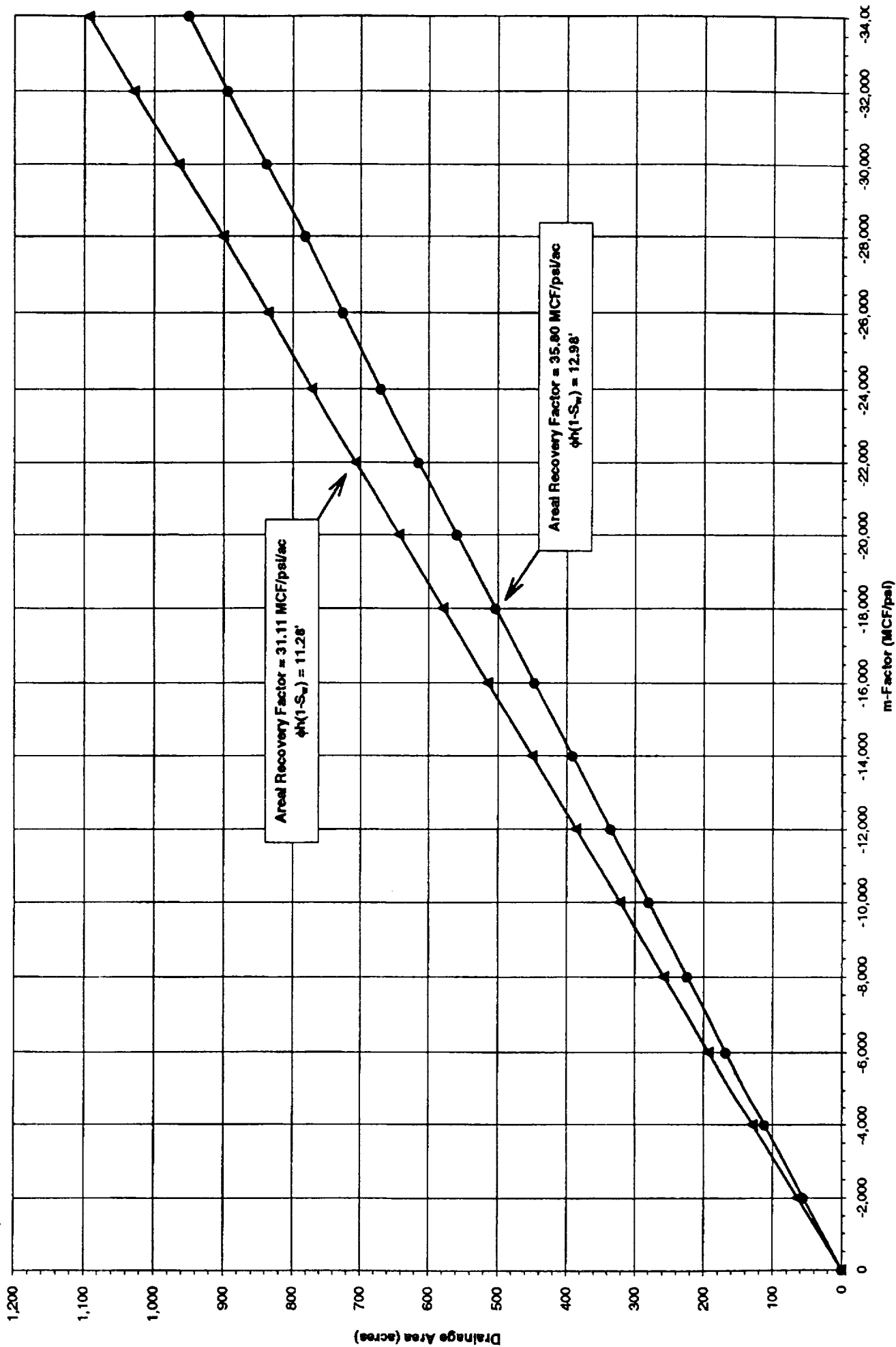


Drainage Area as a Function of  
m-Factor (Stabilized Pressure-Cum Slope) for a  
Rhodes (Yates-U7R) Gas Well  
( $\phi_{avg} = 21.6\%$ ,  $h = 91.5'$ ,  $S_w = 34.4\%$  &  $43.0\%$ )

OIL CONSERVATION DIVISION  
HARTMAN EXHIBIT NO.             
CASE NOS. 12015 & 12017



Drainage Area vs. m-Factor (Pressure - Cum. Slope)  
for a Rhodes (Yates-U7R) Gas Well  
( $\phi = 21.6\%$  and  $Sw = 34.4\%$ )

| $\phi$ | h<br>(ft.) | Rw   | Sw    | T<br>(°K) | Tsc<br>(°K) | Psc<br>(psia) | Pb<br>(psia) | m<br>(mcf/psi) | A<br>(Acres) |
|--------|------------|------|-------|-----------|-------------|---------------|--------------|----------------|--------------|
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -2,000         | 56           |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -4,000         | 112          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -6,000         | 168          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -8,000         | 223          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -10,000        | 279          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -12,000        | 335          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -14,000        | 391          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -16,000        | 447          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -18,000        | 503          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -20,000        | 559          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -22,000        | 615          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -24,000        | 670          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -26,000        | 726          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -28,000        | 782          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -30,000        | 838          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -32,000        | 894          |
| 0.216  | 91.5       | 0.03 | 0.344 | 546       | 520         | 14.7          | 15.025       | -34,000        | 950          |

**Drainage Area vs. m-Factor (Pressure - Cum. Slope)  
for a Rhodes (Yates-U7R) Gas Well  
( $\phi = 21.6$  % and  $Sw = 43.0\%$ )**

| $\phi$ | h<br>(ft.) | Rw   | Sw    | T<br>(°K) | Tsc<br>(°K) | Psc<br>(psia) | Pb<br>(psia) | m<br>(mcf/psi) | A<br>(Acres) |
|--------|------------|------|-------|-----------|-------------|---------------|--------------|----------------|--------------|
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -2,000         | 64           |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -4,000         | 129          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -6,000         | 193          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -8,000         | 257          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -10,000        | 321          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -12,000        | 386          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -14,000        | 450          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -16,000        | 514          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -18,000        | 579          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -20,000        | 643          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -22,000        | 707          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -24,000        | 772          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -26,000        | 836          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -28,000        | 900          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -30,000        | 964          |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -32,000        | 1,029        |
| 0.216  | 91.5       | 0.03 | 0.430 | 546       | 520         | 14.7          | 15.025       | -34,000        | 1,093        |

**Drainage Area as a Function of  
m-Factor (Stabilized Pressure-Cum Slope) for a  
Rhodes (Yates-U7R) Gas Well**

| $\phi$<br>(%) | h<br>(ft) | $R_w$<br>(ohm-m) | $S_w$<br>(%) | m/A:<br>Areal<br>Recovery<br>Factor<br>(MCF/psi/ac) | m:<br>Stabilized<br>Pressure-Cum<br>Slope<br>(MCF/psi) | A:<br>Drainage<br>Area<br>(acres) |
|---------------|-----------|------------------|--------------|-----------------------------------------------------|--------------------------------------------------------|-----------------------------------|
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -34,000                                                | 949.72                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -32,000                                                | 893.85                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -30,000                                                | 837.99                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -28,000                                                | 782.12                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -26,000                                                | 726.26                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -24,000                                                | 670.39                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -22,000                                                | 614.53                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -20,000                                                | 558.66                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -18,000                                                | 502.79                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -16,000                                                | 446.93                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -14,000                                                | 391.06                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -12,000                                                | 335.20                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -10,000                                                | 279.33                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -8,000                                                 | 223.46                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -6,000                                                 | 167.60                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -4,000                                                 | 111.73                            |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | -2,000                                                 | 55.87                             |
| 21.61         | 91.5      | 0.03             | 34.4         | 35.80                                               | 0                                                      | 0.00                              |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -34,000                                                | 1,092.90                          |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -32,000                                                | 1,028.61                          |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -30,000                                                | 964.32                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -28,000                                                | 900.03                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -26,000                                                | 835.74                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -24,000                                                | 771.46                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -22,000                                                | 707.17                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -20,000                                                | 642.88                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -18,000                                                | 578.59                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -16,000                                                | 514.30                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -14,000                                                | 450.02                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -12,000                                                | 385.73                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -10,000                                                | 321.44                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -8,000                                                 | 257.15                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -6,000                                                 | 192.86                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -4,000                                                 | 128.58                            |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | -2,000                                                 | 64.29                             |
| 21.61         | 91.5      | 0.05             | 43.0         | 31.11                                               | 0                                                      | 0.00                              |

Where:  $A = [-m \text{ (Pressure-Cum Plot)}] / [m/A \text{ (Volumetrically-Calculated)}]$

$$A = [-(G_2 - G_1) / (P_2 - P_1)] / [43,560 (\Gamma_w / P_w \Gamma) \phi h (1 - S_w)]$$