EUNICE MONUMENT SOUTH UNIT

EUNICE MONUMENT SOUTH UNIT EXPANSION

WORKING INTEREST OWNERS' MEETING

FEBRUARY 27, 1990

AGENDA

EMSU STATUS REPORT

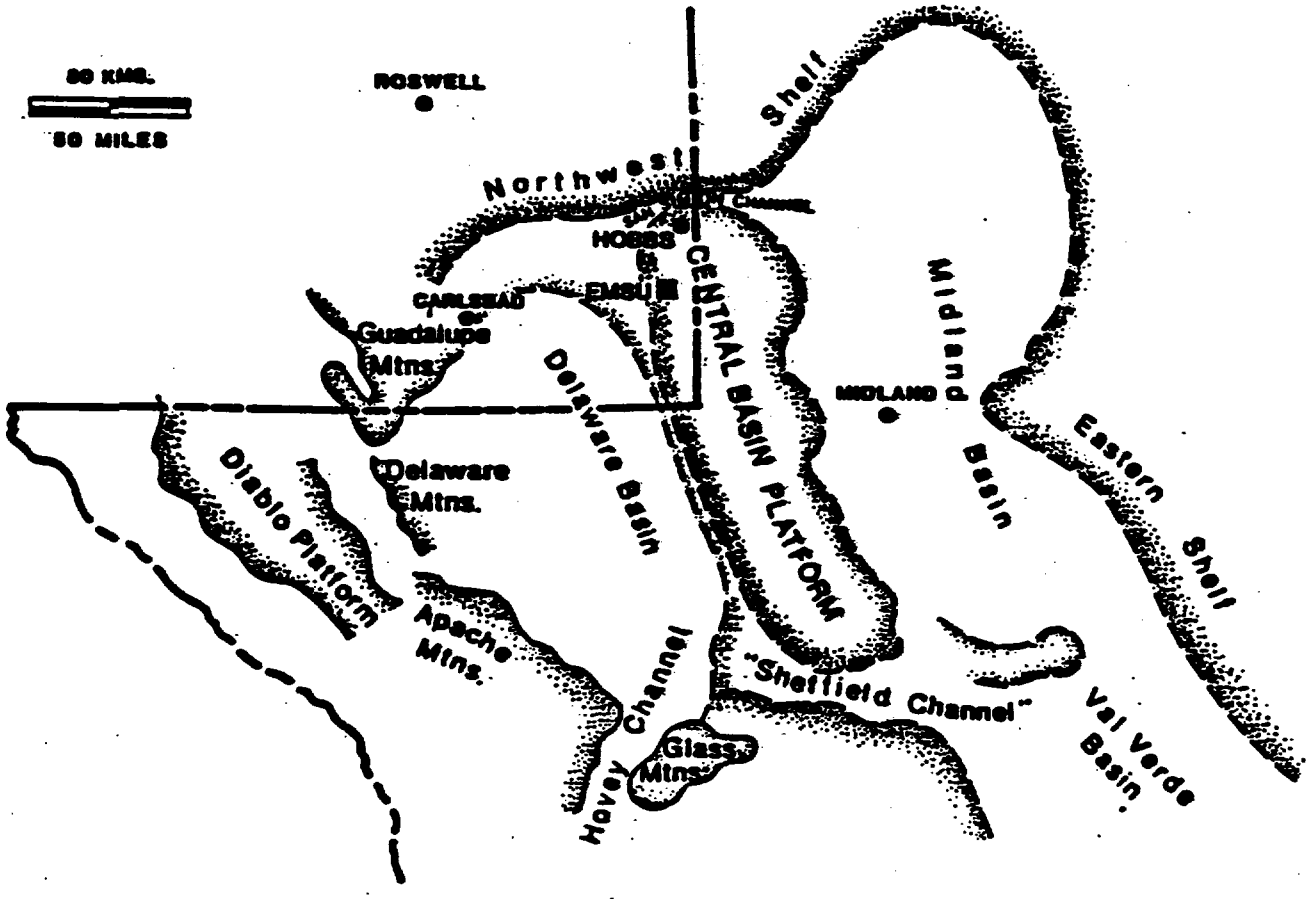
- GEOLOGY
- WATERFLOOD PERFORMANCE
- SIMULATION WORK
- PROJECT ACTIVITIES
- AFE STATUS
- ADDITIONAL DISCUSSION

EMSU EXPANSION

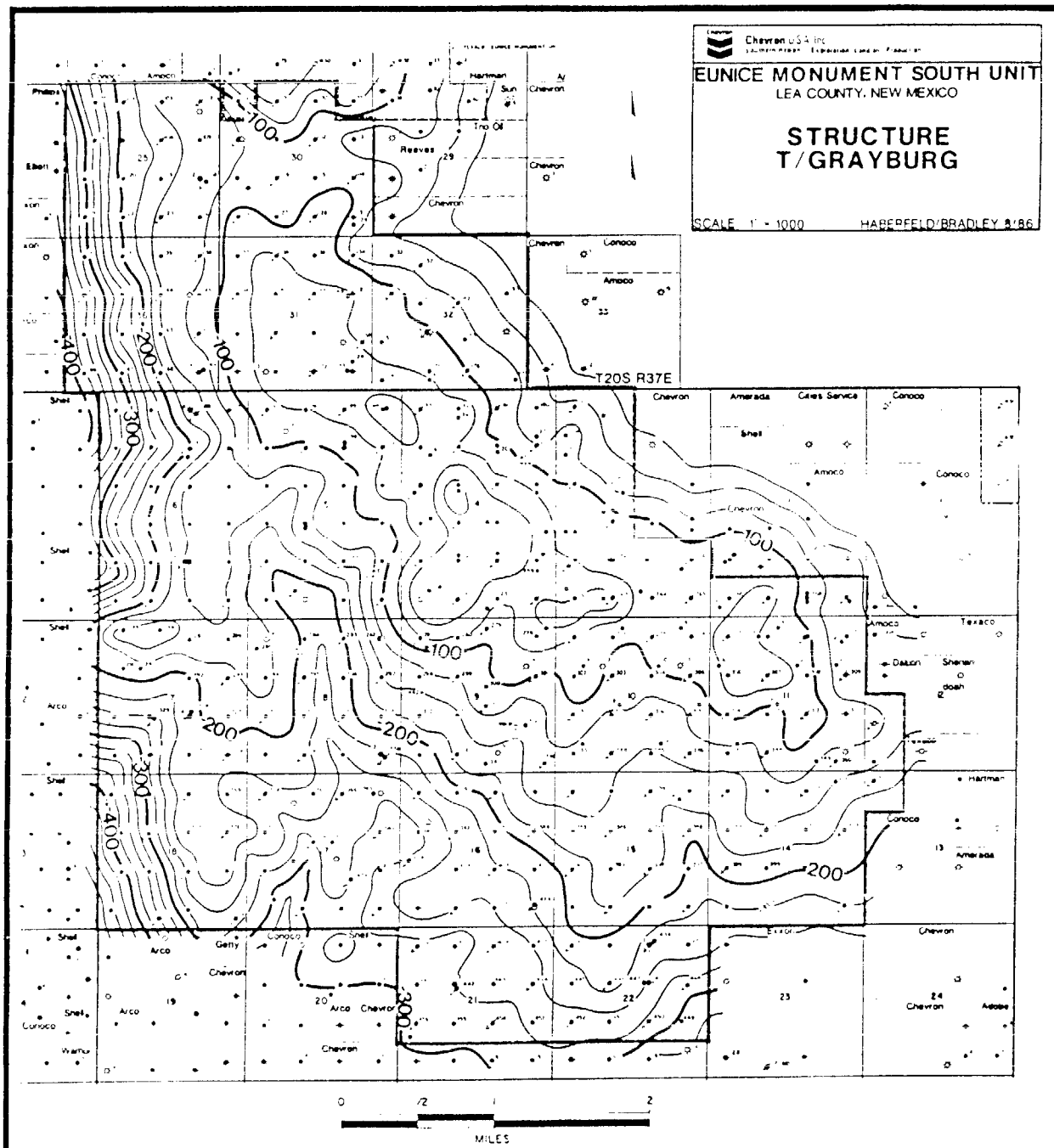
- PROPOSED EXPANSION OVERVIE
- INVESTMENT ADJUSTMENT
- CAPITAL EXPENDITURES
- OPERATING EXPENSE SHARING
- ADDITIONAL DISCUSSION

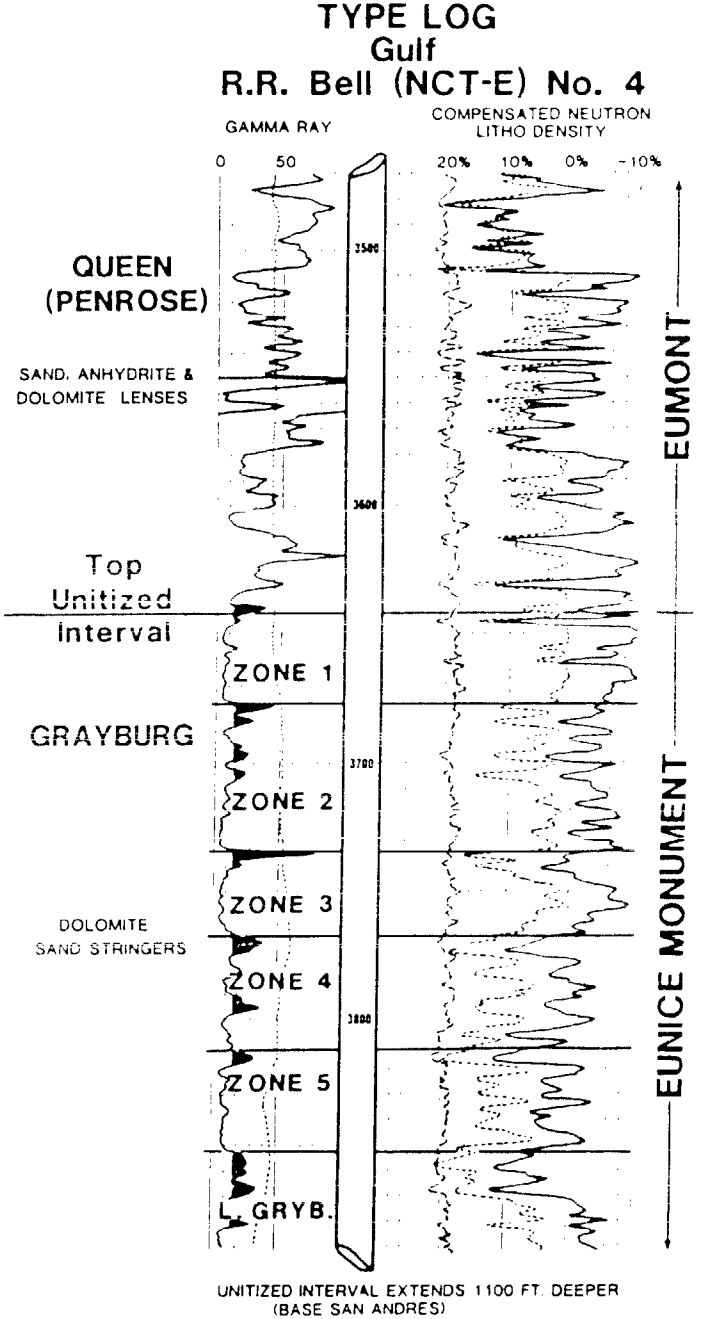
EMSU STATUS REPORT
CHRONOLOGY OF DEVELOPMENT

APRIL 1979	Arco Completed Preliminary Feasibility Study
MAY 1979	First Working Interest Owners' Meeting Gulf to Expedite
JULY 1979	First Tech. Committee Meeting
FEB. 1983	Final Tech. Committee Meeting
AUG. 1983	Final WIO Meeting Prior to State Hearings (21 Owners)
NOV. 1984	OCD Hearing
FEB. 1985	Effective Unit
NOV. 1986	Water Injection Begins
FEB. 1990	87 MMBBL of Water Injected (38% of Fillup)
MAR. 1991	Field Response
SEPT. 1994	Peak Oil Response

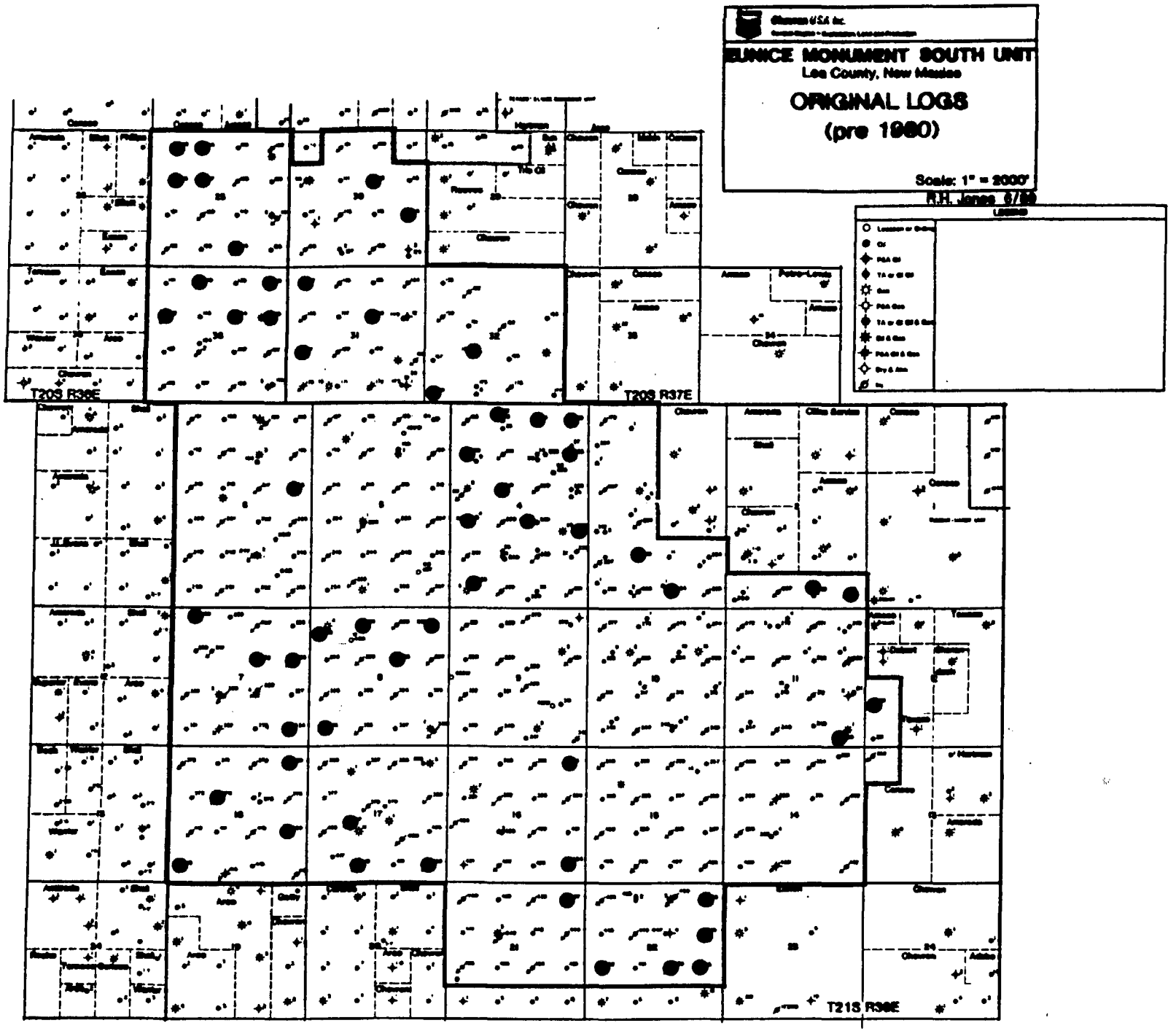


MAP OF THE PERMIAN BASIN OF WEST TEXAS AND SOUTHEASTERN NEW MEXICO SHOWING LARGE SCALE FEATURES DELINEATED BY SUBSURFACE STUDIES AND MOUNTAIN RANGES EXPOSING GUADALUPIAN STRATA ALONG THE WESTERN MARGIN OF THE DELAWARE BASIN. (AFTER WARD, HARRIS, KENDALL, 1986)

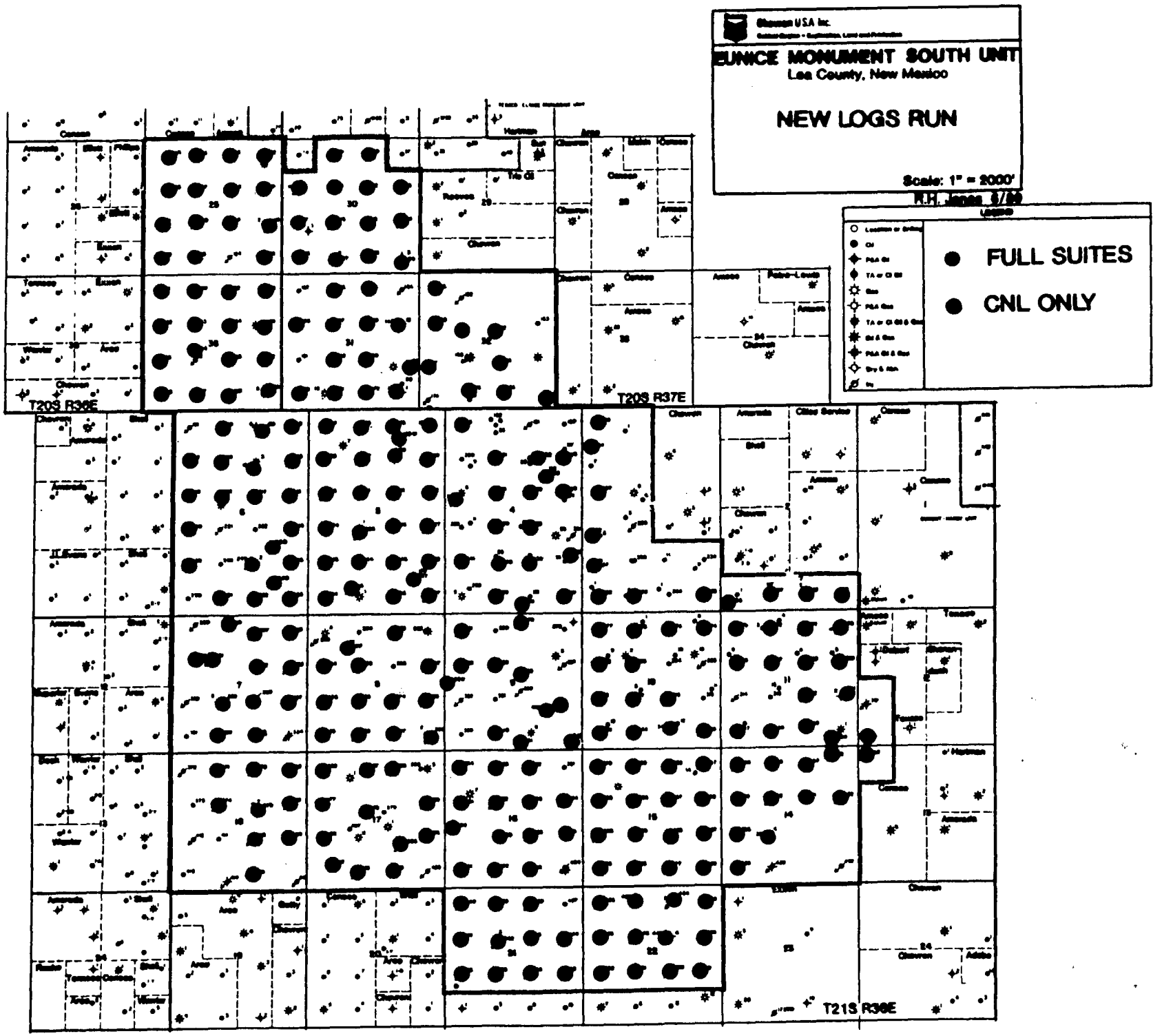

Chevron U.S.A. Inc.
EUNICE MONUMENT SOUTH UNIT
LEA COUNTY, NEW MEXICO
STRUCTURE
T/GRAYBURG
SCALE 1" = 1000
HABERFELD/BRADLEY 8/86
T20S R37E
100
200
300
400
0
1/2
1
2
MILES

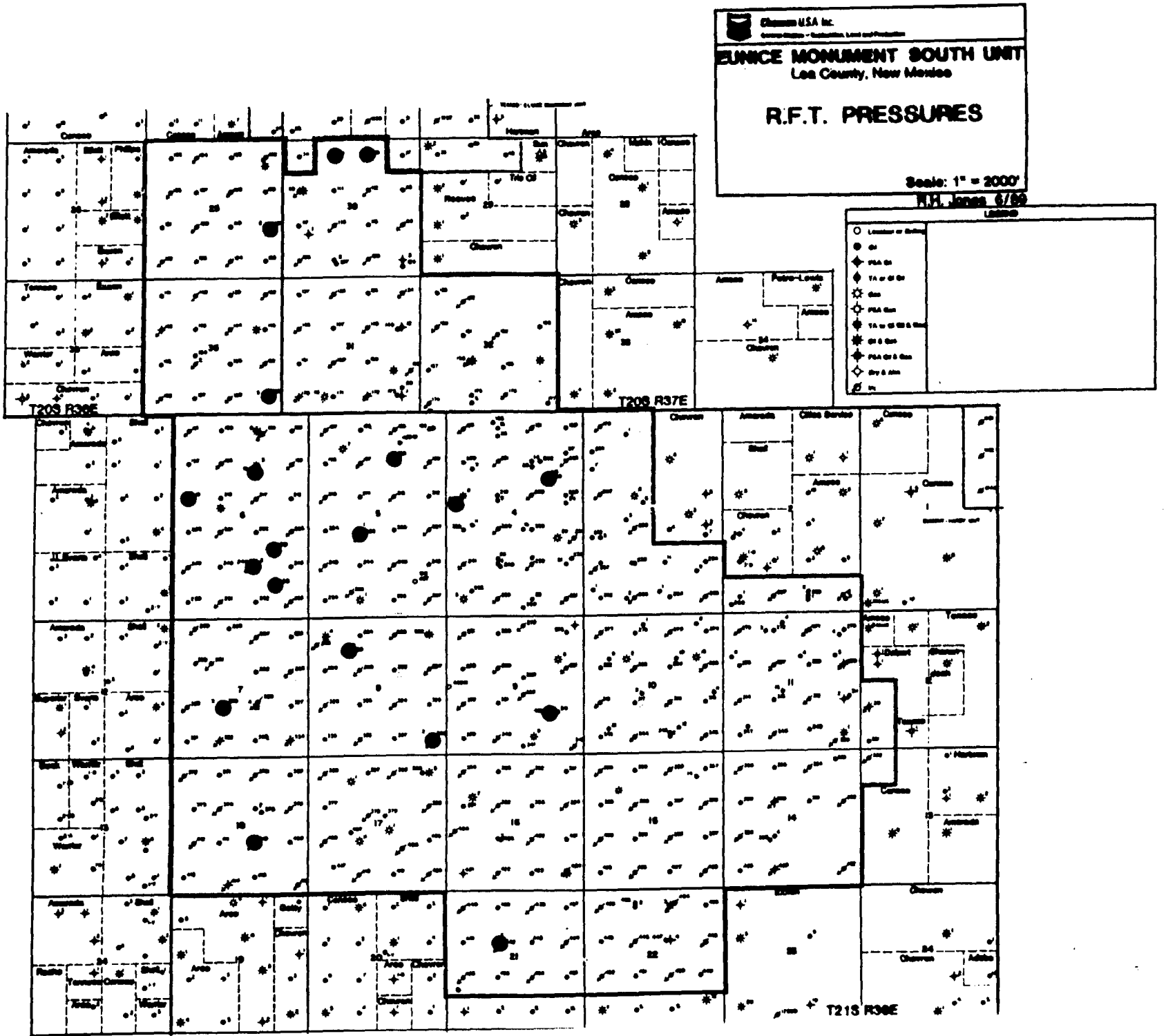

TYPE LOG
Gulf
R.R. Bell (NCT-E) No. 4
GAMMA RAY
0
50
COMPENSATED NEUTRON
LITHO DENSITY
20%
10%
0%
-10%
QUEEN
(PENROSE)
SAND, ANHYDRITE &
DOLOMITE LENSES
Top
Unitized
Interval
GRAYBURG
DOLOMITE
SAND STRINGERS
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
L. GRYB.
3500
3600
3700
3800
EUMONT
EUNICE MONUMENT
UNITIZED INTERVAL EXTENDS 1100 FT. DEEPER
(BASE SAN ANDRES)

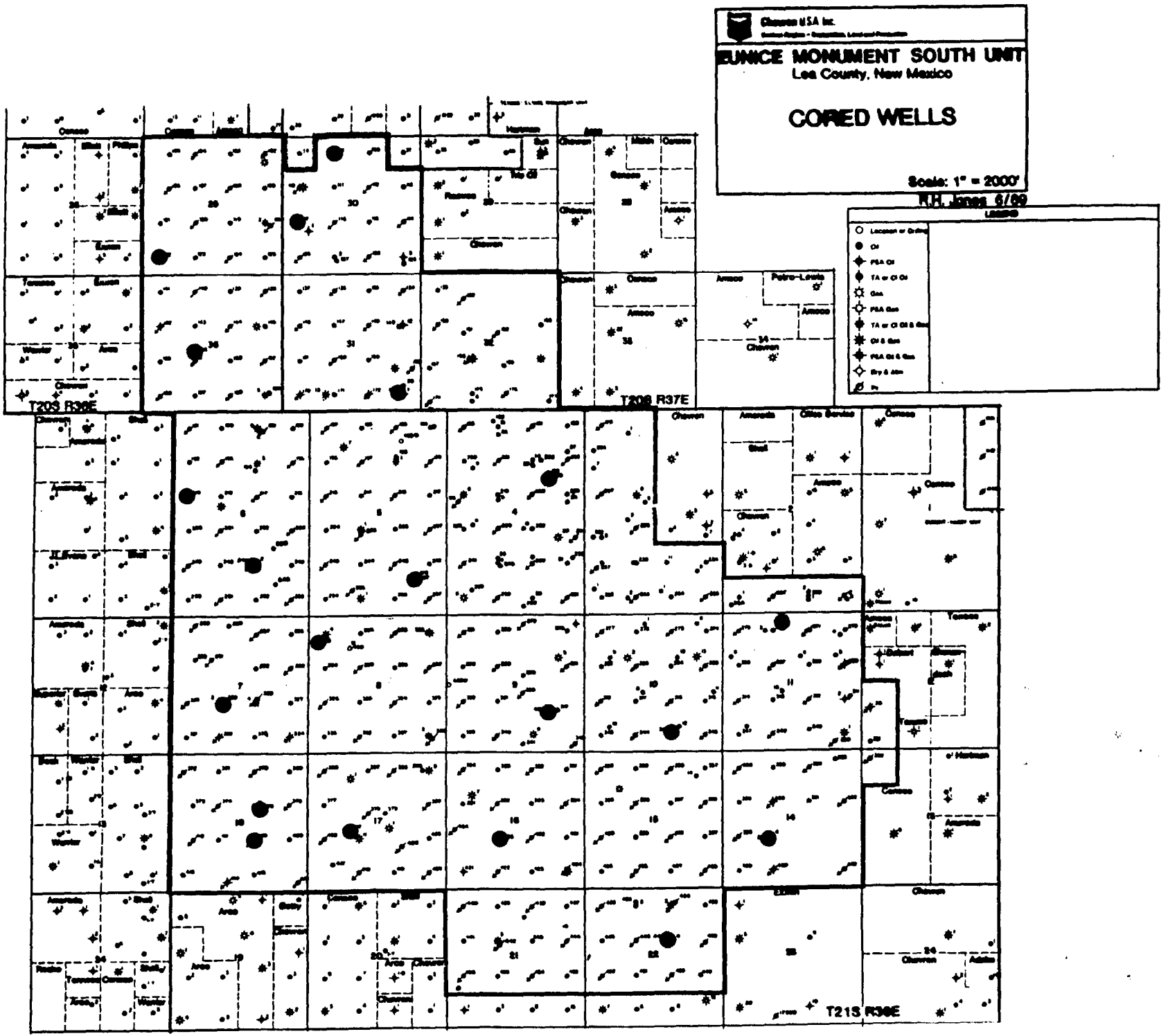
5


EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico
ORIGINAL LOGS
(pre 1980)
Scale: 1" = 2000'
T20S R36E
T20S R37E
T21S R36E

6


Shenon USA Inc.
EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico
NEW LOGS RUN
Scale: 1" = 2000'
R.H. Jones 8/99
FULL SUITES
CNL ONLY
T20S R36E
T20S R37E
T21S R36E


Chevron U.S.A. Inc.
EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico
R.F.T. PRESSURES
Scale: 1" = 2000'
T.P. Jones 6/89
T20S R36E
T20S R37E
T21S R36E


Chevron U.S.A. Inc.
EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico
CORED WELLS
Scale: 1" = 2000'
R.H. Jones 6/99
T20S R36E
T20S R37E
T21S R36E

EMSU (CORE DATA)

DOLOMITES 3877 DATA POINTS

Average Porosity 9.1 %

Average Permeability 2.74 md

GRAINSTONES 1900 DATA POINTS

Average Porosity 11.85%

Average Permeability 11.5 md

MUDSTONES 1977 DATA POINTS

Average Porosity 6.4 %

Average Permeability 0.68 md

SANDS 1008 DATA POINTS

Average Porosity 10.8 %

Average Permeability 0.41 md

EUNICE MONUMENT SOUTH UNIT
WATERFLOOD PERFORMANCE

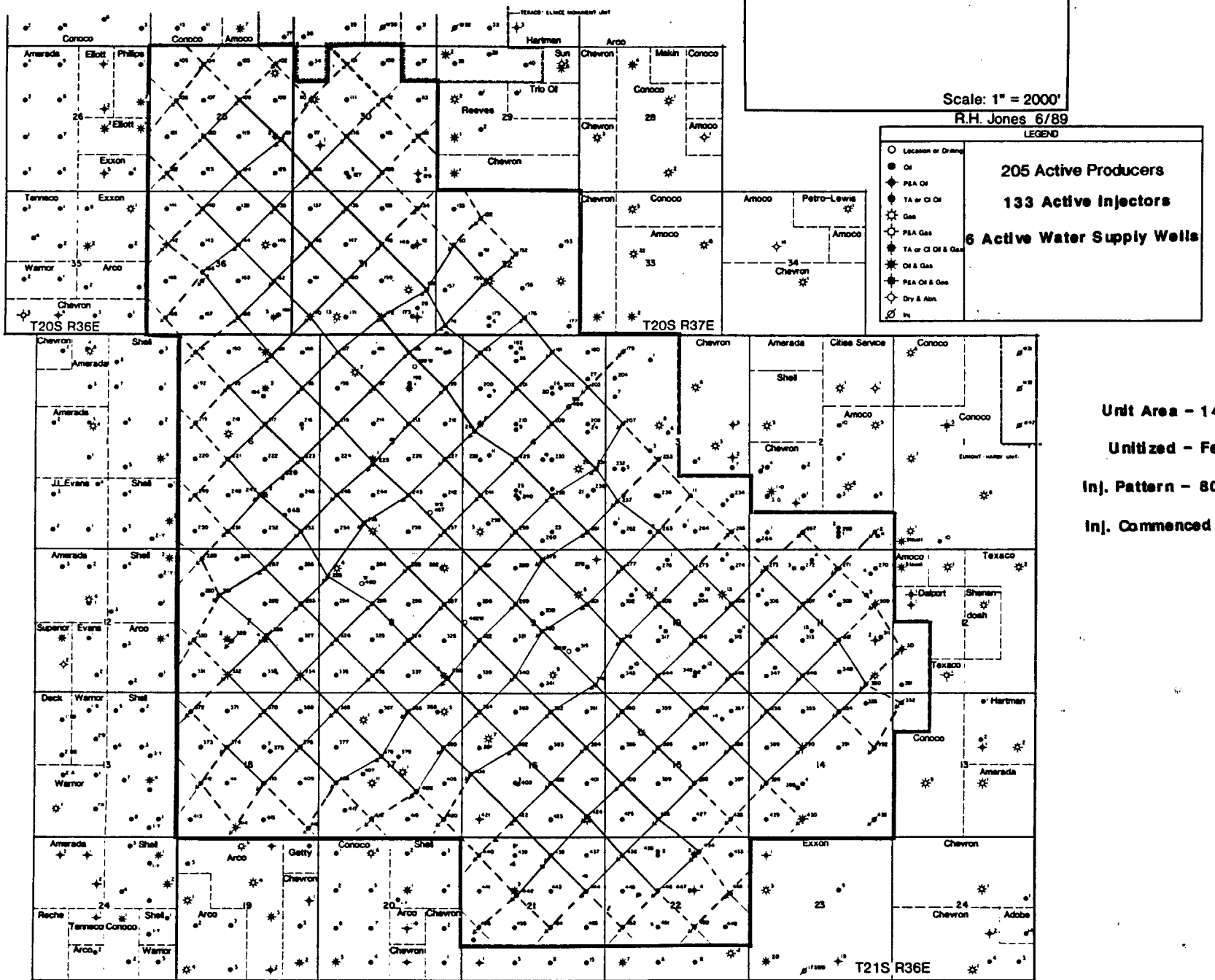
* Unit Status
* Current Unit Performance
* Reservoir Parameters
* Secondary Response Prediction
  - Current Rate Time Prediction
  - Fillup
* Waterflood Response
  - Total Unit
  - Specific Wells
* Unit Performance
  - Current
  - Cumulatives
* Waterflood Monitoring Program
* Future Work
  - Leaseline Conversions
  - Off Center Pattern Evaluation

Eunice Monument South Unit
Current Status

Chevron U.S.A. Inc.
Central Region - Exploration, Land and Production

EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico

Scale: 1" = 2000'
R.H. Jones 6/89



Unit Area - 14190 ac.

Unitized - Feb.1985

Inj. Pattern - 80 ac. 5 spot

Inj. Commenced - Nov.1986

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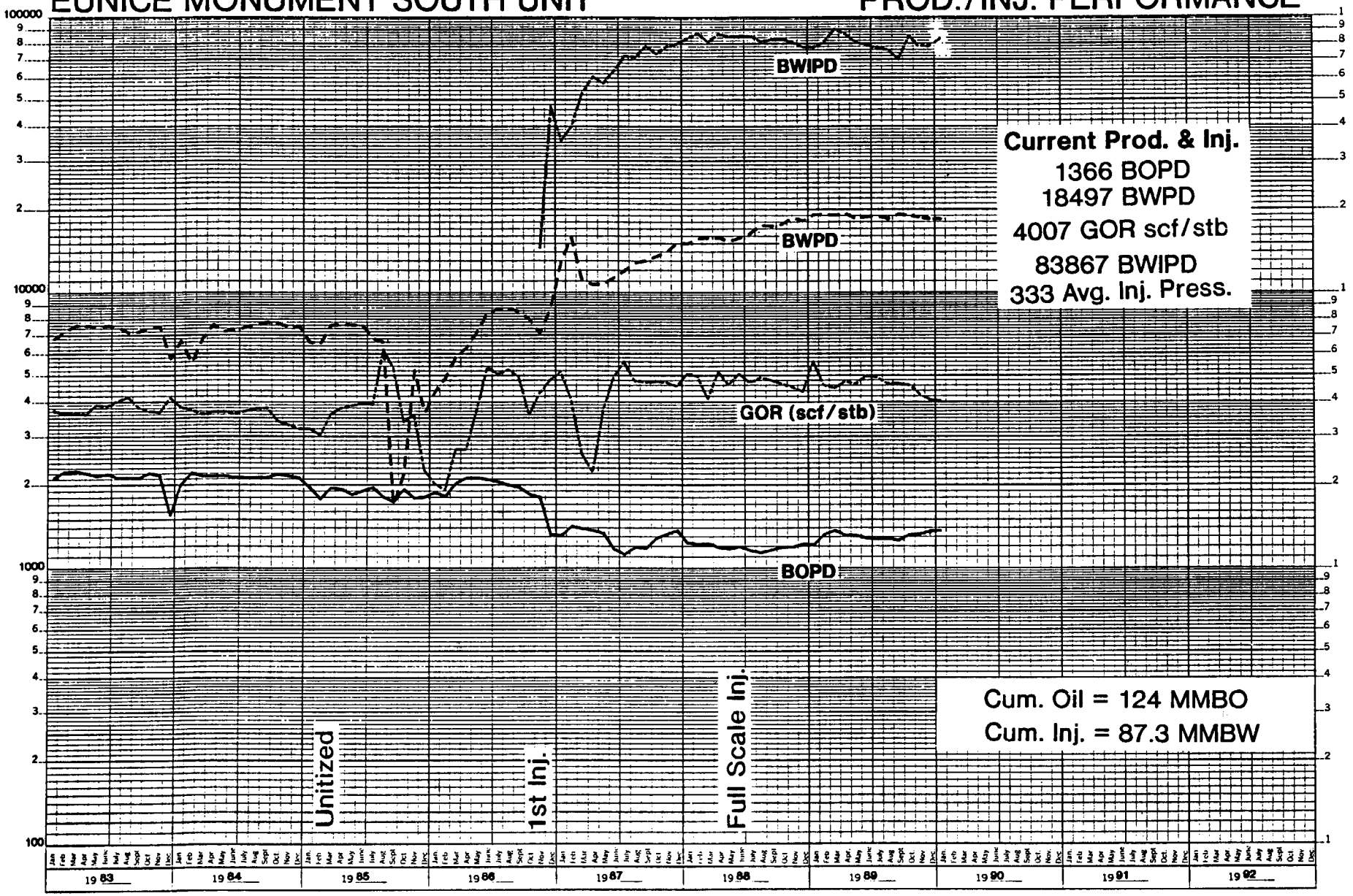
EUNICE MONUMENT SOUTH UNIT — PROD./INJ. PERFORMANCE



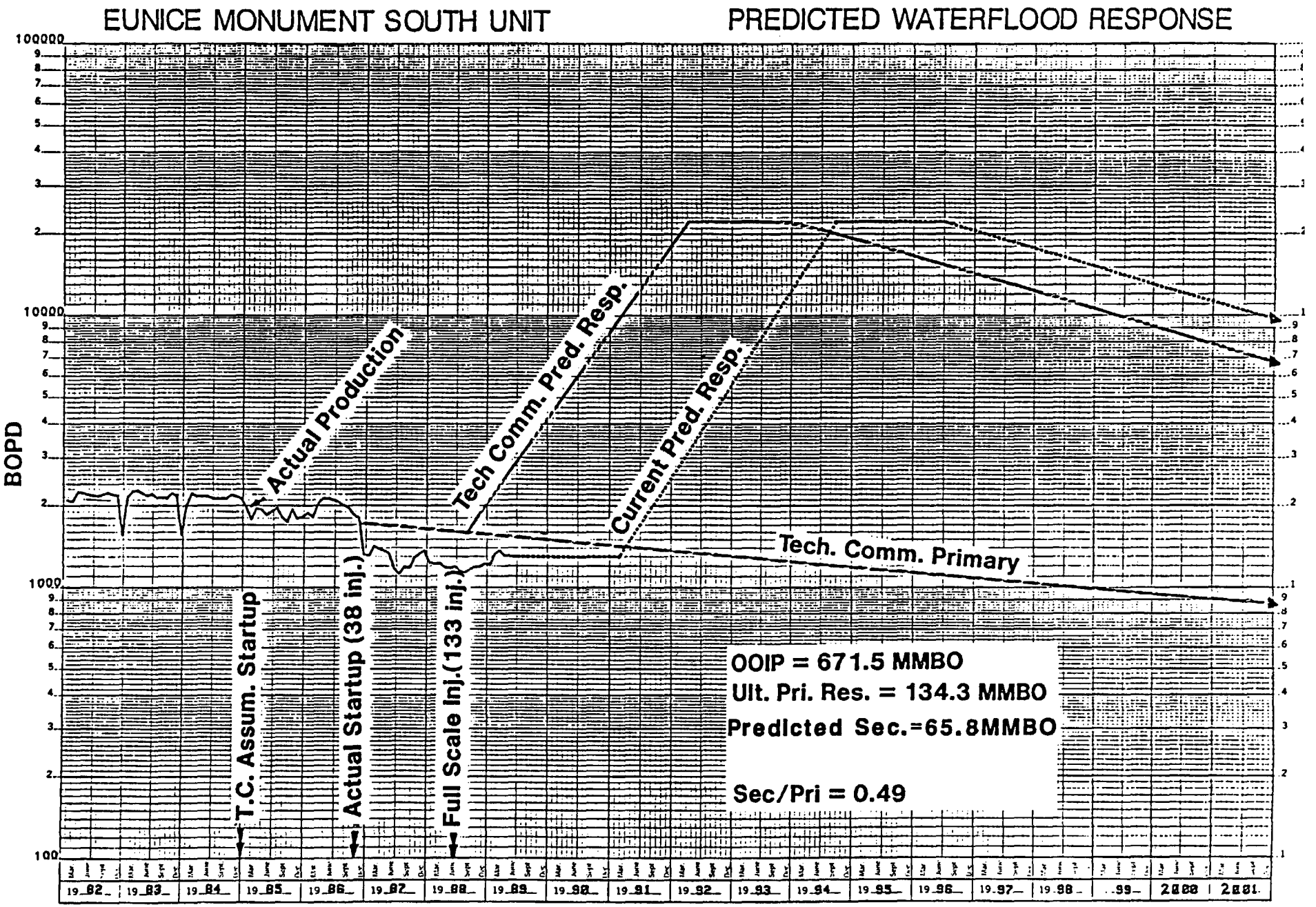
47 6740

K·E 10 YEARS BY MONTHS x 3 LOG CYCLES KEUFFEL & ESSER CO.

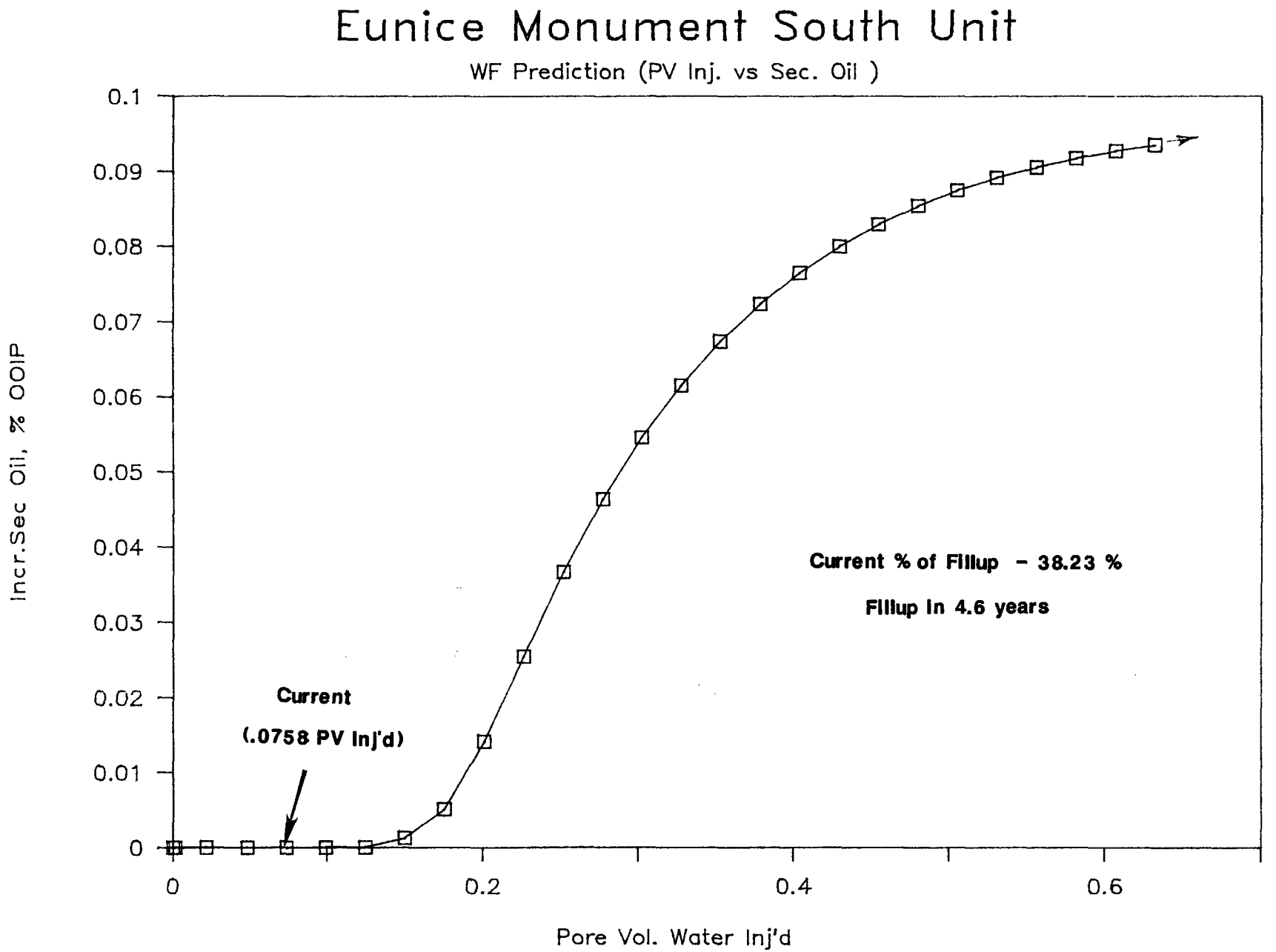
3/

EMSU RESERVOIR PARAMETERS

UNIT AREA	14190 ACRES
INITIAL RESERVOIR PRESSURE	1450 PSI
RESERVOIR PRESSURE AT START OF WATERFLOOD	250 PSI
SATURATION PRESSURE	1372 PSI
SOLUTION GOR	423 SCF/STB
CURRENT PRODUCING GOR	4007 SCF/STB
RESERVOIR TEMPERATURE	90 DEG F
OIL GRAVITY	32 DEG API
INITIAL FORMATION VOLUME FACTOR	1.20 RB/STB
CURRENT FORMATION VOLUME FACTOR	1.05 RB/STB
AVERAGE NET PAY	134 FT
AVERAGE POROSITY	8.0 %
INITIAL WATER SATURATION	30.0 %
OIL SATURATION AT START OF WATERFLOOD	50.0 %
RESIDUAL OIL SATURATION	25.0 %
VOLUMETRIC SWEEP EFFICIENCY	60 %
ULTIMATE PRIMARY RECOVERY	134.3 MMBO 20 % OOIP
OOIP	671.5 MMBO
ESTIMATED SECONDARY RECOVERY	65.8 MMBO 9.8 % OOIP
SECONDARY TO PRIMARY RATIO	49 %
ESTIMATED RECOVERY DUE TO INFILL DRILLING	5 % OOIP 33 MMBO
ESTIMATED RECOVERY DUE TO CO2 FLOODING	10 % OOIP 67 MMBO


EUNICE MONUMENT SOUTH UNIT
PREDICTED WATERFLOOD RESPONSE
BOPD
100000
10000
1000
100
Actual Production
Tech Comm. Pred. Resp.
Current Pred. Resp.
Tech. Comm. Primary
T.C. Assum. Startup
Actual Startup (38 inj.)
Full Scale Inj.(133 inj.)
OOIP = 671.5 MMBO
Ult. Pri. Res. = 134.3 MMBO
Predicted Sec.=65.8MMBO
Sec/Pri = 0.49
19_82_
19_83_
19_84_
19_85_
19_86_
19_87_
19_88_
19_89_
19_90_
19_91_
19_92_
19_93_
19_94_
19_95_
19_96_
19_97_
19_98_
_99_
2000
2001

51


Eunice Monument South Unit
WF Prediction (PV Inj. vs Sec. Oil)
Incr.Sec Oil, % OOIP
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
0.2
0.4
0.6
Pore Vol. Water Inj'd
Current
(.0758 PV Inj'd)
Current % of Fillup - 38.23 %
Fillup In 4.6 years

PRODUCER SHOWING WATERFLOOD RESPONSE

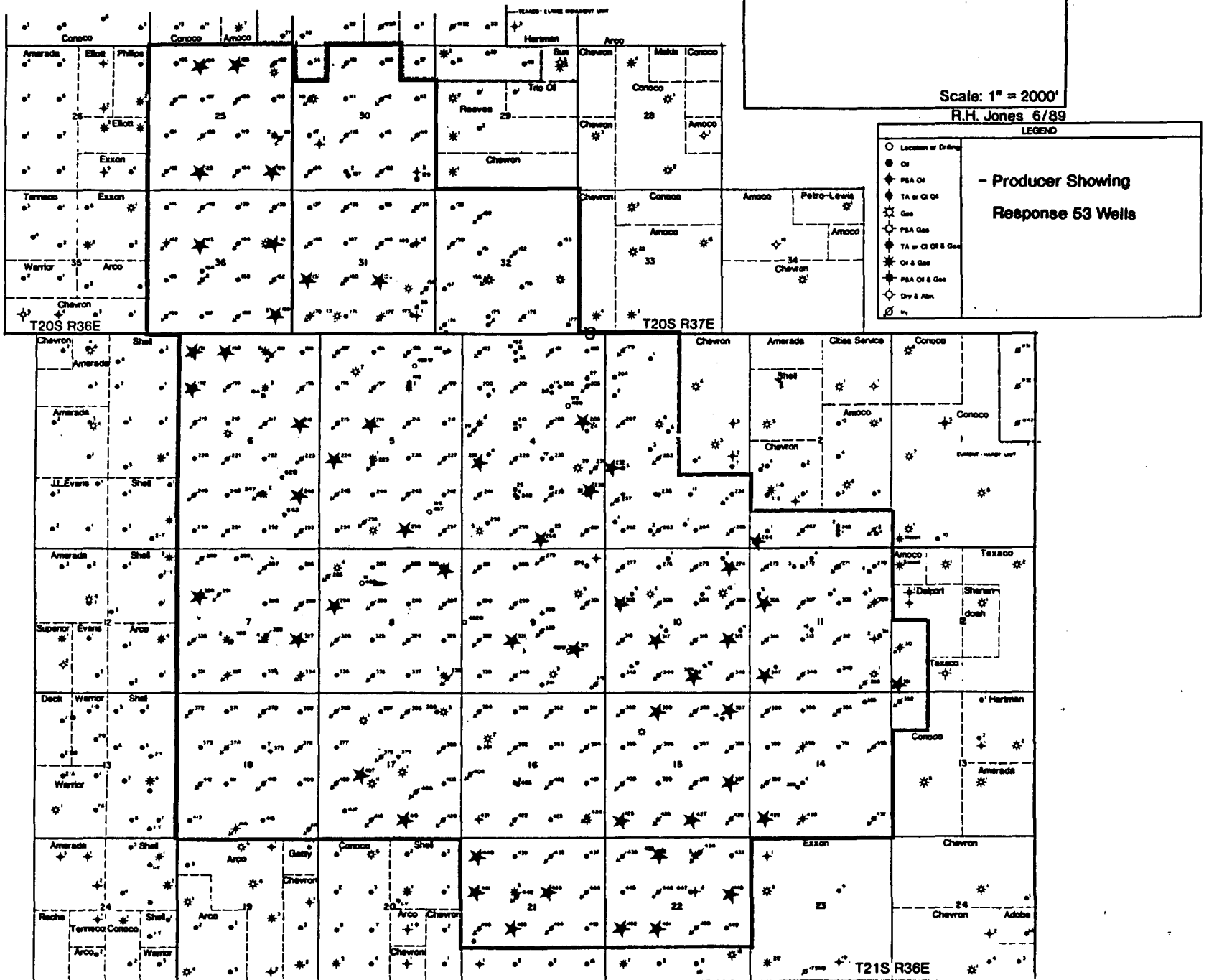
Jan. 1990

Chevron USA Inc.
Central Region – Exploration, Land and Production

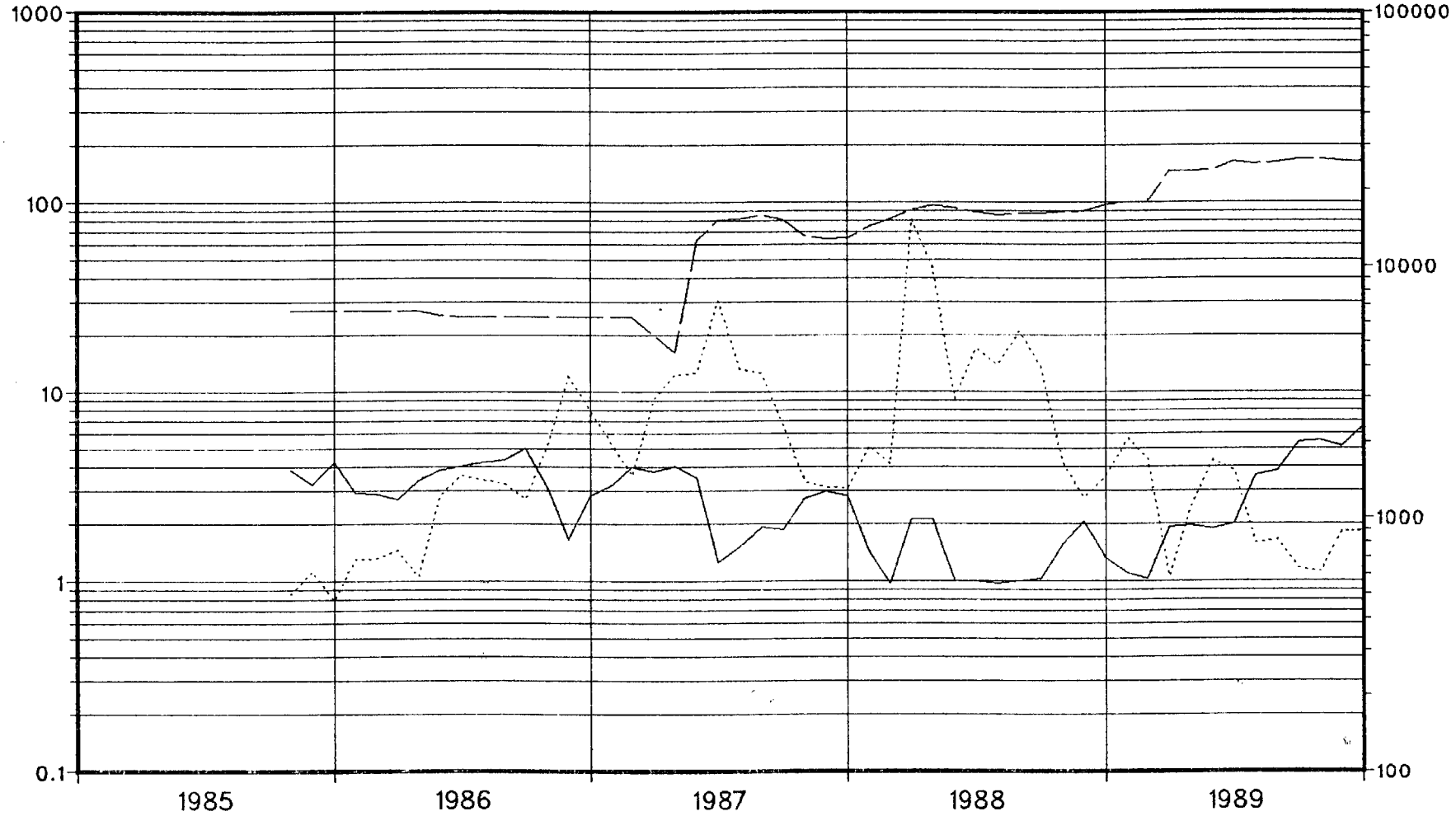
EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico

Scale: 1" = 2000'

R.H. Jones 6/89



EUNICE MONUMENT SOUTH UNIT
PRODUCTION PLOT



LOG (Left)	LOG (Right)			COMPANY : CUSA DIVISION : HOBBS FIELD : EUNICE MONUMENT PROPERTY : EUNICE MONUMENT SOUTH UNIT RESERVOIR: GRAYBURG SAN ANDRES WELL # : 317 COMP ID : FA5731-01
AWD Pr Oil- BPWD AWD Pr WTR- BPWD	Gas Oil Ratio			

PLOT 1 08.02.32 14 Feb, 1990 TJDDO, Chevron

Chevron Production History System

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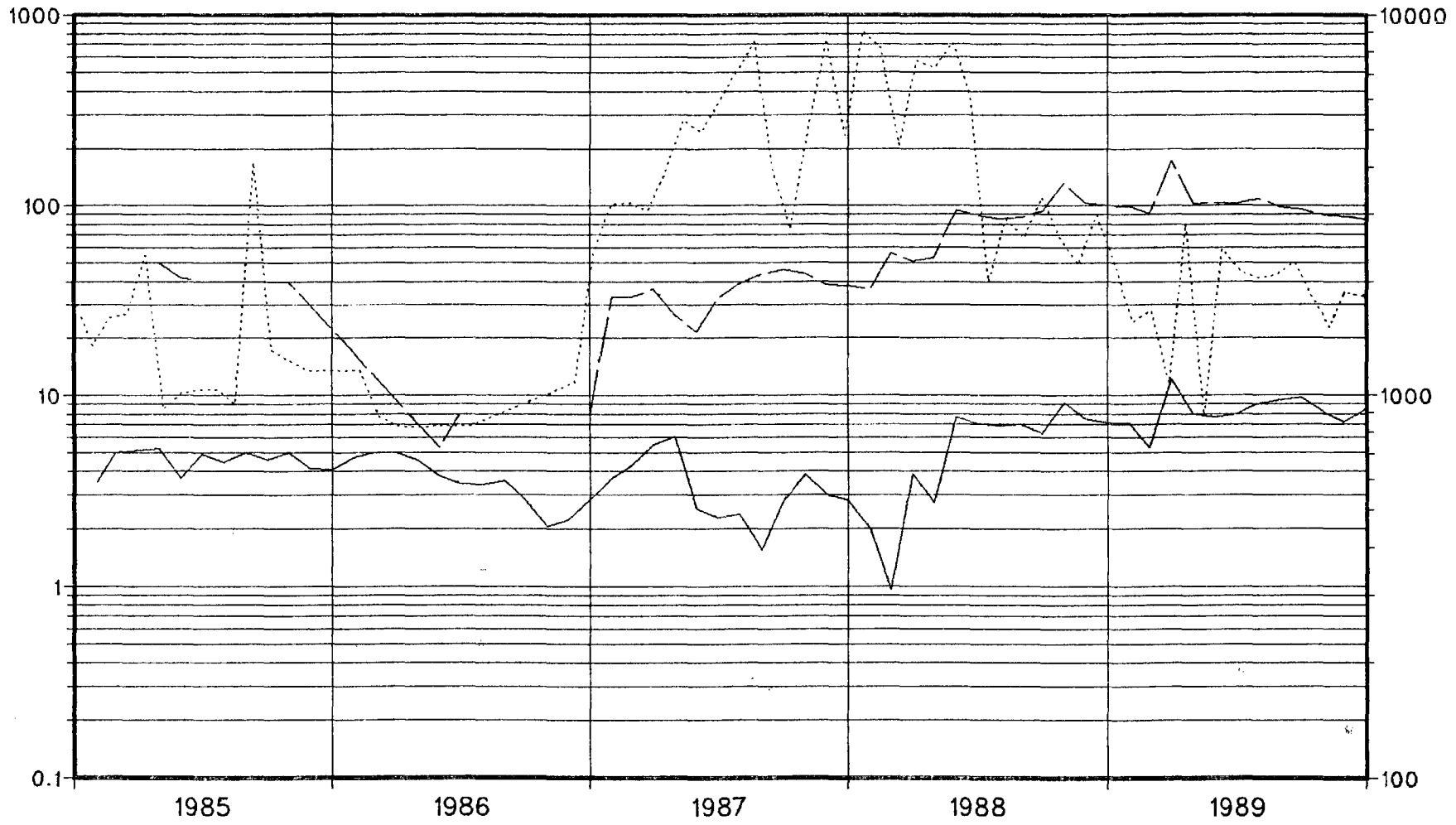
EUNICE MONUMENT SOUTH UNIT
PRODUCTION PLOT

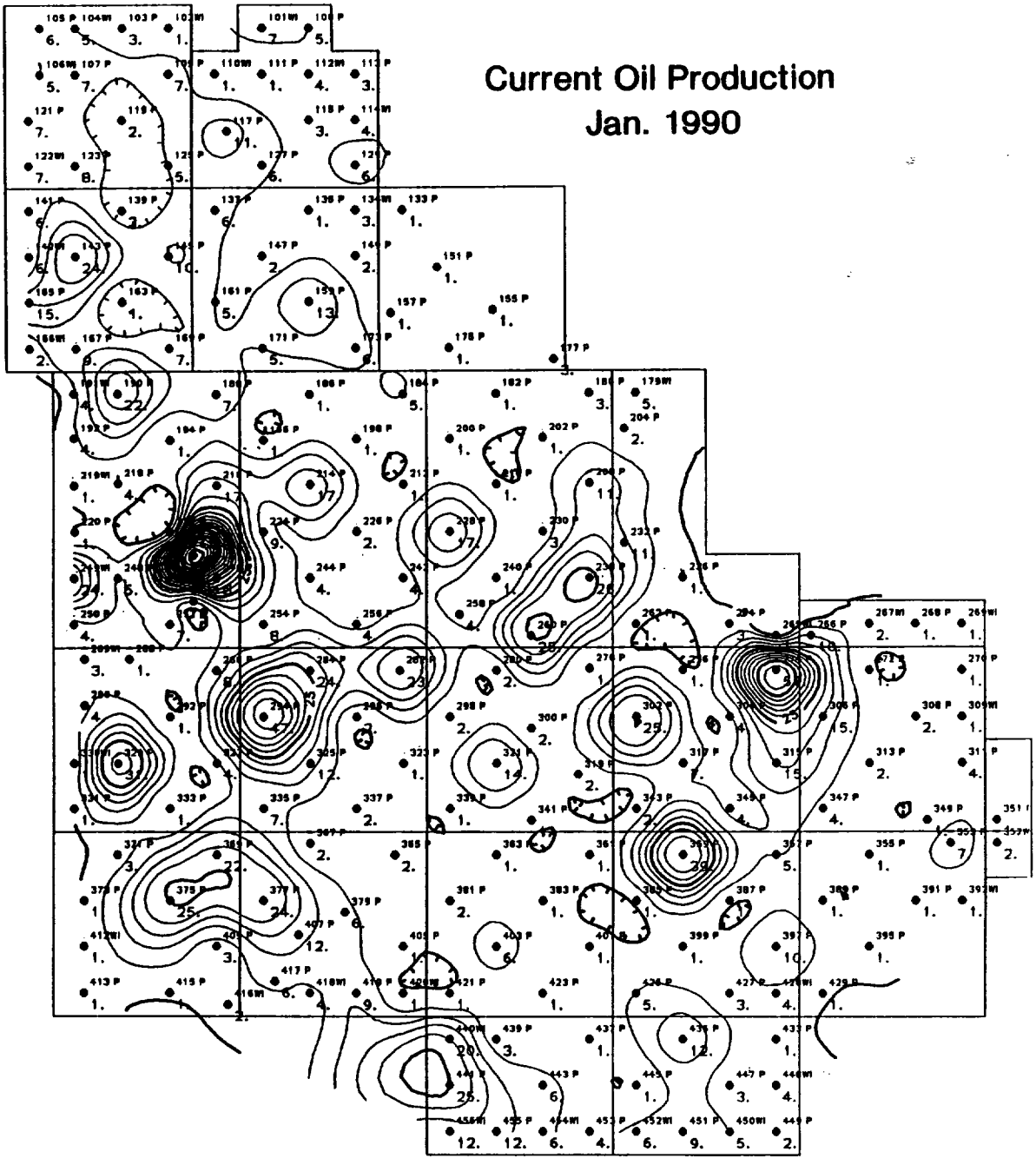


LOG (Left)	LOG (Right)			COMPANY : CUSA
AWD Pr Oil- BPWD AWD Pr WTR- BPWD	Gas Oil Ratio			DIVISION : HOBBS FIELD : EUNICE MONUMENT PROPERTY : EUNICE MONUMENT SOUTH UNIT RESERVOIR: GRAYBURG SAN ANDRES WELL # : 397 COMP ID : FA5787-01

PLOT 2 08.03.21 14 Feb, 1990 TJDDO, Chevron

Chevron Production History System

981



Current Oil Production
Jan. 1990

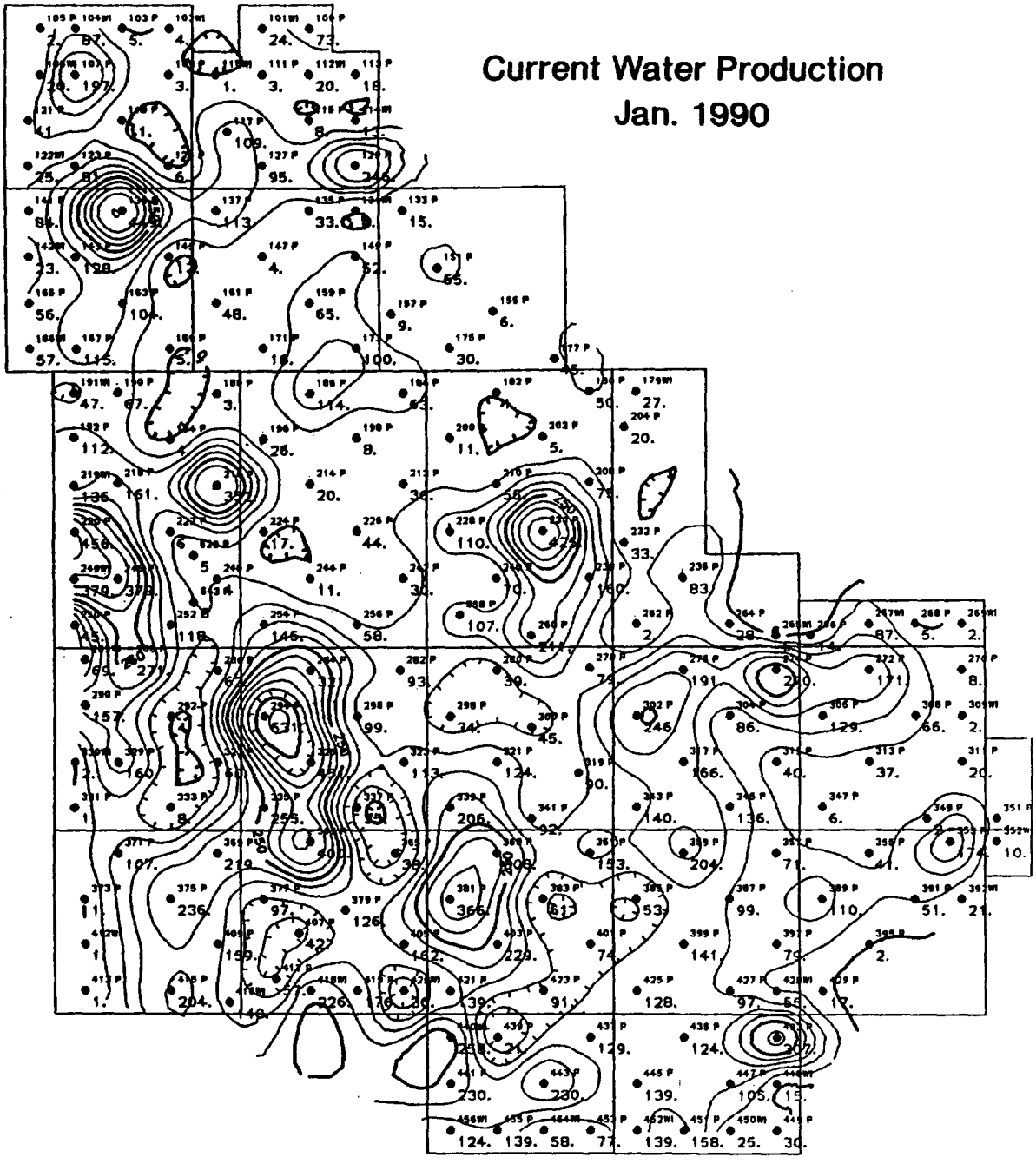
ID = DOLAN
AUTOMAP SYSTEM
02/14/90
SCALE 1 IN = 2640 FEET
CI = 5 UNITS
CONTOUR METHOD = SCAI

LEGEND

• PRODUCING WELL

CHEVRON CORPORATION
EUNICE MONUMENT SOUTH UNIT
CONTOUR BOPD 01/90

0 3 6 9 12 15000 FEET



ID = DOLAN
AUTOMAP SYSTEM
02/14/90
SCALE 1 IN = 2640 FEET
CI = 50 UNITS
CONTOUR METHOD = SCAI

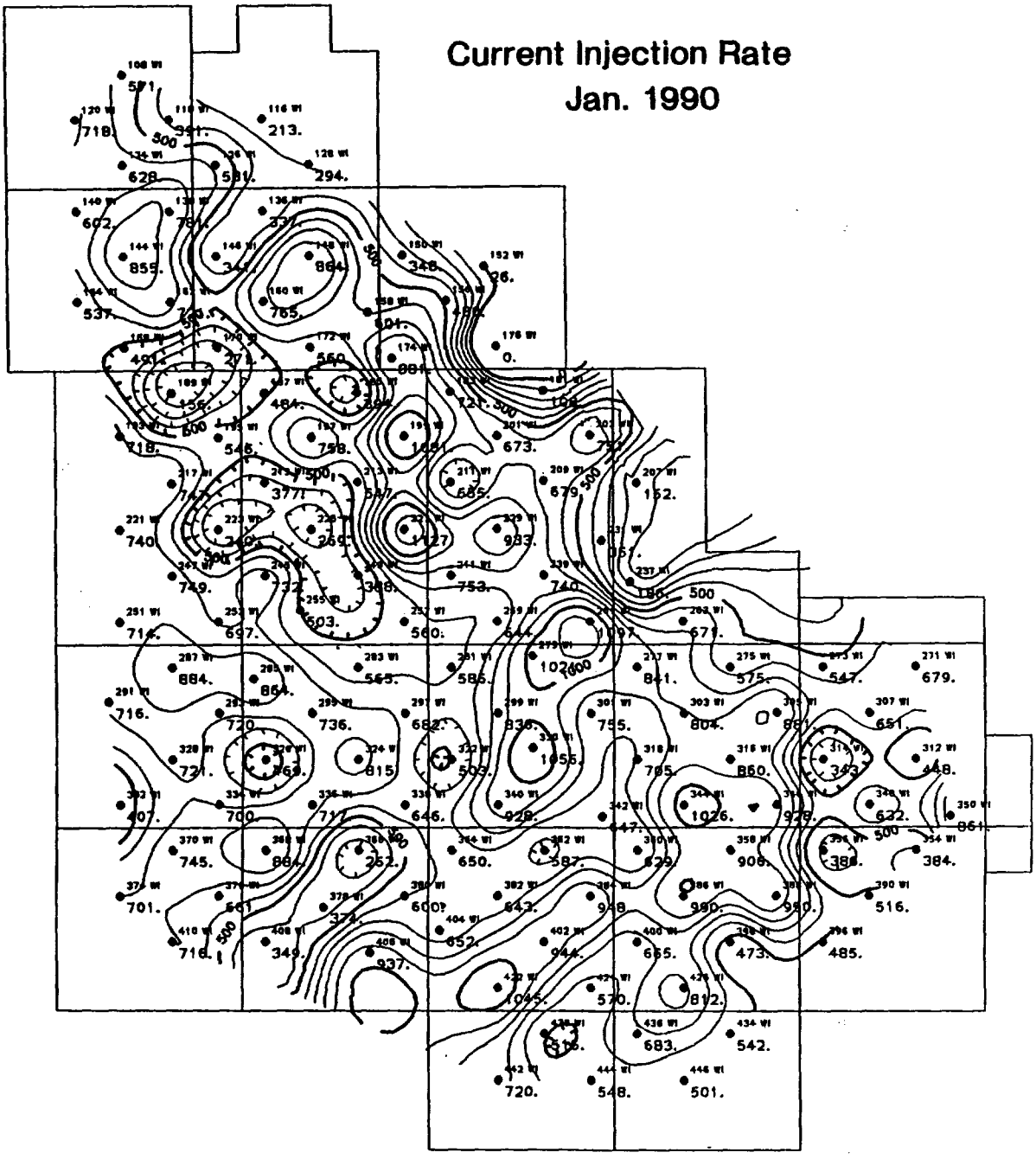
LEGEND

• PRODUCING WELL

CHEVRON CORPORATION
EUNICE MONUMENT SOUTH UNIT
CONTOUR BWPD 01/90

0 3 6 9 12 15000 FEET

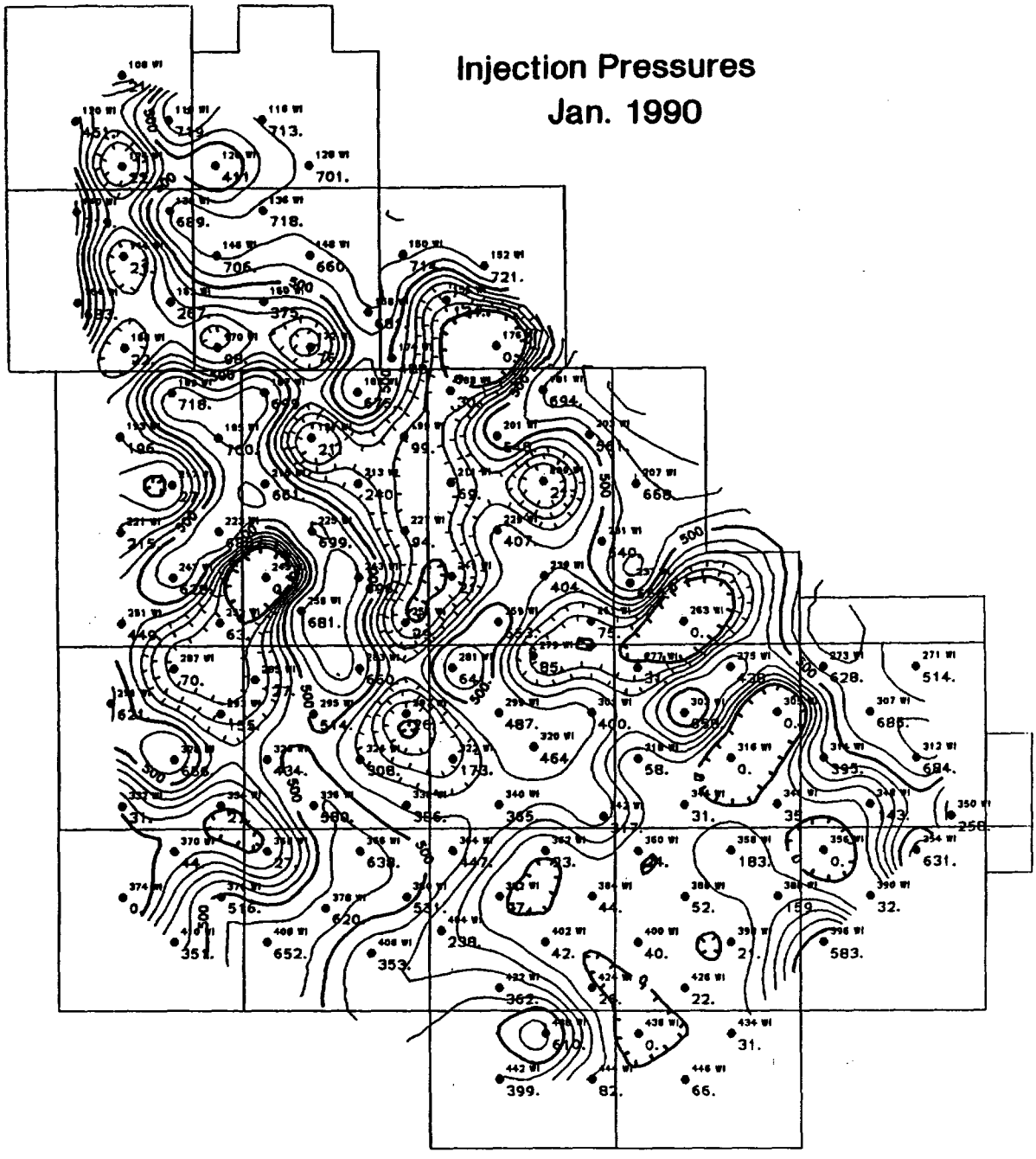
Current Injection Rate
Jan. 1990



ID = DOLAN
AUTOMAP SYSTEM
02/14/90
SCALE 1 IN = 2640 FEET
CI = 100 UNITS
CONTOUR METHOD = SCAI
LEGEND
• INJECTION WELL

CHEVRON CORPORATION
EUNICE MONUMENT SOUTH UNIT
CONTOUR INJ (BWIPD)01/90

0 3 6 9 12 15000 FEET



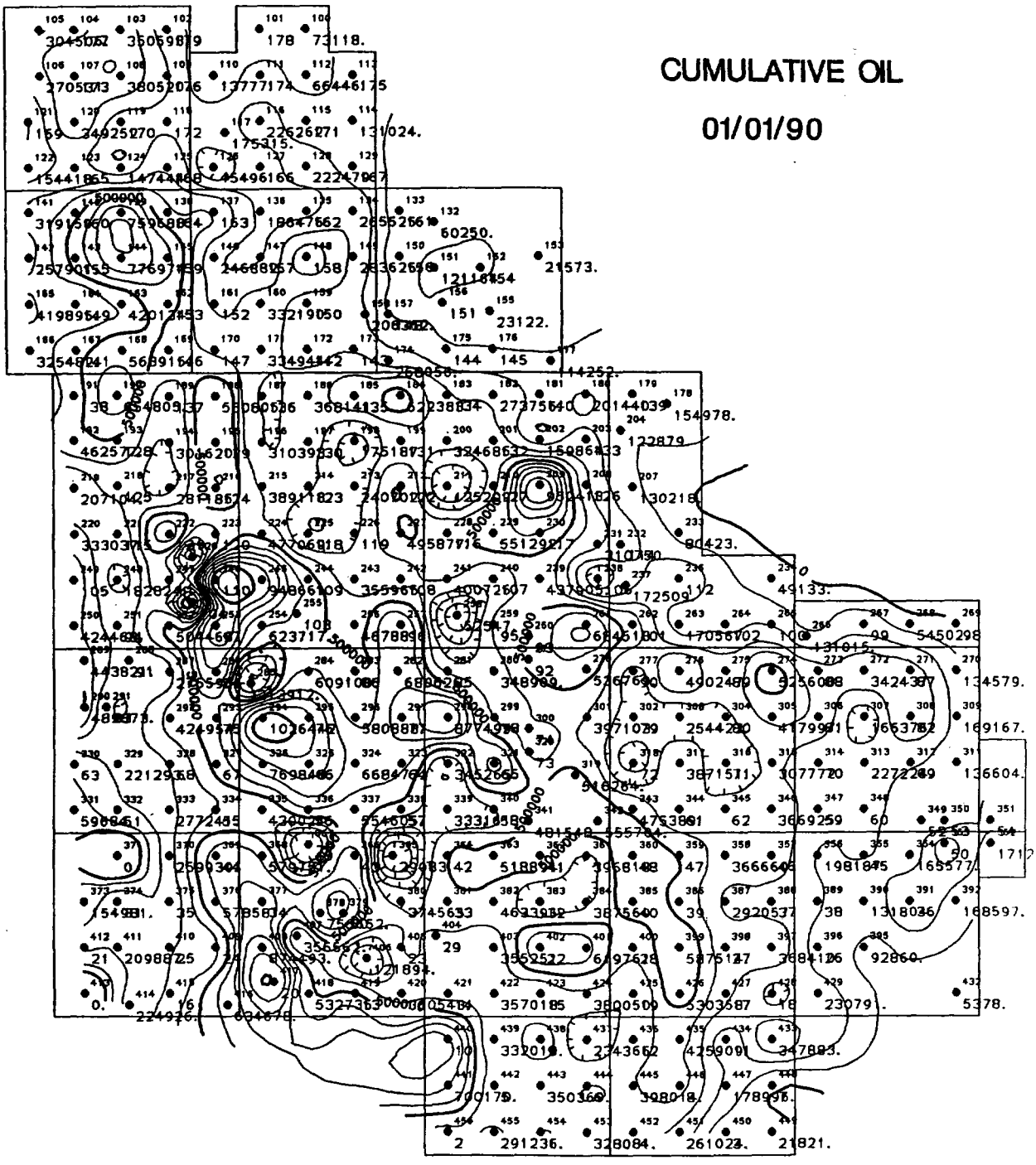
ID = DOLAN
AUTOMAP SYSTEM
02/14/90
SCALE 1 IN = 2640 FEET
CI = 100 UNITS
CONTOUR METHOD = SCAI

LEGEND

- INJECTION WELL

CHEVRON CORPORATION
EUNICE MONUMENT SOUTH UNIT
CONTOUR INJ. PRESS 01/90

0 3 6 9 12 15000 FEET



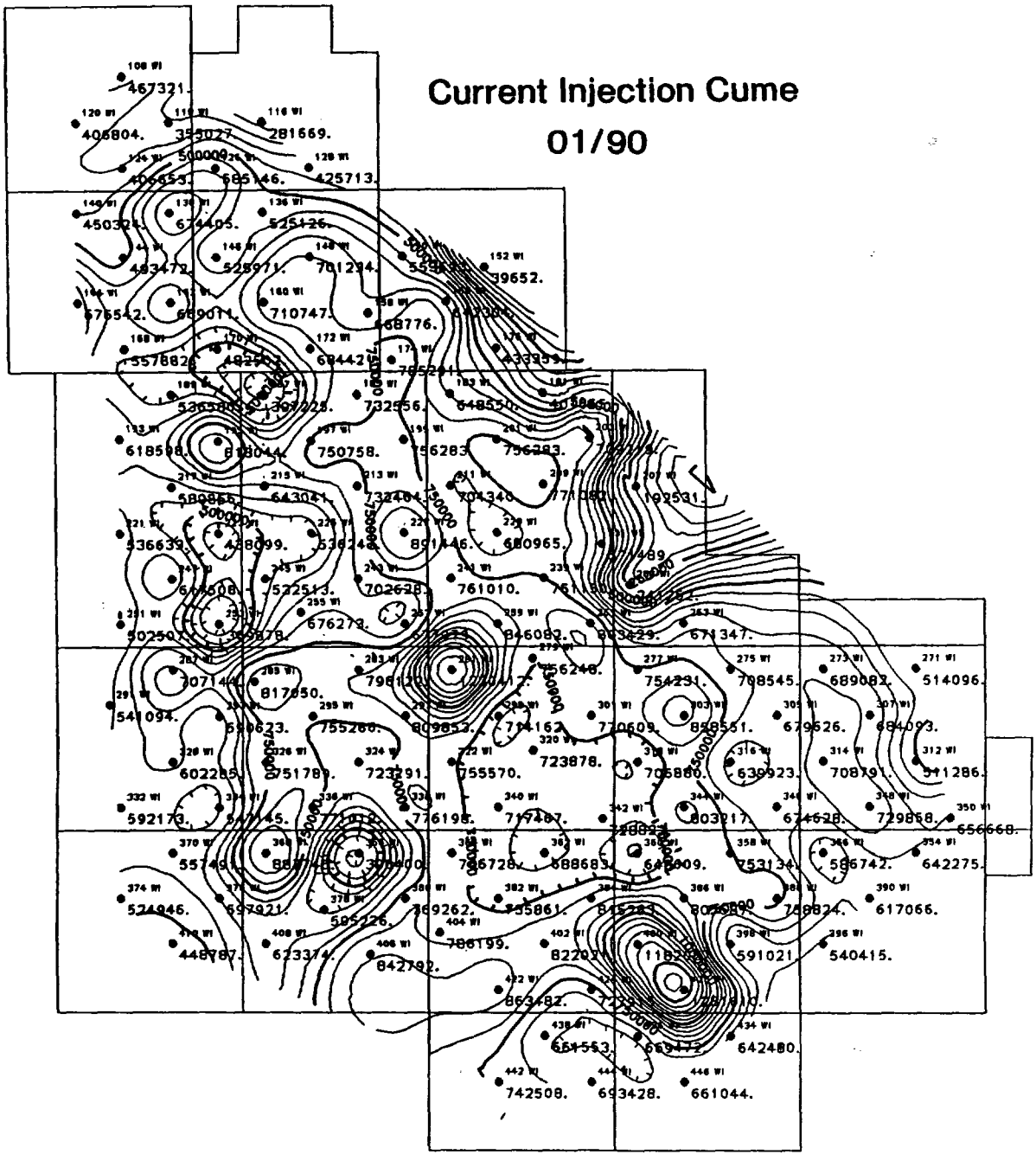
ID = DOLAN
AUTOMAP SYSTEM
02/23/90
SCALE 1 IN = 2640 FEET
CI = 100000 UNITS
CONTOUR METHOD = SCAI

LEGEND

- INJECTION WELL

CHEVRON CORPORATION
EUNICE MONUMENT SOUTH UNIT
CONTOUR ON CUMEOIL 12/89

0 3 6 9 12 15000 FEET



ID = DOLAN
AUTOMAP SYSTEM
02/15/90
SCALE 1 IN = 2640 FEET
CI = 50000 UNITS
CONTOUR METHOD = SCAI

LEGEND

- INJECTION WELL

CHEVRON CORPORATION
EUNICE MONUMENT SOUTH UNIT
CONTOUR CUME INJ. 01/90

0 3 6 9 12 15000 FEET

EUNICE MONUMENT SOUTH UNIT WATERFLOOD MONITORING PLAN

GOAL: MAXIMIZE PROFITS BY OPTIMIZING RECOVERY "OPTIMIZE UNIT PERFORMANCE"

OBJECTIVE	ACTION	SECONDARY ACTION	RESULTS
I. Optimize Vertical Sweep Efficiency	A. Profile Wells (133 by 7/1/89) (every 12 - 18 months thereafter)	1. Analyze Logs 2. Install Data on Workstation (log traces) 3. Install Data on PIECES	a. Generate Sweep Improvement Workovers b. Use data as Diagnostic Tool c. Monitor Sweep / Make Rec's
	B. Maximize Continuity (Review Well Logs)	1. Generate and Evaluate Fence diagrams, X-Sections, etc.	a. Prepare W/O Recommendation i). Add Perforations ii). Squeeze Off Out of Zone Inj.
II. Minimize Fillup Time	A. Step Rate Tests (10-15/yr.)	1. Evaluate Step Rate Tests	a. Recommend Inj. Rate Changes
	B. Hallplot Generation (Qtrly)	1. Evaluate Hallplots	a. Recommend Changes i). Cut rates ii). Stimulate iii). No Action iii). No Action
III. Maximize Oil Production and Minimize Water Production	A. Generate Plots and Evaluate	1. Rate vs. Time (monthly) 2. Rate vs. Cume. (semi-annualy) 3. WOR vs. Cume. (semi-annualy) 4. Miscellaneous Plots (as needed)	a. Generate Workovers b. Recommend Changes c. No Action
	B. Pattern Evaluation (FIFO Qtrly) (Build / Initiate FIFO Prgm by 6/1/90)	1. Balance Patterns 2. Evaluate Performance	a. Stimulate Producers b. Stimulate Injectors c. Change Rates
	C. Gather & Analyze Water Samples (yearly basis)	1. Identify Water Source in Problem Wells	a. Generate Workovers b. No Action
IV. Optimize Recovery Method	A. Model the Reservoir	1. Scale-up CLASS 2. Build CHI-TUBE model	a. Evaluate Present Operations b. Infill Drilling c. CO2 Flooding d. Pattern Re-alignment
V. Obtain Reservoir Parameters	A. Run Buildups (15+ per year) B. Run Falloffs (10-15/yr)	1. Evaluate Data	a. Track Reservoir Pressure Across Unit b. Calculate FVF's c. Calculate Skin Damage / Generate Workovers d. Determine if MMP is Achieved

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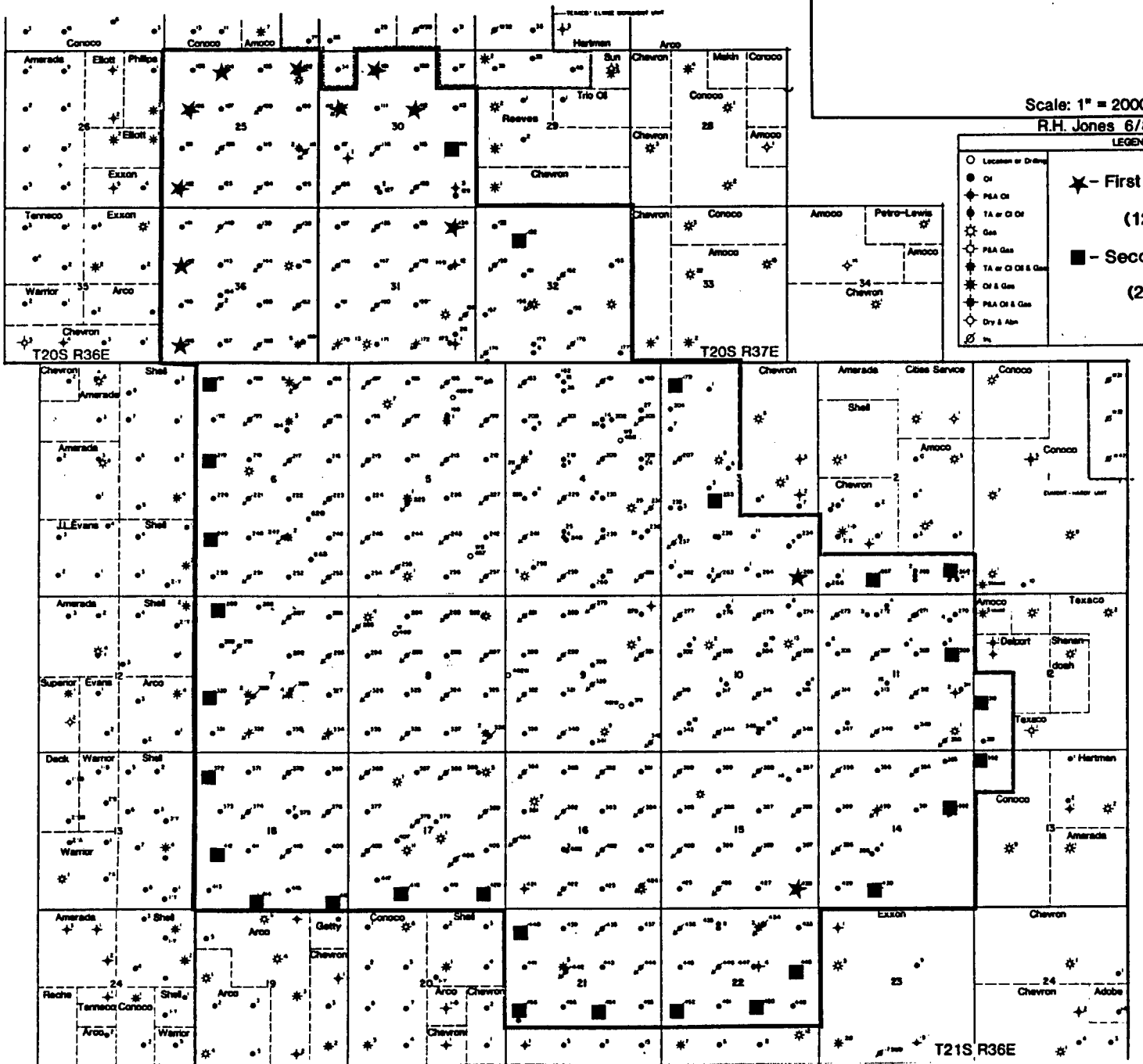
Potential Future Leaseline Injectors

Chevron U.S.A. Inc.
Central Region – Exploration, Land and Production

EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico

Scale: 1" = 2000'
R.H. Jones 6/89

LEGEND
- ★ – First Round Eval. (12 wells)
- ■ – Second Round Eval. (28 wells)



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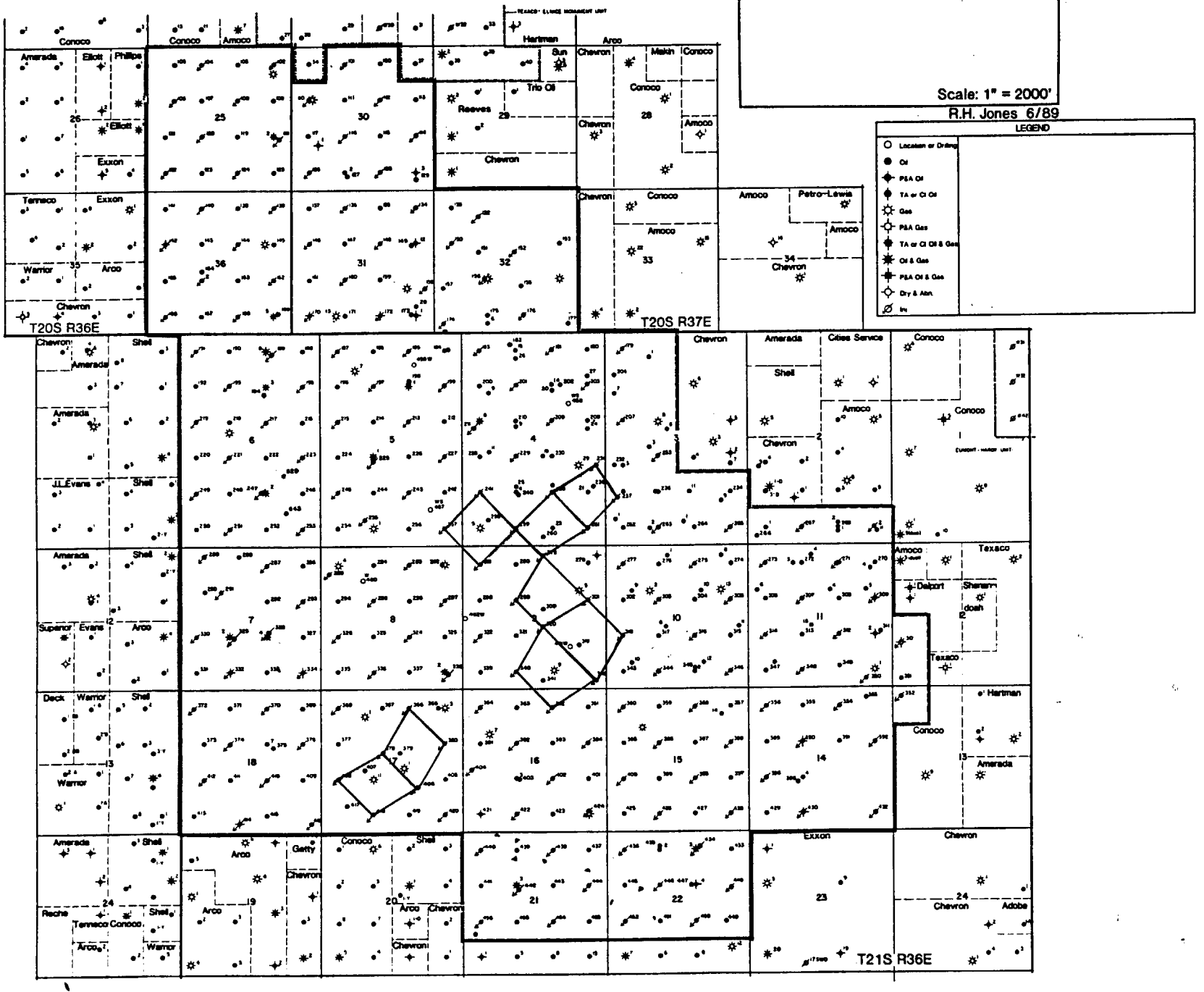
Off Center Producers
(Patterns Under Review)

Chevron U.S.A. Inc.
Central Region – Exploration, Land and Production

EUNICE MONUMENT SOUTH UNIT
Lea County, New Mexico

Scale: 1" = 2000'
R.H. Jones 6/89

LEGEND
- Location or Drilling
- Oil
- PSA Oil
- TA or Cl Oil
- Gas
- PSA Gas
- TA or Cl Oil & Gas
- Oil & Gas
- PSA Oil & Gas
- Dry & Abn.
- Inj.



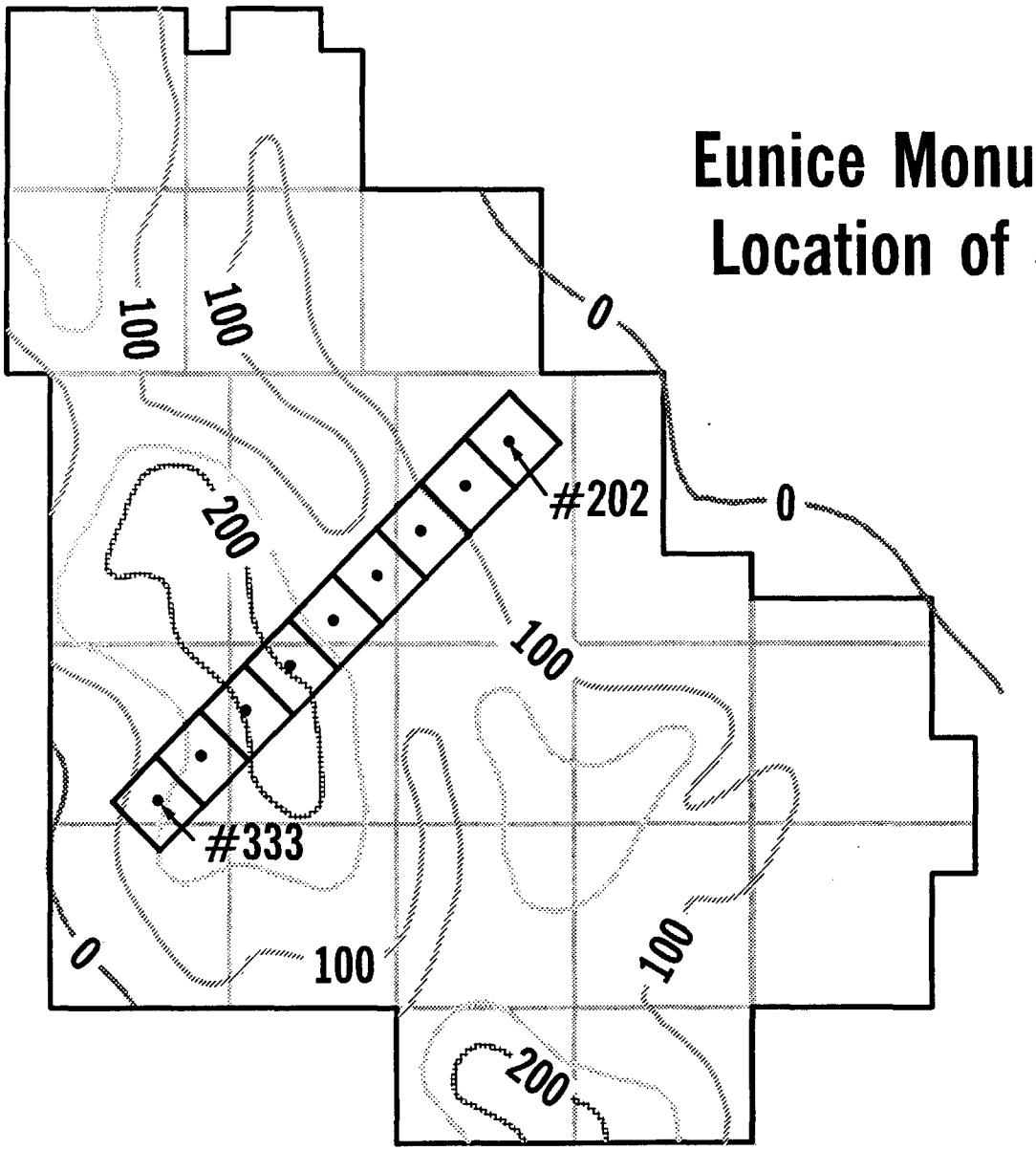
EMSU Simulation

Objective

Predict Unit Waterflood Performance

- **Select Representative Area**
- **Simulate Area**
- **Develop Unit Forecast**

Eunice Monument South Unit
Location of Simulation Area



EMSU Simulation

Model Construction

Model: Black Oil Simulator

Element: 9 Pattern Strip
Aquifer on West Side

Grid: 65 X 7 X 7 (3000 cells)

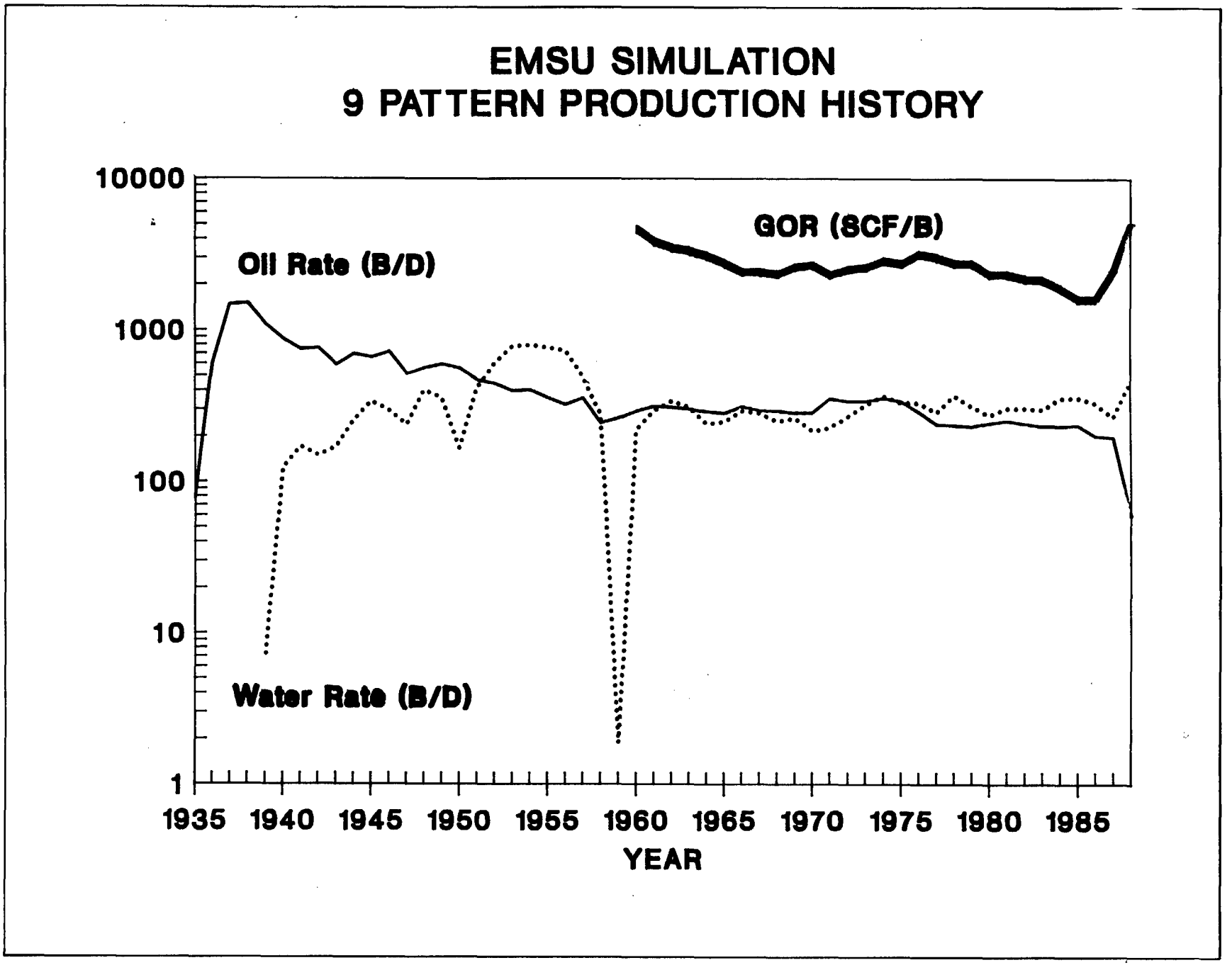
Layering:

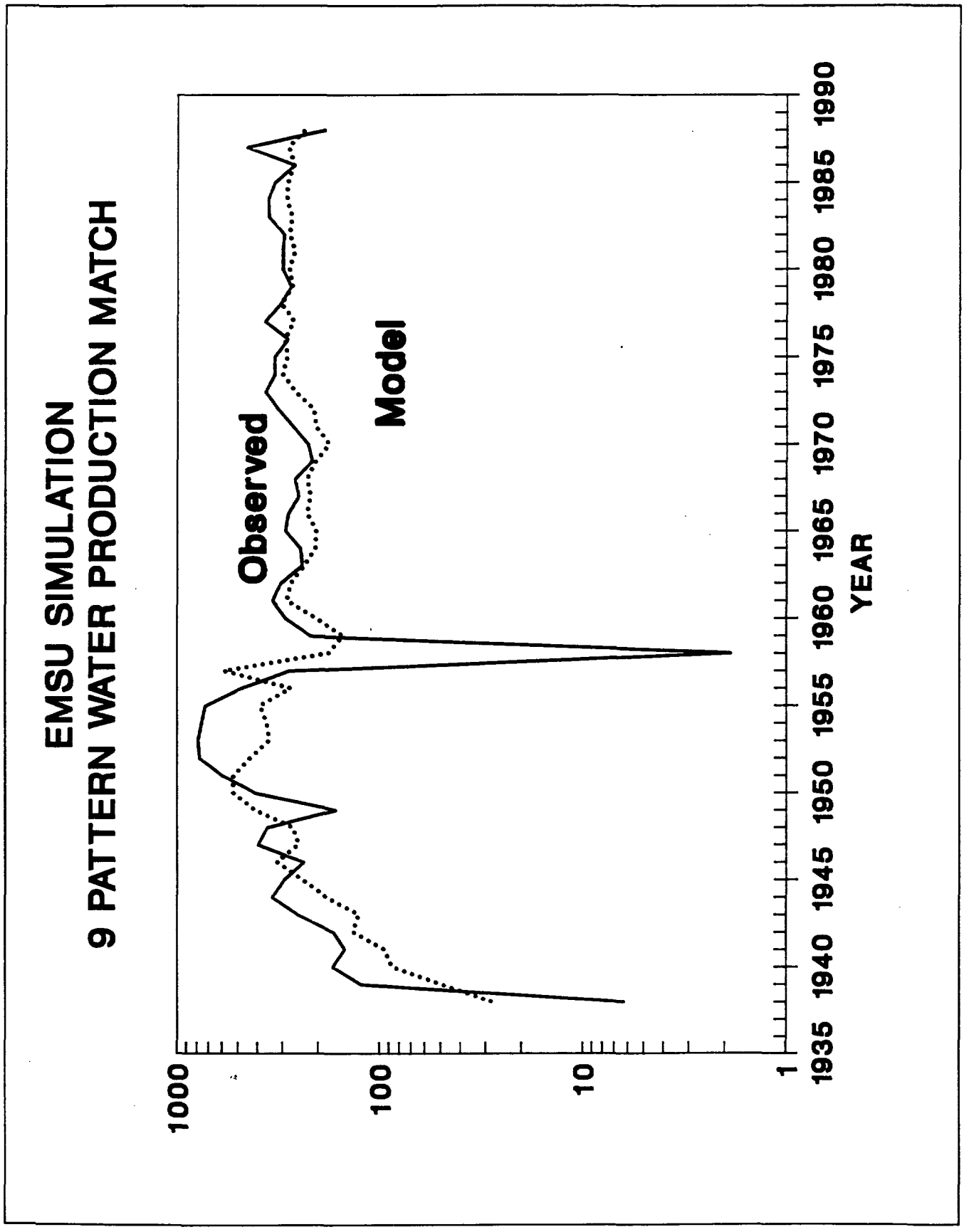
Zone	Layers
Penrose	1
Grayburg 1-6	5
San Andres	1

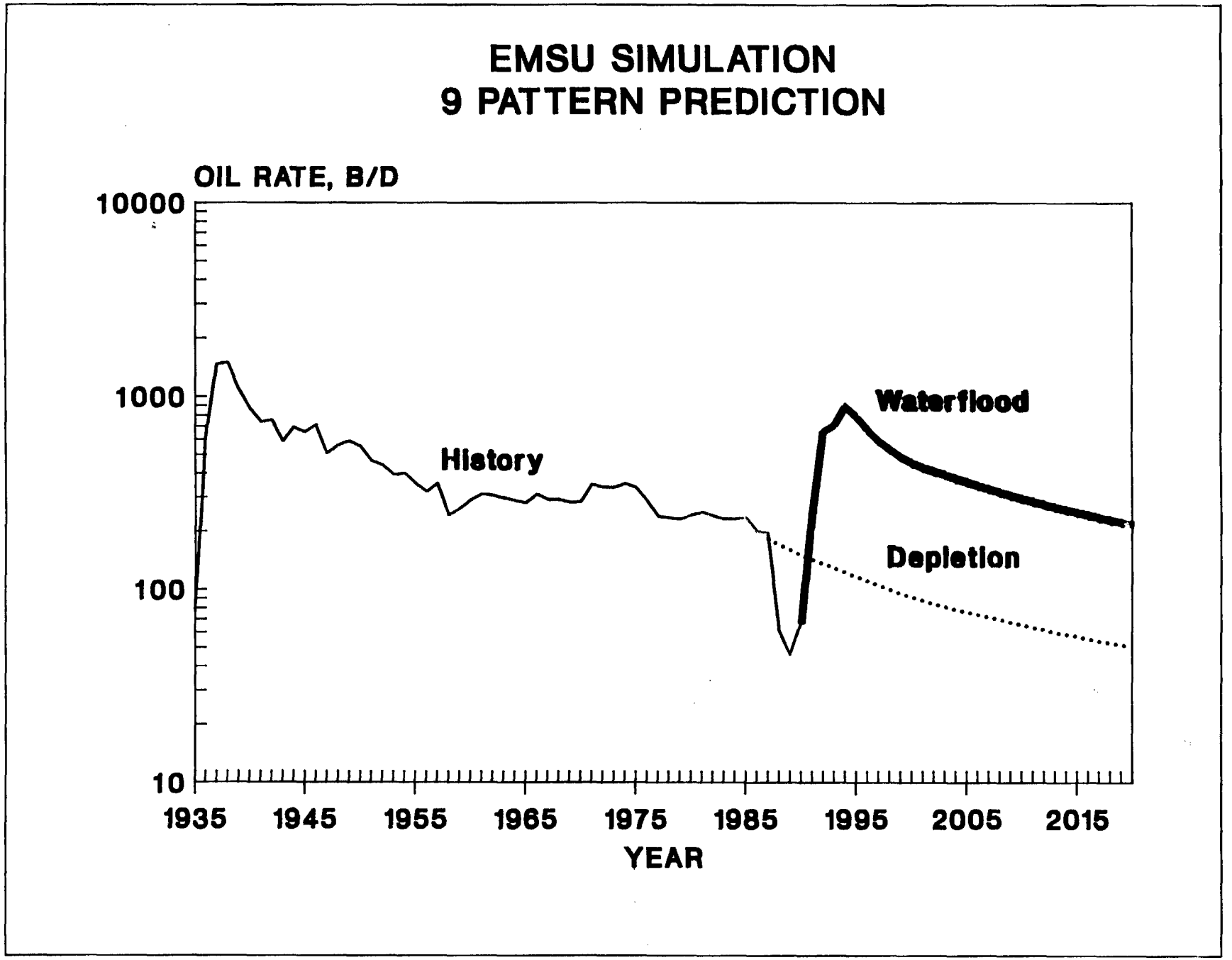
EMSU Simulation

Model Construction (Cont'd)

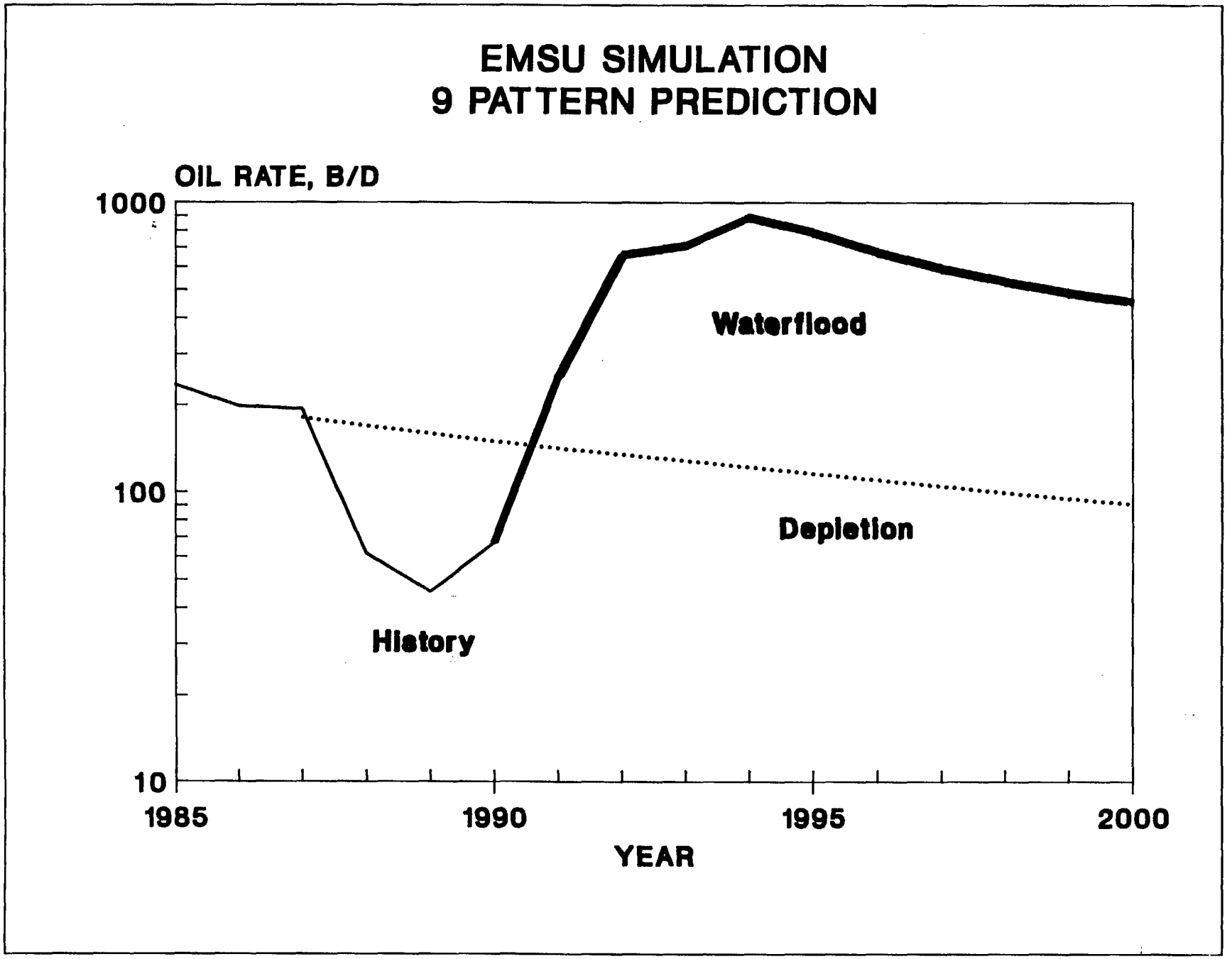
Data: Structure
Thickness
Porosity
Permeability
Water Oil Contact
Initial Water Saturation


EMSU SIMULATION
9 PATTERN PRODUCTION HISTORY
10000
1000
100
10
1
Oil Rate (B/D)
GOR (SCF/B)
Water Rate (B/D)
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
YEAR

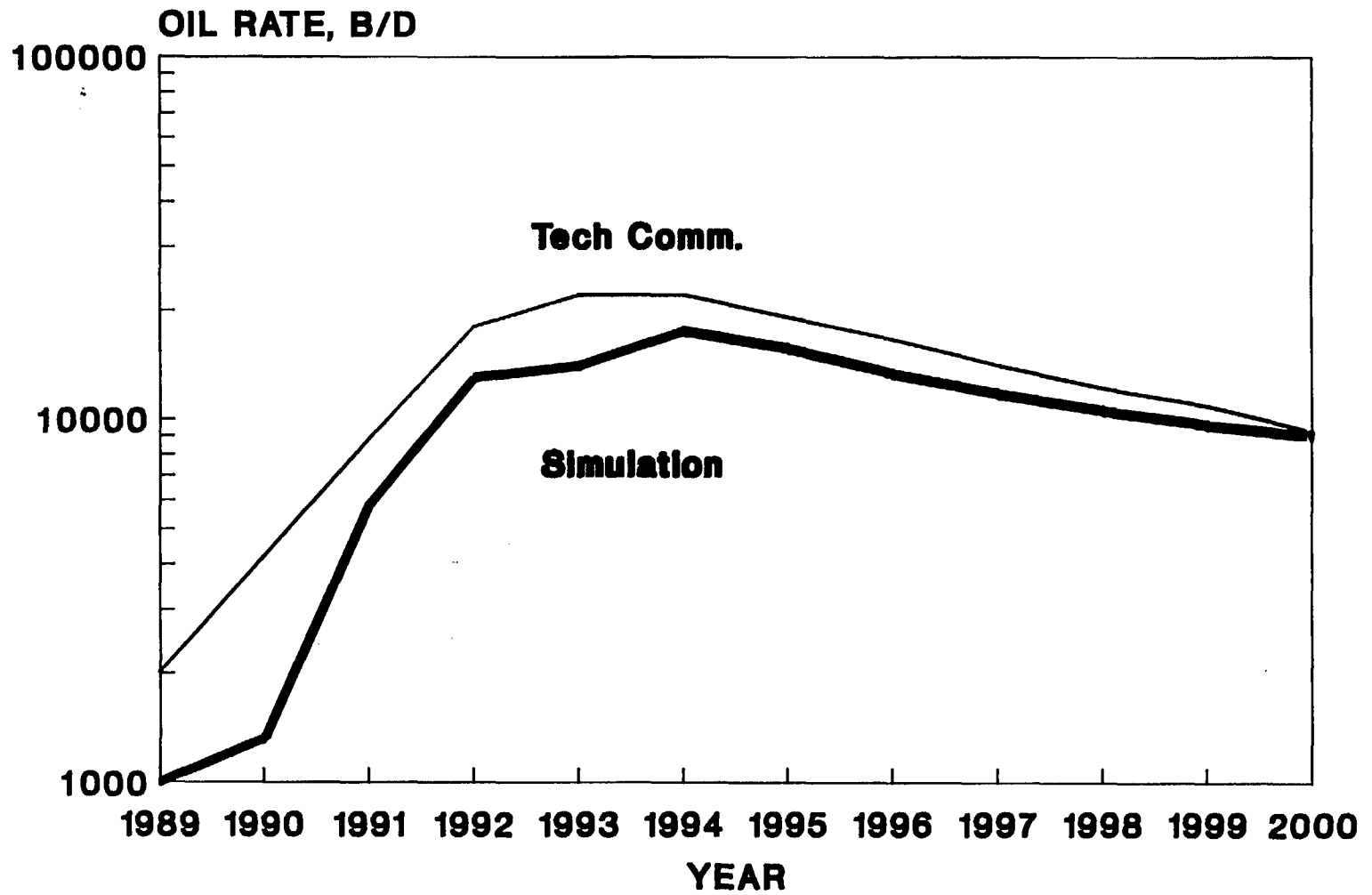

EMSU SIMULATION
9 PATTERN WATER PRODUCTION MATCH
Observed
Model
1000
100
10
1
1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990
YEAR


EMSU SIMULATION
9 PATTERN PREDICTION
OIL RATE, B/D
10000
1000
100
10
History
Waterflood
Depletion
1935
1945
1955
1965
1975
1985
1995
2005
2015
YEAR

34


EMSU SIMULATION
9 PATTERN PREDICTION
OIL RATE, B/D
1000
100
10
Waterflood
Depletion
History
1985
1990
1995
2000
YEAR

EMSU FIELD PREDICTION



EMSU Simulation

Ultimate Recoveries for Nine Patterns

- S/P Ratio = 0.51
- Primary = 9.8 MMSTB
- Primary Plus Secondary = 14.8 MMSTB
- Secondary = 5.0 MMSTB

EMSU Simulation

Summary

- History Match of 9-Pattern Strip Successful
- S/P Ratio for Field = 0.51
- Simulation & Technical Committee Waterflood Forecasts Are Similar

I. EMSU ACTIVITIES

A. WORK TO DATE

1. SURFACE FACILITIES
2. DRILLING WELLS
3. WORKOVERS

B. FUTURE WORKOVERS

1. LEASE LINE CONVERSIONS
2. WATER SHUTOFFS
3. PATTERN ALIGNMENT
4. STIMULATION

C. HIGHLIGHTS

II. AFE STATUS

A. EXPENDITURES

B. COST SAVINGS

EMSU PRODUCTION SYSTEM

* 217 MILES OF PRODUCTION LINES AND FLOW LINES

* 12 SATELLITE BATTERIES

* 48 PRESSURE VESSELS

* 1 CENTRAL TANK BATTERY

* 4 PRESSURE VESSELS

* 12,000 BBLS OF TANKAGE

TOTAL COST $7.6MM

EMSU
INJECTION
SYSTEM

* 5 MULTISTAGE GOULD CENTRIFUGAL PUMPS

* 3 WEMCO FILTERS

* 5 10,000 BBL WATER TANKS

* 67 MILES OF INJECTION PIPE

* 46 INJECTION MANIFOLDS

TOTAL COST $8.2MM

EMSU
GENERAL
FACILITIES

* 151 MILES OF NEW AND IMPROVED ROADS

* 60 MILES OF POWER DISTRIBUTION LINES

* SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM (SCADA)

TOTAL COST $2.9MM

EMSU DRILLING ACTIVITY

* 28 PATTERN PRODUCERS

* 2 INFILL PRODUCERS

* 18 INJECTORS

* 6 WATER SUPPLY WELLS

* 19 WELLS WITH REPEAT FORMATION TESTS

* 17 WELLS CORED

EMSU WORKOVER ACTIVITY

* 404 WORKOVERS PERFORMED
* 270 WELLS DEEPENED
* 115 CONVERSIONS
* 116 RECONDITIONS/PERFS
  CLEAN OUTS/ACIDIZE/LOG
* 20 WATER SHUTOFFS
* 8 PLUGBACK INJECTORS
* 13 WSW REPAIRS
* 10 CASING LEAKS
* 6 INJECTOR TUBING LEAKS

FUTURE WORKOVER ACTIVITY

LEASE LINE INJECTOR CONVERSIONS

* 12 PROBABLE
* 28 POSSIBLE

WATER SHUTOFFS

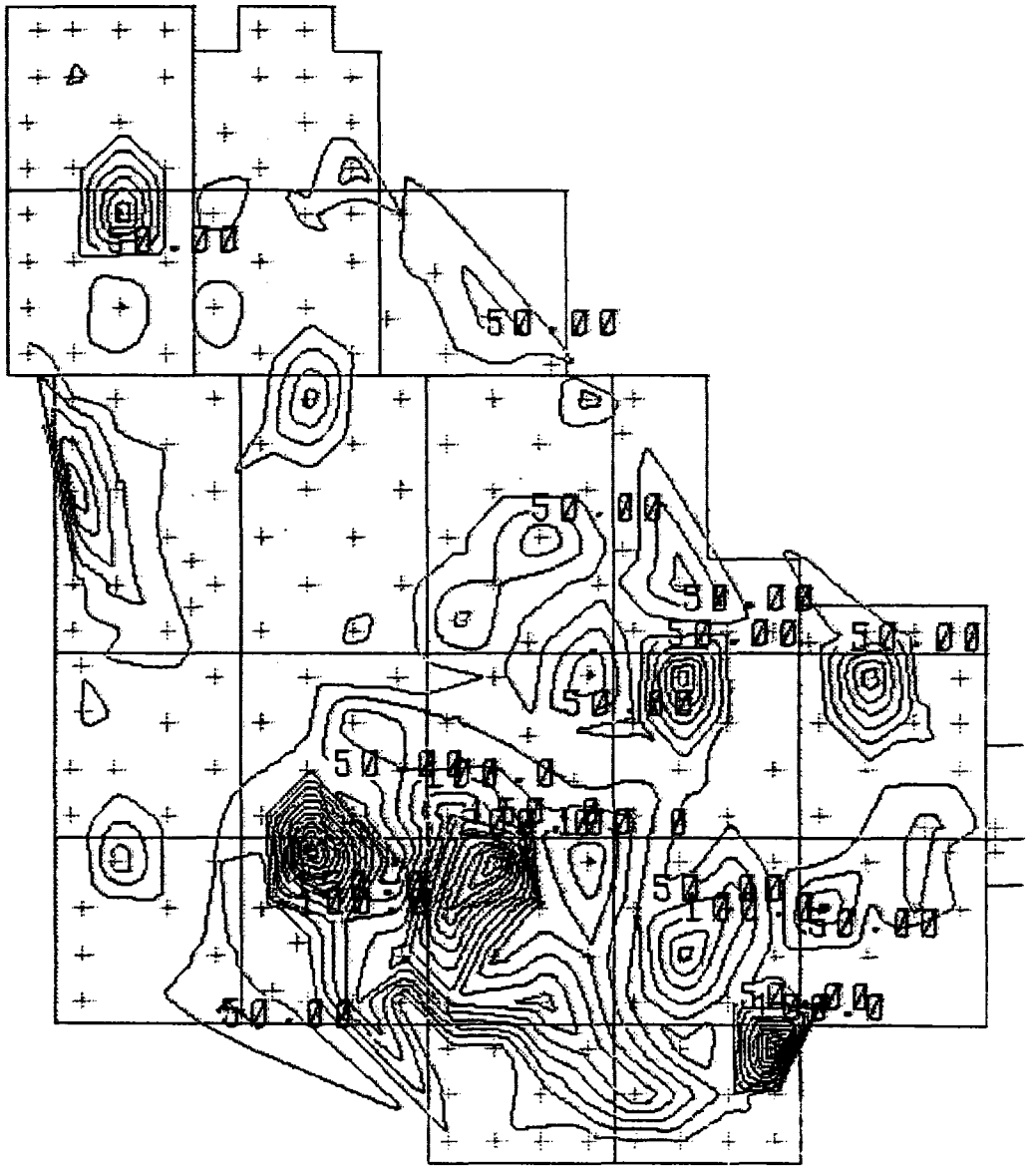
* PLUGBACKS
* LINERS
* POLYMER SQUEEZES

PATTERN ALIGNMENT

* PERFORATE PRODUCERS
* PERFORATE INJECTORS
* SHUTOFF OUT OF ZONE INJECTION
* PROFILE MODIFICATION

STIMULATION

* INCREASE INJECTIVITY
* REMOVE WELLBORE DAMAGE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EMSU
HIGHLIGHTS

* ELIMINATED INTERMEDIATE CASING STRING

* AIR MIST DRILLING

* DRILLED ONLY 6 WSW, RUN 3 OR 4 PUMPS AT ONE TIME

* PORTABLE POC

* COLD WEATHER PRODUCING CAPABILITIES

* OPTIMIZED PUMPING UNITS

* PURCHASED SONIC FL DEVICE

EUNICE MONUMENT SOUTH UNIT
PROJECT DRILLING & WORKOVER METHODS

Drilling

Original Method	–	**Surf 11'3/4" @ 400' (FW Sands) Int. 8 5/8" @ 2700' (Salt Section) Prod. 5 1/2" to TD (last 600' drld. req'd. low fluid loss mud with high concentrations of LCM due to depleted zones)**
Improved Method	–	**Surf 8 5/8" @ 1200' Prod. 5 1/2 to TD (Used Air/Mist drilling program from 2700' to TD')**
Results	–	**ROP increased 101%, mud cost cut 66% . Rotating hours decreased 40% (Savings $35K/well)**
Workovers	–	**Over 270 wells req'd. deepening**
Original Methods	–	**Deepened with mud containing large quantities of LCM**
Improved Method	–	**Deepened with Air/Mist System**
Results	–	**ROP increased 97%, decreased load wtr lost by 50%, job time cut 22%, formation damage decreased, oil prod. return almost instantly (W/O Saving $16K/Well)**

EMSU PORTABLE PUMP OFF CONTROLLERS

EMSU #238

OCT 1988 – WELL PUMPING 17/96 BFPD
SONIC FL INDICATES <50' PS

NOV 1988 – INSTALLED POC
WELL NEVER PUMPED OFF
UPGRADED UNIT TO 320
INCREASED PLUNGER SIZE

DEC 1988 – WELL PUMPING 31/180 BFPD

EMSU #302

JUL 1989 – WELL PUMPING 1/216 BFPD
SONIC FL INDICATED +– 200' PS

LATE 1989 – INSTALLED POC
WELL NEVER PUMPED OFF
UPGRADED UNIT TO 456
INCREASED PLUNGER SIZE
WELL PUMPING 23/280 BFPD

EMSU AFE STATUS

ORIGINAL AFE AMOUNT	$60,599,000
EXPENDITURES TO DATE	$49,455,366
BALANCE	$11,143,634

FUTURE EXPENDITURES

PATTERN ALIGNMENT	$1,500,000
PROBABLE CONVERSIONS	$1,200,000
OTHER CONVERSIONS	$2,800,000
INVESTMENT ADJUSTMENT	($1,061,000)
ESTIMATED FINAL EXPENDITURE	$51,794,366

EMSU
AFE VS. EXPENDITURES

	AFE	ACT	UNDER
SURFACE FACILITIES	19.9	17.8	2.1
WORKOVERS	19.3	19.8	−0.5
DRILLING WELLS	12.2	10.3	1.9
EQUIP TO PUMP	8.2	1.5	6.7
DRILL AND EQUIP	20.4	11.7	8.6
CORING AND TESTING	1.0	0.2	0.8
TOTALS	60.6	49.6	11.0

($MM)

PROPOSED
EUNICE MONUMENT SOUTH UNIT EXPANSION

OUTLINE

* EMSU Expansion Project Overview
  - Location
  - Stand Alone vs. Expansion Cost
  - Working Interest Owners
  - Proposed Well Status
  - Project Costs
  - Waterflood Response Prediction

* Investment Adjustment / Cap. Exp's
  - Inv. Adj. Cost Basis
  - Prorata Share Determination
  - Investment Adjustment Revenue
  - Capital Expenditures

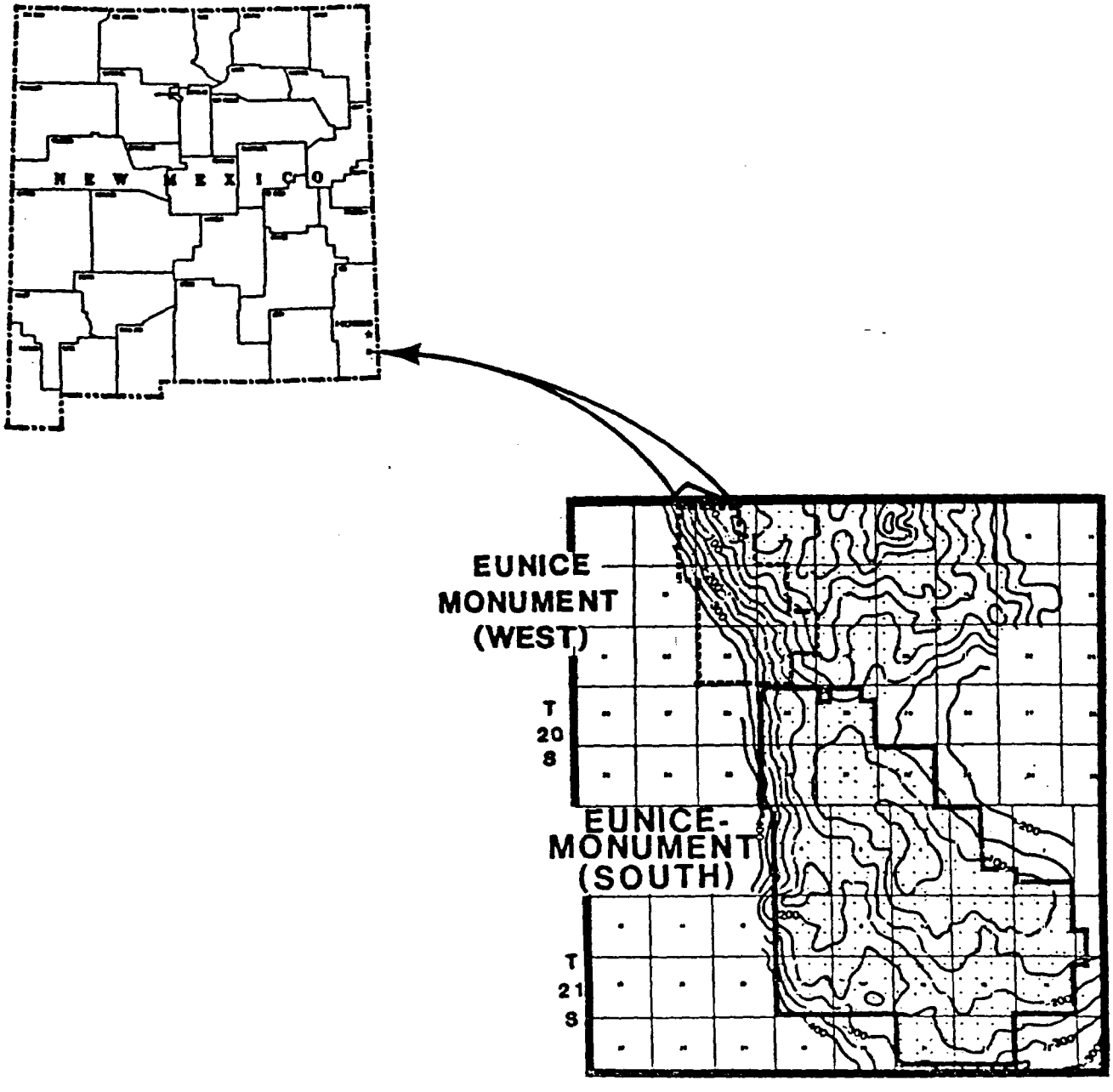
* Operating Expense Sharing
  - Water Requirements
  - Expense Sharing example

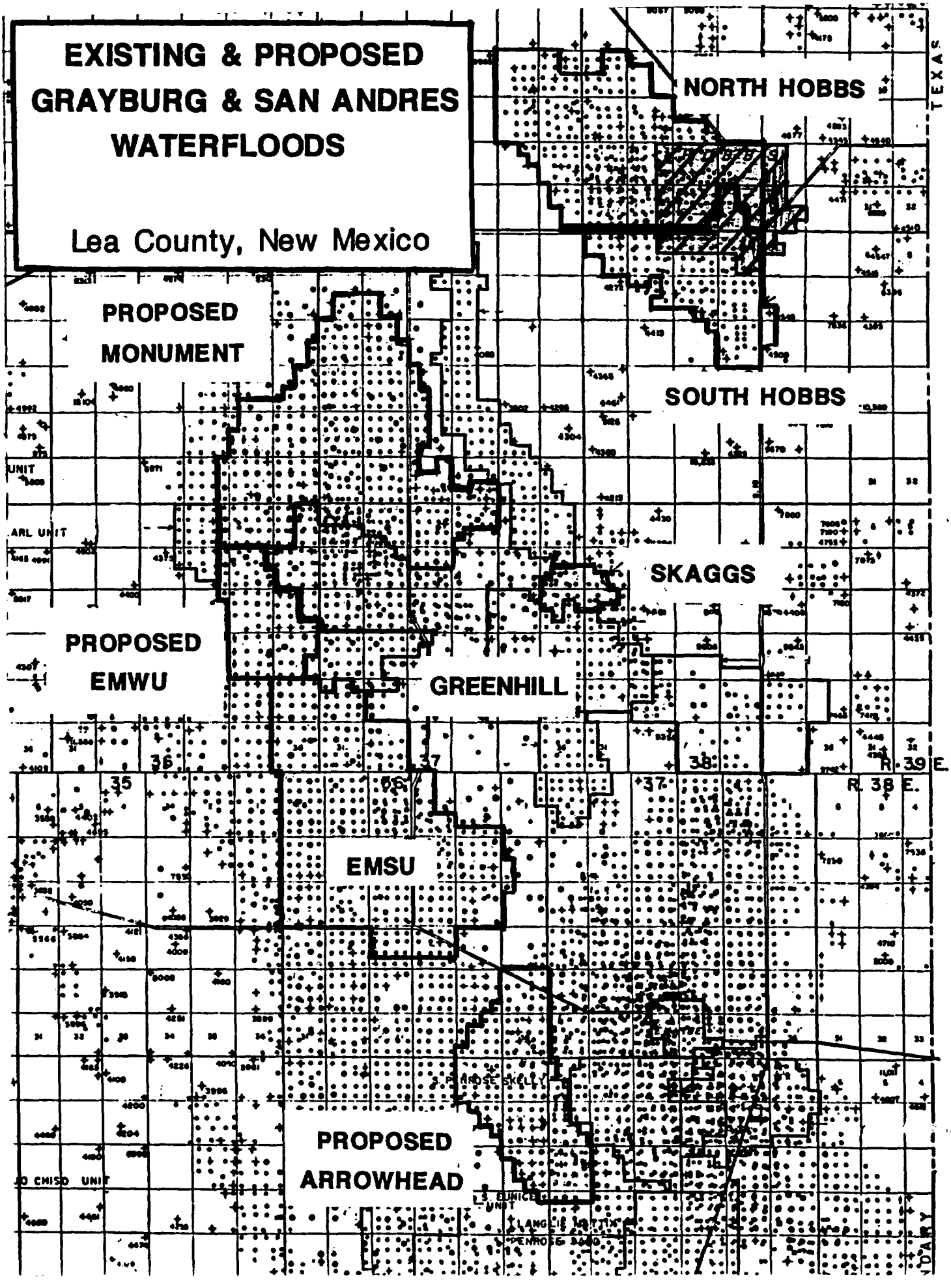
* Summary

EUNICE MONUMENT WEST UNIT

Lea County, New Mexico

WATERFLOOD PROJECT




EXISTING & PROPOSED
GRAYBURG & SAN ANDRES
WATERFLOODS
Lea County, New Mexico
NORTH HOBBS
PROPOSED
MONUMENT
SOUTH HOBBS
SKAGGS
PROPOSED
EMWU
GREENHILL
EMSU
PROPOSED
ARROWHEAD
R. 39 E.
R. 38 E.
TEXAS

EMSU EXPANSION

COMPARATIVE FACILITIES COSTS

	EXPANSION	STAND ALONE
DRILL AND COMPLETE 2 PRODUCERS	$ 350,000	$ 350,000
DRILL AND COMPLETE 3 INJECTORS	515,000	515,000
WORKOVER 47 PRODUCERS	2,961,000	2,961,000
CONVERT 23 PRODUCERS	1,656,000	1,656,000
SURFACE FACILITIES	3,524,000	3,524,000
INVESTMENT ADJUSTMENT	1,060,786	-
INJECTION FACILITIES	-	1,125,000
D & C 2 WATER SOURCE WELLS	-	782,000
D & C 1 SALT WATER DISPOSAL WELL	-	309,000
	10,066,786	11,222,000

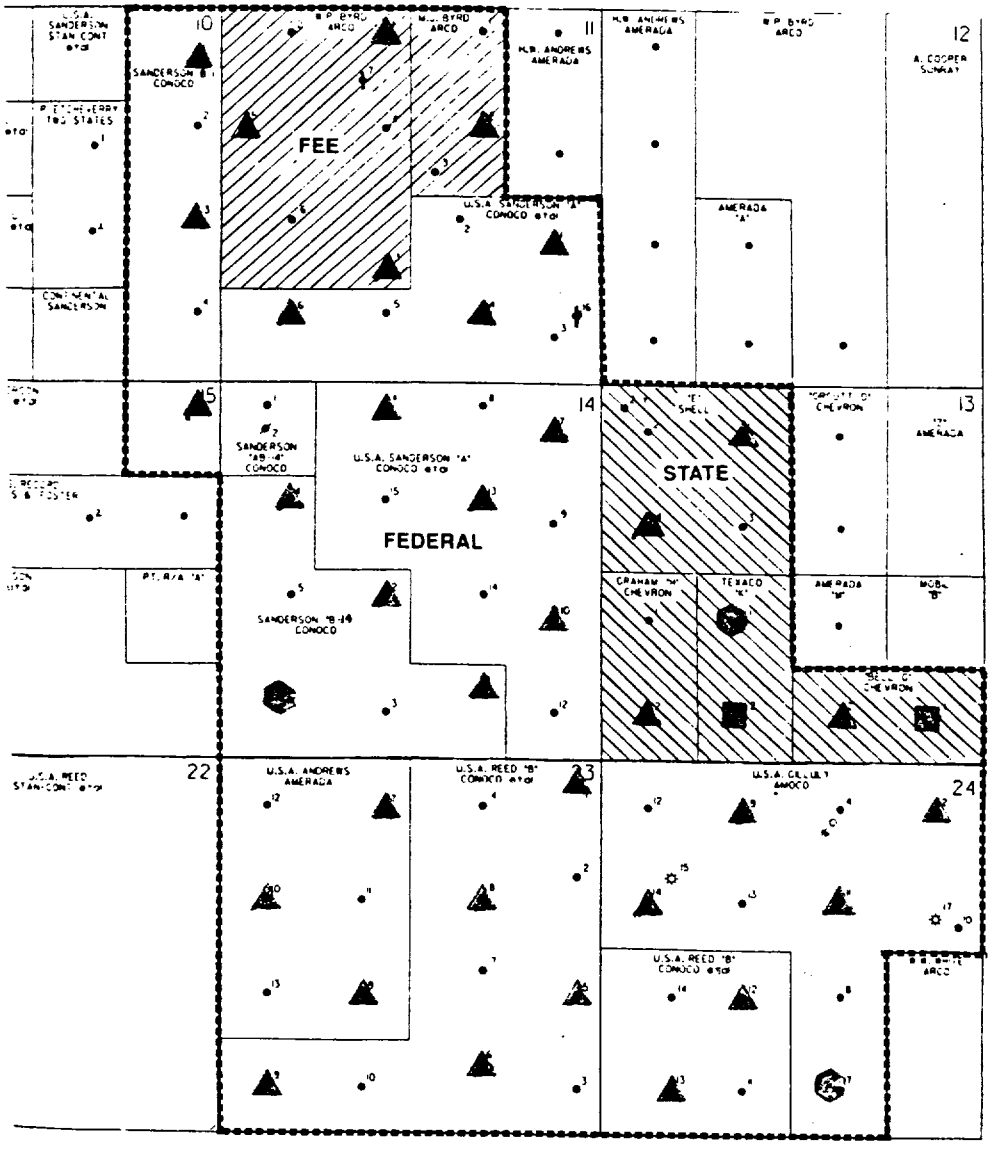
EUNICE MONUMENT WEST UNIT

Proposed Participation

Partner	Working Interest
Amoco	30.54%
Arco	29.40%
Chevron	19.40%
Conoco	13.83%
Shell	4.47%
Amerada Hess	1.72%
Texaco	0.64%

PROPOSED

EUNICE MONUMENT WEST UNIT



Drill & Complete 2 Producers –

Drill & Complete 3 Injectors –

Conv. 35 Prod's to Injection –

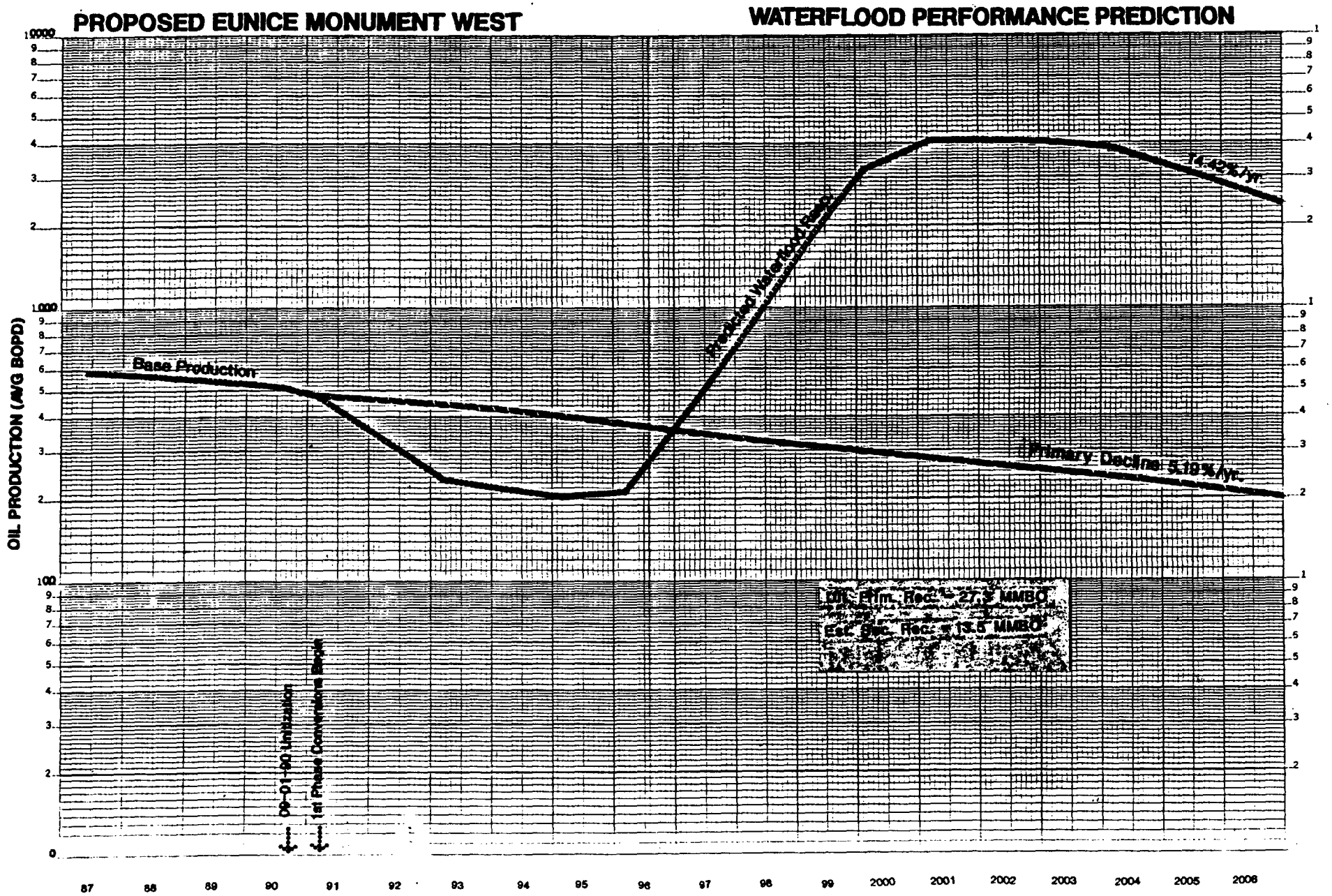
(12 Leaseline)

Total After Fully Developed

37 PRODUCERS
38 INJECTORS

PROPOSED EUNICE MONUMENT WEST UNIT
PROJECT COSTS

	Project 100% ($M)
Drill and Complete 2 Producers	350
Drill and Complete 3 Injectors	515
Workover 47 Wells	2,961
Convert 35 Wells to Injectors	2,520
Surface Facilities	3,858
Investment Adjustment	1,061
TOTAL PROJECT	11,265



47 6843

K•E 20 YEARS BY MONTHS X 3 LOG CYCLES
KEUFFEL & ESSER CO

65

EMSU WIO MEETING
(FEB. 27, 1990)

EMSU EXPANSION PROPOSAL

GOAL: Develop Agreement on the Basis of EMWU Admission into the EMSU

ISSUES:

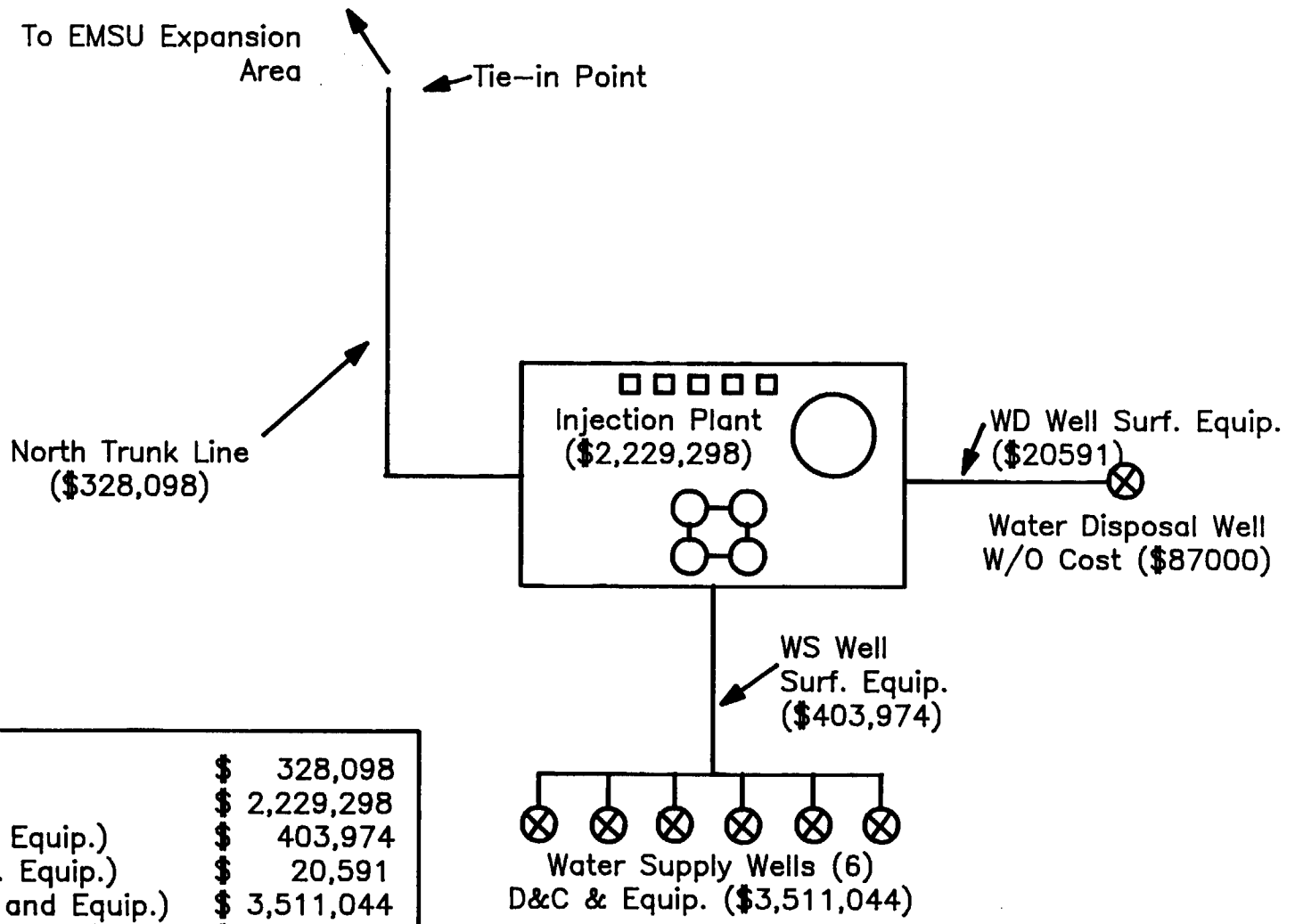
1. **Determine Equitable Investment Adjustment**
   - **Cost to buy into existing EMSU Injection System**

2. **Determine Equitable Expense Sharing Agreement**
   - **Proportionate sharing of common injection system monthly expenses**

3. **Determine Equitable Method of Sharing Capital Expenditures on Common Injection System**

INVESTMENT ADJUSTMENT

COST BASIS



Main Trunk Lines	$ 328,098
Water Inj. Plant	$ 2,229,298
Water Supply Wells (Surf. Equip.)	$ 403,974
Water Disposal Well (Surf. Equip.)	$ 20,591
Water Supply Wells (D&C and Equip.)	$ 3,511,044
Water Disposal Well (W/O Costs)	$ 87,000
TOTAL	$ 6,580,005

Investment Adjustment

Calculation of Capital Depreciation Cost
(Units of Production Method)

EMSU Oil & Gas Production

Year	BOPY	MCFPY	BOEG	Dep./BOEG	Dep. Expenses
1987	469217	1830573	774312.5	$1.18	$ 913,688.75
1988	436255	1787207	734122.0	$0.81	$ 594,638.82
1989	475231	2207220	843101.0	$1.05	$ 885,256.05
1990	487200	1938317	810252.8	$1.05	$ 850,765.48

Total Dep. Expenses $3,244,349.10

(est. 1990 values)

$$\text{Dep.(yrly)} = \frac{\text{Mineral(NBV)}}{\text{Proved Reser.}} + \frac{\text{Wells,Equip.\&Fac.(NBV)}}{\text{Proved Dev. Reser.}} + \frac{\text{Unprovided Aban.Cost}}{\text{Proved Dev. Reser.}}$$

Depreciation Factor = 1 - (Tot.Dep. Exp./Gross Exp. thru 1990)

= 1 - (3244349.1/50000000) = (.93511)

Depreciated EMSU Inv. Adj. Cost Basis = $ 6,153,048.33

EMSU / EMWU

METHODS OF DETERMINING PROPORTIONATE CHARGES

(FOR INVESTMENT ADJUSTMENT AND CAPITAL EXPENDITURES)

				AREA SHARE EMSU	EMWU
1.	Fillup Volume by Area	WU = 47563 MBW	SU = 228383 MBW	82.76%	17.24%
2.	Acreage by Area	WU = 3000 ac	SU = 14190 ac	82.55%	17.45%
3.	Active Inj. Wells	WU = 25 wells	SU = 133 wells	84.18%	15.82%
4.	Yearly Inj.(Projected 1993)	WU = 5891 MBW	SU = 28329 MBW	82.78%	17.22%
5.	Secondary Reserves	WU = 13467 MBO	SU = 65800 MBO	83.01%	16.99%
6.	Average Month Injection (ex.6/93)	WU = 16200 bwipd	SU = 77450 bwipd	82.70%	17.30%
7.	Hydrocarbon Pore Volume	WU = 163496 MBO	SU = 805800 MBO	83.13%	16.87%
8.	Total Potential Inj's by Area	WU = 38 wells	SU = 177 wells	82.33%	17.67%
9.	Remaining Inj. to 1.5 HCPV	WU = 245244 MBW	SU = 1124027 MBW	82.09%	17.91%
10.	Est. Ult. Primary	WU = 27269 MBO	SU = 134300 MBO	83.12%	16.88%
11.	Part. Formula on SU & WU total	.5 (cum) + .4 (rem. pri) + .1 (current)		81.70%	18.30%
			All Method Average	82.76%	17.24%
			Low Value	81.70%	15.82%
			High Value	84.18%	18.30%

EMWU INVESTMENT ADJUSTMENT

Inv. Adj. by various EMWU Proportionate Share Methods

Method	Average	T. C. Report	High EMWU%	Low EMWU%
Inv. Adj.	$1,060,786	$1,056,188	$1,126,008	$973,412

(EMSU Cost Basis = $ 6,153,048.33)

Investment Adjustment Impact on WIO's

Working Interest Owner Income

Company	Average	T.C. Report	High EMWU%	Low EMWU%	Range
Amerada Hess	$13945	$13885	$14803	$12797	$ 2006
Exxon	$57205	$56957	$60722	$52493	$ 8229
Shell WE&P	$71713	$71403	$76123	$65807	$10316
Wiser	$ 1124	$ 1119	$ 1193	$ 1031	$ 162
Koch Expl.	$ 3498	$ 3483	$ 3713	$ 3210	$ 503
Turner Est.	$ 925	$ 921	$ 982	$ 849	$ 133
Catron TR	$ 193	$ 192	$ 204	$ 177	$ 28
Five St. 1987	$ 2540	$ 2529	$ 2696	$ 2331	$ 365
Bruin Energy	$ 5663	$ 5638	$ 6011	$ 5196	$ 815
Five St. 1988	$ 3194	$ 3180	$ 3391	$ 2931	$ 459
Texaco	$77579	$77243	$82349	$71189	$11160
Amoco	$88937	$88552	$94405	$81612	$12794
Arco	$217133	$216192	$230483	$199248	$31235
Pfluger	$ 615	$ 613	$ 653	$ 565	$ 89
Conoco	$99889	$99456	$106030	$91661	$14369
Catron JS TB	$ 193	$ 192	$ 204	$ 177	$ 28
Perdew	$ 182	$ 182	$ 194	$ 167	$ 26
Carpenter O&G	$ 2230	$ 2220	$ 2367	$ 2046	$ 321
Energy Prod.	$ 7715	$ 7682	$ 8190	$ 7080	$ 1110
Chevron	$406313	$404552	$431295	$372846	$58449
TOTALS	$1060786	$1056188	$1126008	$ 973412	$152596

EMSU / EMWU
Injection Facility or Water Supply System
CAPITAL EXPENDITURE COST SHARING

Example - Cost to Partner - $200000 cap. expenditure

WORKING INTEREST OWNERS

EMSU

		Average	High	Low	Range	
Amerada Hess	0.013146	2176	2213	2148	65	
Exxon	0.053926	8926	9079	8812	267	*
Shell WE&P	0.067604	11190	11381	11047	335	
Wiser	0.001059	175	178	173	5	*
Koch Expl.	0.003297	546	555	539	16	*
Turner Est.	0.000871	144	147	142	4	*
Catron TR	0.000181	30	31	30	1	*
Five St. 1987	0.002394	396	403	391	12	*
Enwin Energy	0.005338	884	899	872	26	*
Five St. 1988	0.003011	498	507	492	15	*
Texaco	0.073133	12105	12312	11950	362	
Amoco	0.083340	13877	14115	13700	415	
Arco	0.204690	33880	34461	33447	1014	
Pfluger	0.00058	96	98	95	3	*
Conoco	0.094164	15585	15853	15387	466	
Catron JS TB	0.000181	30	31	30	1	*
Perdew	0.000171	28	29	28	1	*
Carpenter O&G	0.002101	348	354	343	10	*
Energy Prod.	0.007273	1204	1224	1188	36	*
Chevron	0.383030	63399	64485	62587	1897	

Others impacted as noted (*) on EMSU range

EMWU

		Average	High	Low	Range
Amoco	0.3054193	10531	11178	9665	1513
Arco	0.2939991	10137	10760	9304	1456
Chev	0.1939766	6688	7099	6139	961
Conoco	0.1383128	4769	5062	4377	685
Shell	0.0446939	1541	1636	1414	221
Amerada	0.0171688	592	628	543	85
Texaco	0.0064294	222	235	203	32

TOTAL COST COMMON (EMSU & EMWU) PARTICIPANTS

	Average	+ SU high	++ WU high	Range
Amoco	24408	23780	24878	-1098
Arco	24015	23419	24460	-1041
Chev	70087	70623	69687	937
Conoco	20355	20230	20449	-219
Shell	12731	12796	12682	113
Amerada	2763	2757	2776	-20
Texaco	12327	12516	12185	330

+ Highest EMSU ++ Highest EMWU Proportionate Share Method

CS

EMSU / EMWU Shared Operating Expenses

* Base EMWU share of EMSU Operating Expenses on Monthly Water Injection and Water Supply take.
  (% of total inj. and total wat. supplied)

* Direct Measurement of Volumes and Elec.

* Indirect Charges (contract labor, etc.) coded differently and shared proportionally.

* Interruptions in system affect both areas equally.

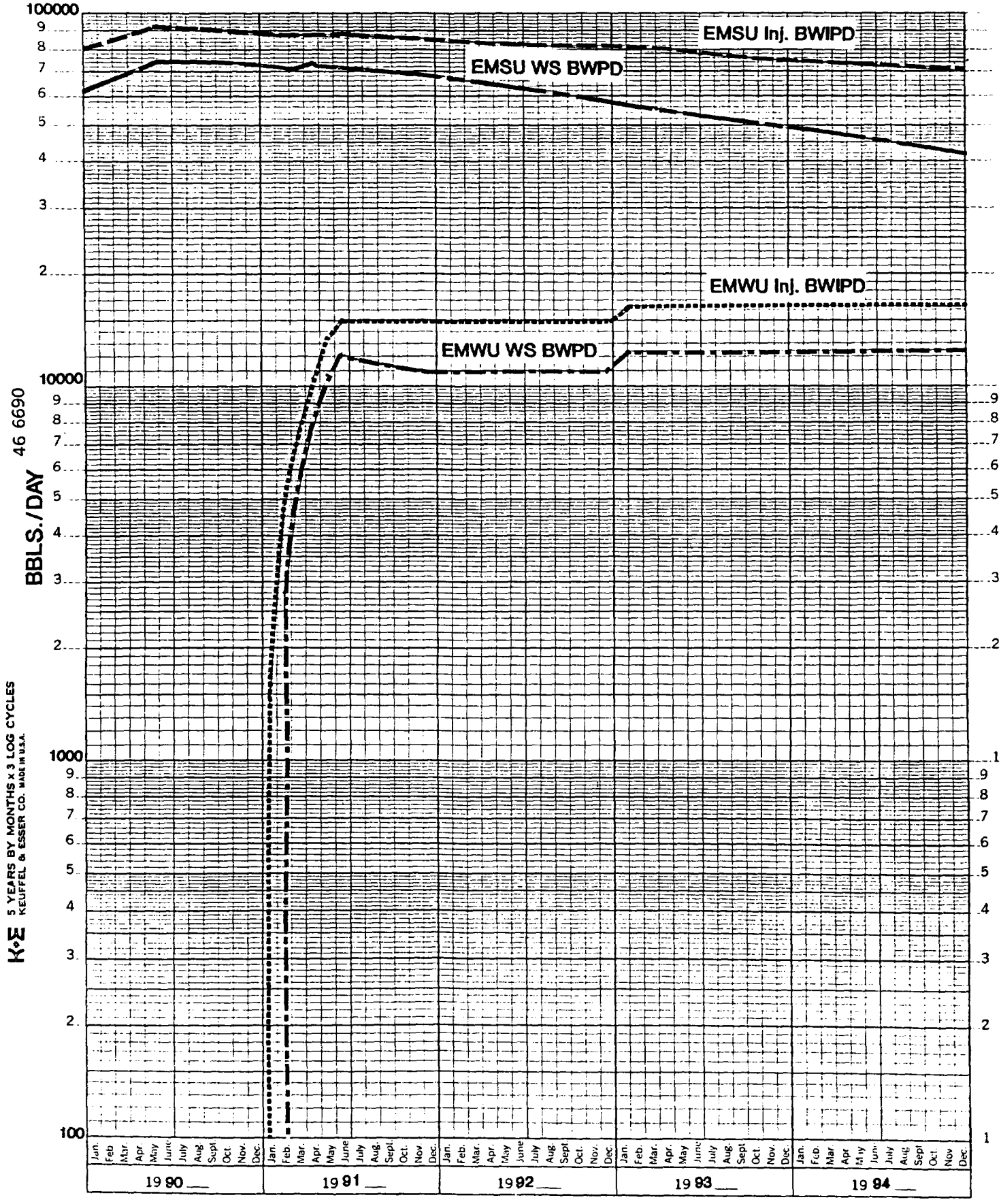
EMWU Operating Expenses

$$\text{Indirect Costs} * \frac{\text{EMWU Inj. (BWIPM)}}{\text{Tot. Inj. (SU \& WU)}} + \text{Fac. Elec.} * \frac{\text{EMWU Inj.}}{\text{Tot. Inj.}}$$

$$+ \text{WSW Elec. Costs} * \frac{\text{EMWU WS (BPM)}}{\text{Total WS (BPM)}}$$

Estimated Water Inj. & Water Supply

EMSU EMWU



K+E 46 6690 5 YEARS BY MONTHS x 3 LOG CYCLES KEUFFEL & ESSER CO. MADE IN U.S.A.

COMMON EMWU/EMSU OPERATING EXPENSES

EXAMPLE

Expenses To Be Shared	Estimated Yrly Total	Estimated Common YRLY	Percent of Total EMSU
Company Labor	$ 535,284	$ 93,656	17.5%
Contract Labor	$ 48,554	$ 2,428	5.0%
Contract Services	$ 356,848	$ 17,842	5.0%
Lease Fuels Other	$ 69,190	$ 6,919	10.0%
Util. Electric	$1,627,267	$1,072,693	65.9%
Chemical	$ 627,407	$ 347,109	55.3%
Matl's/Repair Parts	$ 125,653	$ 12,565	10.0%
Trans.(other)	$ 82,525	$ 8,253	10.0%
Overhead(7wells)	$ 47,544	$ 47,544	100.0%
TOTAL	$3,520,272	$1,609,009	

MONTHLY EXPENSE EXAMPLE (BY AREA)

WATER REQUIREMENTS
EMSU & EMWU

TYPICAL MONTH

Bbl/day (avg.)	1/91	4/91	7/91	12/91	1992	1993	1994
EMSU Inj.	87462	88102	88302	85901	82923	77615	72647
EMWU Inj.	1500	10500	15000	15000	15000	16141	16200
Total Inj.	88962	98602	103302	100901	97923	93756	88847
EMSU Wat Prod	15103	15737	16397	17559	19259	22698	26752
EMWU Wat Prod	2072	2551	3140	4000	4000	3845	3840
EMSU Wat Supply	72359	72365	71905	68342	62665	54917	45895
EMWU Wat Supply	0	7949	11860	11000	11000	12296	12360
Total Supply	72359	80314	83765	79342	74665	67213	58255

ALLOCATIONS (% of Total)

EMSU Inj.	98.31%	89.35%	85.48%	85.13%	84.68%	82.78%	81.77%
EMWU Inj.	1.69%	10.65%	14.52%	14.87%	15.32%	17.22%	18.23%
EMSU Wat Sup	100.00%	90.10%	85.84%	86.14%	85.27%	81.71%	78.78%
EMWU Wat Sup	0.00%	9.90%	14.16%	13.86%	14.73%	18.29%	21.22%

Expenses by Area (shared only)

Exp's by Area = Fac Exp * (Area Inj./Tot. Inj.) + WSW Exp. * (Area WS / Tot. WS)
+ Overhead (7 wells) * (Area Inj. / Tot. Inj.)

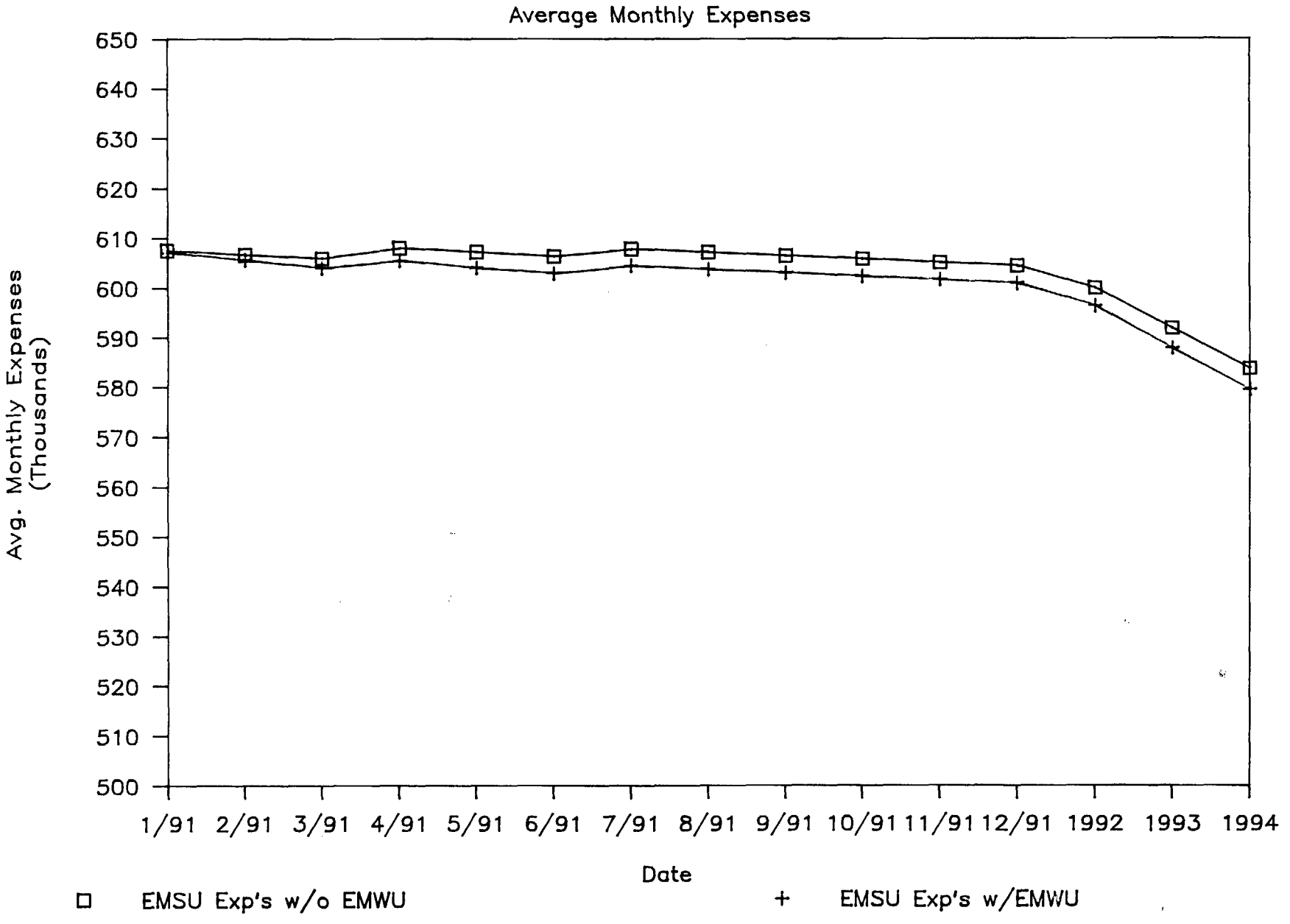
SAMPLE EXPENSES (shared only) BY AREA

EMSU	$121,693	$120,032	$119,027	$115,446	$110,870	$102,247	$93,935
EMWU	$1,461	$13,965	$20,040	$19,688	$19,795	$21,705	$22,020
% of Total							
EMSU	98.81%	89.58%	85.59%	85.43%	84.85%	82.49%	81.01%
EMWU	1.19%	10.42%	14.41%	14.57%	15.15%	17.51%	18.99%

Total EMSU Expenses (assumes most exp's won't inflate)

w/o Expansion	$607,625	$608,082	$607,991	$604,493	$600,023	$591,849	$583,777
w/ Expansion	$607,227	$605,566	$604,561	$600,960	$596,404	$587,781	$579,469
Change	99.93%	99.59%	99.44%	99.42%	99.40%	99.31%	99.26%

EMSU Expense Impact With EMWU Expansion



EUNICE MONUMENT SOUTH UNIT
EXPENSE IMPACT
WITH INCLUSION OF EMWU EXPANSION

Area Injection / Water Supply Required

Typical Month -- Dec. 1991

Area	Injection	Water Supply Req'd
EMSU	85901 bwipd	68342 bwpd
EMWU	15000 bwipd	11000 bwpd

TOTAL EXPENSES (on EMSU)

With EMWU Expansion	$620668	Difference of $16175
Without Expansion	$604493	(EMWU absorbs % of Fixed Costs)

SHARED EXPENSES WITH EMWU EXPANSION (Total $135134)

EMSU share	$115446
EMWU share	$ 19688

IMPACT ON EMSU EXPENSES

EMSU Expenses with EMWU Expansion	$600980
EMSU Expenses without EMWU Expansion	$604493
Net Savings	$ 3515/mo.

EXAMPLE IMPACT TO WORKING INTEREST OWNER

PARTICIPATION = 10 %
Expenses with EMWU Expansion = $60098 Savings of
Expenses without EMWU Expansion = $60449 $ 351 / mo.

Investment Adjustment Rebate = $106079

NET EFFECT -- $106079 Investment Rebate + avg. $351/mo savings

PROPOSED
EUNICE MONUMENT SOUTH UNIT
EXPANSION

SUMMARY

* Expand EMSU to include 3000 ac. tract to the north of the existing unit boundary.
* Treat each area as separate tract.
* EMSU Expansion purchase a 17.24% interest in existing Injection System for $ 1060786.
* Future common Capital Expenditures shared at 17.24% expansion area, 82.76% existing area prorata share.
* Common Operating Expenses shared based on water injection and water supply take by area.