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HIGH ANGLE DRILLING SUCCESS AND FRACTURE DETERMINATION IN THE WEST PANHANDLE FIELD OF N. TEXAS

ABSTRACT:

The West Panhandle Field is a world class under pressured gas field that has produced in excess of 36 TCF of gas from a depth of 2,200' to 3,400'.

This area has produced for approximately 90 years and the entire field is under compression. The reservoir pressure ranges from atmospheric to 0 PSI. The field produces from Pre-Cambrian Basement, Granite Wash of Pennsylvanian Age, Wolfcampian Arkosic Dolomite and Fractured Crystalline Dolomite, all of which are highly compartmentalized.

High Angle Deviation Drilling is the mechanism which has enhanced recovery and stabilized the annual decline by tapping into compartments which have large amounts of incremental reserves with higher reservoir pressure. The success rate depends on the ability to predict and drill perpendicular to fractures intersecting gas from rock volumes that are isolated from the main drainage radii. As estimated 300-500 BCF of incremental reserves potentially can be generated from this exercise, thus preserving long life production and cash flow of the asset.

GENERAL FIELD DATA PAHANDLE WEST FIELD

DISCOVERED	1918
RESERVOIR DEPTH	2,000 to 3,200 ft MD
INITIAL RESERVOIR PRESSURE	450 to 500 psia
RESERVOIR TEMPERATURE	95 to 100 deg F
CURRENT PRODUCING WELLS	2,750
PRODUCING AREA	1.3 million acres
STANDARD WELL SPACING	640 acres per well
CURRENT FIELD PRODUCTION	10 BCF per month
PRORATED FIELD	competitive production
ESTIMATED REMAINING LIFE	30 to 50 years

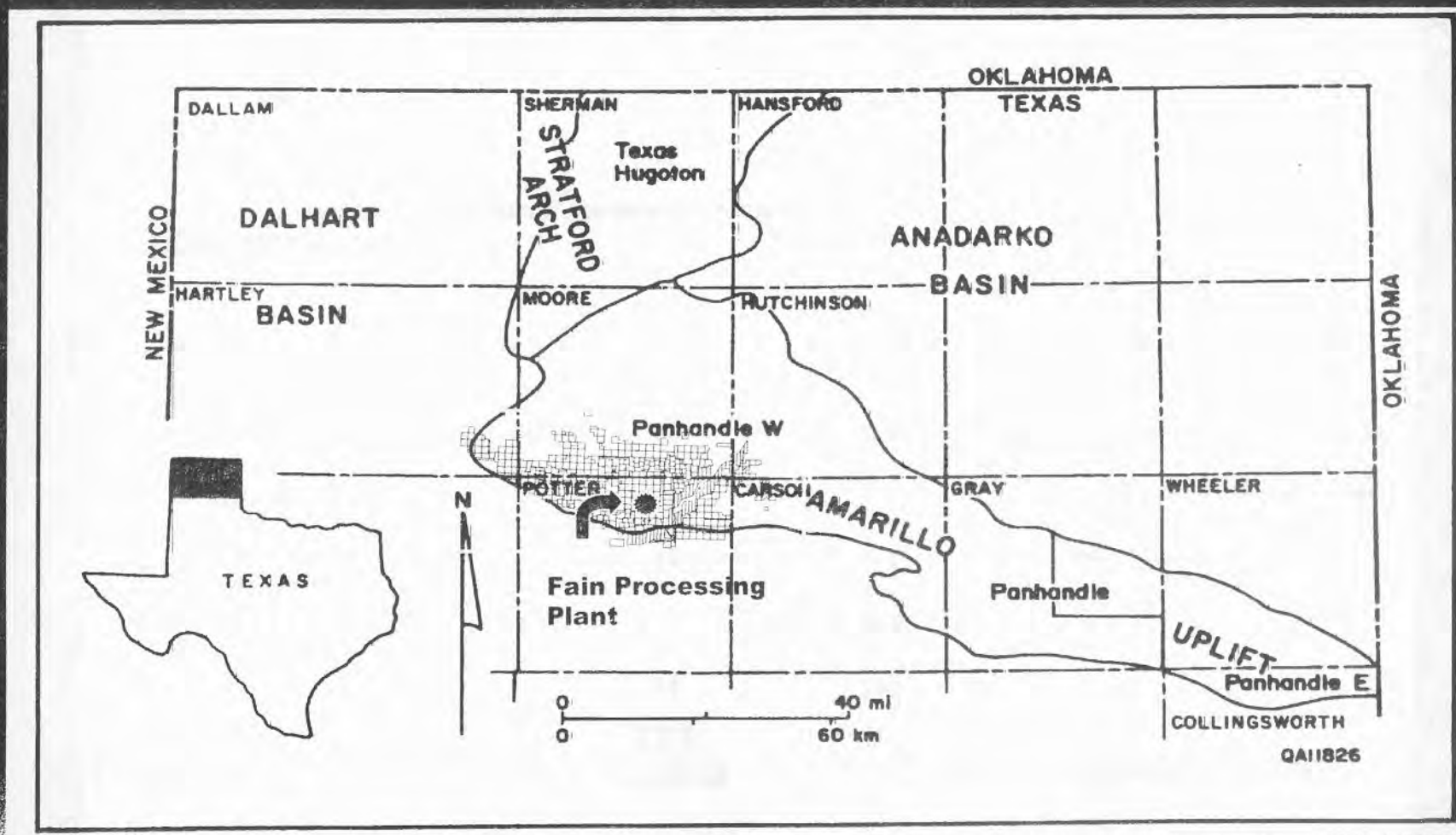
PIONEER POSITION WEST PANHANDLE AREA

<u>PIONEER</u>	<u>BROWN DOLOMITE</u>		<u>RED CAVE</u>		<u>COMMENTS</u>
	<u>NO.</u>	<u>(%)</u>	<u>NO.</u>	<u>(%)</u>	
WELLS	380	14	210	45	
ACREAGE, (M ACRES)	235	18	132	54	
PRODUCTION, (BCFE / MO)	2.8	28	0.7	67	largest producer
HORIZONTAL WELLS	60	40	-	-	most horizontal wells at year end
RESERVES, (BCFE)	250	28	50	67	most reserves

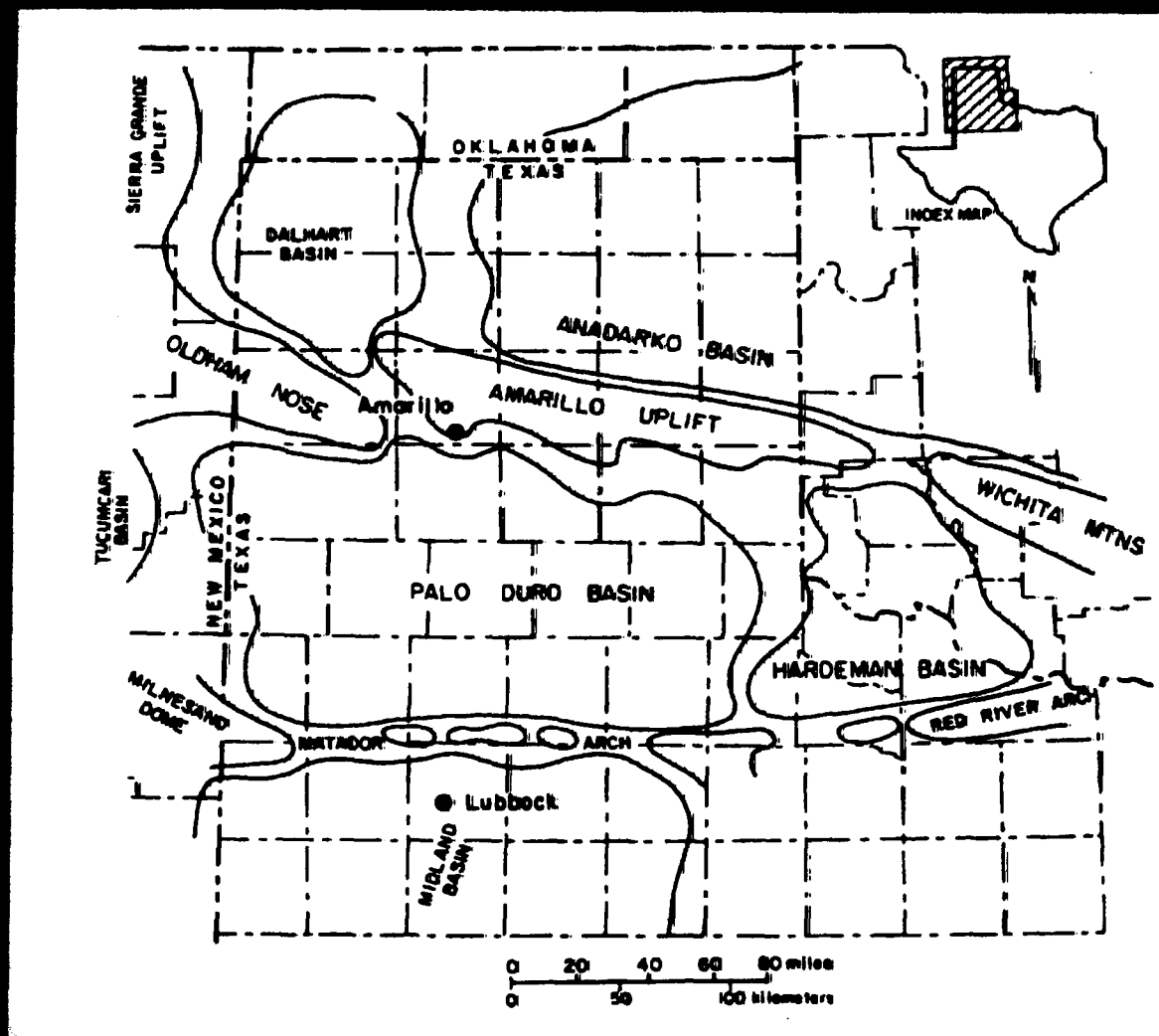
OTHER MAJOR OPERATORS

Phillips, Conoco, Anadarko, Chesapeake, Cresendo, Huber

Regional Location Map W.Panhandle ,Panhandle and Hugoton Fields



Structural Elements

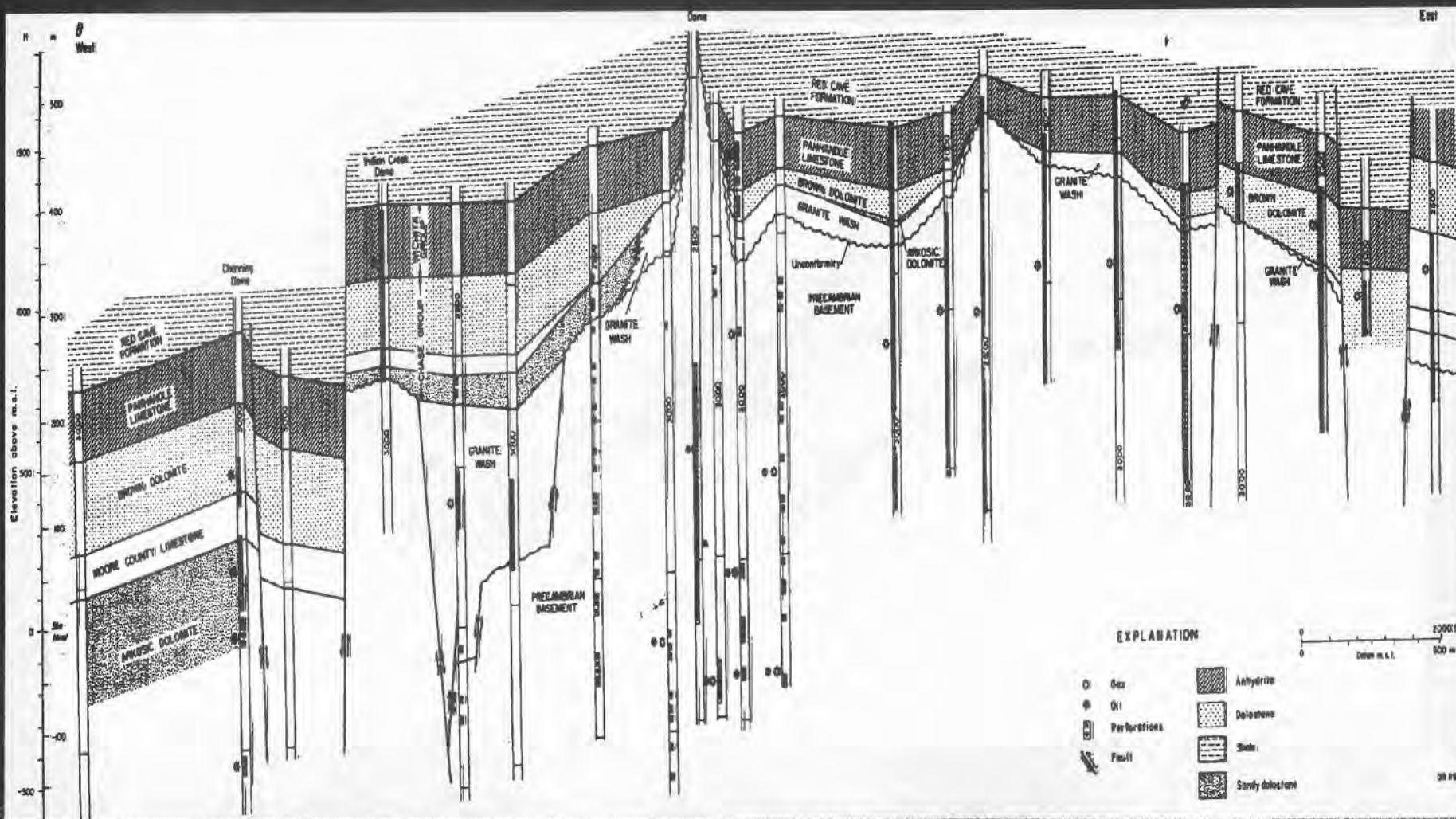


Stratigraphic Column

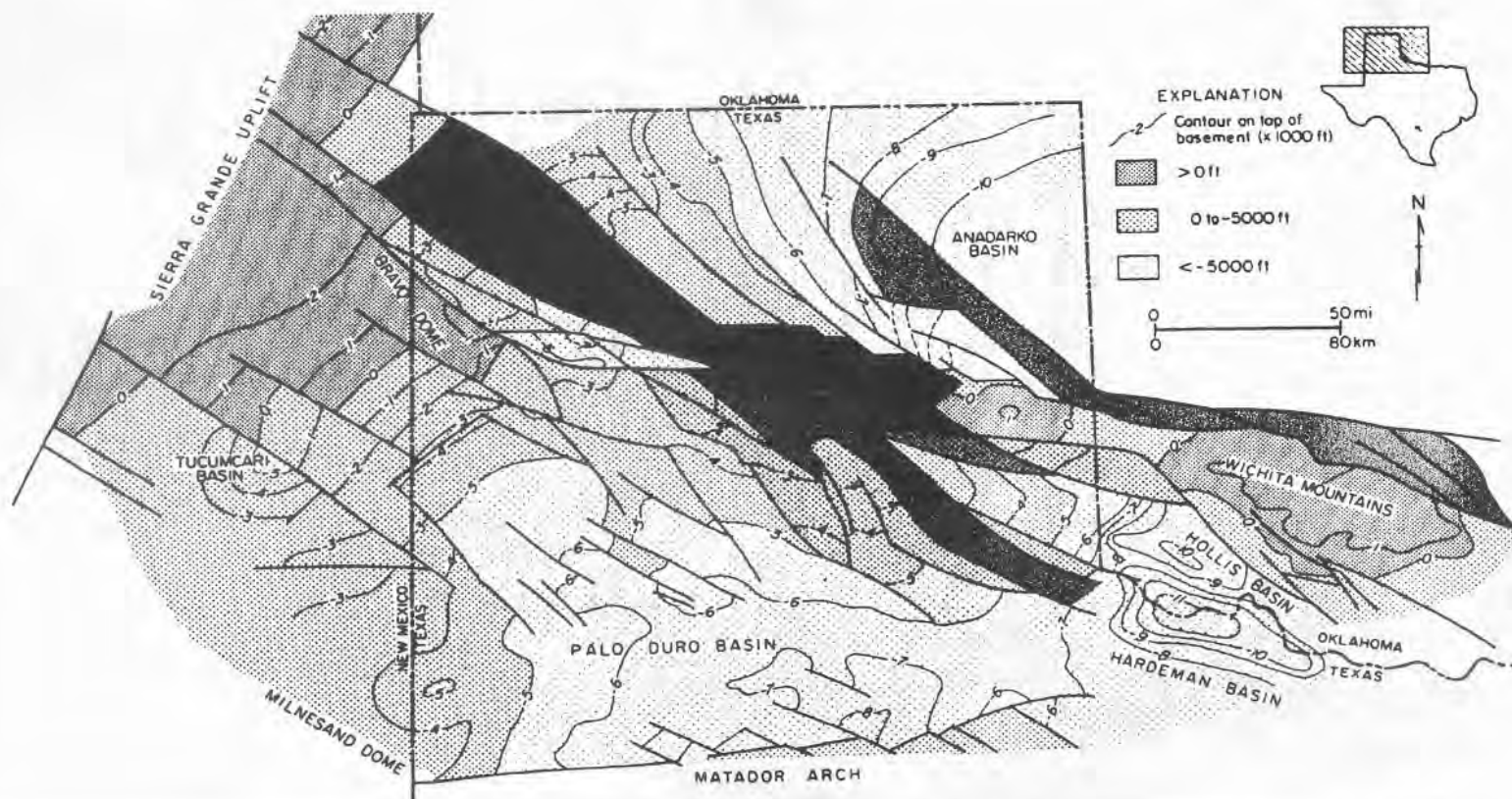
SYSTEM	SERIES	GROUP	LOCAL NOMENCLATURE	
			PANHANDLE FIELD	HUGOTON FIELD
PERMIAN	LEONARD	SUMNER	RED CAVE	RED CAVE
			WICHITA	WICHITA
	WOLFCAMP	CHASE	BROWN DOLOMITE	HERINGTON
			WHITE DOLOMITE	KRIDER
			MOORE CO. LIMESTONE	WINFIELD
			ARKOSIC DOLOMITE	FORT RILEY
			ARKOSIC LIMESTONE	
				WREFORD
		COUNCIL GROVE		COUNCIL GROVE
		ADMIRE		ADMIRE
PENNSYLVANIAN	VIRGIL	WABAUNSEE		WABAUNSEE
		SHAWNEE	GRANITE p.c.	SHAWNEE

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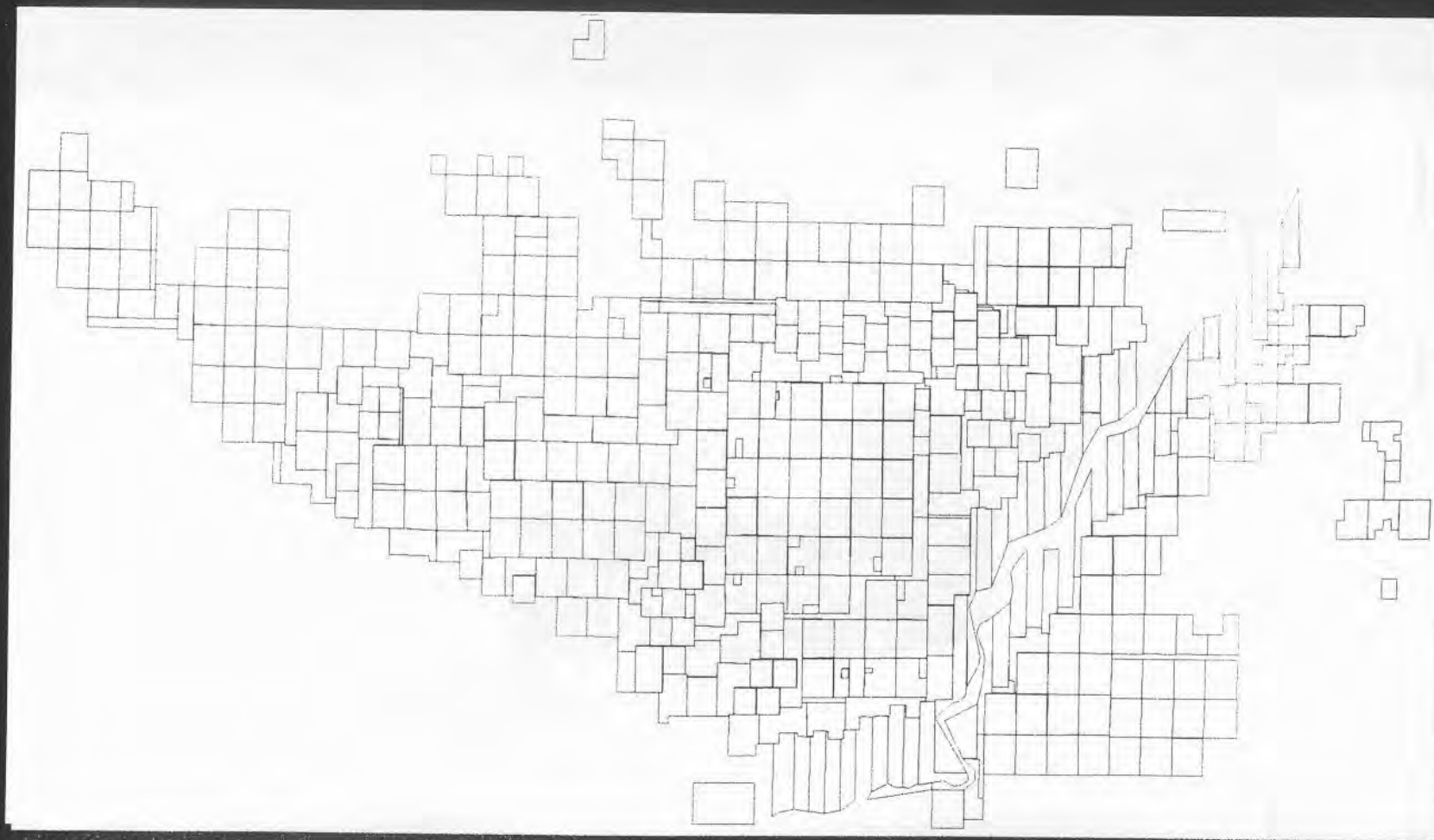
West Panhandle E-W Field Cross Section



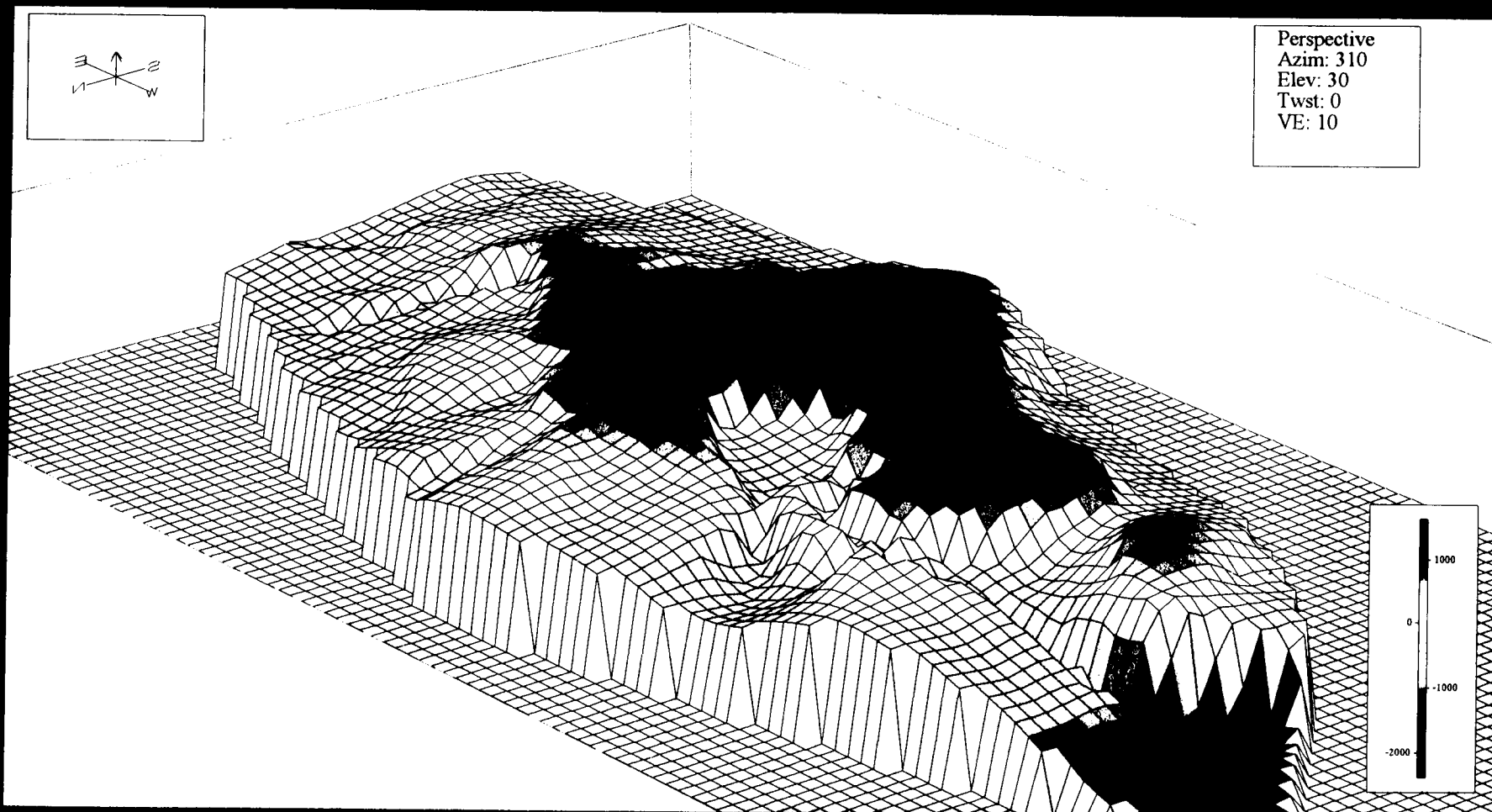
West Panhandle fault system exposed at the pre Cambrian basement level



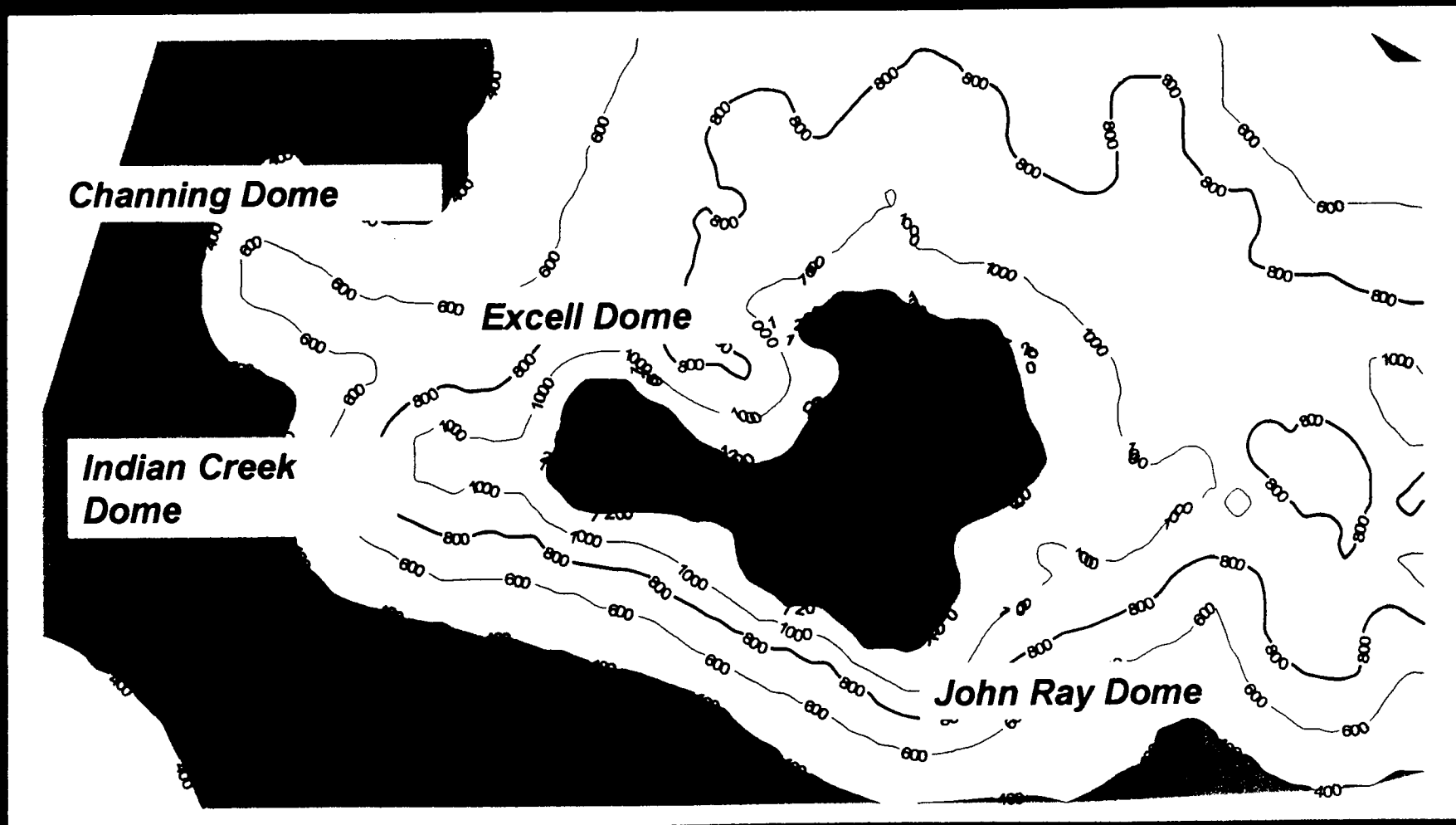
West Panhandle Field : Pioneer Acreage



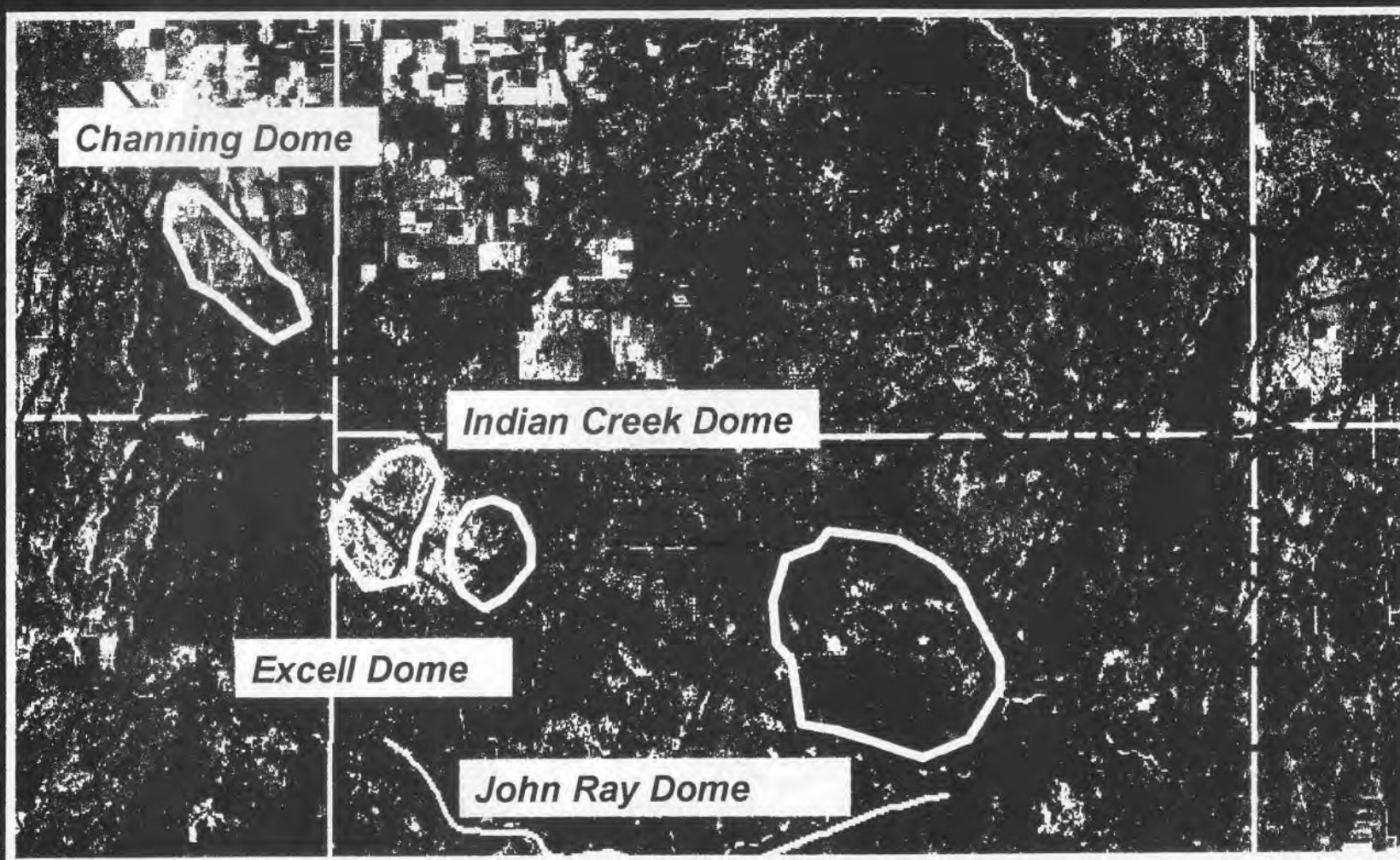
Structure : Top pre-Cambrian Basement



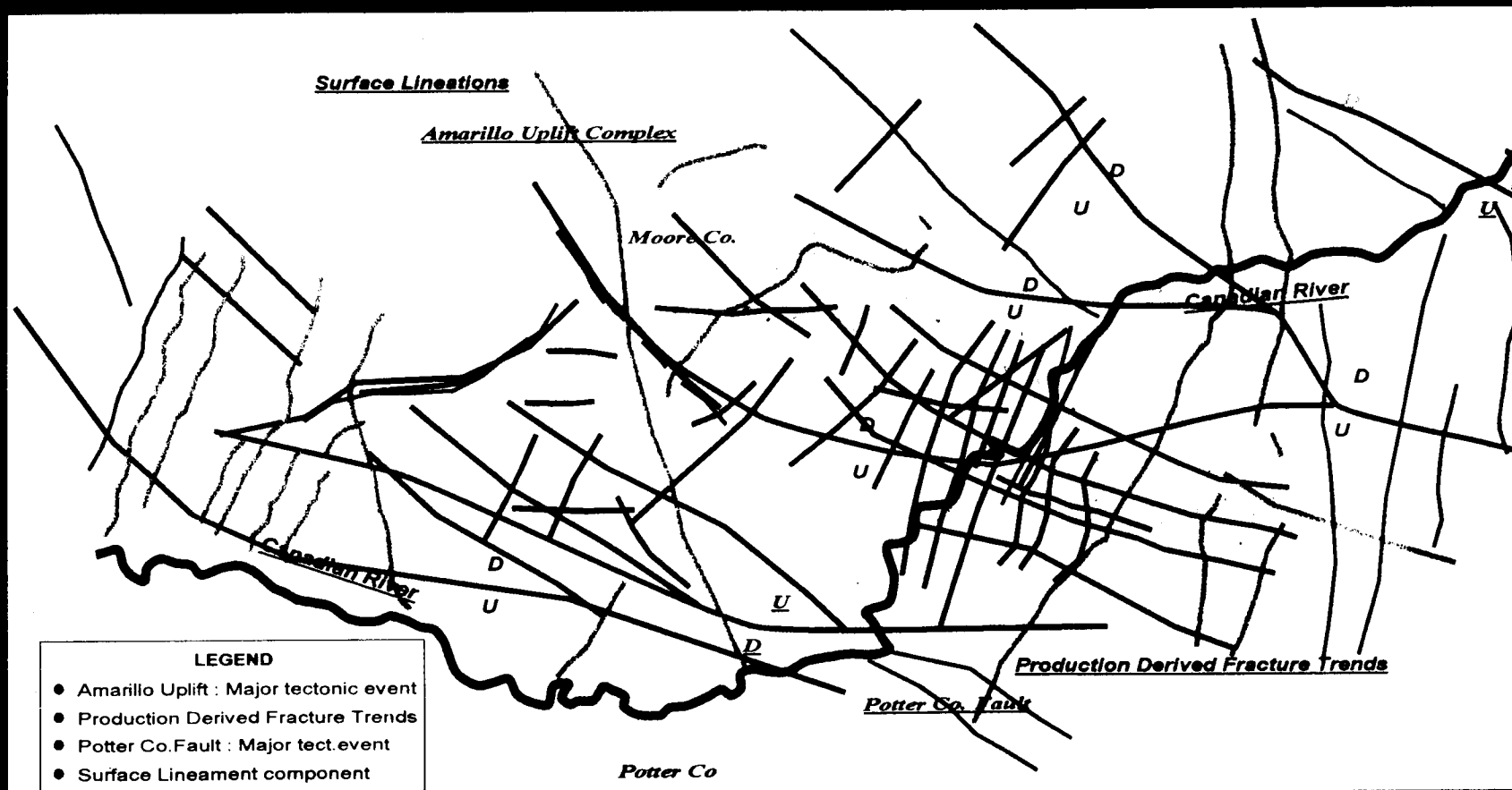
Brown Dolomite Structure



West Panhandle Fracture Net



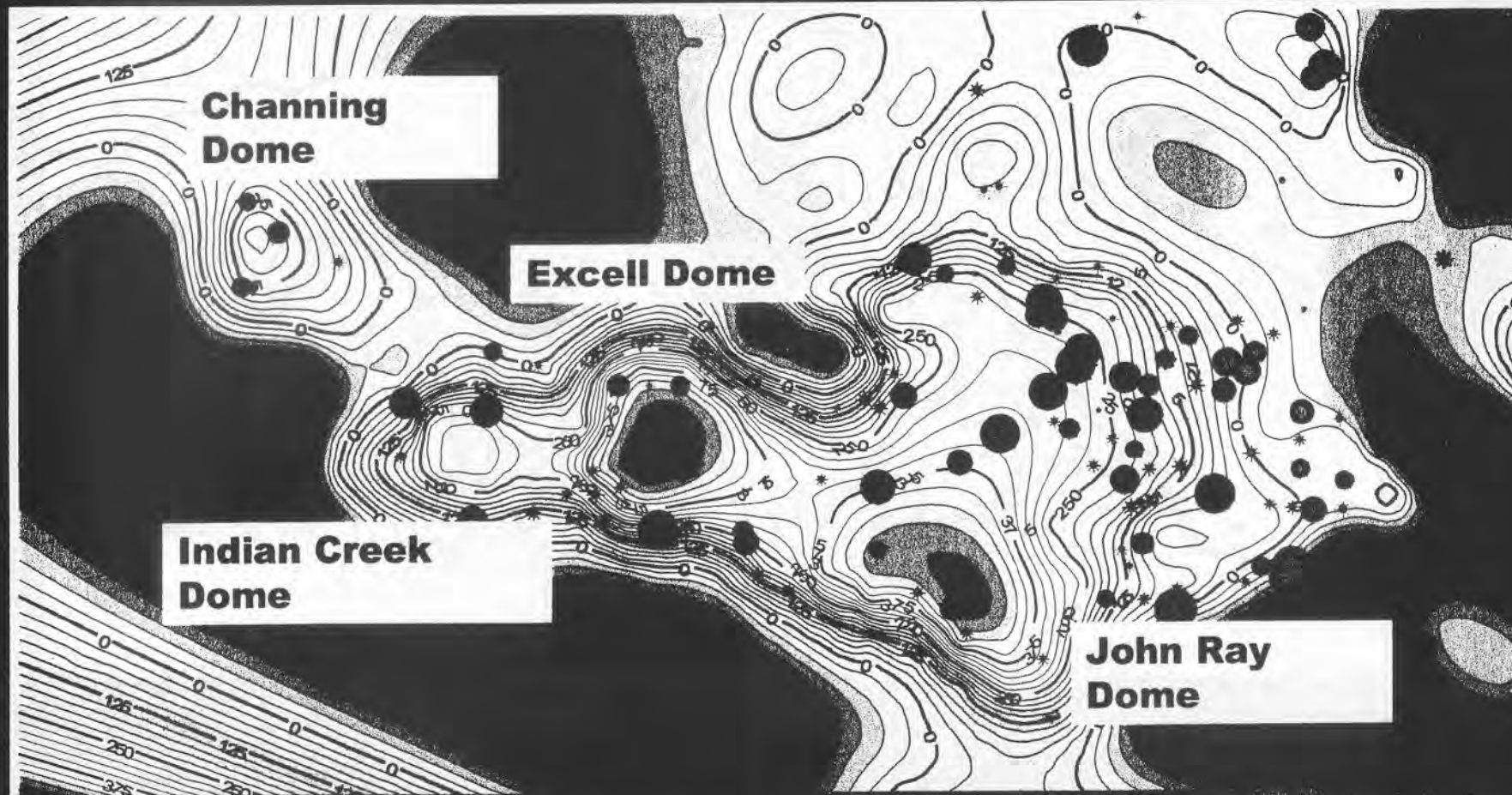
Production derived and high angle aero- photography derived fracture system



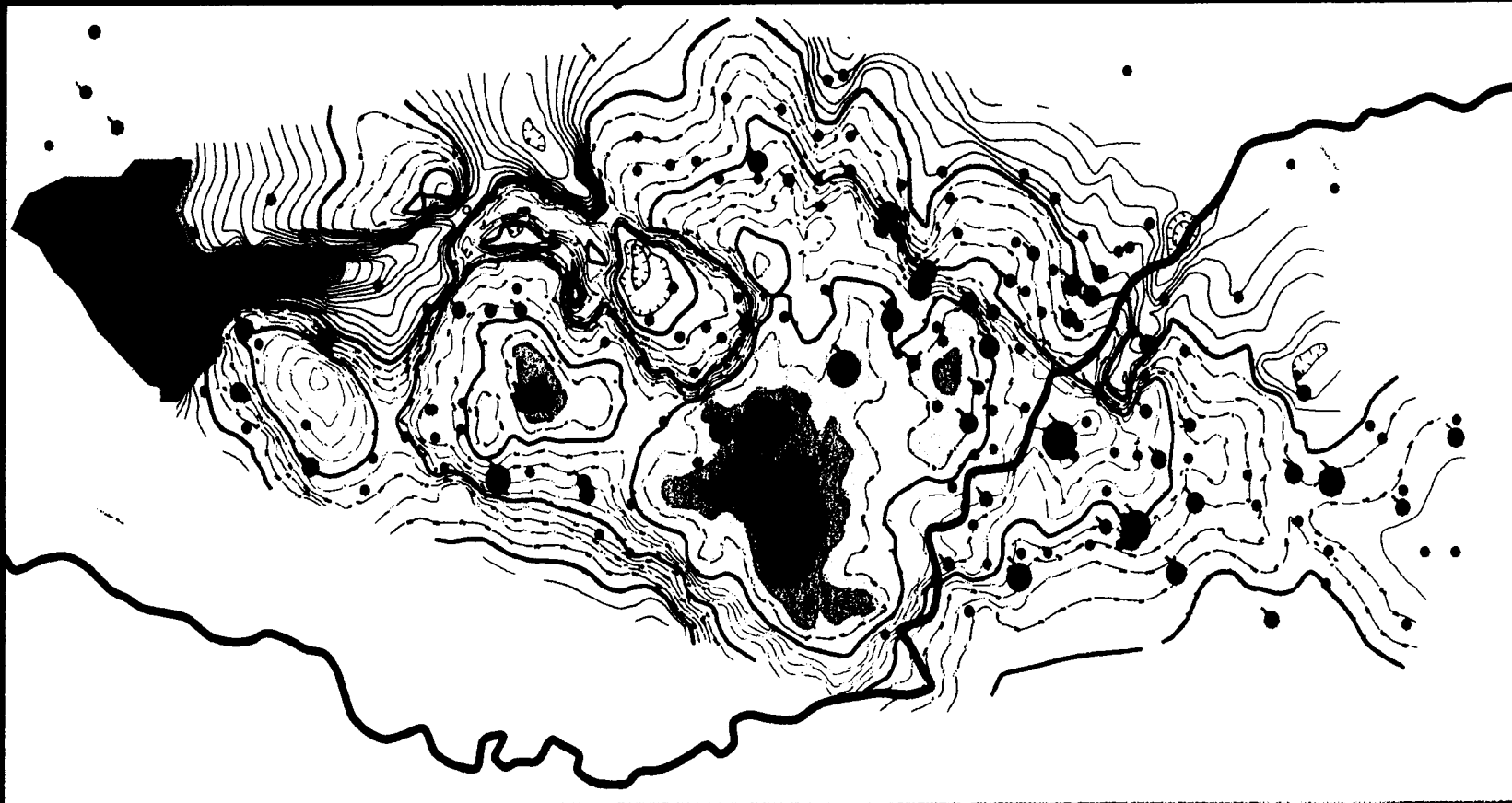
Brown Dolomite Structure w/ Fracture Net



Brown Dolomite Structure : 3rd Order Residual (Max.Curvature) w/ High EUR wells as an overlay



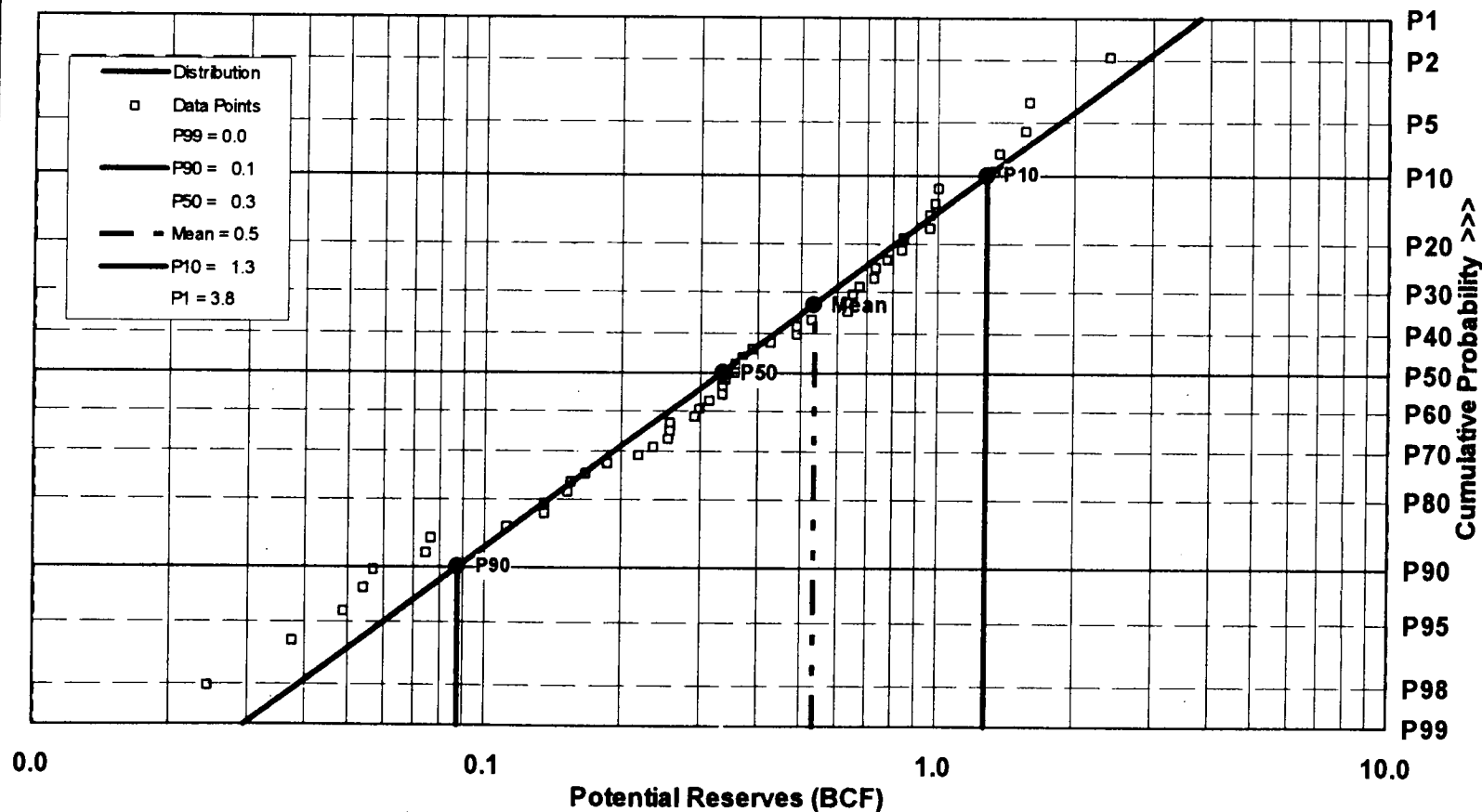
Structural Top of pre-Cambrian w/ Key producers delineating fractures



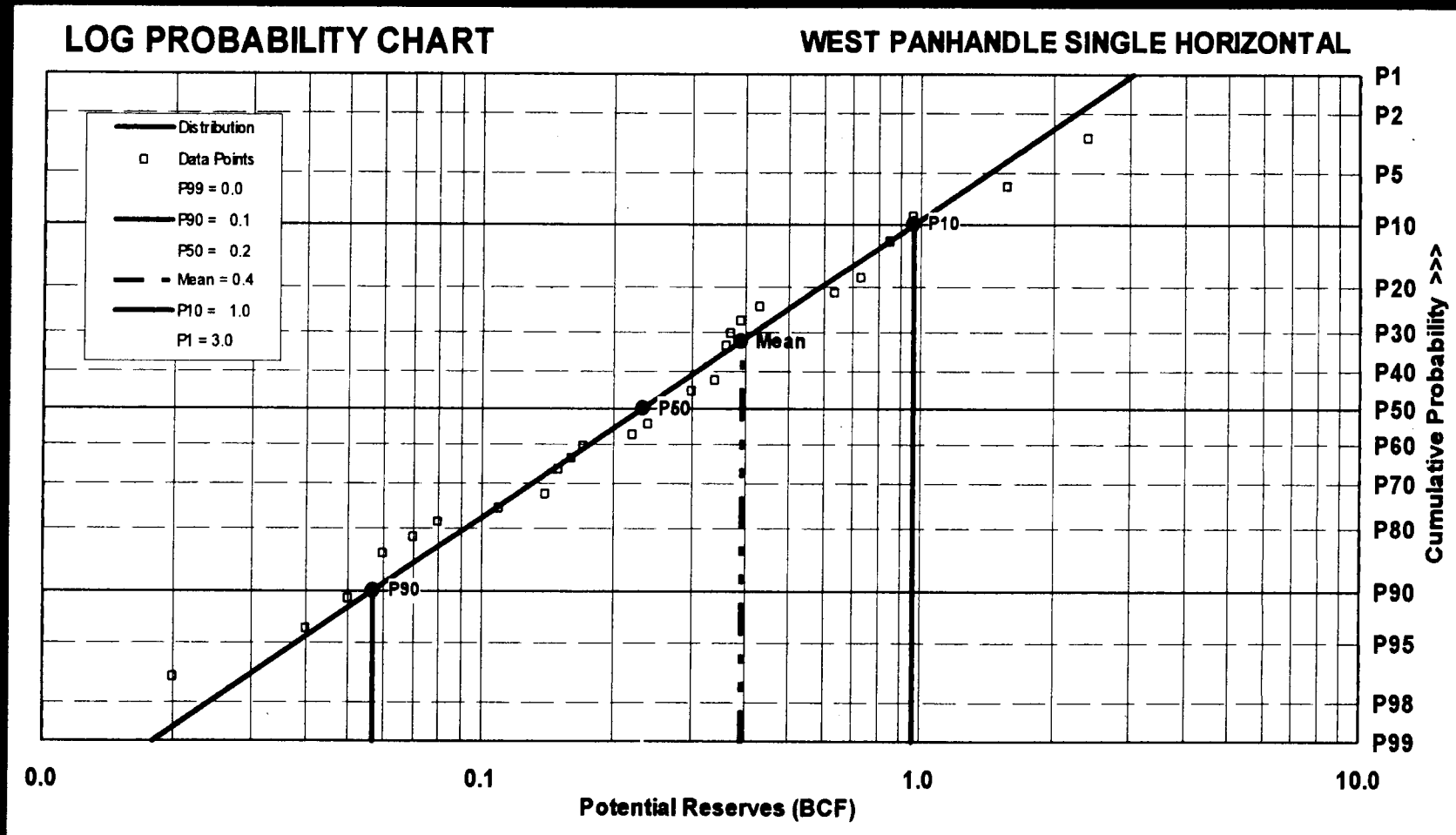
West Panhandle Replacement Well

LOG PROBABILITY CHART

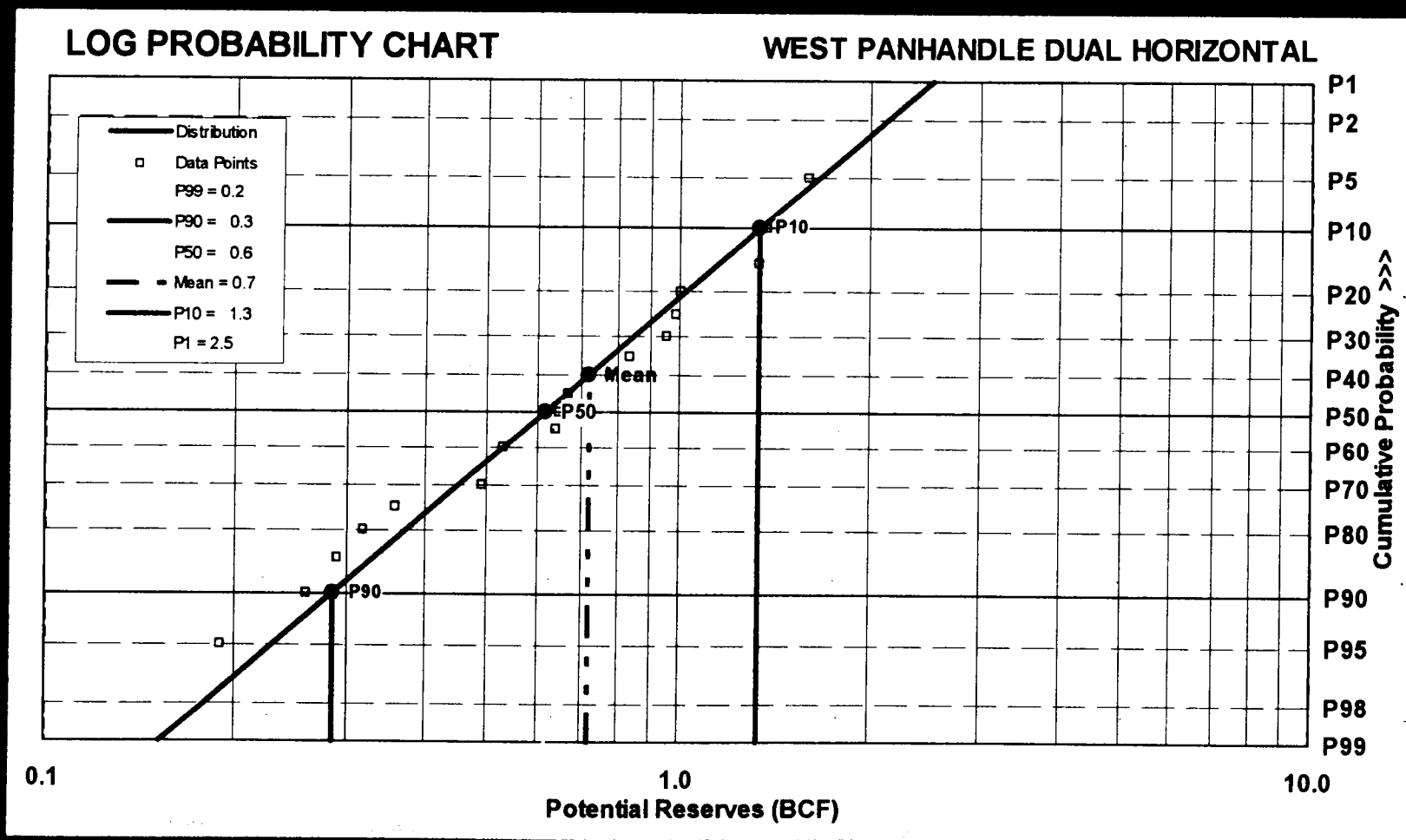
WEST PANHANDLE HORIZONTAL



West Panhandle Single Lateral



West Panhandle Dual Lateral



PIONEER NATURAL RESOURCES USA, INC.
PANHANDLE WEST (BROWN DOLOMITE) FIELD
1999 & 2000 YTD LATERAL SIDETRACK RESULTS
(51 WELLS: 32 SINGLES, 19 DUALS ----- ONLY 13 % OF ACREAGE)

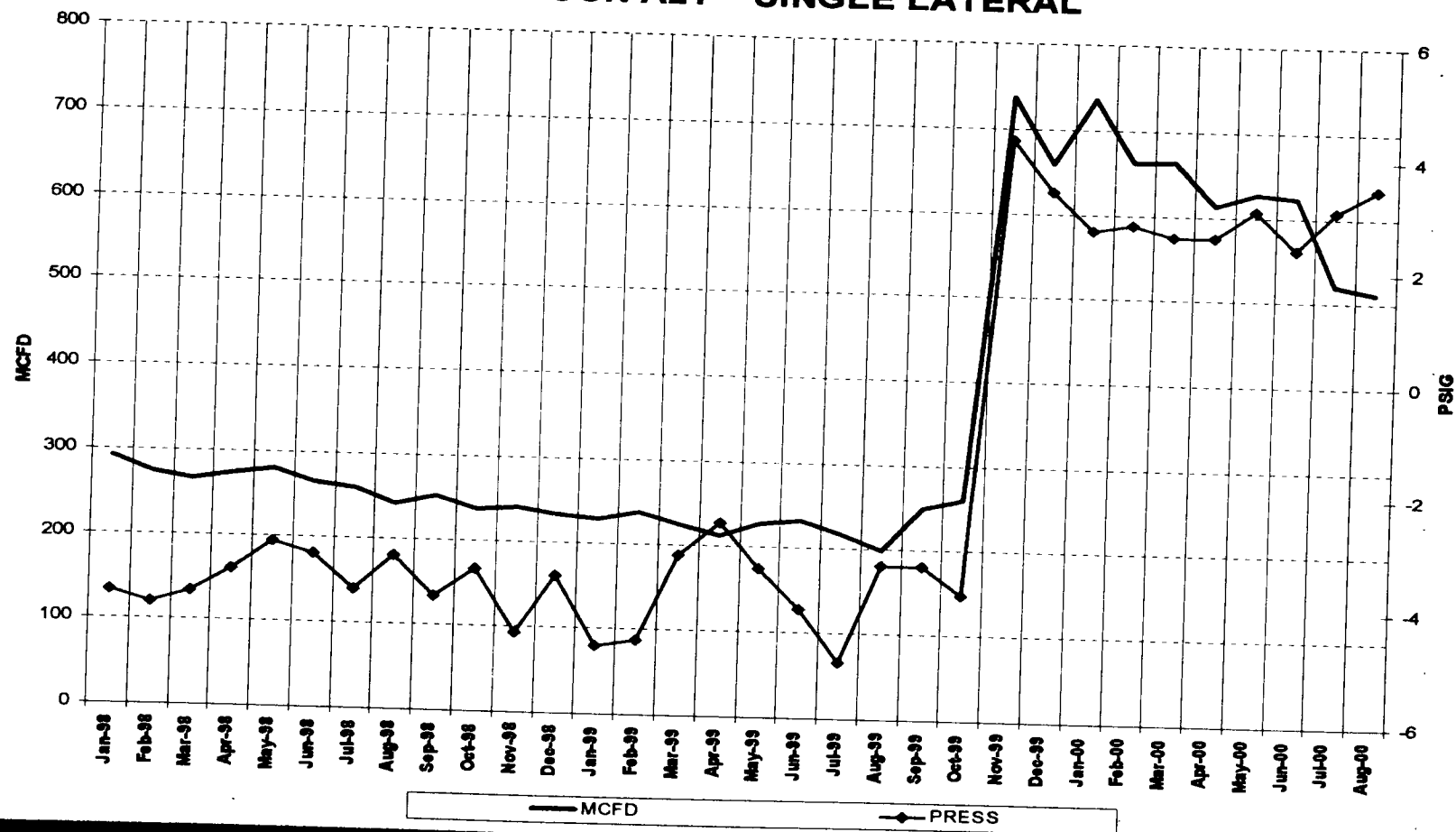
<u>AVERAGE WELL DATA</u>	<u>VERTICAL WELLBORE</u>	<u>COMBINED WELLBORES</u>	<u>INCREASE AMOUNT (%)</u>	
SIWHP PRESSURE (psia)	17.0	19.5 *	2.6	16
DELIVERABILITY (mofd)	380	673	223	64
FWHP (psia)	7	10	3	43
EST DELIV @ PRE-DRILL FWHP (mofd)	380	690	340	97
"C" FACTOR	4.3	7.1	2.8	65 **

* isolated laterals avg pressure is 25.3 psia (49% inc)

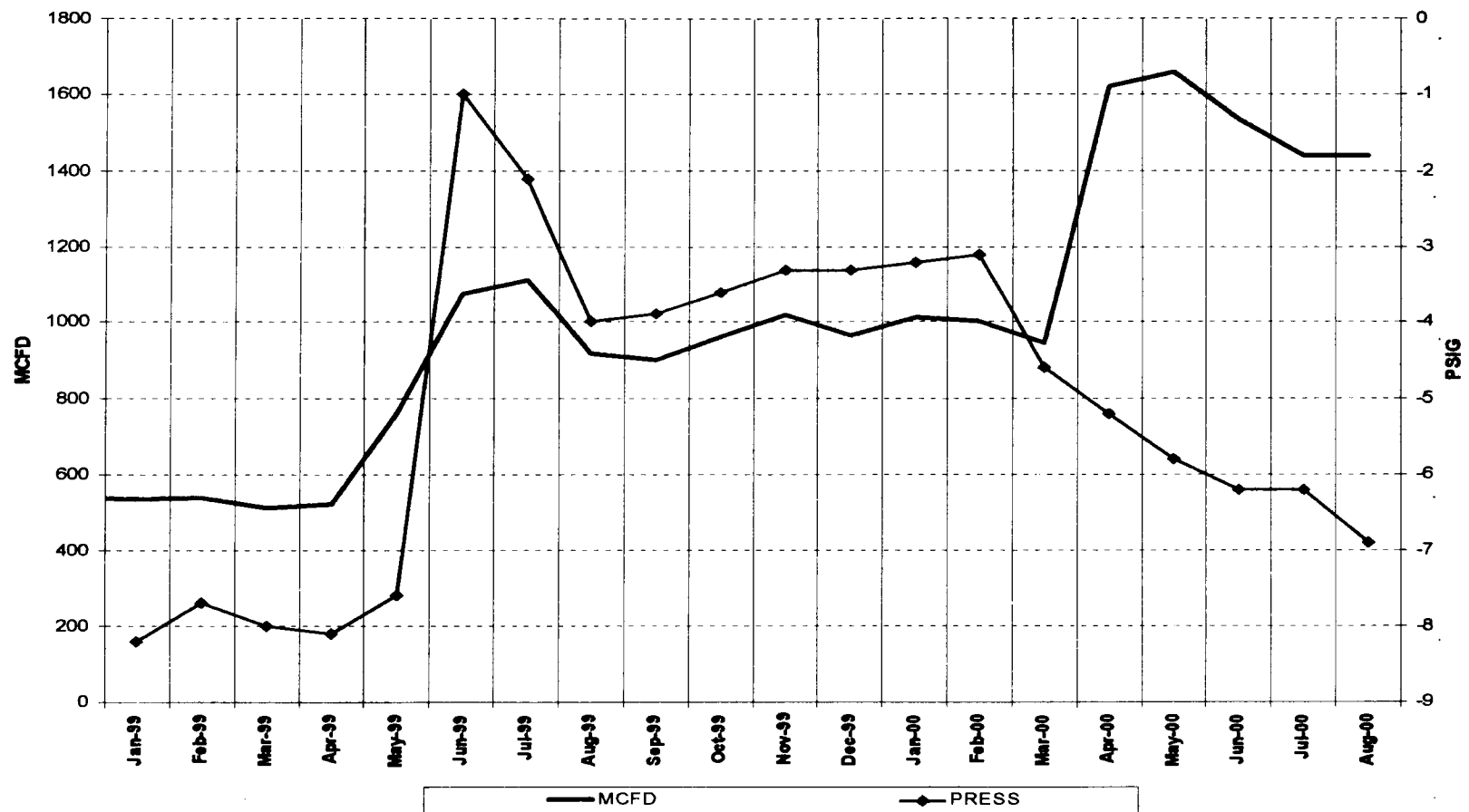
** 20% of wells had an average 230% increase

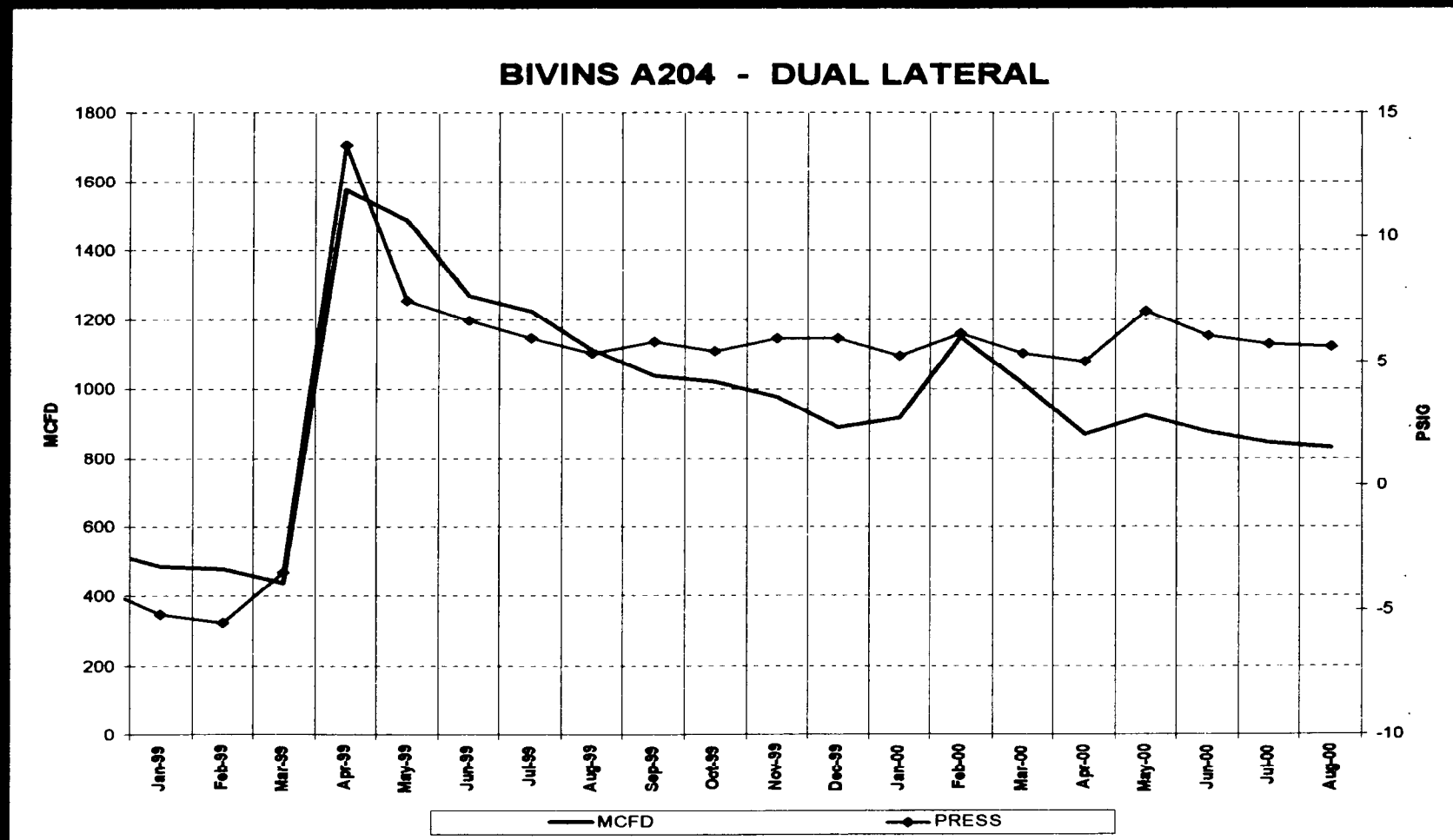
<u>HORIZONTAL DISPLACEMENT</u>		<u>DRILLING COST</u>	<u>ESTIMATED RESERVE INCREASE</u>
WELLBORE RANGE:	761 - 3434 ft	\$ 379 M per well	520 MMCF per well
WELLBORE AVERAGE:	2457 ft	\$ 276 M per wellbore	380 MMCF per wellbore
SINGLE AVERAGE:	2666 ft	\$ 301 M per single	400 MMCF per single well
DUAL AVERAGE:	4733 ft	\$ 611 M per dual	730 MMCF per dual well

MASTERTON A21 - SINGLE LATERAL



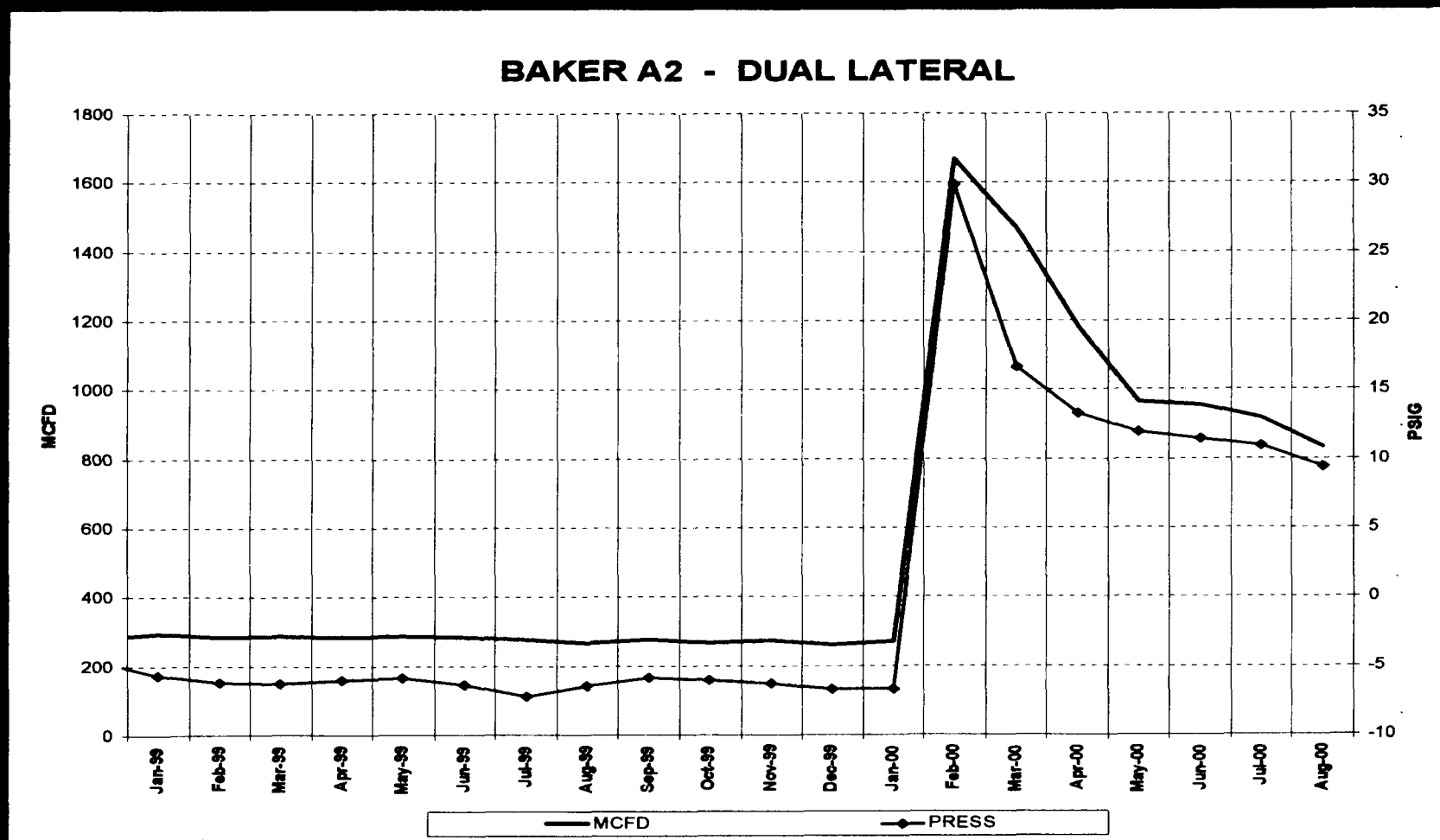
BIVINS A193 - SINGLE LATERAL



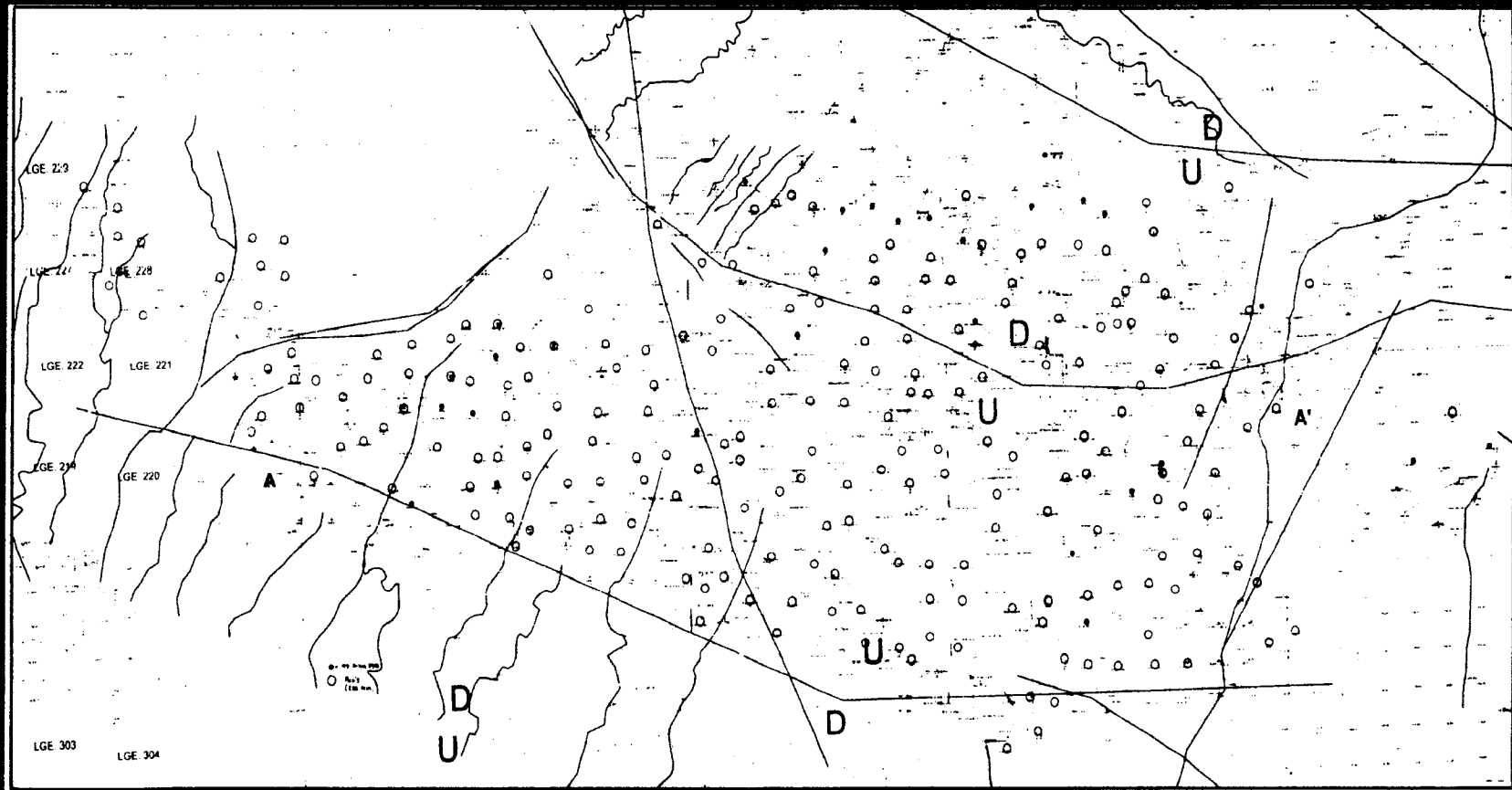


READ A5 - DUAL LATERAL





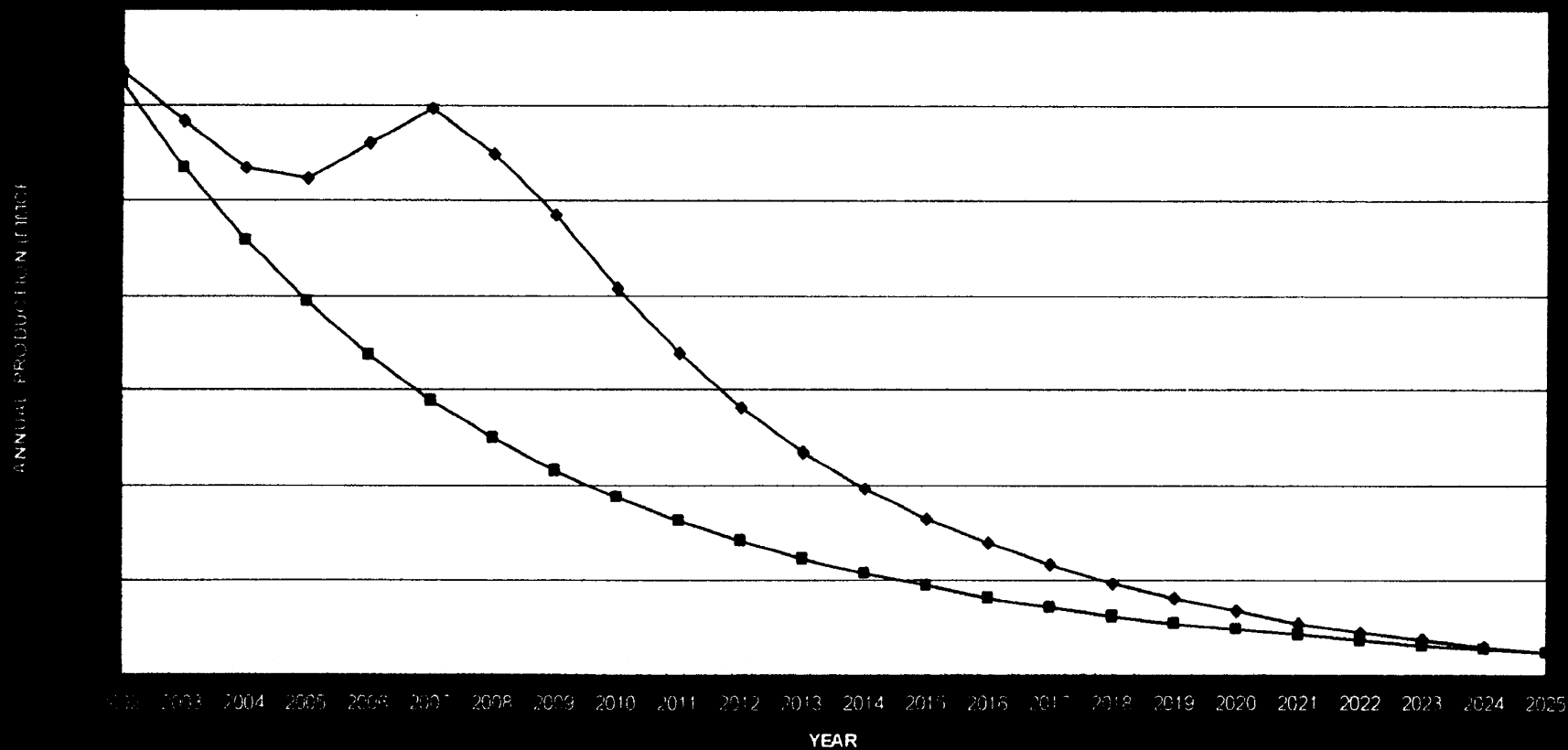
West Panhandle : Brown Dolomite PUDS



Horizontal Impact : Annual Production Growth

HORIZONTAL DRILLING IMPACT PANHANDLE WEST FIELD

—◆— W/ HORIZONTAL WELLS —■— WO/ HORIZONTAL WELLS



Results

High Angle Drilling intersects many more fractures than vertical well bores and increases production by tapping into reservoir compartments previously un-drained by vertical wells.

- By predicting these fracture swarms and the drilling of successful wells we have reduced the 15% normal decline of the field to 6%, and added 300+ BCF of reserves.
- Intersecting fractures have resulted in increased pressure and rate, this supports that we have added incremental reservoir volume.

We have only tested this approach on 18% of Pioneer's acreage