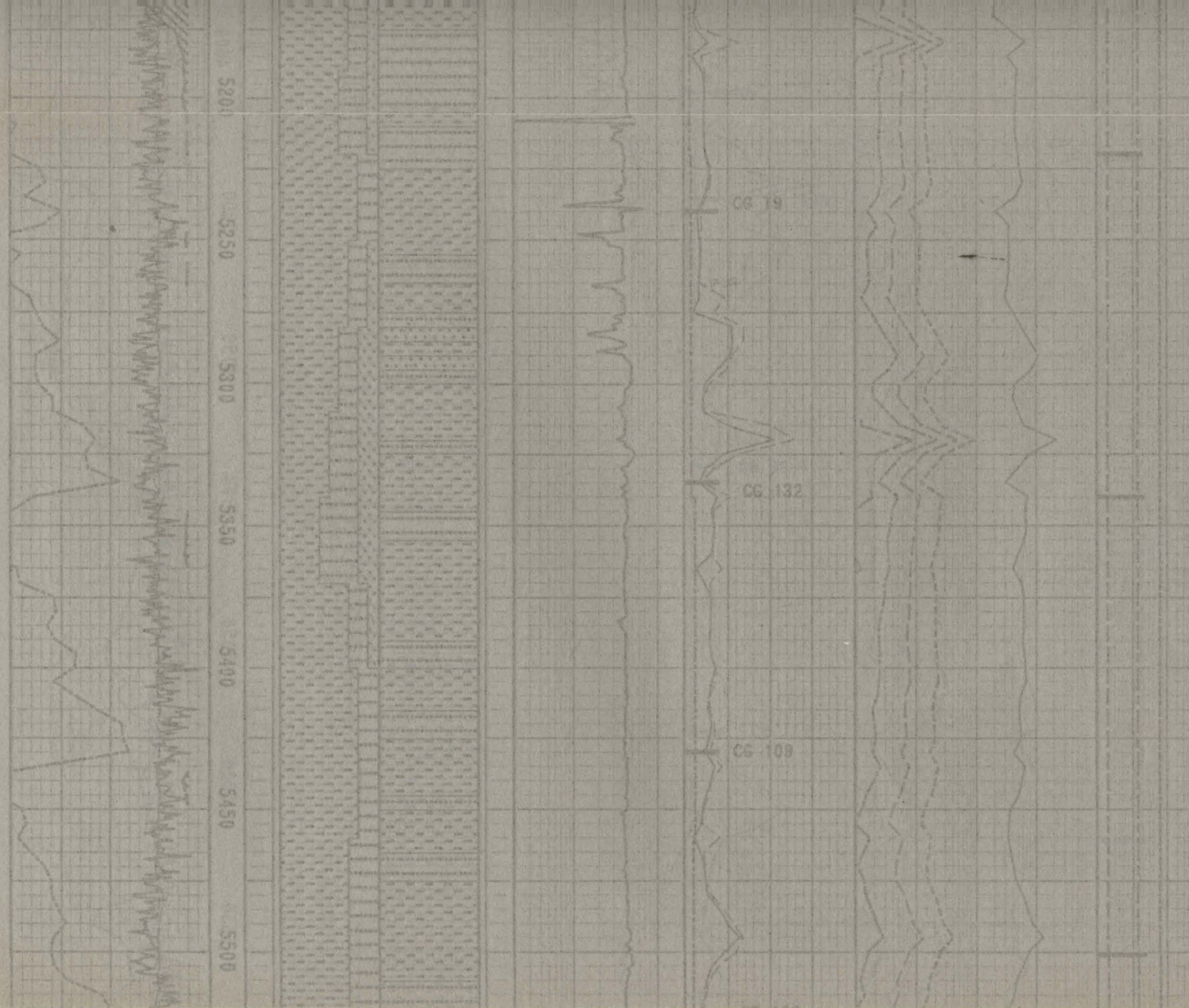
MW 8.8 VIS 82
PV/YP 26/27 FILT 2.4
PH 8.0 CL 17000

0/25/82

CLY-IN LT-MCY AMORPH SLTY
SLT CALC AREN IP TR DISSEM
PRT TR CARB SPECS CHMT
STKY VSFT WERM ONLY IP
HYDRD

DS .33 DEG

CLY-IN VLTGRNGY M IP MOTT IP
AMORPH IN SMPL NCALC SL



CLY-TN. VLSRNGY. WH. IP. NOIT. IP.
AMORPH. IN. SHPL. NCALC. SLT
CALC. AREN. IP. GRNG. TO. SLTST
IP. CARB. SPEC. STKY. CHMY.
VSFT. + VHYDRD

DS .35 DEG

CLY-TN. VLSRNGY. WH. IP. NOIT. IP.
AMORPH. IN. SHPL. NCALC. SLT
CALC. AREN. IP. GRNG. TO. SLTST
IP. CARB. SPEC. STKY. CHMY.
VSFT. + VHYDRD

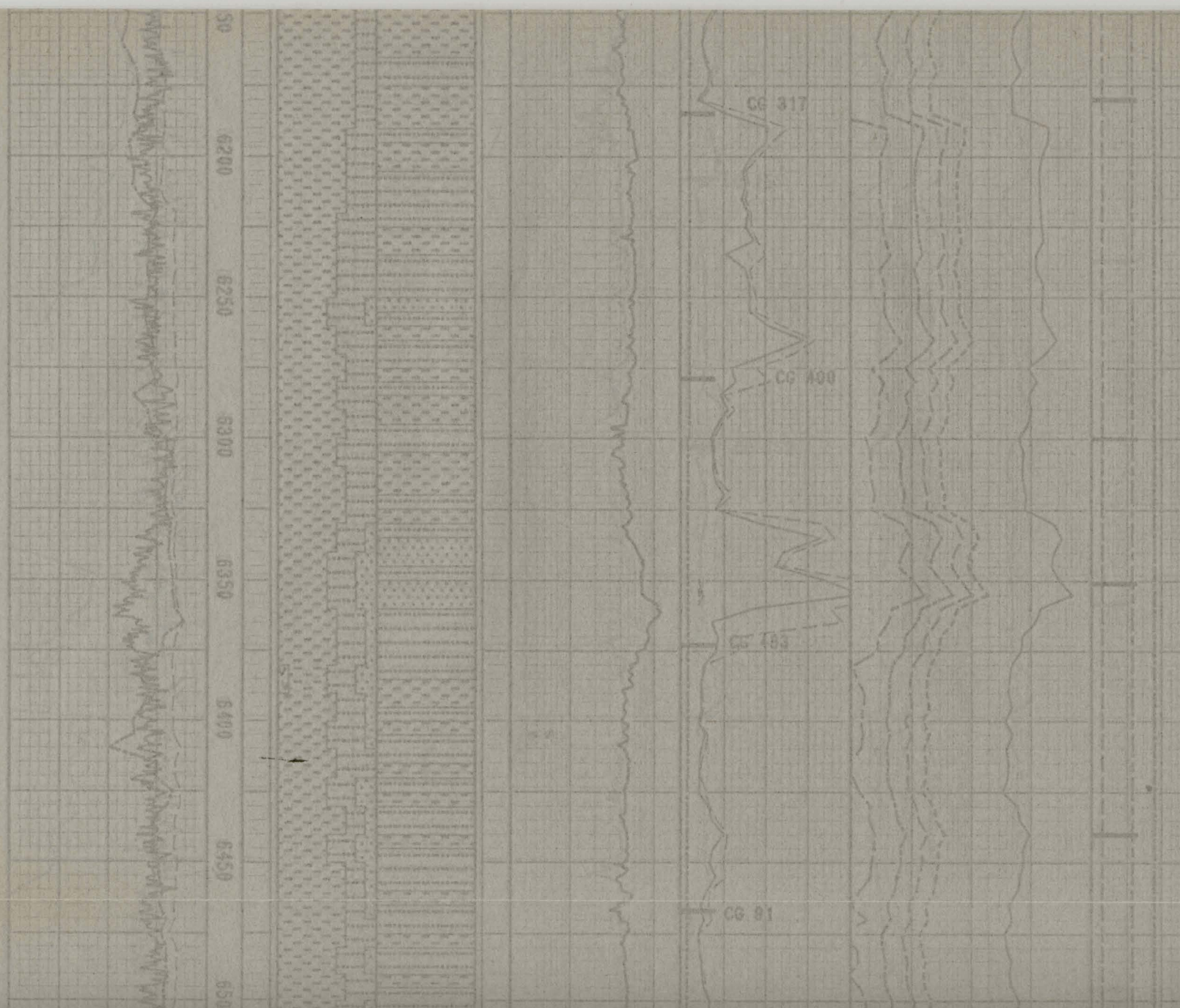
SD-CL. WH. TRANS. TR. GRN. VF-
FOR. PRED. VEGH. GRNG. TO. SLT
SZ. SBANG. RND. PRED. BRND.
*MST. UNCONS. IN. SHPL. PROB
INCL. IN. CLY. + SLT. PRED. QTZ.
SHE. LITH. FRAGS. NSOFC

TR. WH. POSS. SHELL. FRAGS

CLY-TN. LT-HYDRN. AMORPH. AREN
IP. SLTY. GRNG. TO. SLTST. IP.
TR. CARB. SPEC. NCALC. SLT
CALC. SLT. TR. VFR. 30. INCL.
VSFT. + HYDRD. NSOFC

SLTST-LTGY. CYBRN. IP. BLKY. AREN
TR. TR. CARB. CRDG. TO. CLYST. SLT
TR. CALC. SFT. NSOFC

CLY-LTGY. TR. TR. CYBRN. AMORPH. TR.
AREN. SLTY. INTRDS. TR. CARB. KYCA
IP. TR. QTZ. HYD. VSFT. NSOFC



SLTST-LTCY, MGY IP, AMORPH, GMMY, CRDC TO CLYST, NCALC, TR, MICA, TR, CARB, TR, XF, SD, SFT, NSOFC

RAISE MW TO 10.2 PPG

CLY-LTCY, MGY IP, AMORPH, GMMY, CRDC TO SLTST, NCALC, TR, MICA, TR, CARB, TR, XF, SD, SFT

SLTST-LTCY, MGY IP, AMORPH, GMMY, CRDC TO CLYST, NCALC, TR, MICA, TR, CARB, TR, XF, SD, SFT, NSOFC

SLTST-LTCY, MGY IP, AMORPH, GMMY, CRDC TO CLYST, NCALC, TR, MICA, TR, CARB, TR, XF, SD, SFT, NSOFC

SD-CL, LTCY, VGR, SBANG, MSRT, UNCONS, IMBD, IN CLY, SLTST, TR, CARB, NSOFC

RAISE MW TO 10.4 PPG

CLY-LTCY, MGY IP, AMORPH, NCALC, VSLTY-CRDC TO SLTST, TR, PYR, TR, TUFF, GMMY, VSFT, NSOFC

TR, TUFF, M, CRN, MICA, N, FRM, SFT, YEL, MIN, FLOR, NSOFC

SLTST-LTCY, MGY IP, AMORPH, GMMY, CRDC TO CLYST, TR, PYR, MICA, TR, TUFF, SFT, FRM, NSOFC

SD-CL, R, TRANS, VGR, ANG, SBANG, M, MSRT, UNCONS, 80% QZ, 20% LITH, IMBD, IN SLTY, CLYST, NSOFC

TR, TUFF, M, CRN, MICA, N, YEL, MIN, FLOR, NSOFC

SD-CL, R, TRANS, VGR, ANG, SBANG, M, MSRT, UNCONS, 80% QZ, 20% LITH, CARB, MTL, TUFF, IP, IMBD, INSLTY, CLYST, NSOFC

SLTST-LTCY, MGY IP, AMORPH, GMMY, CRDC TO CLYST, TR, PYR, MICA, TR, TUFF, SFT, FRM, NSOFC

DS .45 DEG

SD-CL, R, WH, LTCY, TR, CRN, VGR, SBANG, SBANG, PRD, SBANG, MSRT, UNCONS, PROB, INCL, IN SLTY, CLY, 80% QZ, 20% LITH, GFB, NSOFC

SLTST-LTCY, MGY IP, AMORPH, GMMY, CRDC TO CLYST, TR, PYR, MICA, TR, TUFF, SFT, FRM, NSOFC

DS 46 DEC

SD-CLK. WH. LTCY. TR. CHN. VGR.
FRANC-SEBND. PRED. SBAND. MORT.
UNCONS. PROB. INCL. IN SLT.
CLY. 80% QTZ. 20% LITH. FRG.
NSOFC

SLTST-LT-MGYBN. AMORPH. IN
SMPL. SLT-MCALC. VARG. CPANC
TO CLY. TR. VGR. QTZ. 50 INCL.
TR. CARB. FLKS. VSFT. + VHYOPTD.
NSOFC

SD-CLK. WH. LTCY. TN. TR. BLK. VGR.
DCC. MGR. QTZ. SBAND. END. PRED.
SBAND. M-PSRT. UNCONS. INTBD
W/ CLY. + SLTST. 70% QTZ. 30%
LITH. TR. CARB. PRINGS. NOS.
LITH. STN. ONLY IF. NOFC

TR. PYR. NOOS
TR. TN. + WH. VCLC. STNGRS
MW 10.4 VLS 84
PV/YP 30/41 FLY 3.0
PH 8.1 CL 17000

TR. CALC. FRAC. FILL
CLY-TN. V. LTRN. WH. AMORPH. SLTY
CALC. TR. VGR. SD. INCL. TR. MEG
DISSEM. PYR. DCC. CALC. STNGRS.
VSFT. + VHYOPTD.

9/28/83
STG 557
SLTST-LTGY. TN. IF. MGY. IF. AMORPH
-SBRLKY. NCALC. CARB. IF. MEGA. TR.
VGR. SD. IF. TR. PYR. SFT. NSOFC

CLY-LTGY. LTIN. WH. IF. AMORPH. SLTY
LANS. TR. VGR. SD. INCL. TR. DISSEM
PYR. VSL. CALC. WHID. VSFT. NSOFC

SLTST-LTGY. MGY. IF. AMORPH-SBRLKY
NCALC. CARB. IF. MEGA. TR. VGR. SD.
GRUC. TO CLYST. SFT. NSOFC

DS 46 DEC

CLY-LTGY. TN. IF. AMORPH. SLTY. LANS
VHYD. TR. VGR. SD. INCL. TR. PYR
VSL. CALC. VSFT. NSOFC

SLTST-LTGY. TR. MGY. AMORPH-SBRLKY
VHYD. TR. VGR. SD. TR. MEGA. TR. CARB.

CG 91

CG 422

STG 557

CG 218

6450

6500

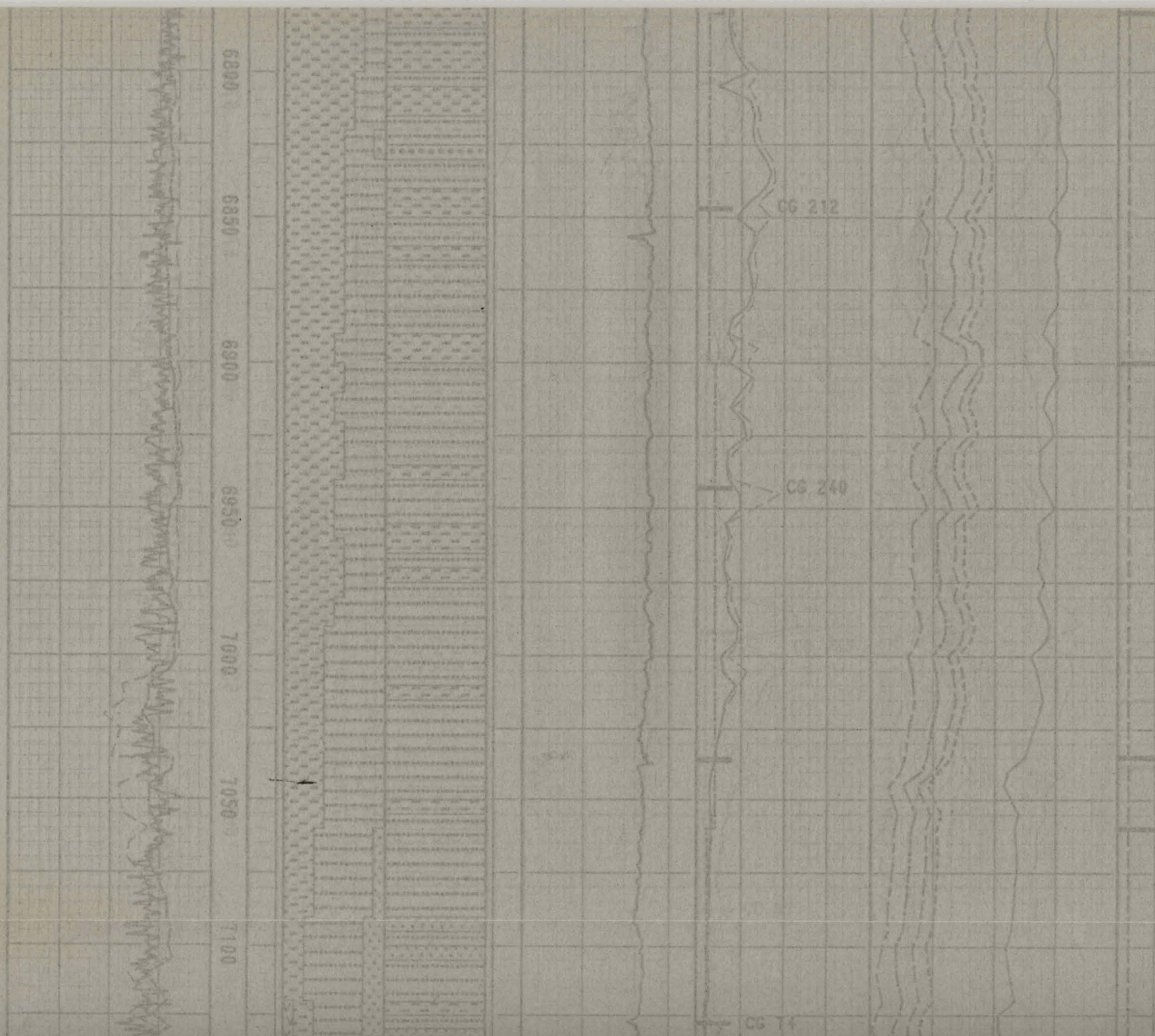
6550

6600

6650

6700

6750



TR PYR. VSL. CALC. CHRS. TO SLTST.
SFT. NSOFC.

CLY-VLGY-LTGY. AMORPH. SLTY. INTD.
SLTY. INCL. V. HYD. TR. VGR. SD. IP.
TR. PYR. VSL. CALC. VSFT. NSOFC.

SS-VLGY-LTGY. S+P. VGR. SSAND.
MSST. FCM. SLTY. CLYST. VSL. CALC.
TR. PYR. TR. CARB. 40%
LITH. SFT. NSOFC.

CG 212

SLTST-VLGY-LTGY. TR. MGY. AMORPH.
MICA. LITH. VSL. CALC. GRDS. TR.
CLYST. TR. PYR. TR. CARB. VSFT.

CLY-LTGY-VLGY. AMORPH. CMY. SD.
CALC. CHRS. SD. SLTST. MICA. TR. PYR.
TR. CARB. HYD. VSFT. NSOFC.

SLTST-LTGY. MGY. IP. AMORPH-SBLKY.
CMY. VSL. CALC. CLY. MICA. TR. PYR.
XF-VF. SD. IP. LITH. SFT. NSOFC.

CLY-LTGY. AMORPH. CMY. VSLTY. GRDS.
TO SLTST. MICA. TR. PYR. HYD.
VSFT. NSOFC.

CG 240

NW 10.5 V18 57
PY. TR. 25/25 /ILT 2.8
PH 8.2 CL 17000

REMARK 40 FOOT SAMPLES
GS. 71 DEG
SLTST-LTGY. TR. MGY. AMORPH-SBLKY.
CLY. VSL. CALC. MICA. TR. PYR. TR.
CARB. VF-VGR. SD. IP. LITH. SFT.
NSOFC.

SLTST-LTGY. AMORPH-SBLKY. CLY.
XF-VF. SD. IP. TR. CARB. TR. PYR.
LITH. SFT. NSOFC.

8/27/83
STC 875
8/28/83

TR. TUFF-MI. TR. L. TORNO. ALKY.
MGY. SLTY. IP. TR. DUL. MORT.
MI. MIN. FLOR.

CG 74

SD-CL. LIT. TRANS. MGY. BLK. V. M.
OGG. MGY. TRANS. SSAND. P. M.
SSAND. MGY. UNCONS. FROM. INCL.
SLTST. OR. UNCONS. N. SLTST.
70% QTZ. 30% LETH. GRN.
NSOFC.

TR TUFF-WH IN LTORN BLKY
WXY SLTY IP TR DUL-MBRD
WH MIN FLOH

SD CLR-LTGY-TRANSL WGY BLK WFK
OCC MCR SBANG-SBRNG MRED
SRAND MBRD UNCHNS FROM INCL
SLTST OM INTBD W SLTST
70% QTZ, 30% LITH GRS
MSOFC

SLTST-W-LTGY-W-LTORN TR IP
AMCRTH-BLKY IP NCALC TR
MOMT FLXS ARG ABMT SD INCL
TR-10% BRT-DUL YEL SMP
FLOH FR WH FLOH CT IN BATCH
CT ONLY CO STRANG WH WXY
CT FLOH NO STN NO VIS FOR
SLT TR 0008

MW 10.5 VIS 60
PV/VP 23/30 FILT 2.8
PH 8.2 CL 17000

TR PYR NODS

DS .88 DEG

SLTST-IN LT-MBRN BLK + CLR
SPCS BLKY WLY IP PLTY IP
NCALC ARG WFGH QTZ + LITH
GRS CARD SPCS + MAT SCMG
FRMR CRONG TO WGR SS IP
SFT + FRI-MED MSOFC

TR SML PBL SZ CHT FRACS

TR TUFF

TR CGR CHT + QTZ FRACS

SLTST-LT-MGY MBRN BLKY NCALC
ARG TR VP-MGR CHT + QTZ GRS
SPONG TO CLYST IP TR-SR
MBRT YEL SMP FLOH NO FLASH
CT FLOH PR YOLO STRANG WXY
CT FLOH NO STN NO VIS FOR

CG 74

CG 164

CG 80

7100

7150

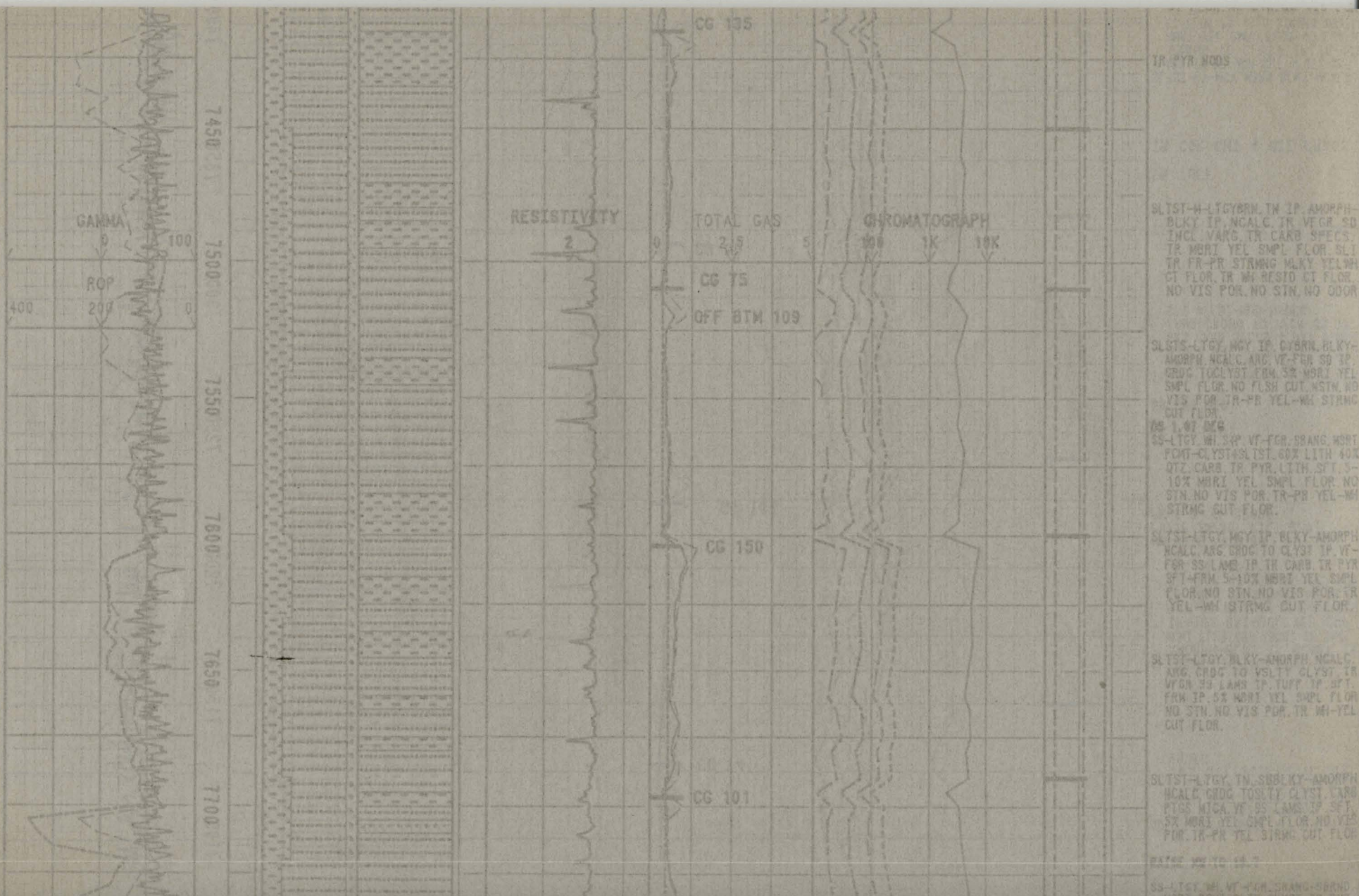
7200

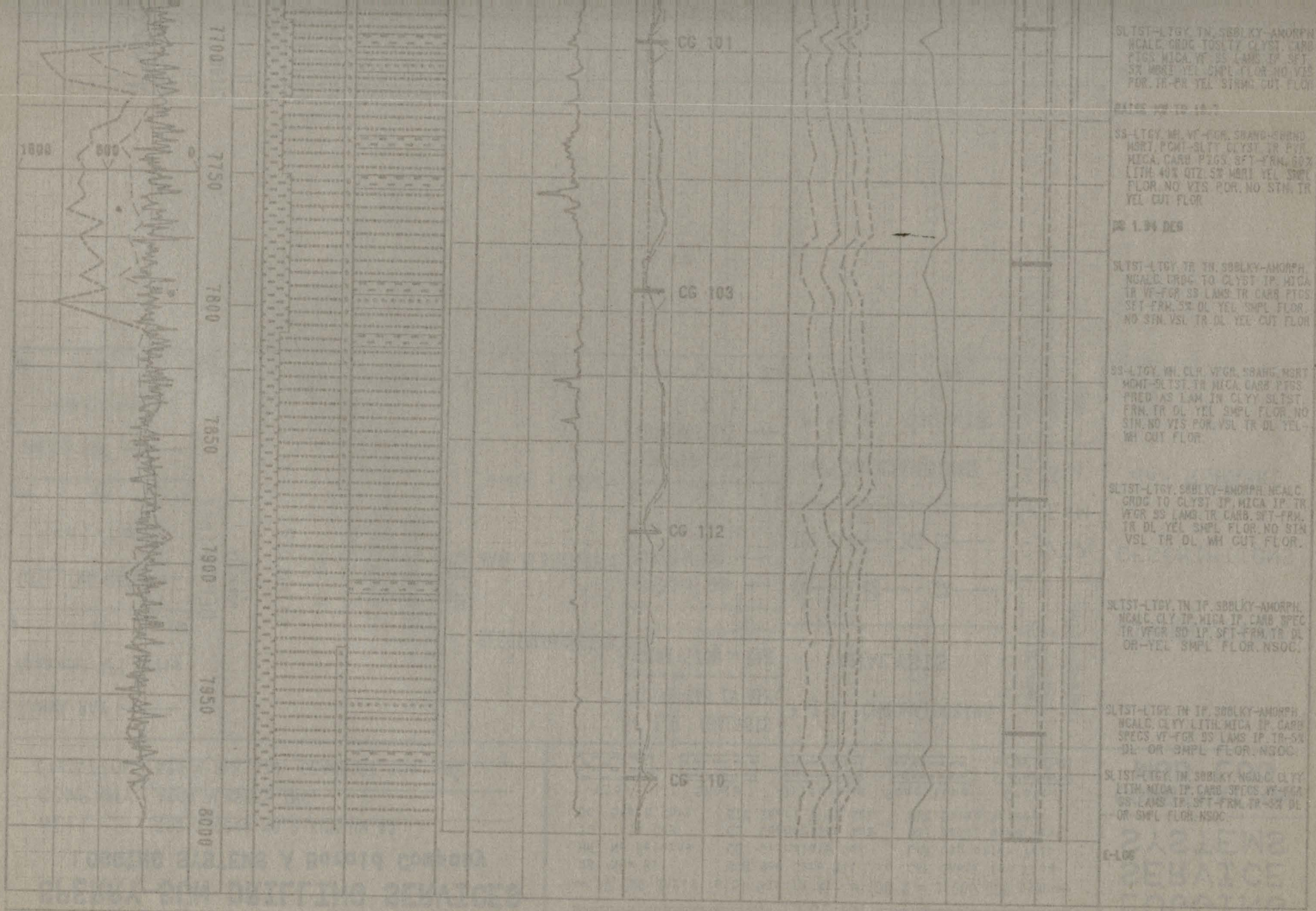
7250

7300

7350

7400





23212AS
23212AS
23212AS

DRILLING SERVICES

LOGGING SYSTEMS

CASING PROGRAM

| | | | |
|-------------------|---------|-------------------|----|
| <u>30</u> | inch at | <u>301</u> | ft |
| <u>20</u> | inch at | <u>1017</u> | ft |
| <u>13 3/8</u> | inch at | <u>3978</u> | ft |
| <u> </u> | inch at | <u> </u> | ft |
| <u> </u> | inch at | <u> </u> | ft |

| | |
|-------------|-------------------|
| FIELD/BLOCK | OCS BLK 672 NR6-4 |
| LOCATION | BEAUFORT SEA |
| STATE | ALASKA |
| SPUD DATE | 28 JUL 93 |

✓

LOGGING SYSTEMS

A Barold Company

BIT RECORD

CASING PROGRAM

30 inch at 309 ft

20 inch at 1022 ft

13 3/8 inch at 3681 ft

inch at ft

inch at **ft**

COMPANY ARCO ALASKA, INC.

WELL OCS-Y-0866 NO. 2 KUVLUM #3

CONTRACTOR CANMAR

MUD COMPANY M & I

FIELD/BLOCK NR6-4 BLOCK 673

LOCATION OFFSHORE - BEAUFORT SEA

STATE ALASKA

SPUD DATE 9-9-93

[illegible]

CASING PROGRAM 30 inch at 301 ft
20 inch at 1017 ft
13 3/8 inch at 3978 ft
inch at ft
inch at ft

DRILLING MUD RECORD

COMPANY ARCO ALASKA INC.
WELL KUVLUM #2
CONTRACTOR CANADIAN MARINE DRILLING
MUD COMPANY M & I

FIELD/BLOCK OCS BLK 672 NR6-4
LOCATION BEAUFORT SEA
STATE ALASKA
SPUD DATE 28 JUL 93

| DATE | DEPTH ft | WEIGHT lb/gal | VIS sec | PV cp | YP lb/hf2 | GELS 10 sec/ 10 min | FLTR ml/30m | HTHP /deg F | CAKE 1/32 | SOL % | OIL % | WATER % | SD % | CEC meq/hg | pH | PM | Pf/Mf | Cl- ppm | CA ppm |
|----------|-------------|------------------|------------|----------|--------------|---------------------------|----------------|----------------|--------------|----------|----------|------------|---------|---------------|-----|-----|---------|------------|-----------|
| 07-29-93 | 1030 | 8.6 | 300 | 48 | 56 | 38/75 | | | | | | | | | | | | | |
| 07-29-93 | 1030 | 8.6 | 100 | | | | | | | | | | | | | | | | |
| 07-30-93 | 1030 | 8.6 | | | | | | | | | | | | | | | | | |
| 07-31-93 | 1030 | 9.8 | 90 | 28 | 19 | 4/8 | 5 | - | 1 | 6.3 | 0 | 93.6 | 0 | NA | 9.5 | 1.8 | .5/1.8 | 17500 | 1560 |
| 08-01-93 | 1040 | 9.8 | 50 | 19 | 26 | 5/8 | 8 | - | 1 | 5.6 | 0 | 94.4 | 0 | 5 | 9.9 | 2.2 | .1/2.9 | 17000 | 400 |
| 08-02-93 | 1956 | 9.8 | 50 | 24 | 21 | 4/5 | 4.6 | - | 1 | 6.3 | 0 | 93.7 | 0 | 0 | 9.6 | 1.3 | .8/1.7 | 16000 | 840 |
| 08-03-93 | 3300 | 9.8 | 54 | 27 | 23 | 3/5 | 4.0 | - | 1 | 8 | 0 | 92 | 0 | 3.25 | 9.5 | 1.1 | .6/1.5 | 16000 | 1200 |
| 08-04-93 | 4005 | 9.8 | 52 | 24 | 22 | 3/5 | 4.2 | - | 1 | 7.8 | 0 | 92.2 | 1.25 | 3.75 | 9.5 | 1.8 | .8/1.9 | 16000 | 800 |
| 08-05-93 | 4005 | 9.8 | 52 | 24 | 22 | 3/5 | 3.8 | - | 1 | 7.8 | 0 | 92.2 | 1.25 | 3.75 | 9.5 | 1.8 | .8/1.9 | 16000 | 200 |
| 08-06-93 | 2240 | 9.8 | 65 | 26 | 30 | 3/6 | 4.2 | - | 1 | 8.3 | 0 | 91.7 | 3.0 | 5.0 | 9.2 | 1.3 | .5/1.6 | 16000 | 600 |
| 08-07-93 | 4005 | 9.8 | 52 | 24 | 26 | 3/4 | 5.2 | - | 1 | 8.3 | 0 | 91.7 | 1.5 | 3.75 | 9.3 | 1.2 | .4/1.6 | 16000 | 680 |
| 08-08-93 | 4005 | 9.8 | 50 | 23 | 21 | 3/4 | 3.8 | - | 1 | 8.3 | 0 | 91.7 | 1.75 | 3.5 | 9.4 | 1.2 | .4/1.4 | 16000 | 640 |
| 08-09-93 | 4005 | 9.8 | 51 | 15 | 17 | 3/4 | 3.0 | - | 1 | 8 | 0 | 92 | .8 | 3.5 | 9.2 | 1.0 | .3/1.5 | 16000 | 600 |
| 08-10-93 | 4900 | 9.8+ | 58 | 19 | 19 | 3/4 | 3.2 | - | 1 | 8 | 0 | 92 | 1.5 | 3.0 | 9.9 | 1.0 | .3/1.6 | 17000 | 860 |
| 08-11-93 | 5645 | 10.0 | 55 | 20 | 23 | 3/6 | 3.0 | - | 1 | 8.5 | 0 | 91.5 | 1.0 | 4.5 | 9.3 | .7 | .15/1.4 | 17500 | 680 |
| 08-12-93 | 6593 | 10.0+ | 59 | 22 | 28 | 5/9 | 2.7 | - | 1 | 8.5 | 0 | 91.5 | 1.0 | 4.5 | 9.1 | .5 | .1/1.3 | 17000 | 920 |
| 08-13-93 | 6729 | 10.0 | 79 | 26 | 32 | 5/10 | 2.6 | 6.4 @150 | 1 | 9 | .5 | 90.5 | 1.25 | 4.5 | 9.0 | .5 | .1/1.3 | 17500 | 1040 |
| 08-14-93 | 6768 | 10.1 | 69 | 24 | 34 | 5/12 | 3.0 | 6.8 | 1 | 11 | T | 89 | .75 | 5.5 | 8.9 | .3 | .1/1.3 | 17000 | 920 |
| 08-15-93 | 7698 | 10.0 | 59 | 25 | 30 | 3/8 | 2.8 | 6.0 | 1 | 9 | T | 91 | 1.0 | 6.0 | 8.6 | .3 | .1/1.3 | 17500 | 880 |
| 08-16-93 | 9500 | 10.4+ | 70 | 30 | 40 | 5/15 | 2.9 | 6.8 | 1 | 10.5 | T | 89.5 | 1.25 | 6.5 | 8.8 | .3 | .1/1.4 | 17000 | 920 |
| 08-17-93 | 9500 | 10.4 | 68 | 23 | 35 | 4/7 | .3 | 6.8 | 1 | 10 | T | 90 | .75 | 5.5 | 8.8 | .3 | .1/1.5 | 17500 | 920 |
| 08-18-93 | 10270 | 10.5 | 64 | 26 | 34 | 4/12 | 3.4 | 6.8 | 1 | 10 | TR | 90 | 1.0 | 6.5 | 8.6 | .45 | .25/1/5 | 17000 | 920 |
| 08-19-93 | 11125 | 10.7 | 58 | 27 | 34 | 3/9 | 3.1 | 6.0 | 1 | 11.5 | T | 88.5 | 1.0 | 6.5 | 8.6 | .3 | .2/1.5 | 17000 | 960 |
| 08-20-93 | 11125 | 10.8 | 56 | 28 | 36 | 3/13 | 3.0 | 6.2 | 1 | 11.5 | TR | 88.5 | .75 | 7.0 | 8.5 | .3 | .15/1.4 | 17000 | 920 |
| 08-21-93 | 11125 | 10.9 | 68 | 28 | 37 | 3/12 | 2.6 | 7.0 | 1 | 12 | T | 88 | 1.0 | 7.0 | 8.5 | .3 | .15/1.4 | 17000 | 840 |

CASING PROGRAM 30 inch at 309 ft
 20 inch at 1022 ft
 13 3/8 inch at 3681 ft
 inch at ft
 inch at ft

DRILLING MUD RECORD

COMPANY ARCO ALASKA, INC.
 WELL OCS-Y-0866 NO. 2 KUVLUM # 3
 CONTRACTOR CANMAR
 MUD COMPANY M & I

FIELD/BLOCK NR6-4 BLOCK 673
 LOCATION OFFSHORE - BEAUFORT SEA
 STATE ALASKA
 SPUD DATE 9-9-93

| DATE | DEPTH | WEIGHT | VIS | PV | YP | GELS 10 sec/ 10 min | FLTR ml/30m | HTHP /deg F | CAKE 1/32 | SOL % | OIL % | WATER % | SD % | CEC meq/hg | pH | PM | Pt/Mf | Cl- ppm | CA ppm |
|----------|-------|--------|-----|----|--------|---------------------------|----------------|----------------|--------------|----------|----------|------------|---------|---------------|------|-----|---------|------------|-----------|
| 1993 | ft | lb/gal | sec | cp | lb/hf2 | | | | | | | | | | | | | | |
| 09-09-93 | 309 | 8.8 | 70 | 16 | 16 | 12/28 | - | - | - | - | - | - | - | - | 9.0 | - | .15/.3 | 650 | 400 |
| 09-10-93 | 10040 | 9.6 | 58 | 16 | 18 | 6/14 | 13 | - | 1 | - | - | - | TR | - | 9.5 | .4 | .2/.5 | 14000 | 560 |
| 09-11-93 | 1040 | 9.6 | 58 | 16 | 18 | 6/14 | 13.0 | - | 1 | - | - | - | TR | - | 9.5 | .4 | .2/.5 | 14000 | 560 |
| 09-12-93 | 1040 | 9.8 | 53 | 18 | 19 | 4/4 | 4.1 | - | 1 | 6 | 0 | 94 | 0 | 1.5 | 9.0 | .4 | .2/.8 | 18000 | 1800 |
| 09-13-93 | 1284 | 9.7+ | 43 | 16 | 18 | 3/3 | 5.1 | - | 1 | 6.5 | 0 | 93.5 | .75 | 1.5 | 10.0 | 1.5 | .4/1.3 | 17400 | 1560 |
| 09-14-93 | 2702 | 9.7+ | 72 | 29 | 35 | 4/5 | 3.2 | - | 1 | 7 | 0 | 93 | 2 | 3.5 | 10.1 | 1.3 | 1.1/2.7 | 17300 | 880 |
| 09-15-93 | 3705 | 9.9 | 82 | 37 | 44 | 6/9 | 2.2 | - | 1 | 7 | 0 | 93 | 1.75 | 4.5 | 9.8 | 1.2 | .9/2.3 | 17100 | 680 |
| 09-16-93 | 3705 | 10.1 | 74 | 31 | 39 | 6/9 | 2.4 | - | 1 | 8.5 | 0 | 91.5 | 2 | 4.5 | 9.8 | 1.2 | .9/2.4 | 17000 | 720 |
| 09-17-93 | 3705 | 10.0 | 54 | 21 | 26 | 3/4 | 2.8 | - | 1 | 8 | 0 | 92 | .5 | 4.0 | 9.5 | .5 | .5/1.3 | 17000 | 480 |
| 09-18-93 | 2900 | 9.9 | 60 | 29 | 34 | 4/6 | 2.0 | - | 1 | 7.5 | 0 | 92.5 | 1.75 | 3.75 | 9.7 | .5 | .5/1.5 | 17000 | 240 |
| 09-19-93 | 3705 | 9.8+ | 80 | 30 | 42 | 5/9 | 3.6 | - | 1 | 7.5 | 0 | 92.5 | 1.75 | 4.0 | 9.5 | .6 | .5/2.5 | 16800 | 100 |
| 09-20-93 | 3705 | 9.9 | 62 | 22 | 21 | 3/6 | 2.4 | 6.4 | 1 | 7.5 | 0 | 92.5 | 1.5 | 4.0 | 9.9 | .6 | .6/1.9 | 17000 | 320 |
| 09-21-93 | 3705 | 9.8 | 58 | 19 | 20 | 3/4 | 3.4 | 7.8 | 1 | 7.2 | - | 92.8 | .75 | 3.75 | 9.0 | .6 | .25/1.5 | 17000 | 360 |
| 09-22-93 | 3705 | 9.7+ | 56 | 18 | 20 | 3/4 | 3.4 | 8.0 | 1 | 7.2 | - | 92.8 | .75 | 3.75 | 9.0 | .6 | .25/1.5 | 17000 | 360 |
| 09-23-93 | 3875 | 9.7+ | 74 | 20 | 20 | 2/3 | 3.4 | 6.8 | 1 | 7.0 | 0 | 93 | .7 | 4.0 | 9.0 | .2 | .15/2.5 | 17000 | 400 |
| 09-24-93 | 5147 | 9.8 | 60 | 25 | 31 | 3/5 | 3.8 | 7.8 | 1 | 7.5 | tr | 92.5 | .8 | 4.25 | 9.0 | .5 | .2/2.8 | 17000 | 240 |
| 09-25-93 | 6658 | 10.4 | 64 | 30 | 41 | 4/8 | 3.0 | 6.6 | 1 | 10.0 | 0 | 90 | .5 | 4.5 | 9.1 | .5 | .25/2.9 | 17000 | 200 |
| 09-26-93 | 7036 | 10.5 | 57 | 25 | 29 | 4/8 | 2.8 | 6.8 | 1 | 10.0 | 0 | 90 | .5 | 6.0 | 9.2 | .6 | .3/2.0 | 17000 | 320 |
| 09-27-93 | 7170 | 10.5 | 60 | 25 | 30 | 3/8 | 2.8 | 8.0 | 1 | 10.5 | 0 | 89.5 | .5 | 6.0 | 9.2 | .6 | .3/2.0 | 17000 | 280 |
| 09-28-93 | 8000 | 10.6 | 60 | 31 | 43 | 4/9 | 3.0 | 7.6 | 1 | 11 | 0 | 89 | .75 | 6.0 | 9.1 | .6 | .2/2.0 | 17500 | 320 |
| 09-29-93 | 8000 | 10.7 | 62 | 30 | 42 | 7/16 | 3.0 | 7.8 | 1 | 11.5 | 0 | 88.5 | .75 | 5.0 | 9.0 | .4 | .15/1.9 | 17500 | 360 |
| 09-30-93 | 8000 | 10.7 | 65 | 28 | 40 | 5/14 | 3.0 | 8.0 | 1 | 11.5 | 0 | 88.5 | .75 | 5.0 | 9.0 | .3 | .15/2.0 | 17500 | 360 |
| 10-01-93 | 8000 | 10.7 | 81 | 25 | 33 | 4/9 | 2.6 | 8.2 | 1 | 11.5 | 0 | 88.5 | .75 | 5.0 | 9.0 | .3 | .15/1.7 | 17800 | 320 |
| 10-02-93 | 8000 | 10.5 | 59 | 20 | 24 | 3/6 | 3.2 | 8.2 | 1 | 10.5 | 0 | 89.5 | .75 | 4.5 | 9.1 | .3 | .15/1.6 | 18000 | 320 |
| 10-03-93 | 8000 | 10.5 | 61 | 19 | 24 | 3/6 | 3.2 | 8.2 | 1 | 10.5 | 0 | 89.5 | .75 | 4.5 | 9.1 | .3 | .15/1.5 | 18000 | 360 |

ARCO ALASKA, INC.
WILDCAT
AKMM930511:55-171-00009
JULY 1993

KUVLUM #2 OCS-Y-0865-1
KULLUK
NORTH REFERENCE : TRUE NORTH
SHORT COLLAR METHOD
MAG. FIELD STRENGTH (NT) : 57558
DIP ANGLE : 81.01
TOTAL CORRECTION : 31.55

| MEASURED DEPTH | ANGLE DEGREE | DIRECTION DEGREE | VERTICAL DEPTH | LATITUDE FEET | DEPARTURE FEET | VERTICAL SECTION | DOG LEG SEVERITY |
|-------------------|-----------------|---------------------|-------------------|------------------|-------------------|---------------------|---------------------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1074.00 | 0.74 | 253.92 | 1073.97 | -1.92 | -6.65 | -6.45 | 0.07 |
| 1170.82 | 0.48 | 251.58 | 1170.78 | -2.22 | -7.64 | -7.41 | 0.27 |
| 1266.93 | 0.36 | 265.10 | 1266.89 | -2.37 | -8.32 | -8.05 | 0.16 |
| 1358.72 | 0.33 | 259.03 | 1358.68 | -2.45 | -8.86 | -8.52 | 0.05 |
| 1452.16 | 0.30 | 276.86 | 1452.12 | -2.47 | -9.37 | -8.93 | 0.10 |
| 1547.36 | 0.19 | 262.30 | 1547.32 | -2.46 | -9.77 | -9.25 | 0.13 |
| 1641.35 | 0.22 | 294.50 | 1641.31 | -2.40 | -10.08 | -9.47 | 0.12 |
| 1738.12 | 0.43 | 249.86 | 1738.08 | -2.45 | -10.60 | -9.90 | 0.33 |
| 1831.76 | 0.25 | 269.73 | 1831.71 | -2.58 | -11.13 | -10.40 | 0.23 |
| 1927.19 | 0.36 | 260.92 | 1927.14 | -2.62 | -11.64 | -10.83 | 0.13 |
| 2021.51 | 0.17 | 252.23 | 2021.46 | -2.71 | -12.06 | -11.23 | 0.21 |
| 2115.73 | 0.25 | 255.09 | 2115.68 | -2.81 | -12.39 | -11.54 | 0.08 |
| 2210.30 | 0.24 | 259.98 | 2210.25 | -2.89 | -12.78 | -11.91 | 0.00 |
| 2306.32 | 0.12 | 18.84 | 2306.27 | -2.83 | -12.95 | -12.00 | 0.33 |
| 2401.20 | 0.28 | 51.44 | 2401.15 | -2.59 | -12.73 | -11.68 | 0.20 |
| 2495.88 | 0.23 | 60.47 | 2495.83 | -2.35 | -12.39 | -11.26 | 0.07 |
| 2592.00 | 0.17 | 86.01 | 2591.95 | -2.25 | -12.08 | -10.96 | 0.11 |
| 2687.19 | 0.06 | 223.74 | 2687.14 | -2.27 | -11.98 | -10.89 | 0.22 |
| 2781.63 | 0.33 | 81.34 | 2781.58 | -2.23 | -11.66 | -10.61 | 0.28 |
| 2869.95 | 0.24 | 95.79 | 2869.90 | -2.21 | -11.22 | -10.25 | 0.13 |
| 2963.60 | 0.37 | 56.65 | 2963.54 | -2.06 | -10.77 | -9.80 | 0.26 |
| 3060.21 | 0.32 | 47.83 | 3060.15 | -1.70 | -10.31 | -9.22 | 0.08 |
| 3149.29 | 0.43 | 32.30 | 3149.23 | -1.26 | -9.95 | -8.66 | 0.16 |
| 3242.22 | 0.51 | 31.18 | 3242.16 | -0.61 | -9.55 | -7.95 | 0.09 |
| 3333.90 | 0.47 | 1.97 | 3333.83 | 0.11 | -9.33 | -7.34 | 0.27 |
| 3440.99 | 0.40 | 6.58 | 3440.92 | 0.91 | -9.27 | -6.80 | 0.06 |
| 3521.14 | 0.15 | 332.77 | 3521.07 | 1.28 | -9.29 | -6.59 | 0.35 |
| 3614.39 | 0.25 | 5.33 | 3614.32 | 1.59 | -9.32 | -6.43 | 0.15 |
| 3710.52 | 0.23 | 23.76 | 3710.45 | 1.97 | -9.23 | -6.12 | 0.08 |
| 3805.60 | 0.37 | 8.93 | 3805.53 | 2.46 | -9.10 | -5.73 | 0.17 |
| 3899.58 | 0.38 | 5.71 | 3899.51 | 3.07 | -9.02 | -5.29 | 0.03 |
| 3977.56 | 0.39 | 26.62 | 3977.48 | 3.57 | -8.98 | -4.87 | 0.18 |
| 4085.83 | 0.31 | 53.21 | 4085.75 | 4.07 | -8.48 | -4.25 | 0.16 |
| 4180.66 | 0.33 | 48.27 | 4180.58 | 4.41 | -8.07 | -3.72 | 0.02 |
| 4277.02 | 0.37 | 27.97 | 4276.93 | 4.87 | -7.71 | -3.16 | 0.13 |
| 4365.48 | 0.44 | 41.01 | 4365.39 | 5.37 | -7.36 | -2.57 | 0.13 |
| 4456.40 | 0.40 | 35.58 | 4456.31 | 5.89 | -6.95 | -1.93 | 0.06 |
| 4552.26 | 0.47 | 47.53 | 4552.17 | 6.43 | -6.46 | -1.22 | 0.12 |

ARCO ALASKA, INC.
WILDCAT
AKMM930511:55-171-00009
JULY 1993

KUVLUM #2 OCS-Y-0865-1
KULLUK
NORTH REFERENCE : TRUE NORTH
SHORT COLLAR METHOD
MAG. FIELD STRENGTH (NT) : 57558
DIP ANGLE : 81.01
TOTAL CORRECTION : 31.55

| MEASURED DEPTH | ANGLE DEGREE | DIRECTION DEGREE | VERTICAL DEPTH | LATITUDE FEET | DEPARTURE FEET | VERTICAL SECTION | DOG LEG SEVERITY |
|-------------------|-----------------|---------------------|-------------------|------------------|-------------------|---------------------|---------------------|
| 4645.97 | 0.38 | 54.53 | 4645.87 | 6.87 | -5.93 | -0.53 | 0.12 |
| 4739.78 | 0.37 | 51.88 | 4739.68 | 7.23 | -5.44 | 0.08 | 0.04 |
| 4835.25 | 0.39 | 55.89 | 4835.15 | 7.60 | -4.94 | 0.70 | 0.04 |
| 4926.63 | 0.40 | 58.01 | 4926.53 | 7.94 | -4.42 | 1.32 | 0.00 |
| 5020.40 | 0.41 | 67.09 | 5020.30 | 8.24 | -3.84 | 1.97 | 0.07 |
| 5116.55 | 0.61 | 67.27 | 5116.44 | 8.57 | -3.05 | 2.79 | 0.21 |
| 5209.97 | 0.53 | 67.04 | 5209.86 | 8.93 | -2.20 | 3.69 | 0.07 |
| 5305.49 | 0.64 | 77.51 | 5305.37 | 9.22 | -1.27 | 4.60 | 0.16 |
| 5398.53 | 0.70 | 76.33 | 5398.41 | 9.46 | -0.20 | 5.59 | 0.06 |
| 5493.57 | 0.70 | 79.49 | 5493.44 | 9.71 | 0.93 | 6.64 | 0.04 |
| 5582.97 | 0.93 | 77.13 | 5582.83 | 9.97 | 2.17 | 7.78 | 0.26 |
| 5678.24 | 1.09 | 93.97 | 5678.09 | 10.08 | 3.82 | 9.16 | 0.35 |
| 5773.01 | 1.19 | 95.63 | 5772.84 | 9.92 | 5.71 | 10.56 | 0.11 |
| 5867.25 | 1.24 | 86.34 | 5867.06 | 9.88 | 7.70 | 12.12 | 0.21 |
| 5963.31 | 1.34 | 85.98 | 5963.09 | 10.03 | 9.86 | 13.93 | 0.10 |
| 6057.33 | 1.30 | 89.19 | 6057.09 | 10.12 | 12.02 | 15.70 | 0.09 |
| 6155.89 | 1.38 | 88.44 | 6155.62 | 10.17 | 14.33 | 17.56 | 0.08 |
| 6246.52 | 1.40 | 90.58 | 6246.22 | 10.19 | 16.52 | 19.31 | 0.06 |
| 6343.21 | 1.42 | 88.65 | 6342.88 | 10.20 | 18.90 | 21.21 | 0.05 |
| 6437.02 | 1.44 | 96.52 | 6436.66 | 10.10 | 21.24 | 23.00 | 0.21 |
| 6530.52 | 1.40 | 95.36 | 6530.13 | 9.86 | 23.54 | 24.68 | 0.05 |
| 6625.49 | 1.25 | 90.26 | 6625.08 | 9.75 | 25.72 | 26.34 | 0.20 |
| 6717.99 | 1.13 | 90.62 | 6717.56 | 9.73 | 27.64 | 27.86 | 0.12 |
| 6811.52 | 1.11 | 86.25 | 6811.07 | 9.78 | 29.47 | 29.34 | 0.09 |
| 6908.43 | 0.89 | 88.57 | 6907.97 | 9.86 | 31.15 | 30.72 | 0.23 |
| 7001.41 | 0.70 | 87.03 | 7000.94 | 9.91 | 32.43 | 31.77 | 0.20 |
| 7094.07 | 0.65 | 71.73 | 7093.59 | 10.10 | 33.49 | 32.73 | 0.20 |
| 7191.10 | 0.67 | 75.26 | 7190.62 | 10.42 | 34.56 | 33.77 | 0.04 |
| 7289.93 | 0.66 | 79.87 | 7289.44 | 10.66 | 35.68 | 34.81 | 0.05 |
| 7384.33 | 0.57 | 83.08 | 7383.83 | 10.82 | 36.68 | 35.69 | 0.09 |
| 7479.16 | 0.35 | 68.42 | 7478.66 | 10.98 | 37.41 | 36.37 | 0.26 |
| 7576.54 | 0.46 | 53.07 | 7576.04 | 11.32 | 38.00 | 37.05 | 0.16 |
| 7667.12 | 0.62 | 62.88 | 7666.61 | 11.76 | 38.73 | 37.89 | 0.20 |
| 7764.12 | 0.42 | 53.59 | 7763.61 | 12.22 | 39.48 | 38.77 | 0.23 |
| 7855.86 | 0.51 | 50.80 | 7855.35 | 12.67 | 40.06 | 39.51 | 0.09 |
| 7948.98 | 0.40 | 63.86 | 7948.46 | 13.07 | 40.68 | 40.24 | 0.15 |
| 8044.80 | 0.49 | 55.09 | 8044.28 | 13.46 | 41.32 | 40.98 | 0.12 |
| 8135.91 | 0.46 | 52.84 | 8135.39 | 13.90 | 41.93 | 41.74 | 0.04 |
| 8235.49 | 0.50 | 38.54 | 8234.96 | 14.48 | 42.51 | 42.55 | 0.12 |
| 8327.87 | 0.58 | 21.77 | 8327.34 | 15.23 | 42.94 | 43.35 | 0.19 |

ARCO ALASKA, INC.
WILDCAT
AKMM930511:55-171-00009
JULY 1993

KUVLUM #2 OCS-Y-0865-1
KULLUK
NORTH REFERENCE : TRUE NORTH
SHORT COLLAR METHOD
MAG. FIELD STRENGTH (NT) : 57558
DIP ANGLE : 81.01
TOTAL CORRECTION : 31.55

| MEASURED DEPTH | ANGLE DEGREE | DIRECTION DEGREE | VERTICAL DEPTH | LATITUDE FEET | DEPARTURE FEET | VERTICAL SECTION | DOG LEG SEVERITY |
|-------------------|-----------------|---------------------|-------------------|------------------|-------------------|---------------------|---------------------|
| 8422.68 | 0.63 | 30.47 | 8422.14 | 16.13 | 43.38 | 44.25 | 0.11 |
| 8516.08 | 0.63 | 38.17 | 8515.53 | 16.98 | 43.96 | 45.22 | 0.08 |
| 8611.27 | 0.63 | 51.31 | 8610.72 | 17.72 | 44.69 | 46.25 | 0.15 |
| 8705.56 | 0.70 | 47.75 | 8705.00 | 18.43 | 45.52 | 47.34 | 0.08 |
| 8801.41 | 0.77 | 43.45 | 8800.84 | 19.29 | 46.40 | 48.56 | 0.08 |
| 8988.40 | 0.68 | 26.79 | 8987.82 | 21.18 | 47.76 | 50.79 | 0.12 |
| 9176.72 | 0.67 | 26.31 | 9176.13 | 23.16 | 48.74 | 52.78 | 0.00 |
| 9365.32 | 1.02 | 36.50 | 9364.71 | 25.49 | 50.23 | 55.38 | 0.20 |
| 9478.52 | 1.00 | 41.74 | 9477.89 | 27.04 | 51.49 | 57.32 | 0.09 |
| 9574.08 | 1.00 | 34.65 | 9573.43 | 28.35 | 52.52 | 58.93 | 0.13 |
| 9671.24 | 1.30 | 58.34 | 9670.57 | 29.62 | 53.94 | 60.83 | 0.57 |
| 9862.12 | 1.41 | 62.09 | 9861.40 | 31.86 | 57.85 | 65.30 | 0.08 |
| 9954.39 | 1.43 | 58.84 | 9953.64 | 32.99 | 59.84 | 67.56 | 0.09 |
| 10049.37 | 1.06 | 61.01 | 10048.60 | 34.02 | 61.63 | 69.61 | 0.40 |
| 10239.79 | 0.97 | 70.43 | 10238.99 | 35.42 | 64.68 | 72.88 | 0.10 |
| 10332.67 | 1.45 | 65.20 | 10331.85 | 36.17 | 66.49 | 74.77 | 0.53 |
| 10519.48 | 1.54 | 31.86 | 10518.60 | 39.30 | 69.96 | 79.43 | 0.46 |
| 10617.34 | 1.78 | 31.43 | 10616.42 | 41.71 | 71.45 | 82.08 | 0.25 |
| 10713.17 | 2.10 | 34.71 | 10712.19 | 44.43 | 73.22 | 85.15 | 0.35 |
| 10803.90 | 2.43 | 27.34 | 10802.85 | 47.51 | 75.06 | 88.47 | 0.48 |
| 10895.52 | 3.02 | 27.19 | 10894.36 | 51.38 | 77.05 | 92.41 | 0.64 |
| 10993.30 | 3.48 | 25.72 | 10991.99 | 56.34 | 79.52 | 97.39 | 0.48 |
| 11087.35 | 4.03 | 29.16 | 11085.84 | 61.80 | 82.36 | 102.96 | 0.63 |
| 11125.00 | 4.03 | 29.16 | 11123.40 | 64.10 | 83.65 | 105.39 | 0.05 |

CALCULATIONS BASED ON THE MINIMUM CURVATURE METHOD
HORIZONTAL DISPLACEMENT AT A DEPTH OF 11125.0 FEET
IS 105.4 FEET ALONG N 52 DEG 32 MIN E
RELATIVE TO WELL HEAD

VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION COMPUTED ALONG 52.54 DEG
A DECLINATION OF 31.55 HAS BEEN APPLIED

SPERRY-SUN DRILLING SERVICES, INC.

PAGE 1

Arco Alaska
 COOK INLET
 930818 :50-733-20450
 OCTOBER 1993

SOUTH COOK INLET #3
 ROWAN Gilbert Rowe
 NORTH REFERENCE : GRID NORTH
 SHORT COLLAR METHOD
 MAG. FIELD STRENGTH (NT) : 50600
 DIP ANGLE : 60.00
 TOTAL CORRECTION : 0.00

| MEASURED DEPTH (feet) | INCLIN (degree) | AZIMUTH (degree) | VERTICAL DEPTH (feet) | LATITUDE (N/S,+/-) (feet) | DEPARTURE (E/W,+/-) (feet) | VERTICAL SECTION (feet) | DOG LEG SEVERITY (dg/100f) |
|-----------------------------|--------------------|---------------------|-----------------------------|---------------------------------|----------------------------------|-------------------------------|----------------------------------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1168.26 | 0.57 | 322.73 | 1168.24 | 4.64 | -3.53 | 2.01 | 0.05 |
| 1261.74 | 0.41 | 333.21 | 1261.72 | 5.31 | -3.96 | 2.34 | 0.20 |
| 1356.74 | 0.34 | 76.06 | 1356.72 | 5.68 | -3.84 | 2.72 | 0.62 |
| 1452.70 | 0.08 | 101.51 | 1452.67 | 5.73 | -3.50 | 2.95 | 0.29 |
| 1548.29 | 0.31 | 267.17 | 1548.26 | 5.71 | -3.69 | 2.82 | 0.40 |
| 1641.68 | 0.13 | 327.24 | 1641.65 | 5.78 | -3.99 | 2.72 | 0.28 |
| 1733.95 | 0.22 | 329.85 | 1733.92 | 6.02 | -4.14 | 2.85 | 0.10 |
| 1830.39 | 0.20 | 31.05 | 1830.36 | 6.33 | -4.14 | 3.10 | 0.22 |
| 1924.83 | 0.18 | 17.28 | 1924.80 | 6.61 | -4.01 | 3.41 | 0.05 |
| 2022.13 | 0.09 | 22.18 | 2022.10 | 6.82 | -3.94 | 3.63 | 0.09 |
| 2115.36 | 0.27 | 50.38 | 2115.33 | 7.03 | -3.74 | 3.91 | 0.21 |
| 2212.57 | 0.19 | 67.27 | 2212.54 | 7.24 | -3.42 | 4.25 | 0.11 |
| 2307.50 | 0.32 | 64.32 | 2307.47 | 7.41 | -3.04 | 4.61 | 0.14 |
| 2401.75 | 0.25 | 160.42 | 2401.72 | 7.33 | -2.73 | 4.71 | 0.46 |
| 2495.45 | 0.32 | 26.24 | 2495.42 | 7.37 | -2.54 | 4.84 | 0.56 |
| 2590.19 | 0.36 | 52.74 | 2590.16 | 7.79 | -2.19 | 5.39 | 0.17 |
| 2689.37 | 0.33 | 131.61 | 2689.34 | 7.79 | -1.72 | 5.64 | 0.45 |
| 2781.30 | 0.55 | 43.63 | 2781.26 | 7.93 | -1.22 | 6.03 | 0.68 |
| 2874.98 | 0.41 | 21.61 | 2874.94 | 8.57 | -0.79 | 6.79 | 0.24 |
| 2968.18 | 0.33 | 38.28 | 2968.14 | 9.08 | -0.50 | 7.38 | 0.14 |
| 3061.97 | 0.27 | 51.92 | 3061.93 | 9.43 | -0.16 | 7.86 | 0.09 |
| 3152.98 | 0.21 | 69.15 | 3152.94 | 9.62 | 0.17 | 8.20 | 0.09 |
| 3242.33 | 0.14 | 40.00 | 3242.29 | 9.77 | 0.39 | 8.44 | 0.12 |
| 3336.89 | 0.25 | 62.39 | 3336.85 | 9.95 | 0.65 | 8.73 | 0.13 |
| 3430.55 | 0.12 | 62.79 | 3430.51 | 10.09 | 0.92 | 9.00 | 0.13 |
| 3473.83 | 0.25 | 54.91 | 3473.78 | 10.17 | 1.04 | 9.12 | 0.30 |
| 3563.50 | 0.23 | 70.29 | 3563.45 | 10.34 | 1.36 | 9.45 | 0.07 |
| 3676.01 | 0.22 | 101.19 | 3675.96 | 10.37 | 1.78 | 9.70 | 0.10 |
| 3707.84 | 0.22 | 12.97 | 3707.79 | 10.42 | 1.86 | 9.78 | 0.96 |
| 3802.62 | 0.19 | 63.10 | 3802.57 | 10.67 | 2.04 | 10.09 | 0.19 |
| 3897.24 | 0.32 | 63.42 | 3897.19 | 10.86 | 2.42 | 10.45 | 0.14 |
| 3988.52 | 0.48 | 3.65 | 3988.47 | 11.36 | 2.68 | 11.01 | 0.46 |
| 4083.75 | 0.45 | 106.74 | 4083.70 | 11.65 | 3.06 | 11.47 | 0.77 |
| 4179.16 | 0.51 | 217.53 | 4179.11 | 11.21 | 3.16 | 11.15 | 0.83 |
| 4274.97 | 0.60 | 25.09 | 4274.91 | 11.32 | 3.11 | 11.22 | 1.15 |
| 4367.75 | 0.51 | 335.18 | 4367.69 | 12.13 | 3.14 | 11.92 | 0.51 |
| 4461.12 | 0.41 | 29.76 | 4461.06 | 12.80 | 3.14 | 12.47 | 0.46 |

| | | | | | | | |
|---------|------|--------|---------|-------|-------|-------|------|
| 4553.01 | 0.44 | 6.42 | 4552.95 | 13.44 | 3.34 | 13.12 | 0.19 |
| 4646.62 | 0.30 | 83.77 | 4646.55 | 13.82 | 3.62 | 13.59 | 0.50 |
| 4739.28 | 0.31 | 347.11 | 4739.21 | 14.09 | 3.80 | 13.92 | 0.49 |
| 4835.65 | 0.34 | 336.31 | 4835.58 | 14.60 | 3.63 | 14.26 | 0.07 |
| 4929.53 | 0.33 | 347.63 | 4929.46 | 15.12 | 3.46 | 14.60 | 0.07 |
| 5023.80 | 0.24 | 358.70 | 5023.73 | 15.59 | 3.40 | 14.96 | 0.11 |
| 5113.83 | 0.25 | 256.66 | 5113.76 | 15.73 | 3.20 | 14.98 | 0.43 |
| 5210.65 | 0.35 | 347.19 | 5210.58 | 15.97 | 2.93 | 15.03 | 0.45 |
| 5304.72 | 0.31 | 327.06 | 5304.65 | 16.47 | 2.73 | 15.34 | 0.12 |
| 5399.64 | 0.19 | 15.68 | 5399.57 | 16.84 | 2.63 | 15.60 | 0.25 |
| 5493.87 | 0.15 | 328.32 | 5493.79 | 17.09 | 2.60 | 15.80 | 0.15 |
| 5585.79 | 0.23 | 286.16 | 5585.71 | 17.24 | 2.37 | 15.80 | 0.16 |
| 5683.08 | 0.19 | 350.41 | 5683.00 | 17.45 | 2.16 | 15.87 | 0.23 |
| 5777.47 | 0.21 | 53.01 | 5777.39 | 17.71 | 2.27 | 16.14 | 0.22 |
| 5870.88 | 0.27 | 74.87 | 5870.80 | 17.87 | 2.62 | 16.47 | 0.11 |
| 5964.10 | 0.28 | 60.60 | 5964.02 | 18.04 | 3.03 | 16.83 | 0.07 |
| 6060.56 | 0.40 | 18.10 | 6060.48 | 18.48 | 3.35 | 17.37 | 0.28 |
| 6153.23 | 0.49 | 21.54 | 6153.15 | 19.16 | 3.59 | 18.08 | 0.09 |
| 6250.88 | 0.55 | 59.34 | 6250.79 | 19.79 | 4.15 | 18.91 | 0.35 |
| 6344.96 | 0.43 | 55.87 | 6344.87 | 20.22 | 4.83 | 19.64 | 0.12 |
| 6438.75 | 0.48 | 35.79 | 6438.66 | 20.74 | 5.35 | 20.36 | 0.18 |
| 6533.91 | 0.66 | 44.77 | 6533.81 | 21.45 | 5.98 | 21.30 | 0.21 |
| 6628.07 | 0.78 | 52.54 | 6627.96 | 22.23 | 6.87 | 22.43 | 0.16 |
| 6721.85 | 0.76 | 57.76 | 6721.74 | 22.95 | 7.90 | 23.59 | 0.07 |
| 6816.40 | 0.67 | 65.09 | 6816.28 | 23.52 | 8.93 | 24.62 | 0.14 |
| 6910.53 | 0.57 | 55.66 | 6910.40 | 24.01 | 9.81 | 25.52 | 0.15 |
| 7005.88 | 0.71 | 57.18 | 7005.75 | 24.60 | 10.70 | 26.49 | 0.14 |
| 7101.23 | 0.89 | 43.49 | 7101.09 | 25.45 | 11.71 | 27.75 | 0.27 |
| 7289.67 | 0.96 | 56.75 | 7289.50 | 27.38 | 14.03 | 30.62 | 0.12 |
| 7384.20 | 1.09 | 33.23 | 7384.02 | 28.56 | 15.18 | 32.24 | 0.46 |
| 7479.40 | 1.28 | 33.65 | 7479.20 | 30.21 | 16.27 | 34.21 | 0.20 |
| 7572.76 | 1.67 | 35.42 | 7572.53 | 32.19 | 17.64 | 36.62 | 0.42 |
| 7664.78 | 1.86 | 35.42 | 7664.50 | 34.50 | 19.29 | 39.46 | 0.21 |
| 7763.66 | 1.94 | 40.49 | 7763.33 | 37.09 | 21.30 | 42.72 | 0.18 |
| 7856.37 | 2.16 | 48.02 | 7855.98 | 39.45 | 23.62 | 45.96 | 0.37 |
| 7951.11 | 2.18 | 46.41 | 7950.65 | 41.88 | 26.25 | 49.42 | 0.07 |
| 8000.00 | 2.18 | 46.41 | 7999.51 | 43.16 | 27.60 | 51.23 | 0.00 |

CALCULATIONS BASED ON THE MINIMUM CURVATURE METHOD

HORIZONTAL DISPLACEMENT AT A DEPTH OF 8000.0 FEET
IS 51.2 FEET ALONG N 32 DEG 36 MIN E
RELATIVE TO WELL HEAD

VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION COMPUTED ALONG 32.59 DEG

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

Show Report 1 Part B 10
Depth Interval 6470 to 6500
True Vert. Depth to
Prepared by TOM MANSFIELD
Delivered to
Date 8/13/93 Time 06:00 A.M.

Operator ARCO ALASKA INC.
Well Name KUVLUM #2
Location BEAUFORT SEA, ALASKA

| | | | | |
|--------------------|------------------------------|-------------------------------|--------------------------------|---|
| ZONE PRODUCTION | <input type="checkbox"/> GAS | <input type="checkbox"/> OIL | <input type="checkbox"/> WATER | <input checked="" type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS |
| | | | | |
| CONTACT DEPTH | Gas/Oil <u> </u> ft. | Gas/Water <u> </u> ft. | Oil/Water <u> </u> ft. | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---------------------------|--------------------------------|--|-------------------------------------|--------------------|----------------|---|-------------|--|-----------------------------------|-----------------|--|--|--|-----------------------------------|-----------------|-----------------|---|-----------------|-----------------------------------|-----------------|-----------------|---|-----------------|-----------------------------------|-----------------|-----------------|---|-----------------|---------------------|---|-----------------|---|-----------------|---------------------|---|-----------------|---|-----------------|
| 5 | DEPTH <u>6475</u> ft. | GAS <input type="checkbox"/> % | <input checked="" type="checkbox"/> units <u>122</u> | MUD CHLORIDES (ppm) <u>17000</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="0"> <tr> <td>FLOWLINE ppm</td> <td>SUCTION ppm</td> <td>=</td> <td>SHOW ppm</td> <td></td> </tr> <tr> <td colspan="5">(Steam Still ppm's in 1000's)</td> </tr> <tr> <td>C 1 <u>5,850</u></td> <td>-</td> <td><u>1,140</u></td> <td>=</td> <td><u>4,710</u></td> </tr> <tr> <td>C 2 <u>57</u></td> <td>-</td> <td><u>4</u></td> <td>=</td> <td><u>53</u></td> </tr> <tr> <td>C 3 <u>22</u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u>22</u></td> </tr> <tr> <td>C 4 <u>21</u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u>21</u></td> </tr> <tr> <td>C 5 <u>7</u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u>7</u></td> </tr> </table> | | | | | FLOWLINE ppm | SUCTION ppm | = | SHOW ppm | | (Steam Still ppm's in 1000's) | | | | | C 1 <u>5,850</u> | - | <u>1,140</u> | = | <u>4,710</u> | C 2 <u>57</u> | - | <u>4</u> | = | <u>53</u> | C 3 <u>22</u> | - | <u> </u> | = | <u>22</u> | C 4 <u>21</u> | - | <u> </u> | = | <u>21</u> | C 5 <u>7</u> | - | <u> </u> | = | <u>7</u> |
| FLOWLINE ppm | SUCTION ppm | = | SHOW ppm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (Steam Still ppm's in 1000's) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 1 <u>5,850</u> | - | <u>1,140</u> | = | <u>4,710</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 2 <u>57</u> | - | <u>4</u> | = | <u>53</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 3 <u>22</u> | - | <u> </u> | = | <u>22</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 4 <u>21</u> | - | <u> </u> | = | <u>21</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 5 <u>7</u> | - | <u> </u> | = | <u>7</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="0"> <tr> <td colspan="5">HYDROCARBON RATIOS</td> </tr> <tr> <td>C₁ / C₂ =</td> <td><u>89</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C₁ / C₃ =</td> <td><u>214</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C₁ / C₄ =</td> <td><u>224</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C₁ / C₅ =</td> <td><u>673</u></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | HYDROCARBON RATIOS | | | | | C ₁ / C ₂ = | <u>89</u> | | | | C ₁ / C ₃ = | <u>214</u> | | | | C ₁ / C ₄ = | <u>224</u> | | | | C ₁ / C ₅ = | <u>673</u> | | | | | | | | | | | | | |
| HYDROCARBON RATIOS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₂ = | <u>89</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₃ = | <u>214</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₄ = | <u>224</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₅ = | <u>673</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRODUCTION ANALYSIS <input type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input checked="" type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | DEPTH <u> </u> ft. | GAS <input type="checkbox"/> % | <input type="checkbox"/> units <u> </u> | MUD CHLORIDES (ppm) <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="0"> <tr> <td>FLOWLINE ppm</td> <td>SUCTION ppm</td> <td>=</td> <td>SHOW ppm</td> <td></td> </tr> <tr> <td colspan="5">(Steam Still ppm's in 1000's)</td> </tr> <tr> <td>C 1 <u> </u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u> </u></td> </tr> <tr> <td>C 2 <u> </u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u> </u></td> </tr> <tr> <td>C 3 <u> </u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u> </u></td> </tr> <tr> <td>C 4 <u> </u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u> </u></td> </tr> <tr> <td>C 5 <u> </u></td> <td>-</td> <td><u> </u></td> <td>=</td> <td><u> </u></td> </tr> </table> | | | | | FLOWLINE ppm | SUCTION ppm | = | SHOW ppm | | (Steam Still ppm's in 1000's) | | | | | C 1 <u> </u> | - | <u> </u> | = | <u> </u> | C 2 <u> </u> | - | <u> </u> | = | <u> </u> | C 3 <u> </u> | - | <u> </u> | = | <u> </u> | C 4 <u> </u> | - | <u> </u> | = | <u> </u> | C 5 <u> </u> | - | <u> </u> | = | <u> </u> |
| FLOWLINE ppm | SUCTION ppm | = | SHOW ppm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (Steam Still ppm's in 1000's) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 1 <u> </u> | - | <u> </u> | = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 2 <u> </u> | - | <u> </u> | = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 3 <u> </u> | - | <u> </u> | = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 4 <u> </u> | - | <u> </u> | = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C 5 <u> </u> | - | <u> </u> | = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="0"> <tr> <td colspan="5">HYDROCARBON RATIOS</td> </tr> <tr> <td>C₁ / C₂ =</td> <td><u> </u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C₁ / C₃ =</td> <td><u> </u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C₁ / C₄ =</td> <td><u> </u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C₁ / C₅ =</td> <td><u> </u></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | HYDROCARBON RATIOS | | | | | C ₁ / C ₂ = | <u> </u> | | | | C ₁ / C ₃ = | <u> </u> | | | | C ₁ / C ₄ = | <u> </u> | | | | C ₁ / C ₅ = | <u> </u> | | | | | | | | | | | | | |
| HYDROCARBON RATIOS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₂ = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₃ = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₄ = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C ₁ / C ₅ = | <u> </u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRODUCTION ANALYSIS <input type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

LITHOLOGY

SAND-CLEAR, LIGHT GRAY, OCCASIONAL BLACK TO BROWN, VERY FINE GRAIN, OCCASIONAL FINE GRAIN, ANGULAR TO SUB ANGULAR, MODERATELY SORTED, PREDOMINATELY QUARTZ GRAINS, OCCASIONAL LITHIC FRAGMENT, SILTY CLAY MATRIX MATERIAL.

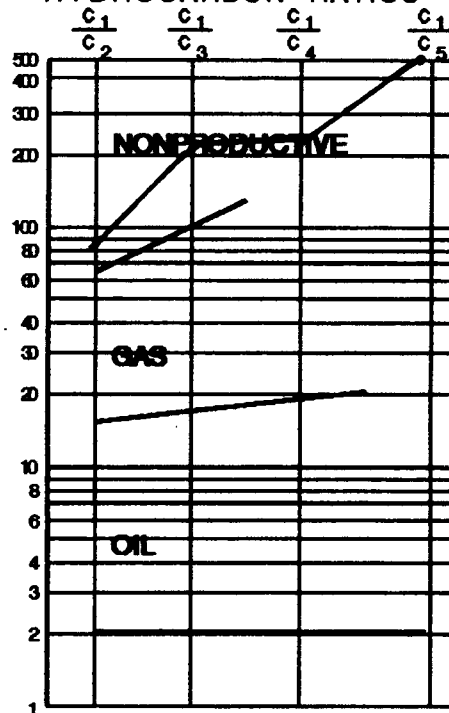
SHOW EVALUATION

LESS THAN 5% DULL ORANGE TO ORANGE FLUORESCENCE, TRACE YELLOW/GREEN FLUORESCENCE, FAIR YELLOW CUT FLUORESCENCE IN PART, NO ODOR, NO STAIN, SILTY CLAY MATRIX MATERIAL WITH POOR VISIBLE POROSITY.

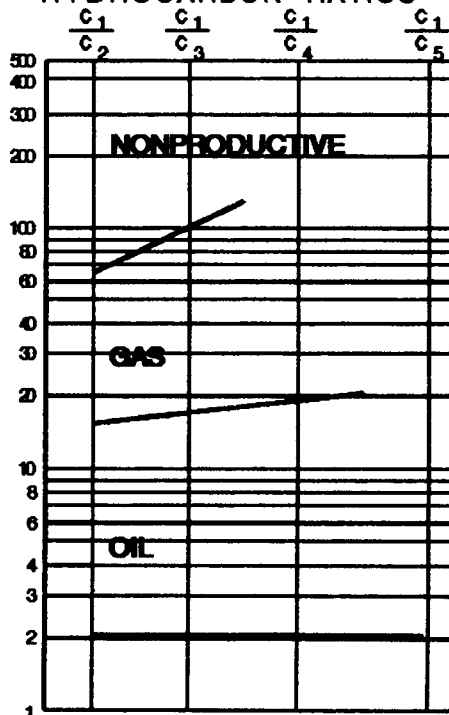
REMARKS

POOR SHOW

HYDROCARBON RATIOS



HYDROCARBON RATIOS



sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

Operator ARCO ALASKA INC.
Well Name KUVLUM #2
Location BEAUFORT SEA, AK

Show Report 2 Part B
Depth Interval 6663 to 6672
True Vert. Depth _____ to _____
Prepared by TOM MANSFIELD
Delivered to _____
Date 8/13/93 Time 22:30

| | | | | |
|--------------------|---|------------------------------|--------------------------------|--|
| ZONE PRODUCTION | <input checked="" type="checkbox"/> GAS | <input type="checkbox"/> OIL | <input type="checkbox"/> WATER | <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS |
| | | | | |
| CONTACT DEPTH | Gas/Oil _____ ft. | Gas/Water _____ ft. | Oil/Water _____ ft. | |

| | | | | | | | | | |
|-----|-------------------------------|------|-----|-------------|---------------------------------------|-------|-----|---------------------|-------|
| 5 | DEPTH | 6665 | ft. | GAS | <input checked="" type="checkbox"/> % | units | 506 | MUD CHLORIDES (ppm) | 17000 |
| | FLOWLINE ppm | | | SUCTION ppm | | | | SHOW ppm | |
| | (Steam Still ppm's in 1000's) | | | | | | | | |
| C 1 | 23,800 | - | | 1,380 | = | | | 22,420 | |
| C 2 | 362 | - | | 17 | = | | | 345 | |
| C 3 | 324 | - | | 11 | = | | | 313 | |
| C 4 | 211 | - | | 10 | = | | | 201 | |
| C 5 | 207 | - | | 7 | = | | | 200 | |

HYDROCARBON RATIOS

| | | |
|-------------|---|-----|
| C_1 / C_2 | = | 65 |
| C_1 / C_3 | = | 72 |
| C_1 / C_4 | = | 112 |
| C_1 / C_5 | = | 112 |

PRODUCTION ANALYSIS ☐ GAS ☐ OIL ☐ WATER ☐ NON-PRODUCIBLE HYDROCARBONS

| | | | | | | | | | |
|-----|-------------------------------|------|-----|-------------|---------------------------------------|-------|-----|---------------------|-------|
| 6 | DEPTH | 6675 | ft. | GAS | <input checked="" type="checkbox"/> % | units | 472 | MUD CHLORIDES (ppm) | 17000 |
| | FLOWLINE ppm | | | SUCTION ppm | | | | SHOW ppm | |
| | (Steam Still ppm's in 1000's) | | | | | | | | |
| C 1 | 10,900 | - | | 1,380 | = | | | 9,520 | |
| C 2 | 134 | - | | 17 | = | | | 117 | |
| C 3 | 100 | - | | 11 | = | | | 89 | |
| C 4 | 64 | - | | 10 | = | | | 54 | |
| C 5 | 59 | - | | 7 | = | | | 52 | |

HYDROCARBON RATIOS

| | | |
|-------------|---|-----|
| C_1 / C_2 | = | 81 |
| C_1 / C_3 | = | 107 |
| C_1 / C_4 | = | 176 |
| C_1 / C_5 | = | 183 |

PRODUCTION ANALYSIS ☐ GAS ☐ OIL ☐ WATER ☒ NON-PRODUCIBLE HYDROCARBONS

LITHOLOGY

SAND-CLEAR, TAN, LIGHT GRAY, BLACK IN PART, SILT-VERY FINE GRAIN,
SUB ANGULAR TO SUB ROUND, PREDOMINATELY SUB ROUNDED
POOR TO MODERATELY SORTED, UNCONSOLIDATED, CLAY
MATRIX, 80-90% QUARTZ, 10-20% LITHIC GRAINS.

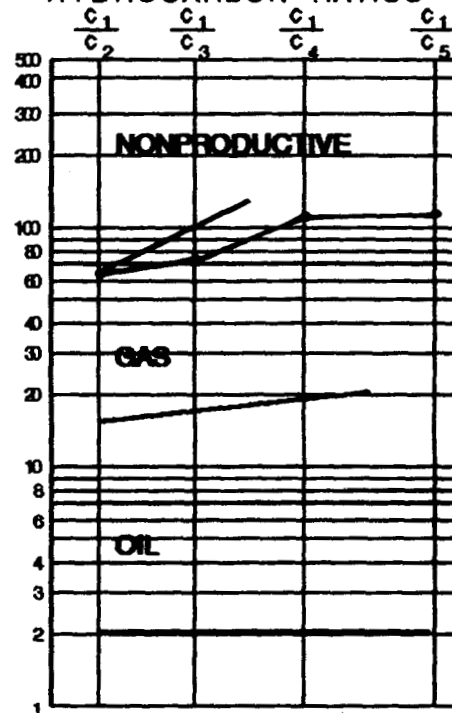
SHOW EVALUATION

MEDIUM TO BRIGHT GREEN/GOLD FLUORESCENCE ON 50% OF
SURFACE, FAIR SLOW YELLOW CUT FLUORESCENCE, GOOD YELLOW/
WHITE RESIDUAL RING CUT FLUORESCENCE. FAINT TO FAIR OIL ODOR,
NO VISIBLE OIL STAINING, CLAY MATRIX, APPEARS LOW IN POROSITY.
FLUORESCENCE INTENSITY FADING SOMEWHAT WITH TIME.

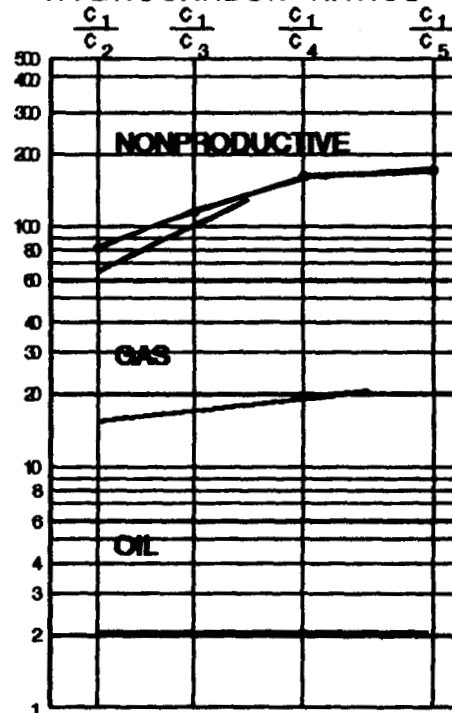
REMARKS

GOOD RESISTIVITY READINGS (10 AVG.) FROM 6665-6670. RATIO
ANALYSIS INDICATES THAT THIS ZONE CONTAINS GAS. FAIR TO GOOD
SHOW RATING FOR GAS/GAS CONDENSATE.

HYDROCARBON RATIOS



HYDROCARBON RATIOS



sperry-sun LOGGING SYSTEMS

DRILLING SERVICES A Baroid Company

Show Report 3 Part B
 Depth Interval 6698 to 6720
 True Vert. Depth _____ to _____
 Prepared by MANFIELD/PATTON
 Delivered to _____
 Date 8/13/93 Time 22:30

Operator ARCO ALASKA INC.
 Well Name KUULUM #2
 Location BEAUFORT SEA, AK

| | | | | |
|-----------------|---|------------------------------|--------------------------------|--|
| ZONE PRODUCTION | <input checked="" type="checkbox"/> GAS | <input type="checkbox"/> OIL | <input type="checkbox"/> WATER | <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS |
| CONTACT DEPTH | Gas/Oil _____ ft. | Gas/Water _____ ft. | Oil/Water _____ ft. | |

| | | | | | | | | |
|--|-------------------------------|------|-------------|-----|---|-----|---------------------|-------|
| 5 | DEPTH | 6700 | ft. | GAS | <input checked="" type="checkbox"/> % units | 523 | MUD CHLORIDES (ppm) | 17000 |
| | FLOWLINE ppm | | SUCTION ppm | = | SHOW ppm | | | |
| | (Steam Still ppm's in 1000's) | | | | | | | |
| C 1 | 45,500 | - | 1,380 | = | 44,120 | | HYDROCARBON RATIOS | |
| C 2 | 620 | - | 17 | = | 603 | | $C_1 / C_2 =$ | 73 |
| C 3 | 398 | - | 11 | = | 387 | | $C_1 / C_3 =$ | 114 |
| C 4 | 271 | - | 10 | = | 261 | | $C_1 / C_4 =$ | 169 |
| C 5 | 260 | - | 7 | = | 253 | | $C_1 / C_5 =$ | 174 |
| PRODUCTION ANALYSIS <input checked="" type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | | | | | | |
| 6 | DEPTH | 6710 | ft. | GAS | <input checked="" type="checkbox"/> % units | 504 | MUD CHLORIDES (ppm) | 17000 |
| | FLOWLINE ppm | | SUCTION ppm | = | SHOW ppm | | | |
| | (Steam Still ppm's in 1000's) | | | | | | | |
| C 1 | 33,800 | - | 1,380 | = | 32,420 | | HYDROCARBON RATIOS | |
| C 2 | 495 | - | 17 | = | 478 | | $C_1 / C_2 =$ | 68 |
| C 3 | 350 | - | 11 | = | 339 | | $C_1 / C_3 =$ | 96 |
| C 4 | 265 | - | 10 | = | 255 | | $C_1 / C_4 =$ | 127 |
| C 5 | 258 | - | 7 | = | 251 | | $C_1 / C_5 =$ | 129 |
| PRODUCTION ANALYSIS <input checked="" type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | | | | | | |

LITHOLOGY

SAND-DARK GRAY, BLACK, CLEAR, TRANSLUCENT, MEDIUM GRAY, VERY FINE TO MEDIUM GRAIN, PREDOMINATELY MEDIUM GRAIN, OCCASIONALLY COARSE TO VERY COARSE GRAIN, SUB ANGULAR TO WELL ROUNDED, PREDOMINATELY SUB ANGULAR, POOR TO MODERATELY SORTED, UNCONSOLIDATED, SILTY CLAY MATRIX, 60-70% CHERT & LITHIC FRAGMENTS, 30-40% QUARTZ.

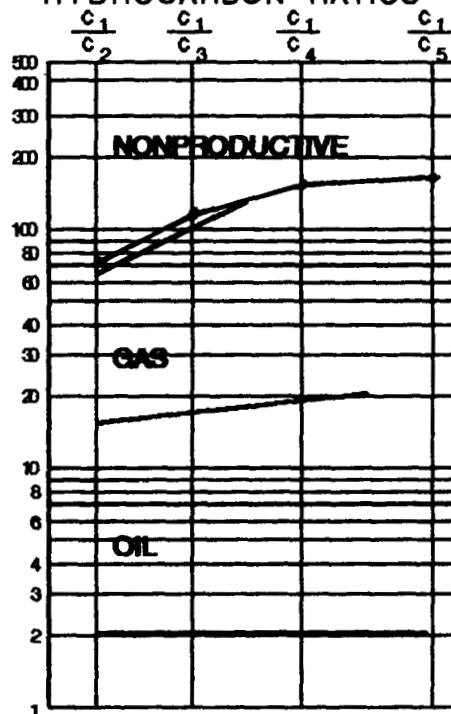
SHOW EVALUATION

50-70% MEDIUM TO BRIGHT GREEN/GOLD FLUORESCENCE ON SAMPLE SURFACE, GOOD FAST STREAMING MILKY WHITE/YELLOW CUT FLUORESCENCE, GOOD WHITE/YELLOW RESIDUAL RING CUT FLUORESCENCE, FAIR OIL ODOR, SLIGHT TRACE OF TAN TO LIGHT BROWN OIL STAIN. FLOURESCENCE INTENSITY FADING WITH TIME IN THE 6700 AND 6710 SAMPLES.

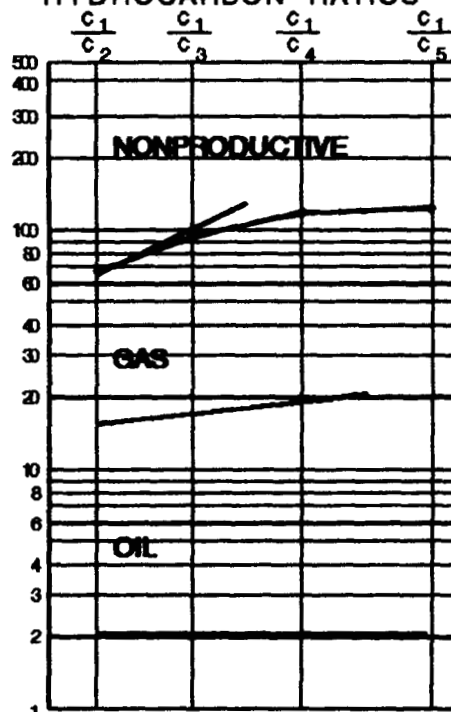
REMARKS

RESISTIVITY READINGS AVERAGING 7-8 IN THIS INTERVAL WHICH IS SOMEWHAT LOW FOR A VERY GOOD SHOW RATING. RATIO ANALYSIS INDICATES THAT THE ZONE IS PREDOMINATELY GAS BEARING OR POSSIBLY TIGHT. GOOD OVERALL SHOW RATING FOR GAS/GAS CONDENSATE.

HYDROCARBON RATIOS



HYDROCARBON RATIOS



sperry-sun LOGGING SYSTEMS

A Baroid Company

Show Report 4 Part B
 Depth Interval 6721 to 6729
 True Vert. Depth _____ to _____
 Prepared by MANSFIELD/PATTON
 Delivered to _____
 Date 8/13/93 Time 24:00

Operator ARCO ALASKA INC.
 Well Name KUVLUM #2
 Location BEAUFORT SEA, AK

| | | | | |
|-----------------|---|------------------------------|--------------------------------|--|
| ZONE PRODUCTION | <input checked="" type="checkbox"/> GAS | <input type="checkbox"/> OIL | <input type="checkbox"/> WATER | <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS |
| CONTACT DEPTH | Gas/Oil _____ ft. | Gas/Water _____ ft. | Oil/Water _____ ft. | |

| | | | |
|--|-------------------------------|---|----------------------------------|
| 5 | DEPTH <u>6525</u> ft. | GAS <input checked="" type="checkbox"/> % | MUD CHLORIDES (ppm) <u>17000</u> |
| | FLOWLINE ppm | SUCTION ppm | SHOW ppm |
| | (Steam Still ppm's in 1000's) | | |
| C 1 | <u>15,500</u> | <u>1,380</u> | <u>14,120</u> |
| C 2 | <u>250</u> | <u>17</u> | <u>233</u> |
| C 3 | <u>194</u> | <u>11</u> | <u>183</u> |
| C 4 | <u>154</u> | <u>10</u> | <u>144</u> |
| C 5 | <u>150</u> | <u>7</u> | <u>143</u> |
| HYDROCARBON RATIOS | | | |
| | $C_1 / C_2 =$ | <u>61</u> | |
| | $C_1 / C_3 =$ | <u>77</u> | |
| | $C_1 / C_4 =$ | <u>98</u> | |
| | $C_1 / C_5 =$ | <u>99</u> | |
| PRODUCTION ANALYSIS <input checked="" type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | |
| 6 | DEPTH <u>6729</u> ft. | GAS <input checked="" type="checkbox"/> % | MUD CHLORIDES (ppm) <u>17000</u> |
| | FLOWLINE ppm | SUCTION ppm | SHOW ppm |
| | (Steam Still ppm's in 1000's) | | |
| C 1 | <u>8,400</u> | <u>1,380</u> | <u>7,020</u> |
| C 2 | <u>141</u> | <u>17</u> | <u>124</u> |
| C 3 | <u>114</u> | <u>11</u> | <u>103</u> |
| C 4 | <u>95</u> | <u>10</u> | <u>85</u> |
| C 5 | <u>97</u> | <u>7</u> | <u>90</u> |
| HYDROCARBON RATIOS | | | |
| | $C_1 / C_2 =$ | <u>57</u> | |
| | $C_1 / C_3 =$ | <u>68</u> | |
| | $C_1 / C_4 =$ | <u>83</u> | |
| | $C_1 / C_5 =$ | <u>78</u> | |
| PRODUCTION ANALYSIS <input checked="" type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | |

LITHOLOGY

SAND-DARK GRAY, BLACK, CLEAR, TRANSLUCENT, MEDIUM GRAY,
 FINE TO MEDIUM GRAIN, OCCASIONAL COARSE GRAIN TO SMALL
 PEBBLE SIZE, SUB ANGULAR TO WELL ROUNDED, POOR TO
 MODERATELY SORTED, UNCONSOLIDATED SILTY CLAY MATRIX,
 60-70% CHERT AND LITHIC FRAGMENTS, 30-40% QUARTZ,
 OCCASIONAL CALCITE, TRACE PYRITE.

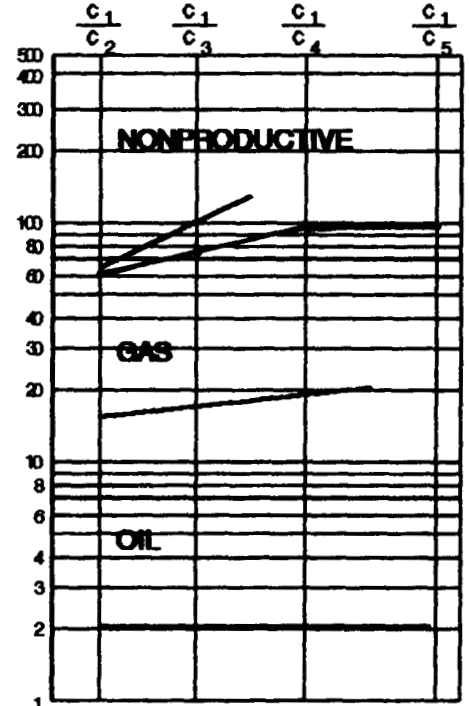
SHOW EVALUATION

60-70% MEDIUM TO BRIGHT GREEN/GOLD FLUORESCENCE ON SAMPLE
 SURFACE, GOOD FAST STREAMING MILKY WHITE/YELLOW CUT
 FLUORESCENCE, GOOD YELLOW/GOLD RESIDUAL RING CUT
 FLUORESCENCE, FAIR OIL ODOR, TRACE OF TAN TO LIGHT
 BROWN OIL STAIN.

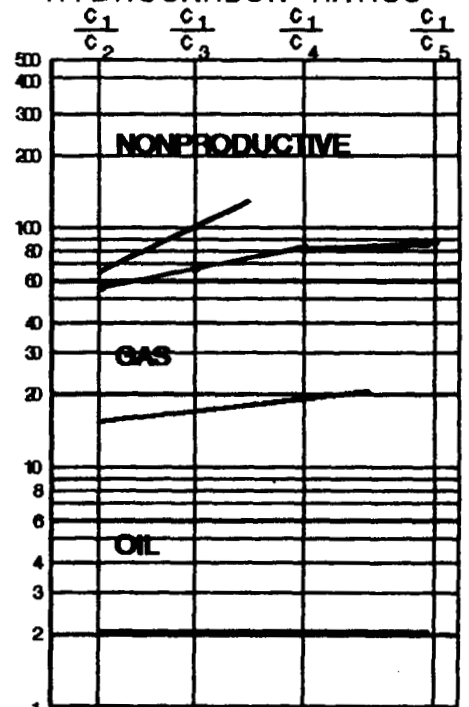
REMARKS

RESISTIVITY READINGS INCREASED IN THIS INTERVAL TO 15+.
 C1/C2 RATIOS ARE STILL IN THE GAS RANGE BUT ARE DECREASING
 WITH DEPTH. GOOD OVERALL SHOW RATING FOR GAS/GAS
 CONDENSATE.

HYDROCARBON RATIOS



HYDROCARBON RATIOS



sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

Operator ARCO ALASKA INC.
Well Name KUVLUM #2
Location BEAUFORT SEA, AK

Show Report 5 Part B
Depth Interval 7095 to 7115
True Vert. Depth 7095 to 7115
Prepared by TOM MANSFIELD
Delivered to _____
Date AUG 15, 93 Time 23:00

| | | | | |
|--------------------|---|------------------------------|--------------------------------|--|
| ZONE PRODUCTION | <input checked="" type="checkbox"/> GAS | <input type="checkbox"/> OIL | <input type="checkbox"/> WATER | <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS |
| | | | | |
| CONTACT DEPTH | Gas/Oil _____ ft. | Gas/Water _____ ft. | Oil/Water _____ ft. | |

| | | | | | |
|--|-----------------------|--|-----|---------------------|-------|
| 5 | DEPTH <u>7100</u> ft. | GAS <input checked="" type="checkbox"/> % <input checked="" type="checkbox"/> units | 258 | MUD CHLORIDES (ppm) | 17000 |
| FLOWLINE ppm | | SUCTION ppm | = | SHOW ppm | |
| (Steam Still ppm's in 1000's) | | | | | |
| C 1 | 15,800 | 1,570 | = | 14,230 | |
| C 2 | 326 | 46 | = | 280 | |
| C 3 | 216 | 70 | = | 146 | |
| C 4 | 212 | 78 | = | 134 | |
| C 5 | 205 | 83 | = | 122 | |
| HYDROCARBON RATIOS | | | | | |
| C ₁ / C ₂ = | | 51 | | | |
| C ₁ / C ₃ = | | 97 | | | |
| C ₁ / C ₄ = | | 106 | | | |
| C ₁ / C ₅ = | | 117 | | | |
| PRODUCTION ANALYSIS <input checked="" type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | | | |

| | | | | | |
|--|-----------------------|--|-----|---------------------|-------|
| 6 | DEPTH <u>7110</u> ft. | GAS <input checked="" type="checkbox"/> % <input checked="" type="checkbox"/> units | 268 | MUD CHLORIDES (ppm) | 17000 |
| FLOWLINE ppm | | SUCTION ppm | = | SHOW ppm | |
| (Steam Still ppm's in 1000's) | | | | | |
| C 1 | 10,800 | 1,570 | = | 9,230 | |
| C 2 | 210 | 46 | = | 164 | |
| C 3 | 160 | 70 | = | 90 | |
| C 4 | 153 | 78 | = | 75 | |
| C 5 | 152 | 83 | = | 69 | |
| HYDROCARBON RATIOS | | | | | |
| C ₁ / C ₂ = | | 56 | | | |
| C ₁ / C ₃ = | | 103 | | | |
| C ₁ / C ₄ = | | 123 | | | |
| C ₁ / C ₅ = | | 134 | | | |
| PRODUCTION ANALYSIS <input checked="" type="checkbox"/> GAS <input type="checkbox"/> OIL <input type="checkbox"/> WATER <input type="checkbox"/> NON-PRODUCIBLE HYDROCARBONS | | | | | |

LITHOLOGY

SAND-BLACK, M TO DARK GRAY, CLEAR, TRANSLUCENT, WHITE, FINE TO COARSE GRAIN, PREDOMINATELY COARSE GRAIN, ANGULAR TO SUB ANGULAR, POORLY SORTED, UNSCONSOLIDATED, TRACE CALCITE CEMENT (ONLY IN PART), 80% LITHIC FRAGMENTS, 20% QUARTZ, 10% DULL ORANGE MINERAL FLUORESCENCE.

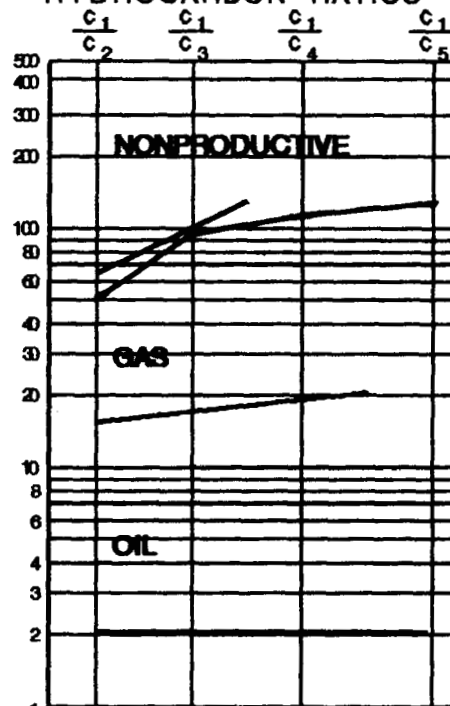
SHOW EVALUATION

10% BRIGHT YELLOW/WHITE SAMPLE FLUORESCENCE, VERY SLOW POOR WHITE CUT FLUORESCENCE, NO RESIDUAL CUT FLUORESCENCE. NO STAIN.

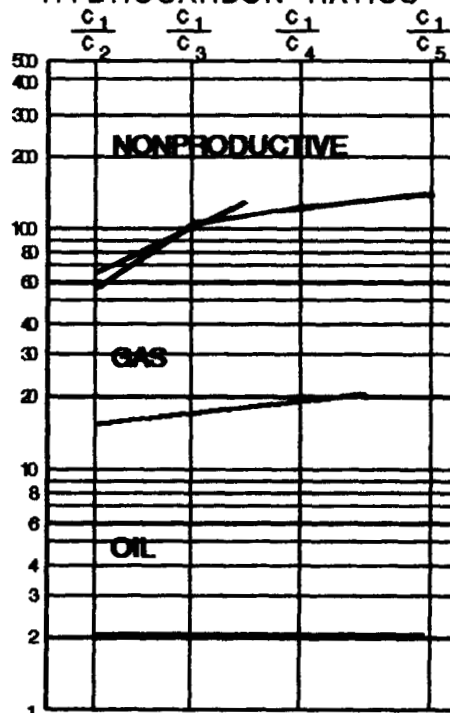
REMARKS

RESISTIVITY READINGS AVERAGED 7-8 FOR THIS INTERVAL. RATIO ANALYSIS INDICATES THAT THIS ZONE CONTAINS GAS. FAIR OVERALL SHOW RATING FOR GAS.

HYDROCARBON RATIOS



HYDROCARBON RATIOS



SHOW EVALUATION REPORTS

This section of the report contains copies of show evaluation reports for Kuvlum No. 2 and Kuvlum No. 3. These reports are based on chromatography evaluations of gases retrieved from mud samples injected into Sperry-Sun's Steam Still apparatus; consequently, interpretations made on each report reflect this procedure. Show reports are not always included in the well report analysis because of restricted information requirements placed on some wildcat wells. They do offer some insight of fluid content on potential producing zones of good permeability; however, they are often inadequate on tight zones or when gas samples are taken while coring.

See attachment regarding SPE-AIME, B.O. Pixler referencing hydrocarbon ratio evaluations.



Formation Evaluation by Analysis of Hydrocarbon Ratios

B. O. Pixler, SPE-AIME, Baroid Div. National Lead Co.

Introduction

Mud logging was first offered commercially in Aug., 1939. This logging method quickly gained favor among many operators because the type of fluid in the formation could be determined within minutes after the formation was drilled. The presence and magnitude of the methane show was and is the most important factor in mud log interpretation. However this magnitude in some instances was improperly understood, and as a consequence some operators still do not use mud logging, even though the early technique frequently made the difference between a successful well and an abandoned hole. Both the "hot wire" log of gas combustibles in the sample and the percent-of-gas log obtained with the conventional gas trap and the gas chromatograph indicate only that the reservoir in question contains hydrocarbons. These methods do not necessarily indicate the quantitative amounts of the various hydrocarbons in the mud.

The addition of a new Steam Still-Reflux gas sampling system to gas chromatography enables accurate determination of the composition of the mud gas sample. A knowledge of gas composition makes it possible to establish the relationship of methane to the heavier hydrocarbon shows. An awareness of this relationship led to a new, additional mud log interpretative technique that permits relating the quantitative amounts of methane (C_1), ethane (C_2), propane (C_3), butane (C_4), and pentane (C_5) to in-place reservoir fluid content.

A long-accepted premise is that as formations are drilled, the drilling mud filtrate partially flushes the formation fluid ahead of the bit. It was generally thought that the formations were flushed to an irreducible minimum — generally considered to be about 30 percent of in-place fluid. Experience in mud logging, however, has shown that this rarely happens. This partial flushing does not prevent mud logging from successfully determining productive or non-productive formations. Experienced logging engineers, in possession of quantitative gas analyses, make interpretations that take into account the flushing that results in rocks of various permeabilities, the effect of overbalanced mud weight and the effect of initial filtrate loss.

Method

Ordinarily, when formation cuttings are drilled they retain much of the formation pore fluid. This fluid is released to the mud column as the cuttings travel up the annulus. Most of the formation fluid in the cuttings will be "produced" into the drilling mud during the top 500 ft of hole travel. Conventionally, a mud sample is diverted to a mechanically operated gas trap to obtain a sample of the gas in the mud. The efficiency of this trap is from 15 to 70 percent, depending upon the gel strength of the mud, the amount of mud flowing through the trap and the rotation speed of the trap impeller. The magnitude of the conventional

The ratio of methane to the heavier hydrocarbon components — ethane, propane, butane, and pentane — is indicative of gas, oil and water productive potential. The Steam Still-Reflux Unit, used in conjunction with mud logs and gas chromatographs yields a quantitative analysis from which this ratio can be plotted.

gas show is, therefore, quantitative only to the air-gas sample obtained. The sample is accurately analyzed by the gas chromatograph; but, because the sample furnished by the conventional gas trap represents only a fraction of the gas present in the mud, and because that fraction is not representative of the total gases in the mud, the results are still only qualitative.

When the Steam Still-Reflux Unit is used to obtain the gas sample, the gas sample will represent almost 100 percent of the hydrocarbon fractions C_1 through C_5 that were in the mud sample. This enables the chromatograph analysis to be related quantitatively to the mud, and the readings to be reported as parts per million of each hydrocarbon vapor (C_1 through C_5) to mud volume.

Because the cuttings from a particular formation "produce" the gas they contain into the drilling mud, it was reasonable to assume that this same formation, if completed, would produce gases of a similar composition. This assumption led to a comparison of ppm Logs of hydrocarbon vapors with similar data from producing wells. Plots were made of the ratio of methane to each of the heavier hydrocarbons from many analyses of wellhead samples. These plots were compared with plots, made from ppm Logs, of gas in mud. Both groups of plots showed definite patterns between (1) the magnitude of the ratios of methane to each of the heavier hydrocarbons, and (2) the slope of the lines of the plotted ratios. These, in turn, indicate productive potential and reservoir permeability.

The Steam Still-Reflux Unit consists of a small steam boiler, mud-injection port, mud-steam mixing chamber, Reflux-Condensing Unit and a gas-extraction port. Five ml of mud are injected into the purged mud-steam mixing chamber. The mud is rolled with 2,000 to 4,000 volumes of steam. The hydrocarbons (C_1 through C_5) extracted from the mud are collected

at the Reflux-Condensing Unit, withdrawn with a syringe, diluted to the standard chromatograph sample size and injected into the chromatograph for analysis. The Reflux-Condensing Unit removes only the lighter paraffin series hydrocarbons from the mud sample tested. For example, if the mud contains diesel oil, the more complex hydrocarbons — C_6 and above — condense and drop back into the mud-steam mixing chamber. Therefore, regardless of whether the fluid phase of the mud is oil or water, the gas sample analyzed contains only the light fractions through C_5 , and the analysis is representative of the formation gas.

The full importance of determining formation gas composition has not always been apparent. At first it was observed that if the magnitude of butane in the mud was greater than the magnitude of either propane or ethane, the zone in question would produce water and hydrocarbons. Later, the ratios of methane to each of the heavier hydrocarbon components were plotted on semilog paper. Hydrocarbon ratio plots obtained from ppm Logs and available data from wellhead gas sample analyses were compared. The comparison of the plots from ppm Logs and wellhead gas analysis data showed a striking correlation. The correlation demonstrated that ppm Logs made with Steam Still-Reflux samples could be interpreted in terms of in-place formation content.

The magnitude of the methane-to-ethane ratio determines if the reservoir contains gas or oil or if it is nonproductive. The slope of the line of the ratio plot of C_1/C_2 , C_1/C_3 , C_1/C_4 , and C_1/C_5 indicates whether the reservoir will produce hydrocarbons or hydrocarbons and water. Positive line slopes indicate production; negative slopes indicate water-bearing formations. An undersaturated reservoir may show a negative slope, but such occurrences are rare. The ratio plots may not be definitive for low permeability zones, but unusually steep plots indicate tight zones.

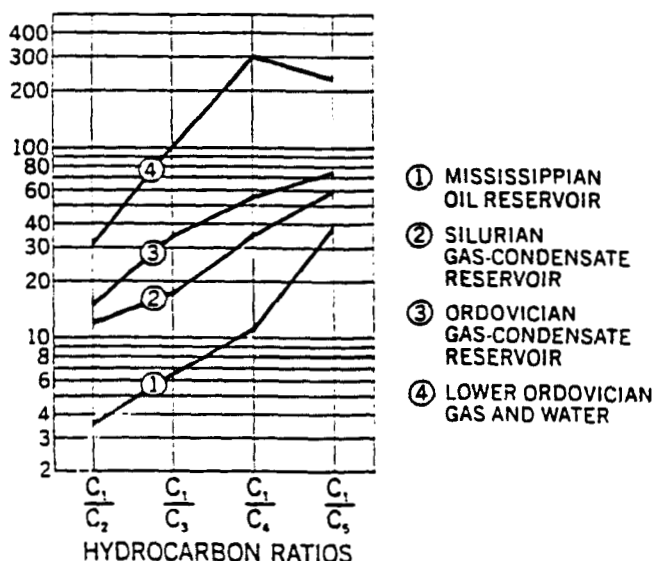


Fig. 1—Hydrocarbon ratio plots obtained from wellhead sample analyses data, limestone reservoirs, Rocky Mountain area.

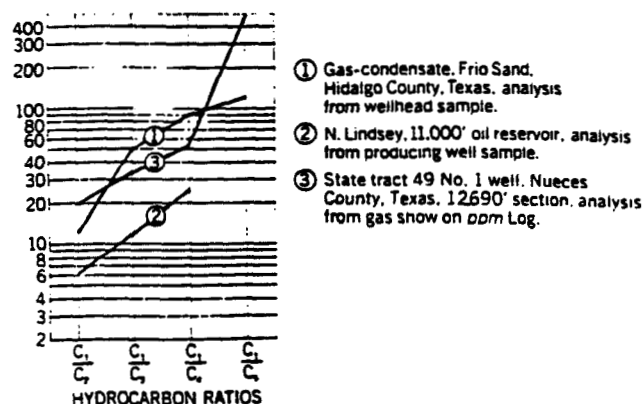


Fig. 2—Hydrocarbon ratio plots, productive reservoirs, South Texas.

A ratio of C_1/C_2 between 2 and 15 indicates oil. A ratio of C_1/C_2 between 15 and 65 indicates gas. The lower the C_1/C_2 ratio, the richer the gas or the lower the oil gravity. If the ratio of C_1/C_2 is below about 2 or above about 65 the zone is nonproductive.

Field Examples

Fig. 1 shows average hydrocarbon ratio plots from limestone reservoirs in the Rocky Mountain area. Plot 1 is derived from analyses of gases from Mississippian oil-producing reservoirs. The C_1/C_2 ratio is 3.5. The slope of the line is positive and not steep. Plot 2 was obtained from analyses of gases from wells producing gas-condensate from the Silurian. The C_1/C_2 ratio is 12; the line slope is again positive and not steep. Plot 3 is from gas-condensate wells producing from the Ordovician. The C_1/C_2 ratio is 15 and, again, the slope of the line is not steep; all three plots show slopes favorable for production. Plot 4 shows ratios obtained from an analysis of gas from the Lower Ordovician, which produced gas and water. The plot shows a negative slope of the section from the C_1/C_4 ratio to the C_1/C_5 ratio. Many tests have verified the fact that if a ratio plot shows a negative slope, the zone in question is water-bearing.

Fig. 2 shows plotted hydrocarbon ratios for productive reservoirs in South Texas. Plot 1 was made from an analysis of a wellhead sample of gas-condensate produced from a Frio sand, Hidalgo County. The production is rich in liquid hydrocarbons as indicated by the low C_1/C_2 ratio. Plot 2 is from an analysis of a wellhead gas sample from an 11,000-ft oil reservoir, North Lindsey field. The pentane was not reported, but the low C_1/C_2 ratio indicates oil production. Plot 3 was obtained from a gas show at 12,690 ft on the ppm Log of the State Tract 49 No. 1 Well, Nueces County, Tex. Formation tests resulted in gas production.

Experience shows that if the C_1/C_2 ratio is above 65 the zone is too tight for commercial production. Fig. 3 shows the ratio plots obtained from ppm Logs on Texas Gulf Coast wells that were nonproductive in the zones of interest. Plot 1 is from the ppm Log of the R. A. Tally No. 1 Well, Victoria County, Tex. The C_1/C_2 ratio was 470. The zone was tested extensively but it was a low permeability reservoir that could not be commercially completed. Plots 2 and 3 are from the State Tract 49 No. 1 Well, Nueces County, Tex. Plot 2 was from a sand encountered at about 8,060 ft. The relatively high ratios of C_1/C_2 , C_1/C_3 , C_1/C_4 , and C_1/C_5 indicated that the zone was nonproductive because of the low permeability. This was subsequently verified by testing. Plot 3 was obtained from a sand at 9,130 ft. The negative slope of the ratio plot, C_1/C_2 to C_1/C_3 , indicated that the zone was water-bearing. Subsequent formation tests showed water and non-commercial amounts of gas.

Plot 4 was obtained from the ppm Log of the Kovar No. 1 Well, Victoria County, Tex. The sand encountered from which the plot was made is at 10,120 ft. The gas show appeared to be good, but a negative slope of the C_1/C_3 ratio to the C_1/C_4 ratio was positive identification of a water-bearing formation.

Evaluation Technique

It is apparent that with this evaluation system, potential production can be accurately predicted. The only significant time lapse between penetration of the formation and evaluation of its productive possibilities is the time required to pump the mud from the bottom of the hole to the surface and analyze it by the Steam Still-Reflux and Chromatograph method. Fig. 4 shows the evaluation technique, which may be described as follows.

First, record the net increase of each gas component over the background gas; next, plot the ratios

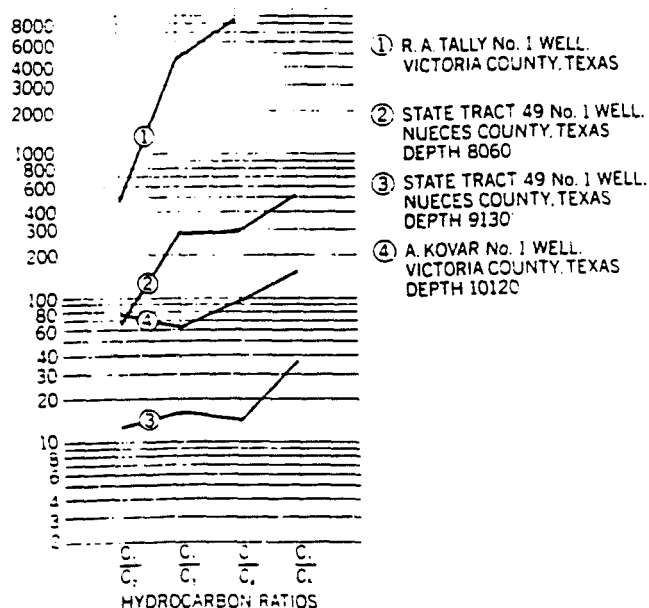


Fig. 3—Hydrocarbon ratio plots, nonproductive reservoirs. South Texas—analyses from gas shows on ppm Logs.

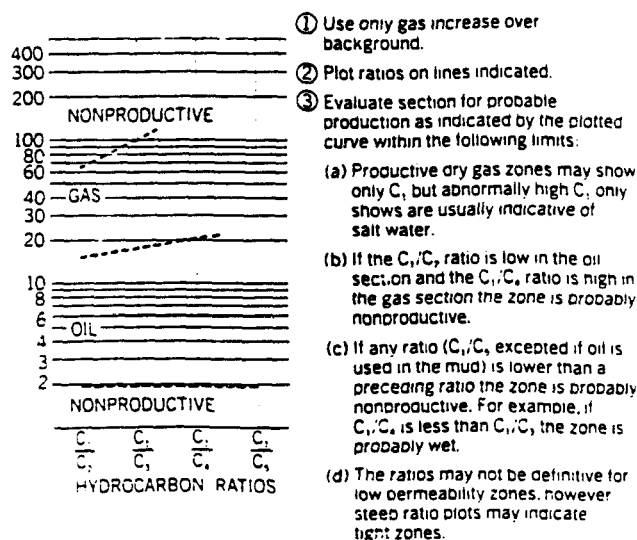


Fig. 4—ppm Log and report form for evaluation of show.

C_1/C_2 , C_1/C_3 , C_1/C_4 , C_1/C_5 on the ratio lines as indicated. Then evaluate, within the following limits, the section in question for probable production as indicated by the plotted curve:

1. Productive dry gas zones may show only C_1 , but abnormally high shows of C_1 only are usually indicative of salt water.

2. If the C_1/C_2 ratio is low in the oil section and the C_1/C_4 ratio is high in the gas section the zone is probably nonproductive.

3. If any ratio (C_1/C_5 excepted if oil is used in the mud) is lower than a preceding ratio, the zone is probably nonproductive. For example, if C_1/C_4 is less than C_1/C_3 , the zone is probably water-bearing.

4. The ratios may not be definitive for low permeability zones; however, steep ratio plots may indicate tight zones.

Application

The ppm Log is only one of many tools that are ordinarily used for formation evaluation. But in many instances, the ppm Log has furnished the vital information necessary to make the final decision on a well. One well drilled in inland waters of Louisiana had

what appeared on the ppm Log to be a good sand body, but the ppm Log showed only a nominal increase in gas. After the sand was penetrated and the well deepened, hole trouble was encountered. No other information of interest was available on the sand. The cost of the side-tracking to investigate the sand was sizable. Tight hole conditions and the low magnitude of the gas show indicated that the sand had good permeability and that possibly formation hydrocarbons had been flushed ahead of the bit. A plot of the hydrocarbon ratios indicated oil production. Therefore, at considerable expense, the sand was investigated and a new oil field was found.

An interesting well recently drilled in St. Martin Parish, La., was the No. 1 St. Martin Bank and Trust located on the southeast flank of the Anse La Butte Dome. A good sand encountered at about 8,000 ft showed oil, but the negative slope of the ratio plot indicated that the sand was water-bearing. The well was deepened to approximately 9,600 ft. One of the partners, a successful independent with a talent for finding oil by "feel" and by prudent use of the latest technology, decided that the formations in which the well was being drilled were tilted to almost vertical.

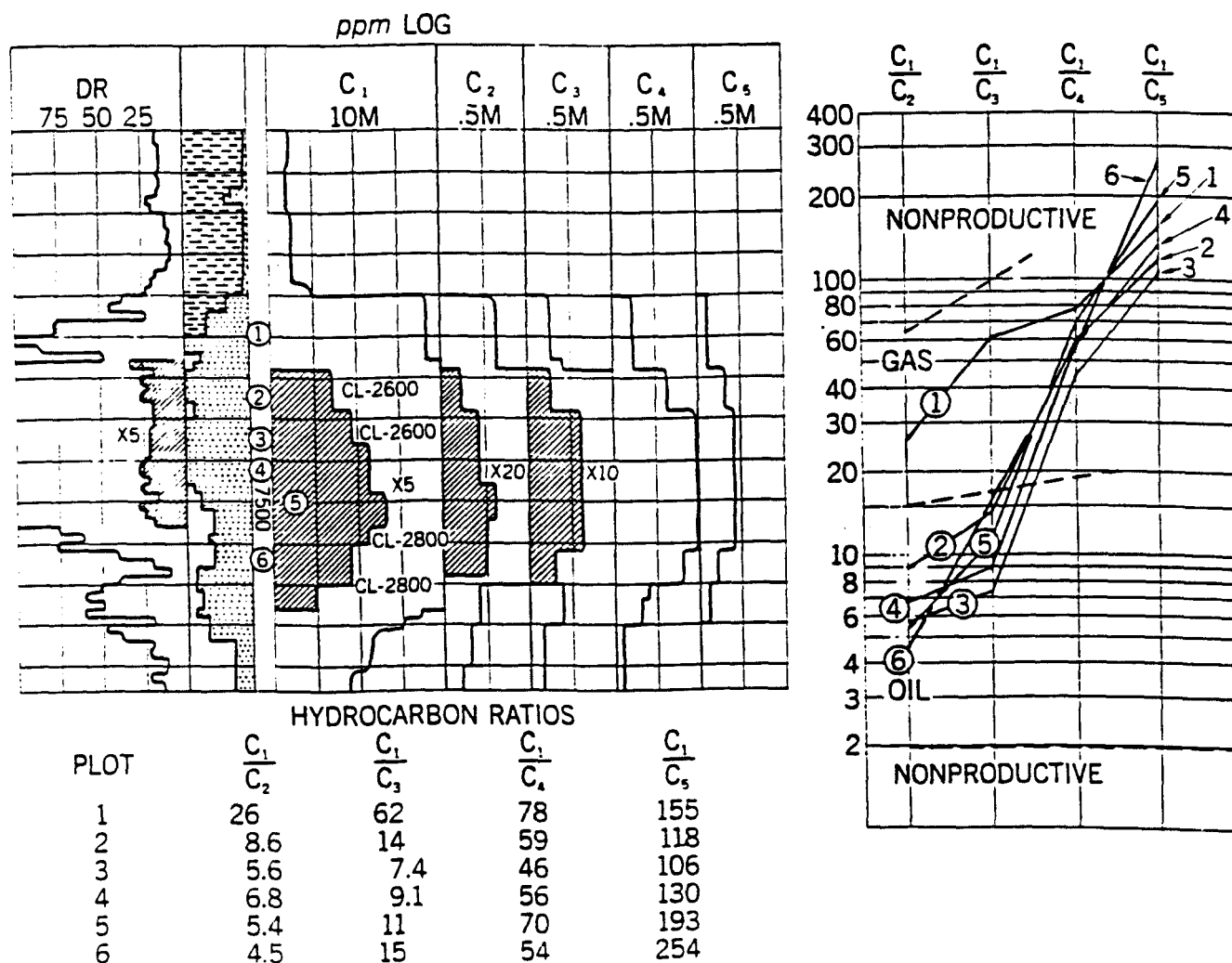


Fig. 5—ppm Log and hydrocarbon ratio plots. No. 1 St. Martin Bank and Trust Well, St. Martin Parish, La.

On his recommendaion the well was plugged back to about 7,000 ft and sidetracked. The sand that was drilled at 8,000 ft in the first hole was encountered in the directional hole at approximately 7,400 ft and the entire sand was hydrocarbon saturated.

The ppm Log and the ratio plots from the sand in the sidetrack hole are shown in Fig. 5. Table 1 shows the mud gas components related to percent of total gas. In actual practice the ppm gas shows obtained from the ppm Log are not converted to percent of total gas; but note the general decrease in percent methane in the lower section of the sand compared with that in the upper section. The magnitude of the gas show in the straight hole and in the sidetrack hole was significant. An accurate determination, however, of the composition of the gas in both cases led to correct conclusions on the potential productivity of the sand at the different depths in each hole. Note that the ratio Plot 1 at the top of the sand indicates a gas cap. As shown in Table 1, the gas was 93.1 percent methane. Subsequent plots indicated that production would be oil. In each of these cases the C_1/C_2 ratio was less than 9. The lowest ratio, 4.5, is shown in Plot 6, which was made from the show at

TABLE 1—MUD GAS COMPONENTS, PERCENT OF TOTAL GAS

| Depth (ft) | C_1 | C_2 | C_3 | C_4 | C_5 |
|------------|-------|-------|-------|-------|-------|
| 7,460 | 93.1 | 3.6 | 1.5 | 1.2 | 0.6 |
| 7,475 | 82.4 | 9.6 | 5.9 | 1.4 | 0.7 |
| 7,485 | 74.4 | 13.3 | 10.0 | 1.6 | 0.7 |
| 7,490 | 78.0 | 11.4 | 8.6 | 1.4 | 0.6 |
| 7,500 | 77.0 | 14.3 | 7.2 | 1.1 | 0.4 |
| 7,515 | 76.1 | 17.1 | 5.1 | 1.4 | 0.3 |

the bottom of the sand.

Another example of the application of the ppm Log is No. 1 State Tract 198 Well, Aransas County, Tex. Many sands were encountered showing the presence of hydrocarbons. The logging crew submitted more than 60 ratio plots to the operator during the drilling of the well. In almost all instances subsequent information verified the logging engineers' predictions of probable productivity based on the ratio plots. Fig. 6 shows a section of the ppm Log and the ratio plots for this well. The gas composition relating the percent of each gas component to the total gas is shown in Table 2. Gas condensate production is indi-

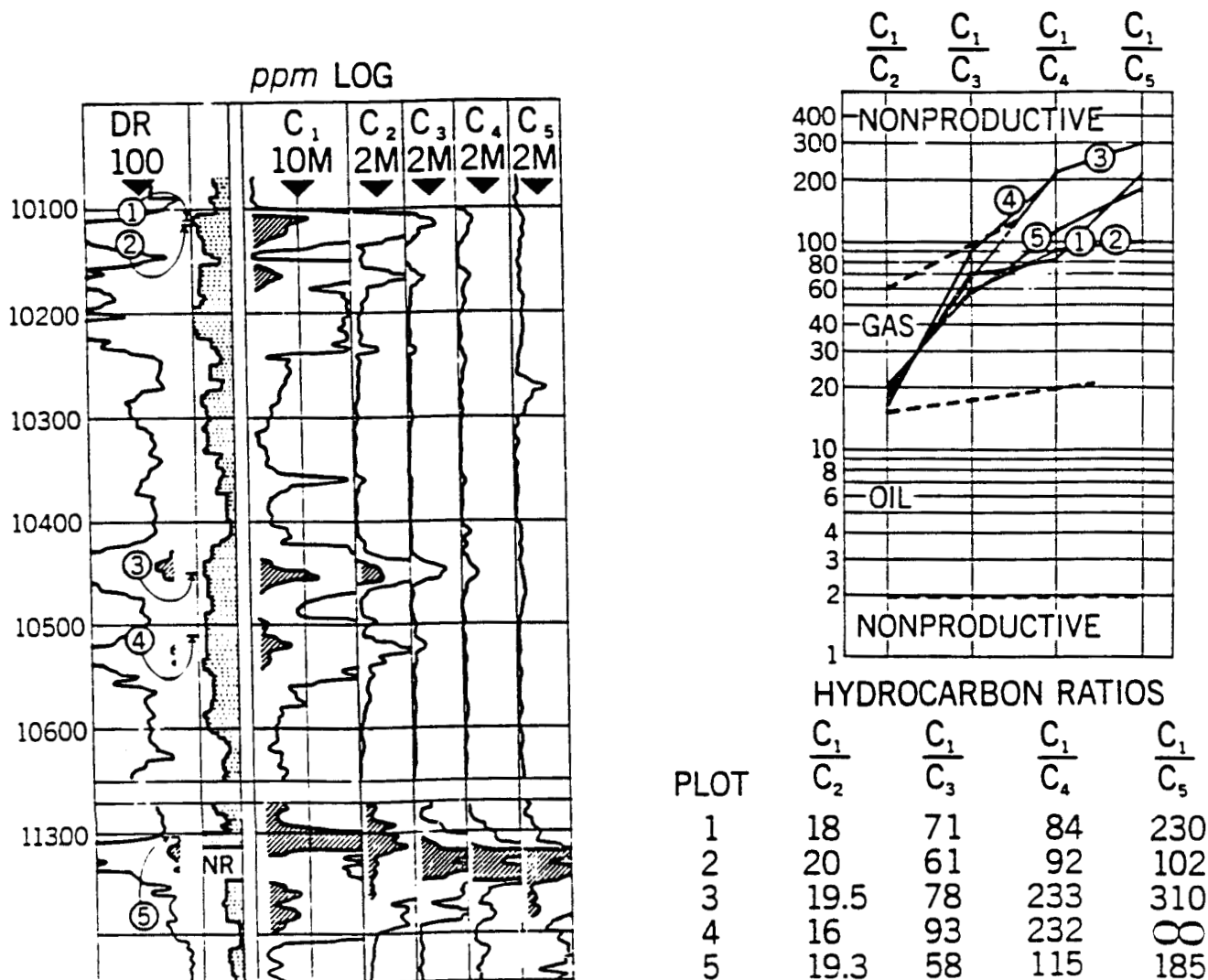


Fig. 6—ppm Log and hydrocarbon ratio plots, No. 1 State Tract 198 Well, Aransas County, Tex.

TABLE 2—MUD GAS COMPOSITION, PERCENT OF
TOTAL GAS

| Depth (ft) | C ₁ | C ₂ | C ₃ | C ₄ | C ₅ |
|---------------|----------------|----------------|----------------|----------------|----------------|
| 10,110 | 92.0 | 5.2 | 1.3 | 1.1 | 0.4 |
| 10,115 | 92.0 | 4.6 | 1.5 | 1.0 | 0.9 |
| 10,450 | 93.3 | 4.8 | 1.2 | 0.4 | 0.3 |
| 10,520 | 92.8 | 5.8 | 1.0 | 0.4 | 0.0 |
| 11,305 | 92.3 | 4.8 | 1.6 | 0.8 | 0.5 |

cated by the ppm Log and ratio plots as shown. The zones are tight marine deposits — especially the 10,520-ft zone. Plot 4 has the steepest line slope; pentane was not present. The slope of Plot 3 is steep. Plots 2 and 5 show more favorable (less steep) line slopes. The electric log and subsequent formation tests made of each zone indicated probable production. The well was completed as a gas condensate producer in the 11,300-ft section, which is the section plotted as No. 5.

Conclusions

Only qualitative shows of hydrocarbons in the mud can be derived from conventional mud logs. If chromatography is used, only a general indication of in-place gas composition is obtainable. Such hydrocarbon shows may be reported as units of gas or percent hydrocarbons or parts per million of gas in the air-gas mixture tested. Only the presence in relative amounts, not the actual quantity, of hydrocar-

bons in mud is indicated, and other supplemental information may be necessary to evaluate the formation in terms of potential productivity. However, if the composition of the gas sample obtained from the mud is representative of the in-place formation gas, then the gas analysis is accurate. The use of the Steam Still-Reflux Unit makes possible a report of formation gas composition on the ppm Log. Meaningful ratio plots of gas composition can then be made. Even though many factors affect the amount of reservoir fluid released to the drilling mud, reservoir potential productive capabilities can be determined by a study of the ratio of methane to each of the heavier hydrocarbon components. The hydrocarbon ratio plot is a unique technique and provides the operator with new information for evaluating productive possibilities of exploratory wells.

Computer programs involving percent gas in mud (ppm Log) and gas composition are being used in special cases to determine reservoir potential production. The use of computers in mud log interpretation, although new, will contribute significantly towards a better application of the data shown on the ppm Log.

JPT

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sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 296
OPERATION DRLG
FOOTAGE 71

NO. 1
DATE Jul 29 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|--------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | | |
|-----------------|-----------------|-----------------|--------------------|-----|--|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | NA | |
| | | | LITHOLOGY | NA | |
| BACKGROUND | 0-1 | | SAMPLE DEPTH | | |
| CONNECTION | | | TRIP CHLORIDES | | |
| TRIP | | | LAG DOWN DP | | |
| FLOWLINE TEMP | NA | degrees F | LAG OFF BOTTOM | NA | |
| | | | DRILL RATE ft/hr | 5.2 | |
| | | | CORRECTED 'D' EXP. | | |
| | | | SHALE DENSITY g/cc | | |
| | | | EWR Res. | | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----|-----|-------------|-----|-----|-----------|-----|-----|
| PORE PRESSURE | | psi | | ppg | 131 | psi | 8.5 | ppg |
| FRACTURE PRESSURE | NA | psi | | ppg | | psi | | ppg |
| ECD | | psi | | ppg | 132 | psi | 8.6 | ppg |

MUD DATA

| | |
|------------------|-----------|
| TIME | |
| TYPE | SEA WATER |
| WEIGHT IN | 8.5 |
| FUNNEL VIS. | |
| PV/YP | |
| GELS | |
| pH | |
| FILT/CAKE API | |
| HP-HT | |
| Pm | |
| Pf/Mf | |
| CHLORIDES ppm | |
| CALCIUM ppm | |
| OIL/WATER/SOLIDS | |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|-----------|
| BIT NO. | 1 |
| TYPE | ATXG1 |
| IADC CODE | |
| SIZE | 26 |
| JETS | 3-21.1-22 |
| DEPTH OUT | |
| ROT HRS. | 14.7 |
| FOOTAGE | 67 |
| AVG ft/hr | 5.2 |
| GRADE | |
| HOLE DEV. | |
| COST/FT | |
| RPM | 140 |
| WOB | 35 |

HYDRAULIC DATA

| | | | | |
|---------------------|----|-----------|----|---------|
| PUMPS | 1. | ID 1600 | 2. | 1D |
| SIZE inches | | 7.5x12 | | 7.5x12 |
| CAPACITY gal/stk | | 6.54 | | 6.54 |
| PUMP RATE stks/min | | 81 | | 80 |
| FLOW RATE gal/min | | 530 | | 523 |
| PRESSURE psi | | 1490 | | |
| PD SURF / DS psi | | 193 | | |
| ANN / BIT psi | | 0 | | |
| JET VELOCITY ft/sec | | 246 | | |
| JET IMPACT lbs | | 1149 | | |
| BIT HP | | 988 | | |
| HP RATIO / HP/IN2 | | .4 hp/in2 | | |
| REDUCED 1 | | psi at | | stk/min |
| RATE 2 | | psi at | | stk/min |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|--------|--------------|-----------------|-----------------|-----------------|--------------|
| 9.5X26 | 71 | .636 | 40 | 378 | 14 |
| 5X26 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH |
|---------------|-------|-------|-------|---------------|
| OD-inches | 5.0 | 5.0 | 9.5 | |
| ID-inches | 4.276 | 3.0 | 2.875 | |
| CAP-bbls/ft | | .0087 | .0080 | |
| DISP-bbls/ft | | .0181 | .0707 | |
| LENGTH-ft | | 193 | 103 | |
| WEIGHT-lbs/ft | 19.5 | 49 | 195 | |

REMARKS AND RECOMMENDATIONS

MW _____ GPM _____ JETS _____ ft/mi = _____ sec/std

RIG UP TO RUN 30' CSG. RUN 30' CSG AND LOCK INTO PGB. PU 26" BIT. BHA AND MUD MOTOR. DRILL AND WASH CSG TO 296'. NO RISER.

GAS LIFT SYSTEM INSTALLED. BACKGROUND GAS 0-1 UNIT.

ADT DON WALTERS

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

DEPTH 915
OPERATION DRLG
FOOTAGE 619

No. 2
DATE Jul 30 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|--------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | | |
|-----------------|-----------------|-----------------|--------------------|----|--|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | NA | |
| | | | LITHOLOGY | NA | |
| BACKGROUND | 5 | 8 | SAMPLE DEPTH | | |
| CONNECTION | | | TRIP CHLORIDES | | |
| TRIP | | | LAG DOWN DP | | |
| FLOWLINE TEMP | NA | degrees F | LAG OFF BOTTOM | NA | |
| | | | DRILL RATE ft/hr | 85 | |
| | | | CORRECTED 'D' EXP. | | |
| | | | SHALE DENSITY g/cc | | |
| | | | EWR Res. | | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----|-----|-------------|-----|-----|-----------|-----|-----|
| PORE PRESSURE | 133 | psi | 8.5 | ppg | 404 | psi | 8.5 | ppg |
| FRACTURE PRESSURE | NA | psi | | ppg | | psi | | ppg |
| ECD | 135 | psi | 8.64 | ppg | 419 | psi | 8.8 | ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | |
|------------------|-----------|-----------|-----------|---------------------|----|-----------|----|---------|
| TIME | SEA WATER | BIT NO. | 1 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| WEIGHT IN | 8.5 | TYPE | ATXG1 | SIZE inches | | 7.5x12 | | 7.5x12 |
| FUNNEL VIS. | | IADC CODE | | CAPACITY gal/stk | | 6.54 | | 6.54 |
| PV/YP | | SIZE | 26 | PUMP RATE stks/min | | 80 | | 80 |
| GELS | | JETS | 3-21.1-22 | FLOW RATE gal/min | | 523 | | 523 |
| pH | | DEPTH OUT | | PRESSURE psi | | 1900 | | |
| FILT/CAKE API | | ROT HRS. | 33.4 | PD SURF / DS psi | | 176/991 | | |
| HP-HT | | FOOTAGE | 705 | ANN / BIT psi | | 1/416 | | |
| Pm | | AVG ft/hr | 20.6 | JET VELOCITY ft/sec | | 234 | | |
| Pf/Mf | | GRADE | | JET IMPACT lbs | | 1040 | | |
| CHLORIDES ppm | | HOLE DEV. | | BIT HP | | 245 | | |
| CALCIUM ppm | | COST/FT | | HP RATIO / HP/IN2 | | .5 hp/in2 | | |
| OIL/WATER/SOLIDS | | RPM | 107 | REDUCED 1 | | psi at | | stk/min |
| DAILY/CUM. COST | | WOB | 22 | RATE 2 | | psi at | | stk/min |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|--------|--------------|-----------------|-----------------|-----------------|--------------|
| 9.5X26 | 690 | .636 | 42 | 390 | 14 |
| 5X26 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

PIPE DATA

| DRILL STRING | | | | CASING: | | | |
|---------------|-------|-------|-------|---------|-------|--|--|
| | DP | HWDP | DC | DEPTH | 301 | | |
| OD-inches | 5.0 | 5.0 | 9.5 | | 30 | | |
| ID-inches | 4.276 | 3.0 | 2.875 | | 28 | | |
| CAP-bbbls/ft | | .0087 | .0080 | | .7616 | | |
| DISP-bbbls/ft | | .0181 | .0707 | | | | |
| LENGTH-ft | | 587 | 103 | | 90 | | |
| WEIGHT-lbs/ft | 19.5 | 49 | 195 | | 310 | | |

REMARKS AND RECOMMENDATIONS

MW _____ GPM _____ JETS _____ ft/mi = _____ sec/std

LAND 30' CSG AT 301'. UNLATCH FROM CASING AND DRILL AHEAD WITH 26' BIT AND MUD MOTOR TO 915'. MONITORING WELL VIA GAS LIFT TO SHALE SHAKERS. BACKGROUND GAS 4-6 UNITS. MAX GAS 8 UNITS.

ADT DON WALTERS

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 1030
OPERATION DRLG
FOOTAGE 115

NO. 3
DATE Jul 31 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|--------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|----------------------------|-----------------|-----------------|--------------------|--------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 1030 1.5 Deg |
| | | | LITHOLOGY | NA |
| BACKGROUND CONNECTION TRIP | 5 | 9 | SAMPLE DEPTH | |
| | | | TRIP CHLORIDES | |
| FLOWLINE TEMP | NA | degrees F | LAG DOWN DP | |
| | | | LAG OFF BOTTOM | NA |
| | | | DRILL RATE ft/hr | 30 |
| | | | CORRECTED 'D' EXP. | |
| | | | SHALE DENSITY g/cc | |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|-----|-----|-----|-------------|-----|-----|-----|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 133 | psi | 8.5 | ppg | 404 | psi | 8.5 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | NA | psi | | ppg | | psi | | ppg | | psi | | ppg | ft |
| ECD | | psi | | ppg | | psi | | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------|-----------|-----------|-----------|---------------------|-----------|-----------------|
| TIME | | BIT NO. | 1 | PUMPS | 1. ID1600 | 2. ID1600 |
| TYPE | SEA WATER | TYPE | ATXG1 | SIZE inches | 7.5x12 | 7.5x12 |
| WEIGHT IN | 8.5 | IADC CODE | | CAPACITY gal/stk | 6.54 | 6.54 |
| FUNNEL VIS. | | SIZE | 26 | PUMP RATE stks/min | | |
| PV/YP | | JETS | 3-21.1-22 | FLOW RATE gal/min | | |
| GELS | | DEPTH OUT | 1030 | PRESSURE psi | STATIC | |
| pH | | ROT HRS. | 36.3 | PD SURF / DS psi | | |
| FILT/CAKE API | | FOOTAGE | 819 | ANN / BIT psi | | |
| HP-HT | | AVG ft/hr | 22.5 | JET VELOCITY ft/sec | | |
| Pm | | GRADE | | JET IMPACT lbs | | |
| Pf/Mf | | HOLE DEV. | 1.5 | BIT HP | | |
| CHLORIDES ppm | | COST/FT | 1028 | HP RATIO / HP/IN2 | | |
| CALCIUM ppm | | RPM | 111 | REDUCED 1 | | psi at stks/min |
| OIL/WATER/SOLIDS | | WOB | 21 | RATE 2 | | psi at stks/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------|--------------|-----------------|-----------------|-----------------|--------------|
| 20X30 | 101 | .4857 | | | |
| 20X26 | 704 | .2681 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

PIPE DATA

| DRILL STRING | | | | CASING: | | | |
|---------------|-------|-------|-------|---------|-------|-------|--|
| | DP | HWDP | DC | DEPTH | 301 | 1017 | |
| OD-inches | 5.0 | 5.0 | 9.5 | | 30 | 20 | |
| ID-inches | 4.276 | 3.0 | 2.875 | | 28 | 18.75 | |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .7616 | .3408 | |
| DISP-bbls/ft | .0075 | .0181 | .0707 | | | | |
| LENGTH-ft | | | | | 90 | 805 | |
| WEIGHT-lbs/ft | 19.5 | 49 | 195 | | 310 | 133 | |

REMARKS AND RECOMMENDATIONS

MW _____ GPM _____ JETS _____ ft/mi = _____ sec/std

DRILL AHEAD WITH 26" BIT AND MUD MOTOR TO 1030'. PUMP SWEEP. DROP SURVEY. SHORT TRIP TO 375'. RIH. CIRC HOLE UNTIL AIRFLT CLEAN. DISPLACE HOLE WITH 9.9 ppg MUD. POOH. RIG UP TO RUN 20" CSG. RUN 19 JTS OF 133 LB/FT 20" CSG. LAND CSG AT 1017'. CMT 20 AND 30 INCH CASING TO MUD LINE.

ADT DON WALTERS

LOGGING SYSTEMS

FOOTAGE 0

A Baroid Company

A Baroid Company

MORNING REPORT

| | |
|------|-------|
| DATE | Aug 7 |
| TIME | 04 00 |

ALASKA

LOGGING DATA

DRILL RATE ft/hr
CORRECTED 'D' EXP.
SHALE DENSITY g/cc
EWR Res.

FORMATION PRESSURE DATA

| OPEN HOLE | | |
|-----------|-----------|----------|
| _____ psi | _____ ppg | _____ ft |
| _____ psi | _____ ppg | _____ ft |
| _____ psi | _____ ppg | _____ ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| PUMPS | 1. | ID1600 | 2. | ID1600 |
|---------------------|----|--------|----|---------|
| SIZE inches | | 6.5X12 | | 6.5X12 |
| CAPACITY gal/stk | | 4.91 | | 4.91 |
| PUMP RATE stks/min | | | | |
| FLOW RATE gal/min | | | | |
| PRESSURE psi | | STATIC | | |
| PD SURF / DS psi | | | | |
| ANN / BIT psi | | | | |
| JET VELOCITY ft/sec | | | | |
| JET IMPACT lbs | | | | |
| BIT HP | | | | |
| HP RATIO / HP/IN2 | | | | |
| REDUCED 1 | | psi at | | stk/min |
| RATE 2 | | psi at | | stk/min |

ANNULAR DATA

[illegible]

PIPE DATA

| | DRILL STRING | | | | | CASING: | | | |
|---------------|--------------|-------|--|----|--|---------|-------|-------|--|
| | DP | HWDP | | DC | | DEPTH | 301 | 1018 | |
| OD-inches | 5.0 | 5.0 | | | | | 30 | 20 | |
| ID-inches | 4.276 | 3.0 | | | | | 28 | 18.75 | |
| CAP-bbls/ft | .0178 | .0087 | | | | | .7616 | .3408 | |
| DISP-bbls/ft | .0075 | .0181 | | | | | | | |
| LENGTH-ft | | | | | | | 90 | 793 | |
| WEIGHT-lbs/ft | 19.5 | 49 | | | | | 310 | 133 | |

REMARKS AND RECOMMENDATIONS

| | | | | | |
|--|-------------|------|-------|---|---------|
| MW | GPM | JETS | ft/mi | = | sec/std |
| FINISH CEMENTING 20" CSG TO MUD LINE.WOC. TEST IBOP VALVE. TEST CHOKE MANIFOLD. RIG UP TO RUN BOP STACK. | | | | | |
| | | | | | |
| | | | | | |
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| | | | | | |
| ADT | DON WALTERS | | | | |

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 1040
OPERATION TRIP
FOOTAGE 10

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 5
DATE Aug 2 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|--------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|----------------------------|-----------------|-----------------|--------------------|--------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 1030 1.5 Deg |
| | | | LITHOLOGY | 100% CLAY |
| | | | SAMPLE DEPTH | 1040 |
| BACKGROUND CONNECTION TRIP | | | TRIP CHLORIDES | |
| | | | LAG DOWN DP | |
| | | | LAG OFF BOTTOM | NA |
| FLOWLINE TEMP | NA | degrees F | DRILL RATE ft/hr | |
| | | | CORRECTED 'D' EXP. | |
| | | | SHALE DENSITY g/cc | |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----|-----|-------------|-----|-----|-----------|-----|-----|
| PORE PRESSURE | 450 | psi | 8.5 | ppg | 500 | psi | 8.5 | ppg |
| FRACTURE PRESSURE | 697 | psi | 12.9 | ppg | | psi | | ppg |
| ECD | | psi | | ppg | | psi | | ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | | |
|------------------|---------------|-----------|-----------|-----------|---------------------|--------|--------|----|---------|
| TIME | 2400 1 AUG 93 | BIT NO. | 3 | 2 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| TYPE | GENERIC #2 | TYPE | FDTC | SS33SGJ4 | SIZE inches | 6.5X12 | 6.5X12 | | |
| WEIGHT IN | 9.8 | IADC CODE | | | CAPACITY gal/stk | 4.91 | 4.91 | | |
| FUNNEL VIS. | 50 | SIZE | 12.5 | 17.5 | PUMP RATE stks/min | | | | |
| PV/YP | 19/26 | JETS | 3x14.1-10 | 3-18.1-11 | FLOW RATE gal/min | | | | |
| GELS | 5/8 | DEPTH OUT | | 1040 | PRESSURE psi | STATIC | | | |
| pH | 9.9 | ROT HRS. | | 2.8 | PD SURF / DS psi | | | | |
| FILT/CAKE API | 4.8/1 | FOOTAGE | | 10 | ANN / BIT psi | | | | |
| HP-HT | | AVG ft/hr | | 3.6 | JET VELOCITY ft/sec | | | | |
| Pm | 2.2 | GRADE | | | JET IMPACT lbs | | | | |
| Pf/Mf | .5/1.81.1/2.9 | HOLE DEV. | | 1.5 | BIT HP | | | | |
| CHLORIDES ppm | 17000 | COST/FT | | 4019 | HP RATIO / HP/IN2 | | | | |
| CALCIUM ppm | 400 | RPM | | 64 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | 0/5.6/94.4 | WOB | | 8 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 8X12.5 | | .0836 | | | |
| 5X12.5 | | .1215 | | | |
| 5X17.5 | | .2733 | | | |
| 5X18.75 | | .3083 | | | |
| 5X20 | | .3644 | | | |

PIPE DATA

| DRILL STRING | | | | CASING: | | | |
|---------------|-------|-------|-------|---------|-------|-------|--|
| | DP | HWDP | DC | DEPTH | 301 | 1018 | |
| OD-inches | 5.0 | 5.0 | 8 | | 30 | 20 | |
| ID-inches | 4.276 | 3.0 | 2.875 | | 28 | 18.75 | |
| CAP-bbbls/ft | .0178 | .0087 | .0076 | | .7616 | .3408 | |
| DISP-bbbls/ft | .0075 | .0181 | .0545 | | | | |
| LENGTH-ft | | 656 | 384 | | 90 | 793 | |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 310 | 133 | |

REMARKS AND RECOMMENDATIONS

MW _____ GPM _____ JETS _____ ft/mi = _____ sec/std

RIG UP STACK AND DIVERTER. RUN STACK AND DIVERTER TO PBG. TEST STACK. RIH AND TEST CASING TO 2200 psi. POOH. PICK UP BHA AND 17.5' BIT. RIH. TAG CMT AT 993'. DRILL CMT TO 1008'. CHANGE HOLE OVER TO 9.8 ppg GENERIC #2 MUD. DRILL CMT. SHOE AND 10' OF NEW HOLE. PERFORM LEAK OFF TEST-170 psi-12.9 ppg. POOH. LAY DOWN BHA AND 17.5' BIT. PICK UP NEW BHA. MWD TOOL AND 12.25' BIT NO. 3.

ADT DON WALTERS

sperry-sun
DRILLING SERVICES *LOGGING SYSTEMS*
A Baroid Company

DEPTH 2275
OPERATION DRILL
FOOTAGE 1225

NO. 6
DATE Aug 3 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | | | | | | | | | |
|--------------------------------|---------------------------|-----------------------------------|-------------------------------------|-------------------------------------|--------------------------|--------------------------------|------------------------------|---------------------------------|-----------------------------|--------------------------------|-----------------------------|-------------------|
| AVG GAS (units) <u>14</u> | MAX GAS (units) <u>28</u> | AT DEPTH (feet) <u>1185</u> | SURVEY DATA <u>.24 Deg at 2210'</u> | LITHOLOGY <u>90 % CLAY 10% SAND</u> | SAMPLE DEPTH <u>2200</u> | TRIP CHLORIDES <u>252 stks</u> | LAG DOWN DP <u>4015 stks</u> | LAG OFF BOTTOM <u>4015 stks</u> | DRILL RATE ft/hr <u>100</u> | CORRECTED 'D' EXP. <u>0.79</u> | SHALE DENSITY g/cc <u>2</u> | EWR Res. <u>2</u> |
| BACKGROUND CONNECTION <u>0</u> | TRIP <u>0</u> | FLOWLINE TEMP <u>33</u> degrees F | | | | | | | | | | |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | |
|-------------------|----------------|-----------------|--|-----------------|-----------------|--|--|-----------|--|--|--|
| PORE PRESSURE | <u>450</u> psi | <u>8.5</u> ppg | | <u>1010</u> psi | <u>8.5</u> ppg | | | | | | |
| FRACTURE PRESSURE | <u>697</u> psi | <u>12.9</u> ppg | | | | | | | | | |
| ECD | <u>524</u> psi | <u>9.9</u> ppg | | <u>1175</u> psi | <u>10.0</u> ppg | | | | | | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | |
|------------------------------------|-----------------------|--|------------------|
| TIME <u>2400 1 AUG 93</u> | BIT NO. <u>3</u> | PUMPS 1. <u>ID1600</u> | 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u>FDTG</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>9.8</u> | IADC CODE <u></u> | CAPACITY gal/stk <u>4.91</u> | <u>4.91</u> |
| FUNNEL VIS. <u>50</u> | SIZE <u>12.5</u> | PUMP RATE stks/min <u>68</u> | <u>68</u> |
| PV/YP <u>24/21</u> | JETS <u>3x14.1-10</u> | FLOW RATE gal/min <u>334</u> | <u>334</u> |
| GELS <u>4/5</u> | DEPTH OUT <u></u> | PRESSURE psi <u>2040</u> | |
| pH <u>9.6</u> | ROT HRS. <u>14.4</u> | PD SURF / DS psi <u>93/862</u> | |
| FILT/CAKE API <u>4.6/1</u> | FOOTAGE <u>1235</u> | ANN / BIT psi <u>11/1436</u> | |
| HP-HT <u></u> | AVG ft/hr <u>85</u> | JET VELOCITY ft/sec <u>405</u> | |
| Pm <u>1.3</u> | GRADE <u></u> | JET IMPACT lbs <u>1368</u> | |
| Pf/Mf <u>.8/1.7</u> | HOLE DEV. <u>.24</u> | BIT HP <u>558</u> | |
| CHLORIDES ppm <u>16000</u> | COST/FT <u></u> | HP RATIO / HP/IN2 <u>4.7hp/in2</u> | |
| CALCIUM ppm <u>840</u> | RPM <u>125</u> | REDUCED 1 <u></u> psi at <u></u> stk/min | |
| OIL/WATER/SOLIDS <u>0/6.3/93.7</u> | WOB <u>9</u> | RATE 2 <u></u> psi at <u></u> stk/min | |
| DAILY/CUM. COST <u></u> | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 8X12.5 | <u>384</u> | <u>.0836</u> | <u>191</u> | <u>319</u> | <u>34</u> |
| 5X12.5 | <u>851</u> | <u>.1215</u> | <u>131</u> | <u>261</u> | <u>104</u> |
| 5X17.5 | <u>22</u> | <u>.2733</u> | <u>58</u> | <u>213</u> | <u>6</u> |
| 5X18.75 | <u>853</u> | <u>.3083</u> | <u>50</u> | <u>223</u> | <u>270</u> |
| 5X20 | <u>165</u> | <u>.3644</u> | <u>44</u> | <u>216</u> | <u>60</u> |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | | | |
|---------------|--------------|--------------|--------------|---------------|--------------|--|--|
| | DP | HWDP | DC | 301 | 1018 | | |
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8</u> | <u>30</u> | <u>20</u> | | |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | <u>28</u> | <u>18.75</u> | | |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0076</u> | <u>.7616</u> | <u>.3408</u> | | |
| DISP-bbls/ft | <u>.0075</u> | <u>.0181</u> | <u>.0545</u> | | | | |
| LENGTH-ft | <u>1170</u> | <u>656</u> | <u>384</u> | <u>90</u> | <u>793</u> | | |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>149</u> | <u>310</u> | <u>133</u> | | |

REMARKS AND RECOMMENDATIONS

MW GPM JETS ft/mi = sec/std

RUN IN HOLE WITH 12.25" BIT NO. 3. DRILL AHEAD THRU CLAY/SAND WHILE CONTROL DRILLING AT 100ft/hr TO 2275'. NO APPARENT HOLE PROBLEMS.

ADT DON WALTERS

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 3545
OPERATION DRILL
FOOTAGE 1280

NO. 7
DATE Aug 4 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|--------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|-------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .40 at 3441' |
| 16 | 27 | 2315 | LITHOLOGY | 60 % CLAY 40% SILTSTONE |
| BACKGROUND CONNECTION | TRIP | 2430 | SAMPLE DEPTH | 3440 |
| 0 | 61 | | TRIP CHLORIDES | |
| | | | LAG DOWN DP | 445 stks |
| FLOWLINE TEMP | 34 | degrees F | LAG OFF BOTTOM | 5420 stks |
| | | | DRILL RATE ft/hr | 103 |
| | | | CORRECTED 'D' EXP. | 1.10 |
| | | | SHALE DENSITY g/cc | |
| | | | EWR Res. | 2 |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|-----|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 450 | psi | 8.5 | ppg | 1601 | psi | 8.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 697 | psi | 12.9 | ppg | 2577 | psi | 14 | ppg | | psi | | ppg | ft |
| ECD | 529 | psi | 10.0 | ppg | 1840 | psi | 10.0 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------|---------------|-----------|-----------|---------------------|-----------|-----------------|
| TIME | 2400 3 AUG 93 | BIT NO. | 3 | PUMPS | 1. ID1600 | 2. ID1600 |
| TYPE | GENERIC #2 | TYPE | FDTG | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 9.8 | IADC CODE | | CAPACITY gal/stk | 4.91 | 4.91 |
| FUNNEL VIS. | 54 | SIZE | 12.5 | PUMP RATE stks/min | 72 | 71 |
| PV/YP | 27/23 | JETS | 3x14.1-10 | FLOW RATE gal/min | 353 | 349 |
| GELS | 3/5 | DEPTH OUT | | PRESSURE psi | | 2390 |
| pH | 9.5 | ROT HRS. | 28.6 | PD SURF / DS psi | | 103/1139 |
| FILT/CAKE API | 4/1 | FOOTAGE | 2505 | ANN / BIT psi | | 20/1599 |
| HP-HT | | AVG ft/hr | 85 | JET VELOCITY ft/sec | | 427 |
| Pm | 1.3/1 | GRADE | | JET IMPACT lbs | | 1524 |
| Pf/Mf | .6/1.5 | HOLE DEV. | .40 | BIT HP | | 656 |
| CHLORIDES ppm | 16000 | COST/FT | | HP RATIO / HP/IN2 | | 5.6hp/in2 |
| CALCIUM ppm | 1200 | RPM | 118 | REDUCED 1 | | psi at stks/min |
| OIL/WATER/SOLIDS | 0/8/92 | WOB | 30 | RATE 2 | | psi at stks/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 8X12.5 | 384 | .0836 | 200 | 339 | 34 |
| 5X12.5 | 2121 | .1215 | 138 | 277 | 257 |
| 5X17.5 | 22 | .2733 | 61 | 225 | 6 |
| 5X18.75 | 853 | .3083 | 53 | 236 | 270 |
| 5X20 | 165 | .3644 | 46 | 228 | 60 |
| | | | | | |
| | | | | | |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | | | |
|--------------|-------|------|-------|---------------|-------|--|--|
| OD-inches | DP | HWDP | DC | 301 | 1018 | | |
| 5.0 | 5.0 | | 8 | 30 | 20 | | |
| 4.276 | 3.0 | | 2.875 | 28 | 18.75 | | |
| .0178 | .0087 | | .0076 | .7616 | .3408 | | |
| .0075 | .0181 | | .0545 | | | | |
| 2503 | 656 | | 384 | 90 | 793 | | |
| 19.5 | 49 | | 149 | 310 | 133 | | |

REMARKS AND RECOMMENDATIONS

MW _____ GPM _____ JETS _____ ft/mi = _____ sec/std

DRILL AHEAD THRU CLAY/SAND TO 2430'. CIRC OUT. SHORT TRIP TO SHOE. FLOW CHECK EVERY 10 STANDS. HOLE PULLED TIGHT AT 1766'. RIH. REAM FROM 1729-1761'. WASH TO BOTTOM FROM 2380'. NO FILL. CBU AFTER TRIP. MAX GAS 61u. DRILL AHEAD TO 3545'. NO APPARENT PROBLEMS.

ADT DON WALTERS

DRILLING SERVICES
A Baroid Company

LOGGING SYSTEMS

| | |
|-----------|------|
| DEPTH | 4005 |
| OPERATION | CIRC |
| FOOTAGE | 460 |

NO. 8
DATE Aug 5 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY

MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|--------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | | | |
|---------------|---------|---------|-----------|----------------|----------------------------------|--------------------|
| | AVG | MAX | AT | SURVEY DATA | .39 at 3977 | |
| | GAS | GAS | DEPTH | LITHOLOGY | 60 % CLAY 30% SILTSTONE 10% SAND | |
| | (units) | (units) | (feet) | SAMPLE DEPTH | 4005 | |
| BACKGROUND | 16 | 39 | 3775 | TRIP CHLORIDES | | DRILL RATE ft/hr |
| CONNECTION | 0 | | | LAG DOWN DP | | CORRECTED 'D' EXP. |
| TRIP | | | | LAG OFF BOTTOM | | SHALE DENSITY g/cc |
| FLOWLINE TEMP | | | degrees F | | | EWR Res. |

FORMATION PRESSURE DATA

| | CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|--------|-----|------|-----|-------------|-----|-----|-----|-----------|-----|--|-----|--|----|
| PORE PRESSURE | 450 | psi | 8.5 | ppg | 1601 | psi | 8.7 | ppg | | psi | | ppg | | ft |
| FRACTURE PRESSURE | 697 | psi | 12.9 | ppg | 2577 | psi | 14 | ppg | | psi | | ppg | | ft |
| ECD | | psi | | ppg | | psi | | ppg | | psi | | ppg | | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | |
|------------------|---------------|-----------|-----------|---------------------|----|--------|----|---------|
| TIME | 2400 4 AUG 93 | BIT NO. | 3 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| TYPE | GENERIC #2 | TYPE | FDTG | SIZE inches | | 6.5X12 | | 6.5X12 |
| WEIGHT IN | 9.8 | IADC CODE | | CAPACITY gal/stk | | 4.91 | | 4.91 |
| FUNNEL VIS. | 52 | SIZE | 12.5 | PUMP RATE stks/min | | | | |
| PV/YP | 24/22 | JETS | 3x14.1-10 | FLOW RATE gal/min | | | | |
| GELS | 3/5 | DEPTH OUT | 4005 | PRESSURE psi | | | | |
| pH | 9.5 | ROT HRS. | 33.7 | PD SURF / DS psi | | | | |
| FILT/CAKE API | 4.2/1 | FOOTAGE | 2966 | ANN / BIT psi | | | | |
| HPHT | - | AVG ft/hr | 88 | JET VELOCITY ft/sec | | | | |
| Pm | 1.8 | GRADE | | JET IMPACT lbs | | | | |
| PI/Mf | .6/1.9 | HOLE DEV. | .39 | BIT HP | | | | |
| CHLORIDES ppm | 16000 | COST/FT | 311 | HP RATIO / HP/IN2 | | | | |
| CALCIUM ppm | 800 | RPM | 122 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | 0/92.2/7.8 | WOB | 14 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | 165 | .3644 | | | |
| 5X18.75 | 853 | .3083 | | | |
| 5X17.5 | 22 | .2733 | | | |
| 5X12.5 | 2121 | .1215 | | | |
| 8X12.5 | 384 | .0836 | | | |
| | | | | | |
| | | | | | |

PIPE DATA

| | DRILL STRING | | | | CASING: | | | | |
|---------------|--------------|-------|--|-------|---------|-------|-------|-------|--|
| | DP | HWDP | | DC | | DEPTH | 301 | 1018 | |
| OD-inches | 5.0 | 5.0 | | 8 | | | 30 | 20 | |
| ID-inches | 4.276 | 3.0 | | 2.875 | | | 28 | 18.75 | |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | | .7616 | .3408 | |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | | | | |
| LENGTH-ft | 2503 | 656 | | 384 | | | 90 | 793 | |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | | 310 | 133 | |

REMARKS AND RECOMMENDATIONS

[illegible]

sperry-sun DRILLING SERVICES LOGGING SYSTEMS

DEPTH 4005
OPERATION E-LOG
FOOTAGE 0

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 9
DATE Aug 6 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|----------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .39 at 3977 |
| | | | LITHOLOGY | 60 % CLAY 30% SILTSTONE 10% SAND |
| BACKGROUND | 0 | | SAMPLE DEPTH | 4005 |
| CONNECTION | 0 | | TRIP CHLORIDES | |
| TRIP | 85 | 4005 | LAG DOWN DP | 520 |
| FLOWLINE TEMP | NA | degrees F | LAG OFF BOTTOM | 5900 |
| | | | DRILL RATE ft/hr | NA |
| | | | CORRECTED 'D' EXP. | NA |
| | | | SHALE DENSITY g/cc | |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|---------|----------|-------------|---------|--|-----------|-----|----|
| PORE PRESSURE | 450 psi | 8.5 ppq | 1601 psi | 8.7 ppq | | psi | ppq | ft |
| FRACTURE PRESSURE | 697 psi | 12.9 ppq | 2577 psi | 14 ppq | | psi | ppq | ft |
| ECD | | ppq | | ppq | | psi | ppq | ft |

MUD DATA

| | |
|------------------|---------------|
| TIME | 2400 AUG 5 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 9.8 |
| FUNNEL VIS. | 52 |
| PV/YP | 24/22 |
| GELS | 3/5 |
| pH | 9.5 |
| FILT/CAKE API | 3.8/1 |
| HP-HT | |
| Pm | 1.8 |
| Pf/Mf | .8/1.9 |
| CHLORIDES ppm | 16000 |
| CALCIUM ppm | 200 |
| OIL/WATER/SOLIDS | 0/92.2/7.8 |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|-----------|
| BIT NO. | 3 |
| TYPE | FDTC |
| IADC CODE | |
| SIZE | 12.5 |
| JETS | 3x14.1-10 |
| DEPTH OUT | 4005 |
| ROT HRS. | 33.7 |
| FOOTAGE | 2966 |
| AVG ft/hr | 88 |
| GRADE | |
| HOLE DEV. | .39 |
| COST/FT | 311 |
| RPM | 122 |
| WOB | 14 |

HYDRAULIC DATA

| | | |
|---------------------|-------------|-----------|
| PUMPS | 1. ID1600 | 2. ID1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | | |
| FLOW RATE gal/min | | |
| PRESSURE psi | STATIC PAST | |
| PD SURF / DS psi | 24 HRS | |
| ANN / BIT psi | | |
| JET VELOCITY ft/sec | | |
| JET IMPACT lbs | | |
| BIT HP | | |
| HP RATIO / HP/IN2 | | |
| REDUCED 1 | psi at | stk/min |
| RATE 2 | psi at | stk/min |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | 165 | .3644 | | | |
| 5X18.75 | 853 | .3083 | | | |
| 5X17.5 | 22 | .2733 | | | |
| 5X12.5 | 2121 | .1215 | | | |
| 8X12.5 | 384 | .0836 | | | |

PIPE DATA

| DRILL STRING | | | | CASING: | | | |
|---------------|-------|-------|-------|---------|-------|-------|--|
| | DP | HWDP | DC | DEPTH | 301 | 1018 | |
| OD-inches | 5.0 | 5.0 | 8 | | 30 | 20 | |
| ID-inches | 4.276 | 3.0 | 2.875 | | 28 | 18.75 | |
| CAP-bbls/ft | .0178 | .0087 | .0076 | | .7616 | .3408 | |
| DISP-bbls/ft | .0075 | .0181 | .0545 | | | | |
| LENGTH-ft | 2503 | 656 | 384 | | 90 | 793 | |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 310 | 133 | |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 800 JETS 4-14'S ft/mi = sec/std

POOH FOR E-LOGS. HOLE PULLED WITHOUT EXCESS DRAG. RIG UP SCHLUMBERGER. RUN ELECTRIC LOGS.

ADT J. PATTON

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 2905
OPERATION OPEN HOLE
FOOTAGE 1887

No. 10
DATE Aug 7 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | |
|--------------------------------|---------------------------|-----------------------------------|--------------------------------|---|
| AVG GAS (units) <u>5-10</u> | MAX GAS (units) <u>22</u> | AT DEPTH (feet) <u>2360</u> | SURVEY DATA <u>.39 at 3977</u> | LITHOLOGY <u>60 % CLAY 30% SILTSTONE 10% SAND</u> |
| BACKGROUND CONNECTION <u>0</u> | TRIP <u>NA</u> | FLOWLINE TEMP <u>NA</u> degrees F | SAMPLE DEPTH <u>4005</u> | TRIP CHLORIDES <u>375</u> |
| | | | LAG DOWN DP <u>375</u> | DRILL RATE ft/hr <u>375</u> |
| | | | LAG OFF BOTTOM <u>7100</u> | CORRECTED 'D' EXP. <u>.66</u> |
| | | | | SHALE DENSITY g/cc <u>-</u> |
| | | | | EWR Res. <u>-</u> |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------------|-----------------|-----------------|-----------------|--------------|--------------|-------------|--|
| PORE PRESSURE | <u>450</u> psi | <u>8.5</u> ppg | <u>1601</u> psi | <u>8.7</u> ppg | <u>-</u> psi | <u>-</u> ppg | <u>-</u> ft | |
| FRACTURE PRESSURE | <u>697</u> psi | <u>12.9</u> ppg | <u>3020</u> psi | <u>14.5</u> ppg | <u>-</u> psi | <u>-</u> ppg | <u>-</u> ft | |
| ECD | <u>518</u> psi | <u>9.8</u> ppg | <u>-</u> psi | <u>-</u> ppg | <u>-</u> psi | <u>-</u> ppg | <u>-</u> ft | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|------------------------------------|-----------------------|-------------------|--|------------------|
| TIME <u>24:00 AUG 6 93</u> | BIT NO. <u>3</u> | RR3 | PUMPS 1. <u>ID1600</u> | 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u>FDTC</u> | <u>FDTC/H.O.</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>9.8</u> | IADC CODE <u>-</u> | | CAPACITY gal/stk <u>4.91</u> | <u>4.91</u> |
| FUNNEL VIS. <u>65</u> | SIZE <u>12.25</u> | <u>12.25/17.5</u> | PUMP RATE stks/min <u>115</u> | <u>115</u> |
| PV/YP <u>26/30</u> | JETS <u>3x14.1-10</u> | <u>TFA:1.44</u> | FLOW RATE gal/min <u>1132</u> | |
| GELS <u>3/6</u> | DEPTH OUT <u>4005</u> | <u>NA</u> | PRESSURE psi <u>2200</u> | |
| pH <u>9.2</u> | ROT HRS. <u>33.7</u> | <u>4.2</u> | PD SURF / DS psi <u>100/1545</u> | |
| FILT/CAKE API <u>4.2 - 1/32</u> | FOOTAGE <u>2966</u> | <u>1887</u> | ANN / BIT psi <u>5/550</u> | |
| HP-HT <u>-</u> | AVG ft/hr <u>88</u> | <u>449</u> | JET VELOCITY ft/sec <u>250</u> | |
| Pm <u>1.3</u> | GRADE <u>INC</u> | <u>INC</u> | JET IMPACT lbs <u>1440</u> | |
| Pf/Mf <u>.5/1.6</u> | HOLE DEV. <u>.39</u> | | BIT HP <u>365</u> | |
| CHLORIDES ppm <u>18000</u> | COST/FT <u>311</u> | <u>NA</u> | HP RATIO / HP/IN2 <u>28% - 1.5/IN2</u> | |
| CALCIUM ppm <u>600</u> | RPM <u>122</u> | <u>150</u> | REDUCED 1 <u>-</u> psi at <u>-</u> stk/min | |
| OIL/WATER/SOLIDS <u>0/91.7/8.3</u> | WOB <u>14</u> | <u>10-20</u> | RATE 2 <u>-</u> psi at <u>-</u> stk/min | |
| DAILY/CUM. COST <u>-</u> | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | <u>165</u> | <u>.3644</u> | <u>74</u> | <u>241</u> | |
| 5X18.75 | <u>853</u> | <u>.3083</u> | <u>85</u> | <u>249</u> | |
| 5X17.5 | <u>1587</u> | <u>.2733</u> | <u>99</u> | <u>238</u> | |
| 5X12.25 | | <u>.1215</u> | | | |
| 8X17.5 | <u>300</u> | <u>.2354</u> | <u>115</u> | <u>263</u> | |
| | | | | | |
| | | | | | |

PIPE DATA

| DRILL STRING | | | | CASING: | | | |
|---------------|--------------|--------------|--------------|---------|--------------|--------------|--|
| | DP | HWDP | DC | DEPTH | 301 | 1018 | |
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8</u> | | <u>30</u> | <u>20</u> | |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | | <u>28</u> | <u>18.75</u> | |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0076</u> | | <u>.7616</u> | <u>.3408</u> | |
| DISP-bbls/ft | <u>.0075</u> | <u>.0181</u> | <u>.0545</u> | | | | |
| LENGTH-ft | <u>2179</u> | <u>426</u> | <u>300</u> | | <u>90</u> | <u>793</u> | |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>149</u> | | <u>310</u> | <u>133</u> | |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM - JETS - ft/mi = - sec/std

RUN ELECTRIC LOGS. MAKE UP NEW BOTTOM HOLE ASSEMBLY HR BIT 3 AND A 17.5' HOLE OPENER. RIH TO BOTTOM OF 20' CASING.

OPEN HOLE TO 17.5' FOR NEXT CASING RUN. GOOD PENETRATION RATES WHILE REAMING.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

No. 11
DATE Aug 8 93
TIME 04 00

DEPTH 4005
OPERATION CIRCULATE
FOOTAGE 1100

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | | | |
|--------------------------------|---------------------------|-----------------------------------|--------------------------------|---|----------------------------|-------------------------------|
| AVG GAS (units) <u>5</u> | MAX GAS (units) <u>28</u> | AT DEPTH (feet) <u>3850</u> | SURVEY DATA <u>.39 at 3977</u> | LITHOLOGY <u>60 % CLAY 30% SILTSTONE 10% SAND</u> | SAMPLE DEPTH <u>4005</u> | DRILL RATE ft/hr <u>140</u> |
| BACKGROUND CONNECTION <u>0</u> | TRIP <u>60</u> | FLOWLINE TEMP <u>48</u> degrees F | TRIP CHLORIDES <u>550</u> | LAG DOWN DP <u>9700</u> | LAG OFF BOTTOM <u>9700</u> | CORRECTED 'D' EXP. <u>.90</u> |
| | | | | | | SHALE DENSITY g/cc <u></u> |
| | | | | | | EWR Res. <u></u> |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------------|-----------------|-----------------|-----------------|-------------|-------------|------------|--|
| PORE PRESSURE | <u>450</u> psi | <u>8.5</u> ppG | <u>1601</u> psi | <u>8.7</u> ppG | <u></u> psi | <u></u> ppG | <u></u> ft | |
| FRACTURE PRESSURE | <u>697</u> psi | <u>12.9</u> ppG | <u>3020</u> psi | <u>14.5</u> ppG | <u></u> psi | <u></u> ppG | <u></u> ft | |
| ECD | <u>518</u> psi | <u>9.84</u> ppG | <u>2051</u> psi | <u>9.85</u> ppG | <u></u> psi | <u></u> ppG | <u></u> ft | |

MUD DATA

TIME 24:00 AUG 7 93
TYPE GENERIC #2
WEIGHT IN 9.8
FUNNEL VIS. 52
PV/YP 24/26
GELS 3/4
pH 9.3
FILT/CAKE API 5.2 - 1/32
HP-HT
Pm 1.2
PI/Mf 4/1.6
CHLORIDES ppm 16000
CALCIUM ppm 680
OIL/WATER/SOLIDS 0/91.7/8.3
DAILY/CUM. COST

BIT DATA

BIT NO. 3 RR3
TYPE FDTG FDTG/H.O.
IADC CODE
SIZE 12.25 12.25/17.5
JETS 3x14.1-10 TFA:1.44
DEPTH OUT 4005 4005
ROT HRS. 33.7 10.1
FOOTAGE 2966 2987
AVG ft/hr 88 294
GRADE INC INC
HOLE DEV. .39
COST/FT 311 NA
RPM 122 145
WOB 14 10-20

HYDRAULIC DATA

PUMPS 1. ID1600 2. ID1600
SIZE inches 6.5X12 6.5X12
CAPACITY gal/stk 4.91 4.91
PUMP RATE stks/min 115 115
FLOW RATE gal/min 1132
PRESSURE psi 2475
PD SURF / DS psi 100/1815
ANN / BIT psi 10/550
JET VELOCITY ft/sec 250
JET IMPACT lbs 1440
BIT HP 365
HP RATIO / HP/IN2 28% - 1.5/IN2
REDUCED 1 psi at stk/min
RATE 2 psi at stk/min

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | <u>171</u> | <u>.3644</u> | <u>74</u> | <u>221</u> | <u></u> |
| 5X18.75 | <u>847</u> | <u>.3083</u> | <u>85</u> | <u>229</u> | <u></u> |
| 5X17.5 | <u>2687</u> | <u>.2733</u> | <u>99</u> | <u>218</u> | <u></u> |
| 5X12.25 | <u></u> | <u>.1215</u> | <u></u> | <u></u> | <u></u> |
| 8X17.5 | <u>300</u> | <u>.2354</u> | <u>115</u> | <u>243</u> | <u></u> |
| | <u></u> | <u></u> | <u></u> | <u></u> | <u></u> |
| | <u></u> | <u></u> | <u></u> | <u></u> | <u></u> |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|----------------------------|--------------|--------------|--|---------------|--------------|--------------|-------|
| DP | HWDP | DC | | | | | |
| OD-inches <u>5.0</u> | <u>5.0</u> | <u>8</u> | | <u>171</u> | <u>301</u> | <u>1018</u> | |
| ID-inches <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | | <u>21.0</u> | <u>30</u> | <u>20</u> | |
| CAP-bbbls/ft <u>.0178</u> | <u>.0087</u> | <u>.0076</u> | | <u>20.0</u> | <u>28</u> | <u>18.75</u> | |
| DISP-bbbls/ft <u>.0075</u> | <u>.0181</u> | <u>.0545</u> | | <u>.3887</u> | <u>.7616</u> | <u>.3408</u> | |
| LENGTH-ft <u>3279</u> | <u>426</u> | <u>300</u> | | <u>NA</u> | <u>.113</u> | <u>.0479</u> | |
| WEIGHT-lbs/ft <u>19.5</u> | <u>49</u> | <u>149</u> | | <u>170.5</u> | <u>95</u> | <u>812</u> | |
| | | | | | <u>310</u> | <u>133</u> | |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM JETS 13 3/8" CSG 160 ft/mi = 15 sec/std

OPEN HOLE TO 17.5' TO 4005'. CBU. SHORT TRIP TO SHOE. TIGHT HOLE CONDITIONS NOTED ON THE WAY OUT WITH THE HOLE TRYING TO SWAB. BACK REAM TO KEEP FROM SWABBING. WASH AND REAM TO BOTTOM. GAS FROM BOTTOM ON SHORT TRIP = 60 UNITS. CIRCULATE AND CONDITION HOLE FOR RUNNING CASING.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

DEPTH 4005
OPERATION CEMENT
FOOTAGE 0

No. 12
DATE Aug 9 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|----------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .39 at 3977 |
| 5 | | | LITHOLOGY | 60 % CLAY 30% SILTSTONE 10% SAND |
| CONNECTION | 0 | | SAMPLE DEPTH | 4005 |
| TRIP | 10 | 4005 | TRIP CHLORIDES | |
| FLOWLINE TEMP | 48 | degrees F | LAG DOWN DP | 4905 |
| | | | LAG OFF BOTTOM | 4850 |
| | | | DRILL RATE ft/hr | NA |
| | | | CORRECTED 'D' EXP. | NA |
| | | | SHALE DENSITY g/cc | |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|-----|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 450 | psi | 8.5 | ppg | 1601 | psi | 8.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 697 | psi | 12.9 | ppg | 3020 | psi | 14.5 | ppg | | psi | | ppg | ft |
| ECD | 524 | psi | 9.9 | ppg | 2082 | psi | 10.0 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | | |
|------------------|----------------|-----------|-----------|------------|---------------------|----|--------|----|---------|
| TIME | 24:00 AUG 8 93 | BIT NO. | 3 | RR3 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| TYPE | GENERIC #2 | TYPE | FDTG | FDTG/H.O. | SIZE inches | | 6.5X12 | | 6.5X12 |
| WEIGHT IN | 9.8 | IADC CODE | | | CAPACITY gal/stk | | 4.91 | | 4.91 |
| FUNNEL VIS. | 50 | SIZE | 12.25 | 12.25/17.5 | PUMP RATE stks/min | | 87 | | |
| PV/YP | 23/21 | JETS | 3x14.1-10 | TFA:1.44 | FLOW RATE gal/min | | 427 | | |
| GELS | 3/4 | DEPTH OUT | 4005 | 4005 | PRESSURE psi | | 410 | | |
| pH | 9.4 | ROT HRS. | 33.7 | 10.1 | PD SURF / DS psi | | 50/355 | | |
| FILT/CAKE API | 3.8 - 1/32 | FOOTAGE | 2966 | 2987 | ANN / BIT psi | | 5/- | | |
| HP-HT | | AVG ft/hr | 88 | 294 | JET VELOCITY ft/sec | | | | |
| Pm | 1.2 | GRADE | INC | INC | JET IMPACT lbs | | | | |
| PI/MF | .4/1.4 | HOLE DEV. | .39 | | BIT HP | | | | |
| CHLORIDES ppm | 16000 | COST/FT | 311 | NA | HP RATIO / HP/IN2 | | | | |
| CALCIUM ppm | 640 | RPM | 122 | 145 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | 0/91.7/8.3 | WOB | 14 | 10-20 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|--------------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | 171 | .3644 | 28 | 268 | |
| 13.375/18.75 | 847 | .2038 | 61 | 367 | |
| 13.375/17.5 | 2959 | .1238 | 82 | 371 | |

PIPE DATA

| DRILL STRING | | | | CASING: | RISER | COND. | SURF. |
|--------------|-------|-------|-------|---------|-------|-------|--------|
| OD-inches | DP | HWDP | DC | DEPTH | | | |
| 5.0 | 5.0 | | 8 | 171 | 301 | 1018 | 3977 |
| 4.276 | 4.276 | 3.0 | 2.875 | 21.0 | 30 | 20 | 13.375 |
| .0178 | .0178 | .0087 | .0076 | 20.0 | 28 | 18.75 | 12.415 |
| .0075 | .0075 | .0181 | .0545 | .3887 | .7616 | .3408 | .1498 |
| | | | | NA | .113 | .0479 | .024 |
| | | | | 170.5 | 95 | 812 | 3771 |
| | | | | | 310 | 133 | 68 |

REMARKS AND RECOMMENDATIONS

MW 9.6 GPM 600 JETS 2-14,1-13 (OR 4-12'S) ft/mi = 15 sec/std

POOH. RIG UP FOR RUNNING CASING. RUN AND LAND 68 LB/FT - 13 3/8" CASING TO 3977'. CIRCULATE TO CONDITION HOLE BEFORE CEMENTING. GOOD RETURNS NOTED WHILE RUNNING CASING. MAX GAS FROM BOTTOMS UP = 10 UNITS. PUMP AND DISPLACE APP. 480 BBL OF CEMENT AND SPACER.

ADT J. PATTON

sperry-sun
DRILLING SERVICES *LOGGING SYSTEMS*
A Baroid Company

DEPTH 4005
OPERATION RIH
FOOTAGE 0

NO. 13
DATE Aug 10 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|-----------------------------------|-----------------|-----------------|---|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA <u>.39 at 3977</u> |
| | | | LITHOLOGY <u>60 % CLAY 30% SILTSTONE 10% SAND</u> |
| BACKGROUND <u>0</u> | | | SAMPLE DEPTH <u>4005</u> |
| CONNECTION <u>0</u> | | | TRIP CHLORIDES |
| TRIP <u>10</u> | | <u>4005</u> | LAG DOWN DP <u>570</u> |
| FLOWLINE TEMP <u>48</u> degrees F | | | LAG OFF BOTTOM <u>4850</u> |
| | | | DRILL RATE ft/hr <u>NA</u> |
| | | | CORRECTED 'D' EXP. <u>NA</u> |
| | | | SHALE DENSITY g/cc |
| | | | EWR Res. |

FORMATION PRESSURE DATA

| CASING | BOTTOM HOLE | OPEN HOLE |
|--|---------------------------------|------------|
| PORE PRESSURE <u>1800</u> psi <u>8.7</u> ppG | <u>1601</u> psi <u>8.7</u> ppG | psi ppG ft |
| FRACTURE PRESSURE <u>NA</u> psi | <u>3020</u> psi <u>14.5</u> ppG | psi ppG ft |
| ECD <u>NA</u> psi | psi ppG | psi ppG ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|---------------------------------|-----------------------|-------------------|------------------------------|------------------|
| TIME <u>24:00 AUG 9 93</u> | BIT NO. <u>4</u> | RR3 | PUMPS 1. <u>ID1600</u> | 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u>FDTC</u> | <u>FDTC/H.O.</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>9.8</u> | IADC CODE | | CAPACITY gal/stk <u>4.91</u> | <u>4.91</u> |
| FUNNEL VIS. <u>51</u> | SIZE <u>12.25</u> | <u>12.25/17.5</u> | PUMP RATE stks/min | |
| PV/YP <u>15/17</u> | JETS <u>4-12'S</u> | <u>TFA:1.44</u> | FLOW RATE gal/min | |
| GELS <u>3/4</u> | DEPTH OUT <u>4005</u> | | PRESSURE psi <u>STATIC</u> | |
| pH <u>9.2</u> | ROT HRS. | <u>10.1</u> | PD SURF / DS psi | |
| FILT/CAKE API <u>3.0 - 1/32</u> | FOOTAGE <u>2987</u> | | ANN / BIT psi | |
| HP-HT | AVG ft/hr <u>294</u> | | JET VELOCITY ft/sec | |
| Pm <u>1.0</u> | GRADE <u>INC</u> | | JET IMPACT lbs | |
| Pt/Mf <u>.3/1.5</u> | HOLE DEV. | | BIT HP | |
| CHLORIDES ppm <u>16000</u> | COST/FT | <u>NA</u> | HP RATIO / HP/IN2 | |
| CALCIUM ppm <u>600</u> | RPM <u>145</u> | | REDUCED 1 <u>psi at</u> | <u>stk/min</u> |
| OIL/WATER/SOLIDS <u>0/92/8</u> | WOB <u>10-20</u> | | RATE 2 <u>psi at</u> | <u>stk/min</u> |
| DAILY/CUM. COST | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|------------------------|--------------|-----------------|-----------------|-----------------|--------------|
| <u>5X20</u> DP-RISER | <u>171</u> | <u>.3644</u> | | | |
| <u>5X13 3/8</u> DP-CSG | | <u>.1255</u> | | | |
| <u>8X13 3/8</u> DC-CSG | | <u>.0876</u> | | | |
| <u>8X12.25</u> DC-HOLE | | <u>.0836</u> | | | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | | <u>8</u> | | <u>171</u> | <u>301</u> | <u>1018</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | | <u>2.875</u> | | <u>21.0</u> | <u>30</u> | <u>20</u> |
| CAP-bbbls/ft | <u>.0178</u> | <u>.0087</u> | | <u>.0076</u> | | <u>20.0</u> | <u>28</u> | <u>18.75</u> |
| DISP-bbbls/ft | <u>.0075</u> | <u>.0181</u> | | <u>.0545</u> | | <u>.3887</u> | <u>.7616</u> | <u>.3408</u> |
| LENGTH-ft | | <u>728</u> | | <u>476</u> | | <u>NA</u> | <u>.113</u> | <u>.0479</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | | <u>149</u> | | <u>170.5</u> | <u>95</u> | <u>812</u> |
| | | | | | | | <u>310</u> | <u>133</u> |
| | | | | | | | | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 9.6 GPM 600 JETS 2-14,1-13 (OR 4-12'S) ft/mi = 15 sec/std

COMPLETE CEMENTING JOB. GOOD RETURNS NOTED WHILE CEMENTING. R/U SCHLUMBERGER. RUN VSP AND TEMPERATURE LOGS.

TEST BOP. MAKE UP NEW BIT AND BHA. RIH.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 5146
OPERATION DRILLING
FOOTAGE 1141

NO. 14
DATE Aug 11 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|----------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 48 at 5043' |
| 50 | 229 | 4585 | LITHOLOGY | 70 % CLAY 20% SILTSTONE 10% SAND |
| 105 | | | SAMPLE DEPTH | 5050 |
| 10 | | 4005 | TRIP CHLORIDES | |
| | | | LAG DOWN DP | 685 |
| | | | LAG OFF BOTTOM | 5950 |
| BACKGROUND CONNECTION | | | DRILL RATE ft/hr | 105 |
| TRIP | | | CORRECTED 'D' EXP. | 1.03 |
| FLOWLINE TEMP | 80 | degrees F | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 2.5 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 1800 psi | 8.7 ppg | 2382 psi | 8.9 ppg | | | | |
| FRACTURE PRESSURE | 3081 psi | 14.9 ppg | 4094 psi | 15.3 ppg | | | | |
| ECD | 2068 psi | 10.0 ppg | 2703 psi | 10.1 ppg | | | | |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 10 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 9.8+ |
| FUNNEL VIS. | 58 |
| PV/YP | 19/19 |
| GELS | 3/4 |
| pH | 9.9 |
| FILT/CAKE API | 3.2 - 1/32 |
| HP-HT | |
| Pm | 1.0 |
| Pf/Mf | .3/1.6 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 860 |
| OIL/WATER/SOLIDS | 0/92/8 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|------------|------------|
| BIT NO. | 4 | RR3 |
| TYPE | FDTG | FDTG/H.O. |
| IADC CODE | | |
| SIZE | 12.25 | 12.25/17.5 |
| JETS | 4-12'S | TFA:1.44 |
| DEPTH OUT | | 4005 |
| ROT HRS. | 12.4 | 10.1 |
| FOOTAGE | 1141 | 2987 |
| AVG ft/hr | 92 | 294 |
| GRADE | INC | INC |
| HOLE DEV. | .48 @ 5043 | |
| COST/FT | | NA |
| RPM | 130 | 145 |
| WOB | 25 | 10-20 |

HYDRAULIC DATA

| | | |
|---------------------|-----------|-----------------|
| PUMPS | 1. ID1600 | 2. ID1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | 61 | 61 |
| FLOW RATE gal/min | 600 | |
| PRESSURE psi | | 2725 |
| PD SURF / DS psi | | 75/960 |
| ANN / BIT psi | | 25/1665 |
| JET VELOCITY ft/sec | | 435 |
| JET IMPACT lbs | | 1325 |
| BIT HP | | 580 |
| HP RATIO / HP/IN2 | | 61% - 5.0/IN2 |
| REDUCED 1 | | psi at stks/min |
| RATE 2 | | psi at stks/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 39 | 210 | |
| 5X13 3/8 | DP-CSG | 728 | .1255 | 114 | 265 | |
| 8X13 3/8 | DC-CSG | 3771 | .0876 | 118 | 247 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 171 | 296 | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|--------------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | | 8 | | 171 | 301 | 1018 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 21.0 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | 20.0 | 28 | 18.75 |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | .3887 | .7616 | .3408 |
| LENGTH-ft | 3970 | 728 | | 476 | | NA | .113 | .0479 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | 170.5 | 95 | 812 |
| | | | | | | | 310 | 133 |
| | | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 600 JETS 2-14,1-13 (OR 4-12'S) ft/mi = 15 sec/std

RIH WITH NB 4. TAG CEMENT AT 3889'. CBU. TEST CASING TO 3500 PSI. DRILL OUT CEMENT AND SHOE PLUS 10' OF NEW HOLE. CBU.

RUN EAK OFF TEST TO 14.9 PPG WITHOUT BREAKING DOWN FORMATION. DRILL AHEAD. CONNECTION GAS LOGGED BELOW 4300' AVERAGING APP 50 UNITS OVER BACKGROUND. SLIGHT TREND NOTED ON PRESSURE PLOTS. RAISED PORE PRESSURE ESTIMATE TO 8.9 - 9.0 PPG.

DRILL AHEAD.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES

A Baroid Company

DEPTH 5925
OPERATION DRILLING
FOOTAGE 779

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 15
DATE Aug 12 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|----------------------------|-----------------|-----------------|--------------------|----------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 1.19 at 5773' |
| 35 | 250 | 5220 | LITHOLOGY | 60 % CLAY 30% SILTSTONE 10% SAND |
| 92 | | | SAMPLE DEPTH | 5650 |
| 95 | | 4525 | TRIP CHLORIDES | |
| 94 | | | LAG DOWN DP | 805 |
| | | | LAG OFF BOTTOM | 6800 |
| BACKGROUND CONNECTION TRIP | | | DRILL RATE ft/hr | 85 |
| | | | CORRECTED 'D' EXP. | 1.18 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 2.5 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 1800 psi | 8.7 ppg | 2773 psi | 9.0 ppg | | | | |
| FRACTURE PRESSURE | 3081 psi | 14.9 ppg | 4837 psi | 15.7 ppg | | | | |
| ECD | 2109 psi | 10.2 ppg | 3173 psi | 10.3 ppg | | | | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | |
|------------------|-----------------|-----------|-------------|------------|---------------------|-----------|----------------|
| TIME | 24:00 AUG 11 93 | BIT NO. | 4 | RR3 | PUMPS | 1. ID1600 | 2. ID1600 |
| TYPE | GENERIC #2 | TYPE | FDTC | FDTC/H.O. | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 10.0 | IADC CODE | | | CAPACITY gal/stk | 4.91 | 4.91 |
| FUNNEL VIS. | 55 | SIZE | 12.25 | 12.25/17.5 | PUMP RATE stks/min | 68 | 69 |
| PV/YP | 20/23 | JETS | 4-12'S | TFA:1.44 | FLOW RATE gal/min | 670 | |
| GELS | 3/6 | DEPTH OUT | | 4005 | PRESSURE psi | | 3450 |
| pH | 9.3 | ROT HRS. | 21.4 | 10.1 | PD SURF / DS psi | | 100/1200 |
| FILT/CAKE API | 3.0 - 1/32 | FOOTAGE | 1920 | 2987 | ANN / BIT psi | | 35/2115 |
| HP-HT | | AVG ft/hr | 90 | 294 | JET VELOCITY ft/sec | | 487 |
| Pm | .7 | GRADE | INC | INC | JET IMPACT lbs | | 1687 |
| PI/Mf | .15/1.4 | HOLE DEV. | 1.19 @ 5773 | | BIT HP | | 825 |
| CHLORIDES ppm | 17500 | COST/FT | | NA | HP RATIO / HP/IN2 | | 61% - 7.0/IN2 |
| CALCIUM ppm | 680 | RPM | 130 | 145 | REDUCED 1 | | psi at stk/min |
| OIL/WATER/SOLIDS | 0/91.5/8.8 | WOB | 45 | 10-20 | RATE 2 | | psi at stk/min |
| DAILY/CUM. COST | | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 44 | 246 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 127 | 302 | |
| 5X12.25 | DP-HOLE | 1452 | .1215 | 131 | 282 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 191 | 332 | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|--------------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | | 8 | | 171 | 301 | 1018 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 21.0 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | 20.0 | 28 | 18.75 |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | .3887 | .7616 | .3408 |
| LENGTH-ft | 4721 | 728 | | 476 | | NA | .113 | .0479 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | 170.5 | 95 | 812 |
| | | | | | | | 310 | 133 |
| | | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.0 GPM 600 JETS 3-13,1-11 ft/mi = 15 sec/std

CONTROL DRILL WITH BIT NO. 4. CONSISTANT CONECTION GAS READINGS AVERAGING ABOUT 50 UNITS ABOVE BACKGROUND.

DRILL TO 5525'. CBU. SHORT TRIP TO SHOE. HOLE TRYING TO SWAB WITH TIGHT HOLE ON THE WAY OUT. PUMP-BACKREAM OUT OFF THE

HOLE. NO EXCESS DRAG NOTED ON WAY BACK IN. MAX GAS RECORDED WHILE DRILLING AHEAD AFTER GETTING BACK TO BOTTOM = 95

UNITS. DRILL AHEAD.

ADT J. PATTON

sperry-sun DRILLING SERVICES *LOGGING SYSTEMS*

A Baroid Company

DEPTH 6593
OPERATION POOH
FOOTAGE 668

NO. 16
DATE Aug 13 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|-------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 1.40 at 6531' |
| | | | LITHOLOGY | 80 % CLAY 20% SILTSTONE |
| BACKGROUND | 40 | 125 | SAMPLE DEPTH | 6580 |
| CONNECTION | 85 | | TRIP CHLORIDES | |
| TRIP | 95 | | LAG DOWN DP | 905 |
| FLOWLINE TEMP | 94 | degrees F | LAG OFF BOTTOM | 7250 |
| | | | DRILL RATE ft/hr | 45 |
| | | | CORRECTED 'D' EXP. | 1.32 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3.5 |

FORMATION PRESSURE DATA

| CASING | BOTTOM HOLE | OPEN HOLE | |
|-------------------|-------------------|-------------------|--|
| PORE PRESSURE | 1800 psi 8.7 ppg | 3120 psi 9.1 ppg | |
| FRACTURE PRESSURE | 3081 psi 14.9 ppg | 5383 psi 15.7 ppg | |
| ECD | 2109 psi 10.2 ppg | 3531 psi 10.3 ppg | |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 12 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 10.0+ |
| FUNNEL VIS. | 59 |
| PV/YP | 22/28 |
| GELS | 5/9 |
| pH | 9.1 |
| FILT/CAKE API | 2.7 - 1/32 |
| HP-HT | |
| Pm | .5 |
| Pf/Mf | .1/1.3 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 920 |
| OIL/WATER/SOLIDS | 0/91.5/8.5 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|------------|------------|
| BIT NO. | 4 | RR3 |
| TYPE | FDTG | FDTG/H.O. |
| IADC CODE | | |
| SIZE | 12.25 | 12.25/17.5 |
| JETS | 4-12'S | TFA:1.44 |
| DEPTH OUT | 6593 | 4005 |
| ROT HRS. | 34.1 | 10.1 |
| FOOTAGE | 2588 | 2987 |
| AVG ft/hr | 76 | 294 |
| GRADE | INC | INC |
| HOLE DEV. | 1.4 @ 6531 | |
| COST/FT | 370 | NA |
| RPM | 130 | 145 |
| WOB | 40 | 10-20 |

HYDRAULIC DATA

| | | |
|---------------------|-----------|----------------|
| PUMPS | 1. ID1600 | 2. ID1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | 62 | 63 |
| FLOW RATE gal/min | 615 | |
| PRESSURE psi | | 3250 |
| PD SURF / DS psi | | 100/1320 |
| ANN / BIT psi | | 50/1780 |
| JET VELOCITY ft/sec | | 447 |
| JET IMPACT lbs | | 1422 |
| BIT HP | | 640 |
| HP RATIO / HP/IN2 | | 55% - 5.4/IN2 |
| REDUCED 1 | | psi at stk/min |
| RATE 2 | | psi at stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 40 | 291 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 117 | 351 | |
| 5X12.25 | DP-HOLE | 2139 | .1215 | 121 | 327 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 175 | 380 | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|--------------|
| OD-inches | 5.0 | 5.0 | 8 | | 171 | 301 | 1017 3978 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 21.0 | 30 | 20 13.375 |
| CAP-bbbls/ft | .0178 | .0087 | .0076 | | 20.0 | 28 | 18.75 12.415 |
| DISP-bbbls/ft | .0075 | .0181 | .0545 | | .3887 | .7616 | .3408 .1498 |
| LENGTH-ft | 4721 | 728 | 476 | | NA | .113 | .0479 .024 |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 170.5 | 95 | 811 3772 |
| | | | | | | 310 | 133 68 |

REMARKS AND RECOMMENDATIONS

MW 10.0 GPM 600 JETS 3-13,1-11 ft/mi = 15 sec/std

DRILL AHEAD WITH BIT NO. 4. RAISE MUD WEIGHT TO 10.0 PPG TO STABILIZE HOLE CONDITIONS ON TRIPS. CONNECTION GAS AVERAGING ABOUT 50 UNITS ABOVE BACKGROUND. DRILL TO 6593'. CBU. POOH ON SLOW PENETRATION RATES AND BIT HOURS. SMALL SHOWS NOTED IN SANDS LOGGED DURING THE LAST 100' OF DRILLING. BACKREAM WHILE PULLING OUT OF THE HOLE.. AVERAGE GAS WHILE CIRCULATING IWAS 100 UNITS. MAX GAS RECORDED FOR PAST 24 HRS WAS 344 UNITS - ALSO LOGGED FROM BACKREAMING OUT OF THE HOLE.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES

A Baroid Company

DEPTH 6729
OPERATION RIH/CORE #1
FOOTAGE 136

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 17
DATE Aug 14 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|----------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 1.25 at 6625' |
| 45 | 525 | 6700 | LITHOLOGY | 30 % CLAY 30% SILTSTONE 40% SAND |
| BACKGROUND CONNECTION | 85 | 6562 | SAMPLE DEPTH | 6729 |
| TRIP | 142 | 6593 | TRIP CHLORIDES | |
| FLOWLINE TEMP | 88 | degrees F | LAG DOWN DP | 940 |
| | | | LAG OFF BOTTOM | 7500 |
| | | | DRILL RATE ft/hr | 85 |
| | | | CORRECTED 'D' EXP. | .72 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 15 |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|------|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 3149 | psi | 9.0 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 5494 | psi | 15.7 | ppg | | psi | | ppg | ft |
| ECD | 2109 | psi | 10.2 | ppg | 3569 | psi | 10.2 | ppg | | psi | | ppg | ft |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 13 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 10.0 |
| FUNNEL VIS. | 79 |
| PV/YP | 26/32 |
| GELS | 5/10 |
| pH | 9.0 |
| FILT/CAKE API | 2.6 - 1/32 |
| HP-HT | |
| Pm | .5 |
| Pf/Mf | .1/1.3 |
| CHLORIDES ppm | 17500 |
| CALCIUM ppm | 1040 |
| OIL/WATER/SOLIDS | .5/90.5/9 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|---------|------------|
| BIT NO. | 6 | 5 |
| TYPE | CB-1 | DS-40 PDC |
| IADC CODE | | |
| SIZE | 8.5 | 12.25 |
| JETS | TFA: .7 | 2-14, 3-13 |
| DEPTH OUT | | 6729 |
| ROT HRS. | | 1.8 |
| FOOTAGE | | 136 |
| AVG ft/hr | | 76 |
| GRADE | | INC |
| HOLE DEV. | | |
| COST/FT | | 1360 |
| RPM | | 130 |
| WOB | | 5-10 |

HYDRAULIC DATA

| | | |
|---------------------|-----------|-----------------|
| PUMPS | 1. ID1600 | 2. ID1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | 71 | 71 |
| FLOW RATE gal/min | 700 | |
| PRESSURE psi | | 2650 |
| PD SURF / DS psi | | 100/1600 |
| ANN / BIT psi | | 50/950 |
| JET VELOCITY ft/sec | | 326 |
| JET IMPACT lbs | | 1180 |
| BIT HP | | 387 |
| HP RATIO / HP/IN2 | | 36% - 3.3/IN2 |
| REDUCED 1 | | psi at stks/min |
| RATE 2 | | psi at stks/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 46 | 314 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 133 | 380 | |
| 5X12.25 | DP-HOLE | 2284 | .1215 | 137 | 355 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 199 | 414 | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8 | | 171 | 301 | 1017 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 21.0 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0076 | | 20.0 | 28 | 18.75 |
| DISP-bbls/ft | .0075 | .0181 | .0545 | | .3887 | .7616 | .3408 |
| LENGTH-ft | 5525 | 728 | 476 | | NA | .113 | .0479 |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 170.5 | 95 | 811 |
| | | | | | | 310 | 133 |
| | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.0 GPM 600 JETS 3-13,1-11 ft/mi = 15 sec/std

RIH WITH NB # 5. REAM LAST TWO STANDS TO BOTTOM. DRILL AHEAD. BREAK IN BIT WITH LOW WEIGHT ON BIT. DRILL AHEAD TO 6729'.
CIRCULATE OUT HOLE VOLUME ON POTENTIAL SHOW INDICATED BY MWD TOOL. ZERO DISCHARGE DRILL CUTTINGS FROM ZONE OF
INTEREST. MAX GAS FROM SAND FORMATION AT 6700' = 525 UNITS. CIRCULATE AND CONDITION HOLE FOR CORING. BACKGROUND GAS
TO LESS THAN 50 UNITS. POOH. HOLE PULLED GOOD ON THIS TRIP. PICK UP CORE BARREL. RIH FOR CORE NO. 1.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 7205
OPERATION DRILLING
FOOTAGE 476

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 18
DATE Aug 15 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|-------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .65 at 7094' |
| BACKGROUND | 60 | 464 | LITHOLOGY | 40 % CLAY 60% SILTSTONE |
| CONNECTION | 90 | 7127 | SAMPLE DEPTH | 7070 |
| TRIP | 98 | 6732 | TRIP CHLORIDES | |
| FLOWLINE TEMP | 93 | degrees F | LAG DOWN DP | 998 |
| | | | LAG OFF BOTTOM | 7950 |
| | | | DRILL RATE ft/hr | 80 |
| | | | CORRECTED 'D' EXP. | .75 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 5 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|------------------|------|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 3372 | psi | 9.0 | ppg |
| FRACURE PRESSURE | 3081 | psi | 14.9 | ppg | 5920 | psi | 15.8 | ppg |
| ECD | 2151 | psi | 10.3 | ppg | 3896 | psi | 10.4 | ppg |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 14 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 10.1 |
| FUNNEL VIS. | 69 |
| PV/YP | 24/34 |
| GELS | 5/12 |
| pH | 8.9 |
| FILT/CAKE API | 3.0 - 1/32 |
| HP-HT | 6.8 @ 150 |
| Pm | .3 |
| Pf/Mf | .1/1.3 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 920 |
| OIL/WATER/SOLIDS | TR/11/89 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|---------|------------|
| BIT NO. | CB-1 | RR5 |
| TYPE | RC-412 | DS-40H |
| IADC CODE | CORE #1 | PDC |
| SIZE | 8.5 | 12.25 |
| JETS | TFA: .7 | 2-14, 3-13 |
| DEPTH OUT | 6732 | NA |
| ROT HRS. | .9 | 5.6 |
| FOOTAGE | 3 | 473 |
| AVG ft/hr | 3.3 | 84 |
| GRADE | | INC |
| HOLE DEV. | | |
| COST/FT | NA | 650 |
| RPM | 60 | 130 |
| WOB | 10 | 5-10 |

HYDRAULIC DATA

| | | |
|---------------------|-----------|-----------------|
| PUMPS | 1. ID1600 | 2. ID1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | 71 | 70 |
| FLOW RATE gal/min | 693 | |
| PRESSURE psi | | 2650 |
| PD SURF / DS psi | | 100/1610 |
| ANN / BIT psi | | 70/940 |
| JET VELOCITY ft/sec | | 322 |
| JET IMPACT lbs | | 1170 |
| BIT HP | | 380 |
| HP RATIO / HP/IN2 | | 36% - 3.2/IN2 |
| REDUCED 1 | | psi at stks/min |
| RATE 2 | | psi at stks/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 45 | 334 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 132 | 396 | |
| 5X12.25 | DP-HOLE | 2751 | .1215 | 136 | 369 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 197 | 423 | |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|--------|
| DP | HWDP | DC | | 171 | 301 | 1017 | 3978 |
| OD-inches | 5.0 | 5.0 | 8 | 21.0 | 30 | 20 | 13.375 |
| ID-inches | 4.276 | 3.0 | 2.875 | 20.0 | 28 | 18.75 | 12.415 |
| CAP-bbls/ft | .0178 | .0087 | .0076 | .3887 | .7616 | .3408 | .1498 |
| DISP-bbls/ft | .0075 | .0181 | .0545 | NA | .113 | .0479 | .024 |
| LENGTH-ft | 6001 | 728 | 476 | 170.5 | 95 | 811 | 3772 |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 310 | 133 | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.0 GPM 600 JETS 3-13,1-11 ft/mi = 15 sec/std

RIH FOR CORE NO. 1. ATTEMPT TO CORE. MAX TRIP GAS FROM BOTTOM = 246 UNITS. POOH AFTER PENETRATING 3 FEET OF HOLE.

CORE BIT APPEARED TO BALL UP WITH CLAY. RR BIT NO. 5. DRILL AHEAD.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

DEPTH 7865
OPERATION DRILLING
FOOTAGE 660

NO. 19
DATE Aug 16 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|------------------|-----------------|-----------------|--------------------|-------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .65 at 7094' |
| BACKGROUND 40 | 180 | 7250 | LITHOLOGY | 40 % CLAY 60% SILTSTONE |
| CONNECTION NA | | | SAMPLE DEPTH | 7070 |
| TRIP 625 | | 7698 | TRIP CHLORIDES | |
| FLOWLINE TEMP 91 | | degrees F | LAG DOWN DP | 998 |
| | | | LAG OFF BOTTOM | 7950 |
| | | | DRILL RATE ft/hr | 160 |
| | | | CORRECTED 'D' EXP. | .78 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 7 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|------|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 3844 | psi | 9.4 | ppg |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 6544 | psi | 16 | ppg |
| ECD | 2151 | psi | 10.3 | ppg | 4212 | psi | 10.3 | ppg |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 15 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 10.0 |
| FUNNEL VIS. | 59 |
| PV/YP | 25/30 |
| GELS | 3/8 |
| pH | 8.6 |
| FILT/CAKE API | 2.8 - 1/32 |
| HPHT | 6.0 @ 150 |
| Pm | .3 |
| PI/Mi | .1/1.3 |
| CHLORIDES ppm | 17500 |
| CALCIUM ppm | 880 |
| OIL/WATER/SOLIDS | TR/9/91 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|---------|------------|
| BIT NO. | CB-1 | RR5 |
| TYPE | RC-412 | DS-40H |
| IADC CODE | CORE #1 | PDC |
| SIZE | 8.5 | 12.25 |
| JETS | TFA: .7 | 2-14, 3-13 |
| DEPTH OUT | 6732 | |
| ROT HRS. | .9 | 12.1 |
| FOOTAGE | 3 | 1133 |
| AVG ft/hr | 3.3 | 94 |
| GRADE | | INC |
| HOLE DEV. | | |
| COST/FT | NA | 596 |
| RPM | 60 | 160 |
| WOB | 10 | 15 |

HYDRAULIC DATA

| | | | | |
|---------------------|----|---------------|----|---------|
| PUMPS | 1. | ID1600 | 2. | ID1600 |
| SIZE inches | | 6.5X12 | | 6.5X12 |
| CAPACITY gal/stk | | 4.91 | | 4.91 |
| PUMP RATE stks/min | | 72 | | 71 |
| FLOW RATE gal/min | | 704 | | |
| PRESSURE psi | | 2800 | | |
| PD SURF / DS psi | | 100/1675 | | |
| ANN / BIT psi | | 65/960 | | |
| JET VELOCITY ft/sec | | 328 | | |
| JET IMPACT lbs | | 1195 | | |
| BIT HP | | 395 | | |
| HP RATIO / HP/IN2 | | 33% - 3.3/IN2 | | |
| REDUCED 1 | | psi at | | stk/min |
| RATE 2 | | psi at | | stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 46 | 295 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 134 | 360 | |
| 5X12.25 | DP-HOLE | 3411 | .1215 | 138 | 336 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 201 | 393 | |

PIPE DATA

| | DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|-------|--|-------|------------------|-------|-------|-------|
| | DP | HWDP | | DC | | | | |
| OD-inches | 5.0 | 5.0 | | 8 | | 171 | 301 | 1017 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 21.0 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | 20.0 | 28 | 18.75 |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | .3887 | .7616 | .3408 |
| LENGTH-ft | 6661 | 728 | | 476 | | NA | .113 | .0479 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | 170.5 | 95 | 811 |
| | | | | | | | 310 | 133 |
| | | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.0 GPM 700 JETS TFA: .68 ft/mi = 15 sec/std

DRILL AHEAD LOOKING FOR CORE POINT. PRESSURE TREND STARTING TO DEVELOP ON D-EXPONENT PLOT AT 7000'. INCREASE ROP APPROXIMATELY 50% BY ADDING WEIGHT ON BIT AND ADDITIONAL RPM BELOW 7500'. SLIGHT INCREASE IN GAS LOGGED FROM BOTTOMS UP ON CONNECTIONS. RAISED PORE PRESSURE ESTIMATE TO 9.4 PPG AT 7675'. DRILL TO 7698'. CBU. POOH TO SHOE. PUMP OUT OF THE HOLE ON STANDS 9,10,11, AND 12. REPAIR TOP DRIVE. RIH. DRILL AHEAD. BOTTOMS UP FROM TRIP = 625 UNITS.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 9500
OPERATION POOH
FOOTAGE 1635

NO. 20
DATE Aug 17 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|--------------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .80 @ 9376 |
| 90 | 1513 | 9020 | LITHOLOGY | 60 % CLAY 40% SILTSTONE TR SANDSTONE |
| CONNECTION | 165 | 9488 | SAMPLE DEPTH | 9500 |
| TRIP | 625 | 7698 | TRIP CHLORIDES | |
| FLOWLINE TEMP | 95 | degrees F | LAG DOWN DP | 1345 |
| | | | LAG OFF BOTTOM | 10450 |
| | | | DRILL RATE ft/hr | 88 |
| | | | CORRECTED 'D' EXP. | .88 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3.5 |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | |
|-------------------|------|-----|------|-------------|------|-----|------|-----------|--|-----|--|----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 3844 | psi | 9.7 | ppg | | psi | | ft |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 6544 | psi | 16.2 | ppg | | psi | | ft |
| ECD | 2151 | psi | 10. | ppg | 4212 | psi | | ppg | | psi | | ft |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 16 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 10.4+ |
| FUNNEL VIS. | 70 |
| PV/YP | 30/40 |
| GELS | 5/15 |
| pH | 8.8 |
| FILT/CAKE API | 2.9 - 1/32 |
| HP-HT | 6.8 @ 150 |
| Pm | .3 |
| Pf/Mf | .1/1.4 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 920 |
| OIL/WATER/SOLIDS | TR/10.5/89.5 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|---------|------------|
| BIT NO. | CB-1 | RR5 |
| TYPE | RC-412 | DS-40H |
| IADC CODE | CORE #1 | PDC |
| SIZE | 8.5 | 12.25 |
| JETS | TFA: 7 | 2-14, 3-13 |
| DEPTH OUT | 6732 | 9500 |
| ROT HRS. | .9 | 27.4 |
| FOOTAGE | 3 | 2768 |
| AVG ft/hr | 3.3 | 101 |
| GRADE | | INC |
| HOLE DEV. | | |
| COST/FT | NA | 331 |
| RPM | 60 | 160 |
| WOB | 10 | 14 |

HYDRAULIC DATA

| | 1. ID1600 | 2. ID1600 |
|---------------------|-----------|----------------|
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | 69 | 70 |
| FLOW RATE gal/min | 686 | |
| PRESSURE psi | | 3600 |
| PD SURF / DS psi | | 100/2450 |
| ANN / BIT psi | | 105/945 |
| JET VELOCITY ft/sec | | 319 |
| JET IMPACT lbs | | 1179 |
| BIT HP | | 380 |
| HP RATIO / HP/IN2 | | 26% - 3.2/IN2 |
| REDUCED 1 | | psi at stk/min |
| RATE 2 | | psi at stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 45 | 361 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 130 | 432 | |
| 5X12.25 | DP-HOLE | 5046 | .1215 | 134 | 403 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 195 | 466 | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|--------------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | | 8 | | 171 | 301 | 1017 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 21.0 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | 20.0 | 28 | 18.75 |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | .3887 | .7616 | .3408 |
| LENGTH-ft | 8296 | 728 | | 476 | | NA | .113 | .0479 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | 170.5 | 95 | 811 |
| | | | | | | | 310 | 133 |
| | | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.4 GPM 650 JETS TFA: .68 ft/mi = 15 sec/std

DRILL AHEAD WITH BIT NO. 5. SLIGHT INCREASE IN BACKGROUND GAS AND CONNECTION GAS LOGGED WITH INCREASING DEPTH. RAISED PORE PRESSURE ESTIMATE TO REFLECT TREND DEVELOPING ON D-EXPONENT AND RESISTIVITY PLOT. CURRENT ESTIMATE IS 9.7 PPG AT THIS DEPTH. THE MUD WEIGHT WAS RAISED IN TWO STAGES TO 10.4 PPG FOR ADDITIONAL OVERBALANCE. CBU AT 9500. POOH.

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 9500
OPERATION RIH
FOOTAGE 0

NO. 21
DATE Aug 18 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|--------------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .80 @ 9376 |
| 0 | 350 | B.REM | LITHOLOGY | 60 % CLAY 40% SILTSTONE TR SANDSTONE |
| CONNECTION | 165 | 9488 | SAMPLE DEPTH | 9500 |
| TRIP | 625 | 7698 | TRIP CHLORIDES | |
| FLOWLINE TEMP | 80 | degrees F | LAG DOWN DP | 1345 |
| | | | LAG OFF BOTTOM | 10450 |
| | | | DRILL RATE ft/hr | 88 |
| | | | CORRECTED 'D' EXP. | .88 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3.5 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|------|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 3844 | psi | 9.7 | ppg |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 6544 | psi | 16.2 | ppg |
| ECD | 2151 | psi | 10.6 | ppg | 4212 | psi | 10.6 | ppg |

MUD DATA

| | |
|------------------|-----------------|
| TIME | 24:00 AUG 17 93 |
| TYPE | GENERIC #2 |
| WEIGHT IN | 10.4 |
| FUNNEL VIS. | 68 |
| PV/YP | 23/35 |
| GELS | 4/7 |
| pH | 8.8 |
| FILT/CAKE API | 2.9 - 1/32 |
| HP-HT | 6.8 @ 150 |
| Pm | .3 |
| Pf/Mf | .1/1.5 |
| CHLORIDES ppm | 17500 |
| CALCIUM ppm | 920 |
| OIL/WATER/SOLIDS | TR/10/90 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|--------|------------|
| BIT NO. | 6 | RR5 |
| TYPE | DS-40H | DS-40H |
| IADC CODE | PDC | PDC |
| SIZE | 12.25 | 12.25 |
| JETS | 5-15 | 2-14, 3-13 |
| DEPTH OUT | | 9500 |
| ROT HRS. | | 27.4 |
| FOOTAGE | | 2768 |
| AVG ft/hr | | 101 |
| GRADE | | INC |
| HOLE DEV. | | |
| COST/FT | | 331 |
| RPM | | 160 |
| WOB | | 14 |

HYDRAULIC DATA

| | | |
|---------------------|-----------|----------------|
| PUMPS | 1. ID1600 | 2. ID1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.91 | 4.91 |
| PUMP RATE stks/min | 69 | 70 |
| FLOW RATE gal/min | 686 | |
| PRESSURE psi | | 3600 |
| PD SURF / DS psi | | 100/2450 |
| ANN / BIT psi | | 105/945 |
| JET VELOCITY ft/sec | | 319 |
| JET IMPACT lbs | | 1179 |
| BIT HP | | 380 |
| HP RATIO / HP/IN2 | | 26% - 3.2/IN2 |
| REDUCED 1 | | psi at stk/min |
| RATE 2 | | psi at stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 45 | 361 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 130 | 432 | |
| 5X12.25 | DP-HOLE | 5046 | .1215 | 134 | 403 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 195 | 466 | |

PIPE DATA

| DRILL STRING | | | | CASING: | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------|-------|-------|-------|
| | DP | HWDP | DC | DEPTH | | | |
| OD-inches | 5.0 | 5.0 | 8 | | 171 | 301 | 1017 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 21.0 | 30 | 20 |
| CAP-bbbls/ft | .0178 | .0087 | .0076 | | 20.0 | 28 | 18.75 |
| DISP-bbbls/ft | .0075 | .0181 | .0545 | | .3887 | .7616 | .3408 |
| LENGTH-ft | 8296 | 728 | 476 | | NA | .113 | .0479 |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 170.5 | 95 | 811 |
| | | | | | | 310 | 133 |
| | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.4 GPM 700 JETS TFA: .75 ft/mi = 15 sec/std

PUMP OUT OF HOLE ON FIRST 20 STANDS. HOLE PULLED GOOD FOR THE REST OF THE WAY OUT. TEST BOP. PICK UP ADDITIONAL DRILL PIPE ON THE WAY BACK IN.

ADT J. PATTON

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 10551
OPERATION S. TRIP
FOOTAGE 1051

NO. 22
DATE Aug 19 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|--------------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .80 @ 9376 |
| BACKGROUND | 50 | 140 | LITHOLOGY | 60 % CLAY 40% SILTSTONE TR SANDSTONE |
| CONNECTION | 92 | 10456 | SAMPLE DEPTH | 9500 |
| TRIP | 1541 | 9500 | TRIP CHLORIDES | |
| FLOWLINE TEMP | 105 | degrees F | LAG DOWN DP | 1505 |
| | | | LAG OFF BOTTOM | 11750 |
| | | | DRILL RATE ft/hr | 95 |
| | | | CORRECTED 'D' EXP. | .81 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3.5 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|------|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 5432 | psi | 9.9 | ppg |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 9053 | psi | 16.5 | ppg |
| ECD | 2113 | psi | 10.7 | ppg | 5870 | psi | 10.6 | ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | | |
|------------------|-----------------|-----------|--------|------------|---------------------|--------|---------------|----|---------|
| TIME | 24:00 AUG 18 93 | BIT NO. | 6 | RR5 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| TYPE | GENERIC #2 | TYPE | DS-40H | DS-40H | SIZE inches | 6.5X12 | 6.5X12 | | |
| WEIGHT IN | 10.5 | IADC CODE | PDC | PDC | CAPACITY gal/stk | 4.91 | 4.91 | | |
| FUNNEL VIS. | 64 | SIZE | 12.25 | 12.25 | PUMP RATE stks/min | 69 | 69 | | |
| PV/YP | 26/34 | JETS | 5-15 | 2-14, 3-13 | FLOW RATE gal/min | 678 | | | |
| GELS | 4/12 | DEPTH OUT | | 9500 | PRESSURE psi | | 3200 | | |
| pH | 8.8 | ROT HRS. | 11.6 | 27.4 | PD SURF / DS psi | | 100/2400 | | |
| FILT/CAKE API | 3.4 - 1/32 | FOOTAGE | 1051 | 2768 | ANN / BIT psi | | 100/600 | | |
| HP-HT | 6.8 @ 150 | AVG ft/hr | 90 | 101 | JET VELOCITY ft/sec | | 252 | | |
| Pm | .45 | GRADE | INC | 40% - 1/8 | JET IMPACT lbs | | 929 | | |
| PI/Mf | .25/1.5 | HOLE DEV. | | | BIT HP | | 235 | | |
| CHLORIDES ppm | 17000 | COST/FT | 503 | 331 | HP RATIO / HP/IN2 | | 19% - 2.0/IN2 | | |
| CALCIUM ppm | 920 | RPM | 155 | 160 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | TR/10/90 | WOB | 8-10 | 14 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | 44 | 321 | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | 129 | 385 | |
| 5X12.25 | DP-HOLE | 6098 | .1215 | 133 | 359 | |
| 8X12.25 | DC-HOLE | 476 | .0836 | 193 | 416 | |

PIPE DATA

| DRILL STRING | | | | CASING: | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------|-------|-------|--------|
| DP | HWDP | DC | DEPTH | 171 | 301 | 1017 | 3978 |
| OD-inches | 5.0 | 5.0 | 8 | 21.0 | 30 | 20 | 13.375 |
| ID-inches | 4.276 | 3.0 | 2.875 | 20.0 | 28 | 18.75 | 12.415 |
| CAP-bbls/ft | .0178 | .0087 | .0076 | .3887 | .7616 | .3408 | .1498 |
| DISP-bbls/ft | .0075 | .0181 | .0545 | NA | .113 | .0479 | .024 |
| LENGTH-ft | 9347 | 728 | 476 | 170.5 | 95 | 811 | 3772 |
| WEIGHT-lbs/ft | 19.5 | 49 | 149 | | 310 | 133 | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.5 GPM 700 JETS TFA: .75 ft/mi = 15 sec/std

DRILL AHEAD WITH BIT NO. 6. MAX GAS FROM BOTTOM ON TRIP = 1543 UNITS. VERY GOOD PENETRATION RATES WITH NEW BIT.

RESISTIVITY DATA INDICATING INCREASING PORE PRESSURE GRADIENT CONTINUOUS TO ABOUT 10,000'. RAISED PORE PRESSURE ESTIMATE TO 9.9 PPG AT THIS DEPTH. TREND APPEARS TO STABILIZE BELOW 10,000'. DRILL TO 10551'. SHORT TRIP PAST 9,500' TO CONDITION THE HOLE.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES

A Baroid Company

DEPTH 11125
OPERATION S. TRIP
FOOTAGE 574

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 23
DATE Aug 20 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|--------------|-------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM NO. 2 | FIELD/BLOCK | OCS BLK 672 NR6-4 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Jul 28 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|-------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 4.03 Deg at 11125' |
| 40 | 130 | 10555 | LITHOLOGY | 40 % CLAY 60% SILTSTONE |
| CONNECTION | 10 | 10927 | SAMPLE DEPTH | 11125 |
| TRIP | 683 | 10551 | TRIP CHLORIDES | |
| FLOWLINE TEMP | | degrees F | LAG DOWN DP | |
| | | | LAG OFF BOTTOM | |
| | | | DRILL RATE ft/hr | 20 |
| | | | CORRECTED 'D' EXP. | |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 1800 psi | 8.7 ppg | 5432 psi | 9.9 ppg | | | | |
| FRACTURE PRESSURE | 3081 psi | 14.9 ppg | 9053 psi | 16.5 ppg | | | | |
| ECD | | | | | | | | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------|-----------------|-----------|--------|---------------------|-----------|-----------|
| TIME | 24:00 AUG 19 93 | BIT NO. | 6 | PUMPS | 1. ID1600 | 2. ID1600 |
| TYPE | GENERIC #2 | TYPE | DS-40H | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 10.7 | IADC CODE | PDC | CAPACITY gal/stk | 4.91 | 4.91 |
| FUNNEL VIS. | 58 | SIZE | 12.25 | PUMP RATE stks/min | | |
| PV/YP | 27/34 | JETS | 5-15 | FLOW RATE gal/min | | |
| GELS | 3/9 | DEPTH OUT | 11125 | PRESSURE psi | STATIC | |
| pH | 8.6 | ROT HRS. | 25.1 | PD SURF / DS psi | | |
| FILT/CAKE API | 3.1 - 1/32 | FOOTAGE | 1625 | ANN / BIT psi | | |
| HP-HT | 6.0 @ 150 | AVG ft/hr | 65 | JET VELOCITY ft/sec | | |
| Pm | .3 | GRADE | | JET IMPACT lbs | | |
| Pf/Mf | .2/1.5 | HOLE DEV. | 4.03 | BIT HP | | |
| CHLORIDES ppm | 17000 | COST/FT | 517 | HP RATIO / HP/IN2 | | |
| CALCIUM ppm | 960 | RPM | 152 | REDUCED 1 | | |
| OIL/WATER/SOLIDS | TR/11.5/88.5 | WOB | 11 | RATE 2 | | |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | | | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | | | |
| 5X12.25 | DP-HOLE | 6098 | .1215 | | | |
| 8X12.25 | DC-HOLE | 476 | .0836 | | | |

PIPE DATA

| | DRILL STRING | | | | CASING: | RISER | COND. | SURF. |
|---------------|--------------|-------|--|-------|---------|-------|-------|-------|
| | DP | HWDP | | DC | DEPTH | 171 | 301 | 1017 |
| OD-inches | 5.0 | 5.0 | | 8 | | 21.0 | 30 | 20 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 20.0 | 28 | 18.75 |
| CAP-bbbls/ft | .0178 | .0087 | | .0076 | | .3887 | .7616 | .3408 |
| DISP-bbbls/ft | .0075 | .0181 | | .0545 | | NA | .113 | .0479 |
| LENGTH-ft | 9919 | 728 | | 476 | | 170.5 | 95 | 811 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | | 310 | 133 |

REMARKS AND RECOMMENDATIONS

MW 10.5 GPM 700 JETS TFA: .75 ft/mi = 15 sec/std

RIH AFTER SHORT TRIP. SHORT TRIP GAS = 683. DRILL AHEAD WITH BIT NO 6 THRU SILTSTONE/CLAY TO 11125'. SHORT TRIP TO SHOE TO CONDITION HOLE TO RUN E LOGS. HOLE PULLED TIGHT AT 10261-10071' AND 9057-8767'.

ADT D. WALTERS

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 11125
OPERATION E LOG
FOOTAGE

No. 25
DATE Aug 22 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | | | | | | | | | |
|--|---|-----------------------------------|---------------------------------------|--|---------------------------|----------------------------------|-------------------------------|----------------------------------|------------------------------------|--------------------------------------|------------------------------|----------------------------|
| AVG GAS (units) <u>NA</u> | MAX GAS (units) <u> </u> | AT DEPTH (feet) <u> </u> | SURVEY DATA <u>4.03 Deg at 11125'</u> | LITHOLOGY <u>40 % CLAY 60% SILTSTONE</u> | SAMPLE DEPTH <u>11125</u> | TRIP CHLORIDES <u> </u> | LAG DOWN DP <u> </u> | LAG OFF BOTTOM <u> </u> | DRILL RATE ft/hr <u> </u> | CORRECTED 'D' EXP. <u> </u> | SHALE DENSITY g/cc <u>NA</u> | EWR Res. <u> </u> |
| BACKGROUND CONNECTION TRIP <u> </u> | FLOWLINE TEMP <u> </u> degrees F | | | | | | | | | | | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|--|
| PORE PRESSURE | <u>1800</u> psi | <u>8.7</u> ppG | <u>5727</u> psi | <u>9.9</u> ppG | <u> </u> psi | <u> </u> ppG | <u> </u> ft | |
| FRACTURE PRESSURE | <u>3081</u> psi | <u>14.9</u> ppG | <u>9545</u> psi | <u>16.5</u> ppG | <u> </u> psi | <u> </u> ppG | <u> </u> ft | |
| ECD | <u> </u> psi | <u> </u> ppG | <u> </u> psi | <u> </u> ppG | <u> </u> psi | <u> </u> ppG | <u> </u> ft | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | |
|-----------------------------------|------------------------|--|
| TIME <u>2100 21 AUG 93</u> | BIT NO. <u>6</u> | PUMPS 1. <u>ID1600</u> 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u>D8-40H</u> | SIZE inches <u>6.5X12</u> <u>6.5X12</u> |
| WEIGHT IN <u>10.9</u> | IADC CODE <u>PDC</u> | CAPACITY gal/stk <u>4.91</u> <u>4.91</u> |
| FUNNEL VIS. <u>68</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u> </u> |
| PV/YP <u>28/37</u> | JETS <u>5-15</u> | FLOW RATE gal/min <u> </u> |
| GELS <u>3/12</u> | DEPTH OUT <u>11125</u> | PRESSURE psi <u> </u> STATIC |
| pH <u>8.5</u> | ROT HRS. <u>25.1</u> | PD SURF / DS psi <u> </u> |
| FILT/CAKE API <u>2.6/1</u> | FOOTAGE <u>1625</u> | ANN / BIT psi <u> </u> |
| HP-HT <u>7.0 @ 150</u> | AVG ft/hr <u>85</u> | JET VELOCITY ft/sec <u> </u> |
| Pm <u>.3</u> | GRADE <u>4-4-X-1/8</u> | JET IMPACT lbs <u> </u> |
| PI/MI <u>.15/1.4</u> | HOLE DEV. <u>4.03</u> | BIT HP <u> </u> |
| CHLORIDES ppm <u>17000</u> | COST/FT <u>517</u> | HP RATIO / HP/IN2 <u> </u> |
| CALCIUM ppm <u>940</u> | RPM <u>152</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min |
| OIL/WATER/SOLIDS <u>TR/12/88</u> | WOB <u>11</u> | RATE 2 <u> </u> psi at <u> </u> stk/min |
| DAILY/CUM. COST <u> </u> | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|-----------------|-----------------|--------------|-----------------|-------------------|-------------------|-------------------|
| <u>5X20</u> | <u>DP-RISER</u> | <u>171</u> | <u>.3644</u> | <u> </u> | <u> </u> | <u> </u> |
| <u>5X13 3/8</u> | <u>DP-CSG</u> | <u>3906</u> | <u>.1255</u> | <u> </u> | <u> </u> | <u> </u> |
| <u>5X12.25</u> | <u>DP-HOLE</u> | <u>6098</u> | <u>.1215</u> | <u> </u> | <u> </u> | <u> </u> |
| <u>8X12.25</u> | <u>DC-HOLE</u> | <u>476</u> | <u>.0836</u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. | INT. |
|----------------------------|--------------|--------------|--|---------------|--------------|--------------|---------------|------|
| DP | HWDP | DC | | | | | | |
| OD-inches <u>5.0</u> | <u>5.0</u> | <u>8</u> | | <u>171</u> | <u>301</u> | <u>1017</u> | <u>3978</u> | |
| ID-inches <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | | <u>21.0</u> | <u>30</u> | <u>20</u> | <u>13.375</u> | |
| CAP-bbbls/ft <u>.0178</u> | <u>.0087</u> | <u>.0076</u> | | <u>20.0</u> | <u>28</u> | <u>18.75</u> | <u>12.415</u> | |
| DISP-bbbls/ft <u>.0075</u> | <u>.0181</u> | <u>.0545</u> | | <u>.3887</u> | <u>.7616</u> | <u>.3408</u> | <u>.1498</u> | |
| LENGTH-ft <u>9921</u> | <u>728</u> | <u>476</u> | | <u>NA</u> | <u>.113</u> | <u>.0479</u> | <u>.024</u> | |
| WEIGHT-lbs/ft <u>19.5</u> | <u>49</u> | <u>149</u> | | <u>170.5</u> | <u>95</u> | <u>811</u> | <u>3772</u> | |
| | | | | | <u>310</u> | <u>133</u> | <u>68</u> | |

REMARKS AND RECOMMENDATIONS

MW 10.5 GPM 700 JETS TFA: .75 ft/mi = 15 sec/std

E LOG. HOLE TAKING .5 BBLS/HR

ADT D. WALTERS

LOGGING SYSTEMS

DEPTH 11125
OPERATION E LOG
FOOTAGE

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

NO. 27
DATE Aug 24 93
TIME 04 00

| | |
|------------|-------------------|
| OPERATOR | ARCO ALASKA, INC. |
| CONTRACTOR | CANMAR |
| START DATE | Jul 28 93 |

| | |
|-----------|--------------|
| WELL NAME | KUVLUM NO. 2 |
| RIG NAME | KULLUK |
| LOC. | OFFSHORE |

| | |
|-------------|-------------------|
| FIELD/BLOCK | OCS BLK 672 NR6-4 |
| AREA | BEAUFORT SEA |
| STATE | ALASKA |

LOGGING DATA

| | | | | | |
|---------------|---------|---------|-----------|----------------|-------------------------|
| | AVG | MAX | AT | SURVEY DATA | 4.03 Deg at 11125' |
| | GAS | GAS | DEPTH | LITHOLOGY | 40 % CLAY 60% SILTSTONE |
| | (units) | (units) | (feet) | SAMPLE DEPTH | 11125 |
| BACKGROUND | NA | | | TRIP CHLORIDES | |
| CONNECTION | | | | LAG DOWN DP | |
| TRIP | | | | LAG OFF BOTTOM | |
| FLOWLINE TEMP | | | degrees F | | |
| | | | | | DRILL RATE ft/hr |
| | | | | | CORRECTED 'D' EXP. |
| | | | | | SHALE DENSITY g/cc |
| | | | | | NA |
| | | | | | EWR Res. |

FORMATION PRESSURE DATA

| | CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | |
|-------------------|--------|-----|------|-----|-------------|-----|------|-----|-----------|-----|--|-----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 5727 | psi | 9.9 | ppg | | psi | | ppg |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 9545 | psi | 16.5 | ppg | | psi | | ppg |
| ECD | | psi | | ppg | | psi | | ppg | | psi | | ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | |
|------------------|----------------|-----------|-----------|---------------------|----|--------|----|---------|
| TIME | 1900 22 AUG 93 | BIT NO. | 6 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| TYPE | GENERIC #2 | TYPE | D8-40H | SIZE inches | | 6.5X12 | | 6.5X12 |
| WEIGHT IN | 10.9 | IADC CODE | PDC | CAPACITY gal/stk | | 4.91 | | 4.91 |
| FUNNEL VIS. | 68 | SIZE | 12.25 | PUMP RATE stks/min | | | | |
| PV/YP | 28/33 | JETS | 5-15 | FLOW RATE gal/min | | | | |
| GELS | 3/14 | DEPTH OUT | 11125 | PRESSURE psi | | STATIC | | |
| pH | 8.5 | ROT HRS. | 25.1 | PD SURF / DS psi | | | | |
| FILT/CAKE API | 2.8/1 | FOOTAGE | 1625 | ANN / BIT psi | | | | |
| HP-HT | 8.6 @ 150 | AVG ft/hr | 85 | JET VELOCITY ft/sec | | | | |
| Pm | .3 | GRADE | 4-4-X-1/8 | JET IMPACT lbs | | | | |
| Pf/Mf | .15/1.4 | HOLE DEV. | 4.03 | BIT HP | | | | |
| CHLORIDES ppm | 17000 | COST/FT | 517 | HP RATIO / HP/IN2 | | | | |
| CALCIUM ppm | 960 | RPM | 152 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | TR/12/88 | WOB | 11 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | | | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | | | |
| 5X12.25 | DP-HOLE | 6098 | .1215 | | | |
| 8X12.25 | DC-HOLE | 476 | .0836 | | | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. | INT. |
|---------------|-------|-------|--------------|-------|------------------|-------|-------|-------|--------|
| | | | | | | 171 | 301 | 1017 | 3978 |
| OD-inches | 5.0 | 5.0 | | 8 | | 21.0 | 30 | 20 | 13.375 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 20.0 | 28 | 18.75 | 12.415 |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | .3887 | .7616 | .3408 | .1498 |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | NA | .113 | .0479 | .024 |
| LENGTH-ft | 9921 | 728 | | 476 | | 170.5 | 95 | 811 | 3772 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | | 310 | 133 | 68 |

REMARKS AND RECOMMENDATIONS

| | | | | | |
|--|-----|------|-------|---|---------|
| MW | GPM | JETS | ft/mi | = | sec/std |
| E LOG. LOST 70 BBLs MUD TO HOLE IN 56 HRS. RIH FOR CLEANOUT RUN. HOLE TIGHT AT 10837'. WASH TO BOTTOM. CBU. TRIP GAS=1469. | | | | | |
| POOH FOR MORE E LOGS. | | | | | |

ADT D. WALTERS

LOGGING SYSTEMS

FOOTAGE

A Baroid Company

MORNING REPORT

TIME 04 00

| | |
|------------|------------------|
| START DATE | <u>Jul 28 93</u> |
|------------|------------------|

LOC. OFFSHORE

STATE ALASKA

LOGGING DATA

| | | | | | |
|---------------|---------|---------|-----------|----------------|-------------------------|
| | AVG | MAX | AT | SURVEY DATA | 4.03 Deg at 11125' |
| | GAS | GAS | DEPTH | LITHOLOGY | 40 % CLAY 60% SILTSTONE |
| | (units) | (units) | (feet) | SAMPLE DEPTH | 11125 |
| BACKGROUND | NA | | | TRIP CHLORIDES | |
| CONNECTION | | | | LAG DOWN DP | |
| TRIP | | | | LAG OFF BOTTOM | |
| FLOWLINE TEMP | | | degrees F | | |
| | | | | | DRILL RATE ft/hr |
| | | | | | CORRECTED 'D' EXP. |
| | | | | | SHALE DENSITY g/cc |
| | | | | | NA |
| | | | | | EWR Res. |
| | | | | | |

FORMATION PRESSURE DATA

| | CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | |
|-------------------|--------|-----|------|-----|-------------|-----|------|-----|-----------|-----|--|-----|----|
| PORE PRESSURE | 1800 | psi | 8.7 | ppg | 5727 | psi | 9.9 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 3081 | psi | 14.9 | ppg | 9545 | psi | 16.5 | ppg | | psi | | ppg | ft |
| ECD | | psi | | ppg | | psi | | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | |
|------------------|----------------|-----------|-----------|---------------------|----|--------|----|---------|
| TIME | 1900 24 AUG 93 | BIT NO. | 6 | PUMPS | 1. | ID1600 | 2. | ID1600 |
| TYPE | GENERIC #2 | TYPE | D8-40H | SIZE inches | | 6.5X12 | | 6.5X12 |
| WEIGHT IN | 10.9 | IADC CODE | PDC | CAPACITY gal/stk | | 4.91 | | 4.91 |
| FUNNEL VIS. | 68 | SIZE | 12.25 | PUMP RATE stks/min | | | | |
| PV/YP | 28/32 | JETS | 5-15 | FLOW RATE gal/min | | | | |
| GELS | 3/14 | DEPTH OUT | 11125 | PRESSURE psi | | STATIC | | |
| pH | 8.5 | ROT HRS. | 25.1 | PD SURF / DS psi | | | | |
| FILT/CAKE API | 2.8/1 | FOOTAGE | 1625 | ANN / BIT psi | | | | |
| HP-HT | 8.8 @ 150 | AVG ft/hr | 85 | JET VELOCITY ft/sec | | | | |
| Pm | .3 | GRADE | 4-4-X-1/8 | JET IMPACT lbs | | | | |
| Pf/Mf | .15/1.4 | HOLE DEV. | 4.03 | BIT HP | | | | |
| CHLORIDES ppm | 17000 | COST/FT | 517 | HP RATIO / HP/IN2 | | | | |
| CALCIUM ppm | 960 | RPM | 152 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | TR/12/88 | WOB | 11 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5X20 | DP-RISER | 171 | .3644 | | | |
| | | | | | | |
| 5X13 3/8 | DP-CSG | 3906 | .1255 | | | |
| | | | | | | |
| 5X12.25 | DP-HOLE | 6098 | .1215 | | | |
| 8X12.25 | DC-HOLE | 476 | .0836 | | | |
| | | | | | | |

PIPE DATA

| | DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. | INT. |
|---------------|--------------|-------|--|-------|------------------|-------|-------|-------|--------|
| | DP | HWDP | | DC | | 171 | 301 | 1017 | 3978 |
| OD-inches | 5.0 | 5.0 | | 8 | | 21.0 | 30 | 20 | 13.375 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 20.0 | 28 | 18.75 | 12.415 |
| CAP-bbls/ft | .0178 | .0087 | | .0076 | | .3887 | .7616 | .3408 | .1498 |
| DISP-bbls/ft | .0075 | .0181 | | .0545 | | NA | .113 | .0479 | .024 |
| LENGTH-ft | 9921 | 728 | | 476 | | 170.5 | 95 | 811 | 3772 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 149 | | | 310 | 133 | 68 |

REMARKS AND RECOMMENDATIONS

| | | | | | | | | | | | | | | | | |
|--|------------|-----|--|------|--|--|--|--|--|--|--|-------|---|--|---------|--|
| MW | | GPM | | JETS | | | | | | | | ft/mi | = | | sec/std | |
| E LOG. LOST 15 BBLs MUD TO HOLE IN 20 HRS. | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | |
| ADT | D. WALTERS | | | | | | | | | | | | | | | |

sperry-sun
DRILLING SERVICES *LOGGING SYSTEMS*
A Baroid Company

DEPTH 11125
OPERATION CIRC
FOOTAGE

NO. 29
DATE Aug 26 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|--|------------------------------------|--------------------------------------|--|
| AVG GAS (units) <u>NA</u> | MAX GAS (units) <u> </u> | AT DEPTH (feet) <u> </u> | SURVEY DATA <u>4.03 Deg at 11125'</u> |
| BACKGROUND CONNECTION TRIP <u> </u> | LAG DOWN DP <u> </u> | LAG OFF BOTTOM <u> </u> | LITHOLOGY <u>40 % CLAY 60% SILTSTONE</u> |
| FLOWLINE TEMP <u> </u> degrees F | DRILL RATE ft/hr <u> </u> | CORRECTED 'D' EXP. <u> </u> | SAMPLE DEPTH <u>11125</u> |
| | SHALE DENSITY g/cc <u>NA</u> | EWR Res. <u> </u> | TRIP CHLORIDES <u> </u> |

FORMATION PRESSURE DATA

| CASING | BOTTOM HOLE | OPEN HOLE |
|---|---|---|
| PORE PRESSURE <u>1800</u> psi <u>8.7</u> ppg | <u>5727</u> psi <u>9.9</u> ppg | <u> </u> psi <u> </u> ppg |
| FRACTURE PRESSURE <u>3081</u> psi <u>14.9</u> ppg | <u>9545</u> psi <u>16.5</u> ppg | <u> </u> psi <u> </u> ppg |
| ECD <u> </u> psi <u> </u> ppg | <u> </u> psi <u> </u> ppg | <u> </u> psi <u> </u> ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | |
|-----------------------------------|------------------------|--|
| TIME <u>1900 24 AUG 93</u> | BIT NO. <u>6</u> | PUMPS 1. <u>ID1600</u> 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u>D8-40H</u> | SIZE inches <u>6.5X12</u> <u>6.5X12</u> |
| WEIGHT IN <u>10.9</u> | IADC CODE <u>PDC</u> | CAPACITY gal/stk <u>4.91</u> <u>4.91</u> |
| FUNNEL VIS. <u>68</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u> </u> |
| PV/YP <u>28/32</u> | JETS <u>5-15</u> | FLOW RATE gal/min <u> </u> |
| GELS <u>3/14</u> | DEPTH OUT <u>11125</u> | PRESSURE psi <u>STATIC</u> |
| pH <u>8.5</u> | ROT HRS. <u>25.1</u> | PD SURF / DS psi <u> </u> |
| FILT/CAKE API <u>2.8/1</u> | FOOTAGE <u>1625</u> | ANN / BIT psi <u> </u> |
| HP-HT <u>8.8 @ 150</u> | AVG ft/hr <u>85</u> | JET VELOCITY ft/sec <u> </u> |
| Pm <u>.3</u> | GRADE <u>4-4-X-1/8</u> | JET IMPACT lbs <u> </u> |
| Pf/Mf <u>.15/1.4</u> | HOLE DEV. <u>4.03</u> | BIT HP <u> </u> |
| CHLORIDES ppm <u>17000</u> | COST/FT <u>517</u> | HP RATIO / HP/IN2 <u> </u> |
| CALCIUM ppm <u>960</u> | RPM <u>152</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min |
| OIL/WATER/SOLIDS <u>TR/12/88</u> | WOB <u>11</u> | RATE 2 <u> </u> psi at <u> </u> stk/min |
| DAILY/CUM. COST <u> </u> | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-----------------|--------------|-----------------|-------------------|-------------------|-------------------|
| 5X20 DP-RISER | <u>171</u> | <u>.3644</u> | <u> </u> | <u> </u> | <u> </u> |
| 5X13 3/8 DP-CSG | <u>3906</u> | <u>.1255</u> | <u> </u> | <u> </u> | <u> </u> |
| 5X12.25 DP-HOLE | <u>6098</u> | <u>.1215</u> | <u> </u> | <u> </u> | <u> </u> |
| 8X12.25 DC-HOLE | <u>476</u> | <u>.0836</u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. | INT. |
|---------------|--------------|--------------|--------------|-------------------|--------------|--------------|---------------|---------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8</u> | <u>171</u> | <u>21.0</u> | <u>301</u> | <u>1017</u> | <u>3978</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | <u>20.0</u> | <u>28</u> | <u>18.75</u> | <u>12.415</u> | <u>12.415</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0076</u> | <u>.3887</u> | <u>.7616</u> | <u>.3408</u> | <u>.1498</u> | <u>.1498</u> |
| DISP-bbls/ft | <u>.0075</u> | <u>.0181</u> | <u>.0545</u> | <u>NA</u> | <u>.113</u> | <u>.0479</u> | <u>.024</u> | <u>.024</u> |
| LENGTH-ft | <u>9921</u> | <u>728</u> | <u>476</u> | <u>170.5</u> | <u>95</u> | <u>811</u> | <u>3772</u> | <u>3772</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>149</u> | <u> </u> | <u>310</u> | <u>133</u> | <u>68</u> | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW GPM JETS ft/mi = sec/std

E LOG. LOGGING TOOL STUCK AT 6200'. TRIP IN HOLE STRIPPING OVER WIRELINE TO RECOVER FISH. RECOVER FISH. POOH. RIH FOR CLEANOUT RUN. CIRCULATE AND CONDITION HOLE.

ADT D. WALTERS

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 11125
OPERATION CIRC
FOOTAGE

NO. 30
DATE Aug 27 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUULUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|---|-----------------------------------|-----------------------------------|--|
| AVG GAS (units) <u>NA</u> | MAX GAS (units) <u> </u> | AT DEPTH (feet) <u> </u> | SURVEY DATA <u>4.03 Deg at 11125'</u> |
| BACKGROUND CONNECTION <u>NA</u> | TRIP <u>1231</u> | TRIP CHLORIDES <u>8/26/93</u> | LITHOLOGY <u>40 % CLAY 60% SILTSTONE</u> |
| FLOWLINE TEMP <u> </u> degrees F | LAG DOWN DP <u> </u> | LAG OFF BOTTOM <u> </u> | SAMPLE DEPTH <u>11125</u> |
| | | | DRILL RATE ft/hr <u> </u> |
| | | | CORRECTED 'D' EXP. <u> </u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u> </u> |

FORMATION PRESSURE DATA

| CASING | BOTTOM HOLE | OPEN HOLE |
|---|---|--|
| PORE PRESSURE <u>1800</u> psi <u>8.7</u> ppg | <u>5727</u> psi <u>9.9</u> ppg | <u> </u> psi <u> </u> ppg <u> </u> ft |
| FRACTURE PRESSURE <u>3081</u> psi <u>14.9</u> ppg | <u>9545</u> psi <u>16.5</u> ppg | <u> </u> psi <u> </u> ppg <u> </u> ft |
| ECD <u> </u> psi <u> </u> ppg | <u> </u> psi <u> </u> ppg | <u> </u> psi <u> </u> ppg <u> </u> ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | |
|-----------------------------------|------------------------|--|
| TIME <u>1900 24 AUG 93</u> | BIT NO. <u>6</u> | PUMPS 1. <u>ID1600</u> 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u>D8-40H</u> | SIZE inches <u>6.5X12</u> <u>6.5X12</u> |
| WEIGHT IN <u>10.6</u> | IADC CODE <u>PDC</u> | CAPACITY gal/stk <u>4.91</u> <u>4.91</u> |
| FUNNEL VIS. <u>56</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u> </u> |
| PV/YP <u>22/26</u> | JETS <u>5-15</u> | FLOW RATE gal/min <u> </u> |
| GELS <u>3/12</u> | DEPTH OUT <u>11125</u> | PRESSURE psi <u> </u> <u>STATIC</u> |
| pH <u>9.8</u> | ROT HRS. <u>25.1</u> | PD SURF / DS psi <u> </u> |
| FILT/CAKE API <u>4.0/1</u> | FOOTAGE <u>1625</u> | ANN / BIT psi <u> </u> |
| HP-HT <u>9.5 @ 150</u> | AVG ft/hr <u>85</u> | JET VELOCITY ft/sec <u> </u> |
| Pm <u>2.0</u> | GRADE <u>4-4-X-1/8</u> | JET IMPACT lbs <u> </u> |
| Pt/Mf <u>1.7/5.4</u> | HOLE DEV. <u>4.03</u> | BIT HP <u> </u> |
| CHLORIDES ppm <u>17000</u> | COST/FT <u>517</u> | HP RATIO / HP/IN2 <u> </u> |
| CALCIUM ppm <u>240</u> | RPM <u>152</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min |
| OIL/WATER/SOLIDS <u>TR/11/89</u> | WOB <u>11</u> | RATE 2 <u> </u> psi at <u> </u> stk/min |
| DAILY/CUM. COST <u> </u> | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-----------------|--------------|-----------------|-------------------|-------------------|-------------------|
| 5X20 DP-RISER | <u>171</u> | <u>.3644</u> | <u> </u> | <u> </u> | <u> </u> |
| 5X13 3/8 DP-CSG | <u>3906</u> | <u>.1255</u> | <u> </u> | <u> </u> | <u> </u> |
| 5X12.25 DP-HOLE | <u>6098</u> | <u>.1215</u> | <u> </u> | <u> </u> | <u> </u> |
| 8X12.25 DC-HOLE | <u>476</u> | <u>.0836</u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. | INT. |
|---------------|--------------|--------------|-------------------|--------------|---------------|--------------|--------------|---------------|-------------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u> </u> | <u>8</u> | <u>171</u> | <u>301</u> | <u>1017</u> | <u>3978</u> | <u> </u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u> </u> | <u>2.875</u> | <u>21.0</u> | <u>30</u> | <u>20</u> | <u>13.375</u> | <u> </u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u> </u> | <u>.0076</u> | <u>20.0</u> | <u>28</u> | <u>18.75</u> | <u>12.415</u> | <u> </u> |
| DISP-bbls/ft | <u>.0075</u> | <u>.0181</u> | <u> </u> | <u>.0545</u> | <u>.3887</u> | <u>.7616</u> | <u>.3408</u> | <u>.1498</u> | <u> </u> |
| LENGTH-ft | <u>9921</u> | <u>728</u> | <u> </u> | <u>476</u> | <u>NA</u> | <u>.113</u> | <u>.0479</u> | <u>.024</u> | <u> </u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u> </u> | <u>149</u> | <u>170.5</u> | <u>95</u> | <u>811</u> | <u>3772</u> | <u> </u> |
| | | | | | | <u>310</u> | <u>133</u> | <u>68</u> | |

REMARKS AND RECOMMENDATIONS

MW GPM JETS ft/mi = sec/std

CIRCULATE HOLE. TRIP GAS-1231u. POOH. PULLED TIGHT AT 10900 AND 10500. E LOG.

ADT D. WALTERS

sperry-sun
DRILLING SERVICES *LOGGING SYSTEMS*
A Baroid Company

DEPTH 11125
OPERATION PLUG
FOOTAGE

NO. 31
DATE Aug 28 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|-------------------------------|--------------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM NO. 2</u> | FIELD/BLOCK <u>OCS BLK 672 NR6-4</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Jul 28 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | |
|---|-----------------------------------|-----------------------------------|---------------------------------------|--|
| AVG GAS (units) <u>NA</u> | MAX GAS (units) <u> </u> | AT DEPTH (feet) <u> </u> | SURVEY DATA <u>4.03 Deg at 11125'</u> | LITHOLOGY <u>40 % CLAY 60% SILTSTONE</u> |
| BACKGROUND CONNECTION TRIP <u>1231</u> | <u>8/26/93</u> | <u> </u> | SAMPLE DEPTH <u>11125</u> | TRIP CHLORIDES <u> </u> |
| FLOWLINE TEMP <u> </u> degrees F | | | LAG DOWN DP <u> </u> | LAG OFF BOTTOM <u> </u> |
| | | | DRILL RATE ft/hr <u> </u> | CORRECTED 'D' EXP. <u> </u> |
| | | | SHALE DENSITY g/cc <u>NA</u> | EWR Res. <u> </u> |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|--|
| PORE PRESSURE | <u>1800</u> psi | <u>8.7</u> ppg | <u>5727</u> psi | <u>9.9</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | |
| FRACTURE PRESSURE | <u>3081</u> psi | <u>14.9</u> ppg | <u>9545</u> psi | <u>16.5</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | |
| ECD | <u> </u> psi | <u> </u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|-----------------------------------|-----------------------------|------------------|--|-------------------|
| TIME <u>1800 24 AUG 93</u> | BIT NO. <u> </u> | <u>6</u> | PUMPS 1. <u>ID1600</u> | 2. <u>ID1600</u> |
| TYPE <u>GENERIC #2</u> | TYPE <u> </u> | <u>D8-40H</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>10.9</u> | IADC CODE <u> </u> | <u>PDC</u> | CAPACITY gal/stk <u>4.91</u> | <u>4.91</u> |
| FUNNEL VIS. <u>5665</u> | SIZE <u> </u> | <u>12.25</u> | PUMP RATE stks/min <u> </u> | <u> </u> |
| PV/YP <u>28/35</u> | JETS <u> </u> | <u>5-15</u> | FLOW RATE gal/min <u> </u> | <u> </u> |
| GELS <u>4/16</u> | DEPTH OUT <u> </u> | <u>11125</u> | PRESSURE psi <u> </u> | <u>STATIC</u> |
| pH <u>9.5</u> | ROT HRS. <u> </u> | <u>25.1</u> | PD SURF / DS psi <u> </u> | <u> </u> |
| FILT/CAKE API <u>3.4/2</u> | FOOTAGE <u> </u> | <u>1625</u> | ANN / BIT psi <u> </u> | <u> </u> |
| HP-HT <u>8.9 @ 150</u> | AVG ft/hr <u> </u> | <u>85</u> | JET VELOCITY ft/sec <u> </u> | <u> </u> |
| Pm <u>1.7</u> | GRADE <u> </u> | <u>4-4-X-1/8</u> | JET IMPACT lbs <u> </u> | <u> </u> |
| PI/Mf <u>1.3/3.7</u> | HOLE DEV. <u> </u> | <u>4.03</u> | BIT HP <u> </u> | <u> </u> |
| CHLORIDES ppm <u>17000</u> | COST/FT <u> </u> | <u>517</u> | HP RATIO / HP/IN2 <u> </u> | <u> </u> |
| CALCIUM ppm <u>260</u> | RPM <u> </u> | <u>152</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min | <u> </u> |
| OIL/WATER/SOLIDS <u>TR/12/88</u> | WOB <u> </u> | <u>11</u> | RATE 2 <u> </u> psi at <u> </u> stk/min | <u> </u> |
| DAILY/CUM. COST <u> </u> | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-----------------|-----------------|--------------|-----------------|-------------------|-------------------|-------------------|
| <u>5X20</u> | <u>DP-RISER</u> | <u>171</u> | <u>.3644</u> | <u> </u> | <u> </u> | <u> </u> |
| <u>5X13 3/8</u> | <u>DP-CSG</u> | <u>3906</u> | <u>.1255</u> | <u> </u> | <u> </u> | <u> </u> |
| <u>5X12.25</u> | <u>DP-HOLE</u> | <u>6098</u> | <u>.1215</u> | <u> </u> | <u> </u> | <u> </u> |
| <u>8X12.25</u> | <u>DC-HOLE</u> | <u>476</u> | <u>.0836</u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. | INT. |
|---------------|--------------|--------------|--------------|-------------------|---------------|--------------|--------------|---------------|------|
| | DP | HWDP | DC | | | | | | |
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8</u> | <u> </u> | <u>171</u> | <u>301</u> | <u>1017</u> | <u>3978</u> | |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | <u> </u> | <u>21.0</u> | <u>30</u> | <u>20</u> | <u>13.375</u> | |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0076</u> | <u> </u> | <u>20.0</u> | <u>28</u> | <u>18.75</u> | <u>12.415</u> | |
| DISP-bbls/ft | <u>.0075</u> | <u>.0181</u> | <u>.0545</u> | <u> </u> | <u>.3887</u> | <u>.7616</u> | <u>.3408</u> | <u>.1498</u> | |
| LENGTH-ft | <u>9921</u> | <u>728</u> | <u>476</u> | <u> </u> | <u>NA</u> | <u>.113</u> | <u>.0479</u> | <u>.024</u> | |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>149</u> | <u> </u> | <u>170.5</u> | <u>95</u> | <u>811</u> | <u>3772</u> | |
| | | | | | | <u>310</u> | <u>133</u> | <u>68</u> | |

REMARKS AND RECOMMENDATIONS

MW GPM JETS ft/mi = sec/std

E LOG. RIH TO 7630'. CIRC 15 MIN. PUMP SLUG. PULL 4 STANDS. CEMENT AND PLUG HOLE.

ADT D. WALTERS

sperry-sun
DRILLING SERVICES *LOGGING SYSTEMS*
A Baroid Company

DEPTH 405
OPERATION DRILLING
FOOTAGE 189

NO. 1
DATE Sep 10 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | | | | | | | | | |
|--|--------------------------|--------------------------|-----------------------|---------------------|-----------------------|-------------------------|-----------------------|--------------------------|----------------------------|-------------------------------|-----------------------------|-------------------|
| AVG GAS (units) <u>0</u> | MAX GAS (units) <u>2</u> | AT DEPTH (feet) <u>0</u> | SURVEY DATA <u>NA</u> | LITHOLOGY <u>NA</u> | SAMPLE DEPTH <u>0</u> | TRIP CHLORIDES <u>0</u> | LAG DOWN DP <u>25</u> | LAG OFF BOTTOM <u>NA</u> | DRILL RATE ft/hr <u>45</u> | CORRECTED "D" EXP. <u>.91</u> | SHALE DENSITY g/cc <u>0</u> | EWR Res. <u>0</u> |
| BACKGROUND CONNECTION TRIP FLOWLINE TEMP <u>33</u> degrees F | | | | | | | | | | | | |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|------------|-----|------------|-------------|------------|-----|------------|-----------|----------|-----|----------|-----|----|
| PORE PRESSURE | <u>137</u> | psi | <u>8.5</u> | ppg | <u>179</u> | psi | <u>8.5</u> | ppg | <u>0</u> | psi | <u>0</u> | ppg | ft |
| FRACTURE PRESSURE | <u>NA</u> | psi | <u>NA</u> | ppg | <u>200</u> | psi | <u>9.5</u> | ppg | <u>0</u> | psi | <u>0</u> | ppg | ft |
| ECD | <u>137</u> | psi | <u>8.5</u> | ppg | <u>179</u> | psi | <u>8.5</u> | ppg | <u>0</u> | psi | <u>0</u> | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|---------------------------|-----------------------|--|-----------------------|-----------------------|
| TIME <u>00:00 9/9/93</u> | BIT NO. <u>1</u> | PUMPS <u>1</u> | ID-1600 <u>0</u> | ID-1600 <u>0</u> |
| TYPE <u>SWEEP STORAGE</u> | TYPE <u>ATXG1</u> | SIZE inches <u>7.5X12</u> | 7.5X12 <u>0</u> | 7.5X12 <u>0</u> |
| WEIGHT IN <u>8.8</u> | IADC CODE <u>0</u> | CAPACITY gal/stk <u>6.54</u> | 6.54 <u>0</u> | 6.54 <u>0</u> |
| FUNNEL VIS. <u>70</u> | SIZE <u>26"</u> | PUMP RATE stks/min <u>77</u> | 77 <u>0</u> | 77 <u>0</u> |
| PV/YP <u>16/16</u> | JETS <u>3-21,1-22</u> | FLOW RATE gal/min <u>1007</u> | 1007 <u>0</u> | 1007 <u>0</u> |
| GELS <u>12/28</u> | DEPTH OUT <u>0</u> | PRESSURE psi <u>1300</u> | 1300 <u>0</u> | 1300 <u>0</u> |
| pH <u>9.0</u> | ROT HRS. <u>14.6</u> | PD SURF / DS psi <u>100/790</u> | 100/790 <u>0</u> | 100/790 <u>0</u> |
| FILT/CAKE API <u>0</u> | FOOTAGE <u>189</u> | ANN / BIT psi <u>0/410</u> | 0/410 <u>0</u> | 0/410 <u>0</u> |
| HP-HT <u>0</u> | AVG ft/hr <u>12.9</u> | JET VELOCITY ft/sec <u>232</u> | 232 <u>0</u> | 232 <u>0</u> |
| P _m <u>0</u> | GRADE <u>INC</u> | JET IMPACT lbs <u>1024</u> | 1024 <u>0</u> | 1024 <u>0</u> |
| Pf/Mf <u>.15/.3</u> | HOLE DEV. <u>0</u> | BIT HP <u>240</u> | 240 <u>0</u> | 240 <u>0</u> |
| CHLORIDES ppm <u>650</u> | COST/FT <u>226</u> | HP RATIO / HP/IN2 <u>30% - .5/IN2</u> | 30% - .5/IN2 <u>0</u> | 30% - .5/IN2 <u>0</u> |
| CALCIUM ppm <u>400</u> | RPM <u>160 (CALC)</u> | REDUCED 1 <u>0</u> psi at <u>0</u> stk/min | 0 <u>0</u> | 0 <u>0</u> |
| OIL/WATER/SOLIDS <u>0</u> | WOB <u>2/10</u> | RATE 2 <u>0</u> psi at <u>0</u> stk/min | 0 <u>0</u> | 0 <u>0</u> |
| DAILY/CUM. COST <u>0</u> | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|----------|---------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 27 | DP-CSG | <u>93</u> | <u>.6842</u> | <u>34</u> | <u>NA</u> | <u>0</u> |
| 5 X 26 | DP-HOLE | <u>0</u> | <u>.6326</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| 9.0 x 27 | | <u>6</u> | <u>.5905</u> | <u>36</u> | <u>0</u> | <u>0</u> |
| 9.0 X 26 | DC-HOLE | <u>96</u> | <u>.5692</u> | <u>41</u> | <u>0</u> | <u>0</u> |
| | | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| | | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. |
|---------------|--------------|--------------|--------------|---------------|--------------|----------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>9.5</u> | <u>21</u> | <u>30</u> | <u>0</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | <u>20</u> | <u>27</u> | <u>0</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0080</u> | <u>.3887</u> | <u>.7085</u> | <u>0</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | <u>.0707</u> | <u>0</u> | <u>.113</u> | <u>0</u> |
| LENGTH-ft | <u>0</u> | <u>303</u> | <u>102</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>195</u> | <u>0</u> | <u>450</u> | <u>0</u> |

REMARKS AND RECOMMENDATIONS

MW 8.5 GPM 0 JETS 0 ft/mi = 0 sec/std

ON LOCATION 8-30-93. DRILL PILOT HOLE WITH 26" PILOT BIT TO 230'. DRILL 24' GLORY HOLE FROM THE MUD LINE AT 172' TO 211'. LAND 24' PROTECTIVE CAISSON INSIDE OF GLORY HOLE. CONTINUE DRILLING WITH GLORY HOLE BIT WHILE WASHING DOWN CAISSON TO 216'. LAND GUIDE BASE. RIH WITH 30" CONDUCTOR CSG IN CONJUNCTION WITH BIT NO. 1 AND MUD MOTOR. JET DRILL CASING. LAND 30" CASING AT 309'. DRILL AHEAD WITH BIT NO. 1.

ADT J. PATTON

sperry-sun **LOGGING SYSTEMS**

DRILLING SERVICES

A Baroid Company

DEPTH 1040
OPERATION R/U F/20'
FOOTAGE 635

APPLIED DRILLING TECHNOLOGY MORNING REPORT

No. 2
DATE Sep 11 93
TIME 04 00

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | | | | | | | | | |
|--------------------------------|--------------------------|-----------------------------------|-----------------------|---------------------|----------------------------|------------------------------|-----------------------|--------------------------|----------------------------|-------------------------------|------------------------------|------------------------|
| AVG GAS (units) <u>0</u> | MAX GAS (units) <u>3</u> | AT DEPTH (feet) <u>510</u> | SURVEY DATA <u>NA</u> | LITHOLOGY <u>NA</u> | SAMPLE DEPTH <u> </u> | TRIP CHLORIDES <u> </u> | LAG DOWN DP <u>70</u> | LAG OFF BOTTOM <u>NA</u> | DRILL RATE ft/hr <u>50</u> | CORRECTED 'D' EXP. <u>.74</u> | SHALE DENSITY g/cc <u>NA</u> | EWR Res. <u> </u> |
| BACKGROUND CONNECTION <u>0</u> | TRIP <u>0</u> | FLOWLINE TEMP <u>33</u> degrees F | | | | | | | | | | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------------|----------------|----------------|-----------------|-------------------|-------------------|------------------|------------------|
| PORE PRESSURE | <u>137</u> psi | <u>8.5</u> ppg | <u>460</u> psi | <u>8.5</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | <u> </u> ft |
| FRACTURE PRESSURE | <u>NA</u> psi | <u>NA</u> ppg | <u>660</u> psi | <u>12.2</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | <u> </u> ft |
| ECD | <u>137</u> psi | <u>8.5</u> ppg | <u>460</u> psi | <u>8.5</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | <u> </u> ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | |
|--|-------------------------|--|---------------|
| TIME <u>00:00 9/10/93</u> | BIT NO. <u>1</u> | PUMPS <u>1.</u> ID-1600 | 2. ID-1600 |
| TYPE <u>DISPLACED MUD</u> | TYPE <u>ATXG1</u> | SIZE inches <u>7.5X12</u> | <u>7.5X12</u> |
| WEIGHT IN <u>9.6</u> | IADC CODE <u> </u> | CAPACITY gal/stk <u>6.54</u> | <u>6.54</u> |
| FUNNEL VIS. <u>58</u> | SIZE <u>26"</u> | PUMP RATE stks/min <u>71</u> | <u>71</u> |
| PV/YP <u>16/18</u> | JETS <u>3-21,1-22</u> | FLOW RATE gal/min <u>927</u> | <u> </u> |
| GELS <u>6/14</u> | DEPTH OUT <u>1040</u> | PRESSURE psi <u>1450</u> | <u> </u> |
| pH <u>9.5</u> | ROT HRS. <u>26.7</u> | PD SURF / DS psi <u>100/1000</u> | <u> </u> |
| FILT/CAKE API <u>13.0</u> | FOOTAGE <u>824</u> | ANN / BIT psi <u>0/350</u> | <u> </u> |
| HP-HT <u> </u> | AVG ft/hr <u>30.7</u> | JET VELOCITY ft/sec <u>215</u> | <u> </u> |
| P _m <u>.4</u> | GRADE <u> </u> | JET IMPACT lbs <u>875</u> | <u> </u> |
| P _f /M _f <u>.2/5</u> | HOLE DEV. <u> </u> | BIT HP <u>190</u> | <u> </u> |
| CHLORIDES ppm <u>14000</u> | COST/FT <u>88</u> | HP RATIO / HP/IN2 <u>24% - .4/IN2</u> | <u> </u> |
| CALCIUM ppm <u>560</u> | RPM <u>165 (CALC)</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min | <u> </u> |
| OIL/WATER/SOLIDS <u> </u> | WOB <u>10</u> | RATE 2 <u> </u> psi at <u> </u> stk/min | <u> </u> |
| DAILY/CUM. COST <u> </u> | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|----------|---------|---------------|-----------------|-----------------|-----------------|---------------|
| 5 X 27 | DP-CSG | <u>93</u> | <u>.6842</u> | <u>32</u> | <u>NA</u> | <u> </u> |
| 5 X 26 | DP-HOLE | <u>722</u> | <u>.6326</u> | <u>35</u> | <u> </u> | <u> </u> |
| 9.0 x 27 | | <u> </u> | <u>.5905</u> | <u> </u> | <u> </u> | <u> </u> |
| 9.0 X 26 | DC-HOLE | <u>102</u> | <u>.5692</u> | <u>38</u> | <u> </u> | <u> </u> |
| | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. |
|---------------|--------------|--------------|--------------|---------------|---------------|--------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>9.5</u> | <u> </u> | <u>21</u> | <u>30</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | <u> </u> | <u>20</u> | <u>27</u> |
| CAP-bbbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0080</u> | <u> </u> | <u>.3887</u> | <u>.7085</u> |
| DISP-bbbls/ft | <u>.0072</u> | <u>.0181</u> | <u>.0707</u> | <u> </u> | <u> </u> | <u>.113</u> |
| LENGTH-ft | <u>217</u> | <u>721</u> | <u>102</u> | <u> </u> | <u> </u> | <u>100</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>195</u> | <u> </u> | <u> </u> | <u>450</u> |

REMARKS AND RECOMMENDATIONS

MW 8.7 GPM JETS ft/mi = sec/std

DRILL AHEAD WITH BIT NO. 1 OCCASIONALLY PUMPING HIGH VIS SWEEPS TO CLEAN THE HOLE. SAND FORMATION INTERPRETED FROM NORMALIZED ROP DATA BETWEEN 770' - 990'. DRILL TO 1040'. CIRCULATE OUT HOLE VOLUME. PUMP HIGH VIS SWEEP. SHORT TRIP TO 30' CASING. PUMP HIGH VIS SWEEP. DISPLACE HOLE WITH 9.6 PPG MUD. POOH. RIG TO RUN 20' CASING.

ADT J. PATTON

sperry-sun DRILLING SERVICES LOGGING SYSTEMS

DEPTH 1040
OPERATION RUN BOP
FOOTAGE 0

A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 3
DATE Sep 12 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | NA |
| 0 | 3 | 510 | LITHOLOGY | NA |
| BACKGROUND CONNECTION | 0 | | SAMPLE DEPTH | |
| TRIP | 0 | | TRIP CHLORIDES | |
| FLOWLINE TEMP | 33 | degrees F | LAG DOWN DP | 77 |
| | | | LAG OFF BOTTOM | 2750 |
| | | | DRILL RATE ft/hr | 50 |
| | | | CORRECTED 'D' EXP. | .74 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----|-----|-------------|-----|-----|-----------|------|-----|
| PORE PRESSURE | 137 | psi | 8.5 | ppg | 460 | psi | 8.5 | ppg |
| FRACTURE PRESSURE | NA | psi | NA | ppg | 660 | psi | 12.2 | ppg |
| ECD | 137 | psi | 8.5 | ppg | 460 | psi | 8.5 | ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------|---------------|-----------|------------|---------------------|-------------|------------|
| TIME | 00:00 9/11/93 | BIT NO. | 1 | PUMPS | 1. ID-1600 | 2. ID-1600 |
| TYPE | MUD IN HOLE | TYPE | ATXG1 | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 9.6 | IADC CODE | | CAPACITY gal/stk | 4.92 | 4.92 |
| FUNNEL VIS. | 58 | SIZE | 26" | PUMP RATE stks/min | | |
| PV/YP | 16/18 | JETS | 3-21,1-22 | FLOW RATE gal/min | | |
| GELS | 6/14 | DEPTH OUT | 1040 | PRESSURE psi | STATIC PAST | |
| pH | 9.5 | ROT HRS. | 26.7 | PD SURF / DS psi | 24 HRS | |
| FILT/CAKE API | 13.0 | FOOTAGE | 824 | ANN / BIT psi | | |
| HP-HT | | AVG ft/hr | 30.7 | JET VELOCITY ft/sec | | |
| Pm | .4 | GRADE | | JET IMPACT lbs | | |
| Pf/Mf | .2/.5 | HOLE DEV. | | BIT HP | | |
| CHLORIDES ppm | 14000 | COST/FT | 88 | HP RATIO / HP/IN2 | | |
| CALCIUM ppm | 560 | RPM | 165 (CALC) | REDUCED 1 | psi at | stk/min |
| OIL/WATER/SOLIDS | | WOB | 10 | RATE 2 | psi at | stk/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| 5 X 20 | DP-RISER | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 18.73 | DP-CSG | | .3644 | | NA | |
| 5 X 12.25 | DP-HOLE | | .3166 | | | |
| 8.0 X 18.73 | DC-CSG | | .1215 | | | |
| 8.0 X 12.25 | DC-HOLE | | .3265 | | | |
| | | | .0836 | | | |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|--------------|-------|-------|----|---------------|-------|-------|-------|
| OD-inches | DP | HWDP | DC | | | | |
| 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 | |
| 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 | |
| .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 | |
| .0072 | .0181 | .0542 | | | .113 | .0478 | |
| 721 | | | | 177 | 100 | 812 | |
| 19.5 | 49 | 147 | | | 450 | 133 | |

REMARKS AND RECOMMENDATIONS

MW 9.6 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

RUN 20' - 133 LD/FT CASING. LAND CASING AT 1022'. CEMENT 20' & 30' AT THE SAME TIME. START RUNNING BOP STACK.

ADT J. PATTON

sperry-sun *LOGGING SYSTEMS*

DRILLING SERVICES

A Baroid Company

DEPTH 1040
OPERATION SQUEEZE
FOOTAGE 0

NO. 4
DATE Sep 13 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | | | | | | | | | |
|-------------------------------------|-----------------------------------|--------------------------|-----------------------|---------------------|-----------------------|-------------------------|-----------------------|----------------------------|----------------------------|-------------------------------|------------------------------|-------------------|
| AVG GAS (units) <u>0</u> | MAX GAS (units) <u>0</u> | AT DEPTH (feet) <u>0</u> | SURVEY DATA <u>NA</u> | LITHOLOGY <u>NA</u> | SAMPLE DEPTH <u>0</u> | TRIP CHLORIDES <u>0</u> | LAG DOWN DP <u>77</u> | LAG OFF BOTTOM <u>2750</u> | DRILL RATE ft/hr <u>50</u> | CORRECTED 'D' EXP. <u>.74</u> | SHALE DENSITY g/cc <u>NA</u> | EWR Res. <u>0</u> |
| BACKGROUND CONNECTION TRIP <u>0</u> | FLOWLINE TEMP <u>33</u> degrees F | | | | | | | | | | | |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | |
|-------------------|----------------|----------------|--|----------------|-----------------|--|--|-----------|--|--|--|
| PORE PRESSURE | <u>137</u> psi | <u>8.5</u> ppg | | <u>460</u> psi | <u>8.5</u> ppg | | | | | | |
| FRACTURE PRESSURE | <u>NA</u> psi | <u>NA</u> ppg | | <u>660</u> psi | <u>12.2</u> ppg | | | | | | |
| ECD | <u>137</u> psi | <u>8.5</u> ppg | | <u>460</u> psi | <u>8.5</u> ppg | | | | | | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | |
|----------------------------|-----------------------|------------------|--|---------------|---------------|
| TIME <u>00:00 9/12/93</u> | BIT NO. <u>1</u> | <u>2</u> | PUMPS <u>1</u> | ID-1600 | ID-1600 |
| TYPE <u>MUD IN PITS</u> | TYPE <u>ATXG1</u> | <u>SS33SGJ4</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>9.8</u> | IADC CODE <u></u> | | CAPACITY gal/stk <u>4.92</u> | <u>4.92</u> | <u>4.92</u> |
| FUNNEL VIS. <u>53</u> | SIZE <u>26"</u> | <u>17.5</u> | PUMP RATE stks/min <u>70</u> | <u>70</u> | <u>70</u> |
| PV/YP <u>18/19</u> | JETS <u>3-21,1-22</u> | <u>3-18,1-11</u> | FLOW RATE gal/min <u>689</u> | | |
| GELS <u>4/4</u> | DEPTH OUT <u>1040</u> | | PRESSURE psi <u>1200</u> | | |
| pH <u>9.0</u> | ROT HRS. <u>26.7</u> | | PD SURF / DS psi <u>90/580</u> | | |
| FILT/CAKE API <u>4.4</u> | FOOTAGE <u>824</u> | | ANN / BIT psi <u>0/530</u> | | |
| HP-HT <u></u> | AVG ft/hr <u>30.7</u> | | JET VELOCITY ft/sec <u>264</u> | | |
| Pm <u>.4</u> | GRADE <u></u> | | JET IMPACT lbs <u>800</u> | | |
| Pf/Mf <u>.2/.8</u> | HOLE DEV. <u></u> | | BIT HP <u>212</u> | | |
| CHLORIDES ppm <u>18000</u> | COST/FT <u>88</u> | | HP RATIO / HP/IN2 <u>24% - .9/IN2</u> | | |
| CALCIUM ppm <u>1800</u> | RPM <u>165 (CALC)</u> | | REDUCED 1 <u></u> psi at <u></u> stk/min | | |
| OIL/WATER/SOLIDS <u></u> | WOB <u>10</u> | | RATE 2 <u></u> psi at <u></u> stk/min | | |
| DAILY/CUM. COST <u></u> | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBL/STK |
|---------------------|--------------|----------------|-----------------|-----------------|-----------------|
| 5 X 20 DP-RISER | <u>177</u> | <u>.3644</u> | <u>45</u> | | |
| 5 X 18.73 DP-CSG | <u>845</u> | <u>.3166</u> | <u>52</u> | | |
| 5 X 12.25 DP-HOLE | | <u>.1215</u> | | | |
| 8.0 X 18.73 DC-CSG | | <u>.3265</u> | | | |
| 8.0 X 12.25 DC-HOLE | | <u>.0836</u> | | | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | <u>.0542</u> | | | <u>.113</u> | <u>.0478</u> |
| LENGTH-ft | | <u>721</u> | | | <u>177</u> | <u>100</u> | <u>812</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>147</u> | | | <u>450</u> | <u>133</u> |

REMARKS AND RECOMMENDATIONS

MW 9.6 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

LAND AND TEST BOP STACK. ATTEMPT TO TEST CASING - NO TEST. RIH WITH 17.5" BIT. WASH DOWN TO FLOAT/SHOE. POOH.

RIH WITH STINGER. STING IN AND SUEEZE WITH 83 BBL OF CEMENT. PULL 4 STANDS. CO.

ADT J. PATTON

sperry-sun *LOGGING SYSTEMS*

DRILLING SERVICES

A Baroid Company

DEPTH 1645
OPERATION DRILLING
FOOTAGE 595

NO. 5
DATE Sep 14 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|--------------------------------|---------------------------|-----------------------------------|---|
| AVG GAS (units) <u>25</u> | MAX GAS (units) <u>44</u> | AT DEPTH (feet) <u>1625</u> | SURVEY DATA <u>.31 DEG @ 1548'</u> |
| BACKGROUND CONNECTION <u>0</u> | TRIP <u>46</u> | FLOWLINE TEMP <u>41</u> degrees F | LITHOLOGY <u>50% SAND 30% CLAY 20% SILT</u> |
| | | | SAMPLE DEPTH <u>1470</u> |
| | | | TRIP CHLORIDES <u>NA</u> |
| | | | LAG DOWN DP <u>155</u> |
| | | | LAG OFF BOTTOM <u>3325</u> |
| | | | DRILL RATE ft/hr <u>105</u> |
| | | | CORRECTED 'D' EXP. <u>.80</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>2</u> |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------------|-----------------|-----------------|-----------------|--|-----------|--|--|
| PORE PRESSURE | <u>452</u> psi | <u>8.5</u> ppg | <u>727</u> psi | <u>8.5</u> ppg | | | | |
| FRACTURE PRESSURE | <u>760</u> psi | <u>14.3</u> ppg | <u>1112</u> psi | <u>13.0</u> ppg | | | | |
| ECD | <u>531</u> psi | <u>10.0</u> ppg | <u>855</u> psi | <u>10.0</u> ppg | | | | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------------------------|-----------------------|------------------|---------------------|-----------------------|-----------|---------------|
| TIME <u>00:00 9/13/93</u> | BIT NO. <u>3</u> | <u>2</u> | PUMPS <u>1.</u> | ID-1600 | <u>2.</u> | ID-1600 |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>FDSS</u> | <u>SS33SGJ4</u> | SIZE inches | <u>6.5X12</u> | | <u>6.5X12</u> |
| WEIGHT IN <u>9.7+</u> | IADC CODE | | CAPACITY gal/stk | <u>4.92</u> | | <u>4.92</u> |
| FUNNEL VIS. <u>43</u> | SIZE <u>12.25</u> | <u>17.5</u> | PUMP RATE stks/min | <u>65</u> | | <u>65</u> |
| PV/YP <u>16/18</u> | JETS <u>3-13,1-12</u> | <u>3-18,1-11</u> | FLOW RATE gal/min | <u>641</u> | | |
| GELS <u>3/3</u> | DEPTH OUT <u>1050</u> | | PRESSURE psi | <u>2050</u> | | |
| pH <u>10.0</u> | ROT HRS. <u>5.9</u> | <u>.15</u> | PD SURF / DS psi | <u>90/465</u> | | |
| FILT/CAKE API <u>5.1</u> | FOOTAGE <u>595</u> | <u>10</u> | ANN / BIT psi | <u>10/1485</u> | | |
| HP-HT | AVG ft/hr <u>101</u> | <u>60</u> | JET VELOCITY ft/sec | <u>412</u> | | |
| Pm <u>1.5</u> | GRADE <u>INC</u> | <u>2-2-1</u> | JET IMPACT lbs | <u>1340</u> | | |
| Pf/Mf <u>.4/1.3</u> | HOLE DEV. <u>.31</u> | | BIT HP | <u>555</u> | | |
| CHLORIDES ppm <u>17400</u> | COST/FT <u>326</u> | <u>NA</u> | HP RATIO / HP/IN2 | <u>72% - .4.7/IN2</u> | | |
| CALCIUM ppm <u>1560</u> | RPM <u>140</u> | <u>95</u> | REDUCED 1 | | psi at | stk/min |
| OIL/WATER/SOLIDS <u>0/6.5/93.5</u> | WOB <u>0/10</u> | <u>10</u> | RATE 2 | | psi at | stk/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|--------------------|-----------------|--------------|-----------------|-----------------|-----------------|--------------|
| <u>5 X 20</u> | <u>DP-RISER</u> | <u>177</u> | <u>.3644</u> | <u>42</u> | <u>211</u> | |
| <u>5 X 18.73</u> | <u>DP-CSG</u> | <u>845</u> | <u>.3166</u> | <u>48</u> | <u>216</u> | |
| <u>5 X 12.25</u> | <u>DP-HOLE</u> | <u>147</u> | <u>.1215</u> | <u>126</u> | <u>242</u> | |
| <u>8.0 X 12.25</u> | <u>DC-HOLE</u> | <u>476</u> | <u>.0836</u> | <u>183</u> | <u>285</u> | |

PIPE DATA

| | DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--|--------------|---------------|--------------|--------------|--------------|
| | DP | HWDP | | DC | | | | |
| OD-inches | <u>5.0</u> | <u>5.0</u> | | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> |
| CAP-bbbls/ft | <u>.0178</u> | <u>.0087</u> | | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> |
| DISP-bbbls/ft | <u>.0072</u> | <u>.0181</u> | | <u>.0542</u> | | | <u>.113</u> | <u>.0478</u> |
| LENGTH-ft | <u>442</u> | <u>727</u> | | <u>476</u> | | <u>177</u> | <u>100</u> | <u>812</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | | <u>147</u> | | | <u>450</u> | <u>133</u> |

REMARKS AND RECOMMENDATIONS

MW 9.6 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

CASING TESTED TO 2200 PSI FOR 30 MINUTES. RIH WITH BIT NO. 2. DRILL OUT CEMENT AND FLOAT/SHOE. DRILL 10' OF NEW HOLE.

CO. SPOT HIGH VIS PILL AT BOTTOM. DISPLACE HOLE WITH PHPA-POLY MUD SYSTEM. RUN LEAK OFF TEST = 14.3 PPG. POOH.

P/U NEW BIT 3 AND MWD TOOL. RIH. DRILL AHEAD THROUGH SAND AND CLAY.

ADT J. PATTON

sperry-sun *LOGGING SYSTEMS*

DRILLING SERVICES
A Baroid Company

DEPTH 3100
OPERATION DRILLING
FOOTAGE 1455

NO. 6
DATE Sep 15 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|--------------------------------|---------------------------|-----------------------------------|---|
| AVG GAS (units) <u>20</u> | MAX GAS (units) <u>56</u> | AT DEPTH (feet) <u>2340'</u> | SURVEY DATA <u>.47 DEG @ 2968'</u> |
| BACKGROUND CONNECTION <u>0</u> | TRIP <u>153</u> | FLOWLINE TEMP <u>37</u> degrees F | LITHOLOGY <u>30% SAND 50% CLAY 20% SILT</u> |
| | | | SAMPLE DEPTH <u>2970</u> |
| | | | TRIP CHLORIDES <u>NA</u> |
| | | | LAG DOWN DP <u>365</u> |
| | | | LAG OFF BOTTOM <u>4800</u> |
| | | | DRILL RATE ft/hr <u>80</u> |
| | | | CORRECTED 'D' EXP. <u>1.01</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>3</u> |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------------|-----------------|-----------------|-----------------|--|-----------|--|--|
| PORE PRESSURE | <u>452</u> psi | <u>8.5</u> ppg | <u>1402</u> psi | <u>8.7</u> ppg | | | | |
| FRACTURE PRESSURE | <u>760</u> psi | <u>14.3</u> ppg | <u>2257</u> psi | <u>14.0</u> ppg | | | | |
| ECD | <u>531</u> psi | <u>10.8</u> ppg | <u>1612</u> psi | <u>10.0</u> ppg | | | | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|--------------------------------|-----------------------|------------------|---------------------|---------------|-----------|-----------------------|
| TIME <u>00:00 9/14/93</u> | BIT NO. <u>3</u> | <u>2</u> | PUMPS <u>1.</u> | ID-1600 | <u>2.</u> | ID-1600 |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>FDSS</u> | <u>SS33SGJ4</u> | SIZE inches | <u>6.5X12</u> | | <u>6.5X12</u> |
| WEIGHT IN <u>9.7+</u> | IADC CODE | | CAPACITY gal/stk | <u>4.92</u> | | <u>4.92</u> |
| FUNNEL VIS. <u>72</u> | SIZE <u>12.25</u> | <u>17.5</u> | PUMP RATE stks/min | | | <u>123</u> |
| PV/YP <u>29/35</u> | JETS <u>3-13,1-12</u> | <u>3-18,1-11</u> | FLOW RATE gal/min | | | <u>605</u> |
| GELS <u>4/5</u> | DEPTH OUT | <u>1050</u> | PRESSURE psi | | | <u>2050</u> |
| pH <u>10.1</u> | ROT HRS. <u>21.1</u> | <u>.15</u> | PD SURF / DS psi | | | <u>90/605</u> |
| FILT/CAKE API <u>3.2</u> | FOOTAGE <u>2050</u> | <u>10</u> | ANN / BIT psi | | | <u>25/1330</u> |
| HP-HT | AVG ft/hr <u>97</u> | <u>60</u> | JET VELOCITY ft/sec | | | <u>389</u> |
| Pm <u>1.3</u> | GRADE <u>INC</u> | <u>2-2-1</u> | JET IMPACT lbs | | | <u>1200</u> |
| Pf/Mf <u>1.1/2.7</u> | HOLE DEV. <u>.47</u> | | BIT HP | | | <u>470</u> |
| CHLORIDES ppm <u>17300</u> | COST/FT <u>295</u> | <u>NA</u> | HP RATIO / HP/IN2 | | | <u>65% - .4.0/IN2</u> |
| CALCIUM ppm <u>880</u> | RPM <u>130</u> | <u>95</u> | REDUCED 1 | | | psi at stks/min |
| OIL/WATER/SOLIDS <u>0/7/93</u> | WOB <u>20</u> | <u>10</u> | RATE 2 | | | psi at stks/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|--------------------|-------------------|--------------|-----------------|-----------------|-----------------|--------------|
| <u>5 X 20</u> | <u>DP-RISER</u> | <u>177</u> | <u>.3644</u> | <u>40</u> | <u>331</u> | |
| <u>5 X 18.73</u> | <u>DP-C&G</u> | <u>845</u> | <u>.3166</u> | <u>45</u> | <u>340</u> | |
| <u>5 X 12.25</u> | <u>DP-HOLE</u> | <u>1602</u> | <u>.1215</u> | <u>119</u> | <u>377</u> | |
| <u>8.0 X 12.25</u> | <u>DC-HOLE</u> | <u>476</u> | <u>.0836</u> | <u>173</u> | <u>440</u> | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | | <u>2.875</u> | | <u>20</u> | <u>27</u> | <u>18.73</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | | <u>.0542</u> | | | <u>.113</u> | <u>.0478</u> |
| LENGTH-ft | <u>1897</u> | <u>727</u> | | <u>476</u> | | <u>177</u> | <u>100</u> | <u>812</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | | <u>147</u> | | | <u>450</u> | <u>133</u> |

REMARKS AND RECOMMENDATIONS

MW 9.6 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

DRILL AHEAD WITH BIT NO. 3. DRILL TO 2336'. CO. SHORT TRIP TO SHOE. HOLE TRYING TO SWAB ON WAY OUT. PUMP AND BACK REAM FROM STAND NO. 6. MAX GAS FROM TRIP = 153 UNITS. DRILL AHEAD. # 1 PUMP DOWN FOR MOST OF DAY.

ADT J. PATTON

sperry-sun DRILLING SERVICES LOGGING SYSTEMS

DEPTH 3705
OPERATION POOH
FOOTAGE 705

A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 7
DATE Sep 16 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|----------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 22 DEG @ 3676' |
| 10 | 60 | 3400' | LITHOLOGY | 10% SAND 80% CLAY 10% SILT |
| 0 | | | SAMPLE DEPTH | 3700 |
| 313 | | 3705' | TRIP CHLORIDES | NA |
| 37 | | | LAG DOWN DP | 365 |
| | | | LAG OFF BOTTOM | 4800 |
| | | | DRILL RATE ft/hr | 45 |
| | | | CORRECTED "D" EXP. | .90 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3 |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|-----|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 452 | psi | 8.5 | ppg | 1676 | psi | 8.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 760 | psi | 14.3 | ppg | 2735 | psi | 14.5 | ppg | | psi | | ppg | ft |
| ECD | 531 | psi | 10.0 | ppg | 1927 | psi | 10.0 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | |
|------------------|----------------|-----------|-----------|-----------|---------------------|------------|----------------|
| TIME | 21:30 9/15/93 | BIT NO. | 3 | 2 | PUMPS | 1. ID-1600 | 2. ID-1600 |
| TYPE | PHPA-SEA WATER | TYPE | FDSS | SS33SGJ4 | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 9.9 | IADC CODE | | | CAPACITY gal/stk | 4.92 | 4.92 |
| FUNNEL VIS. | 82 | SIZE | 12.25 | 17.5 | PUMP RATE stks/min | 66 | 67 |
| PV/YP | 37/44 | JETS | 3-13.1-12 | 3-18.1-11 | FLOW RATE gal/min | 653 | |
| GELS | 6/9 | DEPTH OUT | 3705 | 1050 | PRESSURE psi | | 2700 |
| pH | 19.8 | ROT HRS. | 28.0 | .15 | PD SURF / DS psi | | 100/1020 |
| FILT/CAKE API | 2.2 | FOOTAGE | 2655 | 10 | ANN / BIT psi | | 40/1540 |
| HP-HT | | AVG ft/hr | 95 | 60 | JET VELOCITY ft/sec | | 420 |
| Pm | 1.2 | GRADE | INC | 2-2-I | JET IMPACT lbs | | 1390 |
| Pf/Mf | .9/2.3 | HOLE DEV. | .22 | | BIT HP | | 587 |
| CHLORIDES ppm | 17100 | COST/FT | 297 | NA | HP RATIO / HP/IN2 | | 57% - .5.0/IN2 |
| CALCIUM ppm | 680 | RPM | 140 | 95 | REDUCED 1 | | psi at stk/min |
| OIL/WATER/SOLIDS | 0/7/93 | WOB | 15 | 10 | RATE 2 | | psi at stk/min |
| DAILY/CUM. COST | | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 43 | 386 | |
| 5 X 18.73 | DP-CSG | 845 | .3166 | 49 | 395 | |
| 5 X 12.25 | DP-HOLE | 2207 | .1215 | 128 | 440 | |
| 8.0 X 12.25 | DC-HOLE | 476 | .0836 | 186 | 515 | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|--------------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | | .0542 | | | .113 | .0478 |
| LENGTH-ft | 2502 | 727 | | 476 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 147 | | | 450 | 133 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

DRILL AHEAD WITH BIT NO. 3. DRILL TO 3705'. CO. SHORT TRIP TO SHOE. HOLE TRYING TO SWAB ON WAY OUT. PUMP AND BACK REAM FROM STAND NO. 6. MAX GAS FROM TRIP = 313 UNITS. CIRCULATE AND CONDITION HOLE. POOH. EXCESS DRAG NOTED WHEN BHA REACHED THE 20' SHOE. HOLE AGAIN TRYING TO SWAB. OBSERVE WELL. POOH FOR E-LOGS.

ADT J. PATTON

sperry-sun LOGGING SERVICES

A Baroid Company

DEPTH 3705
OPERATION E-LOG
FOOTAGE 0

NO. 8
DATE Sep 17 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | | |
|-----------------|-----------------|-----------------|--------------------|----------------------------|--|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | | |
| 10 | 60 | 3400' | LITHOLOGY | .22 DEG @ 3676' | |
| 0 | | | SAMPLE DEPTH | 10% SAND 80% CLAY 10% SILT | |
| 214 | | 3705' | TRIP CHLORIDES | 3700 | |
| 41 | | | LAG DOWN DP | NA | |
| | | | LAG OFF BOTTOM | 365 | |
| | | | | 4800 | |
| | | | DRILL RATE ft/hr | 45 | |
| | | | CORRECTED 'D' EXP. | .90 | |
| | | | SHALE DENSITY g/cc | NA | |
| | | | EWR Res. | 3 | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|---------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 452 psi | 8.5 ppg | 1676 psi | 8.7 ppg | | | | |
| FRACTURE PRESSURE | 760 psi | 14.3 ppg | 2735 psi | 14.5 ppg | | | | |
| ECD | 531 psi | 10.0 ppg | 1927 psi | 10.0 ppg | | | | |

MUD DATA

| | |
|------------------|----------------|
| TIME | 21:00 9/16/93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 10.1 |
| FUNNEL VIS. | 74 |
| PV/YP | 31/39 |
| GELS | 6/9 |
| pH | 9.8 |
| FILT/CAKE API | 2.4 |
| HP-HT | |
| Pm | 1.2 |
| Pf/Mf | .9/2.4 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 720 |
| OIL/WATER/SOLIDS | 0/7/93 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|-----------|-----------|
| BIT NO. | 3 | 2 |
| TYPE | FDSS | SS3SGJ4 |
| IADC CODE | | |
| SIZE | 12.25 | 17.5 |
| JETS | 3-13,1-12 | 3-18,1-11 |
| DEPTH OUT | 3705 | 1050 |
| ROT HRS. | 28.0 | .15 |
| FOOTAGE | 2655 | 10 |
| AVG ft/hr | 95 | 60 |
| GRADE | INC | 2-2-I |
| HOLE DEV. | .22 | |
| COST/FT | 297 | NA |
| RPM | 140 | 95 |
| WOB | 15 | 10 |

HYDRAULIC DATA

| | | |
|---------------------|------------|----------------|
| PUMPS | 1. ID-1600 | 2. ID-1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.92 | 4.92 |
| PUMP RATE stks/min | 61 | 62 |
| FLOW RATE gal/min | 605 | |
| PRESSURE psi | | 2425 |
| PD SURF / DS psi | | 190/970 |
| ANN / BIT psi | | 40/1325 |
| JET VELOCITY ft/sec | | 389 |
| JET IMPACT lbs | | 1195 |
| BIT HP | | 467 |
| HP RATIO / HP/IN2 | | 55% - .4.0/IN2 |
| REDUCED 1 | | psi at stk/min |
| RATE 2 | | psi at stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 40 | 386 | |
| 5 X 18.73 | DP-CSG | 845 | .3166 | 45 | 395 | |
| 5 X 12.25 | DP-HOLE | 2207 | .1215 | 119 | 440 | |
| 8.0 X 12.25 | DC-HOLE | 476 | .0836 | 172 | 515 | |

PIPE DATA

| DRILL STRING | | | | CASING: | RISER | COND. | SURF. |
|--------------|-----|-------|-------|---------|-------|-------|-------|
| OD-inches | DP | HWDP | DC | DEPTH | | | |
| 5.0 | 5.0 | | 8.0 | | 21 | 309 | 1022 |
| 4.276 | | 3.0 | 2.875 | | 20 | 30 | 20 |
| .0178 | | .0087 | .0080 | | .3887 | .7085 | 18.73 |
| .0072 | | .0181 | .0542 | | | .113 | .3409 |
| 2502 | | 727 | 476 | | 177 | 100 | .0478 |
| 19.5 | | 49 | 147 | | | 450 | 812 |
| | | | | | | | 133 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

RIG UP SCHLUMBERGER. FIRST SET OF LOG WOULD NOT GO MUCH BELOW SHOE DEPTH. APPARENT CLAY BALL DRAGGED OFF OF STABILIZERS WHILE PULLING OUT OF THE HOLE. RR BIT 3 BACK INTO HOLE FOR WIPER TRIP. WORK ON TOP DRIVE. RIH. CIRCULATE CONDITION HOLE. PUMP HIGH VIS SWEEP. POOH. RUN ELECTRIC LOGS.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES

A Baroid Company

APPLIED DRILLING TECHNOLOGY

MORNING REPORT

DEPTH 3705
OPERATION W.O.W.
FOOTAGE 0

No. 9
DATE Sep 18 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|----------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .22 DEG @ 3676' |
| | | | LITHOLOGY | 10% SAND 80% CLAY 10% SILT |
| BACKGROUND | 0 | 0 | SAMPLE DEPTH | 3700 |
| CONNECTION | 0 | | TRIP CHLORIDES | NA |
| TRIP | 214 | 3705' | LAG DOWN DP | 365 |
| FLOWLINE TEMP | 41 | degrees F | LAG OFF BOTTOM | 4800 |
| | | | DRILL RATE ft/hr | 45 |
| | | | CORRECTED 'D' EXP. | .90 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 452 | psi | 8.5 | ppg | 1676 | psi | 8.7 | ppg |
| FRACTURE PRESSURE | 760 | psi | 14.3 | ppg | 2735 | psi | 14.5 | ppg |
| ECD | 531 | psi | 10.0 | ppg | 1927 | psi | 10.0 | ppg |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | | |
|------------------|----------------|-----------|-----------|-----------|---------------------|--------|--------------|---------|---------|
| TIME | 22:00 9/17/93 | BIT NO. | 3 | 2 | PUMPS | 1. | ID-1600 | 2. | ID-1600 |
| TYPE | PHPA-SEA WATER | TYPE | FDSS | SS33SGJ4 | SIZE inches | 6.5X12 | 6.5X12 | | |
| WEIGHT IN | 10.0 | IADC CODE | | | CAPACITY gal/stk | 4.92 | 4.92 | | |
| FUNNEL VIS. | 54 | SIZE | 12.25 | 17.5 | PUMP RATE stks/min | | | | |
| PV/YP | 21/26 | JETS | 3-13,1-12 | 3-18,1-11 | FLOW RATE gal/min | | | | |
| GELS | 3/4 | DEPTH OUT | 3705 | 1050 | PRESSURE psi | | STATIC | | |
| pH | 9.5 | ROT HRS. | 28.0 | .15 | PD SURF / DS psi | | PAST 24 HRS. | | |
| FILT/CAKE API | 2.8 | FOOTAGE | 2655 | 10 | ANN / BIT psi | | | | |
| HP-HT | | AVG ft/hr | 95 | 60 | JET VELOCITY ft/sec | | | | |
| Pm | .5 | GRADE | INC | 2-2-I | JET IMPACT lbs | | | | |
| Pf/Mf | .5/1.3 | HOLE DEV. | .22 | | BIT HP | | | | |
| CHLORIDES ppm | 17000 | COST/FT | 297 | NA | HP RATIO / HP/IN2 | | | | |
| CALCIUM ppm | 480 | RPM | 140 | 95 | REDUCED 1 | | psi at | stk/min | |
| OIL/WATER/SOLIDS | 0/8/92 | WOB | 15 | 10 | RATE 2 | | psi at | stk/min | |
| DAILY/CUM. COST | | | | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|---------------------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 DP-RISER | 177 | .3644 | | | |
| 5 X 18.73 DP-CSG | 845 | .3166 | | | |
| 5 X 12.25 DP-HOLE | 2207 | .1215 | | | |
| 8.0 X 12.25 DC-HOLE | 476 | .0836 | | | |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|--------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | DP | HWDP | DC | | | | |
| 5.0 | 5.0 | | 8.0 | | | 309 | 1022 |
| 4.276 | 4.276 | 3.0 | 2.875 | 21 | 30 | 20 | |
| .0178 | .0178 | .0087 | .0080 | 20 | 27 | 18.73 | |
| .0072 | .0072 | .0181 | .0542 | .3887 | .7085 | .3409 | |
| 2502 | 2502 | 727 | 476 | | .113 | .0478 | |
| 19.5 | 19.5 | 49 | 147 | 177 | 100 | 812 | |
| | | | | | 450 | 133 | |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 650 JETS 4-12'S 3000 PSI ft/mi = sec/std

COMPLETE ELECTRIC LOGS. DISPLCE RISER WITH SEA WATER AND DISCONNECT FROM WELL BECAUSE OF ROUGH WEATHER.

WAIT ON CONDITIONS TO IMPROVE.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 3705 (3375)
OPERATION OPEN HOLE
FOOTAGE 2325

No. 10
DATE Sep 19 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|----------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .22 DEG @ 3676' |
| 20 | 35 | 1680 | LITHOLOGY | 10% SAND 80% CLAY 10% SILT |
| BACKGROUND CONNECTION | 0 | | SAMPLE DEPTH | 3700 |
| TRIP | 0 | 1050 | TRIP CHLORIDES | NA |
| FLOWLINE TEMP | 45 | degrees F | LAG DOWN DP | 427 |
| | | | LAG OFF BOTTOM | 8250 |
| | | | DRILL RATE ft/hr | 200 |
| | | | CORRECTED 'D' EXP. | .85 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 452 | psi | 8.5 | ppg | 1676 | psi | 8.7 | ppg |
| FRACTURE PRESSURE | 760 | psi | 14.3 | ppg | 2735 | psi | 14.5 | ppg |
| ECD | 531 | psi | 10.0 | ppg | 1927 | psi | 10.0 | ppg |

MUD DATA

| | |
|------------------|----------------|
| TIME | 22:00 9/18/93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 9.9 |
| FUNNEL VIS. | 60 |
| PV/YP | 29/34 |
| GELS | 4/6 |
| pH | 9.7 |
| FILT/CAKE API | 2.0 |
| HP-HT | |
| Pm | .5 |
| Pf/Mf | .5/1.5 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 240 |
| OIL/WATER/SOLIDS | 0/7.5/92.5 |
| DAILY/CUM. COST | |

BIT DATA

| | | |
|-----------|-----------|-----------|
| BIT NO. | 3 | RR3 (4) |
| TYPE | FDSS | FDTC/H.O. |
| IADC CODE | | |
| SIZE | 12.25 | 17.5 |
| JETS | 3-13.1-12 | TFA: 1.44 |
| DEPTH OUT | 3705 | NA |
| ROT HRS. | 28.0 | 11.3 |
| FOOTAGE | 2655 | 2325 |
| AVG ft/hr | 95 | 205 |
| GRADE | INC | INC |
| HOLE DEV. | .22 | |
| COST/FT | 297 | NA |
| RPM | 140 | 145 |
| WOB | 15 | 10-20 |

HYDRAULIC DATA

| | | | | |
|---------------------|----|---------------|----|---------|
| PUMPS | 1. | ID-1600 | 2. | ID-1600 |
| SIZE inches | | 6.5X12 | | 6.5X12 |
| CAPACITY gal/stk | | 4.92 | | 4.92 |
| PUMP RATE stks/min | | 111 | | 110 |
| FLOW RATE gal/min | | 1086 | | |
| PRESSURE psi | | 2500 | | |
| PD SURF / DS psi | | 125/1935 | | |
| ANN / BIT psi | | 25/515 | | |
| JET VELOCITY ft/sec | | 240 | | |
| JET IMPACT lbs | | 1335 | | |
| BIT HP | | 325 | | |
| HP RATIO / HP/IN2 | | 21% - 1.3/IN2 | | |
| REDUCED 1 | | psi at | | stk/min |
| RATE 2 | | psi at | | stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 71 | | |
| 5 X 18.75 | DP-CSG | 845 | .3166 | 82 | | |
| 5 X 17.5 | DP-HOLE | 2056 | .2733 | 95 | | |
| 8.0 X 17.5 | DC-HOLE | 297 | .2354 | 111 | | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .0478 |
| LENGTH-ft | 2351 | 727 | 297 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | 133 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 900 JETS ft/mi = sec/std

LATCH RISER. RIH WITH 17.5' HOLE OPENER. OPENING HOLE TO 17.5'.

ADT J. PATTON

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 3705
OPERATION RUN 13 3/8'
FOOTAGE 0

NO. 11
DATE Sep 20 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | |
|----------------------------|---------------------|----------------------------|
| OPERATOR ARCO ALASKA, INC. | WELL NAME KUVLUM #3 | FIELD/BLOCK NR 6-4 BLK 673 |
| CONTRACTOR CANMAR | RIG NAME KULLUK | AREA BEAUFORT SEA |
| START DATE Sep 9 93 | LOC. OFFSHORE | STATE ALASKA |

LOGGING DATA

| | | | |
|------------------|-----------------|-----------------|--------------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA .22 DEG @ 3676' |
| BACKGROUND 0 | | | LITHOLOGY 10% SAND 80% CLAY 10% SILT |
| CONNECTION 0 | | | SAMPLE DEPTH 3700 |
| TRIP 114 | | 3705 | TRIP CHLORIDES NA |
| FLOWLINE TEMP 45 | | degrees F | LAG DOWN DP 427 |
| | | | LAG OFF BOTTOM 8250 |
| | | | DRILL RATE ft/hr 200 |
| | | | CORRECTED 'D' EXP. .85 |
| | | | SHALE DENSITY g/cc NA |
| | | | EWR Res. |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|-----|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 452 | psi | 8.5 | ppg | 1676 | psi | 8.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 760 | psi | 14.3 | ppg | 2735 | psi | 14.5 | ppg | | psi | | ppg | ft |
| ECD | 531 | psi | 10.0 | ppg | 1927 | psi | 10.0 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|-----------------------------|----------------|-----------|---------------------------------|---------|
| TIME 22:00 9/19/93 | BIT NO. 3 | RR3 (4) | PUMPS 1. ID-1600 | ID-1600 |
| TYPE PHPA-SEA WATER | TYPE FDSS | FDTC/H.O. | SIZE inches 6.5X12 | 6.5X12 |
| WEIGHT IN 9.8+ | IADC CODE | | CAPACITY gal/stk 4.92 | 4.92 |
| FUNNEL VIS. 80 | SIZE 12.25 | 17.5 | PUMP RATE stks/min 111 | 110 |
| PV/YP 30/42 | JETS 3-13,1-12 | TFA: 1.44 | FLOW RATE gal/min 1086 | |
| GELS 5/9 | DEPTH OUT 3705 | 3705 | PRESSURE psi 2500 | |
| pH 9.5 | ROT HRS. 28.0 | 13.3 | PD SURF / DS psi 125/1935 | |
| FILT/CAKE API 3.6 | FOOTAGE 2655 | 2655 | ANN / BIT psi 25/515 | |
| HPHT | AVG ft/hr 95 | 200 | JET VELOCITY ft/sec 240 | |
| Pm .6 | GRADE INC | INC | JET IMPACT lbs 1335 | |
| Pf/Mf .5/2.5 | HOLE DEV. .22 | | BIT HP 325 | |
| CHLORIDES ppm 16800 | COST/FT 297 | NA | HP RATIO / HP/IN2 21% - 1.3/IN2 | |
| CALCIUM ppm 100 | RPM 140 | 145 | REDUCED 1 psi at stk/min | |
| OIL/WATER/SOLIDS 0/7.5/92.5 | WOB 15 | 15 | RATE 2 psi at stk/min | |
| DAILY/CUM. COST | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 71 | | |
| 5 X 18.73 | DP-CSG | 845 | .3166 | 82 | | |
| 5 X 17.5 | DP-HOLE | 2056 | .2733 | 95 | | |
| 8.0 X 17.5 | DC-HOLE | 297 | .2354 | 111 | | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .0478 |
| LENGTH-ft | 2351 | 727 | 297 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | 133 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 700 JETS 2-12,3-13'S ft/mi = sec/std

OPENING HOLE TO 17.5' TO 3705'. CIRCULATE OUT. PUMP HIGH VIS SWEEP. SHORT TRIP TO SHOE. PUMP OUT OF HOLE ON LAST THREE STANDS AT CASING SHOE. MAX GAS FROM SHORT TRIP = 114 UNITS. CIRCULATE AND CONDITION HOLE. POOH. RIG UP FOR RUNNING CASING. RUN 13 3/8" - 68 LB/FT CASING.

ADT J. PATTON

sperry-sun DRILLING SERVICES *LOGGING SYSTEMS*

A Baroid Company

DEPTH 3705
OPERATION C. DRLG LINE
FOOTAGE 0

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 12
DATE Sep 21 93
TIME 04 00

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|-----------------------------------|-----------------|-----------------|---|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA <u>.22 DEG @ 3676'</u> |
| | | | LITHOLOGY <u>10% SAND 80% CLAY 10% SILT</u> |
| BACKGROUND <u>0</u> | | | SAMPLE DEPTH <u>3700</u> |
| CONNECTION <u>0</u> | | | TRIP CHLORIDES <u>NA</u> |
| TRIP <u>35</u> | | <u>3705</u> | LAG DOWN DP <u>475</u> |
| FLOWLINE TEMP <u>45</u> degrees F | | | LAG OFF BOTTOM <u>4200</u> |
| | | | DRILL RATE ft/hr |
| | | | CORRECTED 'D' EXP. |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----------------|----------------|-----------------|-----------------|--|-----------|--|----|
| PORE PRESSURE | <u>1627</u> psi | <u>8.7</u> ppG | <u>1676</u> psi | <u>8.7</u> ppG | | | | ft |
| FRACTURE PRESSURE | | <u>NA</u> ppG | <u>2735</u> psi | <u>14.5</u> ppG | | | | ft |
| ECD | | | | | | | | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------------------------|-----------------------|---------------|---------------------|---------------|-----------|---------------|
| TIME <u>22:00 9/20/93</u> | BIT NO. <u>3</u> | <u>4</u> | PUMPS <u>1.</u> | ID-1600 | <u>2.</u> | ID-1600 |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>FDSS</u> | <u>DS40-H</u> | SIZE inches | <u>6.5X12</u> | | <u>6.5X12</u> |
| WEIGHT IN <u>9.9</u> | IADC CODE | <u>PDC</u> | CAPACITY gal/stk | <u>4.92</u> | | <u>4.92</u> |
| FUNNEL VIS. <u>62</u> | SIZE <u>12.25</u> | <u>12.25</u> | PUMP RATE stks/min | | | |
| PV/YP <u>22/21</u> | JETS <u>3-13,1-12</u> | <u>5-13'S</u> | FLOW RATE gal/min | | | |
| GELS <u>3/6</u> | DEPTH OUT <u>3705</u> | | PRESSURE psi | <u>STATIC</u> | | |
| pH <u>9.9</u> | ROT HRS. <u>28.0</u> | | PD SURF / DS psi | | | |
| FILT/CAKE API <u>2.4</u> | FOOTAGE <u>2655</u> | | ANN / BIT psi | | | |
| HP-HT | AVG ft/hr <u>95</u> | | JET VELOCITY ft/sec | | | |
| Pm <u>.6</u> | GRADE <u>INC</u> | | JET IMPACT lbs | | | |
| Pf/Mf <u>.6/1.9</u> | HOLE DEV. <u>.22</u> | | BIT HP | | | |
| CHLORIDES ppm <u>17000</u> | COST/FT <u>297</u> | | HP RATIO / HP/IN2 | | | |
| CALCIUM ppm <u>320</u> | RPM <u>140</u> | | REDUCED 1 | | psi at | stk/min |
| OIL/WATER/SOLIDS <u>0/7.5/92.5</u> | WOB <u>15</u> | | RATE 2 | | psi at | stk/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|--------------------|-------------------|--------------|-----------------|-----------------|-----------------|--------------|
| <u>5 X 20</u> | <u>DP-RISER</u> | <u>177</u> | <u>.3644</u> | | | |
| <u>5 X 18.73</u> | <u>DP-C&G</u> | | <u>.3166</u> | | | |
| <u>5 X 12.25</u> | <u>DP-HOLE</u> | | <u>.1215</u> | | | |
| <u>8.0 X 12.25</u> | <u>DC-HOLE</u> | | <u>.0836</u> | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

PIPE DATA

| DRILL STRING | | | | CASING: | RISER | COND. | SURF. |
|--------------|--------------|------|--------------|---------|--------------|--------------|--------------|
| OD-inches | DP | HWDP | DC | DEPTH | | | |
| <u>5.0</u> | <u>5.0</u> | | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| <u>4.276</u> | <u>3.0</u> | | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> |
| <u>.0178</u> | <u>.0087</u> | | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>18.73</u> |
| <u>.0072</u> | <u>.0181</u> | | <u>.0542</u> | | | <u>.113</u> | <u>.3409</u> |
| | | | | | | <u>.0478</u> | <u>.1498</u> |
| | | | | | <u>177</u> | <u>100</u> | <u>.0240</u> |
| | | | | | | <u>812</u> | <u>.3774</u> |
| | | | | | | <u>450</u> | <u>133</u> |
| | | | | | | | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 700 JETS 2-12,3-13'S ft/mi = sec/std

LAND 13 3/8' CASING. SHOE DEPTH AT 3681'. CIRCULATE AND CONDITION HOLE BEHIND CASING. MAX GAS FROM BOTTOM = 35 UNITS.

PUMP AP. 388 BBL OF CEMENT AND DISPLACE WITH MUD. TEST BOP. SLIP AND CUT DRILL LINE.

ADT J. PATTON

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 3705
OPERATION W.O.W.
FOOTAGE 0

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

NO. 13
DATE Sep 22 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|----------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .22 DEG @ 3676' |
| 0 | | | LITHOLOGY | 10% SAND 80% CLAY 10% SILT |
| 0 | | | SAMPLE DEPTH | 3700 |
| 0 | | | TRIP CHLORIDES | NA |
| 10 | | 3600 | LAG DOWN DP | 475 |
| | | | LAG OFF BOTTOM | 4200 |
| BACKGROUND CONNECTION | | | DRILL RATE ft/hr | NA |
| TRIP | | | CORRECTED 'D' EXP. | NA |
| FLOWLINE TEMP | 60 | degrees F | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|------|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 1627 | psi | 8.7 | ppg | 1676 | psi | 8.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | | psi | NA | ppg | 2735 | psi | 14.5 | ppg | | psi | | ppg | ft |
| ECD | 1914 | psi | 10.0 | ppg | 1927 | psi | 10.0 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | | | | |
|------------------|----------------|-----------|-----------|--------|---------------------|----|---------------|----|---------|
| TIME | 22:00 9/21/93 | BIT NO. | 4 | 5 | PUMPS | 1. | ID-1600 | 2. | ID-1600 |
| TYPE | PHPA-SEA WATER | TYPE | FDSS | 40-HF | SIZE inches | | 6.5X12 | | 6.5X12 |
| WEIGHT IN | 9.8 | IADC CODE | | PDC | CAPACITY gal/stk | | 4.92 | | 4.92 |
| FUNNEL VIS. | 58 | SIZE | 12.25 | 12.25 | PUMP RATE stks/min | | 72 | | 73 |
| PV/YP | 19/20 | JETS | 3-13,1-12 | 5-13'S | FLOW RATE gal/min | | 712 | | |
| GELS | 3/4 | DEPTH OUT | 3705 | 3600 | PRESSURE psi | | 2450 | | |
| pH | 9.0 | ROT HRS. | 28.0 | | PD SURF / DS psi | | 100/1240 | | |
| FILT/CAKE API | 3.4 | FOOTAGE | 2655 | 0 | ANN / BIT psi | | 20/1090 | | |
| HP-HT | | AVG ft/hr | 95 | | JET VELOCITY ft/sec | | 352 | | |
| Pm | .6 | GRADE | INC | | JET IMPACT lbs | | 1273 | | |
| Pf/Mf | .25/1.5 | HOLE DEV. | .22 | | BIT HP | | 450 | | |
| CHLORIDES ppm | 17000 | COST/FT | 297 | | HP RATIO / HP/IN2 | | 45% - 3.8/IN2 | | |
| CALCIUM ppm | 360 | RPM | 140 | 50-120 | REDUCED 1 | | psi at | | stk/min |
| OIL/WATER/SOLIDS | 0/7.2/92.8 | WOB | 15 | 0-20 | RATE 2 | | psi at | | stk/min |
| DAILY/CUM. COST | | | | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 47 | 223 | |
| 5 X 12.415 | DP-CSG | 2947 | .1255 | 135 | 278 | |
| 5 X 12.25 | DP-HOLE | - | .1215 | | | |
| 8 X 12.415 | | 476 | .0876 | 194 | 327 | |
| 8 X 12.25 | DC-HOLE | - | .0836 | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|--------------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | | 2.875 | | 20 | 30 | 20 |
| CAP-bbbls/ft | .0178 | .0087 | | .0080 | | .3887 | .7085 | 18.73 |
| DISP-bbbls/ft | .0072 | .0181 | | .0542 | | | .113 | .3409 |
| LENGTH-ft | 2397 | 727 | | 476 | | 177 | .0478 | .1498 |
| WEIGHT-lbs/ft | 19.5 | 49 | | 147 | | | .100 | .0240 |
| | | | | | | | .450 | .3774 |
| | | | | | | | | .68 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 700 JETS 2-12,3-13'S ft/mi = sec/std

RIH WITH BIT NO. 4 - PDC TYPE. TEST CASING. ATTEMPT TO DRILL OUT FLOAT COLLAR AFTER TAGGING UP. BIT WOULD NOT DRILL.

POOH TO CHANGE BIT. DISPLACE RISER WITH SEA WATER AND DISCONNECT - WAIT ON WEATHER CONDITIONS TO IMPROVE.

ADT J. PATTON

sperry-sun DRILLING SERVICES LOGGING SYSTEMS

DEPTH 3705
OPERATION W.O.W.
FOOTAGE 0

A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 14
DATE Sep 23 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|----------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .22 DEG @ 3676' |
| BACKGROUND CONNECTION | 0 | | LITHOLOGY | 10% SAND 80% CLAY 10% SILT |
| TRIP | 10 | 3600 | SAMPLE DEPTH | 3700 |
| FLOWLINE TEMP | 60 | degrees F | TRIP CHLORIDES | NA |
| | | | LAG DOWN DP | 475 |
| | | | LAG OFF BOTTOM | 4200 |
| | | | DRILL RATE ft/hr | NA |
| | | | CORRECTED 'D' EXP. | NA |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|------|-----|-------------|-----|------|-----------|------|-----|
| PORE PRESSURE | 1627 | psi | 8.7 | ppg | 1676 | psi | 8.7 | ppg |
| FRACTURE PRESSURE | | psi | NA | ppg | 2735 | psi | 14.5 | ppg |
| ECD | 1914 | psi | 10.0 | ppg | 1927 | psi | 10.0 | ppg |

MUD DATA

| | |
|------------------|----------------|
| TIME | 22:00 9/22/93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 9.7+ |
| FUNNEL VIS. | 56 |
| PV/YP | 18/20 |
| GELS | 3/4 |
| pH | 9.0 |
| FILT/CAKE API | 3.4 |
| HP-HT | 8.0 |
| Pm | .6 |
| Pf/Mf | .25/1.5 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 360 |
| OIL/WATER/SOLIDS | 0/7.2/92.8 |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|--------|
| BIT NO. | 5 |
| TYPE | 40-HF |
| IADC CODE | PDC |
| SIZE | 12.25 |
| JETS | 5-13'S |
| DEPTH OUT | 3600 |
| ROT HRS. | |
| FOOTAGE | 0 |
| AVG ft/hr | |
| GRADE | |
| HOLE DEV. | |
| COST/FT | |
| RPM | 50-120 |
| WOB | 0-20 |

HYDRAULIC DATA

| | | |
|---------------------|-------------|------------|
| PUMPS | 1. ID-1600 | 2. ID-1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.92 | 4.92 |
| PUMP RATE stks/min | | |
| FLOW RATE gal/min | | |
| PRESSURE psi | STATIC PAST | |
| PD SURF / DS psi | 24 HRS | |
| ANN / BIT psi | | |
| JET VELOCITY ft/sec | | |
| JET IMPACT lbs | | |
| BIT HP | | |
| HP RATIO / HP/IN2 | | |
| REDUCED 1 | psi at | stk/min |
| RATE 2 | psi at | stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | | | |
| 5 X 12.415 | DP-CSG | 2947 | .1255 | | | |
| 5 X 12.25 | DP-HOLE | - | .1215 | | | |
| 8 X 12.415 | | 476 | .0876 | | | |
| 8 X 12.25 | DC-HOLE | - | .0836 | | | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | 18.73 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .3409 |
| LENGTH-ft | 2397 | 727 | 476 | | 177 | 100 | .0478 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | .812 |
| | | | | | | | 133 |
| | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

WAIT ON WEATHER CONDITIONS TO IMPROVE.

AOT J. PATTON

sperry-sun DRILLING SERVICES LOGGING SYSTEMS

DEPTH 4285
OPERATION DRILL
FOOTAGE 604

A Baroid Company

NO. 15
DATE Sep 24 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|------------------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .51 @ 4274' |
| 35 | 303 | 4058 | LITHOLOGY | 50% CLAY 20% SLT 30 % SAND TR COAL |
| CONNECTION | 145 | 145 | SAMPLE DEPTH | 3960 |
| TRIP | 8 | 3681 | TRIP CHLORIDES | NA |
| FLOWLINE TEMP | 80 | degrees F | LAG DOWN DP | 540 |
| | | | LAG OFF BOTTOM | 4751 |
| | | | DRILL RATE ft/hr | 110 |
| | | | CORRECTED 'D' EXP. | 1.16 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 3.09 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 1665 psi | 8.7 ppg | 1863 psi | 8.7 ppg | | | | |
| FRACTURE PRESSURE | 2871 psi | 14.8 ppg | 2871 psi | 15.0 ppg | | | | |
| ECD | 1933 psi | 10.1 ppg | 2272 psi | 10.2 ppg | | | | |

MUD DATA

| | |
|------------------|----------------|
| TIME | 2300 23 SEP 93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 9.8+ |
| FUNNEL VIS. | 62 |
| PV/YP | 23/25 |
| GELS | 3/5 |
| pH | 9.0 |
| FILT/CAKE API | 3.8/1 |
| HP-HT | 6.8 |
| Pm | .25 |
| PI/Mf | .15/2.9 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 360 |
| OIL/WATER/SOLIDS | 0/8/92 |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|-----------|
| BIT NO. | 6 |
| TYPE | FDT |
| IADC CODE | |
| SIZE | 12.25 |
| JETS | 3X13 1-12 |
| DEPTH OUT | |
| ROT HRS. | 5.9 |
| FOOTAGE | 604 |
| AVG ft/hr | 102 |
| GRADE | |
| HOLE DEV. | .51 |
| COST/FT | |
| RPM | 135 |
| WOB | 15/25 |

HYDRAULIC DATA

| PUMPS | 1. ID-1600 | 2. ID-1600 |
|---------------------|------------|----------------|
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.92 | 4.92 |
| PUMP RATE stks/min | 68 | 67 |
| FLOW RATE gal/min | 334 | 329 |
| PRESSURE psi | | 2775 |
| PD SURF / DS psi | | 83/1145 |
| ANN / BIT psi | | 30/1617 |
| JET VELOCITY ft/sec | | 426 |
| JET IMPACT lbs | | 1452 |
| BIT HP | | 628 |
| HP RATIO / HP/IN2 | | 7.8/in2 |
| REDUCED 1 | | psi at stk/min |
| RATE 2 | | psi at stk/min |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 DP-RISER | 177 | .3644 | 43 | 260 | 65 |
| 5 X 12.415 DP-CSG | 3504 | .1255 | 126 | 322 | 440 |
| 5 X 12.25 DP-HOLE | 128 | .1215 | 130 | 324 | 16 |
| 8 X 12.415 | | | | | |
| 8 X 12.25 DC-HOLE | 476 | .0836 | 189 | 381 | 40 |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .0478 |
| LENGTH-ft | 3082 | 727 | 476 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | 133 |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

WAIT ON WEATHER CONDITIONS TO IMPROVE. RIH WITH: NB 4 AND MWD TOOL. TEST CASING TO 3000 psi. DRILL FLOAT COLLAR, SHOE AND 20' OF FORMATION. LEAKOFF TEST PERFORMED TO 14.8 ppg EQUIVALENT MUD WEIGHT. DRILL AHEAD THRU SAND/SILT TO 4285'.

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 5475
OPERATION DRILL
FOOTAGE 890

No. 16
DATE Sep 25 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | | |
|---------------------------|----------------------------|-----------------------------------|---|-------------------------------|
| AVG GAS (units) <u>85</u> | MAX GAS (units) <u>324</u> | AT DEPTH (feet) <u>5470</u> | SURVEY DATA <u>.19 @ 5400</u> | |
| CONNECTION <u>100</u> | TRIP <u>520</u> | FLOWLINE TEMP <u>82</u> degrees F | LITHOLOGY <u>60% CLAY 20% SLT 20 % SAND</u> | |
| | | | SAMPLE DEPTH <u>5310</u> | |
| | | | TRIP CHLORIDES <u>NA</u> | DRILL RATE ft/hr <u>109</u> |
| | | | LAG DOWN DP <u>735</u> | CORRECTED 'D' EXP. <u>.78</u> |
| | | | LAG OFF BOTTOM <u>6140</u> | SHALE DENSITY g/cc <u>NA</u> |
| | | | | EWR Res. <u>4.00</u> |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | |
|-------------------|-------------|-----|-----------------|-------------|-----|-----------------|--|-----------|--|-----|----|
| PORE PRESSURE | <u>1665</u> | psi | <u>8.7</u> ppg | <u>2533</u> | psi | <u>8.9</u> ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | <u>2871</u> | psi | <u>15</u> ppg | <u>4270</u> | psi | <u>15.0</u> ppg | | psi | | ppg | ft |
| ECD | <u>1971</u> | psi | <u>10.3</u> ppg | <u>2960</u> | psi | <u>10.4</u> ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|-------------------------------------|----------------------|-------------------|--------------------------------------|-------------------|
| TIME <u>2300 24 SEP 93</u> | BIT NO. <u>7</u> | <u>6</u> | PUMPS 1. <u>ID-1600</u> | 2. <u>ID-1600</u> |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>DS40HF</u> | <u>FDT</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>9.8+</u> | IADC CODE | | CAPACITY gal/stk <u>4.92</u> | <u>4.92</u> |
| FUNNEL VIS. <u>62</u> | SIZE <u>12.25</u> | <u>12.25</u> | PUMP RATE stks/min <u>70</u> | <u>70</u> |
| PV/YP <u>29/27</u> | JETS <u>TFA .751</u> | <u>3X13, 1-12</u> | FLOW RATE gal/min <u>344</u> | <u>344</u> |
| GELS <u>3/7</u> | DEPTH OUT | <u>4585</u> | PRESSURE psi <u>2210</u> | |
| pH <u>9.0</u> | ROT HRS. <u>9.0</u> | <u>9.1</u> | PD SURF / DS psi <u>54/1431</u> | |
| FILT/CAKE API <u>3.4/1</u> | FOOTAGE <u>891</u> | <u>880</u> | ANN / BIT psi <u>41/765</u> | |
| HPHT <u>7.8</u> | AVG ft/hr <u>99</u> | <u>96</u> | JET VELOCITY ft/sec <u>293</u> | |
| P _m <u>.5</u> | GRADE | | JET IMPACT lbs <u>1034</u> | |
| Pf/Mf <u>.2/2.8</u> | HOLE DEV. <u>.19</u> | <u>.51</u> | BIT HP <u>307</u> | |
| CHLORIDES ppm <u>17000</u> | COST/FT | <u>379</u> | HP RATIO / HP/IN2 <u>15.9 hp/in2</u> | |
| CALCIUM ppm <u>240</u> | RPM <u>160</u> | <u>131</u> | REDUCED 1 <u>psi at stk/min</u> | |
| OIL/WATER/SOLIDS <u>TR/7.5/92.5</u> | WOB <u>2/3</u> | <u>22</u> | RATE 2 <u>psi at stk/min</u> | |
| DAILY/CUM. COST | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | <u>177</u> | <u>.3644</u> | <u>45</u> | <u>262</u> | <u>65</u> |
| 5 X 12.415 | DP-C&G | <u>3504</u> | <u>.1255</u> | <u>131</u> | <u>333</u> | <u>583</u> |
| 5 X 12.25 | DP-HOLE | <u>1318</u> | <u>.1215</u> | <u>135</u> | <u>326</u> | <u>16</u> |
| 8 X 12.415 | | | | | | |
| 8 X 12.25 | DC-HOLE | <u>476</u> | <u>.0836</u> | <u>196</u> | <u>378</u> | <u>40</u> |
| | | | | | | |
| | | | | | | |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> <u>3681</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> <u>13 3/8</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> <u>.1498</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | <u>.0542</u> | | | <u>.113</u> | <u>.0478</u> <u>.0240</u> |
| LENGTH-ft | <u>4272</u> | <u>727</u> | <u>476</u> | | <u>177</u> | <u>100</u> | <u>812</u> <u>3774</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>147</u> | | | <u>450</u> | <u>133</u> <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 9.8 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

DRILL AHEAD THRU CLY/SILT/SAND TO 4584'. POOH DUE TO SLOW PENETRATION RATES. HOLE PULLED TIGHT FROM 3937 TO SHOE. BACK REAM TO SHOE. RIH W/NB 7 (PDC) AND MWD TOOL. DRILL TO 5475'. ESTIMATED PORE PRESSURE RAISED TO 8.9 ppg AT 4600'.

ADT D. WALTERS

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 6658
OPERATION TRIP
FOOTAGE 1183

NO. 17
DATE Sep 26 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|---|----------------------------|-----------------------------|-----------------------------------|
| AVG GAS (units) <u>60</u> | MAX GAS (units) <u>630</u> | AT DEPTH (feet) <u>6350</u> | SURVEY DATA <u>.78 @ 6628</u> |
| BACKGROUND CONNECTION <u>160</u> | TRIP <u>422</u> | TRIP CHLORIDES <u>NA</u> | LITHOLOGY <u>70% CLAY 30% SLT</u> |
| FLOWLINE TEMP <u> </u> degrees F | LAG DOWN DP <u>915</u> | LAG OFF BOTTOM <u>7250</u> | SAMPLE DEPTH <u>6658</u> |
| | | | DRILL RATE ft/hr <u>60</u> |
| | | | CORRECTED 'D' EXP. <u>.81</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>4.00</u> |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | | |
|-------------------|-------------|-----|-------------|-------------|-------------|-----|-------------|-----------|-------------------|-----|-------------------|-----|-------------------|----|
| PORE PRESSURE | <u>1665</u> | psi | <u>8.7</u> | ppg | <u>3185</u> | psi | <u>9.2</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |
| FRACTURE PRESSURE | <u>2871</u> | psi | <u>15</u> | ppg | <u>5366</u> | psi | <u>15.5</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |
| ECD | <u>2067</u> | psi | <u>10.8</u> | ppg | <u>3739</u> | psi | <u>10.8</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | |
|-----------------------------------|-----------------------------|--|-------------------|
| TIME <u>2300 25 SEP 93</u> | BIT NO. <u>7</u> | PUMPS 1. <u>ID-1600</u> | 2. <u>ID-1600</u> |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>DS40HF</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>10.4</u> | IADC CODE <u> </u> | CAPACITY gal/stk <u>4.92</u> | <u>4.92</u> |
| FUNNEL VIS. <u>64</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u>71</u> | <u>71</u> |
| PV/YP <u>30/41</u> | JETS <u>TFA .751</u> | FLOW RATE gal/min <u>349</u> | <u>349</u> |
| GELS <u>4/8</u> | DEPTH OUT <u> </u> | PRESSURE psi <u>2350</u> | |
| pH <u>9.1</u> | ROT HRS. <u>23.2</u> | PD SURF / DS psi <u>54/1653</u> | |
| FILT/CAKE API <u>3.0/1</u> | FOOTAGE <u>2074</u> | ANN / BIT psi <u>78/804</u> | |
| HP-HT <u>6.6</u> | AVG ft/hr <u>89</u> | JET VELOCITY ft/sec <u>293</u> | |
| Pm <u>.5</u> | GRADE <u> </u> | JET IMPACT lbs <u>1086</u> | |
| Pf/Mf <u>.25/2.9</u> | HOLE DEV. <u>.78</u> | BIT HP <u>323</u> | |
| CHLORIDES ppm <u>17000</u> | COST/FT <u> </u> | HP RATIO / HP/IN2 <u>16.8 hp/in2</u> | |
| CALCIUM ppm <u>200</u> | RPM <u>155</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min | |
| OIL/WATER/SOLIDS <u>0/10/90</u> | WOB <u>4</u> | RATE 2 <u> </u> psi at <u> </u> stk/min | |
| DAILY/CUM. COST <u> </u> | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLS/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLS |
|------------|----------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 5 X 20 | DP-RISER | <u>177</u> | <u>.3644</u> | <u>45</u> | <u>368</u> | <u>65</u> |
| 5 X 12.415 | DP-C&G | <u>3504</u> | <u>.1255</u> | <u>131</u> | <u>439</u> | <u>583</u> |
| 5 X 12.25 | DP-HOLE | <u>2501</u> | <u>.1215</u> | <u>135</u> | <u>441</u> | <u>267</u> |
| 8 X 12.415 | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| 8 X 12.25 | DC-HOLE | <u>476</u> | <u>.0836</u> | <u>196</u> | <u>471</u> | <u>40</u> |
| | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--|--------------|---------------|------------|--------------|--------------|
| | DP | HWDP | | DC | | | | |
| OD-inches | <u>5.0</u> | <u>5.0</u> | | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> |
| CAP-bbbls/ft | <u>.0178</u> | <u>.0087</u> | | <u>.0080</u> | | <u>20</u> | <u>27</u> | <u>18.73</u> |
| DISP-bbbls/ft | <u>.0072</u> | <u>.0181</u> | | <u>.0542</u> | | <u>177</u> | <u>.3887</u> | <u>.3409</u> |
| LENGTH-ft | <u>5455</u> | <u>727</u> | | <u>476</u> | | | <u>.7085</u> | <u>.0478</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | | <u>147</u> | | | <u>.113</u> | <u>.0240</u> |
| | | | | | | | <u>100</u> | <u>812</u> |
| | | | | | | | <u>450</u> | <u>133</u> |
| | | | | | | | | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 10.2 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

DRILL TO 6373' LOOKING FOR CORE POINT. CBU. DRILL TO 6658'. CBU. SHORT TRIP TO SHOE TO CONDITION HOLE. HOLE PULLED TIGHT.

BACKREAM AND PUMP OUT TO SHOE. BIT APPARENTLY BALLING UP WITH CLAY. ESTIMATED PORE PRESSURE RAISED TO 9.2 ppg. CONDENSED

RESISTIVITY PLOT INDICATES INCREASING PORE PRESSURE AT 5000'. MUD WEIGHT RAISED IN STAGES TO 10.4 ppg.

ADT D. WALTERS

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES

A Baroid Company

DEPTH 7036
OPERATION W.O.W.
FOOTAGE 387

NO. 18
DATE Sep 27 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | .57 @ 6911 |
| BACKGROUND | 85 | 220 | LITHOLOGY | 40% CLAY 60% SLT |
| CONNECTION | 100 | 240 | SAMPLE DEPTH | 7036 |
| TRIP | 365 | 6658 | TRIP CHLORIDES | NA |
| FLOWLINE TEMP | | | LAG DOWN DP | 994 |
| | | | LAG OFF BOTTOM | 7810 |
| | | | DRILL RATE ft/hr | 60 |
| | | | CORRECTED 'D' EXP. | .81 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 4.00 |

FORMATION PRESSURE DATA

| CASING | BOTTOM HOLE | OPEN HOLE | |
|-------------------|-------------------|-------------------|--|
| PORE PRESSURE | 1665 psi 8.7 ppg | 3366 psi 9.2 ppg | |
| FRACTURE PRESSURE | 2832 psi 14.8 ppg | 5671 psi 15.5 ppg | |
| ECD | 2048 psi 10.7 ppg | 3914 psi 10.7 ppg | |

MUD DATA

| | |
|------------------|----------------|
| TIME | 2300 26 SEP 93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 10.5 |
| FUNNEL VIS. | 57 |
| PV/YP | 25/29 |
| GELS | 4/8 |
| pH | 9.2 |
| FILT/CAKE API | 2.8/1 |
| HP-HT | 6.6 |
| Pm | .6 |
| Pf/Mf | .3/2.0 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 320 |
| OIL/WATER/SOLIDS | 0/10/90 |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|----------|
| BIT NO. | 7 |
| TYPE | DS40HF |
| IADC CODE | |
| SIZE | 12.25 |
| JETS | TFA .751 |
| DEPTH OUT | |
| ROT HRS. | 28.8 |
| FOOTAGE | 2455 |
| AVG ft/hr | 85 |
| GRADE | |
| HOLE DEV. | .57 |
| COST/FT | |
| RPM | 171 |
| WOB | 5 |

HYDRAULIC DATA

| | | |
|---------------------|----------------|------------|
| PUMPS | 1. ID-1600 | 2. ID-1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.92 | 4.92 |
| PUMP RATE stks/min | 71 | 71 |
| FLOW RATE gal/min | 349 | 349 |
| PRESSURE psi | 2650 | |
| PD SURF / DS psi | 54/1654 | |
| ANN / BIT psi | 56/812 | |
| JET VELOCITY ft/sec | 293 | |
| JET IMPACT lbs | 1096 | |
| BIT HP | 326 | |
| HP RATIO / HP/IN2 | 19.2 hp/in2 | |
| REDUCED 1 | psi at stk/min | |
| RATE 2 | psi at stk/min | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 DP-RISER | 177 | .3644 | 45 | 280 | 65 |
| 5 X 12.415 DP-C&G | 3504 | .1255 | 131 | 344 | 583 |
| 5 X 12.25 DP-HOLE | 2879 | .1215 | 135 | 346 | 206 |
| 8 X 12.415 | | | | | |
| 8 X 12.25 DC-HOLE | 476 | .0836 | 196 | 377 | 40 |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .0478 |
| LENGTH-ft | 5842 | 727 | 476 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | 133 |

REMARKS AND RECOMMENDATIONS

MW 10.2 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

TRIP IN HOLE AFTER SHORT TRIP. TRIP GAS=365. DRILL AHEAD TO 7036' LOOKING FOR CORE POINT. WEATHER DETERIORATING. POOH TO SHOE AND HANG OFF. WAIT ON WEATHER. RAISED MW TO 10.5 ppg.

ADT D. WALTERS

sperry-sun LOGGING SYSTEMS

DRILLING SERVICES
A Baroid Company

DEPTH 7518
OPERATION DRILL
FOOTAGE 482

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 19
DATE Sep 28 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------|-----------------|-----------------|--------------------|---------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 1.09 @ 7384 |
| 47 | 100 | 7518 | LITHOLOGY | 20% CLAY 70% SLT 10% SAND |
| 75 | 135 | 7415 | SAMPLE DEPTH | 7330 |
| 876 | | 7036 | TRIP CHLORIDES | NA |
| 77 | | | LAG DOWN DP | 1042 |
| | | | LAG OFF BOTTOM | 8333 |
| | | | DRILL RATE ft/hr | 187 |
| | | | CORRECTED 'D' EXP. | .80 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 4.00 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 1665 psi | 8.7 ppg | 3675 psi | 9.4 ppg | | | | |
| FRACTURE PRESSURE | 2832 psi | 14.8 ppg | 5671 psi | 15.5 ppg | | | | |
| ECD | 2208 psi | 11.0 ppg | 4300 psi | 11.0 ppg | | | | |

MUD DATA

| | |
|------------------|----------------|
| TIME | 2300 27 SEP 93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 10.5 |
| FUNNEL VIS. | 60 |
| PV/YP | 25/30 |
| GELS | 3/8 |
| pH | 9.2 |
| FILT/CAKE API | 2.8/1 |
| HP-HT | 8.0 |
| Pm | .6 |
| Pf/Mf | .3/2.0 |
| CHLORIDES ppm | 17000 |
| CALCIUM ppm | 280 |
| OIL/WATER/SOLIDS | 0/10.5/89.5 |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|----------|
| BIT NO. | 7 |
| TYPE | DS40HF |
| IADC CODE | |
| SIZE | 12.25 |
| JETS | TFA .751 |
| DEPTH OUT | |
| ROT HRS. | 32.5 |
| FOOTAGE | 2934 |
| AVG ft/hr | 90 |
| GRADE | |
| HOLE DEV. | 1.08 |
| COST/FT | |
| RPM | 170 |
| WOB | 6 |

HYDRAULIC DATA

| | | |
|---------------------|------------|----------------|
| PUMPS | 1. ID-1600 | 2. ID-1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.92 | 4.92 |
| PUMP RATE stks/min | 74 | 71 |
| FLOW RATE gal/min | 364 | 349 |
| PRESSURE psi | | 2670 |
| PD SURF / DS psi | | 54/1847 |
| ANN / BIT psi | | 64/881 |
| JET VELOCITY ft/sec | | 306 |
| JET IMPACT lbs | | 1191 |
| BIT HP | | 369 |
| HP RATIO / HP/IN2 | | 19.2 hp/in2 |
| REDUCED 1 | | psi at stk/min |
| RATE 2 | | psi at stk/min |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 47 | 290 | 65 |
| 5 X 12.415 | DP-C&G | 3504 | .1255 | 136 | 353 | 583 |
| 5 X 12.25 | DP-HOLE | 3361 | .1215 | 141 | 355 | 265 |
| 8 X 12.415 | | | | | | |
| 8 X 12.25 | DC-HOLE | 476 | .0836 | 204 | 385 | 40 |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .0478 |
| LENGTH-ft | 6315 | 727 | 476 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | 133 |

REMARKS AND RECOMMENDATIONS

MW 10.4 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

WAIT ON WEATHER. RUN BACK IN HOLE FROM SHOE. SHORT TRIP GAS-876. DRILL AHEAD THRU SILTSTONE/CLAY/SAND TO 7518'.

CONDENSED RESISTIVITY PLOT INDICATES PORE PRESSURE INCREASING. RAISED ESTIMATED PORE PRESSURE TO 9.4 ppg.

HOLE OCCASIONALLY PACKING OFF. CONTINUE DRILLING LOOKING FOR CORE POINT.

ADT D. WALTERS

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 8000
OPERATION E LOG
FOOTAGE 482

NO. 20
DATE Sep 29 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|---------------------------|----------------------------|-----------------------------------|--|
| AVG GAS (units) <u>55</u> | MAX GAS (units) <u>100</u> | AT DEPTH (feet) <u>8000</u> | SURVEY DATA <u>2.18 @ 7951</u> |
| CONNECTION <u>75</u> | TRIP <u>525</u> | FLOWLINE TEMP <u>79</u> degrees F | LITHOLOGY <u>20% CLAY 70% SLT 10% SAND</u> |
| | | | SAMPLE DEPTH <u>8000</u> |
| | | | TRIP CHLORIDES <u>NA</u> |
| | | | LAG DOWN DP <u> </u> |
| | | | LAG OFF BOTTOM <u> </u> |
| | | | DRILL RATE ft/hr <u>111</u> |
| | | | CORRECTED 'D' EXP. <u>.78</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>4.73</u> |

FORMATION PRESSURE DATA

| CASING | BOTTOM HOLE | OPEN HOLE |
|---|---------------------------------|--|
| PORE PRESSURE <u>1665</u> psi <u>8.7</u> ppg | <u>4035</u> psi <u>9.7</u> ppg | <u> </u> psi <u> </u> ppg <u> </u> ft |
| FRACTURE PRESSURE <u>2832</u> psi <u>14.8</u> ppg | <u>5671</u> psi <u>15.5</u> ppg | <u> </u> psi <u> </u> ppg <u> </u> ft |
| ECD <u>2124</u> psi <u>11.1</u> ppg | <u>4617</u> psi <u>11.1</u> ppg | <u> </u> psi <u> </u> ppg <u> </u> ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | |
|-----------------------------------|-----------------------------|--|
| TIME <u>2300 28 SEP 93</u> | BIT NO. <u>7</u> | PUMPS 1. <u>ID-1600</u> 2. <u>ID-1600</u> |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>DS40HF</u> | SIZE inches <u>6.5X12</u> <u>6.5X12</u> |
| WEIGHT IN <u>10.6</u> | IADC CODE <u> </u> | CAPACITY gal/stk <u>4.92</u> <u>4.92</u> |
| FUNNEL VIS. <u>6080</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u>74</u> <u>71</u> |
| PV/YP <u>31/43</u> | JETS <u>TFA .751</u> | FLOW RATE gal/min <u>364</u> <u>349</u> |
| GELS <u>4/9</u> | DEPTH OUT <u>8000</u> | PRESSURE psi <u>3100</u> |
| pH <u>9.1</u> | ROT HRS. <u>36.5</u> | PD SURF / DS psi <u>58/2029</u> |
| FILT/CAKE API <u>3.0/1</u> | FOOTAGE <u>2934</u> | ANN / BIT psi <u>99/898</u> |
| HP-HT <u>7.6</u> | AVG ft/hr <u>90</u> | JET VELOCITY ft/sec <u>306</u> |
| Pm <u>.6</u> | GRADE <u> </u> | JET IMPACT lbs <u>1213</u> |
| Pf/Mf <u>.2/2.0</u> | HOLE DEV. <u>1.08</u> | BIT HP <u>376</u> |
| CHLORIDES ppm <u>17000</u> | COST/FT <u>317</u> | HP RATIO / HP/IN2 <u>19.54 hp/in2</u> |
| CALCIUM ppm <u>320</u> | RPM <u>172</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min |
| OIL/WATER/SOLIDS <u>0/11/89</u> | WOB <u>66.4</u> | RATE 2 <u> </u> psi at <u> </u> stk/min |
| DAILY/CUM. COST <u> </u> | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 5 X 20 DP-RISER | <u>177</u> | <u>.3644</u> | <u>47</u> | <u>374</u> | <u>65</u> |
| 5 X 12.415 DP-CSG | <u>3504</u> | <u>.1255</u> | <u>136</u> | <u>445</u> | <u>583</u> |
| 5 X 12.25 DP-HOLE | <u>3843</u> | <u>.1215</u> | <u>141</u> | <u>447</u> | <u>454</u> |
| 8 X 12.415 | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| 8 X 12.25 DC-HOLE | <u>476</u> | <u>.0836</u> | <u>204</u> | <u>477</u> | <u>40</u> |
| | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--------------|---------------|--------------|--------------|---------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | <u>.0542</u> | | | <u>.113</u> | <u>.0478</u> |
| LENGTH-ft | <u>6797</u> | <u>727</u> | <u>476</u> | | <u>177</u> | <u>100</u> | <u>812</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>147</u> | | | <u>450</u> | <u>133</u> |
| | | | | | | | <u>3681</u> |
| | | | | | | | <u>13 3/8</u> |
| | | | | | | | <u>12.415</u> |
| | | | | | | | <u>.1498</u> |
| | | | | | | | <u>.0240</u> |
| | | | | | | | <u>3774</u> |
| | | | | | | | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

DRILL AHEAD THRU SILTSTONE/CLAY/SAND TO 8000' TD. SHORT TRIP TO SHOE. HOLE PULLED TIGHT FROM BOTTOM TO 6120'. RIH. SHORT TRIP

GAS=525. CBU PUMPING SWEEPS TO CLEAN HOLE FOR LOGGING OPS. POOH. COMMENCE E LOGGING. CONDENSED RESISTIVITY PLOT

INCREASING PORE PRESSURE FROM 4700' TO 6100' AND 6800' TO 7800'. ESTIMATED PORE PRESSURE RAISED TO 9.7 ppg AT 7500'. MUD

WEIGHT RAISED TO 10.7 ppg.

ADT D. WALTERS

sperry-sun DRILLING SERVICES LOGGING SYSTEMS

DEPTH 8000
OPERATION TRIP
FOOTAGE

A Baroid Company

NO. 21
DATE Sep 30 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY MORNING REPORT

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|-----------------------|-----------------|-----------------|--------------------|---------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 2.18 @ 7951 |
| | | | LITHOLOGY | 20% CLAY 70% SLT 10% SAND |
| BACKGROUND CONNECTION | | | SAMPLE DEPTH | 8000 |
| TRIP | 181 | 8000 | TRIP CHLORIDES | NA |
| FLOWLINE TEMP | | degrees F | LAG DOWN DP | |
| | | | LAG OFF BOTTOM | |
| | | | DRILL RATE ft/hr | |
| | | | CORRECTED 'D' EXP. | ..78 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 4.73 |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|------|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 1665 | psi | 8.7 | ppg | 4035 | psi | 9.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 2832 | psi | 14.8 | ppg | 5671 | psi | 15.5 | ppg | | psi | | ppg | ft |
| ECD | 2124 | psi | 11.1 | ppg | 4617 | psi | 11.1 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------|----------------|-----------|----------|---------------------|------------|----------------|
| TIME | 2300 29 SEP 93 | BIT NO. | 7 | PUMPS | 1. ID-1600 | 2. ID-1600 |
| TYPE | PHPA-SEA WATER | TYPE | DS40HF | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 10.7 | IADC CODE | | CAPACITY gal/stk | 4.92 | 4.92 |
| FUNNEL VIS. | 62 | SIZE | 12.25 | PUMP RATE stks/min | | |
| PV/YP | 30/42 | JETS | TFA .751 | FLOW RATE gal/min | | |
| GELS | 7/16 | DEPTH OUT | 8000 | PRESSURE psi | STATIC | |
| pH | 9.0 | ROT HRS. | 36.5 | PD SURF / DS psi | | |
| FILT/CAKE API | 3.0/1 | FOOTAGE | 2934 | ANN / BIT psi | | |
| HP-HT | 7.8 | AVG ft/hr | 90 | JET VELOCITY ft/sec | | |
| Pm | .4 | GRADE | | JET IMPACT lbs | | |
| Pf/Mf | .15/1.9 | HOLE DEV. | 1.08 | BIT HP | | |
| CHLORIDES ppm | 17000 | COST/FT | 317 | HP RATIO / HP/IN2 | | |
| CALCIUM ppm | 360 | RPM | 172 | REDUCED 1 | | psi at stk/min |
| OIL/WATER/SOLIDS | 0/11.5/88.5 | WOB | 66.4 | RATE 2 | | psi at stk/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | 177 | .3644 | 47 | 374 | 65 |
| 5 X 12.415 | DP-CSG | 3504 | .1255 | 136 | 445 | 583 |
| 5 X 12.25 | DP-HOLE | 3843 | .1215 | 141 | 447 | 454 |
| 8 X 12.415 | | | | | | |
| 8 X 12.25 | DC-HOLE | 476 | .0836 | 204 | 477 | 40 |
| | | | | | | |
| | | | | | | |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|--------------|-------|-------|-------|---------------|-------|-------|-------|
| OD-inches | DP | HWDP | DC | | | | |
| 5.0 | 5.0 | | 8.0 | | 21 | 309 | 1022 |
| 4.276 | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| .0178 | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| .0072 | .0072 | .0181 | .0542 | | | .113 | .0478 |
| 6797 | 6797 | 727 | 476 | | 177 | 100 | 812 |
| 19.5 | 19.5 | 49 | 147 | | | 450 | 133 |
| | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

LOGGING TOOL WOULD NOT PENETRATE PAST CASING SHOE. RIH TO 2350'. WASH AND REAM CASING FROM 2350 TO 3760'. MAX GAS=80.

POOH FOR LOGGING RUN. LOGGING TOOL WOULD NOT GO TO BOTTOM. RIH. WASH AND REAM FROM 6500' TO 6782'. RUN TO BOTTOM. CBU

TRIP GAS=181. POOH. BACKREAM FROM 6400' TO 6120'. CBU AT SHOE. POOH.

ADT D. WALTERS

sperry-sun LOGGING SYSTEMS

DEPTH 8000
OPERATION W.O.W
FOOTAGE

DRILLING SERVICES
A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

NO. 22
DATE Oct 1 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|----------------------------|-----------------|-----------------|--------------------|---------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 2.18 @ 7951 |
| | | | LITHOLOGY | 20% CLAY 70% SLT 10% SAND |
| BACKGROUND CONNECTION TRIP | | | SAMPLE DEPTH | 8000 |
| | | | TRIP CHLORIDES | NA |
| FLOWLINE TEMP | | degrees F | LAG DOWN DP | |
| | | | LAG OFF BOTTOM | |
| | | | DRILL RATE ft/hr | |
| | | | CORRECTED 'D' EXP. | .78 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 4.73 |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|----------|----------|-------------|----------|--|-----------|--|--|
| PORE PRESSURE | 1665 psi | 8.7 ppg | 4035 psi | 9.7 ppg | | | | |
| FRACTURE PRESSURE | 2832 psi | 14.8 ppg | 5671 psi | 15.5 ppg | | | | |
| ECD | 2124 psi | 11.1 ppg | 4617 psi | 11.1 ppg | | | | |

MUD DATA

| | |
|------------------|----------------|
| TIME | 2300 30 SEP 93 |
| TYPE | PHPA-SEA WATER |
| WEIGHT IN | 10.7 |
| FUNNEL VIS. | 65 |
| PV/YP | 28/40 |
| GELS | 5/14 |
| pH | 9.0 |
| FILT/CAKE API | 3.0/1 |
| HP-HT | 8.0 |
| Pm | .3 |
| Pf/Mf | .15/2.0 |
| CHLORIDES ppm | 17500 |
| CALCIUM ppm | 360 |
| OIL/WATER/SOLIDS | 0/11.5/88.5 |
| DAILY/CUM. COST | |

BIT DATA

| | |
|-----------|----------|
| BIT NO. | 7 |
| TYPE | DS40HF |
| IADC CODE | |
| SIZE | 12.25 |
| JETS | TFA .751 |
| DEPTH OUT | 8000 |
| ROT HRS. | 36.5 |
| FOOTAGE | 2934 |
| AVG ft/hr | 90 |
| GRADE | |
| HOLE DEV. | 1.08 |
| COST/FT | 317 |
| RPM | 172 |
| WOB | 66.4 |

HYDRAULIC DATA

| | | |
|---------------------|------------|------------|
| PUMPS | 1. ID-1600 | 2. ID-1600 |
| SIZE inches | 6.5X12 | 6.5X12 |
| CAPACITY gal/stk | 4.92 | 4.92 |
| PUMP RATE stks/min | | |
| FLOW RATE gal/min | | |
| PRESSURE psi | STATIC | |
| PD SURF / DS psi | | |
| ANN / BIT psi | | |
| JET VELOCITY ft/sec | | |
| JET IMPACT lbs | | |
| BIT HP | | |
| HP RATIO / HP/IN2 | | |
| REDUCED 1 | psi at | stk/min |
| RATE 2 | psi at | stk/min |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBL/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBL/ |
|-------------------|--------------|----------------|-----------------|-----------------|--------------|
| 5 X 20 DP-RISER | 177 | .3644 | | | 65 |
| 5 X 12.415 DP-C&G | 3504 | .1255 | | | 583 |
| 5 X 12.25 DP-HOLE | 3843 | .1215 | | | 454 |
| 8 X 12.415 | | | | | |
| 8 X 12.25 DC-HOLE | 476 | .0836 | | | 40 |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|--------|
| OD-inches | 5.0 | 5.0 | 8.0 | | 21 | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | | 20 | 30 | 20 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | | .3887 | .7085 | .3409 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | | | .113 | .0478 |
| LENGTH-ft | 6797 | 727 | 476 | | 177 | 100 | 812 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | | | 450 | 133 |
| | | | | | | | 3681 |
| | | | | | | | 13 3/8 |
| | | | | | | | 12.415 |
| | | | | | | | .1498 |
| | | | | | | | .0240 |
| | | | | | | | 3774 |
| | | | | | | | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

E LOG. WEATHER DETERIORATING. HANG OFF. WAIT ON WEATHER.

ADT D. WALTERS

sperry-sun

DRILLING SERVICES LOGGING SYSTEMS

DEPTH 8000
OPERATION E LOG
FOOTAGE

A Baroid Company

APPLIED DRILLING TECHNOLOGY

MORNING REPORT

NO. 23
DATE Oct 2 93
TIME 04 00

| | | | | | |
|------------|-------------------|-----------|-----------|-------------|----------------|
| OPERATOR | ARCO ALASKA, INC. | WELL NAME | KUVLUM #3 | FIELD/BLOCK | NR 6-4 BLK 673 |
| CONTRACTOR | CANMAR | RIG NAME | KULLUK | AREA | BEAUFORT SEA |
| START DATE | Sep 9 93 | LOC. | OFFSHORE | STATE | ALASKA |

LOGGING DATA

| | | | | |
|----------------------------|-----------------|-----------------|--------------------|---------------------------|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA | 2.18 @ 7951 |
| | | | LITHOLOGY | 20% CLAY 70% SLT 10% SAND |
| BACKGROUND CONNECTION TRIP | | | SAMPLE DEPTH | 8000 |
| | | | TRIP CHLORIDES | NA |
| FLOWLINE TEMP | | degrees F | LAG DOWN DP | |
| | | | LAG OFF BOTTOM | |
| | | | DRILL RATE ft/hr | |
| | | | CORRECTED 'D' EXP. | .78 |
| | | | SHALE DENSITY g/cc | NA |
| | | | EWR Res. | 4.73 |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | |
|-------------------|------|-----|------|-------------|------|-----|------|-----------|--|-----|--|-----|----|
| PORE PRESSURE | 1665 | psi | 8.7 | ppg | 4035 | psi | 9.7 | ppg | | psi | | ppg | ft |
| FRACTURE PRESSURE | 2832 | psi | 14.8 | ppg | 5671 | psi | 15.5 | ppg | | psi | | ppg | ft |
| ECD | 2124 | psi | 11.1 | ppg | 4617 | psi | 11.1 | ppg | | psi | | ppg | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | | | |
|------------------|----------------|-----------|----------|---------------------|------------|------------|
| TIME | 2300 1 OCT 93 | BIT NO. | 7 | PUMPS | 1. ID-1600 | 2. ID-1600 |
| TYPE | PHPA-SEA WATER | TYPE | DS40HF | SIZE inches | 6.5X12 | 6.5X12 |
| WEIGHT IN | 10.7 | IADC CODE | | CAPACITY gal/stk | 4.92 | 4.92 |
| FUNNEL VIS. | 81 | SIZE | 12.25 | PUMP RATE stks/min | | |
| PV/YP | 25/33 | JETS | TFA .751 | FLOW RATE gal/min | | |
| GELS | 4/9 | DEPTH OUT | 8000 | PRESSURE psi | STATIC | |
| pH | 9.0 | ROT HRS. | 36.5 | PD SURF / DS psi | | |
| FILT/CAKE API | 2.6/1 | FOOTAGE | 2934 | ANN / BIT psi | | |
| HP-HT | 8.2 | AVG ft/hr | 90 | JET VELOCITY ft/sec | | |
| Pm | .3 | GRADE | | JET IMPACT lbs | | |
| PI/Mf | .15/1.7 | HOLE DEV. | 1.08 | BIT HP | | |
| CHLORIDES ppm | 17800 | COST/FT | 317 | HP RATIO / HP/IN2 | | |
| CALCIUM ppm | 320 | RPM | 172 | REDUCED 1 | psi at | stk/min |
| OIL/WATER/SOLIDS | 0/11.5/88.5 | WOB | 66.4 | RATE 2 | psi at | stk/min |
| DAILY/CUM. COST | | | | | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|-------------------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 DP-RISER | 177 | .3644 | | | 65 |
| 5 X 12.415 DP-CSG | 3504 | .1255 | | | 583 |
| 5 X 12.25 DP-HOLE | 3843 | .1215 | | | 454 |
| 8 X 12.415 | | | | | |
| 8 X 12.25 DC-HOLE | 476 | .0836 | | | 40 |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|-------|-------|-------|---------------|-------|-------|--------|
| DP | HWDP | DC | | | | | |
| OD-inches | 5.0 | 5.0 | 8.0 | | | 309 | 1022 |
| ID-inches | 4.276 | 3.0 | 2.875 | 21 | 30 | 20 | 13 3/8 |
| CAP-bbls/ft | .0178 | .0087 | .0080 | 20 | 27 | 18.73 | 12.415 |
| DISP-bbls/ft | .0072 | .0181 | .0542 | .3887 | .7085 | .3409 | .1498 |
| LENGTH-ft | 6797 | 727 | 476 | | .113 | .0478 | .0240 |
| WEIGHT-lbs/ft | 19.5 | 49 | 147 | 177 | 100 | 812 | 3774 |
| | | | | | 450 | 133 | 68 |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

WAIT ON WEATHER. LATCH UP. CONTINUE E LOGGING.

ADT D. WALTERS

sperry-sun **LOGGING SYSTEMS**

DRILLING SERVICES

A Baroid Company

APPLIED DRILLING TECHNOLOGY MORNING REPORT

DEPTH 8000
OPERATION E LOG
FOOTAGE

NO. 24
DATE Oct 3 93
TIME 04 00

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|---|-----------------|-----------------|--|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA <u>2.18 @ 7951</u> |
| | | | LITHOLOGY <u>20% CLAY 70% SLT 10% SAND</u> |
| BACKGROUND CONNECTION TRIP | | | SAMPLE DEPTH <u>8000</u> |
| FLOWLINE TEMP <u> </u> degrees F | | | TRIP CHLORIDES <u>NA</u> |
| | | | LAG DOWN DP <u> </u> |
| | | | LAG OFF BOTTOM <u> </u> |
| | | | DRILL RATE ft/hr <u> </u> |
| | | | CORRECTED 'D' EXP. <u>.78</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>4.73</u> |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | | |
|-------------------|-------------|-----|-------------|-------------|-------------|-----|-------------|-----------|-------------------|-----|-------------------|-----|-------------------|----|
| PORE PRESSURE | <u>1665</u> | psi | <u>8.7</u> | ppg | <u>4035</u> | psi | <u>9.7</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |
| FRACTURE PRESSURE | <u>2832</u> | psi | <u>14.8</u> | ppg | <u>5671</u> | psi | <u>15.5</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |
| ECD | <u>2124</u> | psi | <u>11.1</u> | ppg | <u>4617</u> | psi | <u>11.1</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | |
|-------------------------------------|-----------------------------|---------------------------------------|----------------------------------|
| TIME <u>2300 2 OCT 93</u> | BIT NO. <u>7</u> | PUMPS 1. <u>ID-1600</u> | 2. <u>ID-1600</u> |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>DS40HF</u> | SIZE inches <u>6.5X12</u> | <u>6.5X12</u> |
| WEIGHT IN <u>10.5</u> | IADC CODE <u> </u> | CAPACITY gal/stk <u>4.92</u> | <u>4.92</u> |
| FUNNEL VIS. <u>59</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u> </u> | <u> </u> |
| PV/YP <u>20/24</u> | JETS <u>TFA .751</u> | FLOW RATE gal/min <u> </u> | <u> </u> |
| GELS <u>3/6</u> | DEPTH OUT <u>8000</u> | PRESSURE psi <u> </u> | <u>STATIC</u> |
| pH <u>9.1</u> | ROT HRS. <u>36.5</u> | PD SURF / DS psi <u> </u> | <u> </u> |
| FILT/CAKE API <u>3.2/1</u> | FOOTAGE <u>2934</u> | ANN / BIT psi <u> </u> | <u> </u> |
| HP-HT <u>8.2</u> | AVG ft/hr <u>90</u> | JET VELOCITY ft/sec <u> </u> | <u> </u> |
| Pm <u>.3</u> | GRADE <u> </u> | JET IMPACT lbs <u> </u> | <u> </u> |
| PI/Mf <u>.15/1.6</u> | HOLE DEV. <u>1.08</u> | BIT HP <u> </u> | <u> </u> |
| CHLORIDES ppm <u>18000</u> | COST/FT <u>317</u> | HP RATIO / HP/IN2 <u> </u> | <u> </u> |
| CALCIUM ppm <u>320</u> | RPM <u>172</u> | REDUCED 1 <u> </u> | psi at <u> </u> stk/min |
| OIL/WATER/SOLIDS <u>0/10.5/89.5</u> | WOB <u>66.4</u> | RATE 2 <u> </u> | psi at <u> </u> stk/min |
| DAILY/CUM. COST <u> </u> | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 5 X 20 | DP-RISER | <u>177</u> | <u>.3644</u> | <u> </u> | <u> </u> | <u>65</u> |
| 5 X 12.415 | DP-CSG | <u>3504</u> | <u>.1255</u> | <u> </u> | <u> </u> | <u>583</u> |
| 5 X 12.25 | DP-HOLE | <u>3843</u> | <u>.1215</u> | <u> </u> | <u> </u> | <u>454</u> |
| 8 X 12.415 | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| 8 X 12.25 | DC-HOLE | <u>476</u> | <u>.0836</u> | <u> </u> | <u> </u> | <u>40</u> |
| | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| | | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |

PIPE DATA

| | DP | HWDP | DC | CASING: DEPTH | RISER | COND. | SURF. | |
|---------------|--------------|--------------|--------------|-------------------|-------------------|--------------|--------------|---------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | <u>8.0</u> | <u> </u> | <u>21</u> | <u>309</u> | <u>1022</u> | <u>3681</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | <u>2.875</u> | <u> </u> | <u>20</u> | <u>30</u> | <u>20</u> | <u>13 3/8</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | <u>.0080</u> | <u> </u> | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> | <u>.1498</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | <u>.0542</u> | <u> </u> | <u> </u> | <u>.113</u> | <u>.0478</u> | <u>.0240</u> |
| LENGTH-ft | <u>6797</u> | <u>727</u> | <u>476</u> | <u> </u> | <u>177</u> | <u>100</u> | <u>812</u> | <u>3774</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | <u>147</u> | <u> </u> | <u> </u> | <u>450</u> | <u>133</u> | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

WAIT ON WEATHER. LATCH UP. CONTINUE E LOGGING. SUSPEND E LOGGING. HANG OFF. LATCH UP. CONTINUE E LOGGING. TIH FOR CLEANOUT RUN.

ADT D. WALTERS

sperry-sun *LOGGING SYSTEMS*

DRILLING SERVICES
A Baroid Company

DEPTH 8000
OPERATION E LOG
FOOTAGE

APPLIED DRILLING TECHNOLOGY MORNING REPORT

No. 25
DATE Oct 4 93
TIME 04 00

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|---|-----------------|-----------------|--|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA <u>2.18 @ 7951</u> |
| | | | LITHOLOGY <u>20% CLAY 70% SLT 10% SAND</u> |
| BACKGROUND | | | SAMPLE DEPTH <u>8000</u> |
| CONNECTION | | | TRIP CHLORIDES <u>NA</u> |
| TRIP | <u>517</u> | <u>8000</u> | LAG DOWN DP <u> </u> |
| FLOWLINE TEMP <u> </u> degrees F | | | LAG OFF BOTTOM <u> </u> |
| | | | DRILL RATE ft/hr <u> </u> |
| | | | CORRECTED "D" EXP. <u>.78</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>4.73</u> |

FORMATION PRESSURE DATA

| CASING | | | BOTTOM HOLE | | | OPEN HOLE | | |
|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------------|-----------------------|----------------------|--|
| PORE PRESSURE | <u>1665</u> psi | <u>8.7</u> ppg | <u>4035</u> psi | <u>9.7</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | |
| FRACTURE PRESSURE | <u>2832</u> psi | <u>14.8</u> ppg | <u>5671</u> psi | <u>15.5</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | |
| ECD | <u>2124</u> psi | <u>11.1</u> ppg | <u>4617</u> psi | <u>11.1</u> ppg | <u> </u> psi | <u> </u> ppg | <u> </u> ft | |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | |
|-------------------------------------|-----------------------------|--|
| TIME <u>2300 3 OCT 93</u> | BIT NO. <u>7</u> | PUMPS 1. <u>ID-1600</u> 2. <u>ID-1600</u> |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>D\$40HF</u> | SIZE inches <u>6.5X12</u> <u>6.5X12</u> |
| WEIGHT IN <u>10.5</u> | IADC CODE <u> </u> | CAPACITY gal/stk <u>4.92</u> <u>4.92</u> |
| FUNNEL VIS. <u>61</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u> </u> |
| PV/YP <u>19/24</u> | JETS <u>TFA .751</u> | FLOW RATE gal/min <u> </u> |
| GELS <u>3/6</u> | DEPTH OUT <u>8000</u> | PRESSURE psi <u> </u> <u>STATIC</u> |
| pH <u>9.1</u> | ROT HRS. <u>36.5</u> | PD SURF / DS psi <u> </u> |
| FILT/CAKE API <u>3.2/1</u> | FOOTAGE <u>2934</u> | ANN / BIT psi <u> </u> |
| HP-HT <u>8.2</u> | AVG ft/hr <u>90</u> | JET VELOCITY ft/sec <u> </u> |
| Pm <u>.3</u> | GRADE <u> </u> | JET IMPACT lbs <u> </u> |
| Pf/Mf <u>.15/1.5</u> | HOLE DEV. <u>1.08</u> | BIT HP <u> </u> |
| CHLORIDES ppm <u>18000</u> | COST/FT <u>317</u> | HP RATIO / HP/IN2 <u> </u> |
| CALCIUM ppm <u>360</u> | RPM <u>172</u> | REDUCED 1 <u> </u> psi at <u> </u> stk/min |
| OIL/WATER/SOLIDS <u>0/10.5/89.5</u> | WOB <u>66.4</u> | RATE 2 <u> </u> psi at <u> </u> stk/min |
| DAILY/CUM. COST <u> </u> | | |

ANNULAR DATA

| | LENGTH - FT. | VOLUME BBL\$/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBL\$ |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 5 X 20 DP-RISER | <u>177</u> | <u>.3644</u> | <u> </u> | <u> </u> | <u>65</u> |
| 5 X 12.415 DP-CSG | <u>3504</u> | <u>.1255</u> | <u> </u> | <u> </u> | <u>583</u> |
| 5 X 12.25 DP-HOLE | <u>3843</u> | <u>.1215</u> | <u> </u> | <u> </u> | <u>454</u> |
| 8 X 12.415 | <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| 8 X 12.25 DC-HOLE | <u>476</u> | <u>.0836</u> | <u> </u> | <u> </u> | <u>40</u> |

PIPE DATA

| DRILL STRING | | | | CASING: DEPTH | RISER | COND. | SURF. | |
|--------------|--------------|-------------------|--------------|-------------------|--------------|--------------|---------------|--|
| OD-inches | DP | HWDP | DC | | | | | |
| <u>5.0</u> | <u>5.0</u> | <u> </u> | <u>8.0</u> | <u>21</u> | <u>309</u> | <u>1022</u> | <u>3681</u> | |
| <u>4.276</u> | <u>3.0</u> | <u> </u> | <u>2.875</u> | <u>20</u> | <u>30</u> | <u>20</u> | <u>13 3/8</u> | |
| <u>.0178</u> | <u>.0087</u> | <u> </u> | <u>.0080</u> | <u>.3887</u> | <u>.7085</u> | <u>.3409</u> | <u>.1498</u> | |
| <u>.0072</u> | <u>.0181</u> | <u> </u> | <u>.0542</u> | <u> </u> | <u>.113</u> | <u>.0478</u> | <u>.0240</u> | |
| <u>6797</u> | <u>727</u> | <u> </u> | <u>476</u> | <u>177</u> | <u>100</u> | <u>812</u> | <u>3774</u> | |
| <u>19.5</u> | <u>49</u> | <u> </u> | <u>147</u> | <u> </u> | <u>450</u> | <u>133</u> | <u>68</u> | |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

RIH FOR CLEAN OUT RUN. PUMP SWEEP. CBU. TRIP GAS=517. POOH. E LOG

ADT D. WALTERS

sperry-sun
DRILLING SERVICES LOGGING SYSTEMS
A Baroid Company

DEPTH 8000
OPERATION E LOG
FOOTAGE

NO. 26
DATE Oct 5 93
TIME 04 00

APPLIED DRILLING TECHNOLOGY
MORNING REPORT

| | | |
|-----------------------------------|----------------------------|-----------------------------------|
| OPERATOR <u>ARCO ALASKA, INC.</u> | WELL NAME <u>KUVLUM #3</u> | FIELD/BLOCK <u>NR 6-4 BLK 673</u> |
| CONTRACTOR <u>CANMAR</u> | RIG NAME <u>KULLUK</u> | AREA <u>BEAUFORT SEA</u> |
| START DATE <u>Sep 9 93</u> | LOC. <u>OFFSHORE</u> | STATE <u>ALASKA</u> |

LOGGING DATA

| | | | |
|---|-----------------|-----------------|--|
| AVG GAS (units) | MAX GAS (units) | AT DEPTH (feet) | SURVEY DATA <u>2.18 @ 7951</u> |
| | | | LITHOLOGY <u>20% CLAY 70% SLT 10% SAND</u> |
| BACKGROUND CONNECTION | | | SAMPLE DEPTH <u>8000</u> |
| TRIP | | | TRIP CHLORIDES <u>NA</u> |
| FLOWLINE TEMP <u> </u> degrees F | | | LAG DOWN DP <u> </u> |
| | | | LAG OFF BOTTOM <u> </u> |
| | | | DRILL RATE ft/hr <u> </u> |
| | | | CORRECTED 'D' EXP. <u>.78</u> |
| | | | SHALE DENSITY g/cc <u>NA</u> |
| | | | EWR Res. <u>4.73</u> |

FORMATION PRESSURE DATA

| CASING | | | | BOTTOM HOLE | | | | OPEN HOLE | | | | | | |
|-------------------|-------------|-----|-------------|-------------|-------------|-----|-------------|-----------|-------------------|-----|-------------------|-----|-------------------|----|
| PORE PRESSURE | <u>1665</u> | psi | <u>8.7</u> | ppg | <u>4035</u> | psi | <u>9.7</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |
| FRACTURE PRESSURE | <u>2832</u> | psi | <u>14.8</u> | ppg | <u>5671</u> | psi | <u>15.5</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |
| ECD | <u>2124</u> | psi | <u>11.1</u> | ppg | <u>4617</u> | psi | <u>11.1</u> | ppg | <u> </u> | psi | <u> </u> | ppg | <u> </u> | ft |

MUD DATA

BIT DATA

HYDRAULIC DATA

| | | | | |
|-------------------------------------|-----------------------------|---------------------------------------|---------------------------|---------------------------|
| TIME <u>2300 3 OCT 93</u> | BIT NO. <u>7</u> | PUMPS <u>1.</u> | ID-1600 <u> </u> | ID-1600 <u> </u> |
| TYPE <u>PHPA-SEA WATER</u> | TYPE <u>DS40HF</u> | SIZE inches <u>6.5X12</u> | 6.5X12 <u> </u> | 6.5X12 <u> </u> |
| WEIGHT IN <u>10.5</u> | IADC CODE <u> </u> | CAPACITY gal/stk <u>4.92</u> | 4.92 <u> </u> | 4.92 <u> </u> |
| FUNNEL VIS. <u>61</u> | SIZE <u>12.25</u> | PUMP RATE stks/min <u> </u> | | |
| PV/YP <u>19/24</u> | JETS <u>TFA .751</u> | FLOW RATE gal/min <u> </u> | | |
| GELS <u>3/6</u> | DEPTH OUT <u>8000</u> | PRESSURE psi <u> </u> | STATIC <u> </u> | |
| pH <u>9.1</u> | ROT HRS. <u>36.5</u> | PD SURF / DS psi <u> </u> | | |
| FILT/CAKE API <u>3.2/1</u> | FOOTAGE <u>2934</u> | ANN / BIT psi <u> </u> | | |
| HP-HT <u>8.2</u> | AVG ft/hr <u>90</u> | JET VELOCITY ft/sec <u> </u> | | |
| Pm <u>.3</u> | GRADE <u>E-2-i</u> | JET IMPACT lbs <u> </u> | | |
| Pf/Mf <u>.15/1.5</u> | HOLE DEV. <u>1.08</u> | BIT HP <u> </u> | | |
| CHLORIDES ppm <u>18000</u> | COST/FT <u>317</u> | HP RATIO / HP/IN2 <u> </u> | | |
| CALCIUM ppm <u>360</u> | RPM <u>172</u> | REDUCED 1 <u> </u> | psi at <u> </u> | stk/min <u> </u> |
| OIL/WATER/SOLIDS <u>0/10.5/89.5</u> | WOB <u>66.4</u> | RATE 2 <u> </u> | psi at <u> </u> | stk/min <u> </u> |
| DAILY/CUM. COST <u> </u> | | | | |

ANNULAR DATA

| | | LENGTH - FT. | VOLUME BBLs/FT. | VELOCITY FT/MIN | CRIT-VEL FT/MIN | ANN-VOL BBLs |
|------------|----------|--------------|-----------------|-----------------|-----------------|--------------|
| 5 X 20 | DP-RISER | <u>177</u> | <u>.3644</u> | | | <u>65</u> |
| 5 X 12.415 | DP-CSG | <u>3504</u> | <u>.1255</u> | | | <u>583</u> |
| 5 X 12.25 | DP-HOLE | <u>3843</u> | <u>.1215</u> | | | <u>454</u> |
| 8 X 12.415 | | | | | | |
| 8 X 12.25 | DC-HOLE | <u>476</u> | <u>.0836</u> | | | <u>40</u> |
| | | | | | | |
| | | | | | | |
| | | | | | | |

PIPE DATA

| | DP | HWDP | DRILL STRING | DC | CASING: DEPTH | RISER | COND. | SURF. |
|---------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|
| OD-inches | <u>5.0</u> | <u>5.0</u> | | <u>8.0</u> | | <u>21</u> | <u>309</u> | <u>1022</u> |
| ID-inches | <u>4.276</u> | <u>3.0</u> | | <u>2.875</u> | | <u>20</u> | <u>30</u> | <u>20</u> |
| CAP-bbls/ft | <u>.0178</u> | <u>.0087</u> | | <u>.0080</u> | | <u>.3887</u> | <u>.7085</u> | <u>18.73</u> |
| DISP-bbls/ft | <u>.0072</u> | <u>.0181</u> | | <u>.0542</u> | | | <u>.113</u> | <u>.0478</u> |
| LENGTH-ft | <u>6797</u> | <u>727</u> | | <u>476</u> | | <u>177</u> | <u>100</u> | <u>812</u> |
| WEIGHT-lbs/ft | <u>19.5</u> | <u>49</u> | | <u>147</u> | | | <u>450</u> | <u>133</u> |
| | | | | | | | | <u>68</u> |

REMARKS AND RECOMMENDATIONS

MW 10.7 GPM 650 JETS 2-12,2-13 ft/mi = sec/std

COMPLETE E LOGGING. P&A.

ADT D. WALTERS