

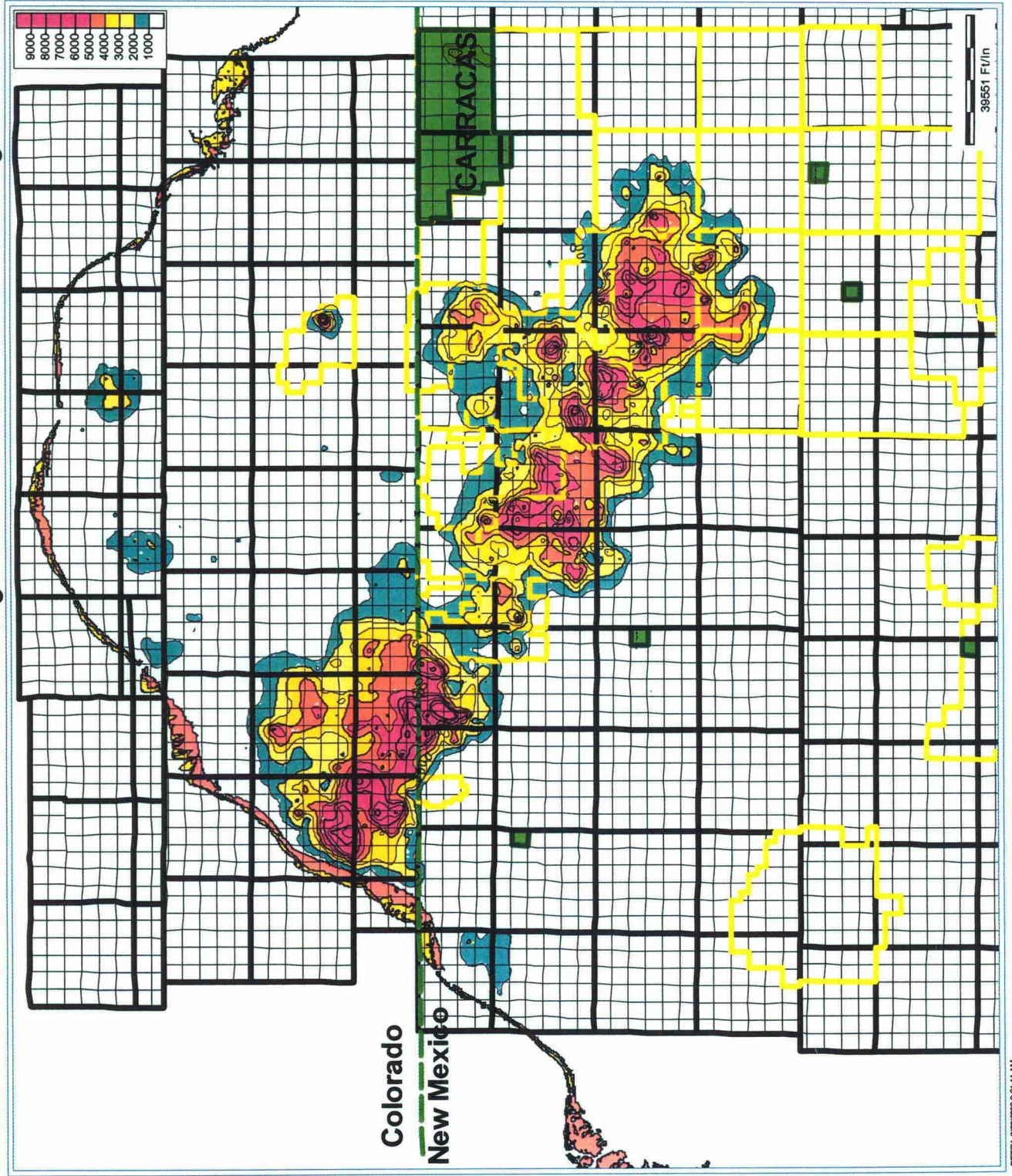
Reservoir Engineering Overview

BP

Vu Dinh

Reservoir Engineer

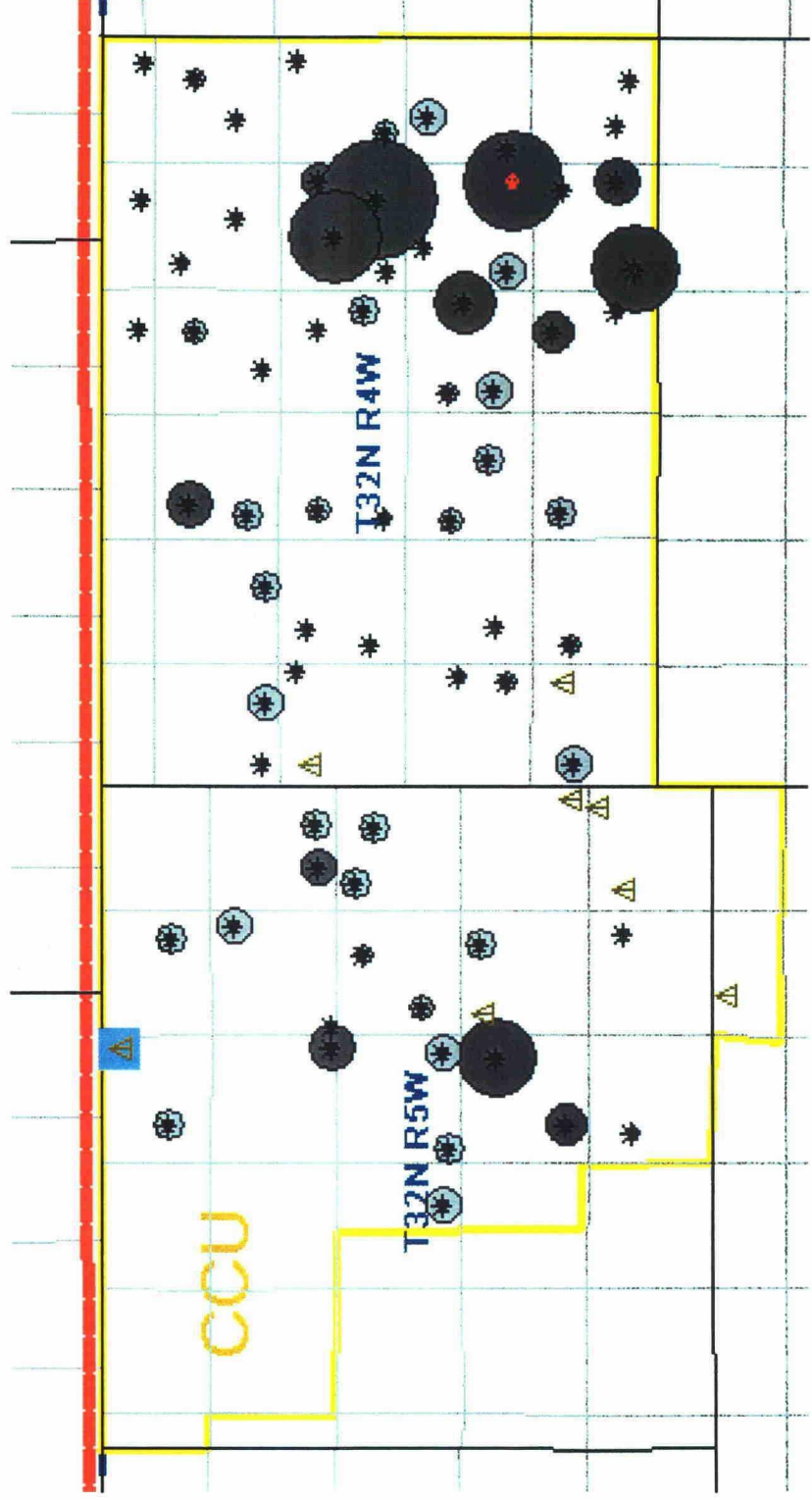
Carracas Canyon Unit Study



CARRACAS CANYON UNIT

2000 YTD Daily Gas Production

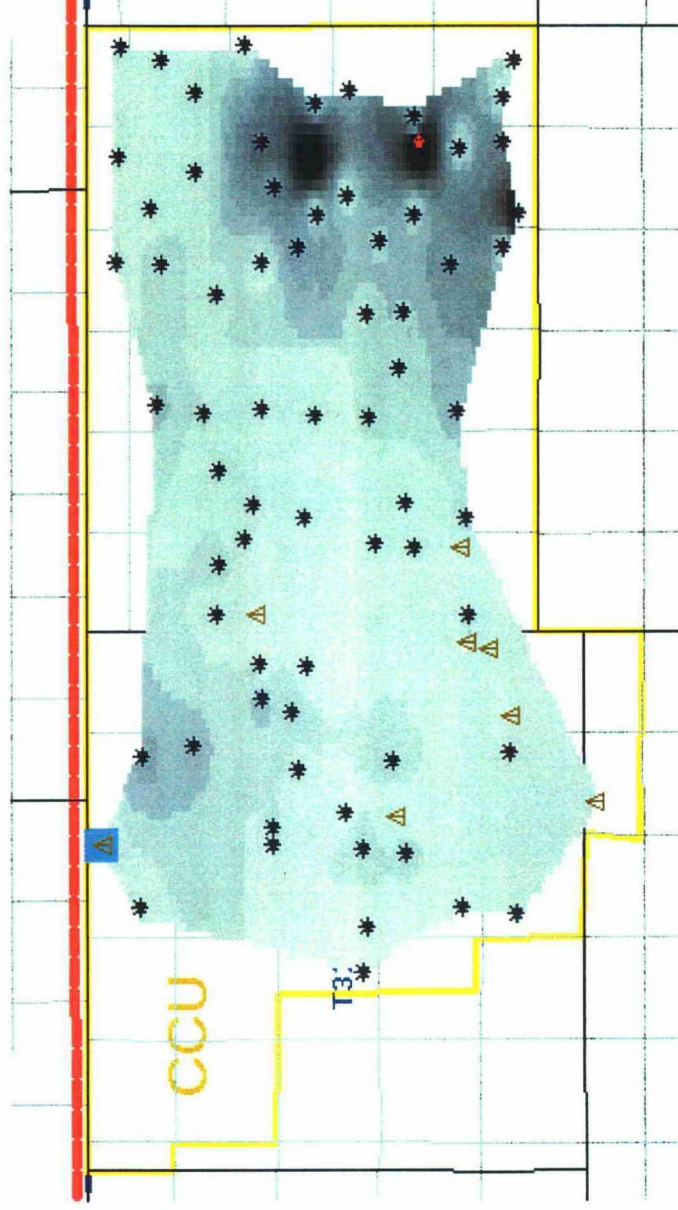
- Size of bubble represents daily gas rate
- Only 13 out of 81 active wells produce more than 100 mcf/d



CARRACAS CANYON UNIT

2000 YTD Cumulative Production

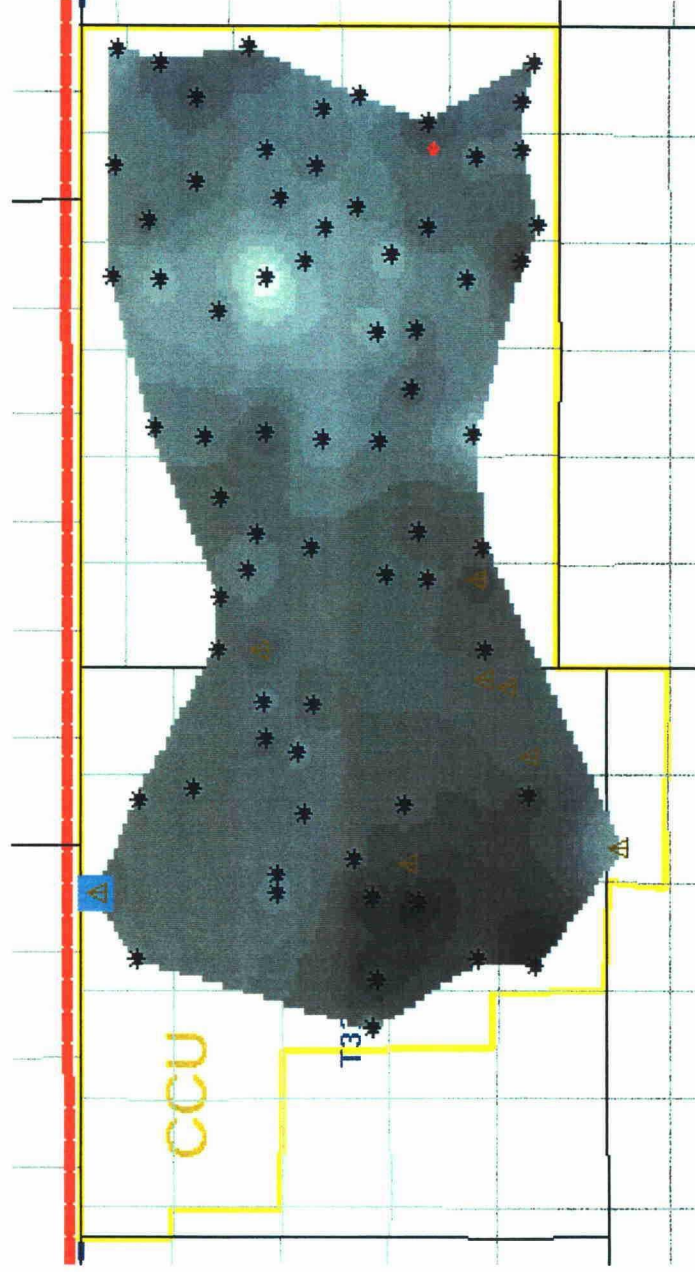
- Darker color represents higher cumulative production
- Only 18 out of 81 active wells have produced more than 500 mmcf



CARRACAS CANYON UNIT

Net Coal Isopach

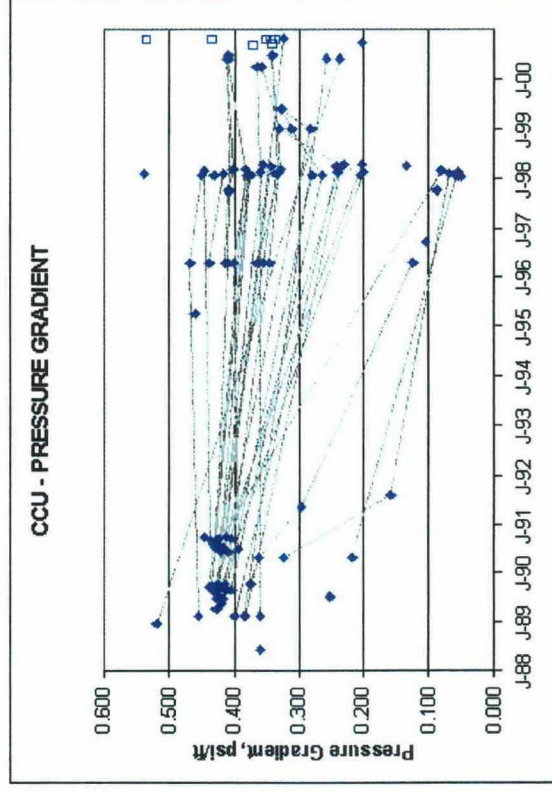
- Darker color represents thicker coal (average 22 ft.)
- Thicker coal in the west, thinning toward the east



CARRACAS CANYON UNIT

Pressure Gradient

- Fruitland coal is slightly underpressure initially (0.42 psi/ft)
- Large portion of field experienced only slight pressure depletion
- 7 newly drilled wells encountered near original reservoir pressure

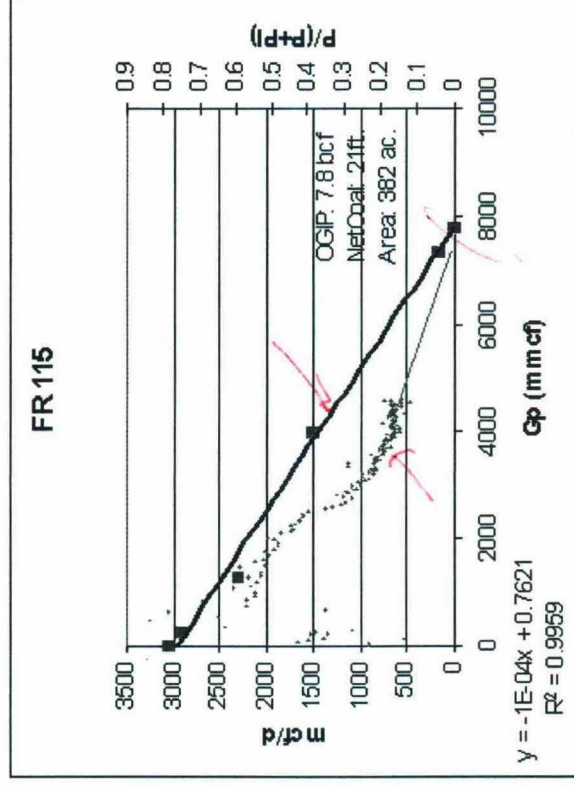


CARRACAS CANYON UNIT

Material Balance Calculation

make sure to use the correct pressure

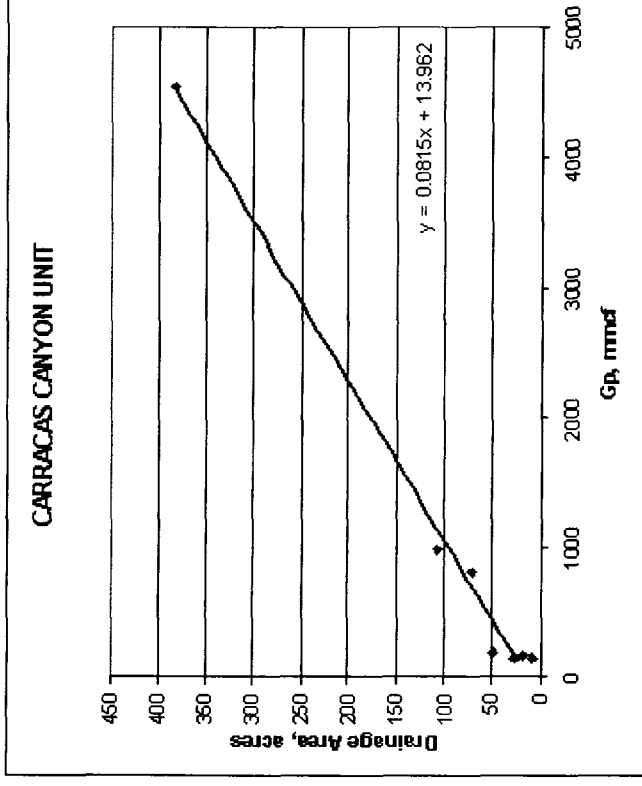
- Use actual pressure depletion to calculate original gas-in-place
- Determine apparent drainage area using net coal thickness



CARRACAS CANYON UNIT

Apparent Drainage Area

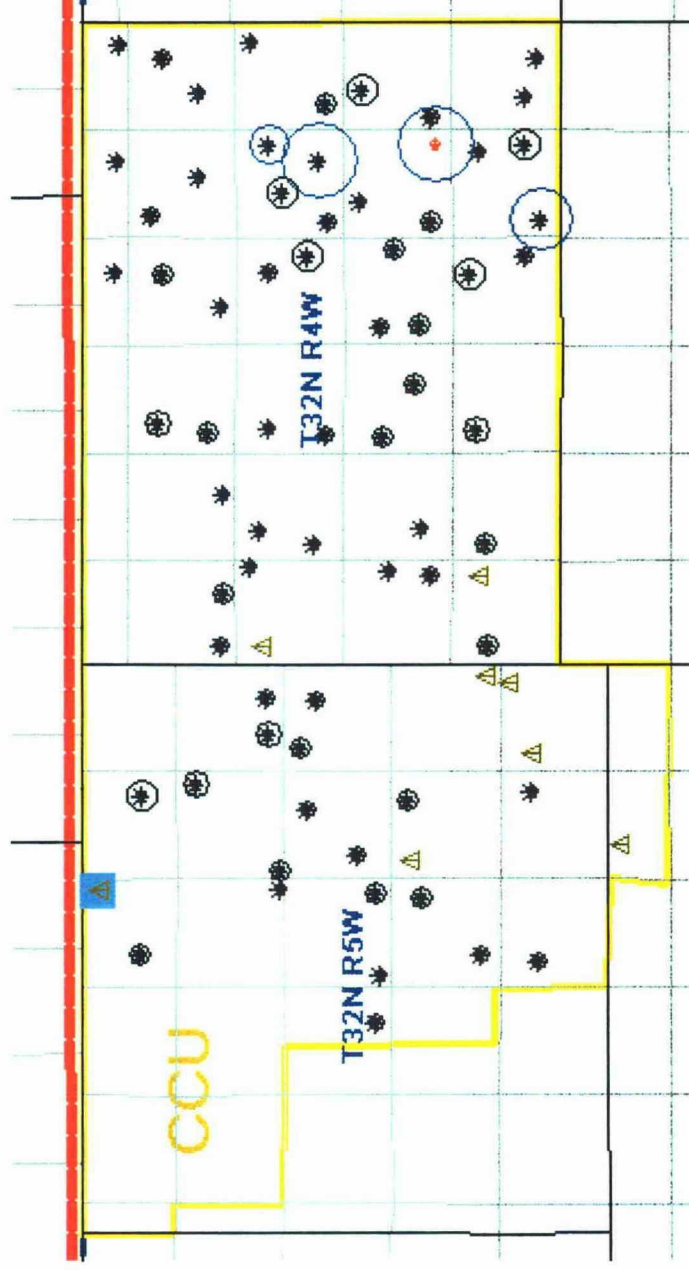
- Correlate cumulative production with apparent drainage area
- Use to determine apparent drainage area for wells without sufficient pressure data for material balance calculation



CARRACAS CANYON UNIT

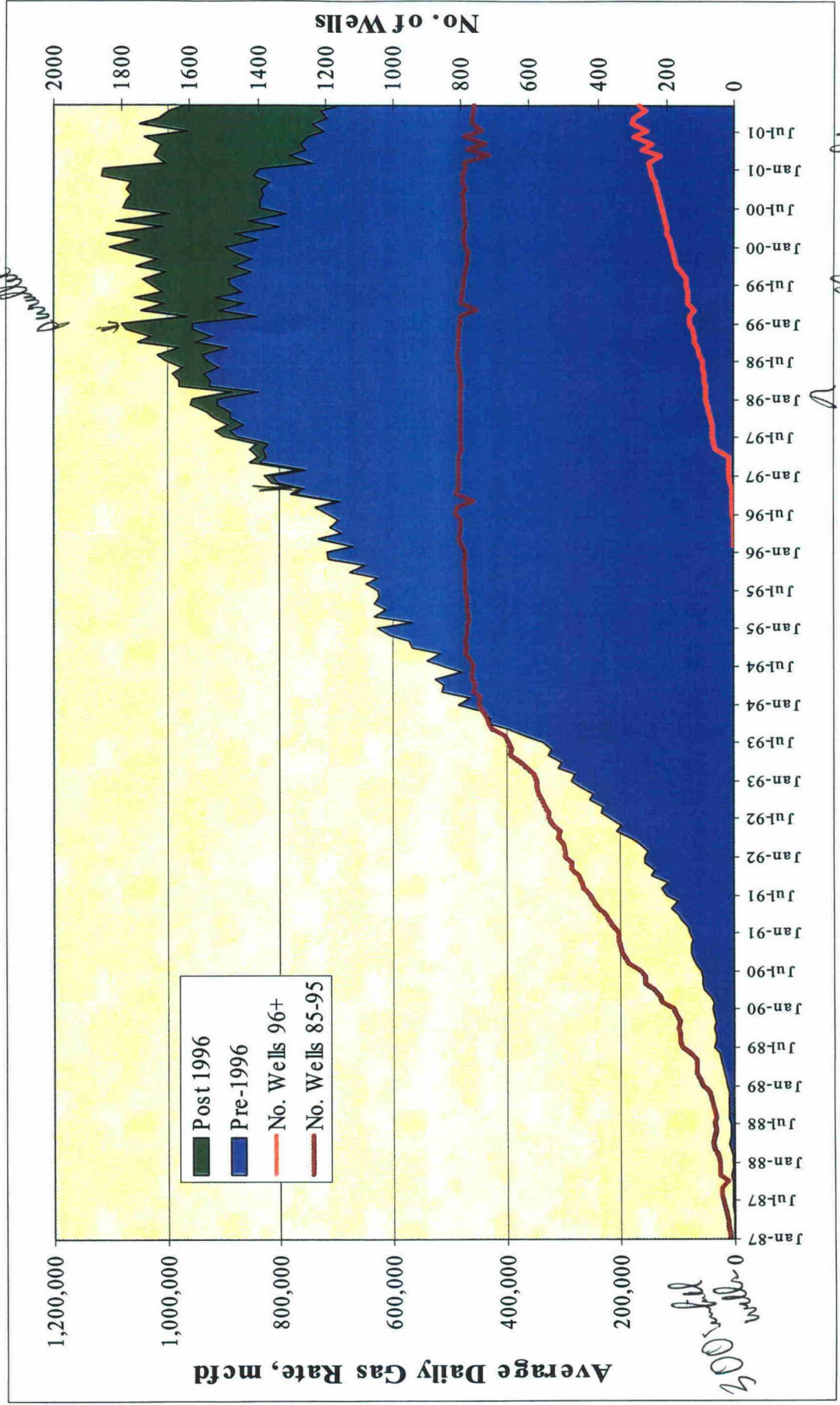
One well per 320 ac. Is Insufficient

- Only 3 wells have apparent drainage area greater than 160 acre
- Most wells have apparent drainage area less than 160 acre
- An additional well in existing 320 ac. spacing unit is necessary to increase gas recovery

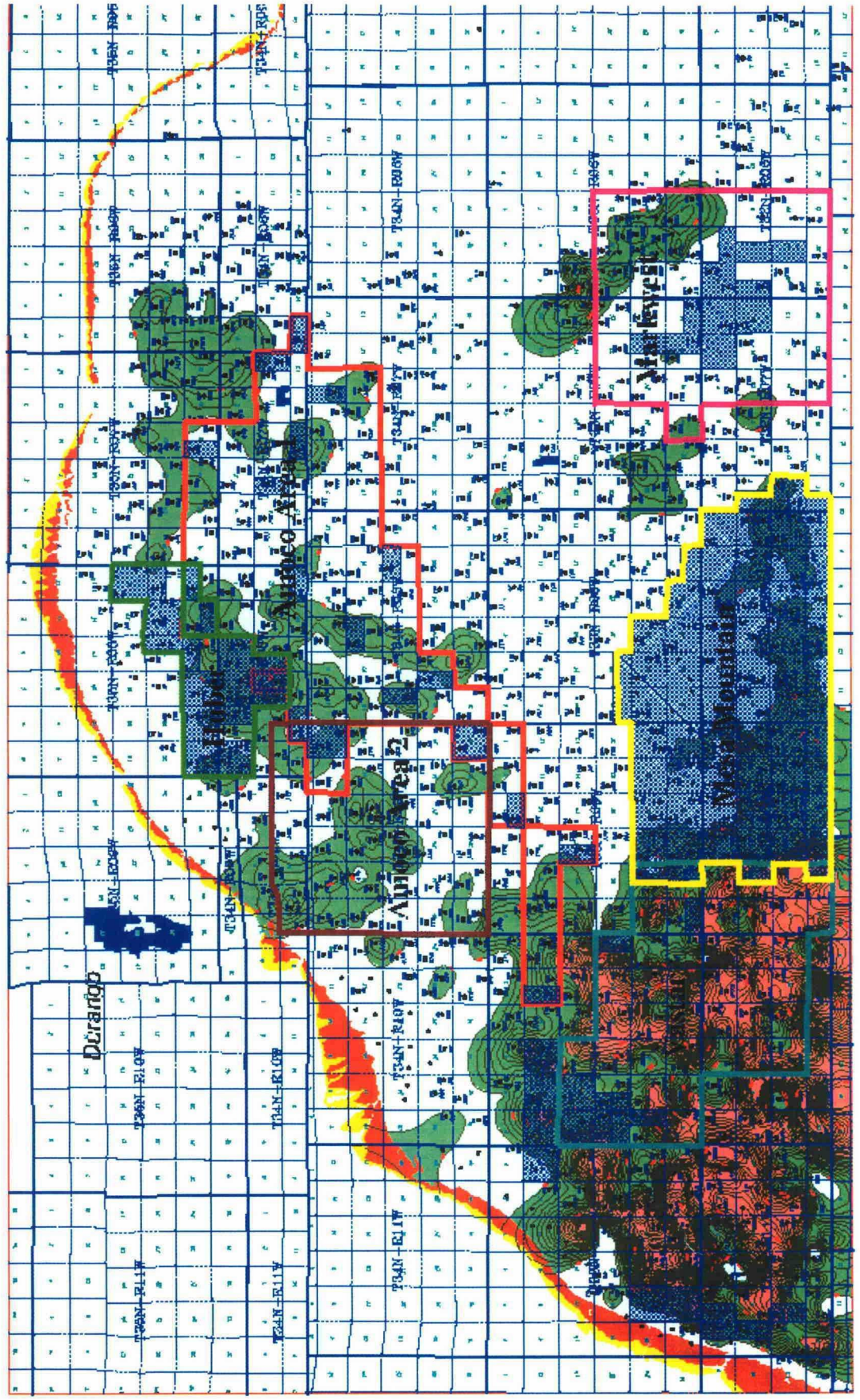


Colorado Historical Production

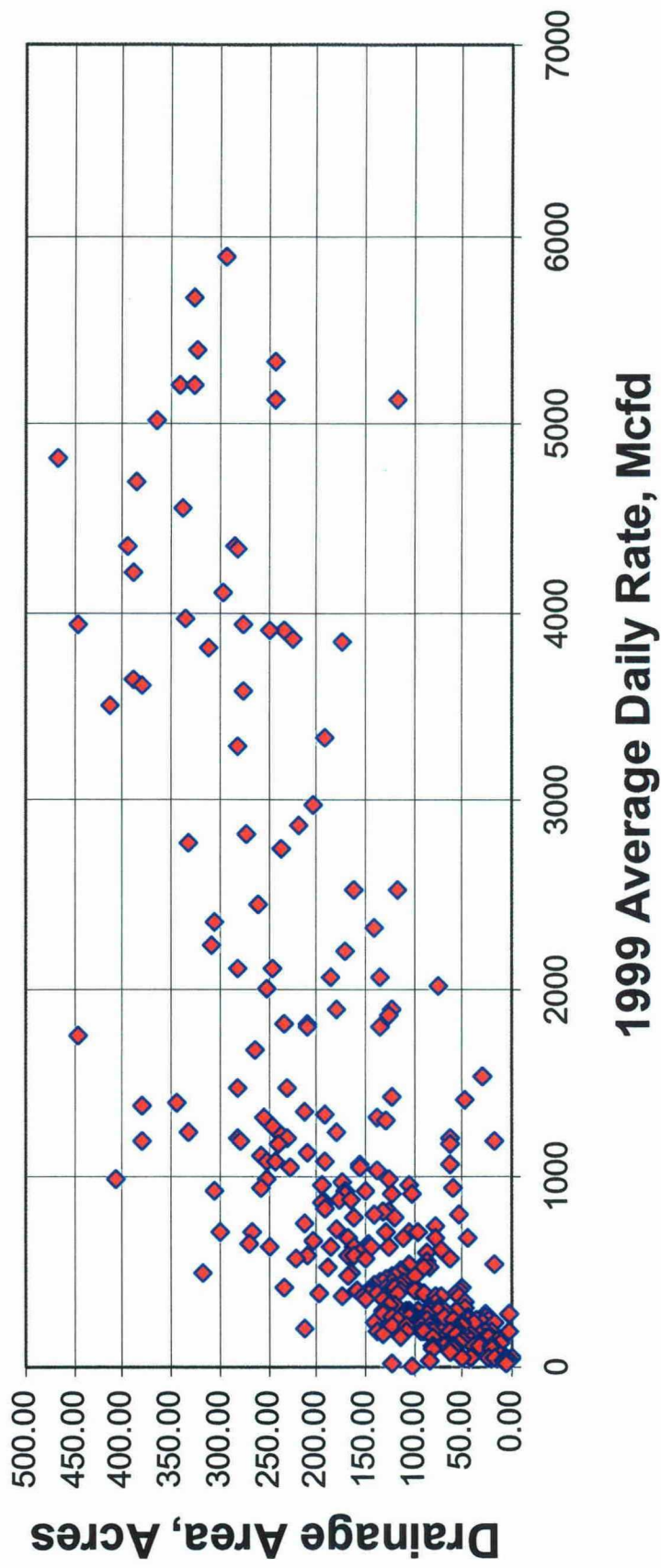
Fruitland Coal Wells



Colorado Fruitland Coal – Study Areas



Drainage Area vs. 1999 Average Daily Rate

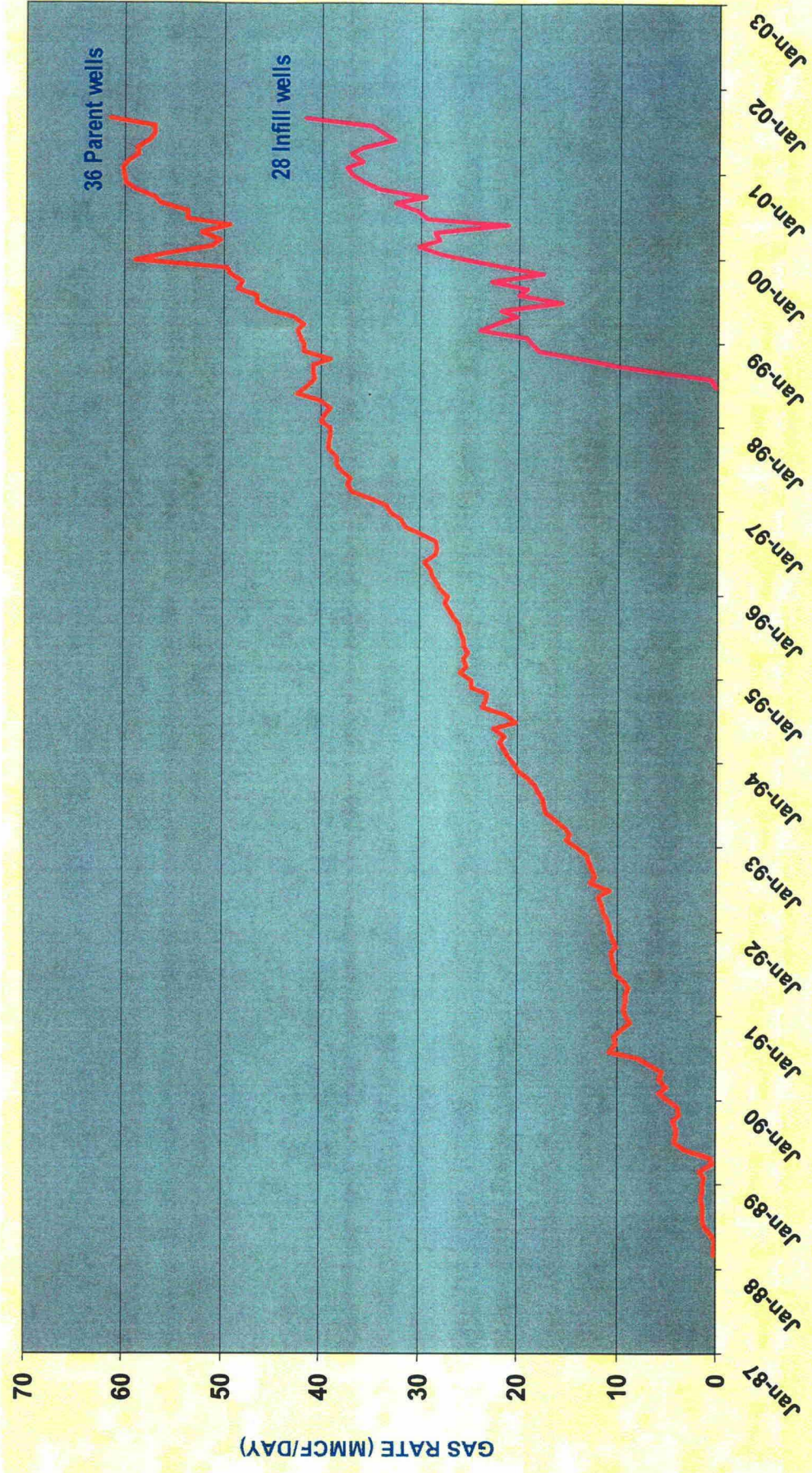


Tap II
Ex. #20

CO/NM Border Fruitland Coal Infill Results

T32N-R8W Sec 13-24

T32N-R9W Sec 13-16, 20-24



Tab 11
Exh. 21

Vastar Infill & Parent Well Initial Pressures

(T32N R8 & 9W)

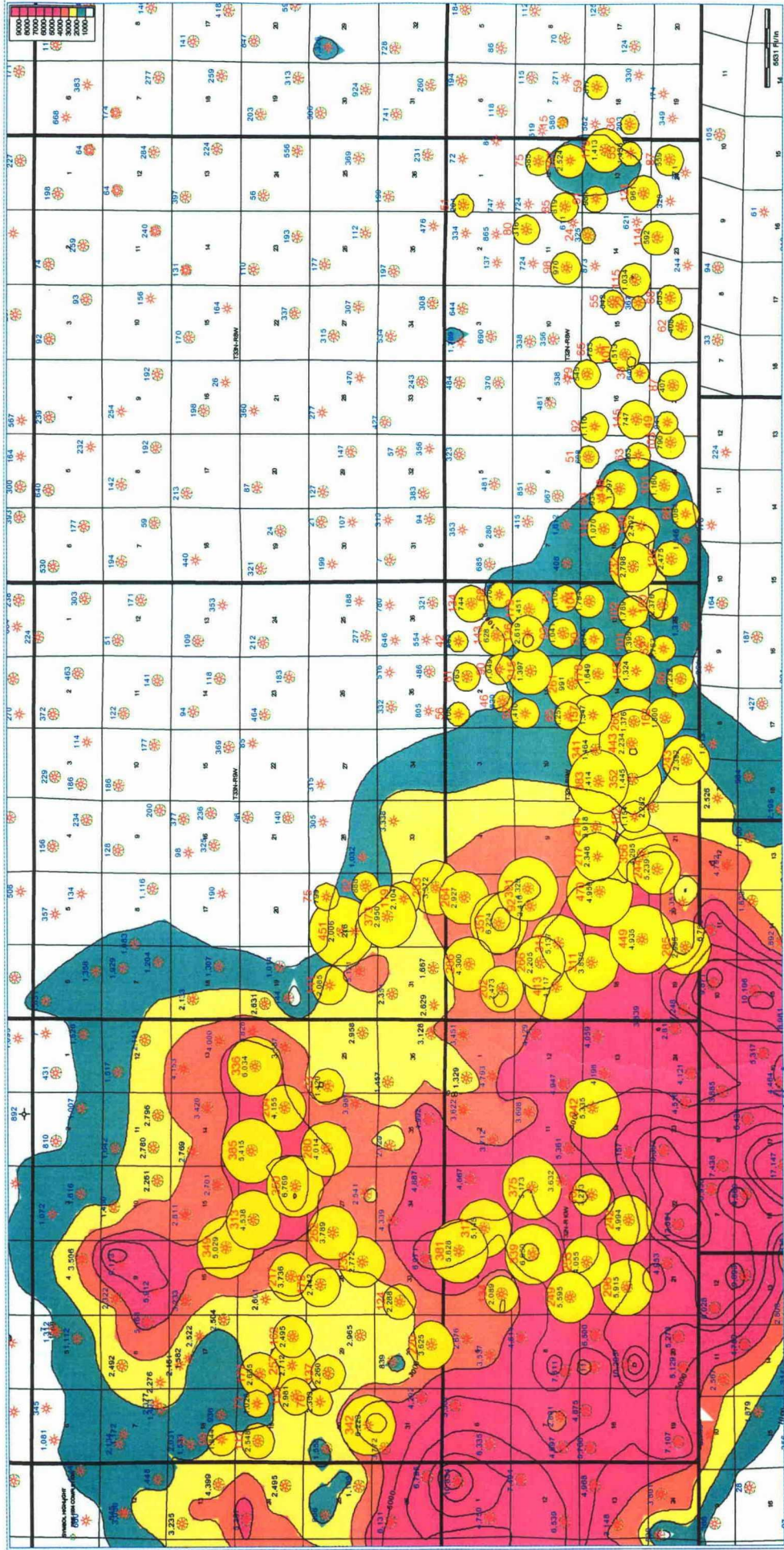
Well	P infill	P parent	Well	P infill	P parent
12-4	1,352	725	2-5	1,401	679
13-3	1,549	700	11-4	1,381	781
15-6	1,372	714	11-3	1,133	672
15-5	1,308	843	12-3	1,131	715
16-4	1,413	709	12-4	1,317	877
16-5	1,310	700	13-5	1,368	938
17-4	857	662	13-6	1,345	925
17-5	1,268	605	16-1	765	575
18-4	1,455	691	16-4	714	576
21-4	1,287	706	21-2	1,005	594
1-4	1,429	604			
1-5	1,305	687	Average	1,258	710
2-4	1,466	642			

1550 ps.

All data psia

Table
Exh. #22

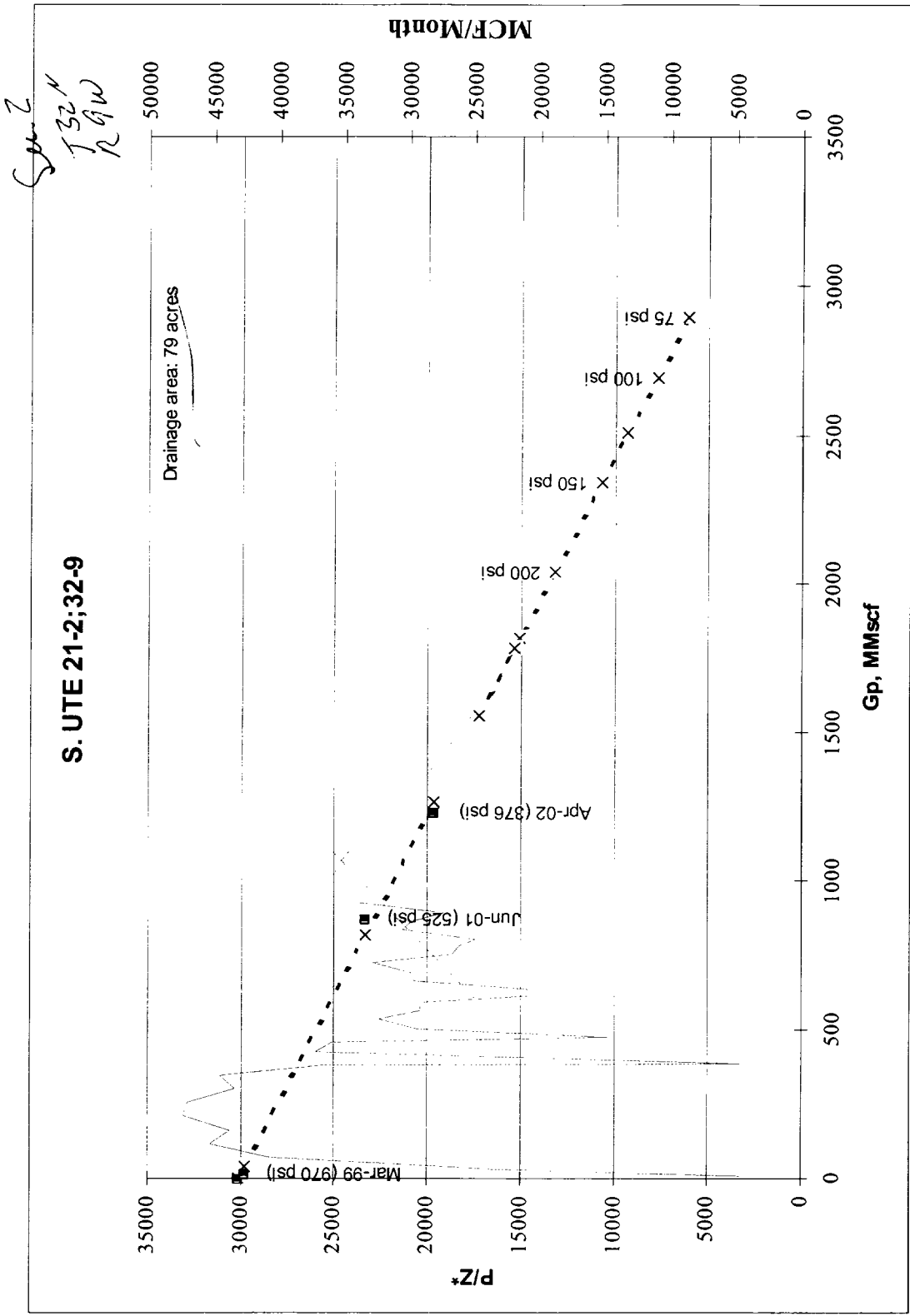
Drainage Area Vs Highest Rate



Refined Model 10/99

Material Balance Plot – SU 21-2;32-9

*Thompson
Four constant*

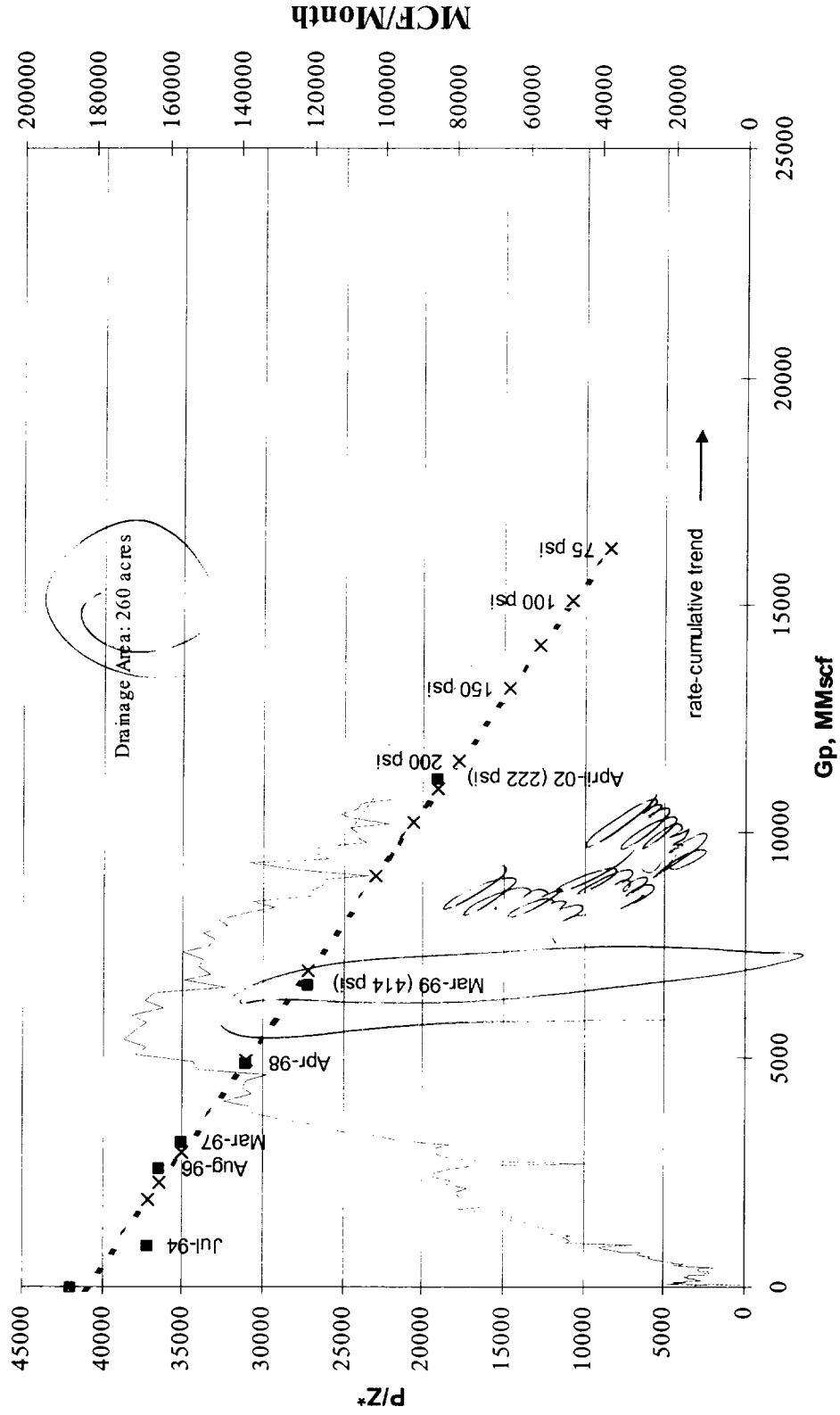


#24

Good Well

Material Balance Plot – SU 21-6;32-9

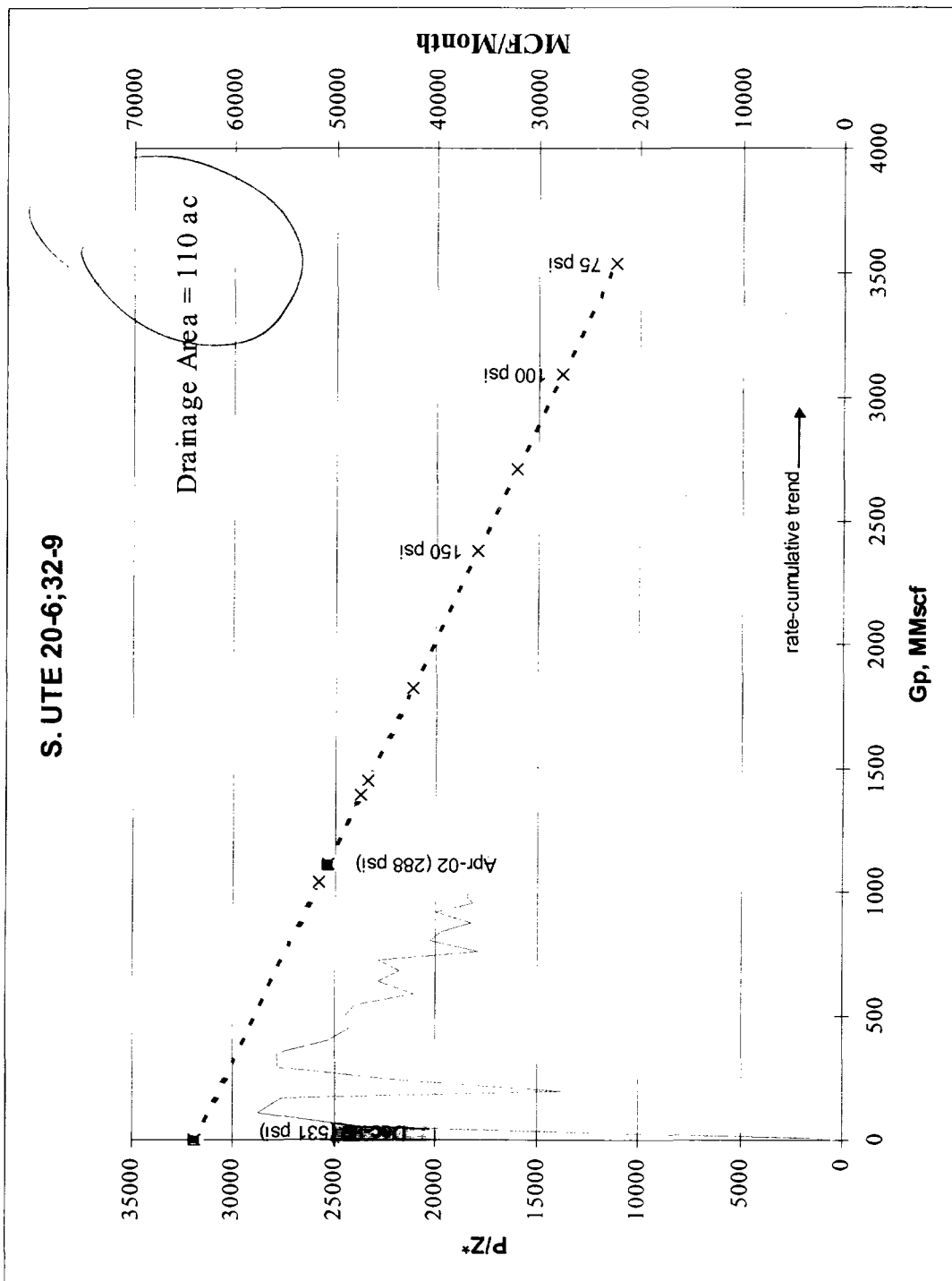
S. UTE 21-6;32-9



#25

Indust

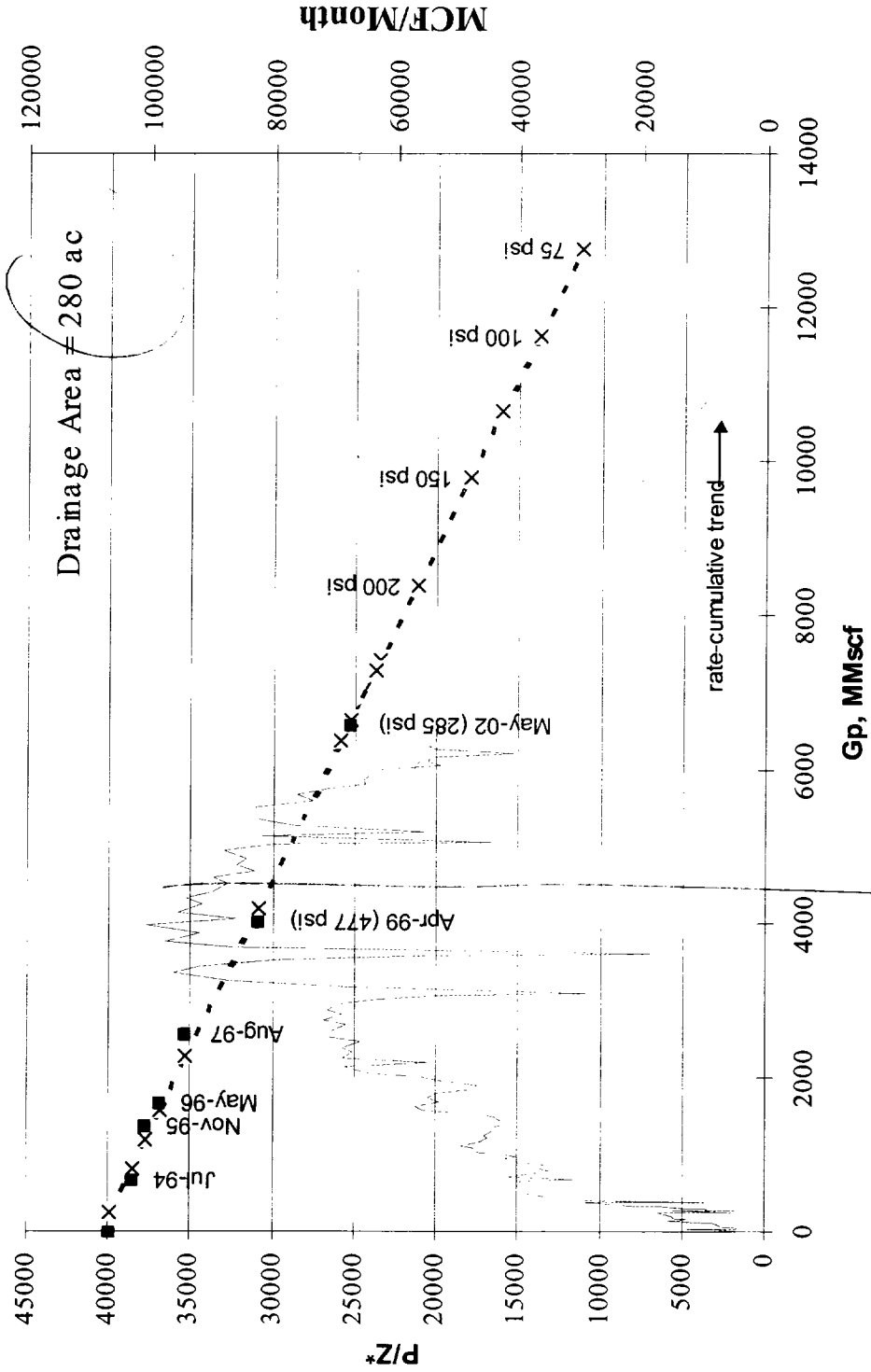
Material Balance Plot – SU 20-6;32-9



#26

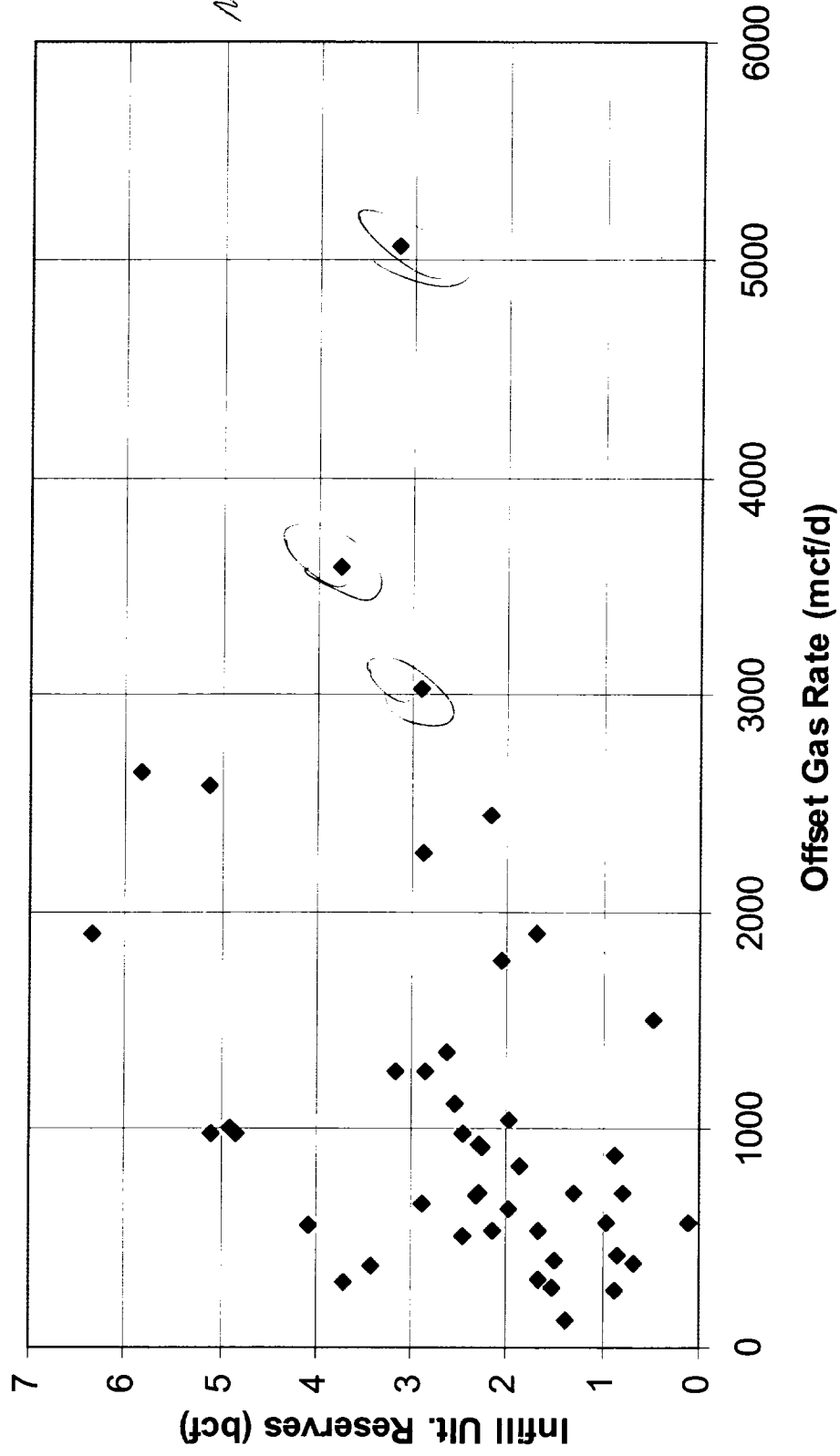
Material Balance Plot – SU 20-5;32-9

S. UTE 20-5;32-9



Dec. 1999 *Griffith Hall drilled* # 27

Vastar's IBF: Infill Reserves vs. Offset Gas Rate



No. Infill
Surveys

NM Infill – Incremental Recovery (Over Pressure Area)

Gas Rate mmcf/d	# of Wells	Incr. Rec. Bcf/well	Total Rec. Bcf
0 to 1	411	1.5	617
1 to 2	212	2.0	424
2 to 3	111	2.5	278
3 to 5	83	3.0	249
TOTAL	817		1567

high production area
overpressure area

- infill in over pressure 1,5 Tri
additional gas to be recovered