GUIDE TO INTERPRETATION AND IDENTIFICATION OF
LYNES DRILL STEM TEST PRESSURE CHARTS

In making any interpretation, our employees will give Customer the benefit of their best judgment as to the correct interpretation. Nevertheless, since all interpretations are opinions based on inferences from electrical, mechanical or other measurements, we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not be liable or responsible, except in the case of gross or wilful negligence on our part, for any loss, costs, damages or expenses incurred or sustained by Customer resulting from any interpretation made by any of our agents or employees.

AK-1 recorders. Read from right to left.

Kuster AK-1

K-3 recorders. Read from left to right.

Kuster K-3

A – Initial Hydrostatic
B – First Initial Flow
C – First Final Flow
D – Initial Shut-in
E – Second Initial Flow
F – Second Final Flow
G – Second Shut-in
H – Third Initial Flow
I – Third Final Flow
J – Third Shut-in
K – Final Hydrostatic

Very low permeability. Usually only mud recovered from interval tested. Virtually no permeability.
Slightly higher permeability. Again usually mud recovered.
Slightly higher permeability. Small recovery, less than 200 ft, pressure.
Average permeability. Final and initial shut-ins differ by 50 psi, low flow pressure.

Excellent permeability where final flow final shut-in pressure.
High permeability where ISIP and FSIP are within 10 psi.
Deep well bore invasion or damage. Final shut-in higher than the initial shut-in.
Tight hole chamber tester. Permeability very difficult to interpret unless the recovery is less than chamber length. Flow pressure builds up rapidly if recovery is less than 200 ft, initial shut-in.
## LYNES, INC.

**Contractor:** Westburne Drlg. Inc.  
**Rig No.:** 52  
**Spot:** SW-NW  
**Sec.:** 2  
**Twp.:** 2 S  
**Rng.:** 41 E  
**Field:** Wildcat  
**County:** Bingham  
**State:** Idaho  
**Elevation:** 6621' "K.B."  
**Formation:** Twin Creeks-Leeds

---

<table>
<thead>
<tr>
<th>Flow</th>
<th>No.</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

**Top Choke:** 1/4"  
**Bottom Choke:** 9/16"  
**Size Hole:** 12 1/4"  
**Size Rat Hole:** --  
**Size & Wt. D. P:** 4 1/2" 19.50  
**I. D. of D. C.:** 2 3/4"  
**Total Depth:** 6677'  
**Interval Tested:** 6575-6677'  
**Type of Test:** Bottom Hole  
**Conventional**

---

**Bottom Hole**  
**Hole Temp.:** 186°F  
**Mud Weight:** 8.9  
**Gravity:** --  
**Viscosity:** 38

**Tool opened @ 5:48 PM.**

---

**Inside Recorder**  
**PRD Make:** Kuster AK-1  
**No.:** 3812  
**Cap.:** 5100  
**@ 6590'**

**Press Corrected**  
<table>
<thead>
<tr>
<th>Initial Hydrostatic</th>
<th>3054</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Hydrostatic</td>
<td>3030</td>
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<tr>
<td>Initial Flow</td>
<td>62</td>
</tr>
<tr>
<td>Final Initial Flow</td>
<td>50</td>
</tr>
<tr>
<td>Initial Shut-in</td>
<td>193</td>
</tr>
<tr>
<td>Second Initial Flow</td>
<td>58</td>
</tr>
<tr>
<td>Second Final Flow</td>
<td>226</td>
</tr>
<tr>
<td>Second Shut-in</td>
<td>626</td>
</tr>
<tr>
<td>Third Initial Flow</td>
<td>--</td>
</tr>
<tr>
<td>Third Final Flow</td>
<td>--</td>
</tr>
<tr>
<td>Third Shut-in</td>
<td>--</td>
</tr>
</tbody>
</table>

**Lynes Dist.:** Rock Springs, Wy.  
**Our Tester:** John Webb  
**Witnessed By:** P.L. Waid

---

**Did Well Flow**  
Gas No  
Oil No  
Water No

**RECOVERY IN PIPE:** 10' Mud = .07 bbl.

---

**1st Flow** - Tool opened with a 1/2" underwater blow and remained thru flow period.

**2nd Flow** - Tool opened with a very weak blow, died in 40 minutes and remained thru flow period.

---

**REMARKS:** Charts indicate tool was possibly plugged during the second flow period.
LYNES, INC.

Operator: American Quasar Petroleum Co, Lease & No. King #2-1

DST No. 3

Outside Recorder

PRD Make: Kuster K-3
No. 5682 Cap 6200 @ 6677

<table>
<thead>
<tr>
<th>Press</th>
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<tbody>
<tr>
<td>Initial Hydrostatic</td>
<td>3074</td>
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<td>Initial Shut-in</td>
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<tr>
<td>Second Initial Flow</td>
<td>69</td>
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<tr>
<td>Second Final Flow</td>
<td>232</td>
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<td>Second Shut-in</td>
<td>631</td>
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<tr>
<td>Third Initial Flow</td>
<td>--</td>
</tr>
<tr>
<td>Third Final Flow</td>
<td>--</td>
</tr>
<tr>
<td>Third Shut-in</td>
<td>--</td>
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</tbody>
</table>

Pressure Below Bottom
Packer Bled To

PRD Make: Kuster AK-1
No. 973 Cap 7900 @ --

<table>
<thead>
<tr>
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<tr>
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<td>3058</td>
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<td>Initial Flow</td>
<td>88</td>
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<tr>
<td>Final Initial Flow</td>
<td>70</td>
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<tr>
<td>Initial Shut-in</td>
<td>195</td>
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<td>Second Initial Flow</td>
<td>79</td>
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<tr>
<td>Second Final Flow</td>
<td>248</td>
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<tr>
<td>Second Shut-in</td>
<td>629</td>
</tr>
<tr>
<td>Third Initial Flow</td>
<td>--</td>
</tr>
<tr>
<td>Third Final Flow</td>
<td>--</td>
</tr>
<tr>
<td>Third Shut-in</td>
<td>--</td>
</tr>
</tbody>
</table>

Pressure Below Bottom
Packer Bled To
<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Initial Shut-In</th>
<th></th>
<th>Time (min)</th>
<th>Final Shut-In</th>
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<tbody>
<tr>
<td>0</td>
<td>50 psig.</td>
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<td>0</td>
<td>226 psig.</td>
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<tr>
<td>6</td>
<td>51</td>
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<td>12</td>
<td>259</td>
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<td>12</td>
<td>56</td>
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<td>24</td>
<td>303</td>
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<td>18</td>
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<td>506</td>
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<td>150</td>
<td></td>
<td>96</td>
<td>546</td>
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<td>54</td>
<td>173</td>
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<td>585</td>
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<tr>
<td>60</td>
<td>193</td>
<td></td>
<td>120</td>
<td>626</td>
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</tbody>
</table>
# LYNES, INC.

## Fluid Sample Report

<table>
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<th>Date</th>
<th>5-5-78</th>
<th>Ticket No.</th>
<th>10318</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>American Quasar Petroleum Co.</td>
<td>DST No.</td>
<td>3</td>
</tr>
<tr>
<td>Well Name &amp; No.</td>
<td>King #2-1</td>
<td>State</td>
<td>Idaho</td>
</tr>
<tr>
<td>County</td>
<td>Bingham</td>
<td>Test Interval</td>
<td>6575-6677'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pressure in Sampler</th>
<th>10</th>
<th>PSIG</th>
<th>BHT</th>
<th>186</th>
<th>°F</th>
</tr>
</thead>
</table>

| Total Volume of Sampler: | 2100 | cc. |
| Total Volume of Sample:  | 2100 | cc. |
| Oil:                     | None | cc. |
| Water:                   | None | cc. |
| Mud:                     | 2100 | cc. |
| Gas:                     | None | cu. ft. |
| Other:                   | None | |

R.W. .85 @ 90°F = 5500 ppm.chl.

### Resistivity

<table>
<thead>
<tr>
<th>Make Up Water</th>
<th>10.0 @ 50°F</th>
<th>of Chloride Content</th>
<th>725 ppm.</th>
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</thead>
<tbody>
<tr>
<td>Mud Pit Sample</td>
<td>1.1 @ 65°F</td>
<td>of Chloride Content</td>
<td>6000 ppm.</td>
</tr>
</tbody>
</table>

Gas/Oil Ratio: _____________

Gravity: _____________ °API @ _____________ °F

Where was sample drained: On location

Remarks: Recovery - R.W. .8 @ 95°F = 6500 ppm.chl.
### Distribution of Final Reports

**Operator:** American Quasar Petroleum Co.  
**Well Name and No.:** King #2-1

<table>
<thead>
<tr>
<th>Copies</th>
<th>Company and Address</th>
<th>Attention</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 copy</td>
<td>American Quasar Petroleum Co., 204 Superior Bldg., Casper, Wyoming 82601</td>
<td>John Sindelar</td>
<td>Casper, WY</td>
</tr>
<tr>
<td>1 copy</td>
<td>American Quasar Petroleum Co., 707 United Bank Tower, 1700 Broadway, Denver, Colorado 80290</td>
<td>Clare Gregg</td>
<td>Denver, CO</td>
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<td>Bill Bogert</td>
<td>Ft Worth, TX</td>
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<td>Herb Hare</td>
<td>Midland, TX</td>
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<td>1 copy</td>
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<td>W.S. Lingley</td>
<td>Casper, WY</td>
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<td>Arthur Zierold</td>
<td>Boise, ID</td>
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<td>Haskell Fleetwood</td>
<td>Dallas, TX</td>
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<td>T.T. Oldroyd</td>
<td>Dallas, TX</td>
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</tbody>
</table>
Contractor: Westburne Drlg. Inc.
Rig No.: 52
Spot: NW
Sec.: 2
Twp.: 2 S
Rng.: 41 E
Field: Wildcat
County: Bingham
State: Idaho
Elevation: 6621' "K.B."
Formation: Nugget

Top Choke: 1/4"
Bottom Choke: 3/4"
Size Hole: 12 1/4"
Size Rat Hole: --
Size & Wt. D. P. 4 1/2" 16.60
Size Wt. Pipe: --
I. D. of D. C.: 2 1/4"
Length of D. C.: 310'
Total Depth: 8660'
Interval Tested: 8550-8660'
Type of Test: Bottom Hole

Flow No. 1: 20 Min.
Shut-in No. 1: 5 Min.
Flow No. 2: 15 Min.
Shut-in No. 2: 5 Min.
Flow No. 3: -- Min.
Shut-in No. 3: -- Min.

Bottom Hole Temp.: 240°F
Mud Weight: 8.9
Gravity: --
Viscosity: 40

Tool opened @ 7:00 AM.

Outside Recorder
PRD Make: Kuster AK-1
No.: 3812
Cap.: 5100 @ 8660'

Initial Hydrostatic A: 4001
Final Hydrostatic K: 4001
Initial Flow B: 571
Final Initial Flow C: 670
Initial Shut-in D: 3457
Second Initial Flow E: 678
Second Final Flow F: 678
Second Shut-in G: 3270
Third Initial Flow H: --
Third Final Flow I: --
Third Shut-in J: --

Lynes Dist.: Rock Springs, Wy.
Our Tester: Bill Alford
Witnessed By: Paul Waid

Did Well Flow - Gas: No, Oil: No, Water: No
RECOVERY IN PIPE: 750' Gas cut mud = 7.77 bbl.
No Charge - Tester had no surface indication of tool opening so test was aborted.

REMARKS.
**LYNES, INC.**  
**Fluid Sample Report**

<table>
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<th>10407</th>
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<td>Company</td>
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<td>DST No.</td>
<td>4</td>
</tr>
<tr>
<td>Well Name &amp; No.</td>
<td>King #2-1</td>
<td>State</td>
<td>Idaho</td>
</tr>
<tr>
<td>County</td>
<td>Bingham</td>
<td>Test Interval</td>
<td>8550-8650</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Pressure in Sampler</th>
<th>0</th>
<th>PSIG</th>
<th>BHT</th>
<th>240</th>
<th>°F</th>
</tr>
</thead>
</table>

| Total Volume of Sampler: | 2100 | cc. |
| Total Volume of Sample:  | 2100 | cc. |
| Oil:                     | None | cc. |
| Water:                   | None | cc. |
| Mud:                     | 2100 | cc. |
| Gas:                     | None | cu. ft. |
| Other:                   | None | |

- R.W. .44 @ 65°F = 15,500 ppm chl.

**Resistivity**

- Make Up Water 10.0 @ 60°F of Chloride Content 600 ppm.
- Mud Fit Sample .8 @ 75°F of Chloride Content 7000 ppm.

- Gas/Oil Ratio Gravity 6°API @ 60°F

**Where was sample drained**

**Remarks:**

Recovery: Top Sample - R.W. .6 @ 100°F = 7600 ppm chl.

Middle Sample - R.W. .2 @ 85°F = 27,750 ppm chl.

Bottom Sample - R.W. .6 @ 65°F = 11,000 ppm chl.
LYNES, INC.

Distribution of Final Reports

Operator: American Quasar Petroleum Co.  Well Name and No.: King #2-1

<table>
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</table>
NOMENCLATURE (Definition of Symbols)

Q = average production rate during test, bbls./day
Q_0 = measured gas production rate during test, MCF/day
k = permeability, md
h = net pay thickness, ft. (when unknown, test interval is chosen)
μ = fluid viscosity, centipoise
Z = compressibility factor
T_0 = reservoir temperature, ° Rankine
m = slope of final SIP buildup plot, psig/cycle (psig%/cycle for gas)
b = approximate radius of investigation, feet
t_m = wellbore radius, feet
P_e = Extrapolated maximum reservoir pressure, psig
P_f = final flowing pressure, psig
P_l = productivity index, bbl./day/psi
P_{l,-} = theoretical productivity index with damage removed, bbl./day/psi
D.R. = damage ratio
E.D.R. = estimated damage ratio
AOF = absolute open flow potential, MCF/D
AOF_{l,-} = theoretical absolute open flow if damage were removed
h_s = subsea depth
W = water gradient based on salinity
H_w = potentiometric surface

INTERPRETATION CALCULATIONS (OIL/WATER)

AVERAGE PRODUCTION RATE DURING TEST

\[ Q = \frac{1440 \times \text{drill collar capacity} \times \text{recoveries} + \text{drill pipe capacity} \times \text{recoveries}}{1440 \times \left(1 + \frac{1}{2} + \frac{1}{3}\right)} \]

TRANSMISSIBILITY

\[ k_b = \frac{162}{Q_0} = 162.6 \left(\text{md/ft}\right) \]

IN SITU CAPACITY

\[ k_a = \left(\frac{1}{2}\right) \left(\text{md/ft}\right) \]

AVERAGE EFFECTIVE PERMEABILITY

\[ k_e = k_a \]

PRODUCTIVITY INDEX

\[ P_{l} = \frac{Q}{P_f - P_i} \]

DAMAGE RATIO

\[ \text{D.R.} = \frac{P_{l,-} - P_{l}}{P_{l,-}} \]

PRODUCTIVITY INDEX WITH DAMAGE REMOVED

\[ P_{l,-} = \frac{P_{l}}{1 - \text{D.R.}} \]

APPROXIMATE RADII OF INVESTIGATION

\[ b = \sqrt{18.4 \times \text{(estimated or actual)}}, \text{ft.} \]

Potential Surface: \[ H_w = Z + P_m, \text{ ft.} \]

\[ P_m = \left\{\begin{array}{ll}
1.0 & \text{if } P_f \leq 1500 \text{ psi} \\
1.5 & \text{if } P_f > 1500 \text{ psi}
\end{array}\right. \]

\[ \text{Draindown Factor} = \frac{1500 \times 18.4 \times 100}{15.0} \]

\[ \text{Draindown Factor} = \frac{1500 \times 18.4 \times 100}{15.0} \]

\[ \text{Potential Surface} = H_w = Z + P_m, \text{ ft.} \]
DRILL STEM TEST
TECHNICAL SERVICE REPORT

PST's 7, 8, 9

LYNES

DRILL STEM TEST
TECHNICAL SERVICE REPORT
Lynes, Inc.

Contractor: Westburne Drg., Inc.
Rig No.: 52
Spot: SW-NW
Sec.: 2
Twp.: 2 S
Rng.: 41 E
Field: Wildcat
County: Bingham
State: Idaho
Elevation: 6621' "K.B."
Formation: Phosphoria

Top Choke: 1"
Bottom Choke: 3/4"
Size Hole: 8 1/2"
Size Rat Hole: --
Size & Wt. D. P.: 4 1/2" 16.60
Size Wt. Pipe: --

Interval Tested: 12830-12884'
Type of Test: Bottom Hole

Flow No. 1: 10 Min.
Shut-in No. 1: 60 Min.
Flow No. 2: 60 Min.
Shut-in No. 2: 120 Min.
Flow No. 3: -- Min.
Shut-in No. 3: -- Min.

Bottom Hole Temp.: 480°F
Mud Weight: 8.7
Gravity: --
Viscosity: 45

Tool opened @ 3:15 PM.

Inside Recorder
PRD Make: Kuster AK-1
No.: 1389
Cap.: 10500 @ 12815'
Ticket No.: 10414

Initial Hydrostatic: A 5824
Final Hydrostatic: K 5821
Initial Flow: B 1395
Final Initial Flow: C 1395
Initial Shut-in: D 4957
Second Initial Flow: E 1403
Second Final Flow: F 1469
Second Shut-in: G 4947
Third Initial Flow: H --
Third Final Flow: I --
Third Shut-in: J --

Lynes Dist.: Rock Springs, Wy.
Our Tester: George Baucon
Witnessed By: Paul Wald

Did Well Flow - Gas No Oil No Water No

RECOVERY IN PIPE: 3390' Total fluid. (Ran 3000' Water cushion with 60 gal. ammonia and
20 gal. petromine.)

50' Petromine & drilling fluid. = .71 bbl.
2710' Water cushion = 38.29 bbl.
630' Water = 3.08 bbl.

REMARKS:
1st Flow - Tool opened with a 1" underwater blow and remained thru flow period.
2nd Flow - Tool opened with no blow and remained thru flow period.

Did Well Flow - Gas No Oil No Water No
Operator: American Quasar Petroleum Co
Lease & No.: King #2-1

DST No.: 7

Outside Recorder

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<tr>
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<th>Kuster K-3</th>
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<td>Cap.</td>
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<td>Press Corrected</td>
<td>@ 12870</td>
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<td>5936</td>
<td>B</td>
<td>1450</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
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<td>I</td>
<td>J</td>
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<tr>
<td>Corrected</td>
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<tr>
<td>Initial Flow</td>
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</table>

Pressure Below Bottom
Packer Bled To

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PRD Make, Cap, Press, Corrected:

<table>
<thead>
<tr>
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<td>Third Shut-in</td>
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</tbody>
</table>

Pressure Below Bottom
Packer Bled To
REPORT # 829

WELL NAME - KING 2-1

WELL OPERATOR - AMERICAN QUASAR PETROLEUM CO.

DST NUMBER - 7

RECORDER NUMBER - 1389

FIRST SHUT IN PRESSURE

<table>
<thead>
<tr>
<th>TIME (MIN)</th>
<th>(T+PHI) / PHI</th>
<th>PSIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.95</td>
<td>0.0000</td>
<td>1395</td>
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<tr>
<td>6.0</td>
<td>2.6667</td>
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<tr>
<td>12.0</td>
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<td>18.0</td>
<td>1.5556</td>
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<td>24.0</td>
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<td>30.0</td>
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<td>36.0</td>
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<td>42.0</td>
<td>1.2381</td>
<td>4957</td>
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<tr>
<td>48.0</td>
<td>1.2083</td>
<td>4957</td>
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<tr>
<td>54.0</td>
<td>1.1852</td>
<td>4957</td>
</tr>
<tr>
<td>60.0</td>
<td>1.1667</td>
<td>4957</td>
</tr>
</tbody>
</table>

EXTRAPOLATION OF FIRST SHUT IN = 4960.22
REPORT # 829

WELL NAME - KING 2-1
WELL OPERATOR - AMERICAN QUASAR PETROLEUM CO.
DST NUMBER - 7
RECORDE R NUMBER - 1389

SECOND SHUT IN PRESSURE

<table>
<thead>
<tr>
<th>TIME(MIN)</th>
<th>(T+PHI) / PHI</th>
<th>PSIG</th>
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<tbody>
<tr>
<td>0.0</td>
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<td>24.0</td>
<td>3.9167</td>
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<tr>
<td>36.0</td>
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<td>4944</td>
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<tr>
<td>48.0</td>
<td>2.4583</td>
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<tr>
<td>60.0</td>
<td>2.1667</td>
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<tr>
<td>72.0</td>
<td>1.9722</td>
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<tr>
<td>84.0</td>
<td>1.8333</td>
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<tr>
<td>96.0</td>
<td>1.7292</td>
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<tr>
<td>108.0</td>
<td>1.6481</td>
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<tr>
<td>120.0</td>
<td>1.5833</td>
<td>4947</td>
</tr>
</tbody>
</table>

FITTED LINE: LOG((T+PHI)/PHI) = -.54203 PSIG + 2681.60986

EXTRAPOLATION OF SECOND SHUT IN = 4947.37 M = 1.84
Company: American Quasar Petroleum Co.  
Well Name & No.: King #2-1  
County: Bingham  
Test Interval: 12830-12884'  

Total Volume of Sampler: 2100 cc.  
Total Volume of Sample: 1300 cc.  
Pressure in Sampler: 250 psig  
Oil: None cc.  
Water: 1300 cc.  
Mud: None cc.  
Gas: None cu. ft.  
Other: None  

R.W. .11 @ 95°F = 50,000 ppm.chl.  

Make Up Water: 11.0 @ 85°F of Chloride Content 400 ppm.  
Mud Pit Sample: .4 @ 95°F of Chloride Content 11,500 ppm.  

Remarks: Recovery - Sample #1 R.W. .55 @ 80°F = 9,500 ppm.chl.  
Sample #2 R.W. 5.0 @ 90°F = 850 ppm.chl.  
Sample #3 R.W. .1 @ 100°F = 52,000 ppm.chl.  
Sample #4 R.W. .1 @ 95°F = 55,000 ppm.chl.
LYNES, INC.

Distribution of Final Reports

Operator: American Quasar Petroleum Co.  Well Name and No.: King #2-1

Original: American Quasar Petroleum Co., 204 Superior Bldg., Casper, Wyoming 82601
          Attn: John Sindelar

1 copy: American Quasar Petroleum Co., 707 United Bank Tower, 1700 Broadway, Denver, Colorado 80290 Attn: Clare Gregg

3 copies: American Quasar Petroleum Co., 2500 Ft. Worth National Bank Bldg., Ft Worth, Texas 76102 Attn: Bill Bogert

1 copy: American Quasar Petroleum Co., 1000 Midland National Bank Bldg., Midland, Tx. 79701 Attn: Herb Ware

1 copy: Gulf Energy & Minerals Company - U.S., P.O. Box 2619, Casper, Wyoming 82602
          Attn: W.S. Lingley

2 copies: Oil & Gas Conservation Comm., Dept. of Lands - Statehouse, Boise, Idaho 83720
          Attn: Arthur Zierold

3 copies: Supron Energy Corp., 1700 Campbell Centre, 8350 N. Central Expressway, Dallas, Texas 75206 Attn: Haskell Fleetwood

3 copies: Sunmark Exploration, P.O. Box 30, Dallas, Texas 75221 Attn: T.T. Oldroyd
Contractor: Westburne Drlg., Inc.
Rig No.: 52
Spot: SW-NW
Sec.: 2
Twp.: 2 S
Rng.: 41 E
Field: Wildcat
County: Bingham
State: Idaho
Elevation: 6626' "K.B."
Formation: Wells
Top Choke: 1"
Bottom Choke: 9/16"
Size Hole: 8 1/2"
Size Rat Hole: --
Size & Wt. D. P.: 4 1/2" 16.60
Size Wt. Pipe: --

Flow No. 1: 10 Min.
Shut-in No. 1: 77 Min.
Flow No. 2: 34 Min.
Shut-in No. 2: -- Min.
Flow No. 3: -- Min.
Shut-in No. 3: -- Min.
Bottom Hole Temp.: 38°F Avg.
Mud Weight: 8.7
Gravity: --
Viscosity: 46

Did Well Flow - Gas: No
Oil: No
Water: No

RECOVERY IN PIPE: 3302' Drilling mud and water = 43.24 bbl. (Ran 3000' water cushion)

1st Flow - Tool opened with a 1/2" underwater blow, increased to a 3 1/2" underwater blow and remained thru flow period.

2nd Flow - Tool opened with blow to bottom of bucket and remained thru flow period.

REMARKS:
MISRUN - Charts indicate communications 34 minutes into the second flow period.
### Inside Recorder

**PRD Make:** Kuster AK-1  
**No.:** 983  
**Cap.:** 6450  
**Date:** 1323

<table>
<thead>
<tr>
<th>Press</th>
<th>Corrected</th>
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<tr>
<td>Initial Hydrostatic A</td>
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<tr>
<td>Final Hydrostatic K</td>
<td>5970</td>
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<td>Initial Flow B</td>
<td>1317</td>
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<tr>
<td>Final Initial Flow C</td>
<td>1331</td>
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<td>Initial Shut-in D</td>
<td>5076</td>
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<tr>
<td>Second Initial Flow E</td>
<td>1302</td>
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<td>Second Final Flow F</td>
<td>1312</td>
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<tr>
<td>Second Shut-in G</td>
<td>1329</td>
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<tr>
<td>Third Initial Flow H</td>
<td>1324</td>
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<tr>
<td>Third Final Flow I</td>
<td>1325</td>
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<tr>
<td>Third Shut-in J</td>
<td>1326</td>
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</tbody>
</table>

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### Outside Recorder

**PRD Make:** Kuster AK-1  
**No.:** 9576  
**Cap.:** 10100  
**Date:** 1325

<table>
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<tbody>
<tr>
<td>Initial Hydrostatic A</td>
<td>5992</td>
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<tr>
<td>Final Hydrostatic K</td>
<td>5963</td>
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<tr>
<td>Initial Flow B</td>
<td>1279</td>
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<tr>
<td>Final Initial Flow C</td>
<td>1296</td>
</tr>
<tr>
<td>Initial Shut-in D</td>
<td>5079</td>
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<tr>
<td>Second Initial Flow E</td>
<td>1286</td>
</tr>
<tr>
<td>Second Final Flow F</td>
<td>1294</td>
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<tr>
<td>Second Shut-in G</td>
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<tr>
<td>Third Initial Flow H</td>
<td>1324</td>
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<tr>
<td>Third Final Flow I</td>
<td>1325</td>
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<tr>
<td>Third Shut-in J</td>
<td>1326</td>
</tr>
</tbody>
</table>

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| Pressure Below Bottom  
Packer Bled To |
|-----------------|

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**Operator:** American Quasar Petroleum Co  
**Lease & No.:** King #2-1  
**DST No.:** 8
REPORT # 901

WELL NAME - KING 2-1

WELL OPERATOR - AMERICAN QUASAR PETROLEUM CO.

DST NUMBER - 8

RECORDER NUMBER - 3696

FIRST SHUT IN PRESSURE

<table>
<thead>
<tr>
<th>TIME (MIN)</th>
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<th>(T+PHI) / PHI</th>
<th>PSIG</th>
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<td>7.7</td>
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<td>15.4</td>
<td>1.6494</td>
<td>4378</td>
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<td>23.1</td>
<td>1.4329</td>
<td>4720</td>
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<td>30.8</td>
<td>1.3247</td>
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<td>1.2597</td>
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<td>1.2165</td>
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<td>53.9</td>
<td>1.1855</td>
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<td>1.1623</td>
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<td>69.3</td>
<td>1.1443</td>
<td>5035</td>
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<td>77.0</td>
<td>1.1299</td>
<td>5060</td>
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FITTED LINE: $\log((T+\phi)/\phi) = -0.00025 \ \text{PSIG} + 1.34129$

EXTRAPOLATION OF FIRST SHUT IN = 5268.28 M = 3927.77
**LYNES, INC.**  
**Fluid Sample Report**

<table>
<thead>
<tr>
<th>Company</th>
<th>American Quasar Petroleum Co.</th>
<th>Date</th>
<th>8-10-78</th>
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</thead>
<tbody>
<tr>
<td>Well Name &amp; No.</td>
<td>King #2-1</td>
<td>Ticket No.</td>
<td>12782</td>
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<tr>
<td>County</td>
<td>Bingham</td>
<td>State</td>
<td>Idaho</td>
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<tr>
<td>Test Interval</td>
<td>13240-13330'</td>
<td>DST No.</td>
<td>8</td>
</tr>
</tbody>
</table>

| Total Volume of Sampler:     | 2100                          |            | cc.     |
| Total Volume of Sample:      | 1300                          |            | cc.     |
| Pressure in Sampler:         | None                          |            | psig    |
| Oil:                         | None                          |            | cc.     |
| Water:                       | None                          |            | cc.     |
| Mud:                         | 1300                          |            | cc.     |
| Gas:                         | None                          |            | cu. ft. |
| Other:                       | None                          |            |         |

R.W. .55 @ 66°F = 11,000 ppm.chl.

**Resistivity**

<table>
<thead>
<tr>
<th>Make Up Water @ of Chloride Content</th>
<th>ppm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud Pit Sample @ 64°F of Chloride Content</td>
<td>3250</td>
</tr>
<tr>
<td>Gas/Oil Ratio Gravity @ 0°F</td>
<td></td>
</tr>
</tbody>
</table>

Where was sample drained: On location

Remarks: Recovery: Top Sample - R.W. 1.9 @ 66°F = 3300 ppm.chl.

Middle Sample - R.W. 7.0 @ 70°F = 760 ppm.chl.

Bottom Sample - R.W. .65 @ 72°F = 9,000 ppm.chl.
LYNES, INC.

Distribution of Final Reports

Operator: American Quasar Petroleum Co.   Well Name and No.: King #2-1

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         Attn: Arthur Zierold

3 copies: Supron Energy Corp., 1700 Campbell Centre, 6350 N. Central Expressway, Dallas,
          Texas 75206 Attn: Haskell Fleetwood

3 copies: Sunmark Exploration, P.O. Box 30, Dallas, Texas 75221 Attn: T.T. Oldroyd
Flow No. 1 \[120\] Min.
Shut-in No. 1 \[240\] Min.
Flow No. 2 -- Min.
Shut-in No. 2 -- Min.
Flow No. 3 -- Min.
Shut-in No. 3 -- Min.

Bottom Hole Temp. \[396^\circ F\]
Mud Weight \[8.6\]
Gravity --
Viscosity \[41\]

Tool opened @ 10:30 AM.

Inside Recorder
PRD Make: Kuster AK-1
No. \[3696\] Cap. \[6500\] @ \[13265\]

Press Corrected
Initial Hydrostatic \[A\] \[5933\]
Final Hydrostatic \[K\] \[5994\]
Initial Flow \[B\] \[1178\]
Final Initial Flow \[C\] \[1497\]
Initial Shut-in \[D\] \[5123\]
Second Initial Flow \[E\] --
Second Final Flow \[F\] --
Second Shut-in \[G\] --
Third Initial Flow \[H\] --
Third Final Flow \[I\] --
Third Shut-in \[J\] --

Lynes Dist.: Casper, Wyo.
Our Tester: R. Hanson
Witnessed By: P. Waid

Well Flow - Gas: \[4070\] Oil: No Water: No

RECOVERY IN PIPE:
4070' Total Fluid (ran 2500' ammonia water cushion)
90' Muddy water = 1.60 bbl.
1765' Water cushion = 31.42 bbl.
2035' Mud and gas cut water = 33.00 bbl.
180' Gas cut mud = .88 bbl.

REMARKS:
1st Flow - Tool opened with a 1" underwater blow, increased to bottom of bucket in 14 minutes. Opened flow line and bled off pressure. Closed flow line and had a 3/4" underwater blow and remained thru flow period.
LYNES, INC.

Operator American Quasar Petroleum Co. Lease & No. King #2-1

DST No. 9

Inside Recorder
PRD Make Kuster AK-1
No. 9576 Cap. 10100 @13260'

Press Corrected
Initial Hydrostatic A 5943
Final Hydrostatic K 5928'
Initial Flow B 1138
Final Initial Flow C 1505
Initial Shut-in D 5109
Second Initial Flow E --
Second Final Flow F --
Second Shut-in G --
Third Initial Flow H --
Third Final Flow I --
Third Shut-in J --

Pressure Below Bottom Packer Bled To

Outside Recorder
PRD Make Kuster AK-1
No.983 Cap.6450 @13295'

Press Corrected
Initial Hydrostatic A 5926
Final Hydrostatic K 5904
Initial Flow B 1203
Final Initial Flow C 1490
Initial Shut-in D 5132
Second Initial Flow E --
Second Final Flow F --
Second Shut-in G --
Third Initial Flow H --
Third Final Flow I --
Third Shut-in J --

Pressure Below Bottom Packer Bled To
LYNES, INC.

Fluid Sample Report

Company: American Quasar Petroleum Co.  Date: 8-12-78
Well Name & No.: King #2-1  Ticket No.: 8488
County: Bingham  State: Idaho
Test Interval: 13281-13418'  DST No.: 9

Total Volume of Sampler: 2150 cc.
Total Volume of Sample: 1700 cc.
Pressure in Sampler: 150 psig
Oil: None cc.
Water: 1700 cc.
Mud: Trace cc.
Gas: 1.2 cu. ft.
Other: None

R.W. .44 @ 60°F = 16,000 ppm.chl.

Resistivity

Make Up Water @ of Chloride Content ppm.
Mud Pit Sample 1.8 @ 70°F of Chloride Content 3200 ppm.

Gas/Oil Ratio Gravity °API @ °F

Where was sample drained: On location

Remarks: Recovery: Top Sample - R.W. .95 @ 86°F = 5100 ppm.chl.
Middle Sample - R.W. 4.0 @ 90°F = 1050 ppm.chl.
Bottom Sample - R.W. .38 @ 72°F = 16,000 ppm.chl.
Comments relative to the analysis of the pressure chart from DST #9, Interval: 13281-13418', which was run in the captioned well located in the SW NW Section 2, T2S-R41E, Bingham County, Idaho:

For purposes of this analysis, the following reservoir and fluid properties and test parameters have been used:

\[ BHT = 396^\circ F, \quad \mu = 1.0 \text{ cp}, \quad h = 10 \text{ feet (estimated)}, \quad t = 120 \text{ minutes}, \quad m = 153 \text{ psi/log cycle}. \]

1. Extrapolation of the shut-in pressure build-up curve indicates a maximum reservoir pressure of 5150 psi at the recorder depth of 13,265 feet. This indicated maximum reservoir pressure at the recorder depth is equivalent to a subsurface pressure gradient of 0.388 psi/ft. This pressure gradient, in turn, is anomalously low compared to a "normal" hydrostatic pressure gradient which ranges from about 0.43 to 0.47 psi/ft., depending upon formation water salinity. It therefore is indicated that the tested reservoir has a somewhat "subnormal" reservoir pressure environment at this test location.

2. The calculated Average Production Rate which was used in this analysis, 335.3 BPD, is based upon the net fluid recovery of 28.0 barrels (excludes the water cushion) and the total flowing time of 120 minutes.

3. The calculated Damage Ratio of 4.4 indicates that significant wellbore damage was present at the time of this formation test. The Damage Ratio implies that the production rate should have been 4.4 times greater than that which occurred (or 1475.3 BPD) if well-bore damage had not been present. It should be noted, in view of the relatively small volume of fluid which was obtained in this test, plus the character of the shut-in pressure build-up curve, that the indicated well-bore damage may be due to the presence of fracture porosity in the formation within the tested interval. It is suggested that the presence of fracture porosity and its choke effect in limiting the productivity of the formation may be the cause of the indicated well-bore damage rather than actual formation damage.
4. The calculated Effective Transmissibility of 355.6 md.-ft./cp. indicates an Average Permeability to the produced fluid of 35.6 md. for the estimated 10 feet of effective porosity within the total 137 feet of interval tested.

5. The evaluation criteria used in the Drill-Stem-Test Analysis System indicate that the results obtained in this analysis should be reliable within reasonable limits relative to the assumptions which have been made.

Roger L. Hoeger
Consultant to Lynes, Inc.
**LYNES INC.**

**REPORT # 906**

**WELL NAME - KING 2-1**

**WELL OPERATOR - AMERICAN QUASAR PETROLEUM CO.**

**DST NUMBER - 9**

**RECORER NUMBER - 3696**

**FIRST SHUT IN PRESSURE**

<table>
<thead>
<tr>
<th>TIME (MIN)</th>
<th>(T+PHI)/PHI</th>
<th>PSIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>.0000</td>
<td>1497</td>
</tr>
<tr>
<td>24.0</td>
<td>6.0000</td>
<td>5015</td>
</tr>
<tr>
<td>48.0</td>
<td>3.5000</td>
<td>5065</td>
</tr>
<tr>
<td>72.0</td>
<td>2.6667</td>
<td>5083</td>
</tr>
<tr>
<td>96.0</td>
<td>2.2500</td>
<td>5093</td>
</tr>
<tr>
<td>120.0</td>
<td>2.0000</td>
<td>5103</td>
</tr>
<tr>
<td>144.0</td>
<td>1.8333</td>
<td>5109</td>
</tr>
<tr>
<td>168.0</td>
<td>1.7143</td>
<td>5114</td>
</tr>
<tr>
<td>192.0</td>
<td>1.6250</td>
<td>5118</td>
</tr>
<tr>
<td>216.0</td>
<td>1.5556</td>
<td>5121</td>
</tr>
<tr>
<td>240.0</td>
<td>1.5000</td>
<td>5123</td>
</tr>
</tbody>
</table>

**Fitted Line:** \( \log((T+\text{PHI})/\text{PHI}) = -0.00652 \times \text{PSIG} + 33.59479 \)

**Extrapolation of First Shut In = 5149.99 m = 153.30**

**Reservoir Parameters:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Rate</td>
<td>430.00</td>
</tr>
<tr>
<td>Initial FLO Time</td>
<td>1140.00</td>
</tr>
<tr>
<td>MUD Expansion</td>
<td>1.00</td>
</tr>
<tr>
<td>Bottom Hole</td>
<td>396.00</td>
</tr>
<tr>
<td>Slope</td>
<td>1.00</td>
</tr>
<tr>
<td>SPEC</td>
<td>1.00</td>
</tr>
<tr>
<td>Water Gradient</td>
<td>6639.00</td>
</tr>
<tr>
<td>Subsea Depth</td>
<td>.433</td>
</tr>
</tbody>
</table>
REPORT # 906

WELL NAME - KING 2-1
WELL OPERATOR - AMERICAN QUASAR PETROLEUM CO.
DST NUMBER - 9
RECORDED NUMBER - 3696

CALCULATIONS: FIRST SHUT IN

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrapolated Reservoir Press (PSI)</td>
<td>5150.0</td>
</tr>
<tr>
<td>No. of points entered</td>
<td>11.0</td>
</tr>
<tr>
<td>No. of points used in extrapolation</td>
<td>5.0</td>
</tr>
<tr>
<td>Root mean square deviation of best fit line (PSI)</td>
<td>.003</td>
</tr>
<tr>
<td>Total flow time (min)</td>
<td>120.0</td>
</tr>
<tr>
<td>Average production rate during test (BBLs/day)</td>
<td>335.3</td>
</tr>
<tr>
<td>Transmissibility (MD-FT/CP)</td>
<td>355.6</td>
</tr>
<tr>
<td>In situ capacity (MD-FT)</td>
<td>355.6</td>
</tr>
<tr>
<td>Average effective permeability (MD)</td>
<td>35.56</td>
</tr>
<tr>
<td>Productivity index (BBLs/day-PSI)</td>
<td>.092</td>
</tr>
<tr>
<td>Damage ratio</td>
<td>4.4</td>
</tr>
<tr>
<td>Productivity index with damage removed (BBLs/day-PSI)</td>
<td>.400</td>
</tr>
<tr>
<td>Radius of investigation (FT)</td>
<td>65.3</td>
</tr>
<tr>
<td>Rawdown factor (z)</td>
<td>.0</td>
</tr>
<tr>
<td>Potentiometric surface (FT)</td>
<td>5254.7</td>
</tr>
</tbody>
</table>
LYNES, INC.

Distribution of Final Reports

Operator: American Quasar Petroleum Co.  
Well Name and No.: King #2-1

Original: American Quasar Petroleum Co., 204 Superior Bldg., Casper, Wyoming 82601
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**NOMENCLATURE (Definition of Symbols)**

- $Q$ = average production rate during test, bbls/day
- $Q_g$ = measured gas production rate during test, MCF/day
- $k$ = permeability, md
- $h$ = net pay thickness, ft. (when unknown, test interval is chosen)
- $\mu$ = fluid viscosity, centipoise
- $Z$ = compressibility factor
- $T_r$ = reservoir temperature, ° Rankine
- $m$ = slope of final SIP buildup plot, psig/cycle (psig$^2$/cycle for gas)
- $b$ = approximate radius of investigation, feet
- $r_w$ = wellbore radius, feet
- $t_o$ = total time, minutes
- $P_{ex}$ = Extrapolated maximum reservoir pressure, psig
- $P_{fr}$ = final reservoir pressure, psig
- $P_{ij}$ = productivity index, bbls/day
- $P_{ijt}$ = theoretical productivity index with damage removed, bbls/day
- $D.R.$ = damage ratio
- $E.D.R.$ = estimated damage ratio
- $AOF$ = absolute open flow potential, MCF/D
- $AOF_r$ = theoretical absolute open flow if damage were removed
- $Z_s$ = subsea depth
- $W$ = water gradient based on salinity
- $H_l$ = potentiometric surface

**INTERPRETATION CALCULATIONS (OIL/WATER)**

**AVERAGE PRODUCTION RATE DURING TEST**

\[
Q = \frac{1}{1440} \times \left( \frac{Dr(t)}{Dc} \right) \times t_f
\]

where $Dr(t)$ is the drawdown at time $t$, $Dc$ is the initial flow time, and $t_f$ is the final flow time.

**FLUID PROPERTIES**

- API Gravity @ 60°F
- Specific Gravity @ 60°F

**TRANSMISSIBILITY**

\[
b = \frac{140}{A_d} = \frac{140}{A_d} \times \left( \frac{P_{ij}}{\mu} \right)
\]

**IN SITU CAPACITY**

\[
b = \frac{P_{ij}}{\mu}
\]

**AVERAGE EFFECTIVE PERMEABILITY**

\[
P_{ij} = \frac{b}{A_d}
\]

**PRODUCTIVITY INDEX**

\[
P = \frac{b}{A_d}
\]

**DAMAGE RATIO**

\[
P_i = \frac{b}{A_d} / \left( \frac{b}{A_d} \right)_{ij}
\]

**PRODUCTIVITY INDEX WITH DAMAGE REMOVED**

\[
P_r = \frac{b}{A_d}
\]

**APPROXIMATE RADIUS OF INVESTIGATION**

\[
b = \sqrt{V_T}
\]

**INTRODUCTION TO FINDINGS**

Drawdown factor = $15.9 - F_{SIP} - 100 \times \left( \frac{1}{h} \right) \times 100$ (considered serious or suboptimal)

Drawdown factor = $15.9 - F_{SIP} - 100 \times \left( \frac{1}{h} \right) \times 100$ (considered serious or suboptimal)

**INTERPRETATION CALCULATIONS (GAS)**

**ESTIMATED GAS PROPERTIES**

- Estimated Bottom-Hole Temperature
- Gravity @ 60°F
- Viscosity @ 60°F
- Compressibility Factor @ 2%</p>

**TRANSMISSIBILITY**

\[
\frac{b}{A_d} = \frac{140}{A_d} \times \left( \frac{P_{ij}}{\mu} \right)
\]

**IN SITU CAPACITY**

\[
b = \frac{P_{ij}}{\mu}
\]

**AVERAGE EFFECTIVE PERMEABILITY**

\[
P_{ij} = \frac{b}{A_d}
\]

**PRODUCTIVITY INDEX**

\[
P = \frac{b}{A_d}
\]

**DAMAGE RATIO**

\[
P_i = \frac{b}{A_d} / \left( \frac{b}{A_d} \right)_{ij}
\]

**PRODUCTIVITY INDEX WITH DAMAGE REMOVED**

\[
P_r = \frac{b}{A_d}
\]

**APPROXIMATE RADIUS OF INVESTIGATION**

\[
b = \sqrt{V_T}
\]

**ESTIMATED RANGE OF AOF POTENTIAL**

\[
\text{Max. AOF} = \frac{\mu}{\mu} \times \left( \frac{P_{ij}}{\mu} \right)
\]

\[
\text{Min. AOF} = \frac{\mu}{\mu} \times \left( \frac{P_{ij}}{\mu} \right)
\]

**ESTIMATED RANGE OF AOF POTENTIAL, DAMAGE REMOVED**

\[
\text{Max. AOF, j} = \left( \frac{\mu}{\mu} \right) \times \left( \frac{P_{ij}}{\mu} \right)
\]

\[
\text{Min. AOF, j} = \left( \frac{\mu}{\mu} \right) \times \left( \frac{P_{ij}}{\mu} \right)
\]

**ESTIMATED RANGE OF AOF POTENTIAL, DAMAGE REMOVED**

\[
\text{Max. AOF, j} = \left( \frac{\mu}{\mu} \right) \times \left( \frac{P_{ij}}{\mu} \right)
\]

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