

KUVLUM #1  
(OCS-Y 0866)

- COCP Insp.

- WELL TEST

Confidential

7530-00-222-3521  
FEDERAL SUPPLY SERVICE  
(GPO)

JAMES B. REGG  
PETROLEUM ENGINEER  
MMS - ALASKA

(2B)

IF leave Stack

↑ LMRP OFF

Shear  
Closed

5"

5"

SSIT already  
hung off  
or 5"

3 1/2"

Gway  
Hole

PRESSURE  
up to close  
SSIT:  
(Ball valve)

& pull top  
1/2 of tool

ONWE CIRC TO  
BLANK

LPR-N  
CLOSE

RTTS

⑤ Release RARS

⑥ Recover anchor lines

⑦ SHEAR GUIDELINES

⑧ Pull LMRP

④A Pull stack

⑦ Move off location

Shut In (wait on)  
45PF  
12600 change  
18"

- useful for perforating tubular  
to establish communication  
w/ casing  
- probably down perforation  
then casing if needed  
to perform test

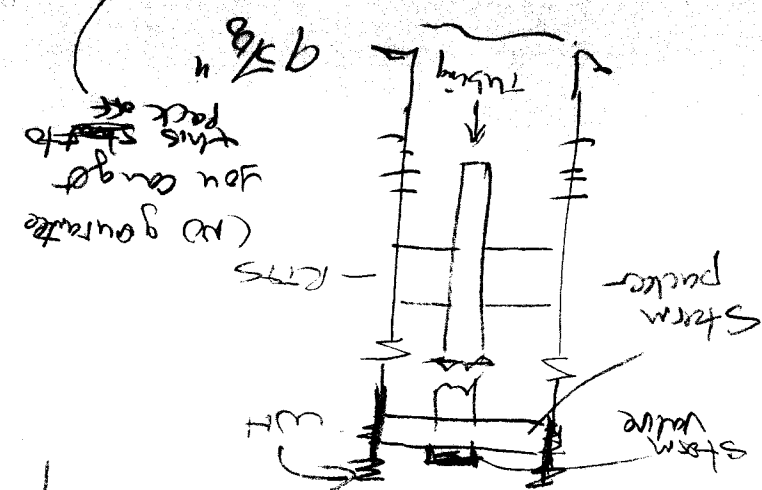
Miscellaneous back into flow  
near rig - better central  
hacking than moving  
fluid.

~~Are Production~~  
~~Bridge plug of X-Liner~~  
~~Polymers designed to~~  
~~flow back with debris~~

Secure During Test  
① Bull head or reverse circulate to kill well.  
② SST must be pulled if  
pulling stroke  
low 5" Rams  
→ (lands on 1" on the wellhead)?  
Replacement of storm packer  
& storm choke (valve)

Packer for annulus

choke (valve) for tubing



when running storm choke  
(over)



Kulluk Inspection

9/16/92

Ice Observer - Bharat Dixit (Phd)

→ Send copy of paper ← Done 9/24/92

- Anchor Tensions: must consider entire

Operating Tension } system (12 anchors); discussed global  
Pre-tension } loads calculated based on various  
Design } anchor tensions  
Breaking Strength }

- anchor lines are tested before beginning operations and inspected for any faulty sections. (Gary Pickard)

- replaced 2 lines prior to Kulluk

- continuously monitored in control room

- calculation routine used to assess global loads

- Ice Monitoring: dependent primarily on radar to track ice & estimate

hazards; also rely heavily on

constant communication from ice

breakers in response to direction

from Kulluk to assess ice

conditions

- Kulluk radar can reliably define

ice conditions out to 6 miles;

total range is ~ 10-12 miles

ice breakers extend range

by "testing" areas directed

by Kulluk & using their

radar systems.

Sounds like  
they would  
work above  
pretension

## Kulluk Inspection

9/16/92

- Very obvious during my observation time that there is extensive communication w/ ice breakers
  - Misasoo is very maneuverable boat  $\therefore$  it is used relatively close to Kulluk to clear ice which has the potential for fouling in anchor & lines (because of smaller size and lower hp)  
→ Kalvik used further out
  - Review SAR imagery received on rig to I.D. floes which pose a hazard - regional focus of monitoring effort; rely on radar for alert levels; STAR is on station with daily calls to operator of plane to identify the need for such flights.
    - none to date  $\left\{ \begin{array}{l} \text{high confidence in} \\ \text{existing monitoring} \end{array} \right.$
    - image sent in w/ Randy Howell on 9/16 shows the event which forced a move from location
    - Helicopter Recon used to verify local ice (often times video taped).
  - - rely extensively on I/B GPS to track floe movements
  - Tour of rig w/ Gary Pidcock (Beaudril)
    - diverter system, storage, rig floor
    - 2 BOP stacks; 10,000 & 15,000 psi WP; using 15,000 psi stack
- 16"
- Color Code (prioritize) floes based on ability to manage, risk to vessel, etc

## Inspection

9/16/92

- test back up BOP at beginning of well
- would test only if necessary to replace stack in use.
- problems w/ glory hole bit; sediments too hard @ location; took longer than anticipated; only ran  $\frac{1}{2}$  of glory hole caisson - future applications may not use caisson in U.S. due to soil consolidation - Idea was conceived for Canadian Beaufort ops.
- Beaudril had no experience prior to Kulluk drilling riserless; procedure was put forward by ARCO based on lack of gas @ site & stability of soils.
  - two primary concerns are gas and "fill" in glory hole; the ability to air lift sediments from glory hole enabled ARCO to drill riserless the 30' 20" strings.
- ARCO had drilled riserless in GOM
- Gary Pidcock says they probably saved several days rig time.

Icebreakers: Misasoo, Kalvik, Supplier, Kigriak

Kulluk Inspection

9/16/92

### Suspension & Securing During Well Test

- ① what procedures will be used to determine suspension & secure?
- ② what would constitute a suspension of a secured well?
- ③ Concern is that if had to suspend & secure there could be oil in drill/test string? How will that effect HT-ST-OT?
- ④ what criteria will be evaluated <sup>what situations</sup> must be available before initiating the well test?
- ⑤ How will testing in presence of ice affect the alert levels?
- ⑥ What if there is a likelihood that the rig will not get back on location?

### Kuvlun Location:

Lat 70° 18' 57.38"  
Long 145° 25' 10.97"

### Off Location 9/17/92 @:

70° 9.4'  
144° 57.8'

A.

K Inspection

9/16/92

### Hall - CORAC

- concerned about data flow from BWASP; feels they need info. real-time from BWASP to supplement Kuvlun aerial program
- have not deployed passive acoustic array due to ice and availability of ice breakers; did try to deploy using Miscaroo but found it to be too hard to hold station for deployment; boats supplied by Arco too small and unstable (20' flat bottom river boats) - Hall not willing to risk personnel safety
- aerial surveys are going smoothly, according to Hall - have not done multiple flights in 1 day - doesn't find any merit in this  
→ he contradicts himself by saying this then stating that they know most whales are submerged so could not see - perhaps more flights would detect more whales

- shifted aerial flights by 2 transect lines to east - continue to fly those west lines also

## Kulluk Inspection

9/14/92

- Hall says that concerns about aerial flights team leader are unfounded
  - he objects to having to fly transects & believes Maryanne Gallagher is well qualified (not sure where NMFS & NMFS MML staff are coming from)
- Hall said Janet Clarke & Sue Moore were not available due to contractual obligations this year.
- will attempt to put instrumentation for passive acoustics program in water to catch what he calls the "second pulse of whales"
  - dependent on ice/weather
- passive acoustic equipment did not arrive at location until early September - not enough time to install & calibrate everything before start of migration

## Kulluk Inspection

9/16/92

### Kulluk Operations Manual -

#### Anchor Tensions -

- ① calculate the anticipated global load based on floe size, drift rate (velocity), winds etc.; an algorithm in computer does calculation
- ② based on information and anticipated global load, assess whether anchor line tensions are adequate for anticipated load - what if not adequate?
  - would alert level be elevated?
- ③ unexpected ice interactions can lead to high and rapidly increasing loads on the Kulluk; in situations where increasing anchor line tensions are occurring with potentially hazardous ice conditions around the Kulluk, frequent communication between ice breakers & Rig are essential
  - emphasis is placed on detection of such situations & transmitting info to ice breakers for ice management.

- ④ major incentive for using ice management is to reduce global loads & anchor line tensions



## Kulluk Inspection

9/16/92

- \* ⑤ generating rubble around the rig by ice management can cause the formation of pressured ice & ridges which in turn cause higher forces on the mooring system

one of the best reasons to monitor anchor line tensions

- \* - ice management functions by breaking & pushing ice into open areas; once there are no open areas left, it becomes difficult to break the ice, and even when broken, there is NO REDUCTION IN ICE FORCES ON THE KULLUK

- maneuverability of ice breakers <sup>significantly</sup> reduced

- - most effective way to deal w/ internal ice pressure is recognition that pressure is imminent;

a) offshore winds drive ice toward land fast ice edge & ice coverage increases

b) open water leads become fewer

c) ice drift slows while wind speed stays constant or increases

d) difficulty in maneuvering ice breakers

ICE RECON  
SHOWED  
136  
CONDUCTED

18

## Kulluk Inspection

9/16/92

- ① stationary or semi-stationary first year ice will partially freeze in the Kulluk (very noticeable in areas where paint from hull is lost); will increase loads

## Observations / Concerns:

- ① Above discussions show importance of monitoring anchor line tensions, but no indication as to how it will affect alert levels

- ② operation above pretension values; pretensions should be max allowable unless operator can somehow demonstrate operating tension can reasonably exceed pretension w/o affecting the integrity of the mooring system (dragging anchor, breaking line, etc.)

- ③ WHAT CONTROLS ANCHOR PRETENSION TEST (TO WHAT VALUE TESTED) ??

Ice floes are color coded on ice map, identifying the priority of the hazard wrt ICE management

- ice maps generated by heli'copter recon, imagery, ship based observations, and radar

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Kulluk Inspection

9/16/92

COLOR CODE ICE MAP -

G - Green: Ice has been managed, ice easily manageable, or is not a threat

B - Blue: Ice is long-term consideration; may threaten rig & will require management

Y - Yellow: Ice is short-term concern; will require management based on current drift implemented on a priority basis

R - Red: Difficult ice that poses an imminent hazard to the Kulluk and should be managed on a high priority basis

BL - Black: "Red" hazards that are not feasible to manage or cannot be managed in time

- coding established by Ice Advisor in consultation w/ Marine Supt. & in discussions w/ ice breakers

- Coding system in addition to Alert Levels for well & vessel.

KULLUK

9/28/92

WELL TEST ANALYSIS

RED UP -

LOG-LOG:  $P_{ws} - P_{wf}$  vs.  $\Delta t_{SHUT-IN}$   
(t; hrs)

HORNER:  $P_{ws}$  vs.  $\frac{t + \Delta t}{\Delta t}$  (semi-log)

SKIN:  $S = 1.1513 \left[ \frac{P_{ina} - P_{wf}}{-m} - \log \left( \frac{k}{\phi \mu c r_w^2} \right) + 3.2275 \right]$

Permeability:  $k = \frac{-162.6 B_o \gamma_o q_o}{m_H h_o}$  md

$\gamma_o$ ; cp

$q_o$ ; BB/day

$m_H$ ; Horner Plot Slope  
(psi/cycle)

DRAWDOWN:  $q_o$  vs.  $t$  (hrs)

$P_{wf}$  vs.  $\log t$

RES. LIMIT:  $P_{wf}$  vs.  $t$   
calculate slope & intercept

Kuvlum

9/29/92

- TOUR TEST facilities 7:00pm w/ ARCO TEST ENGINEER & HRS REP
- DATA COLLECTION ON RIG FLOOR & IN TESTING DOG HOUSE ON 10M DECK
- P, T, BS & W ; Choke size?
  - SAMPLES AFTER HEATER
- 10 - 400 barrel Tanks ; TEST FLUIDS HEATER TO SEPARATOR, THEN COMMINGLE OIL & WATER INTO TANKS (10)
- METHANOL INJECTION AVAILABLE IF NEEDED
- BRINE SOLUTION USED BECAUSE OF NEEDED 9.5 ppg fluid and concerns for Barite fallout; SLIDES TAKEN OF FICATION UNIT
- CONCERNS ABOUT SAND PRODUCTION; WILL BE USING SAND DETECTOR (SOLIDS) -
- FINISHED STRAPPING & CONFIRMATION OF SPACE OUT ; RIGGING UP SUBSEA TEST TREE & REST OF TUBING THIS EVENING ; TESTED SUBSEA TREE BEFORE RUN

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9/29/92

## TEST PROCEDURE - BRAD BERG ; ARCO TEST ENGINEER

- ① FLOW 10 minutes - CLEANUP PERFS
- ② SHUT IN TO RUN PRESSURE READOUT TOOL (SRO) SURFACE READ OUT PROBE ASSEMBLY
- ③ FLOW 12 HOURS (maybe ~~1~~ longer) FOR DRAWDOWN
- ④ SHUT IN FOR BUILD UP (T=?)
- ⑤ OPEN FLOW VARYING DRAWDOWN TO OPTIMIZE DRAWDOWN FOR FORMATION AND TO FIND WHEN SAND PRODUCTION BECOMES PROBLEM
- ⑥ SHUT IN & BULL HEAD FLUIDS INTO FORMATION

- TESTING BEING CONDUCTED BY HALLIBURTON RESERVOIR SERVICES (HRS)
- REPRESENTATIVES FROM ARCO, PHILLIPS, TOTAL, AND UNION TEXAS PETROLEUM

9/30/92

- Discussed ice conditions w/ ARCO engineers
  - Discussed COCP actions w/ test - plans in place based on leaving tests & BOP stack (SSRT) pulling test string @ subsurface tree and (MRP) - RTTS packs off annulus' SSRT closes tubing w/ flapper valve - close shear rams
- Thung off 5" pipe ran

IOE: S. Columbia moving 0.5kts due west  
 ∴ 6 miles away - present trajectory  
 carries to north of N. Columbia (grounded)

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9/30/92

TEST -

Underbalance by pumping diesel down tubing; well displaced to 9.5ppg brine previous to running tools (brine wt assumed)

- brine tested - 9.5ppg 0850 hrs
- diesel tested @ 7.2ppg
- AMBIENT TEMP = 14.6°F

0845 hrs  
 0855 hrs

guns fired, start 10min flow  
 shutin LREN & lubricator  
 ↑  
 pressure up

1000 hrs

RIIT w/ wireline - SRO probe  
 Problems w/ seating SRO;  
 POOH; 1125 hrs SRO @  
 surface

→ NOTE: RIG & ENV. ON YELLOW ALERT  
 HT = 10 hrs - S. Columbia  
 moving due west; N. Columbia  
 and Panama grounded  
 - radar analysis before test

1140 hrs

Decision to flow test w/o  
 SRO; Target stabilized  
 rate; 0.75% choke

ADJUSTABLE  
 CHOKE

1145 hrs  
 1200 hrs  
 1224 hrs

MONITOR SURFACE WT PRESSURE (TP)  
 OPEN TO 16/64ths Choke  
 OPEN TO 20/64ths choke  
 OPEN TO 24/64ths choke

TANK CORRELATION VALUE = 1.6667  $\frac{\text{bbl}}{\text{in}} \cdot \frac{\text{in}}{\text{hr}}$   
 TANK RATE =  $(ST_2 - ST_1) \times 1.667 \times \frac{1}{\text{hr}} \times (24)$   
 STAMP 9/30/92

Kuvlum

1301 hrs

OPEN TO 22/64ths Choke

BS&W @ 1330 hrs 28% (under)

1335 hrs

QTC TO SURFACE  
 CASING PRESSURE @ 1579 psi

FLOW 1000 BPD  
 TUBING PRESSURE @ WH 572 psi  
 TUBING TEMP (WH) 39°F

1405 hrs

SWITCH FLOW TO SURGE TANK

(surge tank not operable)

DUE TO GAS (FLARING)  
 BACK TO TEST SEPARATOR

1445 hrs

TP = 750 ± 10 psi

1507 hrs

TP begin stabilizing @ 78.5 psi

1515 hrs

TANK STRAP 3'9" → 45"

Flow = 1080 BPD

BS&W = 0.75%  
 TOTAL

TP = 784 psi; CP = 1490 psi

T = 37.6°F

1518 hrs

TP increasing after 11 minutes

to 788 psi; Fluctuating ± 4 psi around 784 psi

1530 hrs

TANK STRAP = 50 1/2"

TP = 782.25 psi; T<sub>WH</sub> = 37.6°F

RATE = 880 BPD

1545 hrs

Adding demulsifier @ data header

BS&W = .75% total

TANK STRAP - 60 3/4"

DUMP VALVE ON  
 SEPARATOR STUCK OPEN  
 REASON FOR HIGH FLOW RATE

FLOW RATE = 1640 BPD

1600 hrs

TP = 780 psi; T<sub>WH</sub> = 35.6°F

STRAP - 64 3/4"

TP = 781 psi; T = 37.5°F

GAS RATE = 702 MCFD  
 FLOW RATE = 638 BPD

STOP USE OF DEMULSIFIERS @ ?

- CAUSING GEL TO FORM @ bottom of centrifuge sample

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9/30/92

1600hrs

TP stabilized 780 psi +/- 2 psi

(since 1525hrs)

1615hrs

TANK STRAP = 64 3/4" ; SAME DUE TO

FALL UP OF SURGE TANK

TP = 780 psi ; T = 37.6°F

FLOW RATE = N/A

1630hrs

TANK STRAP = 64 3/4"

TP = 779.25 psi ; T = 37.6°F

FLOW RATE = N/A

CALC. GAS RATE = 775.11 MSCFD

AVE. SINCE 1600hrs

1635hrs

ORIFICE PLATE CHANGE FROM 1.000 in

to 1.500 in FOR GAS METERING

1645hrs

FULL SURGE TANK

1645hrs

TP = 758.5 psi ; T = 37.6°F

1648hrs

change choke from 28/64" adj. to 28/64ths positive

TP = 722.25 psi ; T = 37.4°F

1650hrs

TO SURGE TANK ; DUMP OUT OF SURGE TANK TO TANK FARM (STORAGE)

1700hrs

TANK STRAP = 5'5" => 65"

TP = 713 psi ; T = 37.8°F

→ Tubing Pressure @ wellhead ; Temp @ wellhead

$$\text{TANK RATE} = (70.75 - 65) \left( \frac{1.417}{15 \text{ MIN}} \right) \left( \frac{1 \text{ INCH}}{1 \text{ INCH}} \right) (24 \text{ hrs}) = 920 \text{ BPD}$$

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9/30/92

1715hrs

TP = 705.25 psi ; T = 38.1°F

TANK STRAP = 5'10 3/4" => 70.75"

TANK RATE = 920 BPD

1730hrs

TP = 703 psi ; T = 38.4°F

TANK STRAP = 7'2"

TANK RATE = 2940 BPD

1745hrs

TP = 701 psi ; T = 38.7°F

TANK STRAP = 8'4 3/4"

TANK RATE = 2360 BPD

1745hrs

BEGIN INJECTING DEFOAMER

1800hrs

TP = 698.25 psi ; T = 38.9°F

TANK STRAP = 8'4 3/4" ; FLOW RATE = 0

BS&W = 0

GAS METER = 1079.4 MSCFD

OIL METER = 1445 BPD

1815hrs

TANK STRAP = 10'5 3/4"

TP = 697.75 psi ; T = 39.2°F

- Discuss options regarding foaming - may be affecting oil meter values

- GAS RATE CALCULATED BASED ON MEASURED

DIFFERENTIAL PRESSURE OVER PAST 30 minutes (30 samples - 1 per minute) on HRS Data Sheet

- Oil Rates based on turbine meter reported on HRS Data Sheet

- STABLE FLOW THRU SEPARATOR/SURGE TANK CHECK FOR SHRINKAGE & METER CORRECTION AFTER 1900hrs (?)



28/64th POSITIVE CHOKO

KUULUM

9/30/92

11830 hrs

METERED OIL RATE = 1629 BPD

METERED GAS RATE = 1073.45 MSCFD

WATER = 0

TP = 695.75 psi; T = 39.3°F

TANK STRAP = 11' 5 1/4" ; TANK RATE = 4000 BPD

< PRELIM. API GRAVITY = 34° >

MEASURING 34° API W/ SAMPLES FROM FLOOR

11845 hrs

TP = 694. psi; T = 39.73°F

TANK STRAP = 12' 5 1/4" ~~8' 1/2"~~

TANK RATE = 1912 BPD

11900 hrs

TP = 692.75 psi; T = 39.99°F

TANK STRAP = 13' 6" ; TANK RATE = 2040 BPD

METERED OIL RATE = 1609.72 BPD

" GAS RATE = 1085.4 MSCFD

WATER = 0

→ ACTUAL GAS GRAVITY = 0.722 (measured)

11915 hrs

TP = 691.25 psi; T = 40.21°F

TANK STRAP = 14' 7 1/4"

TANK RATE = 2120 BPD

11930 hrs

TP = 690 psi; T = 40.5°F

← TANK STRAP = 15' 6 1/4"

METERED OIL RATE = 1583.19 BPD

" GAS RATE = 1107.25 MSCFD

TANK RATE

" 1760 BPD

TANK GOR = 627 SCF/BBL

WATER = 0

API GRAVITY = 34.2° (34° from RPT)

GAS GRAVITY = 0.700 (assumed)

1900 hrs - South Columbia FAN moving to north east of rig; current trajectory poses no problem

28/64th choke (positive)

9/30/92

11938 hrs

- 5 gal defoamer pumped (total)

TANK STRAP = 16' 6 1/2"

TP = 688.75 psi; T = 40.6°F

TANK RATE = 490.1 BPD

11940 hrs

TP = 687.25 psi; T = 40.9°F

TANK STRAP = 17' 5 1/2"

TANK RATE = 440.1 BPD

LAST STRAP  
TANK #1

METERED OIL RATE = 1585 BPD

" GAS RATE = 1092 MSCFD

WATER = 0

~~GOR~~ GOR = 690 SCF/BBL (MEAS. BASED)

\* CHANGE TANKS FROM #1 TO #3 \*\*\*

- DO SINGLE STRAP after min 3, let set to get shrinkage & meter correction

EXISTING TANK #3 STRAP = 2" 51-2

STRAP AFTER 1HR FLOW = 51" (49' corrected)

STRAP AFTER #1 HRS STRAP = 51"

- 15 minute straps to continue on TANK #1 until value levels off. - shrinkage (correction factor)

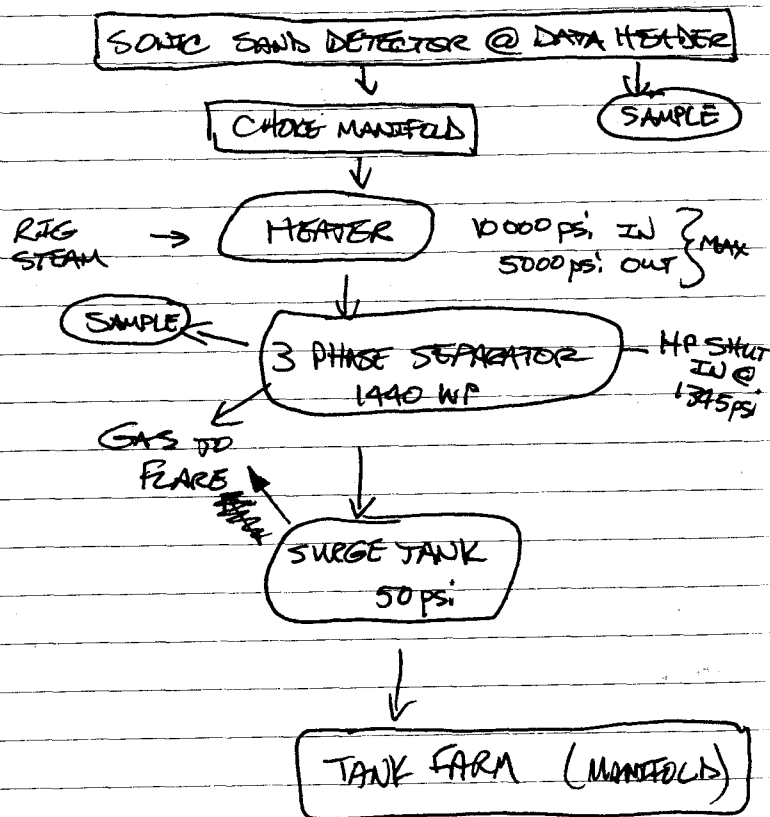
- Flow into TANK #3 for 1 Hour; STRAP EVERY 15 minutes ~~until~~ Hour

- SWITCH TO TANK #10 AFTER 1 Hour TANK #3 FLOW - PRE STRAP = 1.25"

KUULUM

9/30

PIPING & INSTRUMENTATION - TEST  
- GET COPY OF DRAWING FROM ARCO



28/64 POSITIVE CHOKES

KUULUM

9/30/82

STRAPS FOR SHRINKAGE / METER CORRECTIONS

TANK #1 STRAPS

2000 hrs 17' 5 1/4" 80% Full

2315 hrs 17' 5 1/4" ; NO FOAM PER SAMPLE.

⇒ TANKS FALLED TO APPROX. 80% MAX

TANK #3 STRAPS

		NET
2000 hrs (START)	2"	-
2015 hrs	-	-
2030 hrs	-	-
2045 hrs	-	-
2100 hrs	5 1/2"	49"
2115	5 1/2"	} NO GAS BREAKOUT
2130	5 1/2"	
2145	5 1/2"	
2200	5 1/2"	

28/6/11 → POSITIVE CHOKE

KUYUUN

9/30/91

2015 hrs

TP = 686 psi; T = 41.2°F

TANK #3 STRAP =

API GRAVITY = 34.2°

2030 hrs

TP = 685 psi; T = 41.4°F

TANK #3 STRAP = ; TANK RATE = BPD

METER OIL RATE = 1585.6 BPD

METER GAS RATE = 1110.9 MSCFD

WATER = 0

2045 hrs

TP = 683.8 psi; T = 41.7°F

TANK #3 STRAP =

TANK RATE =

\*\*\* SWITCH TO TANK #10 \*\*\* (after 2100 hrs)

2100 hrs

TP = 682.75 psi; T = 41.9°F

METER GOR = 700 SCF/BBL (?)

METER OIL RATE = 1559.5 BPD

METER GAS RATE = 1087.8 MSCFD

TANK #3 STRAP = 4' 3" ; TANK RATE = 1960 BPD

2115 hrs

TP = 681.5 psi; T = 42.1°F

TANK #3 STRAP =

2116 hrs

→ DUMP VALVE ON SURGE TANK STUCK

OPEN ; <sup>WELL</sup> <sup>NEW</sup> RATE @ 2200 hrs

2130 hrs

TP = 680.5 psi; T = 42.3°F

SEP. P<sub>g</sub> = 99.1 psi; SEP. T = 127.7°F

DIFF. PRESS = 60.18 psi

METER OIL RATE = 1559 BPD

METER GAS RATE = 1080 MSCFD

TANK #3 STRAP = GOR = 700 SCF/BBL (?)

→ SURGE TANK @ OPERATING LEVEL; OPEN DUMP VALVE TO TANKS (STORAGE)

28/6/11 → POSITIVE CHOKE

KUYUUN

9/30/92

hrs

TP = 679.5 psi; T = 42.6°F

hrs

TP = 678.25 psi; T = 42.7°F

TANK #10 STRAP = 2' 6 1/4" (INTERNAL 1 1/4")

TANK RATE = 1160 BPD

METER OIL RATE = 1534 BPD

METER GAS RATE = 1059.8 MSCFD

SEP. - { P<sub>STAT</sub> = 98.2 psi; P<sub>DIFF</sub> = 59.8 psi  
T = 122.3°F

API GRAVITY = 34°

METER GOR = 690 SCF/BBL (?)  
TANK GOR = 910 SCF/BBL

hrs

TP = 676 psi; T = 43.2°F

METER OIL RATE = BPD

METER GAS RATE = MSCFD

SEP. - { P<sub>STAT</sub> = 98 psi; P<sub>DIFF</sub> = 54.2 psi  
T = 123.8°F

API GRAVITY = 34°

0.3% CO<sub>2</sub>, 0 H<sub>2</sub>S

hrs

TANK #3 STRAP = 8' 3"

TANK RATE = 1920 BPD

hrs

TP = 672.75 psi; T = 43.8°F

hrs

TP = 672.3 psi; T = 44.0°F

METER OIL RATE = 1528 BPD

METER GAS RATE = 1005.7 MSCFD

METER GOR = 660 SCF/BBL (?)

SEP. - { P<sub>STAT</sub> = 99.5 psi; P<sub>DIFF</sub> = 55.3 psi  
T = 127.9°F

28/6/92 POSITIVE CHECKS

TANK FACTOR = 1.667 bbl/in

KUVLUM

9/30/92 -  
10/1/92

1900 hrs → 2300 hrs

GOR = 510 SCF/bbl

(CNC. BY HRS @  
2330 hrs)

- BASED ON TANK STRAPS &

METERED GAS

\* PREVIOUS GOR'S SUSPECT SINCE BASED

ON UNPROVED OIL METER

2400 hrs  
000 hrs

TP = 670.5 psi ; T = 44.4°F

METER OIL = 1539.7 BPD

METER GAS = 991.8 MSCFD

METER GOR = 640 SCF/bbl (?)

SEP. {  $P_{START} = 98.4$  psi ;  $P_{STOP} = 53$  psi  
T = 130.3°F

→ actual gas gravity = 0.730 (measured)

measured by  
Ranalex S.P.G.R.  
TESTER

TANK # 10 STRAP = 6' 1/2"

TANK RATE = 1690 BPD

TANK GOR =  $\frac{991.8 \text{ M}}{1690} = 587 \frac{\text{SCF}}{\text{bbl}}$

0030 hrs

TP = 668 psi ; T = 44.9°F

METER OIL = 1496.6 BPD

METER GAS = 1081.1 MSCFD

METER GOR =  $\frac{1081.1}{1496.6} = 670 \frac{\text{SCF}}{\text{bbl}}$  (?)

SEP. {  $P_{START} = 118.7$  psi ;  $P_{STOP} = 43.5$  psi  
T = 129.1°F

141

KUVLUM

TANK STRAPS - #3 & #10

- ALTERNATING USE - EACH 1 HR FLOW

TANK # 3

TANK # 10

2000 hrs 2" ← PRE STRAP  
2100 hrs 5"  
2200 hrs 5"  
2300 hrs 9"

2100 hrs 1.25"  
2200 hrs 30.25"

2300 hrs

72.5"

0100 hrs

144"

0200 hrs

117"

184.5"

0300

0400

154.5"

0500

0600

0600

→ SWITCH TO TANK #4 @ 0600 hrs

28/69 hrs POSITIVE CHECK

KUULUM

10/1/92

0100 hrs

TP = 665.8 psi ; T = 45.1 °F

Meter oil = 1521.2 BPD

Meter gas = 1012.7 MSCFD

Meter GOR = 670 SCF/bbl (?)

TANK #3 STRAP = 12' 0"

TANK RATE = 1800 BPD  
TANK GOR = 563 SCF/bbl

SEP. { P<sub>STAT</sub> = 106.6 psi ; P<sub>DIFF</sub> = 51.7 psi  
T = 127.4 °F

OIL GRAVITY = 34° ; 0.3% CO<sub>2</sub>

0130 hrs

TP = 664 psi ; T = 45.4 °F

Meter oil = 1500.7 BPD

Meter gas = 1014.5 MSCFD

METER GOR = 680 SCF/bbl (?)

0200 hrs

TP = 662.8 psi ; T = 45.7 °F

Meter oil = 1494.4 BPD

Meter gas = 991.2 MSCFD

CALC. GOR =  $\frac{991.2 \text{ M}}{1780} = 557 \frac{\text{SCF}}{\text{bbl}}$  METER GOR = 660 SCF/bbl (?)

TANK #10 STRAP = 117" ; TANK RATE = 1780 BPD

SEP. { P<sub>STAT</sub> = 106.7 psi ; P<sub>DIFF</sub> = 52.2 psi  
T = 128.4 °F

TANK GOR =  $\frac{991.2 \text{ M}}{1780} = 557 \frac{\text{SCF}}{\text{bbl}}$

28/69 hrs - POSITIVE CHECK

KUULUM

10/1/92

0200 hrs

TP = 660.8 psi ; T = 46.0 °F

Meter oil = 1465.9 BPD ; Meter gas = 1009.6 MSCFD

METER GOR = 680 SCF/bbl

SEP. { P<sub>STAT</sub> = 106 psi ; P<sub>DIFF</sub> = 50.6 psi  
T = 128 °F

0250 hrs

- meter factor calculated @ 1.19 ←

0300 hrs

TP = 658.8 psi ; T = 46.2 °F

Meter oil = 1761.8 BPD ; Meter gas = 1018.5 MSCFD

METER GOR = 580 SCF/bbl

TANK #3 STRAP = 184.5" ; TANK RATE = 1620 BPD

CALC. GOR (TANK) = 629 SCF/bbl

0330 hrs

TP = 657.3 psi ; T = 46.5 °F

Meter oil = 1751.9 BPD ; Meter gas = 1041.3 MSCFD

METER GOR = 590 SCF/bbl

SEP. { P<sub>STAT</sub> = 105.6 psi ; P<sub>DIFF</sub> = 58.7 psi  
T = 126.3 °F

0400 hrs

TP = 656 psi ; T = 46.7 °F

Meter oil = 1754.7 BPD ; Meter gas = 1045.9 MSCFD

METER GOR = 600 SCF/bbl

TANK #10 STRAP = 154.5" ; TANK RATE = 1500 BPD

TANK GOR = 697 SCF/bbl

0430 hrs

TP = 651.5 psi ; T = 46.9 °F

Meter oil = 1746.7 BPD ; Meter gas = 1043.7 MSCFD

METER GOR = 600 SCF/bbl

SEP. { P<sub>STAT</sub> = 105.4 psi ; P<sub>DIFF</sub> = 54.8 psi  
T = 128 °F



28/64ms POSITIVE CHOKE

KUVUUN

10/1

0500 hrs

TP = 652.5 psi; T = 47.2 °F

Meter oil = 1806.2 BPD; Meter gas = 1037.8 MSCFD  
METER GOR = 570 SCF/bbl

TANK STRAP = ; TANK RATE = BPD  
TANK GOR = SCF/bbl

0530 hrs

TP = 651.5 psi; T = 47.4 °F

Meter oil = 178.9 BPD; Meter gas = 1047.8 MSCFD  
METER GOR = 580 SCF/bbl

SWITCH TO TANK #4 @ 0600 hrs

0600 hrs

TP = 650.5 psi; T = 47.7 °F

Meter oil = 1739.2 BPD; Meter gas = 1023.4 MSCFD  
METER GOR = 590 SCF/bbl

TANK STRAP = 1.0" ~~TANK RATE = 1780 BPD~~  
TANK GOR = ~~580 SCF/bbl~~

0630 hrs

TP = 649.3 psi; T = 47.9 °F

TANK STRAP = 22.6" ; TANK RATE = 1756 BPD  
METER OIL = 1808.8 BPD

METER GAS = 1024.6 MSCFD

METER GOR = 570 SCF/bbl

WATER =  $\phi$

SEP.  $\left\{ \begin{array}{l} P_{STAT} = 109.3 \text{ psi} \\ P_{DIFF} = 52.9 \text{ psi} \\ T = 129.3^\circ \text{F} \end{array} \right.$

0700 hrs

STRAP TANK #4 = 3'8" ; TANK RATE = 1780 BPD

TP = 647 psi; T = 48 °F

METER OIL = 1833 BPD

METER GAS = 1012.5 MSCFD

METER GOR = 550 SCF/bbl ; TANK GOR = 569 SCF/bbl

WATER =  $\phi$

API = 34.0

28/64ms POSITIVE CHOKE  
→ FLUCTUATING RATES DUE TO SEPARATOR PROBLEMS (SURGE TANK)

KUVUUN

10/1

0600 hrs

METER CUM. GAS = 672 MSCF

METER CUM. OIL = 893 BBL (?)

0730 hrs

TP = 645.5 psi; T = 48.3 °F

Meter oil = 1785.3 BPD; Meter gas = 1005.2 MSCFD

METER GOR = 560 SCF/bbl

SEP.  $\left\{ \begin{array}{l} P_{STAT} = 104 \text{ psi} \\ P_{DIFF} = 51.7 \text{ psi} \\ T = 130.1^\circ \text{F} \end{array} \right.$

0750 hrs

START ANOTHER 5 GAL INT. OF DEFORMER

0800 hrs

TP = 644.3 psi; T = 48.5 °F

Meter oil = 1757.3 BPD; Meter gas = 982.2 MSCFD

METER GOR = 560 SCF/bbl

TANK STRAP = 9.5" ; TANK RATE = 2020 BPD

TANK GOR = 486 SCF/bbl

$\left\{ \begin{array}{l} P_{STAT} = 98.2 \text{ psi} \\ T = 123^\circ \text{F} \\ P_{DIFF} = 47.8 \text{ psi} \end{array} \right.$

WATER =  $\phi$

API = 34° ; BS&W =  $\phi$

Cum. oil (meter) = 967 BBL

Cum. gas (meter) = 714 MSCF

0830 hrs

TP = 642.8 psi; T = 48.6 °F

Meter oil = 1775.5 BPD

Meter gas = 937.9 MSCFD

$\left\{ \begin{array}{l} \text{Meter GOR} = 530 \text{ SCF/bbl} \end{array} \right.$

SEP.  $\left\{ \begin{array}{l} P_{STAT} = 97.1 \text{ psi} \\ P_{DIFF} = 47.3 \text{ psi} \\ T = 117.1^\circ \text{F} \end{array} \right.$

DUMP VALVE ON SURGE TANK SCREENED UP @ 0800 hrs

Kuvulu

10/1

0900 hrs

TP = 641.5 psi; T = 48.8 °F

Meter oil = 1809.9 BPD; meter gas = 959.1 MSCFD

Meter GOR = 530 SCF/bbl

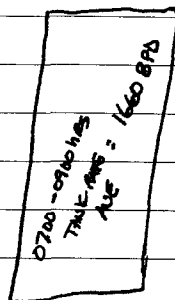
TANK #4 STRAP = 127 1/2"; TANK RATE = 1300 BPD

TANK GOR = 738 SCF/bbl

Cum. oil (metered) = 1042 BBL

Cum. gas (metered) = 743 MSCF

OIL GRAVITY = 34°; ϕ BSF/W



0930 hrs

TP = 639.7 psi; T = 49 °F

Meter oil = 1815 BPD; meter gas = 933.3 MSCFD

Meter GOR = 510 SCF/bbl

TANK #4 STRAP = 146"; TANK RATE = 1480 BPD

TANK GOR = 630 SCF/bbl

metered cum. oil = 1079 bbl; 34° API @ 60°F

metered cum. gas = 773 MSCF

WATER = ϕ BSF/W = ϕ

SEP.   
 P<sub>STM</sub> = 95 psi   
 T = 114 °F

→ ATTEMPT CLOSE IN WELL @ 0930 hrs @ LPR-N (DOWN HOLE)

- BLEEDING CASING PRESSURE FROM 1500 psi

0931 hrs TP = 638.7 psi

0932 TP = 638.0 psi

0933 TP = 638.5 psi

0934 TP = 638.5 psi

0935 TP = 638.8 psi

0936 TP = 638.8 psi

0937 TP = 638.8 psi

0938 TP = 638.8 psi

Kuvulu

10/1

0939 hrs

TP = 638.8 psi

0940

TP = 638.8 psi

0941

TP = 638.5 psi

0942

TP = 638.5 psi

0943

TP = 638.5 psi

0944

TP = 638.5

0945

638.5

0946

638.5

MAYBE?   
 LPR-N   
 ATVAL NOT CLOSED; TRY   
 TO PRESSURE UP   
 AGAIN < CONCERN IS

CHUTE VALVE - 4 WHEEL   
 POSITIONS →

0948

BEGIN PRESSURE UP AGAIN



MONITOR TUBING PRESSURE

SHIFTS   
 positions when   
 pressure up   
 - currently in   
 position 3

0951

TP = 638 psi; CP = 1452.3 psi

0952

" ; CP = 1739 psi

0953

" ; CP = 1723 psi

0954

INCREASE ANNULUS P (CP) TO 2000 psi   
 actual 2035 psi

0955

TP = 638.25 psi; CP = 2002.5 psi

0956

TP = 638.75 psi; CP = 1985.75 psi

0957.5 hrs

TP = 638.75 psi; CP = 0 BLEED OFF C. PRESSURE

0958 hrs

TP = 637.5 psi

0959 hrs

TP = 636.5 psi

1000 hrs

TP = 637 psi

KUMU

1000 hrs

TANK #4 STRAP =  $13'9\frac{3}{4}" \Rightarrow 165.75'$   
 TANK FLOW<sub>RATE</sub> = 1580 BPD

10/1/92

1001 hrs

TP = 637.5 psi

1002

TP = 637.3 psi

1003

TP = 636.5 psi

1004

TP = 636.0 psi

1005

636.5 psi

1006

637 psi

1007

637.5 psi

1008

637.3 psi

1009

637.3 psi

1010

637.3 psi ;  $q_o = 1726$  BPD ;  $q_g = 9626$  MSCFD

1011

1015 hrs

TP = 637 psi ; T = 48.9°F

METER  $q_o = 1794$  BPDMETER  $q_g = 960.7$  MSCFD

540 SEC

1016 hrs

PRESSURE UP ON CASING TO 1950 psi  
 TO OPEN LPRN

1020 hrs

TP = 637 psi

METERED  
 $q_o = 1783$  BPD  
 $q_g = 963$  MSCFD

1021 hrs

UP ANNULUS PRESS. TO 2500 psi

1024 hrs

BLED OFF ANNULUS

KUMU

1035 hrs

TP = 635.5 psi

METERED  
 $q_o = 1776$  BPD  
 $q_g = 974$  MSCFD

1030 hrs

TP = 635.0 psi

METERED  
 $q_o = 1736$  BPD  
 $q_g = 952$

TANK STRAP =  $15'10" \Rightarrow 190'$ 

TANK RATE = 1940 BPD  
 TANK GR = 491 SCF/bbl

1035 hrs

TP = 636 psi

METERED  
 $q_o = 1783$  BPD  
 $q_g = 942.3$  MSCFD

1039 hrs

PRESSURE ANNULUS TO 1500 psi (CYCLE #1)

1040 hrs

BLED DOWN ANNULUS

TP = 635 psi  
 $q_o = 1733$  BPD  
 $q_g = 951$  MSCFD

1041.5

PRESSURE ANNULUS - CYCLE #2

1043 hrs

PRESSURE CYCLE #3

1044 hrs

CYCLE #4 - TO BLEND IN OMANE

1045 hrs

TP = 617.5 psi ← 10460 558. psi

1046 hrs

TP = 557.5 psi

1047 hrs

TP = 1605.5 psi

SUBSEA LUBRICATOR CLOSED

1047.5

TP = 57.4 psi

1048

TP = 35.9 psi

1048.5

TP = 8.8 psi

1049

TP = 0

10/3/92 NOTE:

KUUVUM

LPR-N VALVE PULLED ON 10/2/92  
was partly open - choke downhole  
- careful w/ P.I. calculations 10/1/92  
- affected drawdown

~~1200 hrs~~ ~~BEFORE~~ ~~RE-UP~~ ~~OF~~ ~~SAFETY~~  
~~SPINNER~~ ~~SHUT-IN~~

1045 hrs

BEGIN SHUT-IN; 12 HR +/-  
PLANNED; NO SURFACE  
READOUT; ALL P'S MEASURED  
BELOW ONNI VALVE

1100 hrs

ARCO REPORTS

Small ( $\leq 10$  gal) discharge of  
Condensate from line leading to flare  
@ end of flow period; was burning

When hit ice (Condensate  
accumulates in low spot on  
flare line - low gas rate  
not enough to carry to  
burner except when plug  
hits from separator shut  
down - Supplier is  
monitoring affected ice;  
doesn't appear to be a  
problem - may try to recover  
ice

my estimate  
is less  
than 10 gal

Probably  
representative of  
fluid to ice

- Follow up surveys w/ boat helicopter -  
no evidence of sheering - wasted ice  
- bled line to flare - 99% water;  
1% Condensate (estimated)

KUM

10/1/92

1200 hrs

- Decision made to suspend  
build up test; will circulate  
& reverse out fluids, thru  
separator - flare gas - meter  
liquids & strap tank  
- TANK #5 to catch fluids

1800 hrs

Pick up 10th anchor  
and begin deployment w/  
Miscaroo (9 deployed -  
existing as of 10/1)

35 hrs

Anchor #1 on bottom w/ RAR

1935 hrs

Reverse out fluids, control  
@ choke manifold before  
separator; flow through adjustable  
choke - Current setting  
20/64ths

WIRE IN  
Circulate  
position

WT Pressure 1000 psi @ data  
header prior to opening  
choke

- ~~well shut in~~ - well remains  
shut in

WT = TP

Kuvlun  
1940 hrs

10/1/72  
Continue Reverse out; well shut in  
TP = 959 psi  
- dry gas to flare

1943 hrs

WT = 948 psi

1945 hrs

WT = 925 psi

1950 hrs

WT = 1290 psi

Begin Pump down  
annulus @ 1948  
WT =

Begin to  
- RATE FLOW THEN SEPARATOR  
(PREVIOUS PRECHARGE TANKS)

1952

WT = 1380 psi  
CP = 465

1953

WT = 1313 psi, CP = 450.0 psi

Pump shut  
in

engage pumps slow 1959 hrs

2000 hrs

move to 24/64th adjustable  
TP = 1261 psi; CP = 454 psi  
- dry gas

2000 hrs - 2054 hrs

WATCHED FLARE FOR  
Fluids; NO BURNING ON WATER;  
POSSIBLY < 1 gal water  
discharge

2015

WP = 920

CP = 107

2030

WP = 780

CP = 341

~~2035~~

WP = 410

CP = 297

2100

WP = 12.4

CP = 170

Kuvlun

10/1

2104 hrs

Shut in Choke

2105 hrs

Begin Cycle #1 OMNI Valve  
1500 psi / 1500 psi  
WP = 0

2108 hrs

Begin cycle #2 OMNI  
WP = 1500; CP = 1500

2108 hrs

2110

Bleed down

2110.5

WP/CP = 0

2111

Begin Cycle #3 OMNI

2112.5

WP/CP = 1500 psi

2113

bleed down

2113.25 hrs

WP = 560; CP = 0

OMNI VALVE BLANK  
POSITION

2114.75

TP = 700 psi

2115 hrs

TP = 525 psi

2119 hrs

Bled WH down to 150 psi

2119.5 hrs

TP = 29.6 psi

2121.5 hrs

OMNI IN WELL TEST POSITION  
CP = 1500 psi; TP = 0 psi

- 4 Seals around well rig  
flaring on 9/30 & 10/1



10/1/92

2200 hrs Plans are to pull  
test string; replace ~~test string~~  
LPR-N & UNIT; retrieve  
perf guns & run in hole  
for retest of same zone

- Consideration due to no surface readouts during flow test & shut in - could not get SRO

to seat after 10 minute clean up (junk in hole) & could not run prior to Build up (LAPN failure).

3 attempts  
uses a  
J-LATCH

- hole currently taking brine (lost circulation) & wellbore overbalanced.

- trying to determine rate & will spot lost circulation plug, & control wellbore loss will not retrieve tools until wellbore ~~static~~ static

Probably  
due to  
suspending  
Build up  
too soon

- expect 8-16 hrs to get tools out of hole; should be ready for retest within 24-48 hrs

- current ice conditions  $\rightarrow$  NO hazards  
other than grounded Panama & N. Columbia

10/1/92

grooves

- (CONT'D)

→ Discussed "what ifs" with Fred Johnson (Arco Drilling Engineer) regarding ice & suspensions (similar discussions should have been done between Arco office engineers & DS)

→ Question was what if coming out  
w/ test string & ice alerts increase  
(HT decreasing) - Acco position  
is that well will be dead ~~instead~~  
~~to full string, BHT & RTH~~  
~~packer (close off annulus) &~~  
before pulling string, RTH w/  
RTH packer (close annulus) &  
storm choke (for tubing close)

- this would be secured by  
ARCO standpoint & would  
pull BOP stack because  
potential for damage if  
Panama and/or N. Columbia  
moved through location  
(15' scours)  
checked on  
BOP surveys

- what would MMS position be? suggested calling Dr Ian

reasonable  
over winter  
and amount,  
likely ok  
expect to get  
back on location

isolation  
test zone

Kuvluk

10/1/92

### RIG MODIFICATIONS NEEDED:

- ① Modify flare lines (flexible hoses)  
    & low points allow for water  
    & condensate to collect
- ② Curbs on Kuvluk ~~5m~~ 10m  
    deck nonexistent - Pre-drill?
- ③ Flood lights should be operable  
    when flaring @ night - only  
    necessary for those near flare  
    facing outboard.
- ④ Deeper glory hole for subsequent  
    wells based on ROV survey  
    of N. Columbia & Panama  
    - get copies of surveys

Kuvluk

10/2/92

0800 hrs

TRIP OUT OF HOLE w/ TEST  
STRING CONTINUING (TOOLS ON  
DECK BY 1100 hrs?) - WELL STATIC

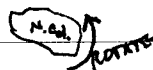
ICE: PANAMA STATIONARY

N. COLUMBIA ROTATING CCW

SINCE 2200 hrs 10/1 & slightly  
sliding to SE

- Supplier & Miscarao monitoring  
N. Columbia; Kigoriak  
Monitoring Panama

(PER 10/2 415 hrs MONITORING ICE  
ANALYSIS FROM I/B GPS &  
Kuvluk Radar.



0830

Panama

fine  
manageable

0830 hrs

Reconfirmed COCP actions w/  
ARCO Engineers; plans posted  
- Frank Johnson  
- Dave Bungardner (rights)  
- Bruce Campbell  
    • company man

\*\*\* - ARCO has several videos from  
ROV surveys of N. Columbia & Panama (3)  
(RUN OFF Supplier) & some reports which  
may be of interest to NMS

Kurum

10/2/92

- ROV survey shows water depths between 92' and 109' around the flows; was not picked up on side scan & subbottom profiler during site-clearance
- Gauge depths up to 15' deep based on hydrostatic measures by the ROV, <sup>expected to WD</sup>
- Deeper gauging <sup>expectations/possibilities</sup> something we should build into our approvals after researching further

1700hrs

Finished BOOH w/ test tools, retrieve LPR-N, OMNE & Perf Guns - Recover Pressure sensors

2000hrs

Running back into hole w/ test tools for Re-test

- Anticipate opening up for retest by 900 or 1000hrs 10/3

- - analysis of LPR-N valve shows
- Scarring on exterior of ball indicating
- possible rust jammed up actuating mechanism - Failed open

Kurum

10/3/92

800hrs

Morning report shows N. Columbia stopped rotating but could move to SW or begin rotating again under predicted NE winds; Panama remains stable

0930hrs

Safety meeting on rig floor

- test procedures
- ice in anchor line; may delay test (no alert)

1030hrs

Miscaroo frees multiyear berg from anchor (against ship) - anchor slack off before it could be moved - berg the size of the Miscaroo - 1 seal around vessel

driv  
ing ice  
stream  
to keep  
miscaroo  
loads to minimum

WELL TEST #2

36hrs

OPEN ON 16/64ths choke; bypass high stage, surge; into tank #5  
CP = 1500psi; TP = 0 psi

039 hrs

TP = 20psi  
22/64ths adjustable choke

041 hrs

TP = 0psi;  
CP = 1500psi

Kulluk

1100 hrs

TP = 38<sup>OF</sup>

10/3/92

~~TP = 38<sup>OF</sup>~~ ; TP = 0 psi

- Bridge Sol plug placed for lost circulation appears to be in fact

- switched to TANK #6

- STRAP TANK #5:

PRE-TEST STRAPS

TANK #6 -

TANK #5 -

1215 hrs

~~TP = 38<sup>OF</sup>~~ ; TP = 0 psi

TP = 36<sup>OF</sup> ; CP = 1500 psi

→ Bridge Sol plug is a cross<sup>link</sup> polymer (very "snotty"); designed to be washed out w/ flow

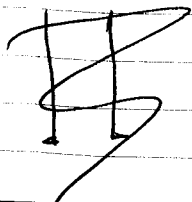
1230 hrs

Switch back to TANK #5

STRAP =

wellhead temp: 35.7°F

adjustable 28/64ths choke



-COC-

KULLUK

10 hrs

10/3/92

Previously unidentified flow called into Kulluk; discovered by Kigoriak - in drift of Kulluk ≈ 4 miles

Kigoriak trying to manage

- ice moving earlier @ 0.4 kts (leaves ≈ 10 hrs HT)

- currently on Yellow Alert

→ CALLED Brian Schoof about circumstances w/ Henry Hite (HNS) & Fred Johnson (ARCO Engineer) - we discussed situation and well seeing options:

→ ARCO

- ① Bullhead well dead; close LPR-N test valve
- ② Pull subsea test tree ~~immediately~~ after pressure up to close ball valve in SSTT; Lay down SSTT & STT <sup>surfaces</sup>
- ③ Run storm packer & choke below wellhead
- \* ④ Pull Stack
- ⑤ Move off location

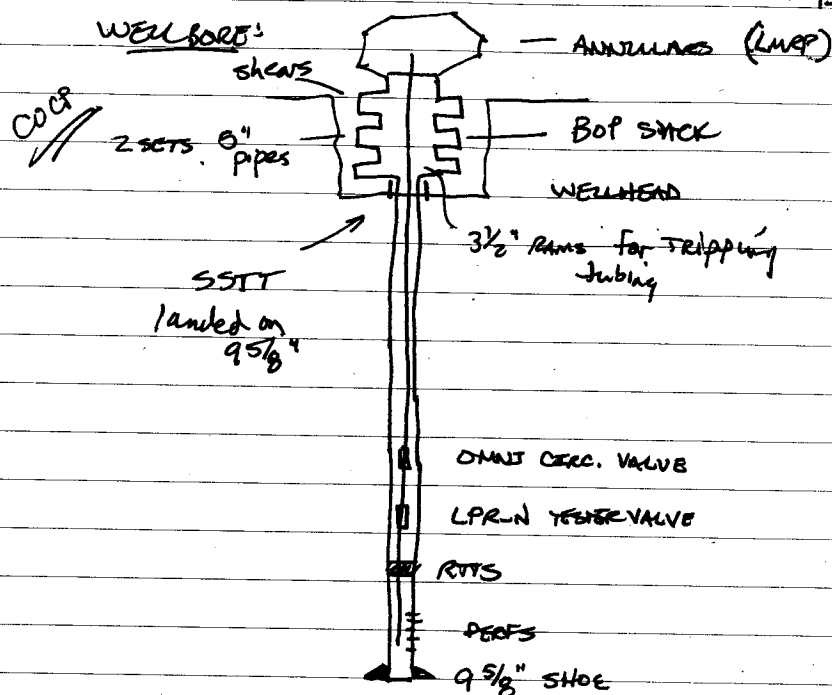
Another HNS RTTS packer (well had to be made up on taking)

→ Brian says to leave stack on well head, no matter what; per approval given to ARCO earlier

NOTE: → well is not currently flowing although it's open (Bridge Sol plug still not washed out)

Kulluk

10/3/92



1415hrs

- Bruce Campbell, Fred Johnson, Henry Hite called Richard Morgan (ARCO Regional Drilling Supv.); was familiar w/ written agreement between ARCO & MMS (Brian) regarding leaving stack on well unless plug is in hole.
- Copy of Brian's approval to be faxed to rig

1430hrs

Appears that ice moving in trajectory which will miss Kulluk; boats are managing ice

Kulluk

10/3/92

TO SET STORM PACKER have to retrieve SSTT.

and valve

- to set another RTTS (storm packer) in 9 5/8", would have to release lower RTTS; POOH; retrieve ~~SSTT~~ SSTT; place RTTS in tubing string; RTTS & land out on 9 5/8"; ROTATE RTTS TO "J-IN" RTTS lower; then upper

Believe <sup>LC</sup> plug in tubing string

1545hrs

Reverse circulate tubing w/ BRINE

1615hrs

Foamy oil cut w/ diesel & water to surface; could be part of pill w/ diesel cushion moved to 32/64ths choke

1624hrs

36/64ths choke transition to brine/oil emulsion

1655hrs

1655hrs

"clean" brine; shut in @ choke manifold  
- line up to displace tubing w/ diesel

1705 hrs

Begin pumping diesel (44 bbls) @ 2 BPM down tubing



Kurum

1700hrs TANK #6 - 3' 2 1/8"

1822hrs

Well open on 3 1/4ths adjust.  
Plan → Flow to clean up & stabilize  
open to 40/64ths adjust.

1824hrs

1825hrs

open to 4 1/4ths adjust.

1834hrs

Back off to 40/64ths adjust.

1837hrs

Back to 32/64ths adjust.

1842hrs

Back to 28/64ths choke; trying  
to get the well pressured up

1845hrs

ON Rig floor; SAMPLE TAKEN  
ALL DIESEL; Choked back to  
16/64ths

BOP Panel - Lower 5" pipe rams (middle  
rams) closed; ~~hang off~~ SSTT

INTERESTING NOTE:

- CLOSING  
TIMES FOR ALL RAMS, & OTHER  
VALVES NOTED ON PANEL:
- PIPE RAMS: 20 sec
  - Shear Rams: 20 sec
  - Annulars: 44 sec
  - Choked Kill: 12 sec

1800hrs

Ice have moved  
away from Kulluk;  
Breakers managed ice  
10/3/92

CP = 1036 PSI  
WHT = 0 PSI

NOTE: → SWITCHING TANKS ON THE HOUR

Kurum

1800hrs

well flowrate very low; Low  
pressure; No WHT pressure;

16/64ths Adjust choke

Brine - 9.2 ppg

Plug - 10.2 ppg

→ Recovered fluids (1624 hrs -  
1655 hrs) - 9.5 ppg (per  
mud engineer tests)

1955hrs

moved to 20/64ths <sup>adjust</sup> choke to  
Keep back pressure down; TP = 70 psi

1958hrs

moved to 24/64ths choke (adjust)  
TP = 30 psi; CP = 1473 psi  
T = 39.4°F

2002hrs

choke backed off to 28/64ths adjust.  
- well seems to be coming on line  
WHT Pressure (JP) = psi

2007hrs

26/64ths adjust. choke  
TP<sub>WHT</sub> = 70 psi

2015hrs

calculated rate = 1200 BPD

2020hrs

formation fluid to surface  
TP = 39 psi

2030hrs

sample taken @ WHT; 75% H<sub>2</sub>O  
25% Oil

TP = 133 psi

- formation fluid to surface; begin  
injection of densifier

AMBIENT TEMP = 14.7°F

KINLUIN

2033 hrs

ph = 7.5

10/3/12  
Open Low Stage (Surge Tank)

TP = 150.5 psi ; T = 40°F

Tank #5 strap = 4' 6"

2030 hrs

TANK RATE =

Previous

strap

4' 3"

- well slugging gas (reason for varying rate)

2040 hrs

TP = 195.6 psi

T = 40°F

Choke = 36/64ths adjust.

2045 hrs

SAMPLE : 90% water  
0.3% Sediment  
9.7% oil

TANK #5 STRAP: 5' 4"

TANK RATE  
1520 BPD

TP = 230.7 psi ; T = 40°F

2100 hrs

15% CO<sub>2</sub>

TP<sub>WH</sub> = 289 psi ; T = 40°F

TANK #6 STRAP = ~~4' 6"~~ 4' 5 1/4"

TANK RATE = BPD

Previous  
#6 STRAP  
4' 2 3/4"

< 1.375" orifice plate in low stage >

2114 hrs

Replace 1.125" orifice plate in Surge

2115 hrs

TP = 356.5 psi ; T = 40.5°F

9.7% oil  
6% H<sub>2</sub>O  
0.1% Sediment

TANK #6 STRAP =

TANK RATE =

→ SWITCHED TO TANK #5 @ 2100 hrs

2130 hrs

TP = 449 psi ; T = 40.9°F

TANK #5 STRAP = 5' 4"

TANK RATE =

0.7% CO<sub>2</sub>

3% water

TRACE SEDIMENT

FILL SURGE TANK

10/3/12

KIN

19

21 hrs

Route flow through separator (high stage)

215 hrs

OPEN TO 40/64ths choke

TP = 439 psi ; T = 41°F

- well flow: still slugging gas

Sample: 5% H<sub>2</sub>O ; TRACE Sediment

2200 hrs

SWITCH TO TANK #5

TANK #6 STRAP = 5' 5 1/4"  
TANK RATE = BPD

TP<sub>WH</sub> = 479 psi ; T<sub>WH</sub> = 42°F

2210 hrs

1.500" orifice plate for separator

2214 hrs

TP = 498 psi ; T = 41.9°F

2230 hrs

TP = 553.8 psi ; T = 43°F

TANK #5 STRAP = 7' 1 1/4" (switch to TANK #6)

TANK RATE = 1700 BPD

Meter rate oil = 0.81/A

gas = 773.7 MSCFD  
water = 0

2245 hrs

TP = 548.8 psi ; T = 41.9°F

Metered G<sub>o</sub> = 3047 BPD

Metered G<sub>g</sub> = 868.5 MSCFD

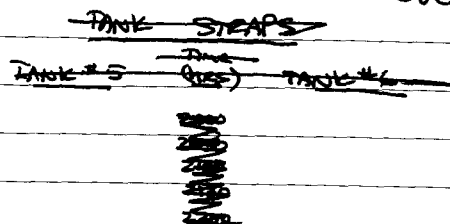
2250 hrs

begin flow through high & low stage separator

G<sub>o</sub> = 2495 BPD  
G<sub>g</sub> = 862 MSCFD

NOTE → Surge tank problems — Use meter rates; meter correction factor by averaging tank rates over several hrs

10/3/92



TANK STRAPS

<u>TANK #5</u>	<u>TIME</u>	<u>TANK #6</u>
	2000 hrs	
	2015	
	2030	
5'4"	2045	—
—	2100	4'5 1/4"
5'4"	2130	—
—	2200	5'5 1/4"
7'1 1/4"	2230	—
—	2300	6'9 1/4"
7'2 1/2"	2312	—
—	2330	—
—	2400	—
—	0100	—
7'4 3/4"	0117	—
—	0130	—
—	0200	11'4"
10'8 1/4"	0230	—
—	0300	14'7 1/2"
13'9 1/4"	0330	—
—	0400	18' 1/4"
17'3 1/4"	0430	—
TANK FULL		TANK FULL

2315 hrs shut in to run prod. logs

10/3/92

200 hrs

TP = 569.5 psi; T = 41.9 °F

switch to Tank #5

make adjustments adjust

TANK #6 STRAP = 6'9 1/4" ; TANK RATE = 1280 BPD

meter g<sub>0</sub> = 1623 BPD

meter g<sub>1</sub> = 886.6 MSCFD

water = 0

308 hrs

shut in @ <sup>choke</sup> manifold

- will not close LPR-N

- Run Schlumberger wireline tools for production logs

shut in @ lubricator (subsea) bleed off <sup>choke</sup> manifold

TP = 580 psi  
T = 42 °F

311 hrs

Lubricator valve closed

- bleeding off manifold pressure

2315 hrs

- Pressure bled down; begin running wireline <sup>for</sup> production logs

- want bottom hole pressure while logging and during stabilized rate

NOTE: GET COPY OF TEST #2 PROGRAM; INCLUDING <sup>LOGS OF</sup> PRODUCTION LOGS TO BE RUN

Kurun

10/4/92

0004 hrs Begin to pressure up to equalize pressure across subsea lubricator (run in w/ wireline)

0011 hrs Lubricator

0018 hrs Running wireline tools into hole thru SS lubricator

0115 hrs OPEN well on  $16/64$  adjust. choke  
Shut in TP = 880 psi BHP<sub>shut in</sub> = 2800 psi

→ 0117 hrs OPEN well to  $20/64$  adjust. choke  
Flow TP<sub>well</sub> = psi  
TP = 779 psi  
inc. downhole flow to

↓ 0118 hrs TP = 766 psi  
Open to  $20/64$  adjust. choke

0119 hrs TP = 752 psi

0120 hrs open to  $36/64$  choke  
TP = 726 psi

0123 hrs BHP = 2459 psi  
TP = 620 psi  
open to  $40/64$  choke (adjust)

Kun

10/4/92

0126 hrs BHP = 2543 psi ; dropping  
TP = 542 psi ; T = 38 °F

0130 hrs open choke to  $46/64$   
switch flow into TANK #6  
GAUGE TANK #5 = 7'4" 3/4  
TANK RATE = 180 BPD  
WH = 512 psi ; T = 38.5 °F

0132 hrs BHP = 2445 psi  
TP = 466 psi ; T = 39.8 °F

BHP  
Press 2000 psi

0135 hrs TP = 464 psi ; T = 40.5 °F

0136 hrs BHP = 2412 psi ; TP = 466 psi  
T = 40.7 °F

0138 hrs open choke to  $52/64$  adjust.  
TP = 464 psi ; T = 41 °F

0140 hrs BHP = 2365 psi ; TP = 415 psi  
T = 41.2 °F

2" choke installed

Kuvlum

10/4/92

0144 hrs

open to 60/64ths adjust.  
TP = 425 psi ; T = 42.2°F

0145 hrs

TP = 324 psi ; T = 42°F

0147 hrs

BHP = 2289 psi ; T = 42.4°F  
TP = 353 psi

0150 hrs

WH = 347 psi ; BHP = 2273 psi  
T = 43.6°F

0155 hrs

WH = 366.5 psi ; BHP = 2269 psi  
T = 43.8°F

0158 hrs

WH = 358.8 psi ; T = 43.8°F

well out  
of control  
flow

0200 hrs

switch to tank #5

WHHP = 352 psi ; T = 44°F

BHP = 2259 psi

TANK GAUGE = 11'4"

TANK RATE = 4381 BPD

- Begin injecting defoamer @ separator

30 min  
averaged  
rate

(rate taken  
every min)  
over 30 min  
interval

neted  $Q_o$  meter = 7100 BPD  
 $Q_g$  meter = 1664 MSCFD

oil grav = 34° API

Flow test -  
(CONT'D)

Kuvlum

10/4/92

0205 hrs

WH = 344 psi ; T = 44.5°F

0210 hrs

WH = 328.3 psi ; T = 44.7°F

trying to  
control  
flow

0215 hrs

WH = 327.3 psi ; T = 45.1°F

0220 hrs

WH = 325.5 psi ; T = 45.3°F  
BHP = psi ;

0225 hrs

open well on 60/64ths choke  
WH = 322.5 psi ; T = 45.5°F

0228 hrs

SAMPLE: SAND - 0.3% Sediment - water  
All 'oil water = 9 ; 34° API

0230 hrs

TANK GAUGE = 10'8 1/4"

TANK RATE = 3160 BPD

WH = 309 psi ; T = 45.9°F

Some sand  
showing in  
drain well

neted  $Q_o$  = 5133 BPD  
 $Q_g$  = 1532 MSCFD } GOR = 300 scf/bbl

BHP = 2220 psi ; dropping

Flowing on 60/64ths adjust. choke

KUM

0235 hrs

Flow TEST - CONT'D

10/4/94

0240 hrs

WH = 309.3 psi ; T = 46.6 °F

meter  $\begin{cases} q_o = 4467 \text{ BPD} \\ q_g = 1937 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} \text{GOR} = \\ 322 \end{array} \right.$

~~0245 hrs~~

34° API gravity

0250 hrs

WH = 305 psi ; T = 46.9 °F

60/64ths choke

meter  $\begin{cases} q_o = 4774 \text{ BPD} \\ q_g = 1392 \text{ MSCFD} \end{cases}$   
water = 0

0300 hrs

WH = 302.5 psi ; T = 47.4 °F

60/64ths choke

meter  $\begin{cases} q_o = 5243 \text{ BPD} \\ q_g = 1339 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} \text{GOR} = 280 \end{array} \right.$

~~0305 hrs~~

- Begin Running production logs

60/64ths choke

Gauge Tank # 6 = 14' 7 1/2"  
TANK RATE = 3160 BPD

0310 hrs

WH = 298 psi ; T = 47.8 °F

meter  $\begin{cases} q_o = 5399 \text{ BPD} \\ q_g = 1276 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} \text{GOR} = \\ 236 \end{array} \right.$

0318 hrs

1.250" Plate in high stage separator

Flowing; 60/64ths Choke (adjust)

KUM

020 hrs

WH = 301.5 psi ; T = 48.1 °F

meter  $\begin{cases} q_o = 5081 \text{ BPD} \\ q_g = 1729 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} \text{GOR} = 340 \end{array} \right.$

030 hrs

WH = 299.5 psi ; T = 48.9 °F

meter  $\begin{cases} q_o = 4156 \text{ BPD} \\ q_g = 1310 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} \text{GOR} = 315 \end{array} \right.$

TANK #5 GAUGE = 13' 9 1/4" ; TANK RATE = 2961 BPD

meter  $\begin{cases} \text{Cum. oil} = 402 \text{ BBL} \\ \text{Cum. gas} = 155 \text{ MSCF} \end{cases}$

0340 hrs

WH = 297 psi ; T = 49 °F

meter  $\begin{cases} q_o = 4381 \text{ BPD} \\ q_g = 1254 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} - 340 \text{ API} \\ - 0.73 \text{ sp.gr.} \\ \text{GOR} = 286 \end{array} \right.$

0350 hrs

WH = 298 psi ; T = 49.5 °F

meter  $\begin{cases} q_o = 4398 \text{ BPD} \\ q_g = 1189 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} - 340 \text{ API} \\ - 0.73 \text{ sp.gr.} \end{array} \right.$

0400 hrs

WH = 298 psi ; T = 49.8 °F

meter  $\begin{cases} q_o = 4625 \text{ BPD} \\ q_g = 1121 \text{ MSCFD} \end{cases} \left\{ \begin{array}{l} \text{GOR} = 242 \end{array} \right.$

TANK #6 GAUGE = 18' 1/4" ; TANK RATE = 3261 BPD

meter  $\begin{cases} \text{Cum. oil} = 495 \text{ BBL} \\ \text{Cum. gas} = 179 \text{ MSCF} \end{cases}$

Flowing on 69/64ths choke (adj.)

Kuulun

10/4/92

0410 hrs

WH = 294 psi ; T = 50 °F

meter {  $q_o = 4756$  BPD  
 $q_g = 1091$  MSCFD } GOR = 229  
 water = 0

0420 hrs

WH = 295 psi ; T = 50.5 °F

Went to 30 min increments { metered {  $q_o =$  — BPD — 34° API  
 $q_g =$  — MSCFD — 0.73 sp.gr.

0430 hrs

WH = 294.5 psi ; T = 50.7 °F

meter {  $q_o = 4717$  BPD } GOR = 212 scf/Bbl  
 $q_g = 999.6$  MSCFD  
 Tank #5 gauge = 17'3 1/4"

TANK RATE = 3361 BPD

\* Switch to TANK #7

METER { Cum. oil = 594 BBL  
 Cum. gas = 201 MSCF. } water = 0

0440 hrs

WH = 294 psi ; T = 51.0 °F

meter {  $q_o = 4633$  BPD } GOR = 189  
 $q_g = 876$  MSCFD

0500 hrs

WH = 292 psi ; T = 51.6 °F

meter {  $q_o = 4757$  BPD } GOR = 162  
 $q_g = 771.3$  MSCFD

TANK GAUGE = 4'9"

TANK RATE = 1561 BPD

meter { Cum. oil = 692 BBL  
 Cum. gas = 218 MSCF

WATER = 0

VLUN

10/4/92

# TANK GAUGES

TANK #7	TIME	TANK #8
4'9"	0500 hrs	—
—	0530	—
—	0600	—
—	0630	—
—	0700	—
—	0730	—
—	0800	—
5'10 1/4"	0830	—
—	0900	3' 1/4"
	0930	—
	1000	—
	1030	—
	1100	—
	1130	—
	1200	—
	1230	—
	1300	—

0917 hrs  
 RED ALERT  
 DECLARED  
 BECAUSE  
 OF ICE

Kuvlum

10/4

0500 hrs

Shut in @ Choke manifold to  
pull wireline tools & Run SPRO  
(surface pressure-read-out)

0512 hrs

Close LPR-N by bleeding  
pressure on annulus

0513 hrs

LPR-N Closed

- will open well again gradually to  
a rate at least equal to the  
previous flow test.

- intent is to get another pressure  
transient into the reservoir, shut  
in at the bottom & build up.

MAXIMUM FLOW TEST (PRIOR TO BUILD UP)

0820 hrs

Open choke manifold, up  
to 26/64ths choke.

BHP =                      psi

WHP =                      psi

T =                      °F

Kuvlum

10/4/92

0825 hrs

BHP = ~~200~~ psi; WHP = 296 psi

open on 76/64ths choke

BHT = 118 °F

WHT = 17.4 °F

0827 hrs

open on 88/64ths choke; well back-  
pressure controlled by separator

BHP =                      psi; WHP =                      psi

0830 hrs

5' 10 1/4"

TANK #2 GAUGE  
TANK RATE = 2651 BPD

0832 hrs

full open on choke - 2"

BHP =                      psi; WHP =                      psi  
T =                      °F

0835 hrs

Plate in service in high stage  
separator (1.375")

WHP =                      psi; BHP =                      psi

0840 hrs

BHP =                      psi; WHP =                      psi  
T =                      °F

0845 hrs

ANNUA

A ICE FIRE ROTATING; MAY  
HAVE TO MOVE FROM LOCATION

- I.E. RECON BY BOATS



Kuvlum

T = °F

10/4/92

0845 hrs

BHP = psi  
WHP = psi

0850 hrs

BHP =

psi ; WHP = psi  
T = °F

0855 hrs

BHP =

psi ; WHP = psi  
T = °F

0900 hrs

TANK #8 GAUGE =  
TANK RATE = BPD

BHP =

psi ; WHP = psi  
T = °F

- SPRO tool leaking; Pressure data ok for flow but would be invalid for Build up

TEST WELL SUSPENDED - RED ALERT DUE TO ICE

COC P

Kuvlum

10/4/92

0916 hrs

RED ALERT DECLARED  
- WELL SHUT-IN NOTICE GIVEN TO SCHLUMBERGER (WIRE LINE TOOL - SPRO)

0917 hrs

LPRN CLOSED

has  
Panama flow, begun to move (rotate) toward the location

PLAN:

- ① Bull head after Schlumberger ~~close~~ out of hole
- ② Close LPR-N
- ③ Cycle OMNI to blank

NOTE:

Subsea Test Tree hung off in wellhead, not on pipe Rms

1000 hrs

Schlumberger tools out of hole

1016 hrs

Blow Down COFLEX Hose w/ AIR - CIRC. OUT OIL INTO TEST SEPARATOR

1017 hrs

ICE PLOTS INDICATE

PANAMA WILL LIKELY MISS US; CONTINUE W/ SECURE PER RED ALERT

## COCF

Kulluk

10/4/92

- DECISION TO BULLHEAD TO BE MADE AFTER FURTHER ICE ANALYSIS

**1020hrs** DOWNGRADE ALERT TO "YELLOW"

- FLOE TO MISS KULLUK
- STANDBY UNTIL FLOE SEPARATES AT A DISTANCE FROM KULLUK
- CONTINUING TO BLOW DOWN COREX

STANDBY ON ICE ALERT STATUS

**1030hrs**

DEBRIEF ON RIG FLOOR

- STATUS OF OPS
- OVERVIEW OF WORK COMPLETED
- DAVE BUNGARDNER (ARCO)

**1100hrs**

Debrief in Control Room w/  
Captain (Guy Kendall) and OIM  
(Grant Stagford)

- discussed safety margins in Alert times (Secure times)
- discussed time savings
- discussed operations to follow per ARCO (in Anchorage) - continue to do build up; time will be determined later

## COCF

Kulluk

10/4/92

- YELLOW ALERT CONTINUES; RECALC. SECURE TIME BASED ON WORK COMPLETED THUS FAR IN SECURE

- ICE FLOE (PANAMA) gouging as it moves: moving much slower than rest of 1<sup>st</sup> year ICE; BRIDGE MONITORING AND ICE BREAKERS KALUK, KIGORIK, and Supplier on Panama; Mitscaroo managing 1<sup>st</sup> year sheet in drift of Kulluk

- WEATHER: POOR VISIBILITY; STRONG WINDS (APPROACHING 30 KTS); VERY COLD

**1105hrs**

Well Test called off officially as of 1130hrs, 10/4/92.

- plan is to ~~pull~~ ~~up~~ pull tubing out of hole, lay down test tools, Rint w/ EZSV, ~~seal~~ bullhead fluids; & squeeze perms, set plugs - P&A
- Build up data (from downhole gauges) until open well again (200 B.U.)

ST NOTES

10/6/92

FOLLOW UP NOTES

- ① Well perforated @ 0845 hrs 9/30
- ② 10 minute clean up flow 0845 - 0855 hrs
- ③ Could not seat (latch) SRD probe  
∴ all P & T readings from  
flowing well head
- ④ flow #1 initiated @ 1145 hrs 9/30  
- opened gradually to 28/64ths choke
- ⑤ Surge Tank (low stage separation)  
problems from improperly working dump  
valve - caused fluctuating Tank  
flow rate readings (based on gauging)
- ⑥ ~~the~~ foaming persistent; began using  
defoamer @ 1745 hrs 9/30
- ⑦ Gas rates through orifice plate,  
calculated on differential pressure
- ⑧ Oil rates measured through turbine  
meter & calculated based on volume  
flowed into stock tank over  $\Delta t$ .

Kuvlum - NOTES

10/6/92

- ⑨ Oil Gravity = 34° API  
Gas Gravity = 0.722 - 0.73  
- both measured on site
- ⑩ Metered oil rates and GOR's are questionable - measured by unproven meter
- ⑪ LPR-N Tester Valve failed in partial open position when attempted to cycle <sup>close</sup> for Build up Test  
- closed OMNI Circulating Valve up hole of LPR-N @ 1045 hrs on 10/1/92
- ⑫ Begin Build Up #1 @ 1045 hrs, 10/1  
- no surface read out since SRO tool could not be latched into place down hole prior to Flow Test.
- ⑬ BU #1 Test suspended @ 1800 hrs 10/1/92  
- RETRIEVE TOOLS, REPLACE LPR-N & OMNI; RECOVER GUNS; RECOVER PRESSURE RECORDERS; RETEST

Kuvlum - NOTES

10/6/92

Flow Test #2 initiated 1036 hrs 10/3/92  
- problems getting well to flow initially because loss circulation pill was used after suspending Build up (well was losing fluids)  
- well came back on line 1822 hrs w/ very low Tubing (well head) pressure and flow rate

- 2030 hrs: formation fluid to surface

→ RAN INTO WELL WITH SUITE OF PRODUCTION LOGS  
OPEN GRADUALLY TO 40/64" TH choke

RUNNING PRODUCTION LOGS BOTTOM TO TOP BEGINNING @ 115 hrs 10/4/92  
- OPEN GRADUALLY TO 60/64" TH choke

Shut in Flow Test #2 to pull wireline logs (production logs) from wellbore @ 0500 hrs 10/4/92

MAXIMUM FLOW RATE TEST (Flow #3) prior to Build up begins @ 0820 hrs 10/4/92

Shut in @ 0917 hrs - RED ALERT DECLARED - ICE

Kurum notes

10/5/92

- (19) Build up #2 Data should be  
available from down hole  
gauges beginning 0917 hrs  
through ?