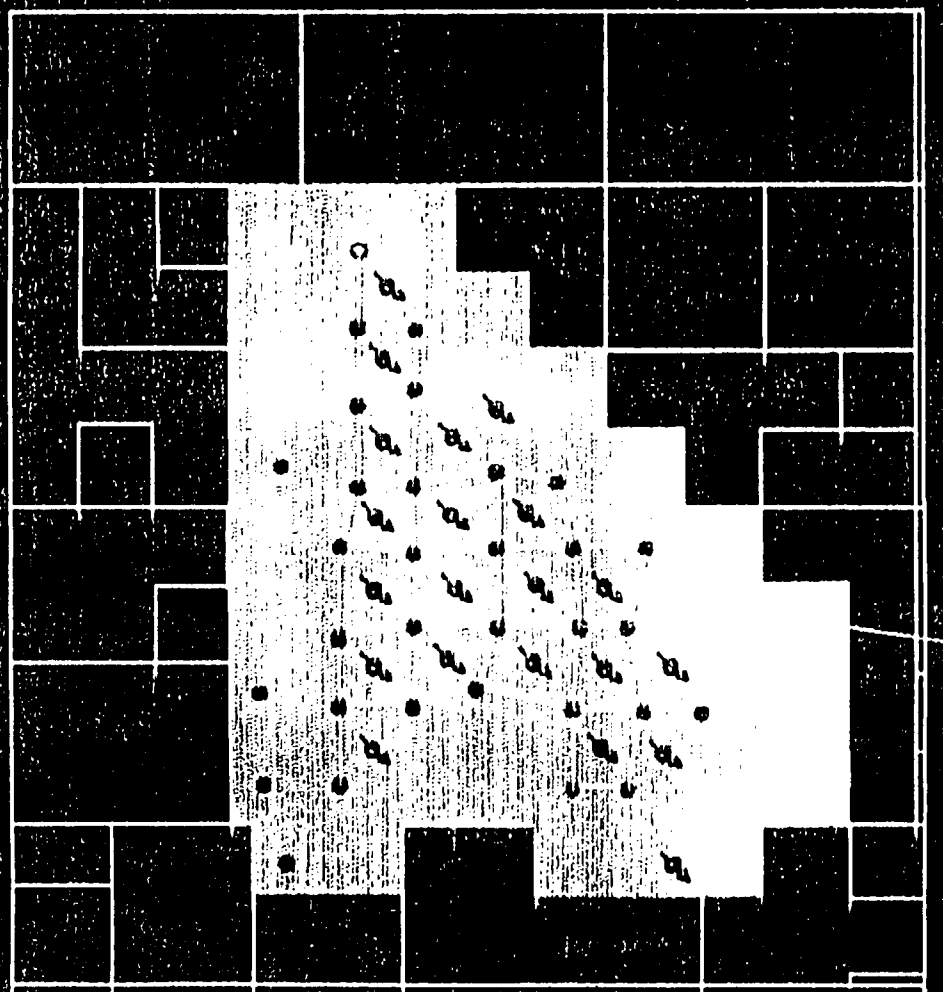
AVALON TECHNICAL REPORT MEETING
WITH YATES PETROLEUM
December 9, 1992

AGENDA ITEM	DISCUSSION LEADER	ESTIMATED TIME
Introduction/Objectives	Larry Long	15 min.
Discussion/Clarification of Concerns	Yates	15 min.
Development Plan	Gil Beuhler	45 min.
Geology and Modeling	Dave Cantrell Mike Goodwin	90 min.
Primary Reserves - 4 Wells	Mike Goodwin	45 min.
Workover Reserves	Dave Cantrell Mike Goodwin	60 min.
Summary: Remaining Concerns and Proposals	Yates	15 min.
Summary: Proposed Action	Larry Long	15 min.

OTHER ATTENDEES: DAVE BONEAU - YATES
BOB FANT - YATES
MARK JONES - EXXON

Exhibit B
12-9-92

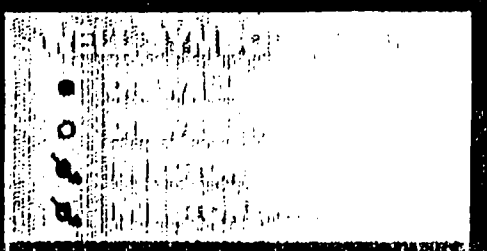
AVALON (DELAWARE) FIELD
WATER INJECTION PHASE DEVELOPMENT



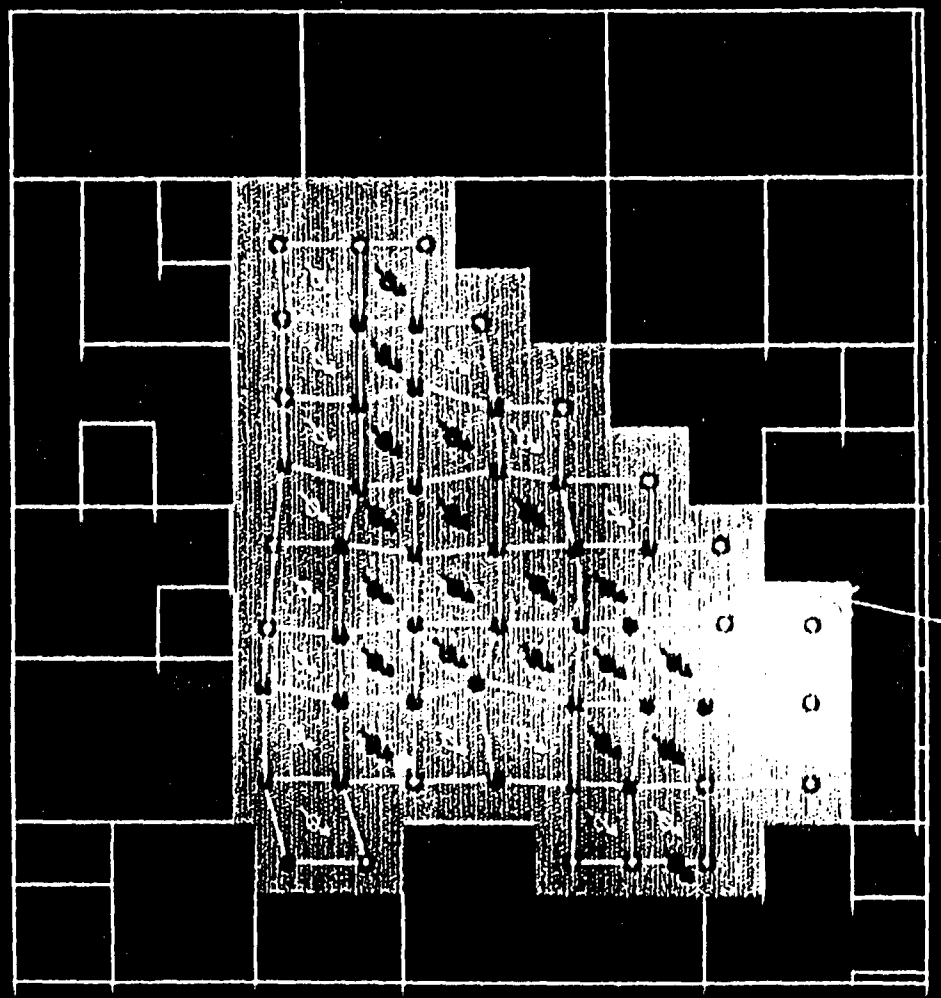
DEVELOPMENT SUMMARY

- START 1Q 93
- 18 INJECTOR DRILLWELLS
- 1 PRODUCER DRILLWELL
- $23M GROSS INVESTMENT

PROPOSED UNIT AREA

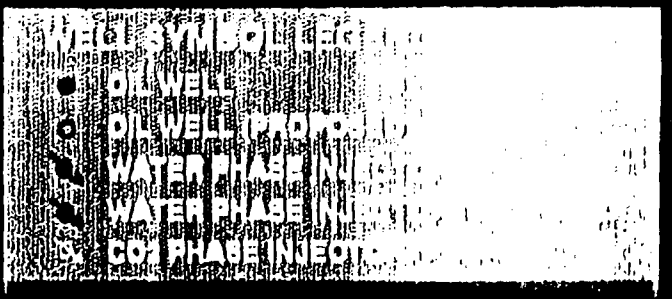


AVALON (DELAWARE) FIELD
CO2 INJECTION PHASE DEVELOPMENT

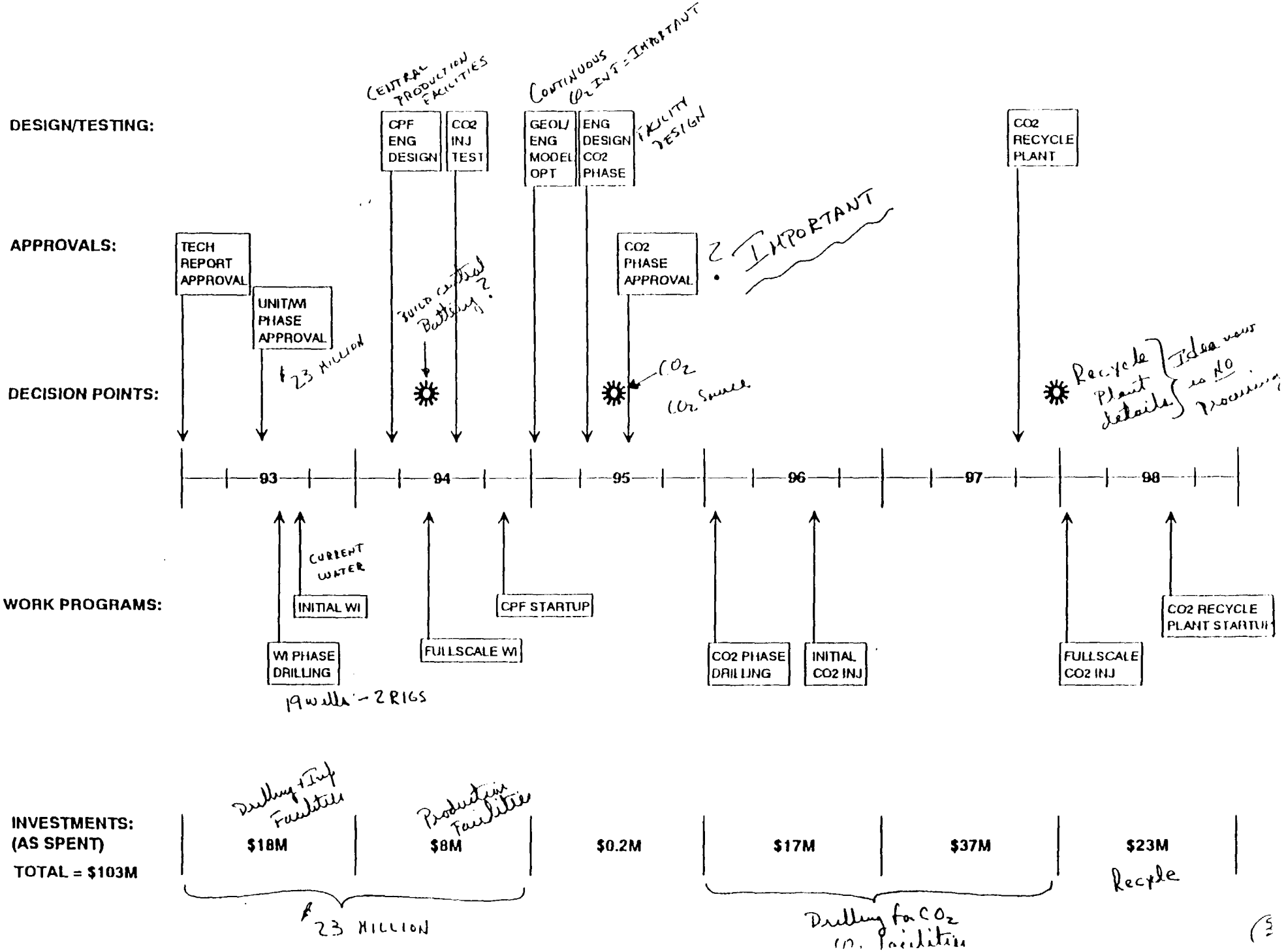


DEVELOPMENT SUMMARY

- START 1Q 96
- 55 INJECTOR DRILLWELLS
- 20 PRODUCER DRILLWELLS
- $61M GROSS INVESTMENT



AVALON EOR PROJECT TIMING



AVALON (DELAWARE) UNIT - INVESTMENT SUMMARY

NOTE: INVESTMENTS ARE 1992$

CASE	INVESTMENT YEAR	(1) DRILLING (M$)	(2) PRODUCTION FACILITIES (M$)	(3) INJECTION FACILITIES (M$)	(4) CAPITAL WORKOVERS (M$)	ART. LIFT ADDITIONS (M$)	OTHER (M$)	TOTAL (M$)	COMMENTS
CONTINUED OPERATIONS	1993	-	-	0.2	-	-	-	0.2	
WATER INJECTION PHASE	1992	-	-	0.6	-	-	-	0.6	
	1993	9.0	0.9	5.1	0.7	0.3	0.2	16.2	DRILLING: 1 PROD, 18 INJ, 1 WSW; OTHER: FORM EVAL
	1994	-	6.5	-	0.1	-	-	6.6	
	TOTAL	9.0	7.4	5.8	0.9	0.3	0.2	23.5	
CO2 INJECTION PHASE	1994	-	-	-	-	-	0.4	0.4	OTHER: CO2 INJECTIVITY TEST
	1995	-	-	0.2	-	-	-	0.2	
	1996	6.6	1.7	6.0	-	-	-	14.4	DRILLING: 5 PROD, 10 INJ
	1997	26.7	0.5	0.5	0.7	0.3	-	28.6	DRILLING: 15 PROD, 45 INJ
	1998	-	0.6	15.8 RECYCLE PLANT	1.0	-	-	17.3	
	TOTAL	33.4	2.8	22.5	1.6	0.3	0.4	61.0	
TOTAL EOR PROJECT	TOTAL	42.3	10.2	28.3	2.5	0.5	0.6	84.4	TOTAL INVESTMENT DOES NOT INCLUDE INVESTMENT FOR CONTINUED OPERATIONS (NOT NEEDED WITH PROJECT)

COMMENTS:

(1) - DRILLED PRODUCERS, INJECTORS, AND WATER SUPPLY WELL; THE YEARLY DRILLWELLS TOTALS DO NOT EXACTLY MATCH EXHIBIT II-3, BUT SHOULD MORE CLOSELY MATCH ACTUAL YEARLY EXPENDITURES

(2) - PRODUCTION FACILITIES INCLUDES FLOWLINES AND CENTRALIZED PRODUCTION FACILITY

(3) - INJECTION FACILITIES INCLUDES INJECTION LINES, WATER INJECTION FACILITIES, CO2 INJECTION LINES, AND CO2 RECYCLE COMPRESSOR FACILITY

(4) - CAPITAL WORKOVERS INCLUDE RECOMPLETING TA'D WELLS AND ADD ZONE WORKOVERS

AVALON EOR PROJECT - "RING" EVALUATION
12/8/92

	BASE CASE EOR PROJECT	DEVEL AREA ONLY	RING AREA ONLY
ECONOMIC SUMMARY:			
PATTERNS	37	19	18
INVESTMENT	$84.2M	$52.3M	$31.9M
RESERVES	42.2 MBO	26.8 MBO	15.4 MBO
PVP @ 10%	$134M	$100M	$34M
ROR	25%	27%	19%
CO2 INJECTION PHASE INVESTMENT SUMMARY:			
PRODUCER DRILLWELLS	20	4	16
INJECTOR DRILLWELLS	55	19	36
MAX. PROCESSING RATE	18.2 MCFPD	12.0 MCFPD	6.2 MCFPD
INVESTMENT DETAIL			
DRILLING	$33.4M	$10.4M	$23.0M
FACILITIES	$25.3M	$16.7M	$ 8.6M
WORKOVERS	$ 1.6M	$ 1.3M	$ 0.3M
MISC	$ 0.7M	$ 0.7M	$ 0.0M
TOTAL	61.0M	$29.1M	$31.9M

NOTE: WATER INJECTION PHASE INVESTMENTS ARE THE SAME IN EACH CASE

12-9-92

FORMATION EVALUATION AND PETROPHYSICS

METHODOLOGY AND CALCULATION PARAMETERS

(Continued)

Porosity Calculation

- Calculate total porosity from neutron-density crossplot (PHI_{nd}) or from Wyllie time-average sonic porosity (PHI_{son})

  $PHI_{son} = (DT - DT_{ma})/(DT_{fl} - DT_{ma})$

  Where DT = sonic transit time measured
  DT_{ma} = matrix transit time (55.5 msec/ft used)
  DT_{fl} = fluid transit time (189 msec/ft used))

- Apply GR cutoff (75 API units) to net out shales
- Calculate clay-corrected effective porosity

  $PHI_e = PHI_{nd} - (V_{clay} * PHI_{clay})$

  Where $PHI_{clay} = 0.26$

  $V_{clay} = 0.33\,[2^{(2 * I_{gr})} - 1.0]$

  Gamma Ray Index (I_{gr}) = $(GR_{log} - GR_{min})/(GR_{max} - GR_{min})$

  Where GR_{log} = gamma ray measured
  GR_{min} = gamma ray from "clean" sand (50 was used)
  GR_{max} = gamma ray from shale (120 was used) (Asquith)

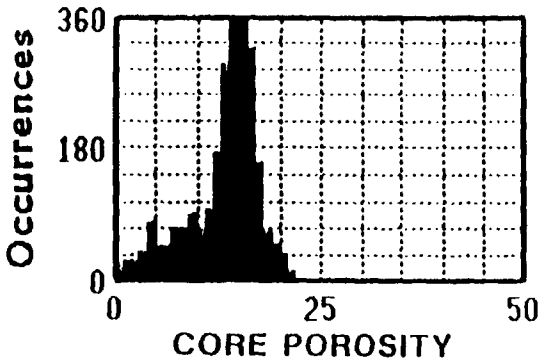
- Calibrate clay-corrected PHI_e to core

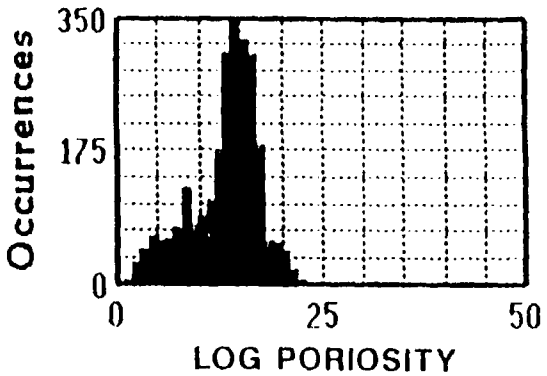
  $PHI_{ec} = (PHI_e + 1.747918)/1.17736$

  PHI_{son} needs no correction or calibration

- Product is foot-by-foot clay-corrected porosity data

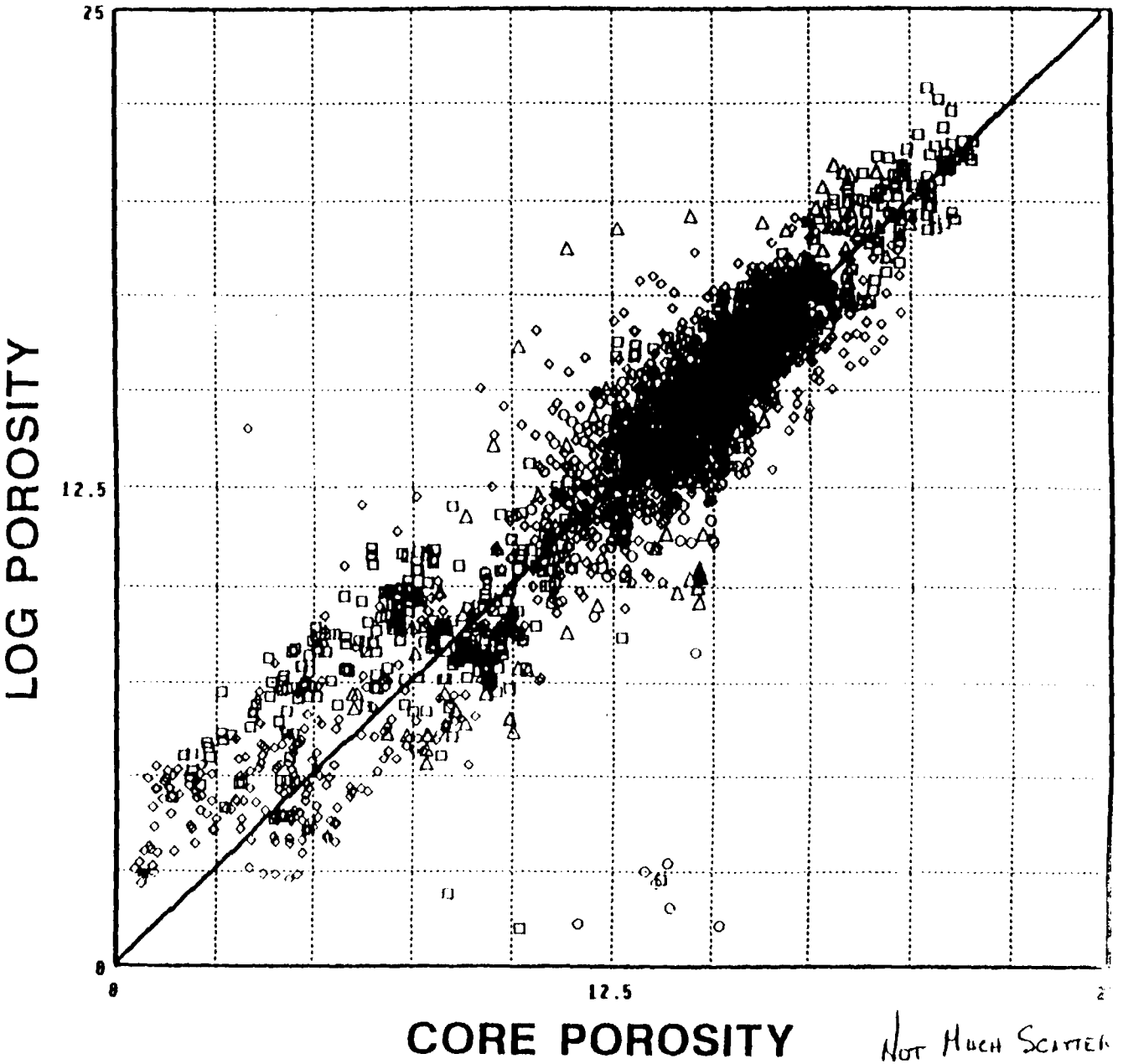
CORE POROSITY VS. LOG POROSITY



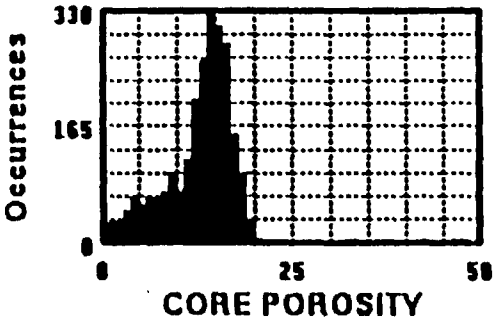


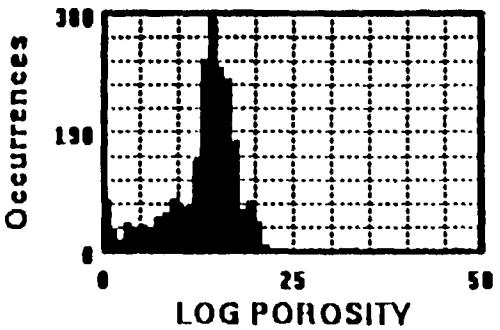
Well/Zone Legend

- ○ yates 'c' federal # 17
  - MIDDLE/LOWER CHERRY
  - UPPER BRUSHY
  - UPPER CHERRY
- □ yates 'c' federal # 18
  - MIDDLE/LOWER CHERRY
  - UPPER BRUSHY
  - UPPER CHERRY
- △ yates 'c' federal #6
  - MIDDLE/LOWER CHERRY
  - UPPER BRUSHY
  - UPPER CHERRY
- ◇ Exxon Yates Federal 'C' 36
  - MIDDLE/LOWER CHERRY
  - UPPER BRUSHY
  - UPPER CHERRY



LOG POROSITY-CORE POROSITY CROSSPLOT

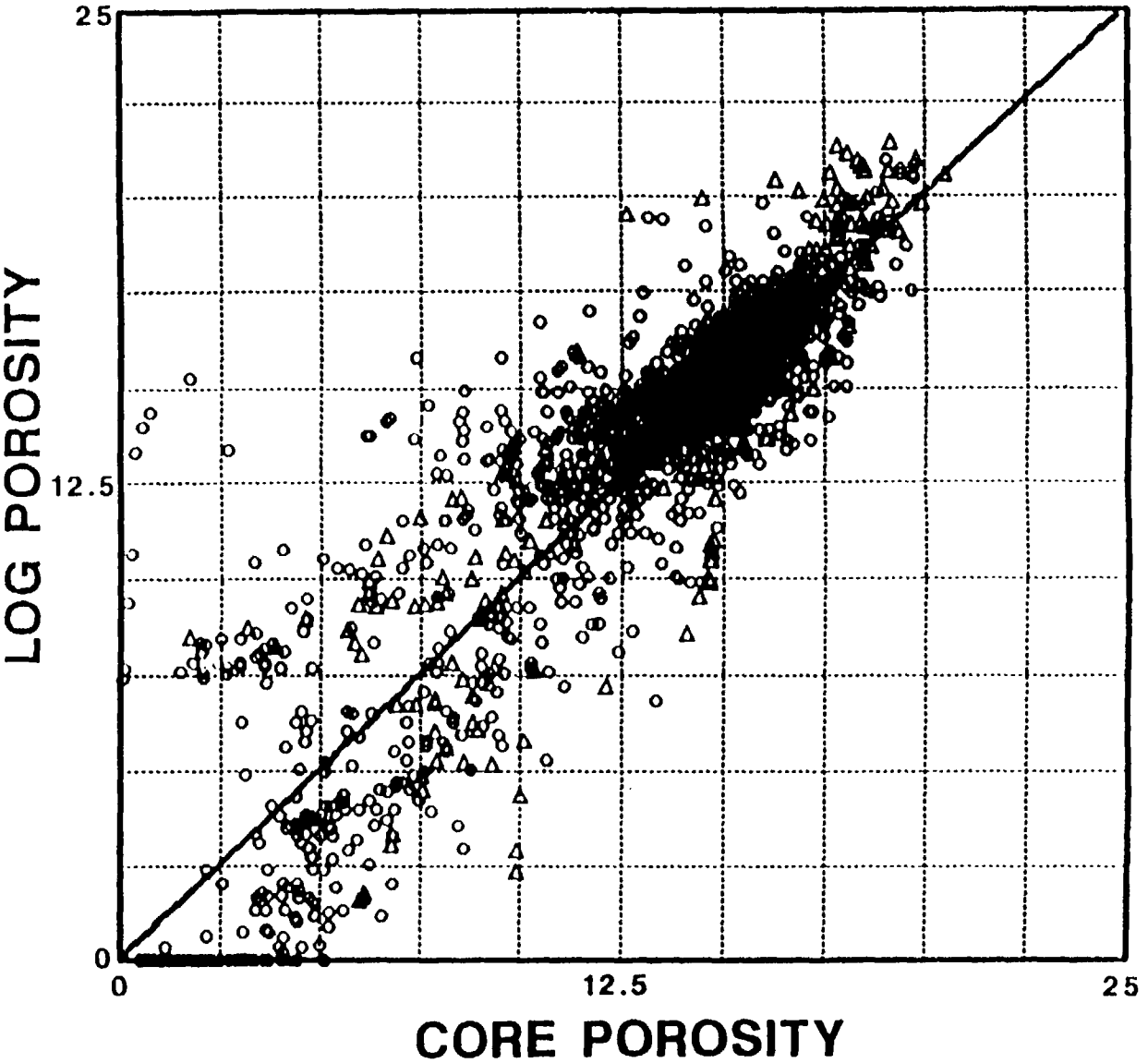




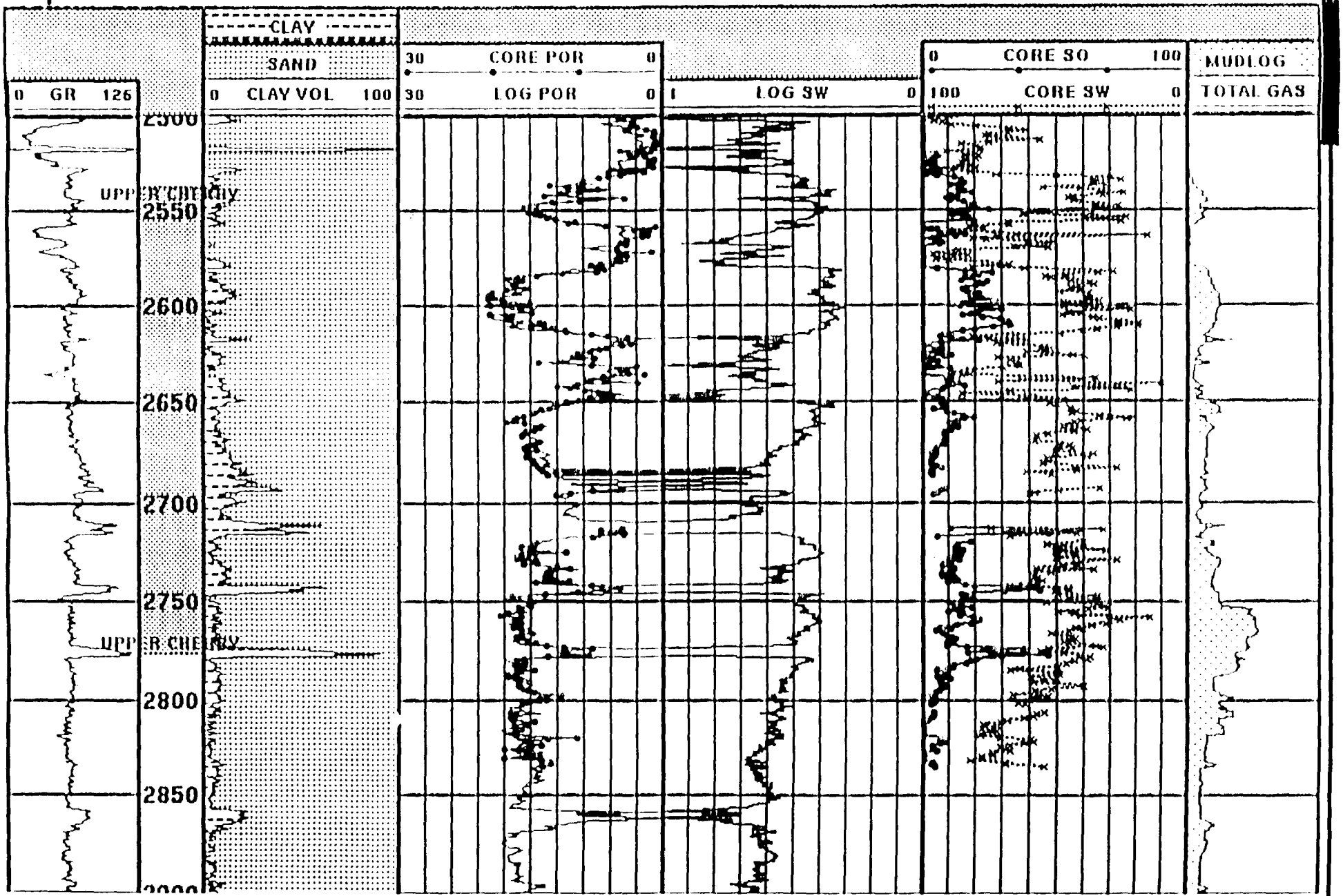
Well/Zone Legend

O Exxon Yates Federal 'C' 38
1
2
3

Δ yates 'c' federal #8
1
2
3



Exxon Yates Federal 'C' 36 Wednesday, 11 November 1992 2:31:49 p.m.
Depth: 2522.759



COMPARISON OF LOG-DERIVED AND CORE-CALCULATED PARAMETERS

WELL	CORE			LOG			
	Net	AP	PT	Net	AP	PT	
Upper Cherry Canyon							
Yates "C" Federal #18	56	0.123	6.9	52	0.125	6.5	(+5.8%)
Yates "C" Federal #36	139	0.147	20.5	150	0.145	21.8	(-6.3%)
Upper Brushy Canyon							
Yates "C" Federal #17	171	0.142	24.3	176	0.142	24.9	(-2.5%)
Yates "C" Federal #36	181	0.145	26.2	185	0.145	26.8	(-2.3%)

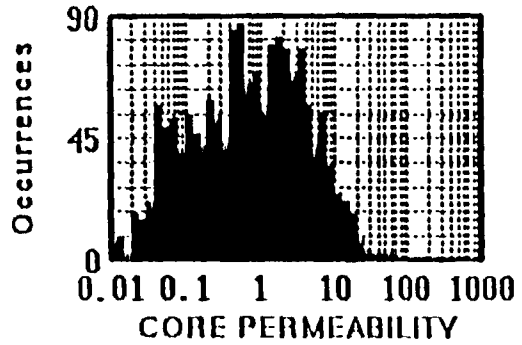
Total Average Difference (Core vs. Log) 4.2%

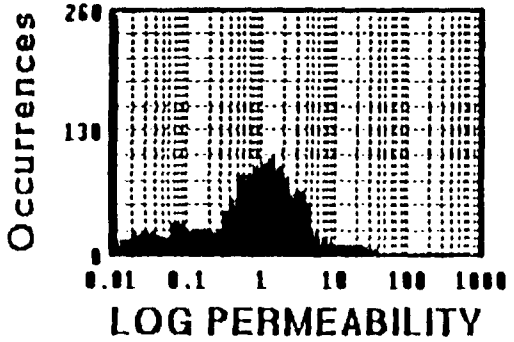
Net = Net feet of porous reservoir which meets cutoff criteria

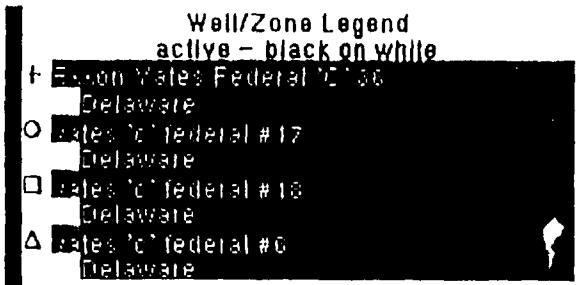
AP = Average porosity of reservoir interval meeting cutoff criteria

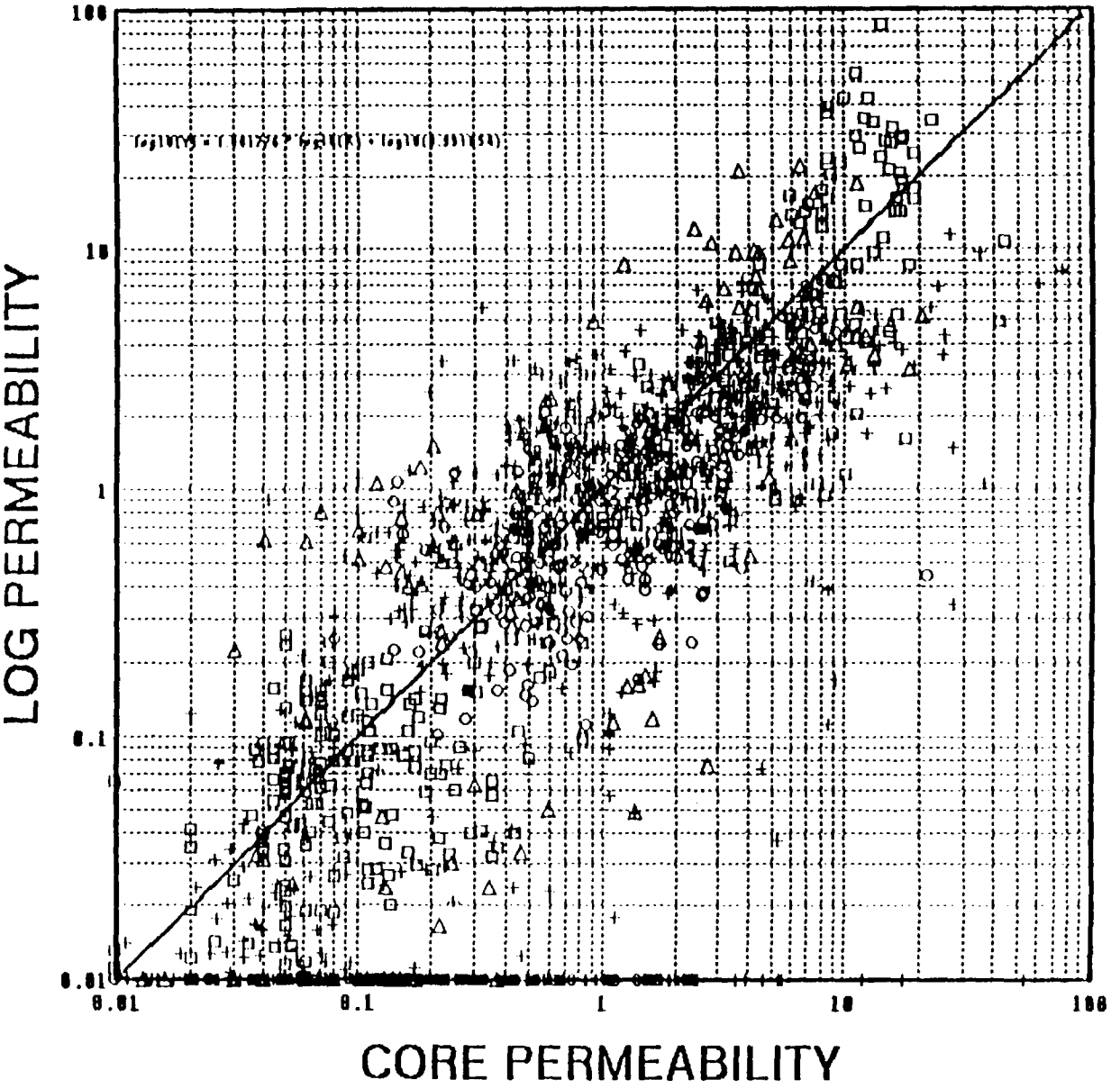
PT = Porosity thickness, product of net thickness and average porosity

Log-Derived vs Core Permeability









TIME BREAKDOWN...
12-9-92.

SIMULATION PROTOTYPE SCALE-UP JUSTIFICATION

- PRACTICAL ALTERNATIVE TO 3D FULL-FIELD SIMULATION

  - AVALON FULL-FIELD MODEL WOULD REQUIRE ±135,000 GRID BLOCKS FOR ADEQUATE AREAL AND VERTICAL DEFINITION (CONTRAST TO FORD GERALDINE MODEL WITH 19,380 GRID BLOCKS)

    MAYBE 75,000 MINIMUM
    26 LAYERS for 300 ft of section

  - ENABLES MULTIPLE SENSITIVITY RUNS (OVER 50 DIFFERENT SENSITIVITIES RUN ON CO_2 DEVELOPMENT SCENARIOS)

  - BENEFITS OF FULL-FIELD MODELING WILL BE MORE FULLY REALIZED ONCE PROJECT IMPLEMENTED

    + PRIMARY PRODUCTION PERFORMANCE GIVES LITTLE INSIGHT INTO INTERWELL HETEROGENEITIES/DESCRIPTION
    + INFILL DRILLING AND WATER INJECTION PERFORMANCE WILL ENABLE MUCH BETTER CALIBRATION OF MODEL

- METHODOLOGY HAS BEEN VALIDATED IN OTHER EXXON MULTI-WELL/MULTI-PATTERN FLOODS

  - WATERFLOODS
  - CO_2

  PROTOTYPE SIMULATION + SCALE UP

- TECHNIQUE SIMILAR TO THAT UTILIZED BY OTHER MAJORS WITHIN INDUSTRY

  - CHEVRON
  - MOBIL
  - ARCO

SIMULATION PROTOTYPE SCALE-UP METHODOLOGY

- DEVELOP SIMULATION PROTOTYPE CURVES
  - IDENTIFY PROTOTYPES
  - DEVELOP PROTOTYPE SIMULATOR MODEL
  - HISTORY MATCH ACTUAL PERFORMANCE
  - GENERATE DIMENSIONLESS MODEL CURVES FOR EXISTING PROCESS
  - GENERATE DIMENSIONLESS MODEL CURVES FOR PROPOSED PROCESS(ES)
- DEVELOP RESERVOIR VOLUMETRICS
  - DEVELOP GEOLOGIC MODEL
  - DEFINE PATTERN ELEMENTS
  - GENERATE PATTERN ELEMENT VOLUMETRICS UTILIZING GEOLOGIC MODEL
- HISTORY MATCH FULL-FIELD PERFORMANCE
  - UTILIZE PROTOTYPE CURVES, PATTERN ELEMENT VOLUMETRICS AND RATES
  - ADJUST MODEL TO OBTAIN MATCH
  - REVIEW NEED FOR ADDITIONAL PROTOTYPES
- DEVELOP FULL-FIELD FLOWSTREAM PREDICTION
  - DEFINE PROJECT DEVELOPMENT PLAN TO ESTABLISH SCHEDULE/TIMING
  - UTILIZE NEW PROCESS CURVES, VOLUMETRICS AND PREDICTED RATES FROM HISTORY MATCH

SIMULATION PROTOTYPE SCALE-UP
AVALON PROCESS DESCRIPTION

- DEVELOP SIMULATION PROTOTYPE CURVES
  - IDENTIFY PROTOTYPES
    - + COMPLETION STATUS
      - o SINGLE ZONE
      - o FRAC JOB
    - + REPRESENTATIVE STRATIFICATION
    - + SELECTED YCF #6 FOR UBC, HONDO "A" STATE #4 FOR UCC
  - DEVELOP PROTOTYPE SIMULATOR MODEL
    - + IDENTIFIED 13 FLOW UNITS IN UCC IN YCF #16 CORE AND CORRELATED TO HONDO "A" #4
    - + IDENTIFIED 13 FLOW UNITS IN UBC IN YCF #17 CORE AND CORRELATED TO YCF #6
    - + AVERAGE FLOW UNIT PERMEABILITIES FROM CORE DATA ASSIGNED TO SIMULATOR LAYERS
    - + SIMULATOR LAYER THICKNESS, DEPTH, AND POROSITY DETERMINED FROM LOGS
    - + MODEL CONFIGURATION IS 24x1x13 (2D VARIABLE WIDTH) FOR BOTH UBC AND UCC
  - HISTORY MATCH ACTUAL PERFORMANCE
    - + ADJUST S_{WI} TO MATCH INITIAL WOR
    - + INITIALIZE GAS SATURATIONS IN UBC MODELS
      - o 7% IN LAYER 8 OF YCF #6 MODEL
      - o 20% IN LAYER 8 OF WM #6 MODEL
    - + MULTIPLY AIR PERMS
      - o 2.4x FOR UCC
      - o 1.7x FOR UBC

- GENERATE DIMENSIONLESS MODEL CURVES FOR EXISTING PROCESS
  + PRIMARY DEPLETION
- GENERATE DIMENSIONLESS MODEL CURVES FOR PROPOSED PROCESS(ES)
  + WATERFLOOD
  + CO_2 FLOOD
    - o SLUG
    - o SLUG/WAG COMBINATION
    - o WAG RATIO
    - o SLUG SIZES
    - o FINAL FLOOD PROCESS

- DEVELOP RESERVOIR VOLUMETRICS
  - DEVELOP GEOLOGIC MODEL
  - DEFINE PATTERN ELEMENTS
    + NO-FLOW BOUNDARIES ≈ SUBPATTERNS
  - GENERATE PATTERN ELEMENT VOLUMETRICS UTILIZING GEOLOGIC MODEL
    + 216 SUB-PATTERNS EX 62
    + 5 LAYERS PER SUBPATTERN
      - o POROSITY, NET PAY, S_{WI}, PERMEABILITY PER GEOLOGIC MODEL

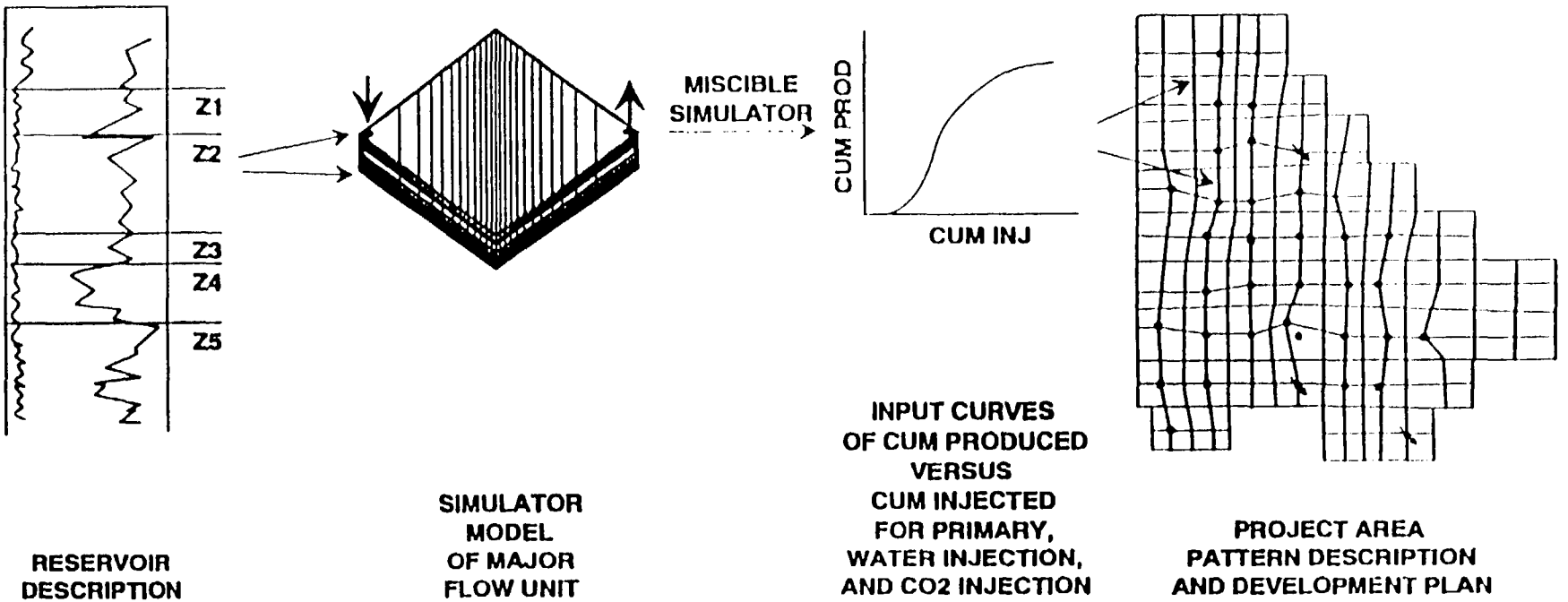
- HISTORY MATCH FULL-FIELD PERFORMANCE
  - UTILIZE PROTOTYPE CURVES, PATTERN ELEMENT VOLUMETRICS AND RATES
    + PRIMARY CURVES
    + ACTUAL RATES
  - ADJUST MODEL TO OBTAIN MATCH
    + WOR & GOR VS. CUM OIL FIRST ORDER CRITERION
    + EUR (MODEL) VS. EUR (DECLINE CURVE ANALYSIS) SECOND ORDER CRITERION
    + RECOGNIZED COMPLETION EFFICIENCIES

+ PARAMETER ADJUSTMENTS (IN PRIORITY ORDER)
  - o ZONE PERMS
  - o ZONE S_{WI}
  - o ZONE CONTINUITY
+ REVIEW NEED FOR ADDITIONAL PROTOTYPES
  - o IDENTIFIED NEED FOR HIGH GOR PROTOTYPE (WM #6)

- DEVELOP FULL-FIELD FLOWSTREAM PREDICTION
  - - DEFINE PROJECT DEVELOPMENT PLAN TO ESTABLISH SCHEDULE/TIMING
    + WATERFLOOD
      - o WORK PROGRAM
      - o INJECTION SCHEDULE
    + CO_2
      - o WORK PROGRAM
      - o INJECTION SCHEDULE
  - - UTILIZE NEW PROCESS CURVES, VOLUMETRICS AND PREDICTED RATES FROM HISTORY MATCH
    + WATER INJECTION CALIBRATION
    + CO_2 PROCESS ALTERNATIVES, SENSITIVITIES
      - o PROCESS TYPE
      - o FINAL FLOOD PROCESS
      - o SLUG SIZE
      - o OTHER SENSITIVITIES

GOODWIN
12-9-92

AVALON (DELAWARE) PROJECT
FLOWSTREAM DEVELOPMENT METHODOLOGY



RESERVOIR DESCRIPTION

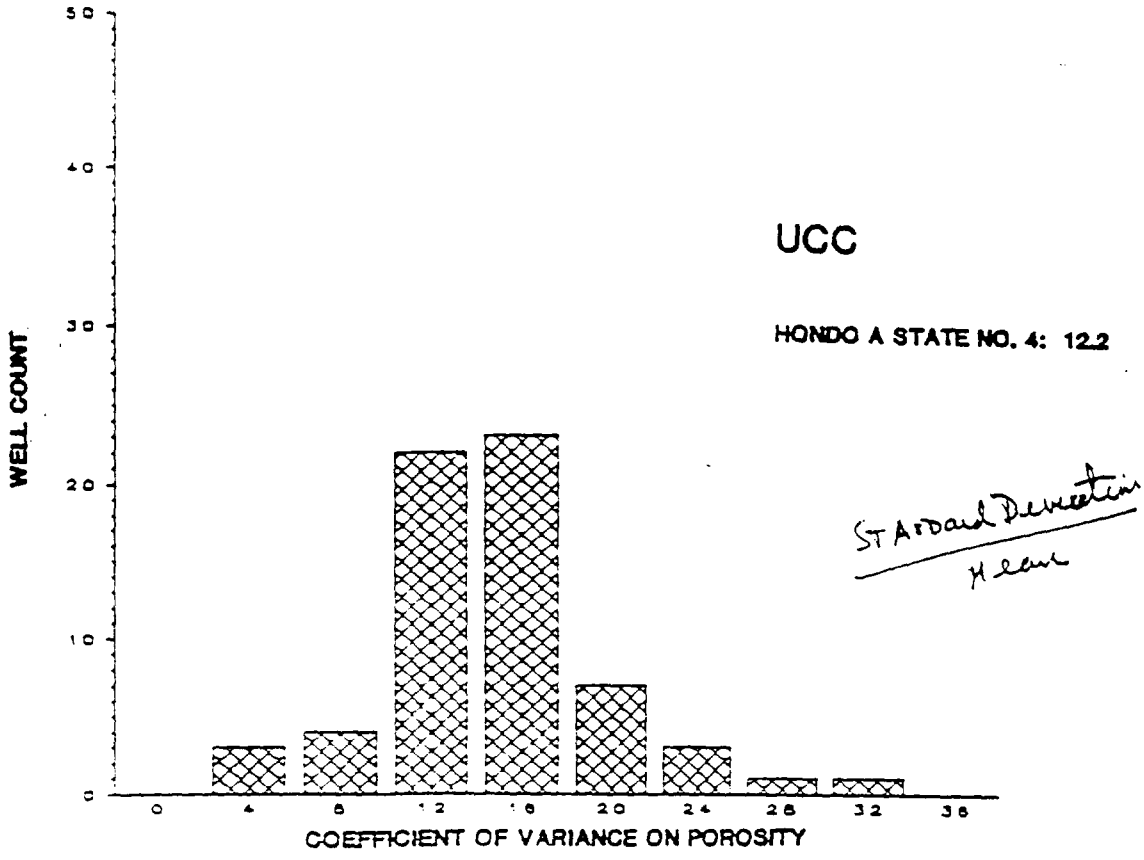
SIMULATOR MODEL OF MAJOR FLOW UNIT

INPUT CURVES OF CUM PRODUCED VERSUS CUM INJECTED FOR PRIMARY, WATER INJECTION, AND CO_2 INJECTION

PROJECT AREA PATTERN DESCRIPTION AND DEVELOPMENT PLAN

Exhibit G-1

FREQUENCY CHART OF THE COEFFICIENT OF VARIANCE ON POROSITY



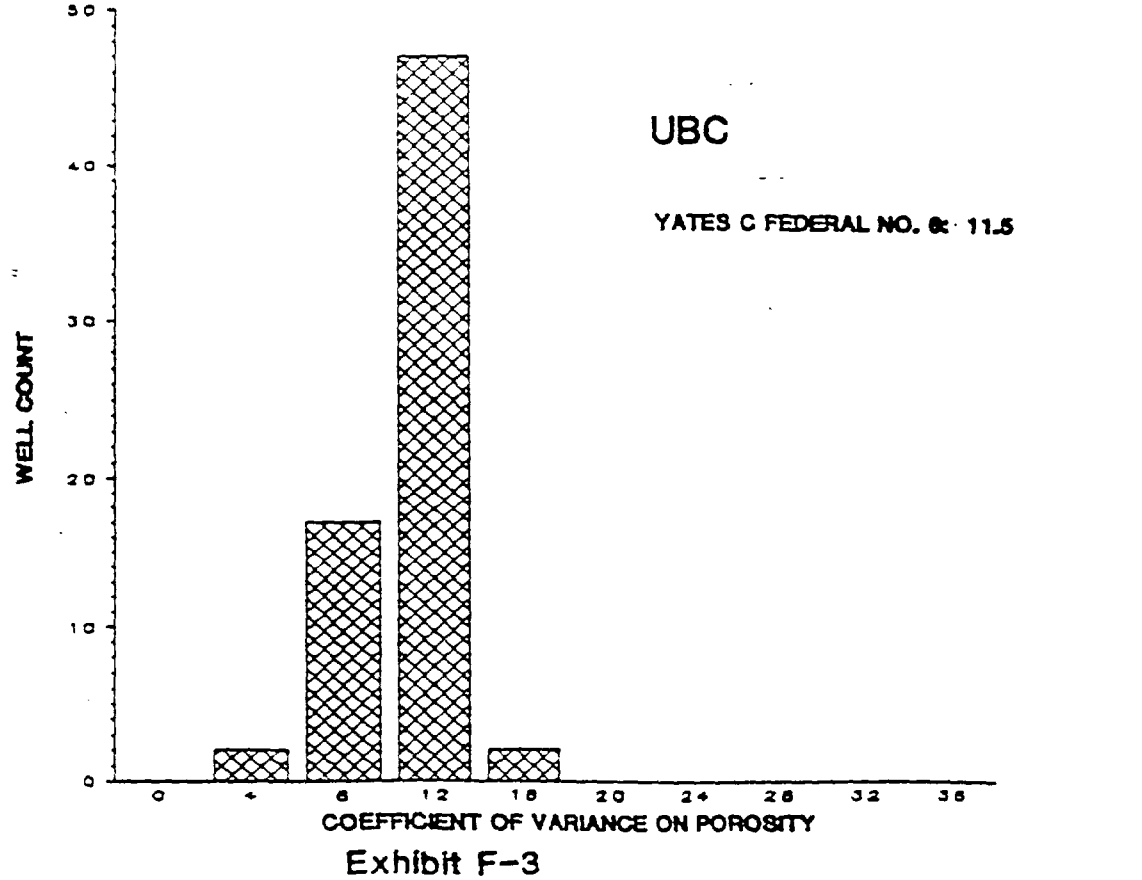


Exhibit F-3

UPPER CHERRY CANYON MODEL DESCRIPTION

LAYER	THICKNESS (FT)	Ø (%)	Kx (MD)	Kz (MD)	LAYER
1	5	11.7	1.20	0	1
2	8	12.5	1.20	0	2
3	16	15.0	1.37	1.62	3
4	16	15.4	4.67	1.28	4
5	12	14.5	2.98	0	5
6	3	14.7	4.56	1.57	6
7	13	16.6	11.24	0.72	7
8	4	15.5	1.57	0	8
9	5	15.9	7.40	0.71	9
10	16	18.3	4.60	0.37	10
11	29	15.8	1.20	0	11
12	24	15.4	1.20	0	12
13	17	16.3	0.75		13

UPPER BRUSHY CANYON MODEL DESCRIPTION

LAYER	THICKNESS (FT)	θ (%)	Kx (MD)	Kz (MD)	LAYER
1	12	15.4	1.49	0	1
2	13	15.6	1.00	0	2
3	12	14.7	1.49	0.36	3
4	8	14.1	0.70	0	4
5	19	14.0	0.87	0.01	5
6	5	15.8	2.02	0.05	6
7	30	14.0	0.95	0	7
8	12	13.6	2.94	0.31	8
9	13	14.7	1.96	0	9
10	8	17.7	6.44	0.37	10
11	13	16.4	2.85	0	11
12	8	13.5	3.32	0.14	12
13	10	16.9	2.47		13

PATTERN ELEMENT MODEL

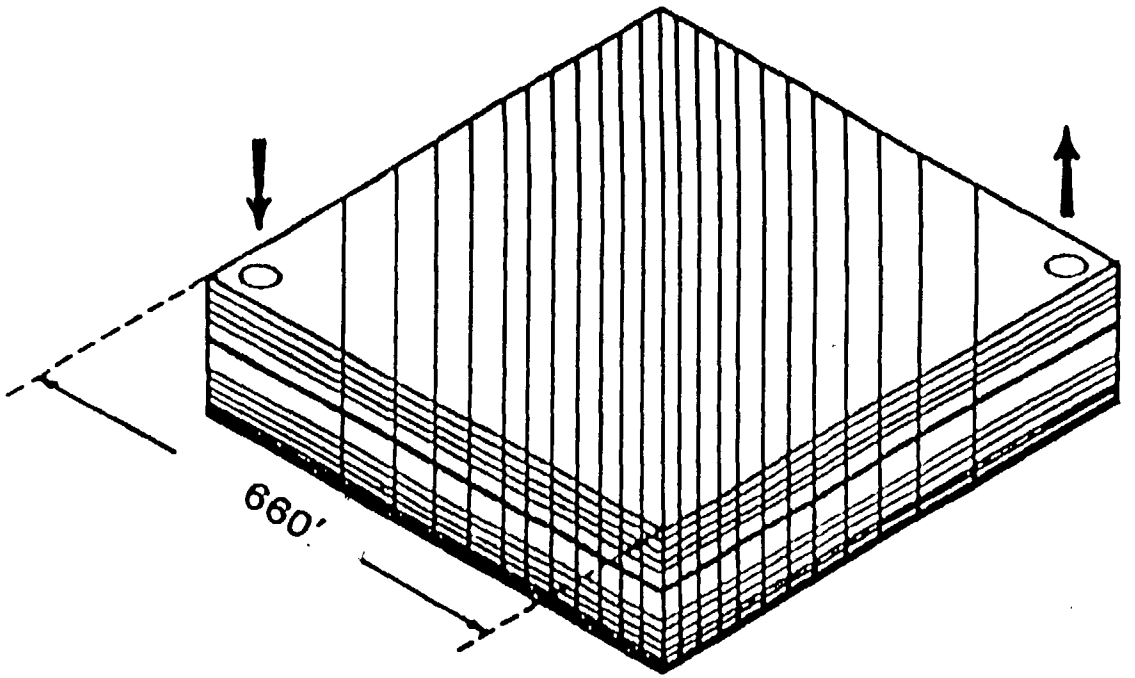
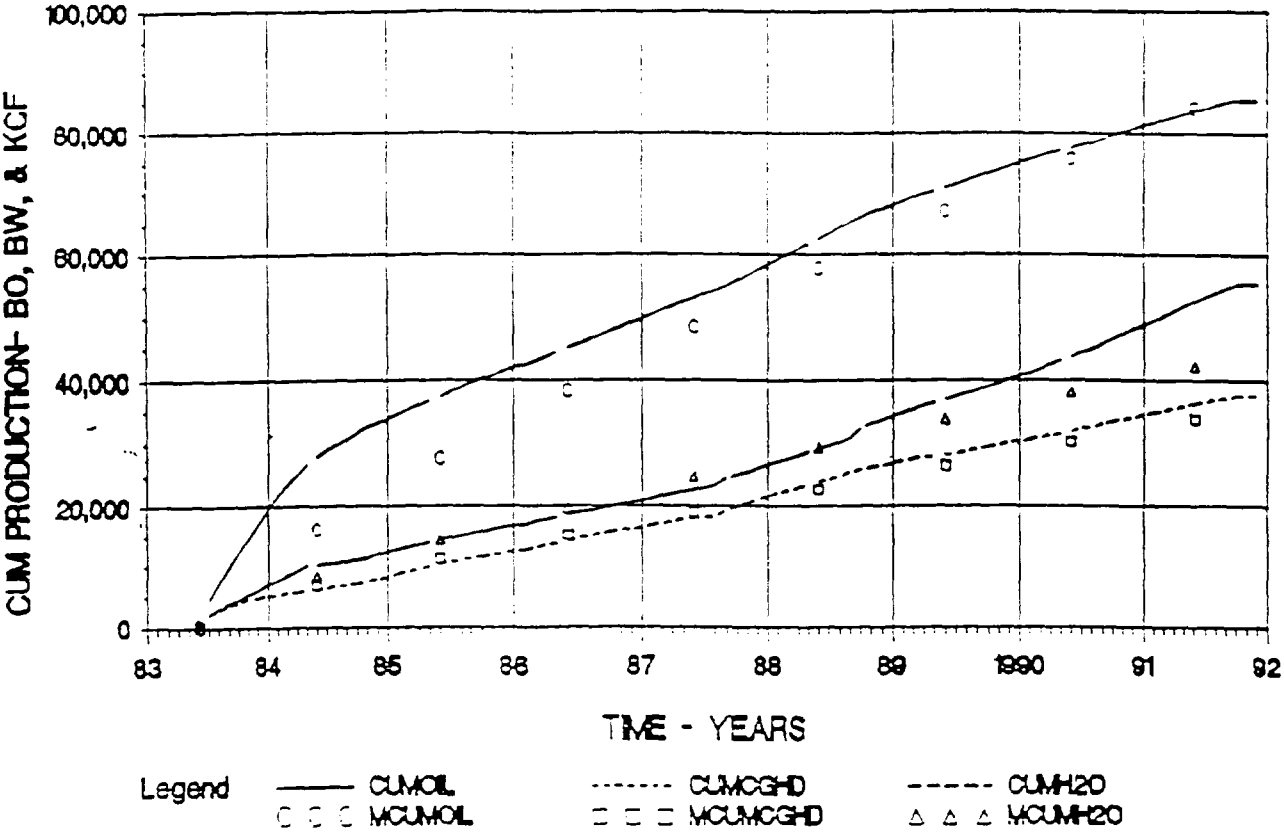


Exhibit F-2

AVALON UCC
HONDO A STATE NO. 4 HISTORY MATCH



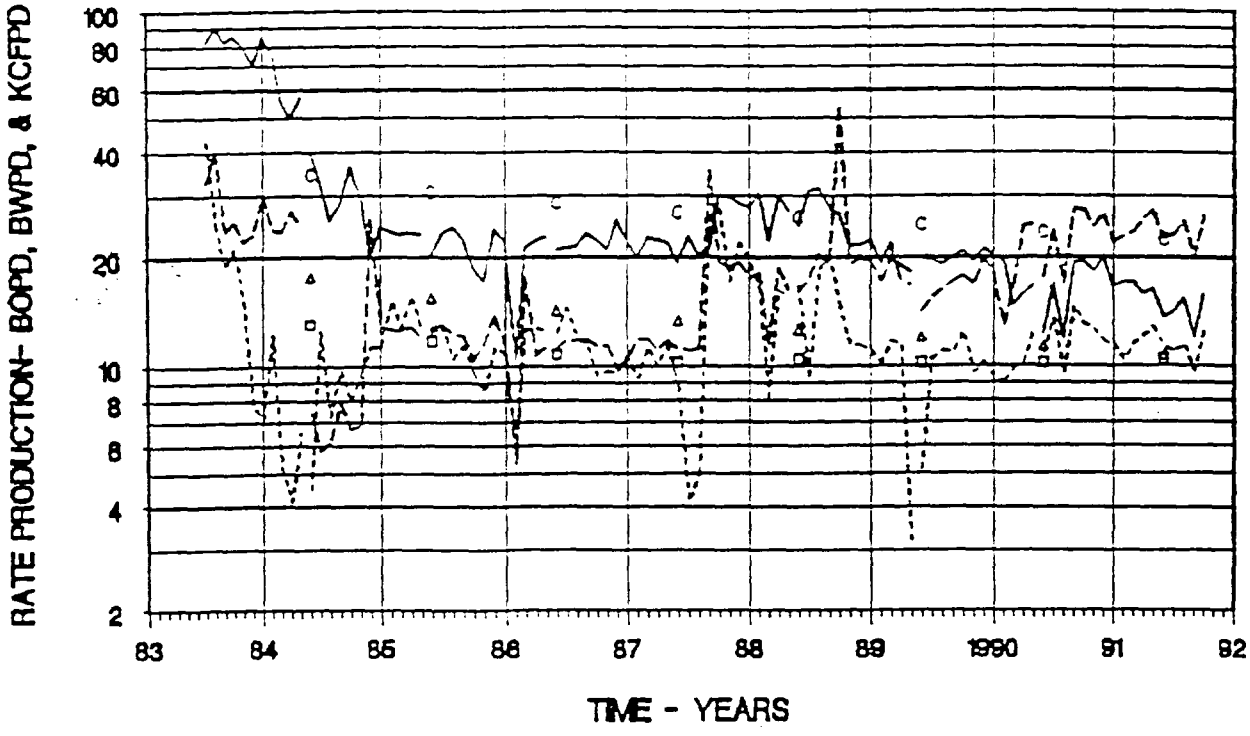
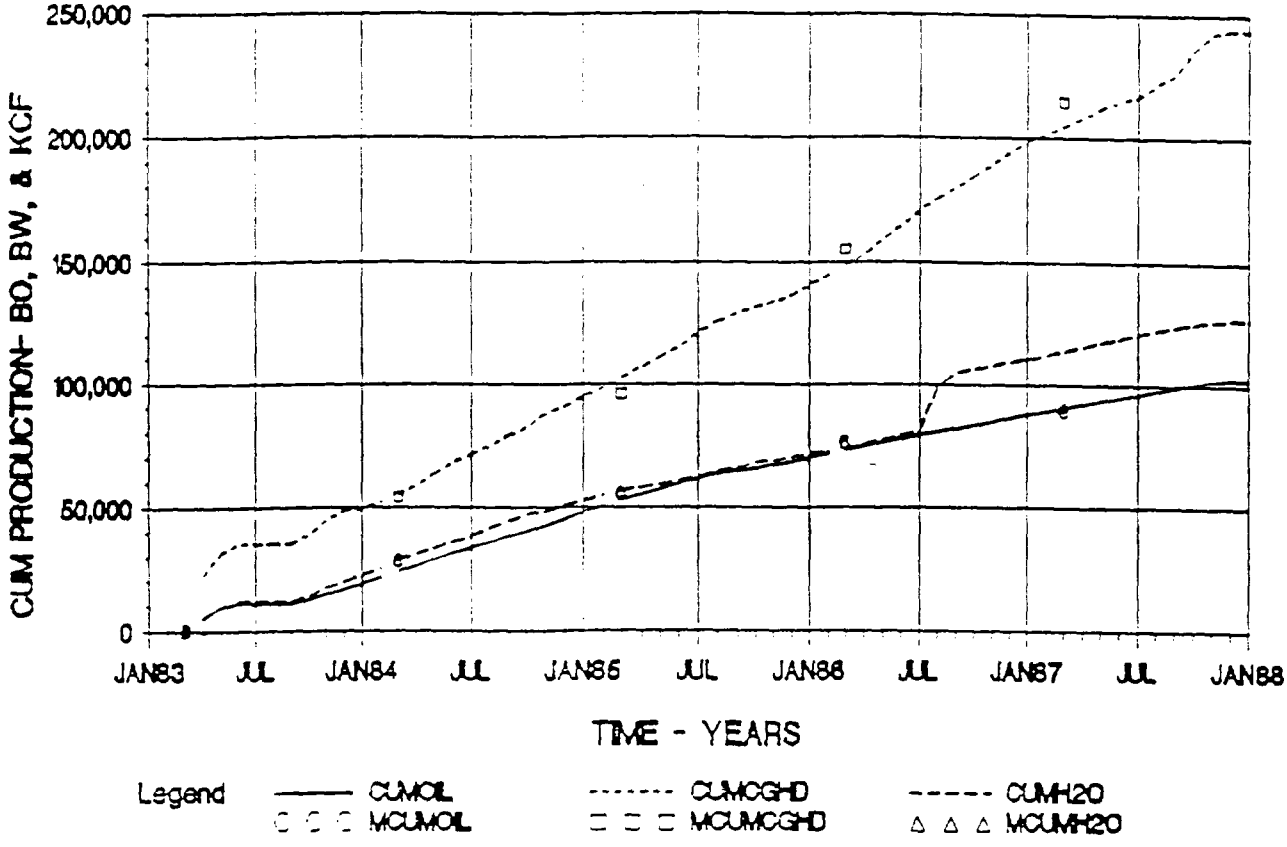


Exhibit F-12

AVALON UBC
YATES C FEDERAL NO. 6 HISTORY MATCH



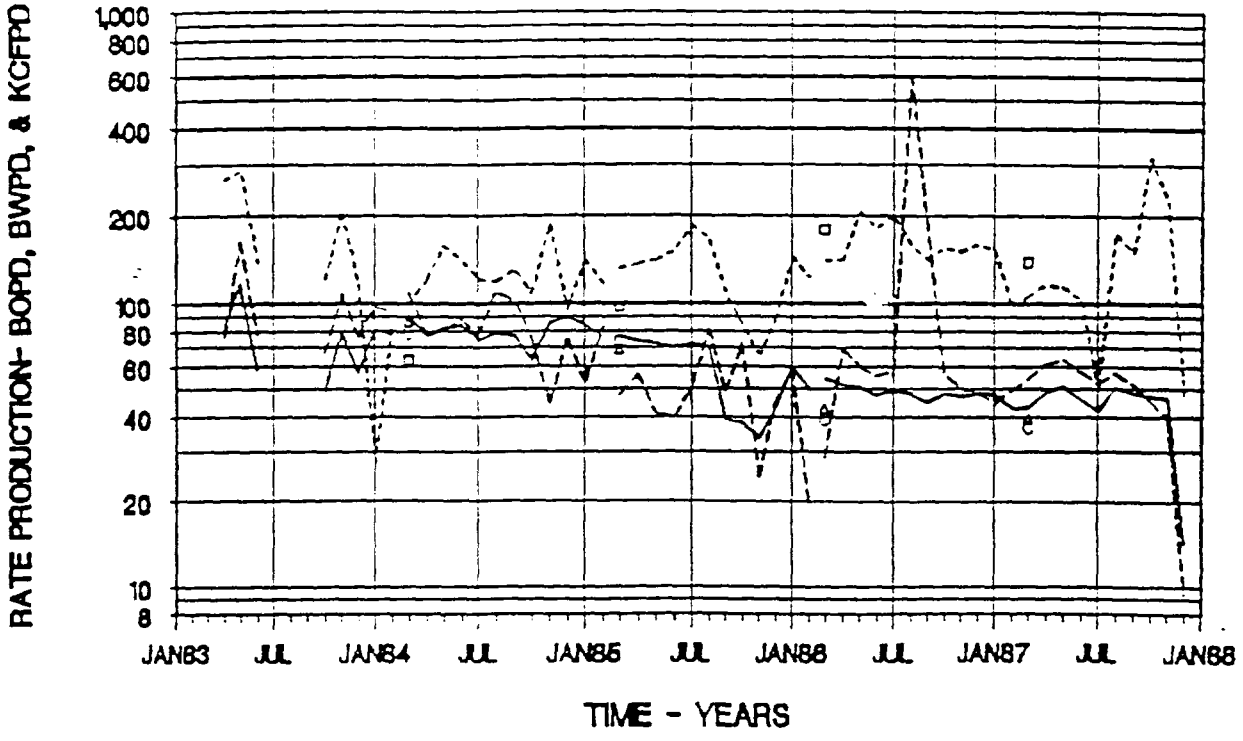
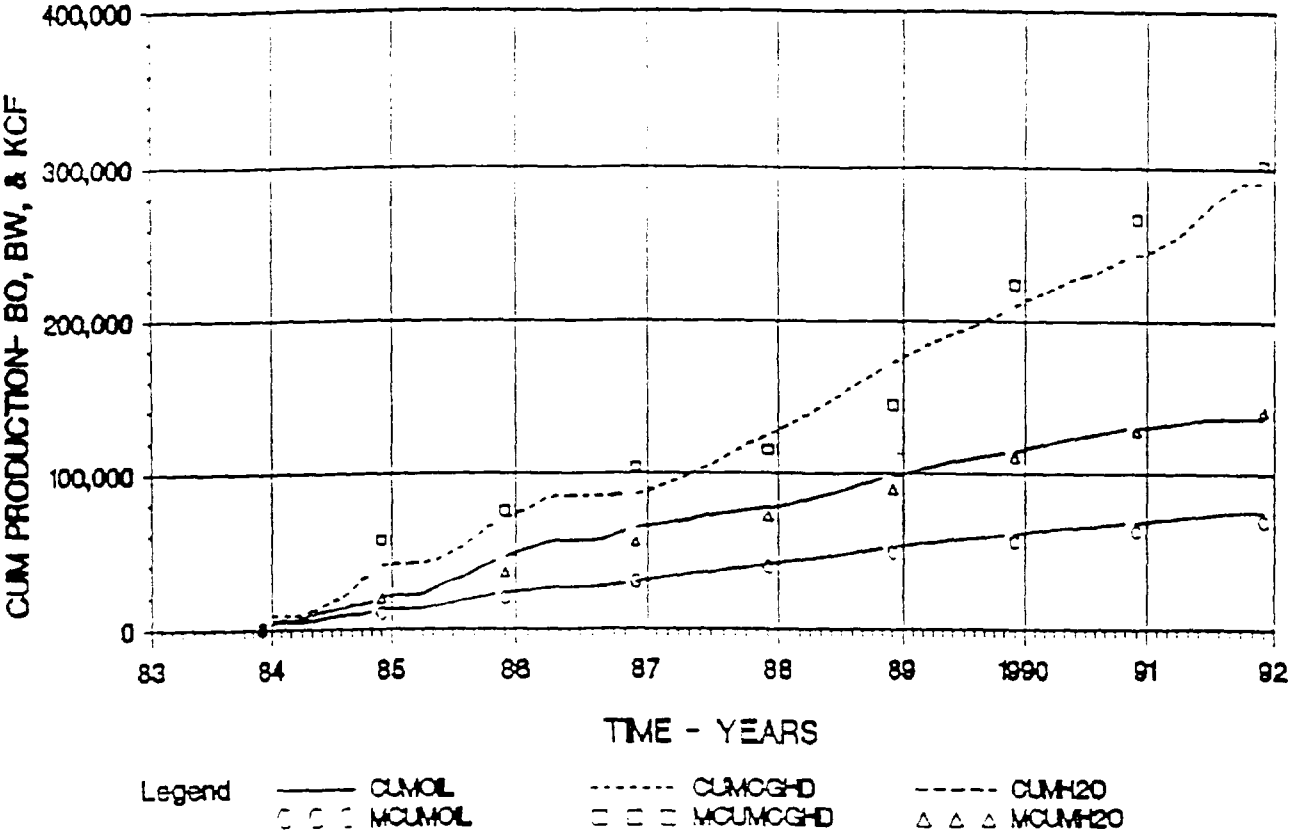


Exhibit F-13

AVALON UBC

STONEWALL WM STATE NO. 6 HISTORY MATCH



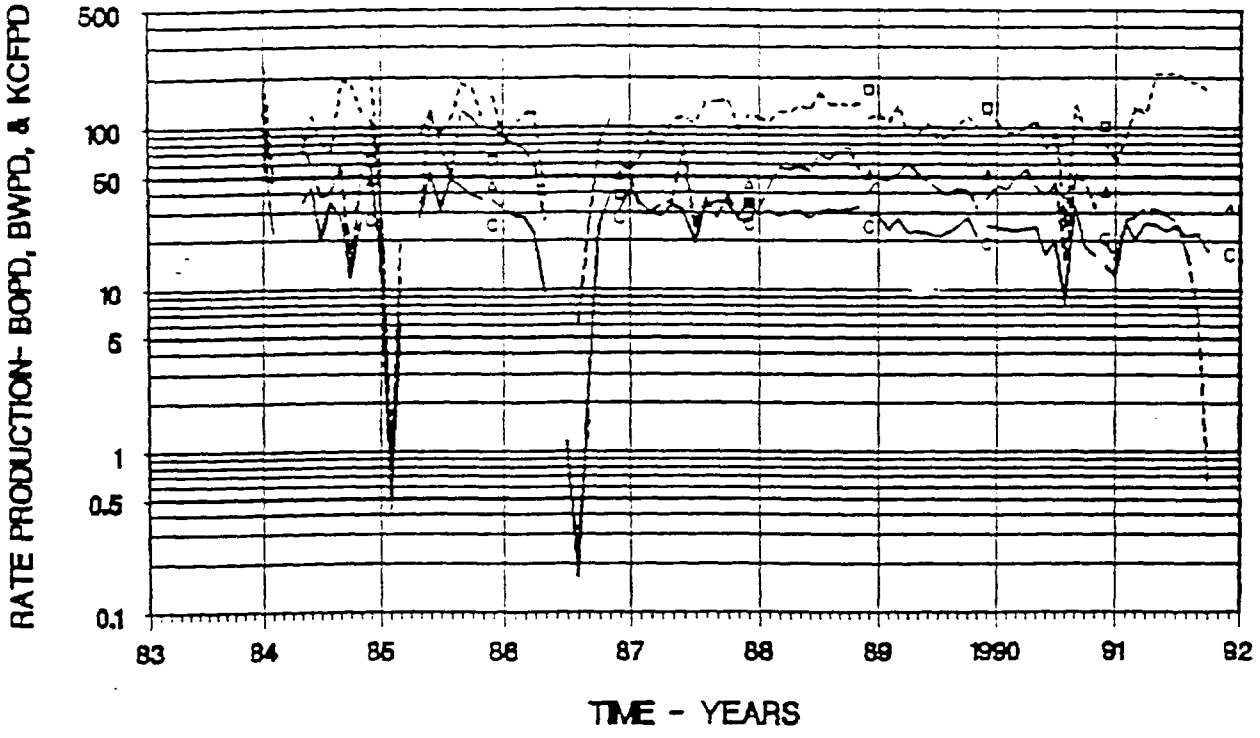
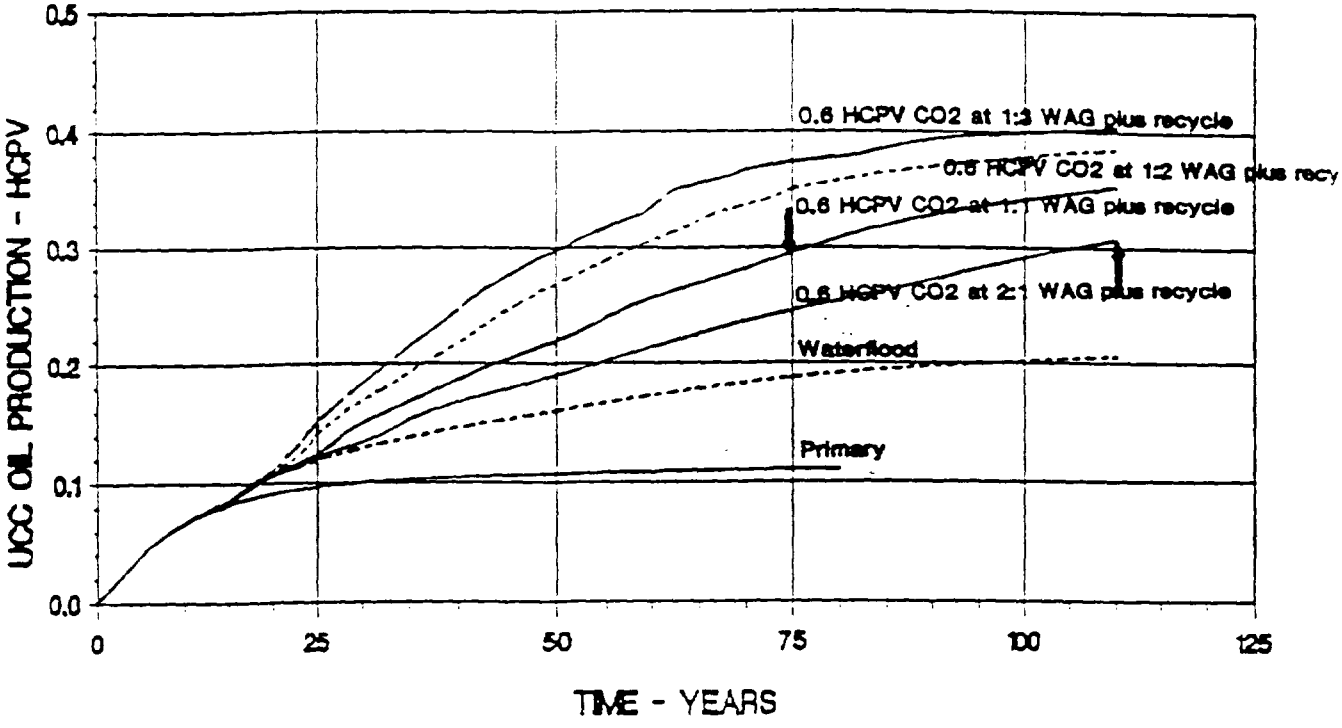
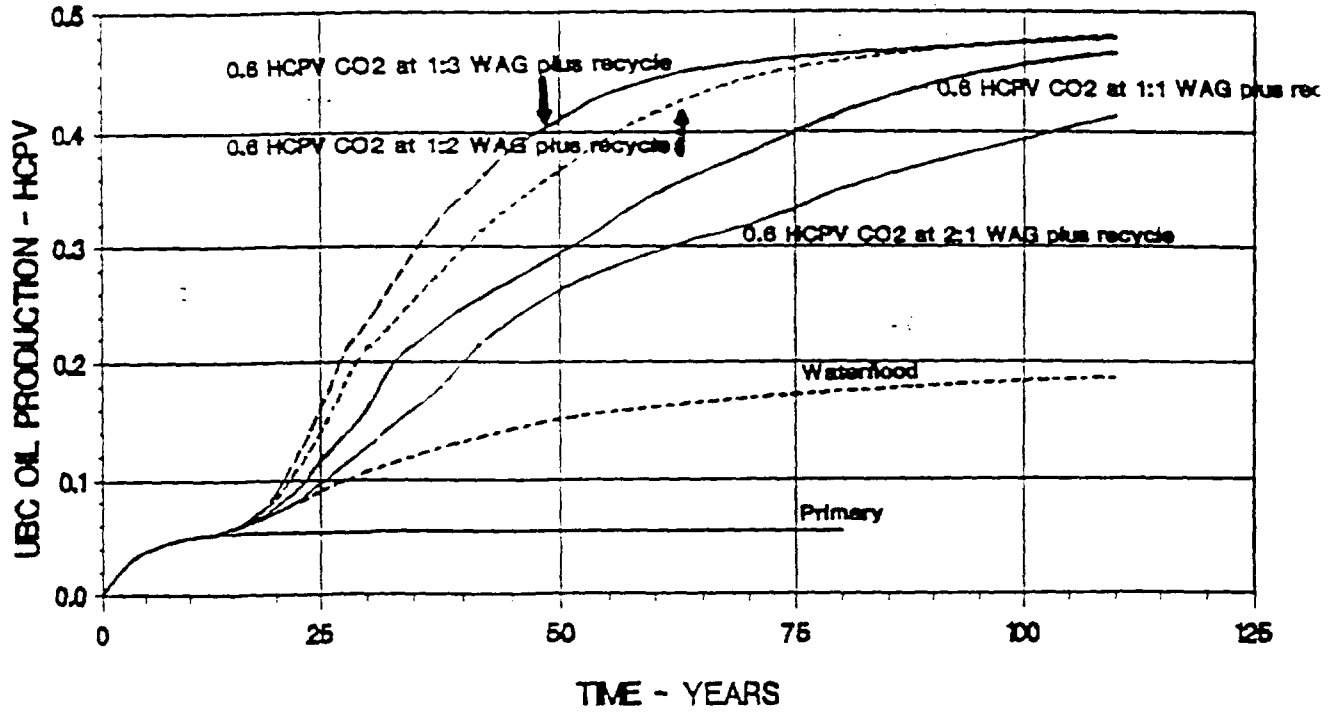


Exhibit F-14

PATTERN ELEMENT MODEL PREDICTIONS
COMPARING WAG RATIOS





Yates 6

Exhibit F-19

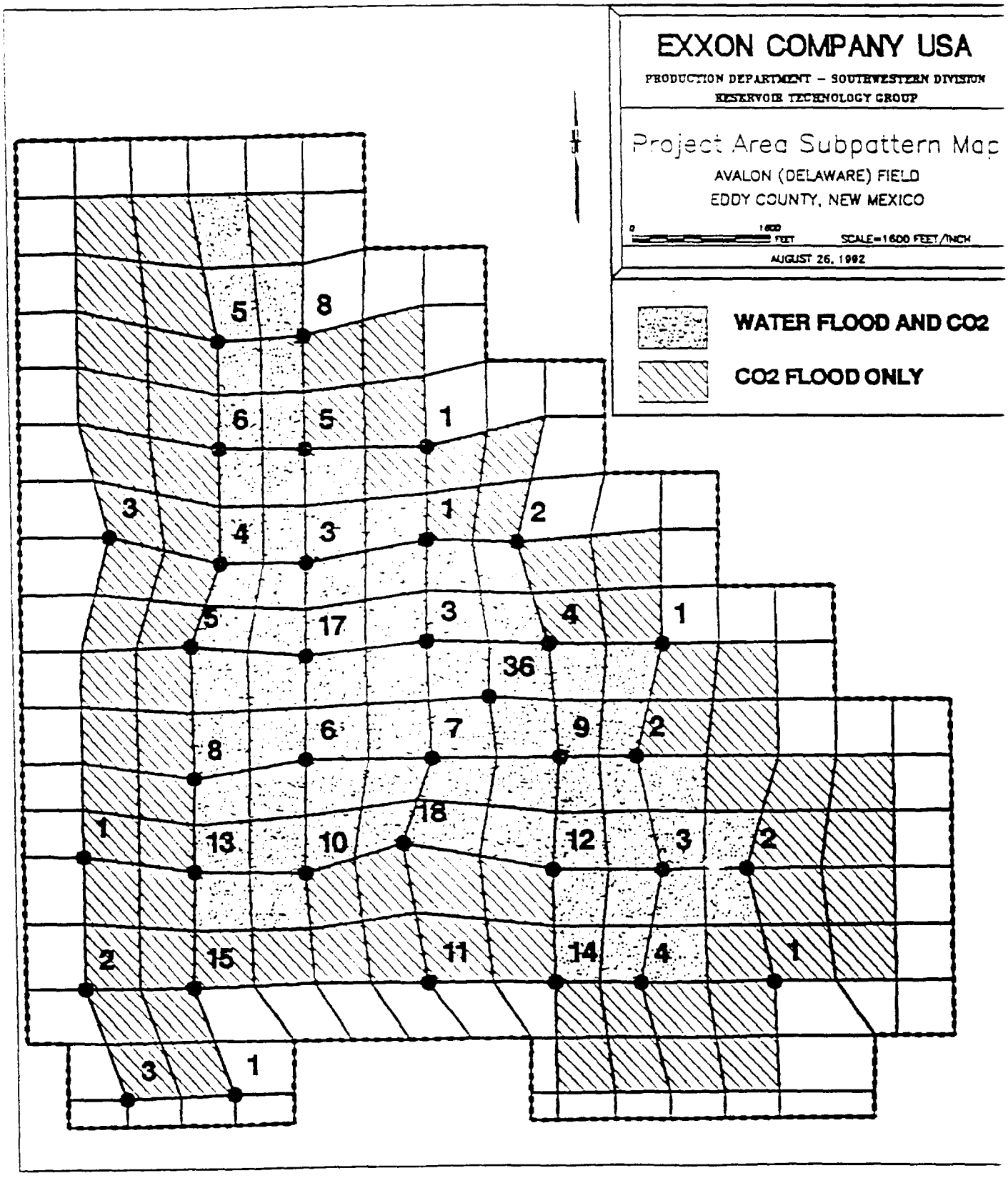
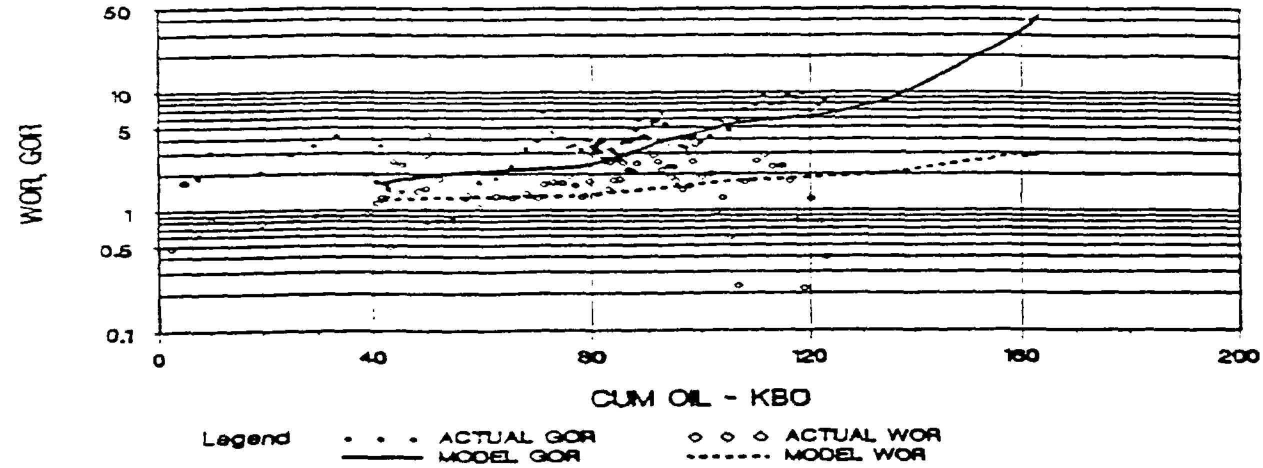

EXXON COMPANY USA
PRODUCTION DEPARTMENT – SOUTHWESTERN DIVISION
RESERVOIR TECHNOLOGY GROUP
Project Area Subpattern Map
AVALON (DELAWARE) FIELD
EDDY COUNTY, NEW MEXICO
0
1600 FEET
SCALE=1600 FEET/INCH
AUGUST 26, 1992
WATER FLOOD AND CO2
CO2 FLOOD ONLY
5
8
6
5
1
3
4
3
1
2
5
17
3
4
1
36
6
7
9
2
8
1
13
10
18
12
3
2
2
15
11
14
4
1
3
1

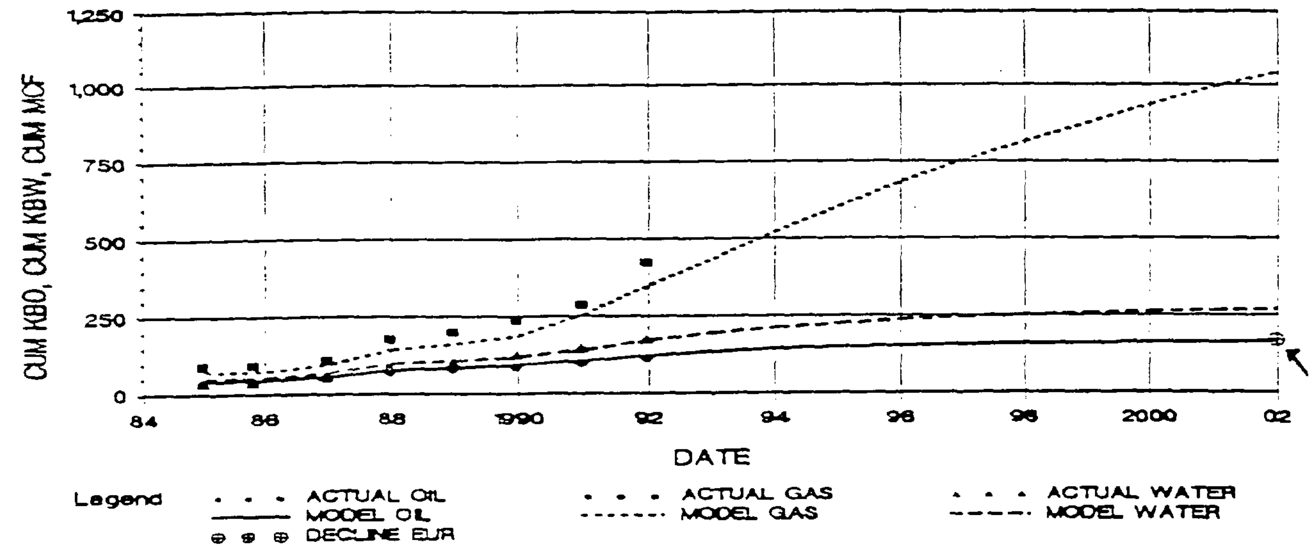
Exhibit G-2

PRIMARY HISTORY MATCH
WELL = STONEWALL EP STATE #05 (1311)

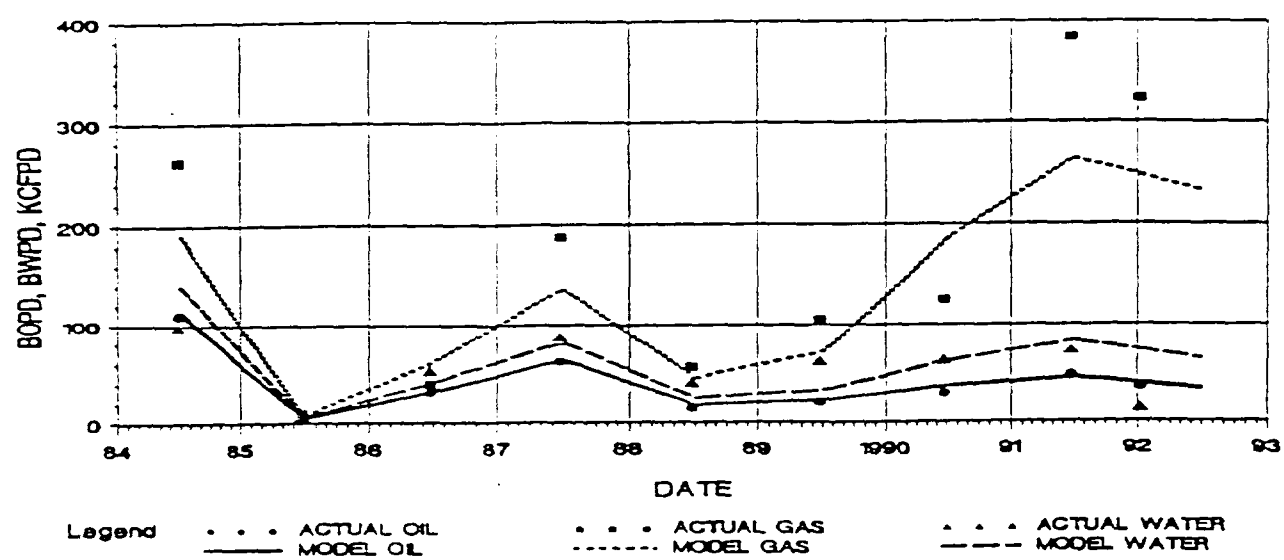
Main Match Criteria



WELL = STONEWALL EP STATE #05 (1311)

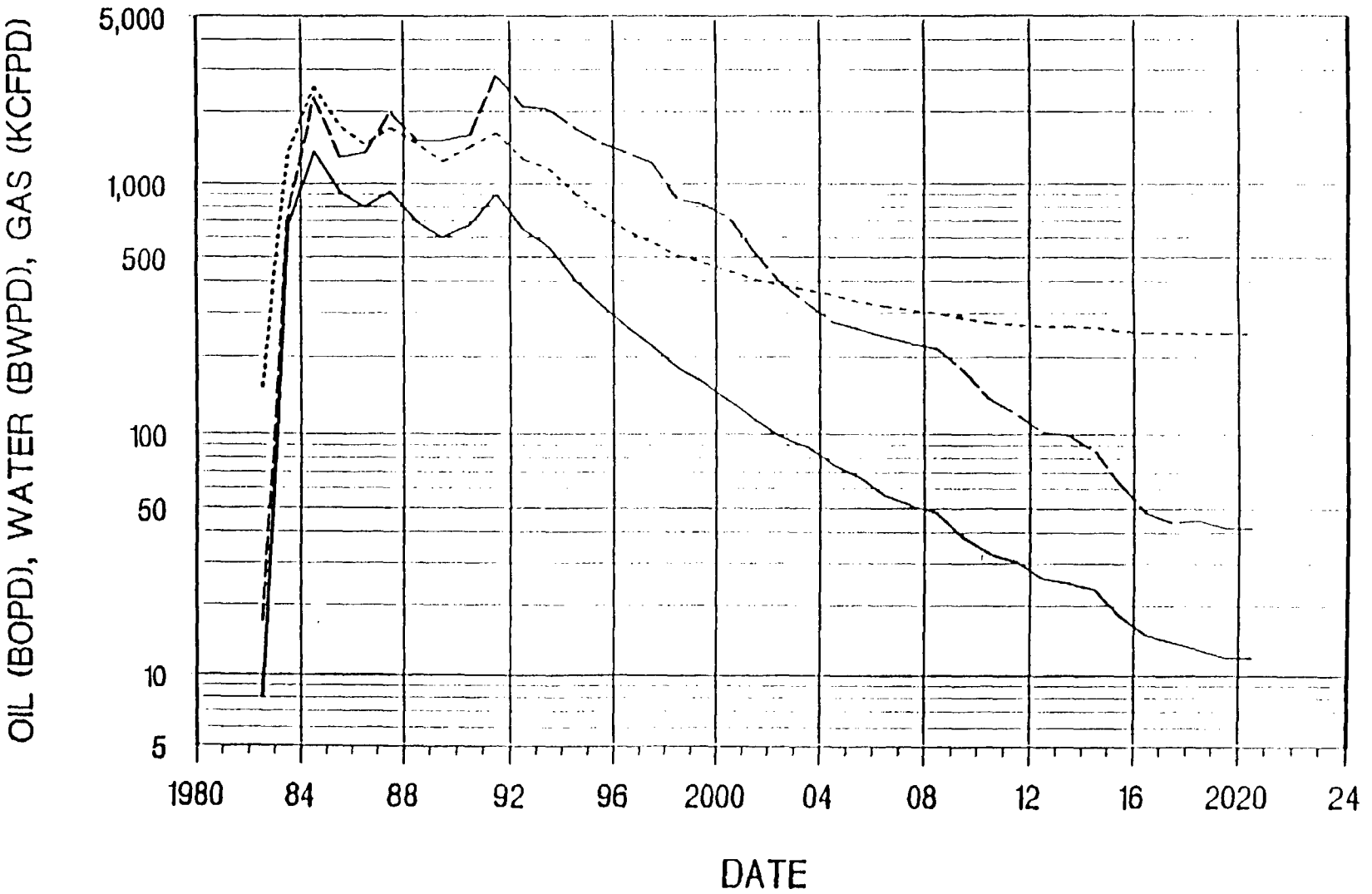


WELL = STONEWALL EP STATE #05 (1311)

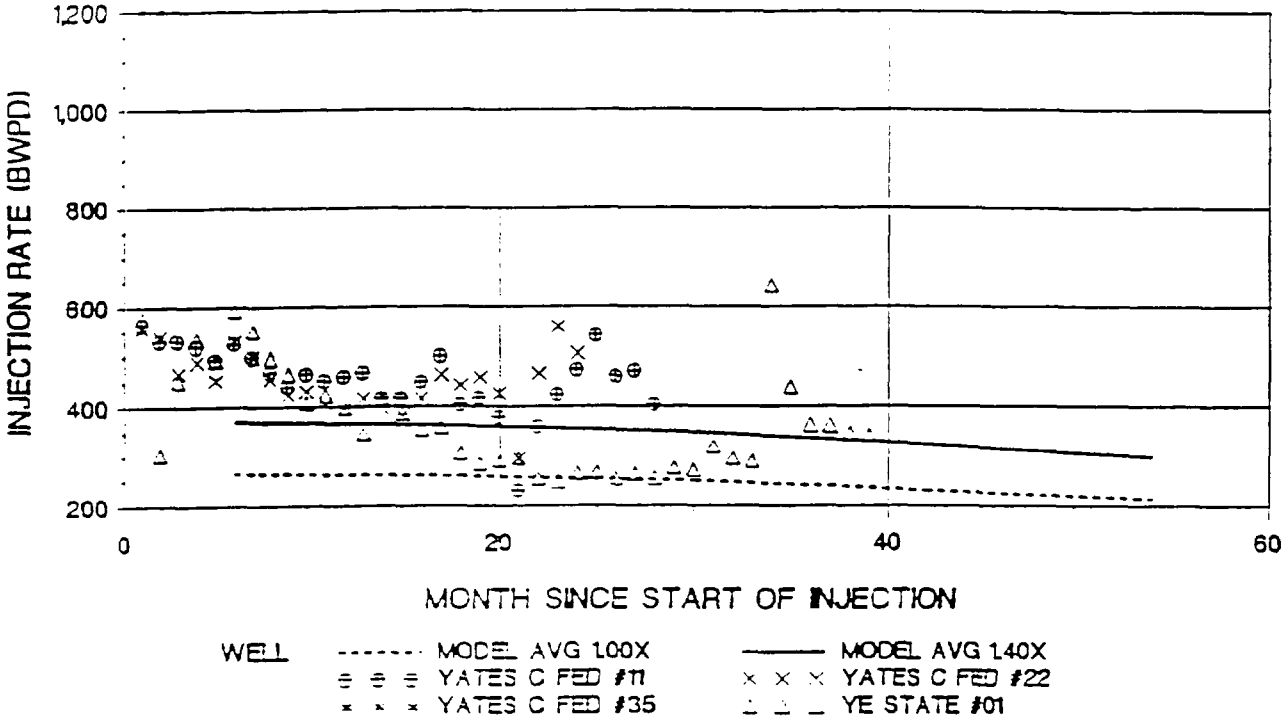


AVALON PROJECT FLOWSTREAMS

CONTINUED PRIMARY



AVALON WATER INJECTIVITY
COMPARISON OF ACTUAL VERSUS MODEL



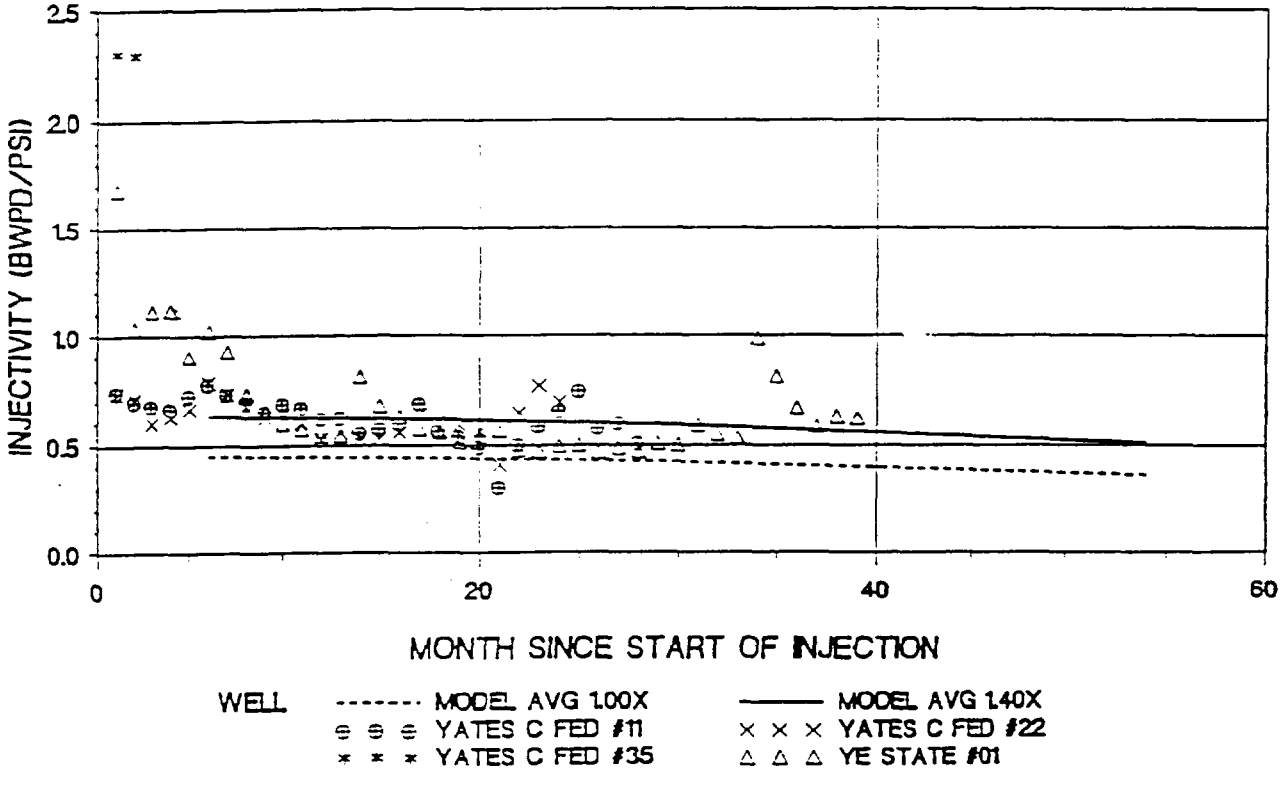
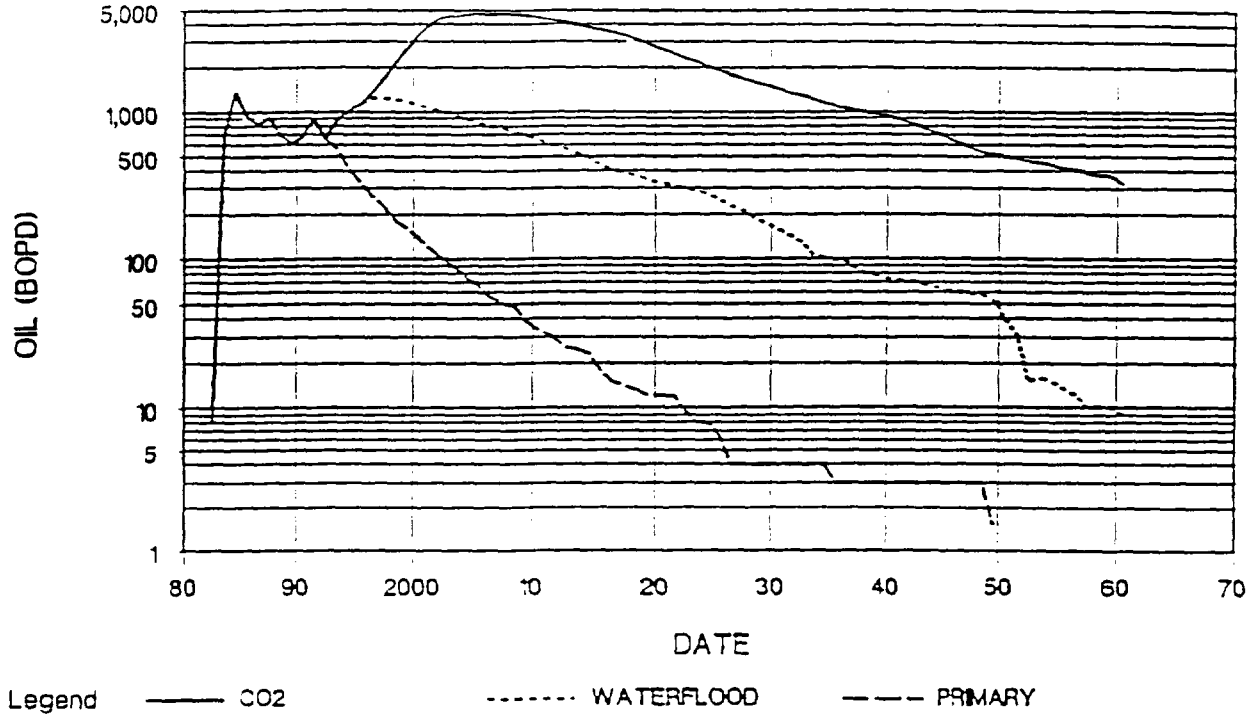


Exhibit G-12

AVALON PROJECT FLOWSTREAMS
PROJECT COMPARISON



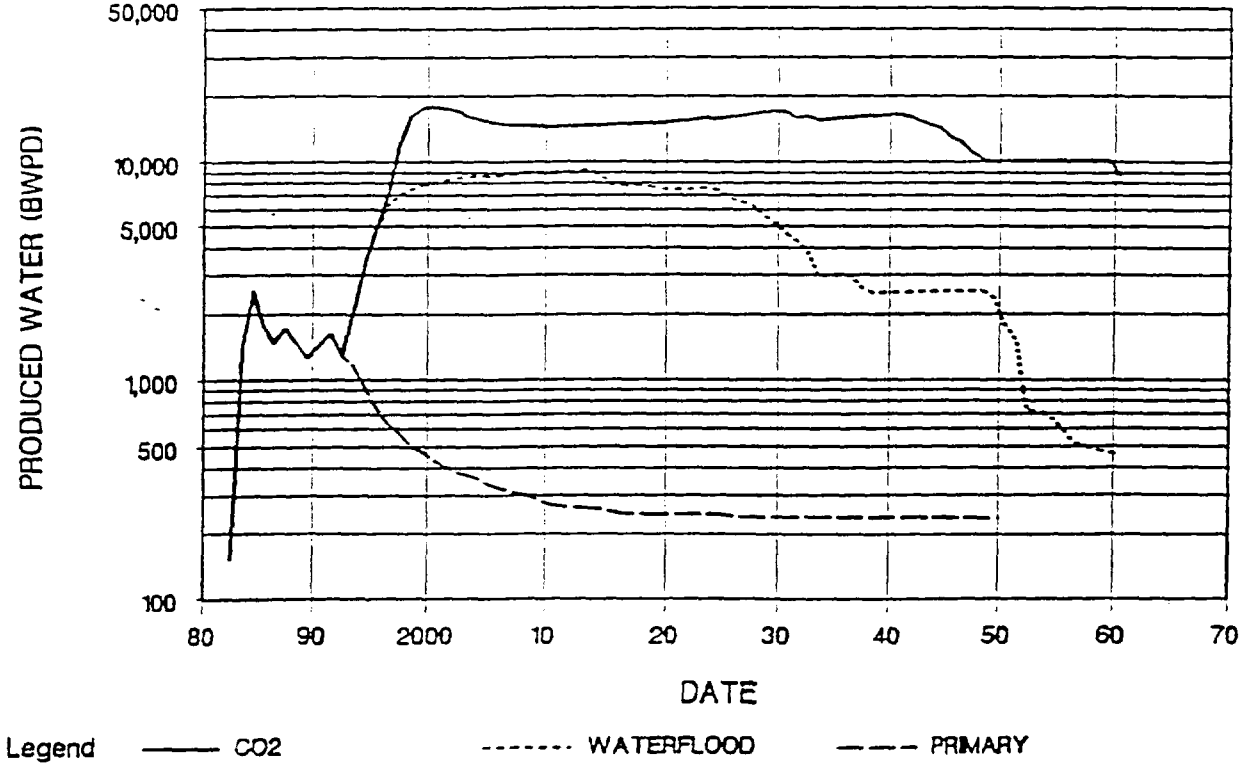


Exhibit G-15

Gol. IN
12-9-92

DECLINE CURVE ANALYSIS METHODOLOGY

- FOR CAPACITY WELLS:
  - DEFINE TIME INTERVAL FOR DECLINE ANALYSIS
  - DEVELOP LEAST-SQUARES FIT FOR LOG OIL RATE VS. TIME, OIL RATE VS. CUM OIL FOR TIME INTERVAL
  - GENERATE WEIGHTED EUR ESTIMATE, WEIGHTING BASED ON CORRELATION COEFFICIENT
- FOR GOR ALLOWABLE RESTRICTED WELLS:
  - DEFINE TIME INTERVALS OF CAPACITY PRODUCTION
  - DEVELOP LEAST SQUARE FIT OF CAPACITY OIL RATE VS. CUM OIL FOR TIME INTERVALS
  - DEFINE TIME INTERVAL FOR GOR TREND ANALYSIS
  - DEVELOP LEAST SQUARE FIT OF LOG GOR VS. CUM OIL
  - GENERATE WEIGHTED EUR ESTIMATE, WEIGHTING BASED ON CORRELATION COEFFICIENT

DECLINE CURVE ANALYSIS
EP #5, EP #8, YCF #3, YCF #4

EP #5 & #8

DATA SUPPORTING INCREASING EUR:

- UPDATED ANALYSIS THROUGH 7/92 W/TECH. RPT. METHODOLOGY
- GOR LIMIT MAY HAVE BEEN RESTRICTIVE
- CAPACITY DECLINE ANALYSIS FOR 10/90-7/92

DATA SUPPORTING DECREASING/NO CHANGE:

- GOR HAS INCREASED TO 8,000-10,000 RANGE
- GOR VERSUS CUM OIL MODELING
- CAPACITY DECLINE ANALYSIS FOR 4/91-7/92

YCF #3

Data Supporting decreasing EUR:

- Updated analysis through 7/92 w/Tech. Rpt. methodology
- Capacity decline analysis for 3/91-7/92

Data supporting increasing/no change:

- GOR still in 4,000-5,000 range
- Performance of YCF #36

YCF #4

Data supporting decreasing EUR:

- Alternate capacity analysis for 12/88-12/90 (well"shut-in" 1991 due to YCF #36 D&C)

Data supporting increasing/no change:

- Technical Report analysis
- Performance of YCF #36
- GOR versus cum oil modeling

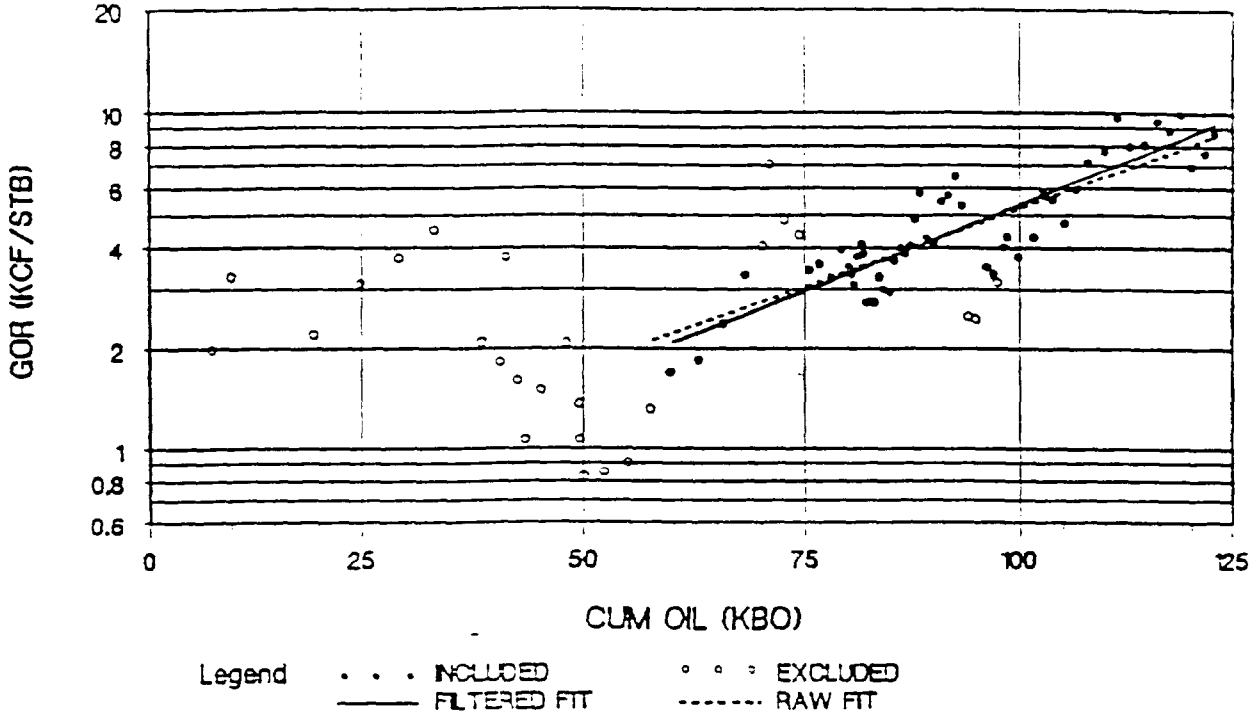
12-9-92

AVALON DECLINE CURVE ANALYSIS

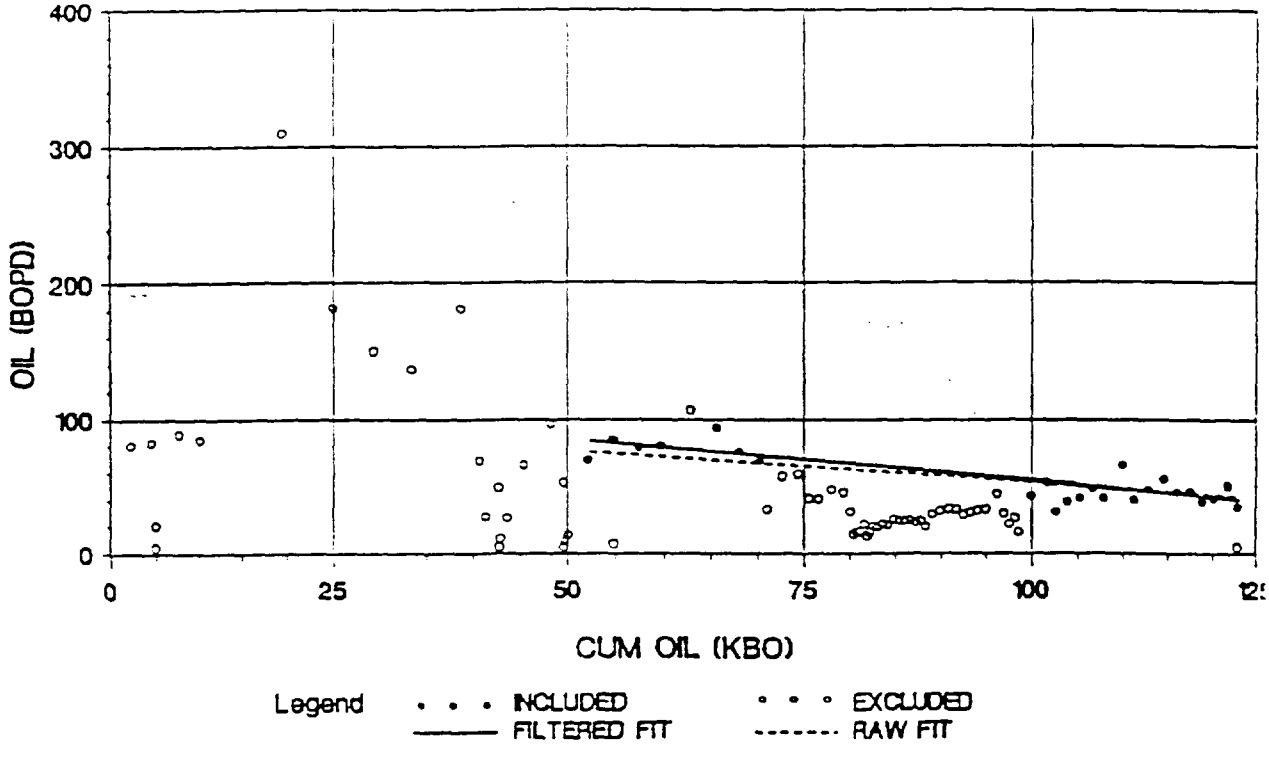
Well	Technical Report Methodology: Capacity Production Date Ranges			GOR Date Range	Tech Rpt EUR	7/92 Update EUR	GOR lim = 30,000 EUR	Capacity Decline Analysis: Date Range	Weighted EUR	Date Range	Weighted EUR
	Range 1	Range 2	Range 3								
EP #5	10/86-3/87	4/87-6/87	9/90-1/92	1/87-1/92	171.6	176.9	186.3	10/90-7/92	252.4	4/91-7/92	153.1
EP #8	5/84-10/84	1/87-6/87	9/90-1/92	11/85-1/92	141.2	144.2	153.2	10/90-7/92	187.3	4/91-7/92	135.9
YCF #3	2/88-9/88	5/89-9/89	2/91-1/92	1/85-1/92	385.7	362.6	425.1	3/91-7/92	296.7		
YCF #4			8/89-6/91		239.7	NC	NC	12/88-12/90	191.2		
YCF #36					44.0			3/91-7/92	200.2		

AVALON FIELD DECLINE CURVES

WELL = STONEWALL EP STATE #05 (1311)

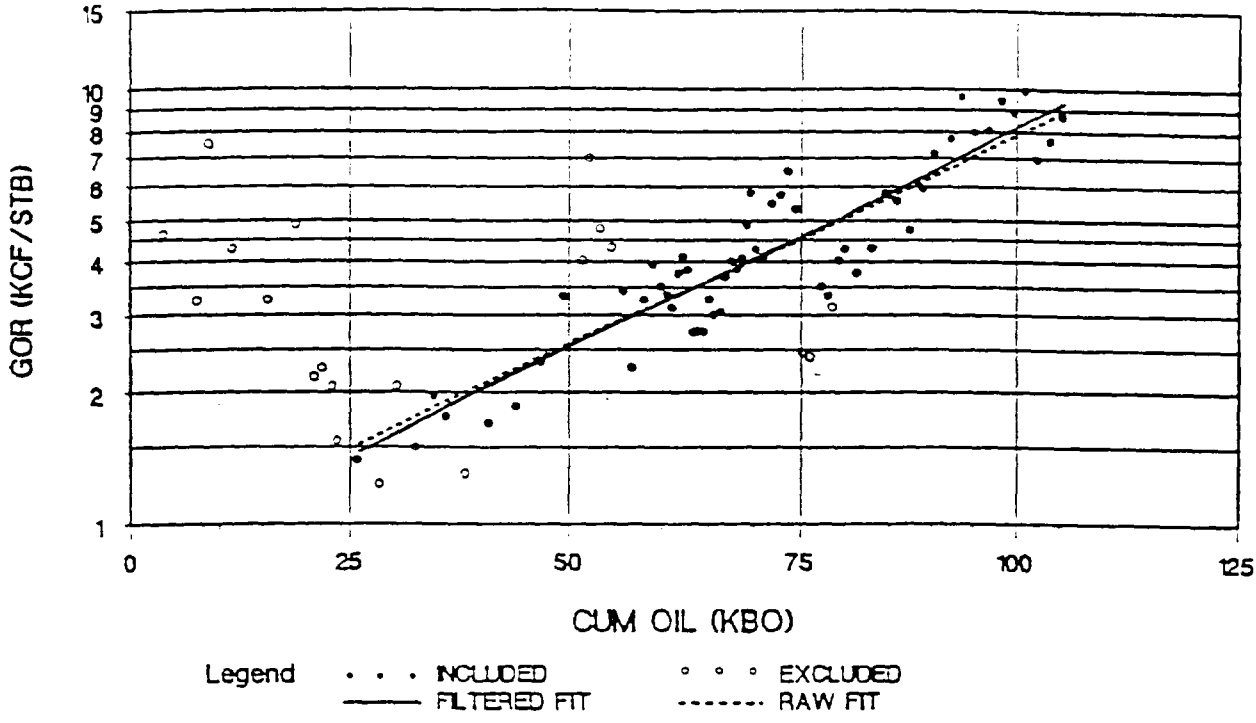


WELL = STONEWALL EP STATE #05 (1311)

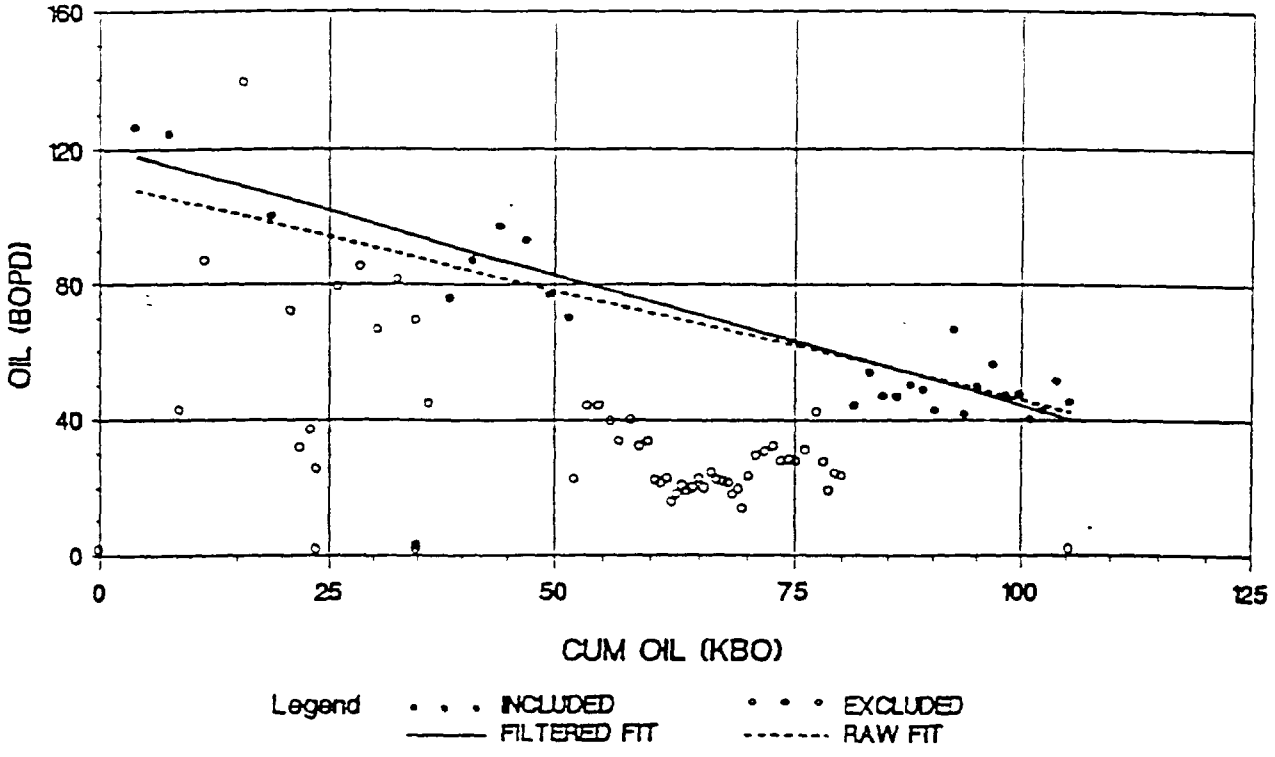


AVALON FIELD DECLINE CURVES

WELL = STONEWALL EP STATE #08 (1313)

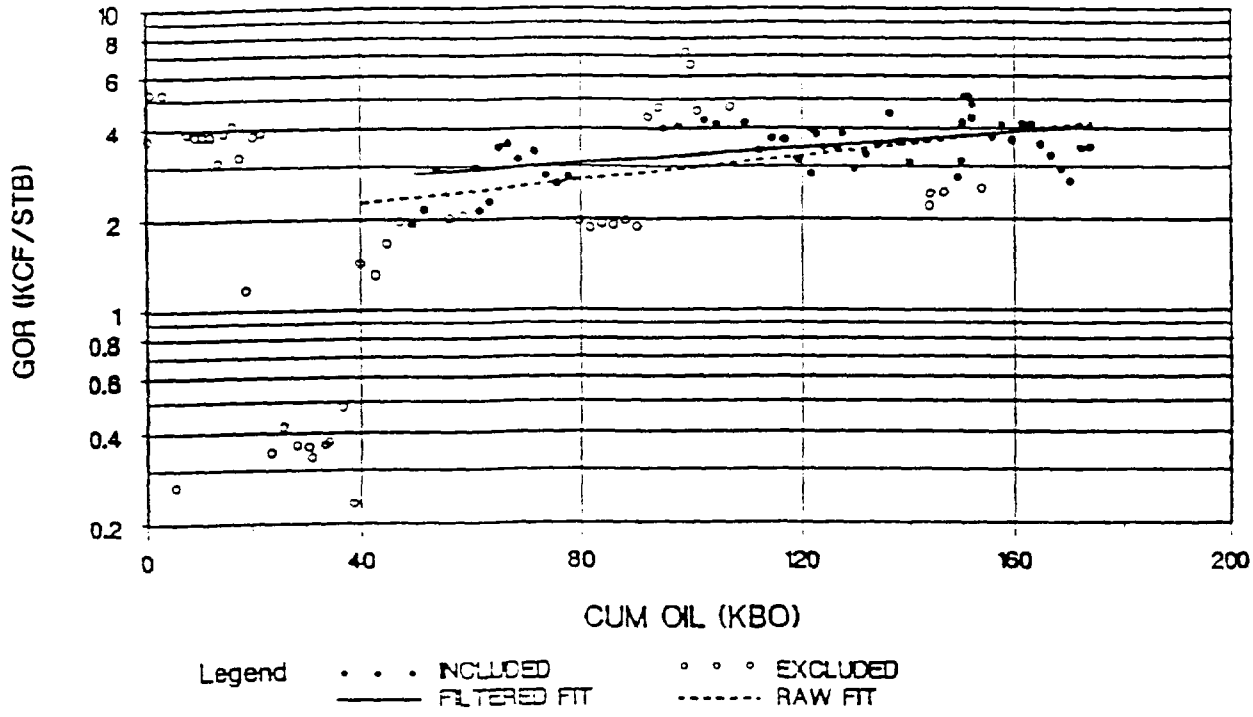


WELL = STONEWALL EP STATE #08 (1313)

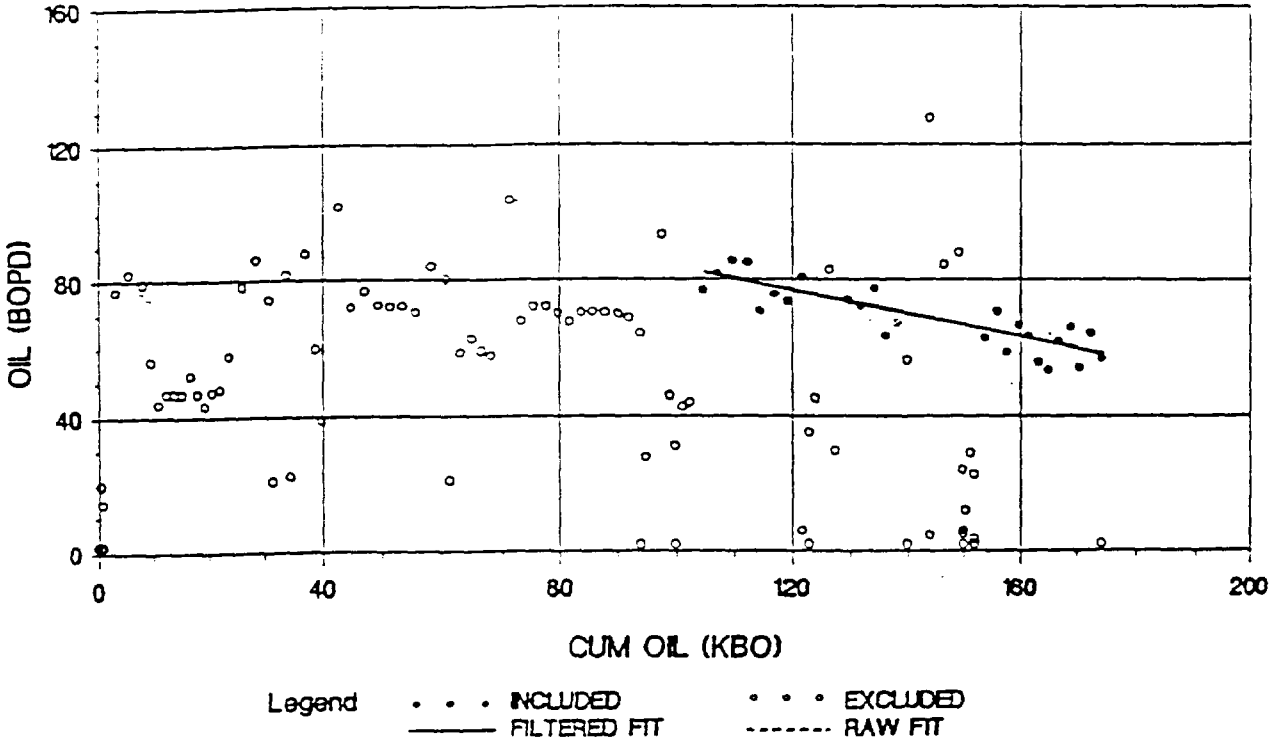


AVALON FIELD DECLINE CURVES

WELL = YATES C FEDERAL #03 (1915)

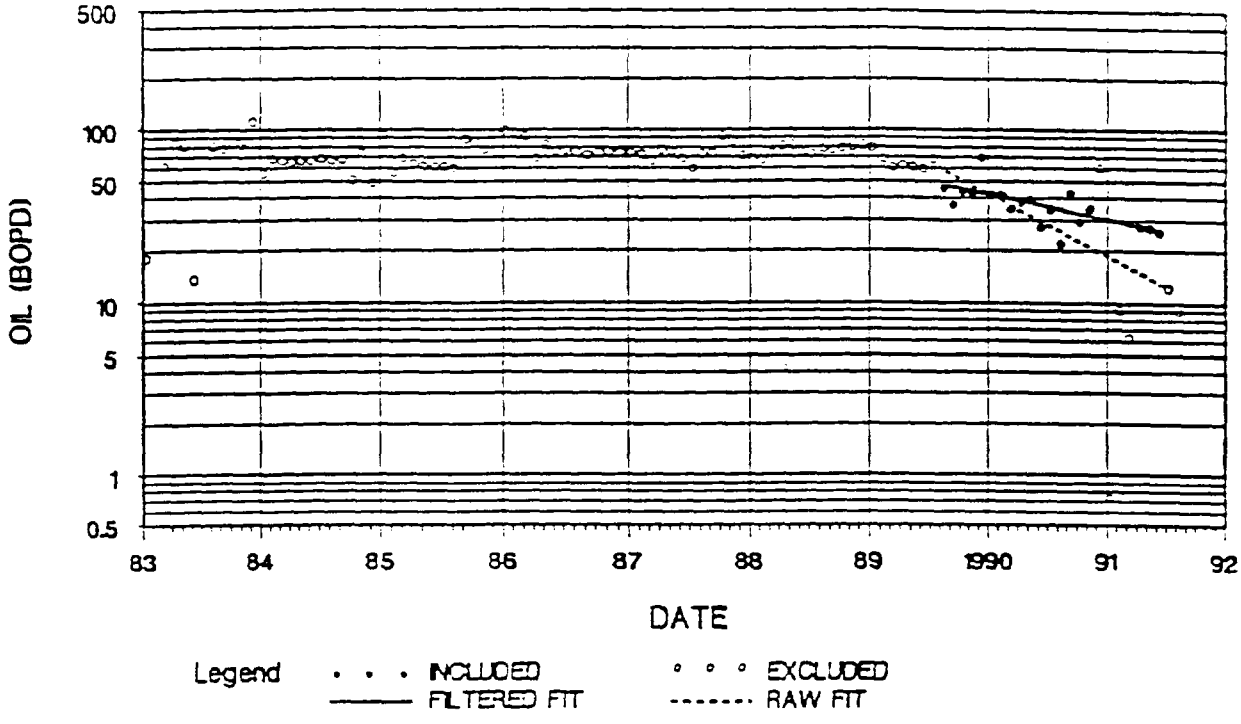


WELL = YATES C FEDERAL #03 (1915)

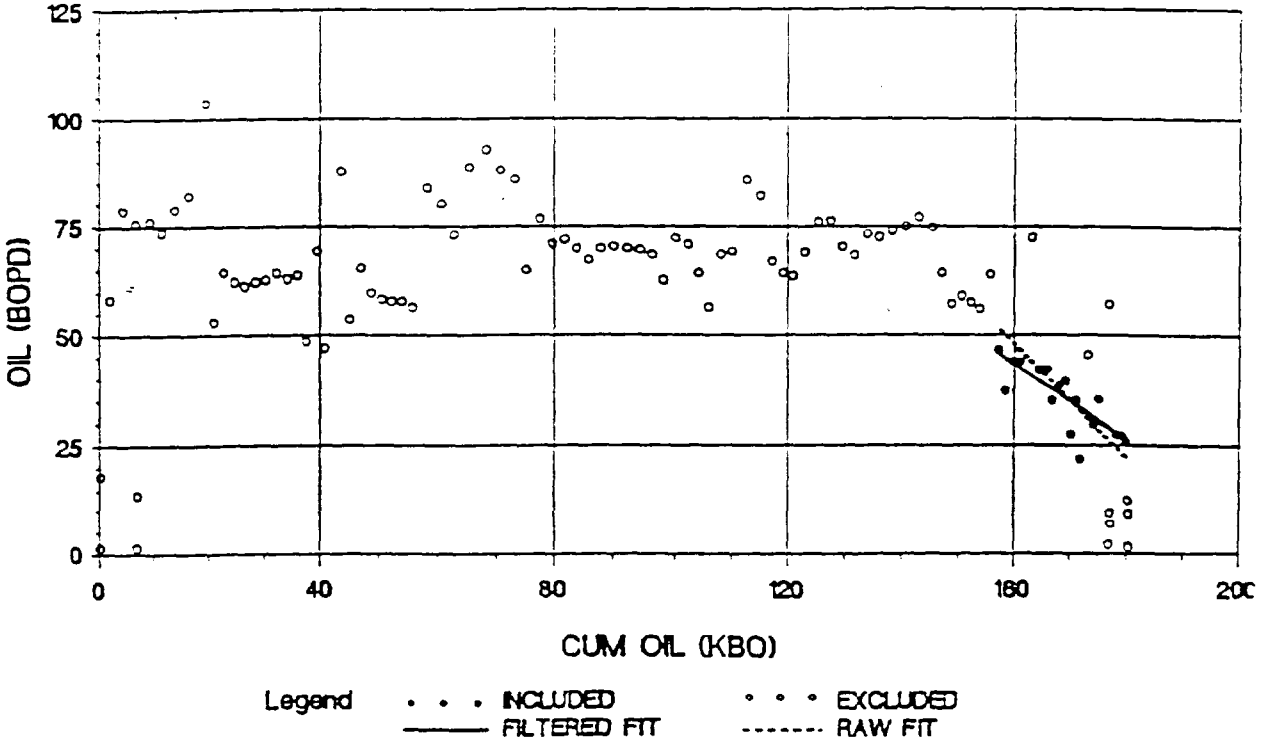


AVALON FIELD DECLINE CURVES

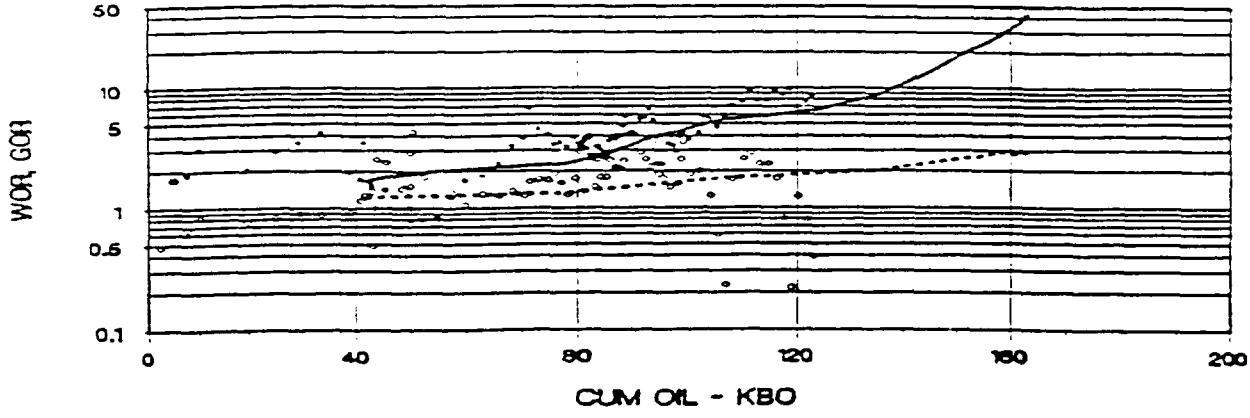
WELL = YATES C FEDERAL #04 (1917)



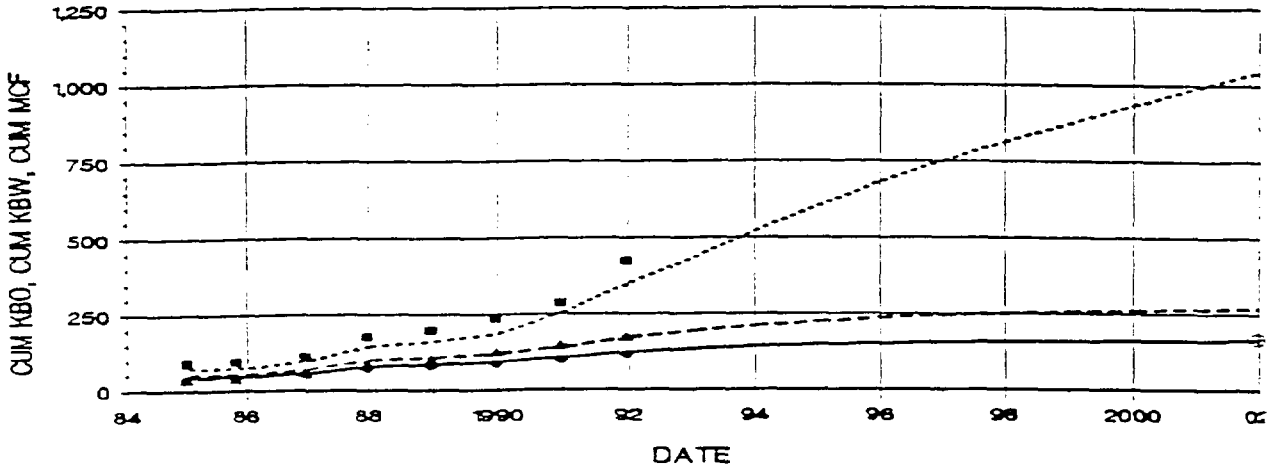
WELL = YATES C FEDERAL #04 (1917)



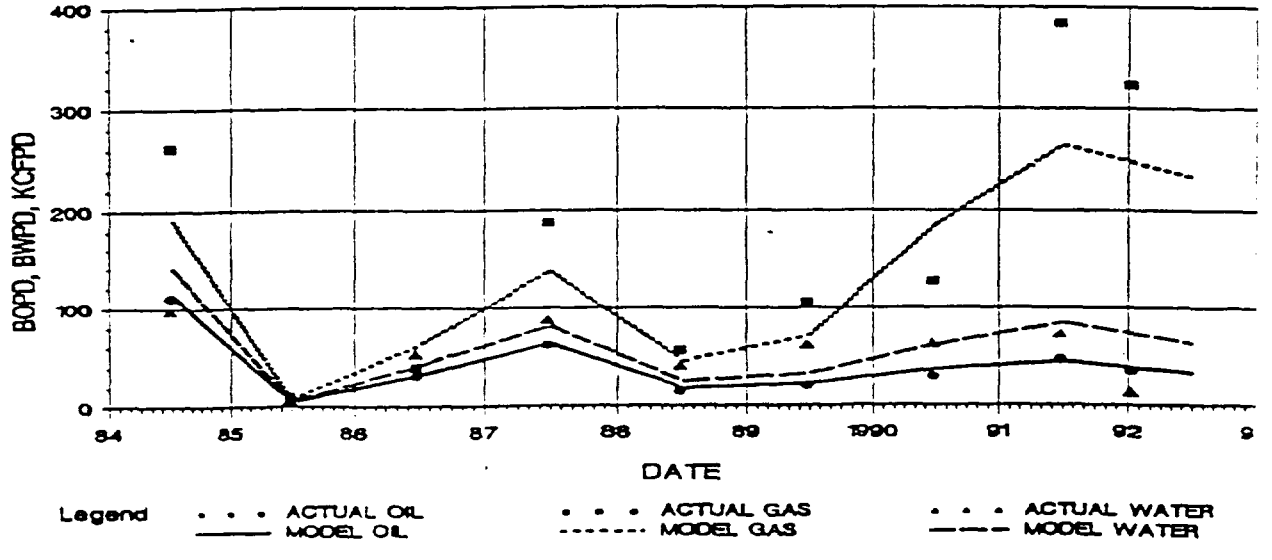
AVALON FIELD
PRIMARY HISTORY MATCH
WELL = STONEWALL EP STATE #05 (1311)



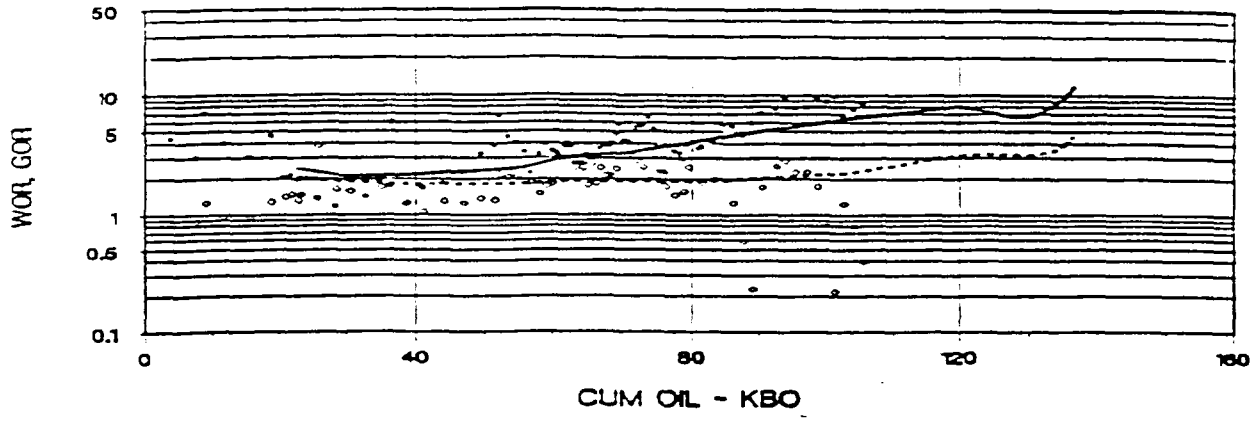
WELL = STONEWALL EP STATE #05 (1311)



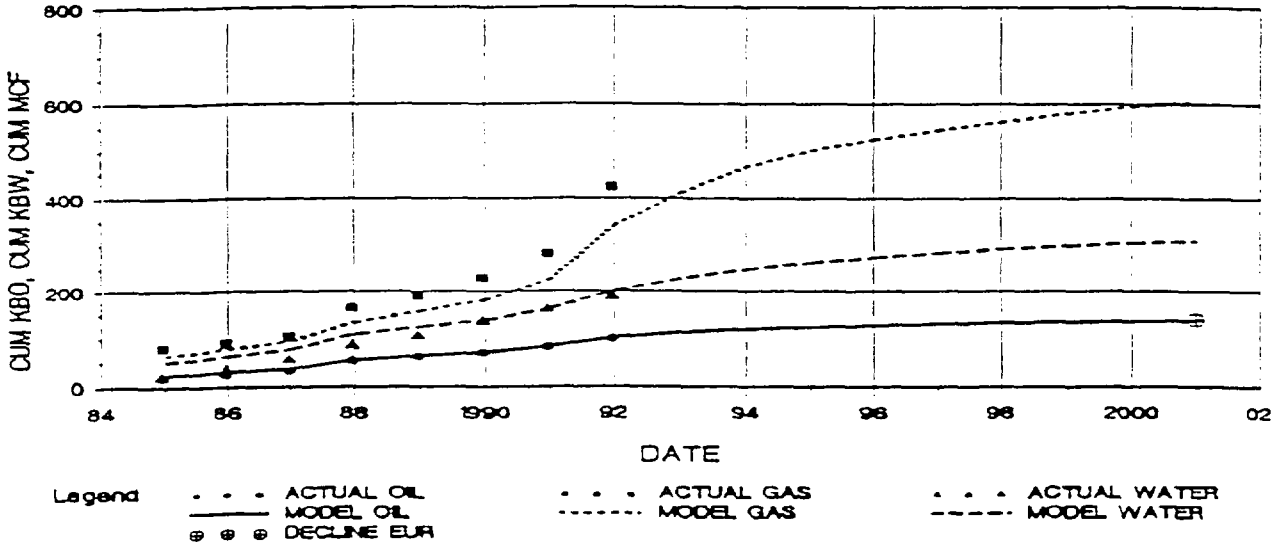
WELL = STONEWALL EP STATE #05 (1311)



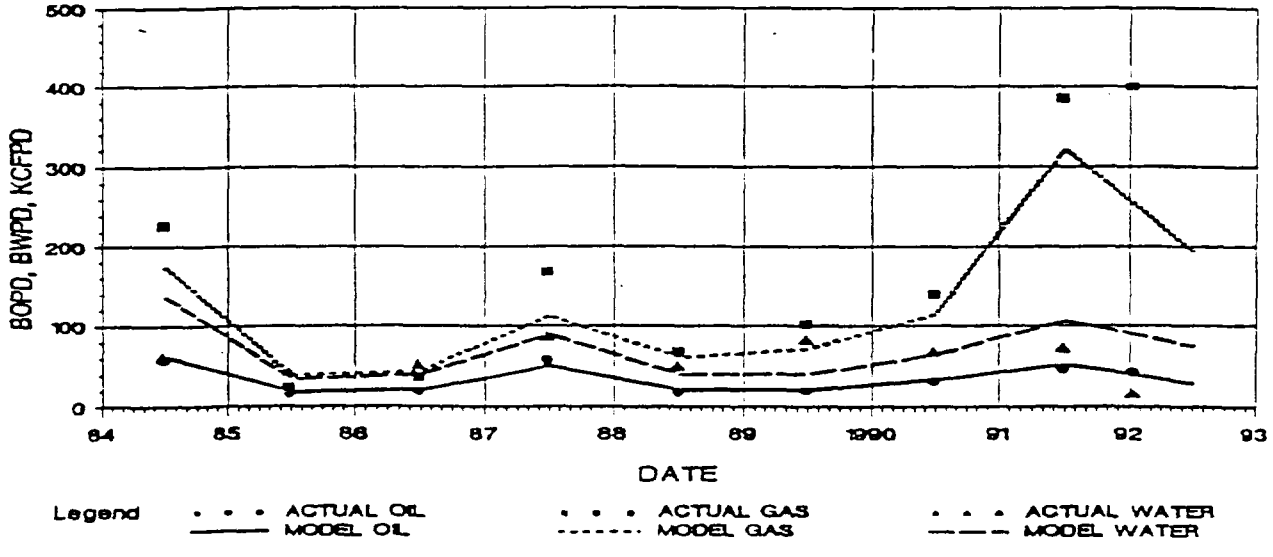
AVALON FIELD
PRIMARY HISTORY MATCH
WELL = STONEWALL EP STATE #08 (1313)



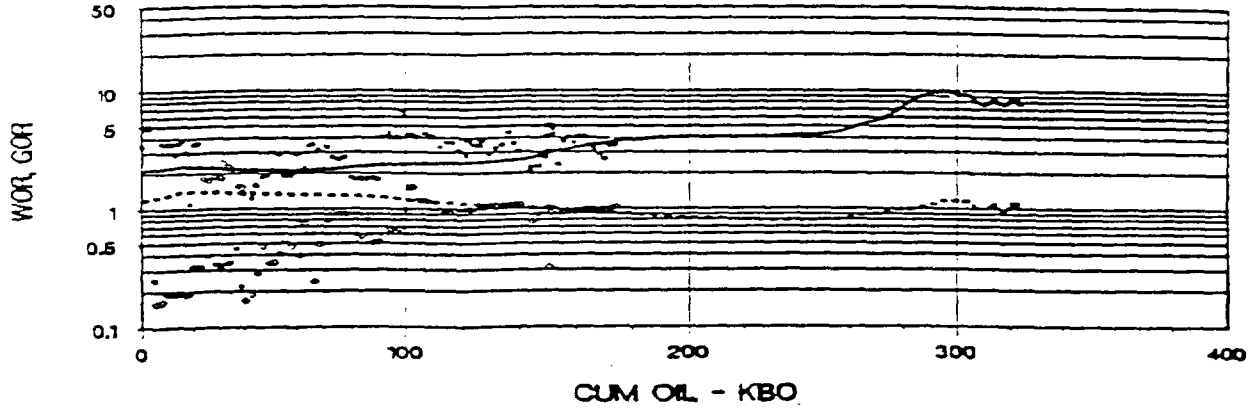
WELL = STONEWALL EP STATE #08 (1313)



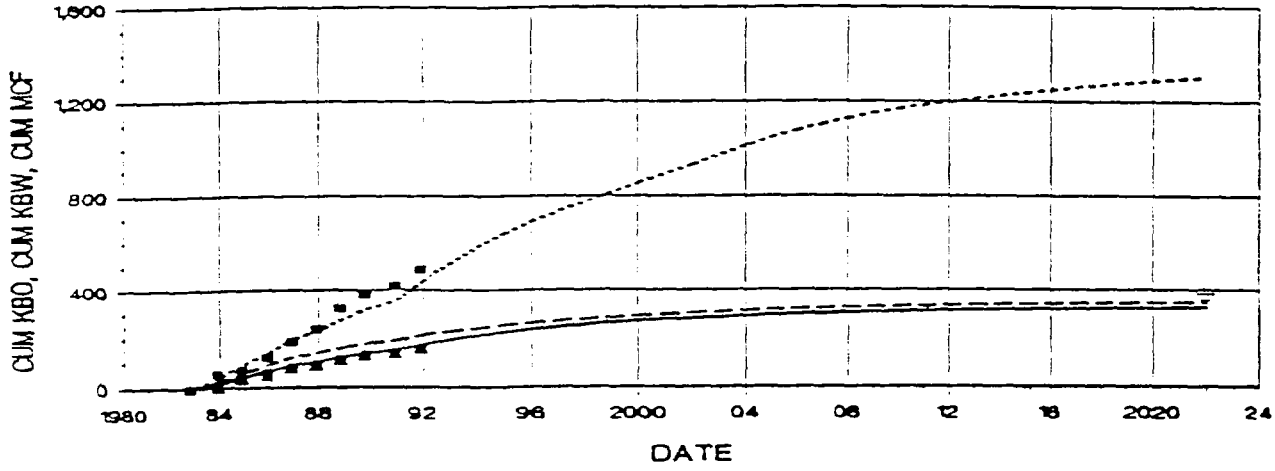
WELL = STONEWALL EP STATE #08 (1313)



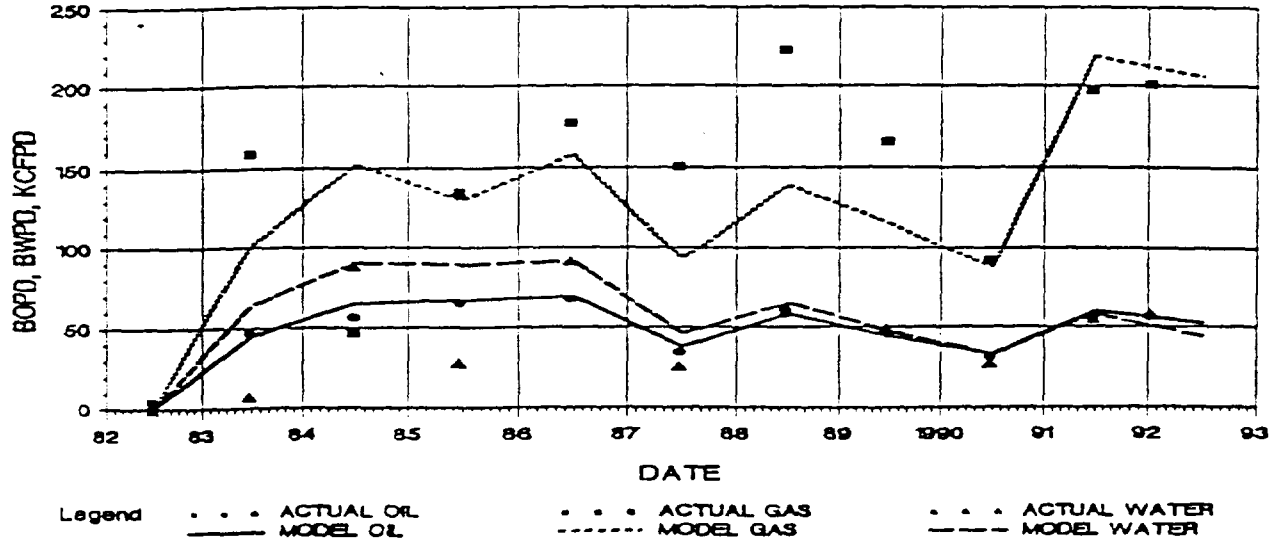
AVALON FIELD
PRIMARY HISTORY MATCH
WELL = YATES C FEDERAL #03 (1915)



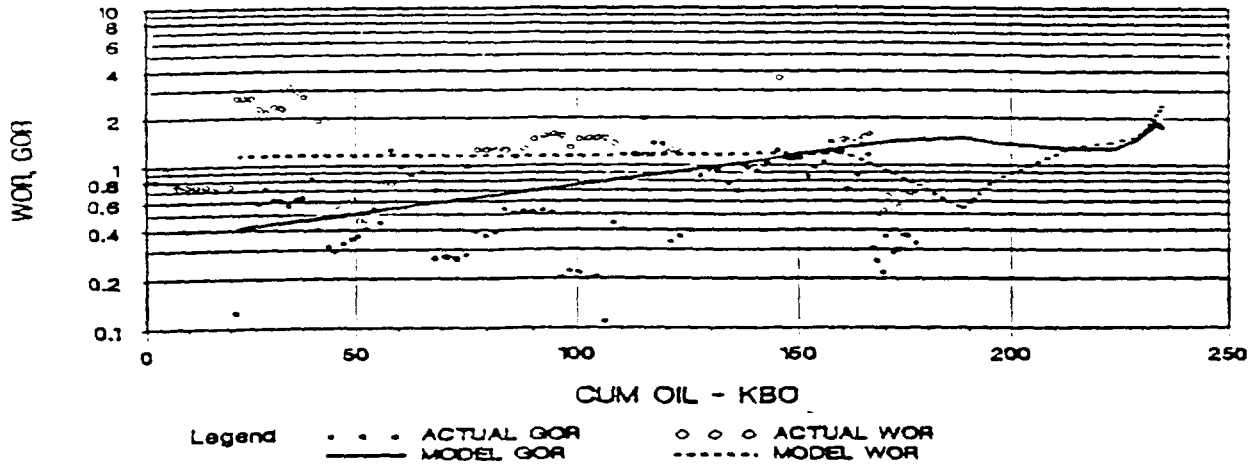
WELL = YATES C FEDERAL #03 (1915)



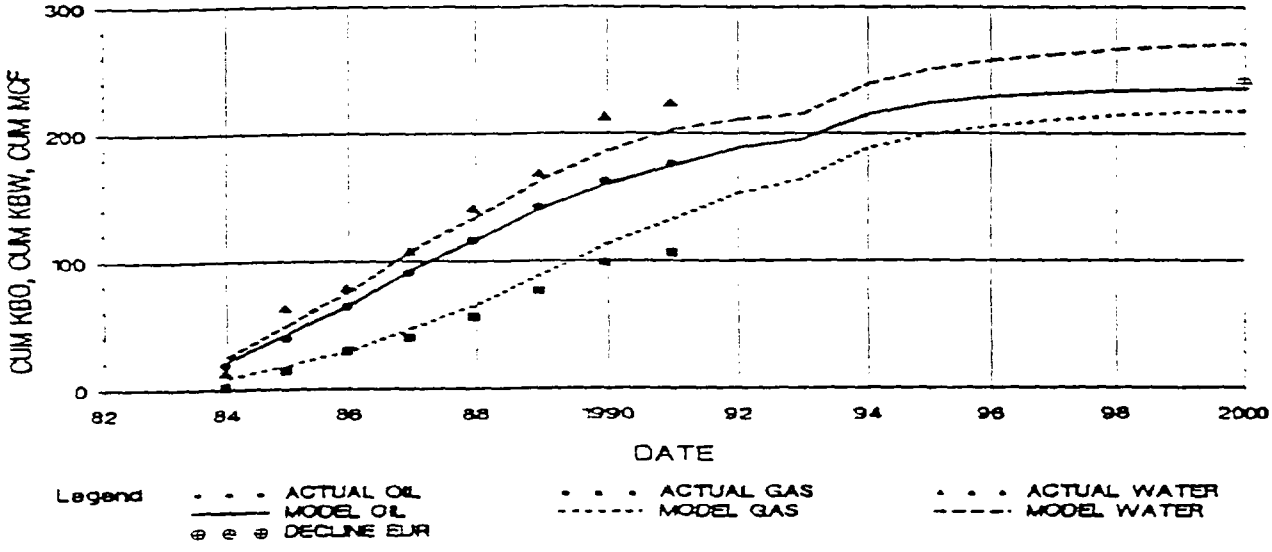
WELL = YATES C FEDERAL #03 (1915)



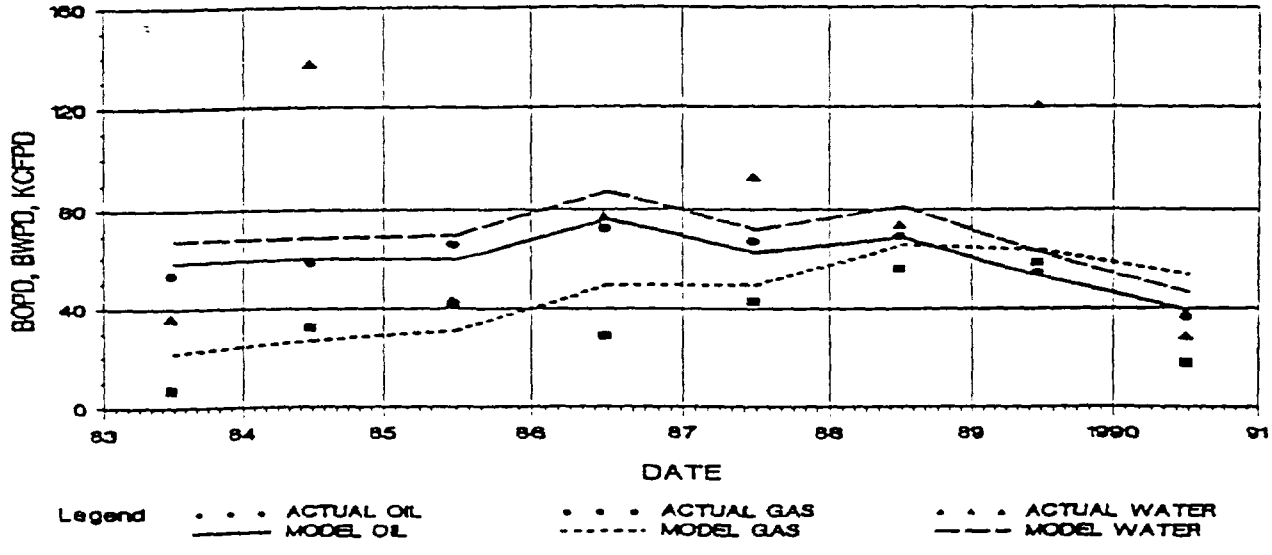
AVALON FIELD
PRIMARY HISTORY MATCH
WELL = YATES C FEDERAL #04 (1917)



WELL = YATES C FEDERAL #04 (1917)

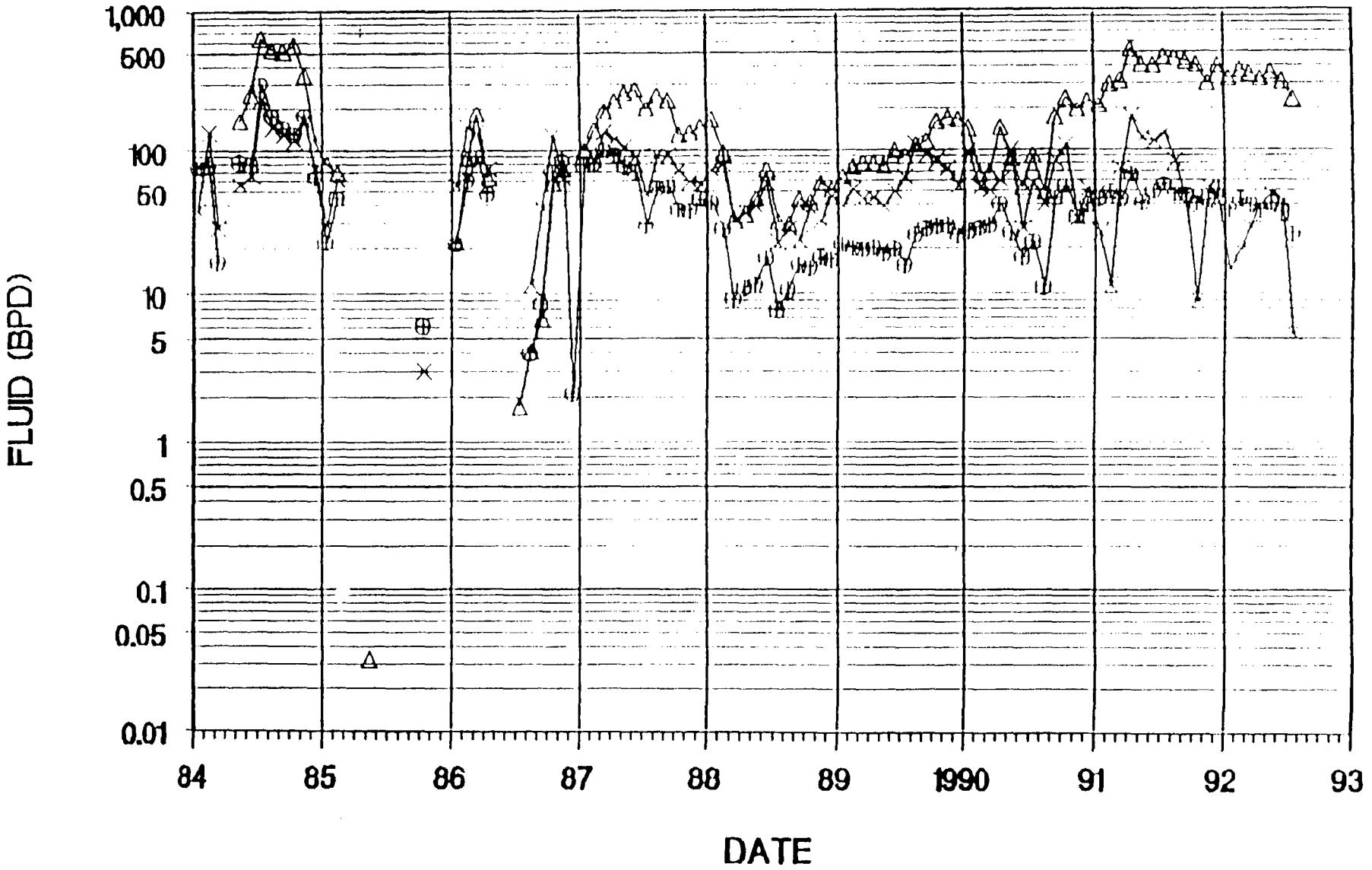


WELL = YATES C FEDERAL #04 (1917)



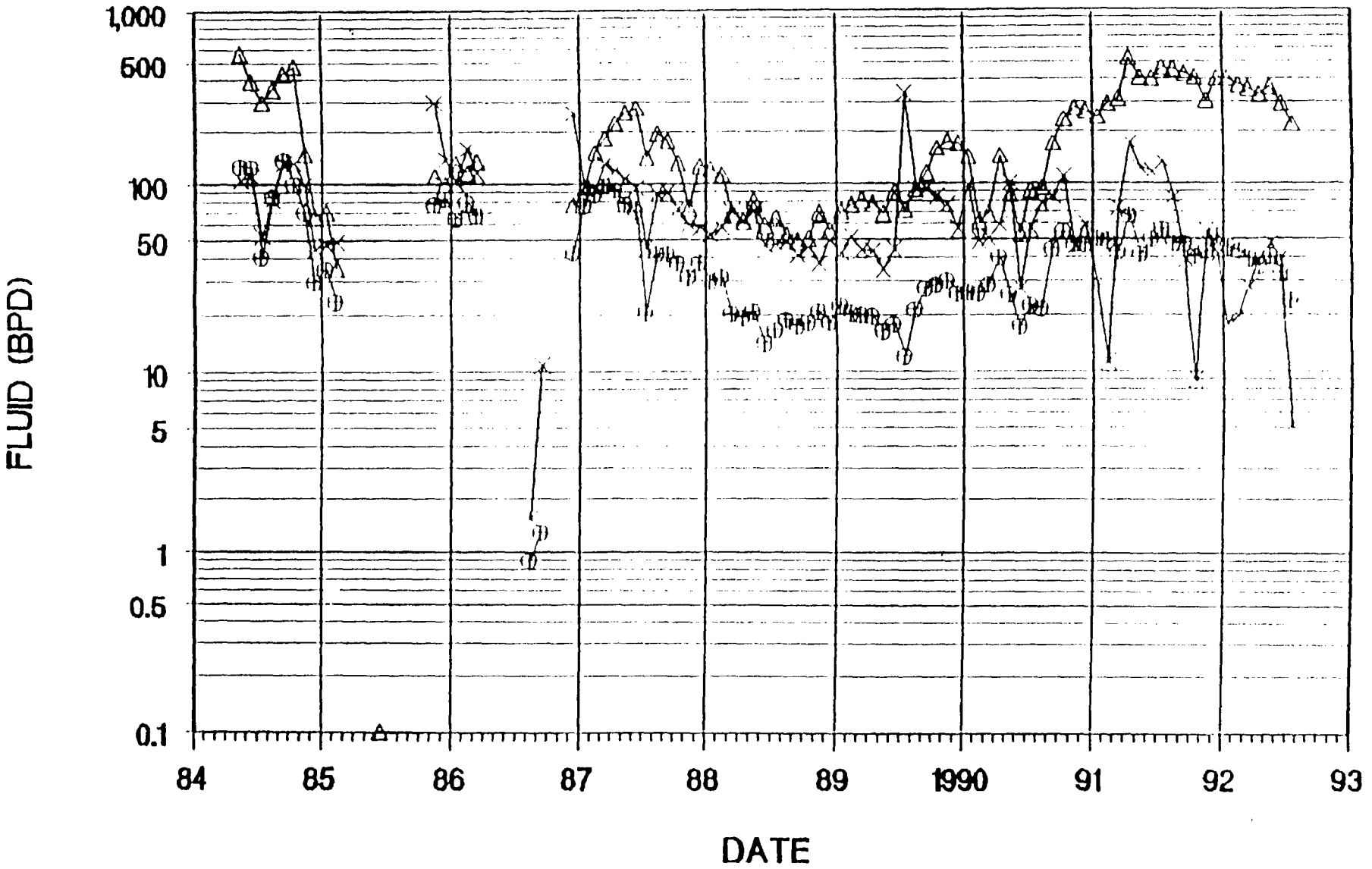
AVALON FIELD PRODUCTION

NEWWELNO = 1311



AVALON FIELD PRODUCTION

NEWWELNO = 1313



AVALON FIELD PRODUCTION

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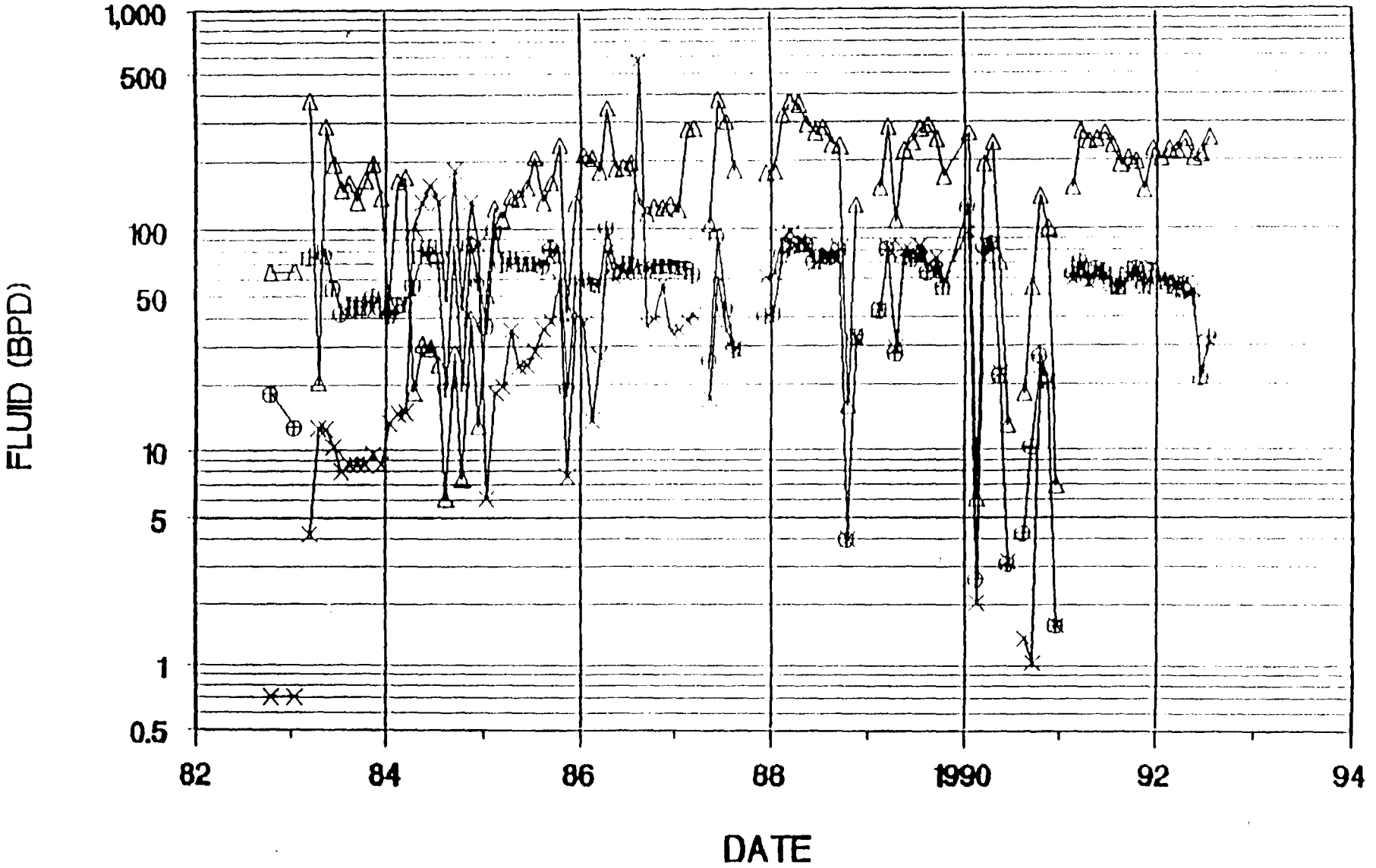
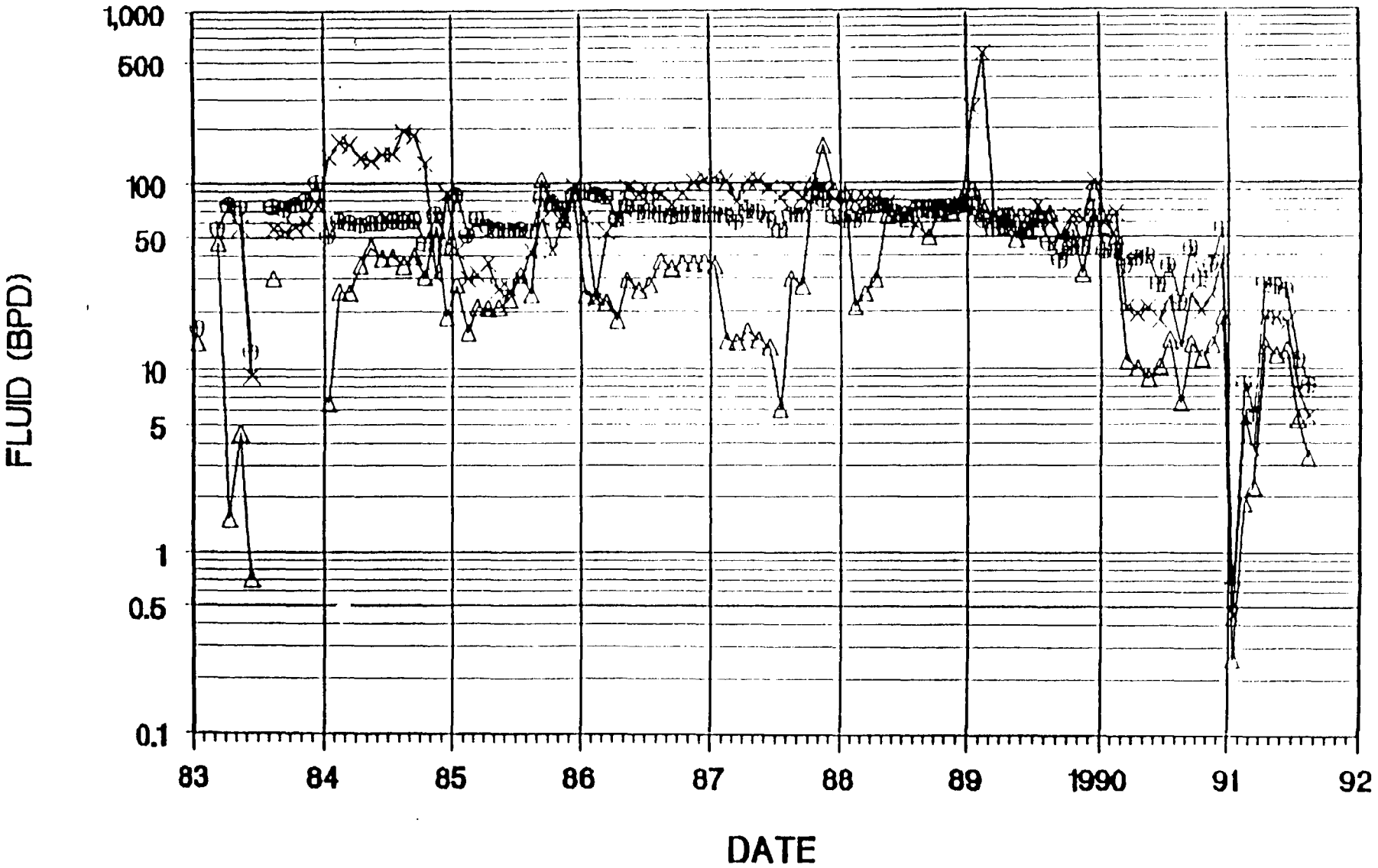


AVALON FIELD PRODUCTION

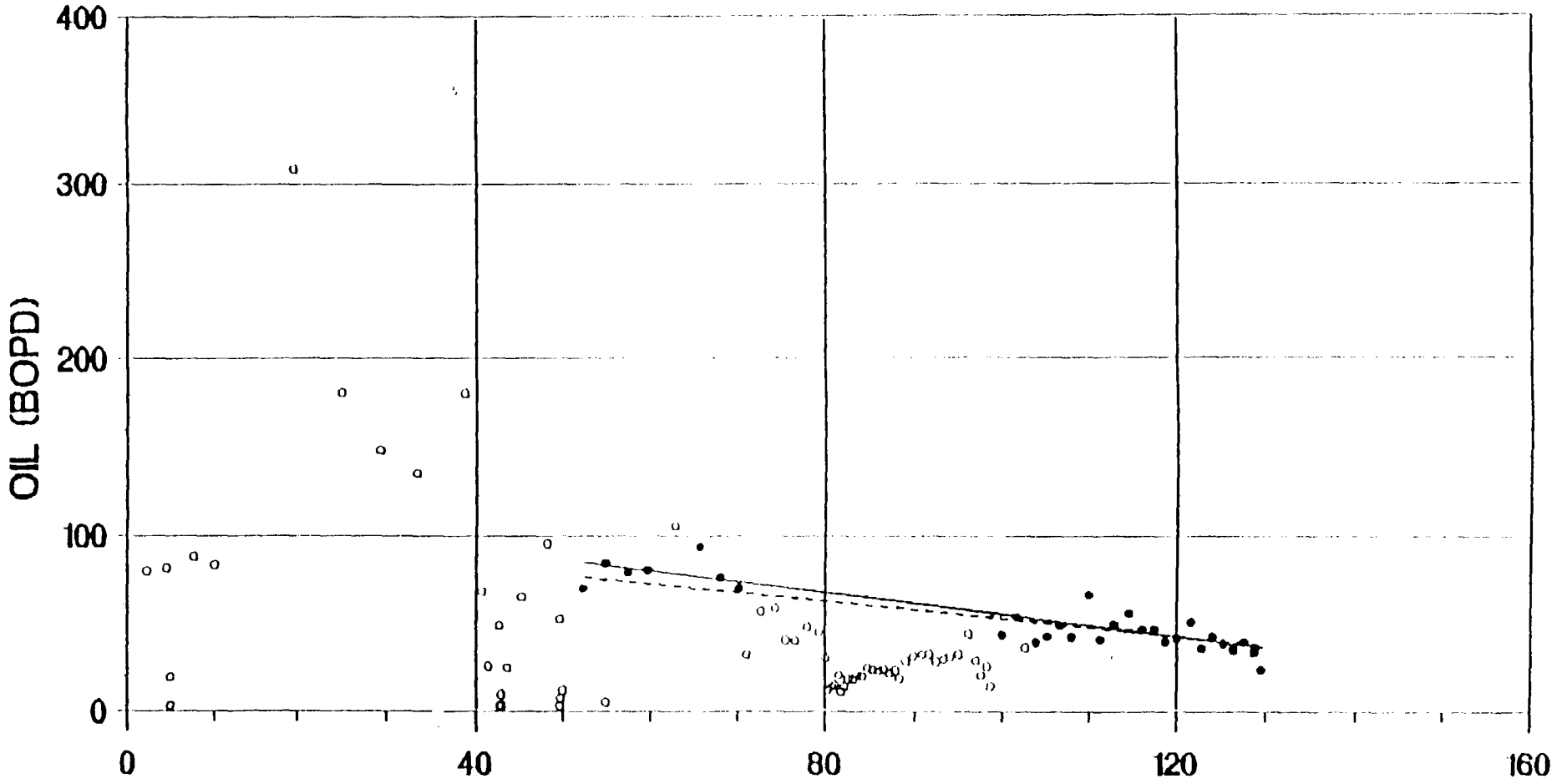
NEWWELNO = 1917



7/92 update

AVALON FIELD DECLINE CURVES

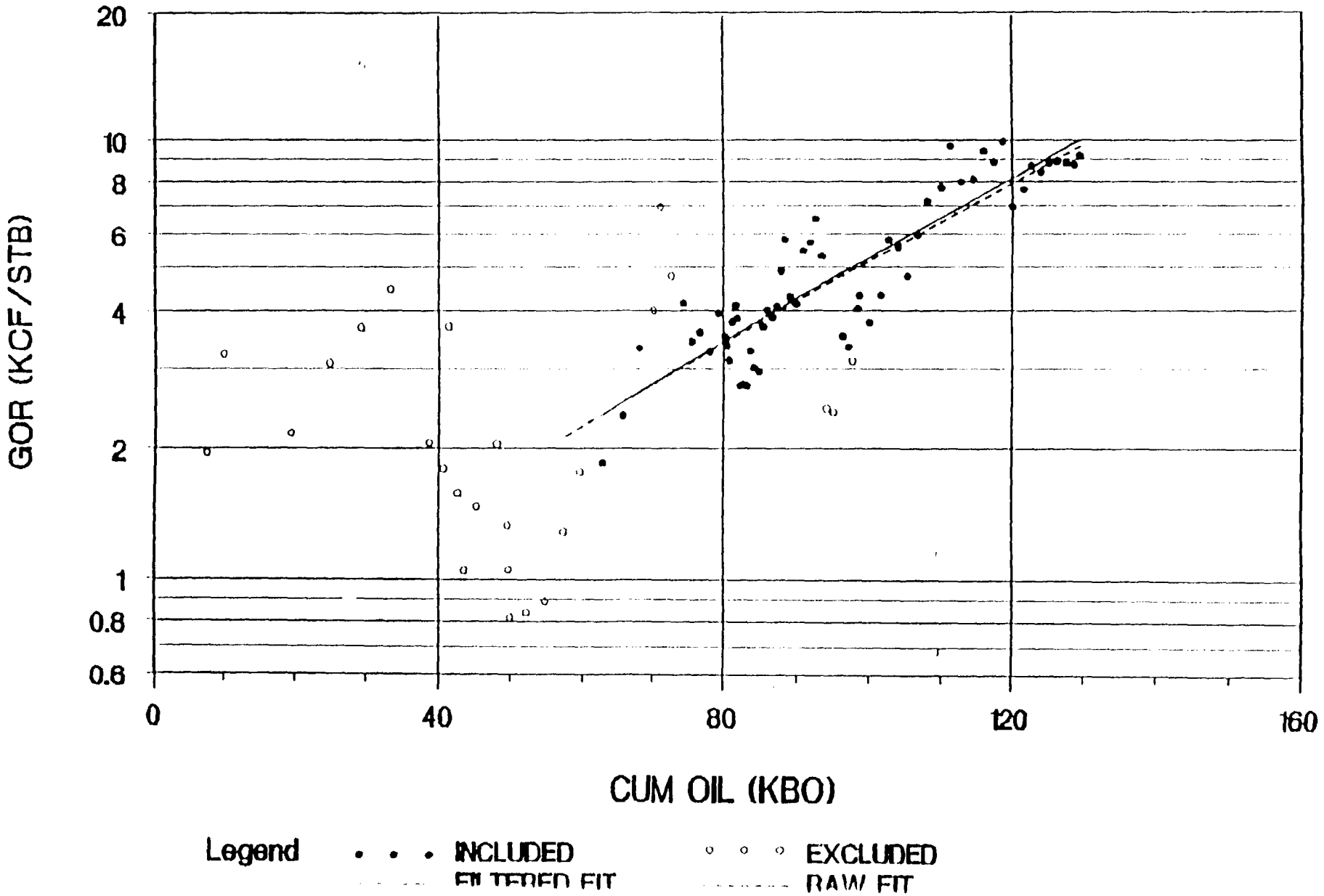
WELL = STONEWALL EP STATE #05 (1311)



* INDICATES PRODUCTION BELOW ASSUMED ECONOMIC LIMIT

AVALON FIELD DECLINE CURVES

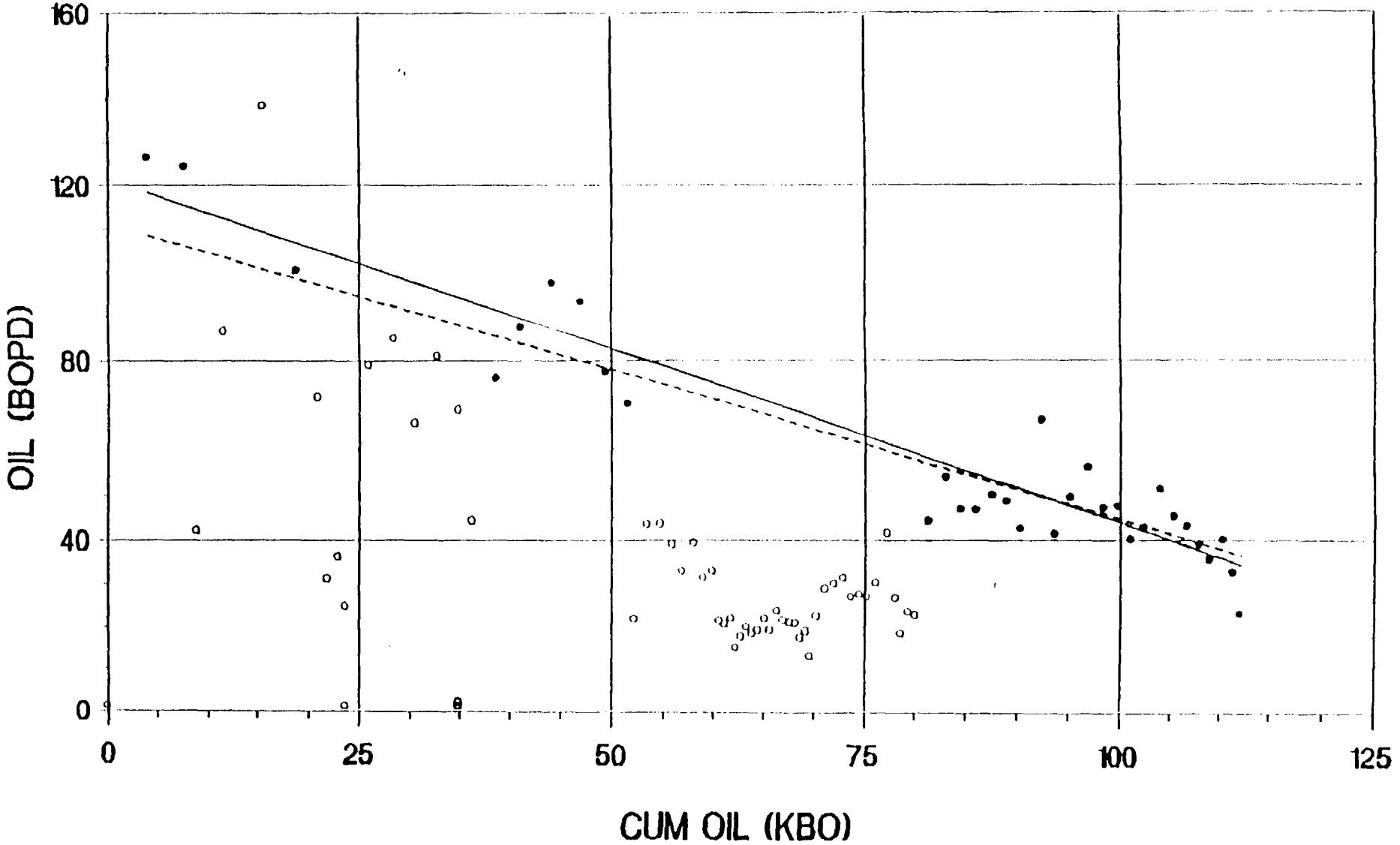
WELL = STONEWALL EP STATE #05 (1311)



1/92 upd. fa

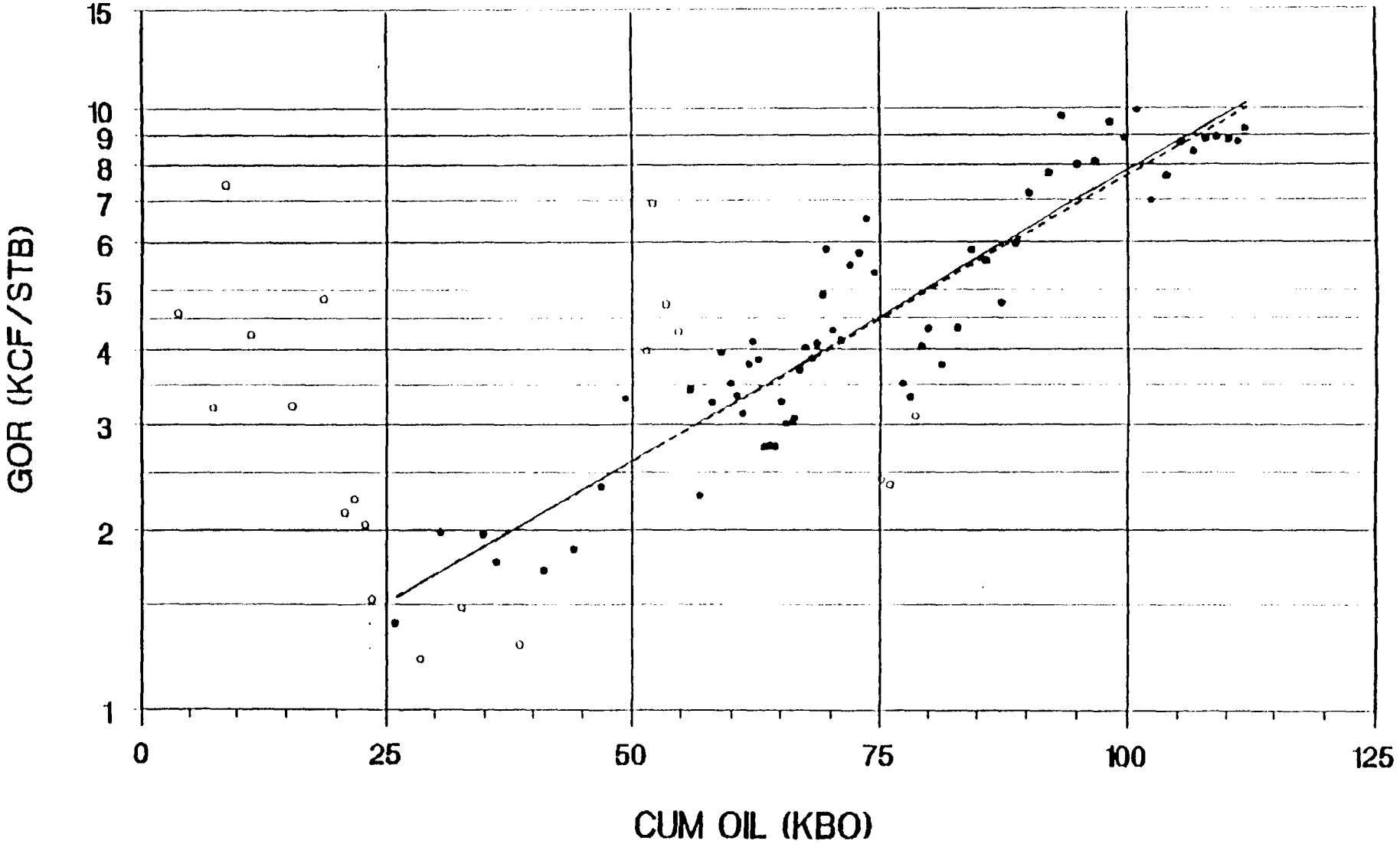
AVALON FIELD DECLINE CURVES

WELL = STONEWALL EP STATE #08 (1313)



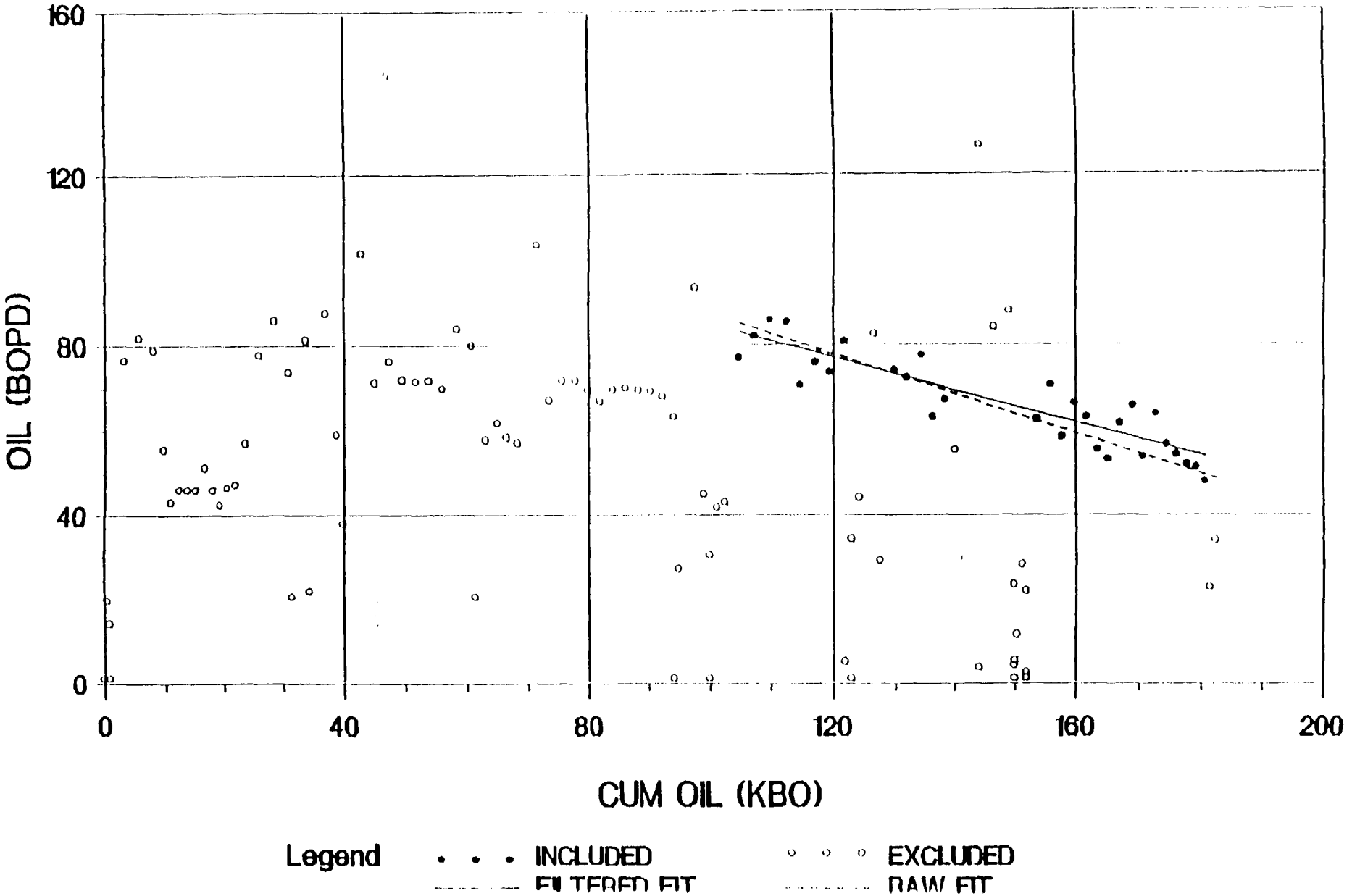
AVALON FIELD DECLINE CURVES

WELL = STONEWALL EP STATE #08 (1313)



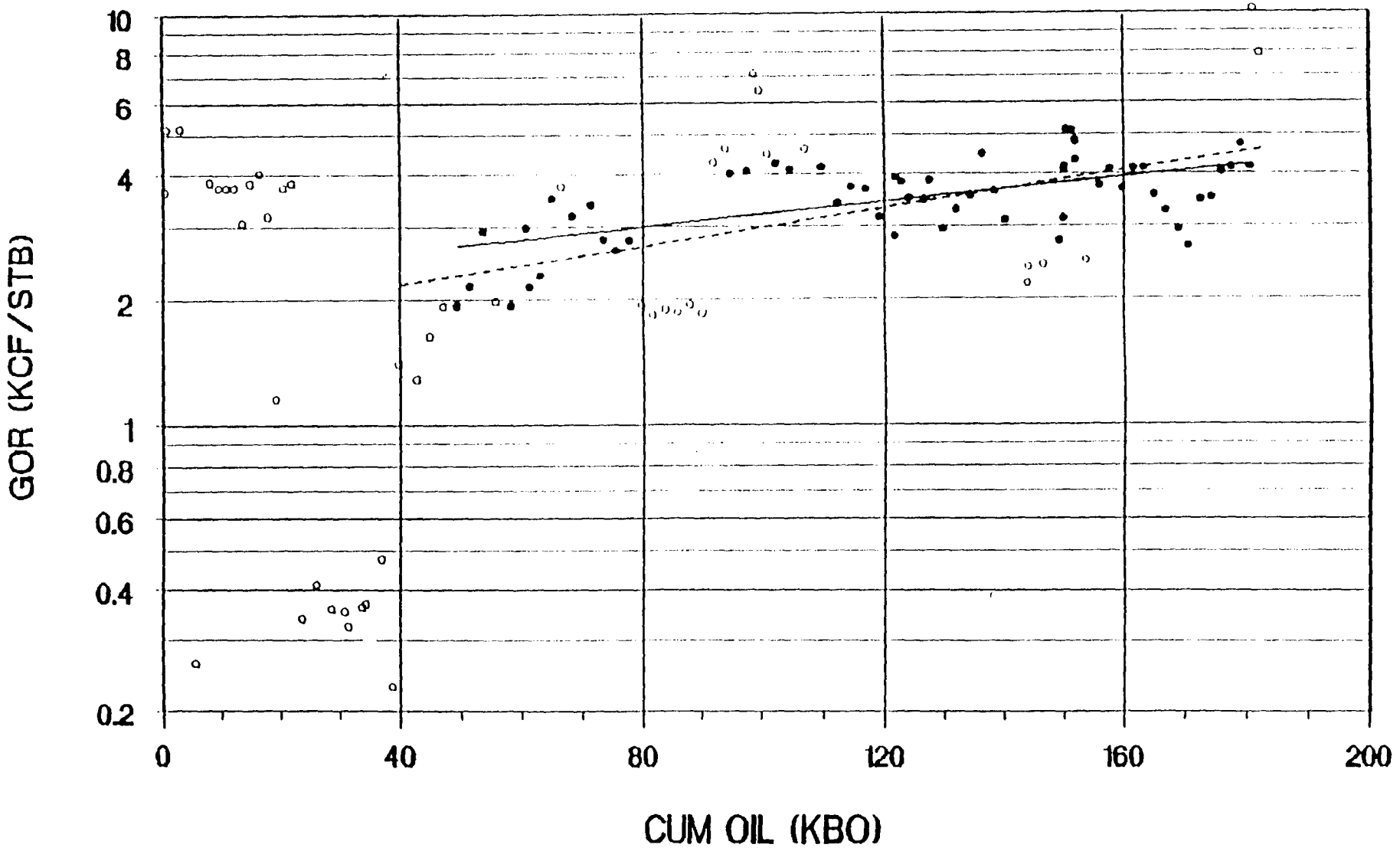
AVALON FIELD DECLINE CURVES

WELL = YATES C FEDERAL #03 (1915)



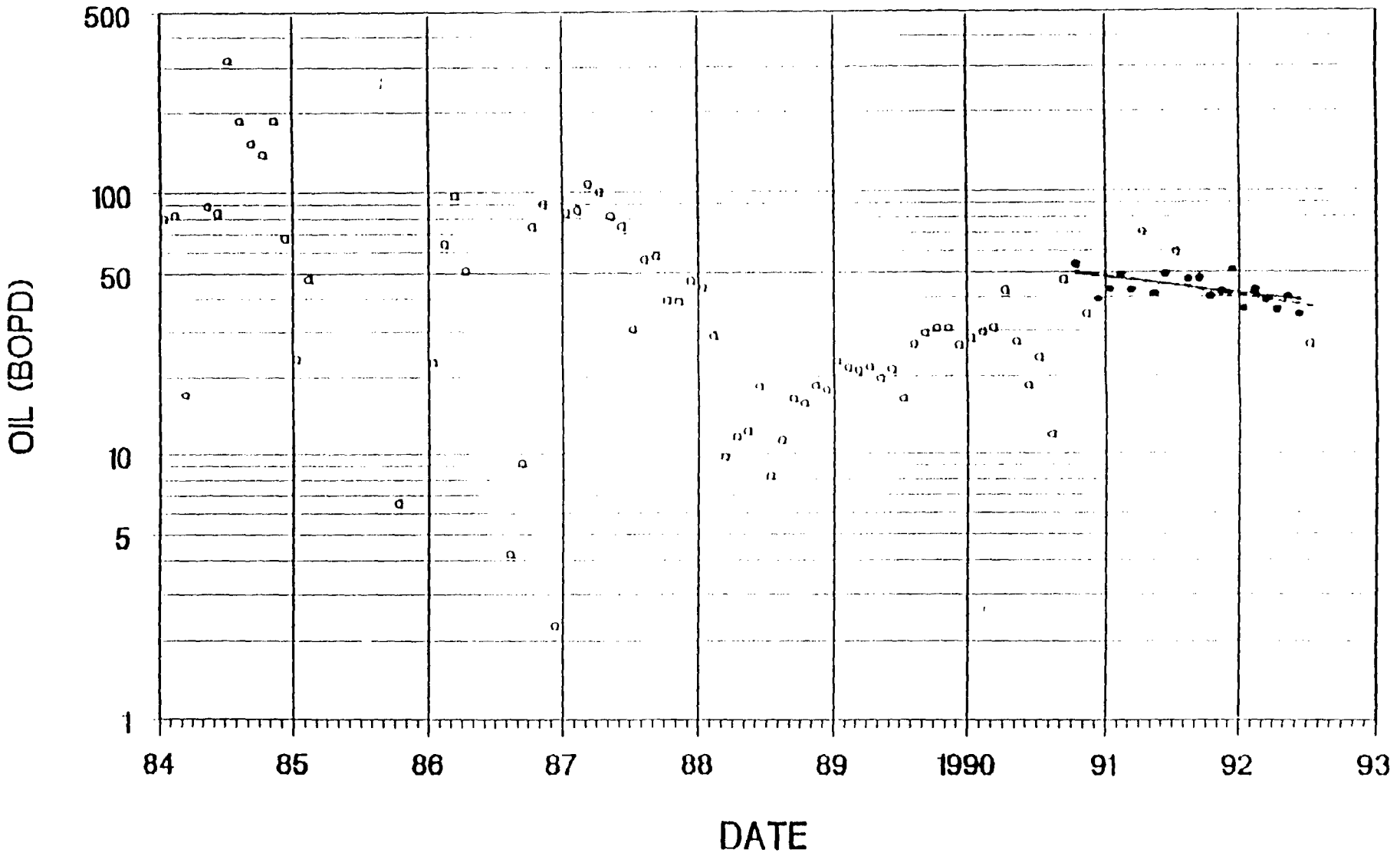
AVALON FIELD DECLINE CURVES

WELL = YATES C FEDERAL #03 (1915)



AVALON FIELD DECLINE CURVES

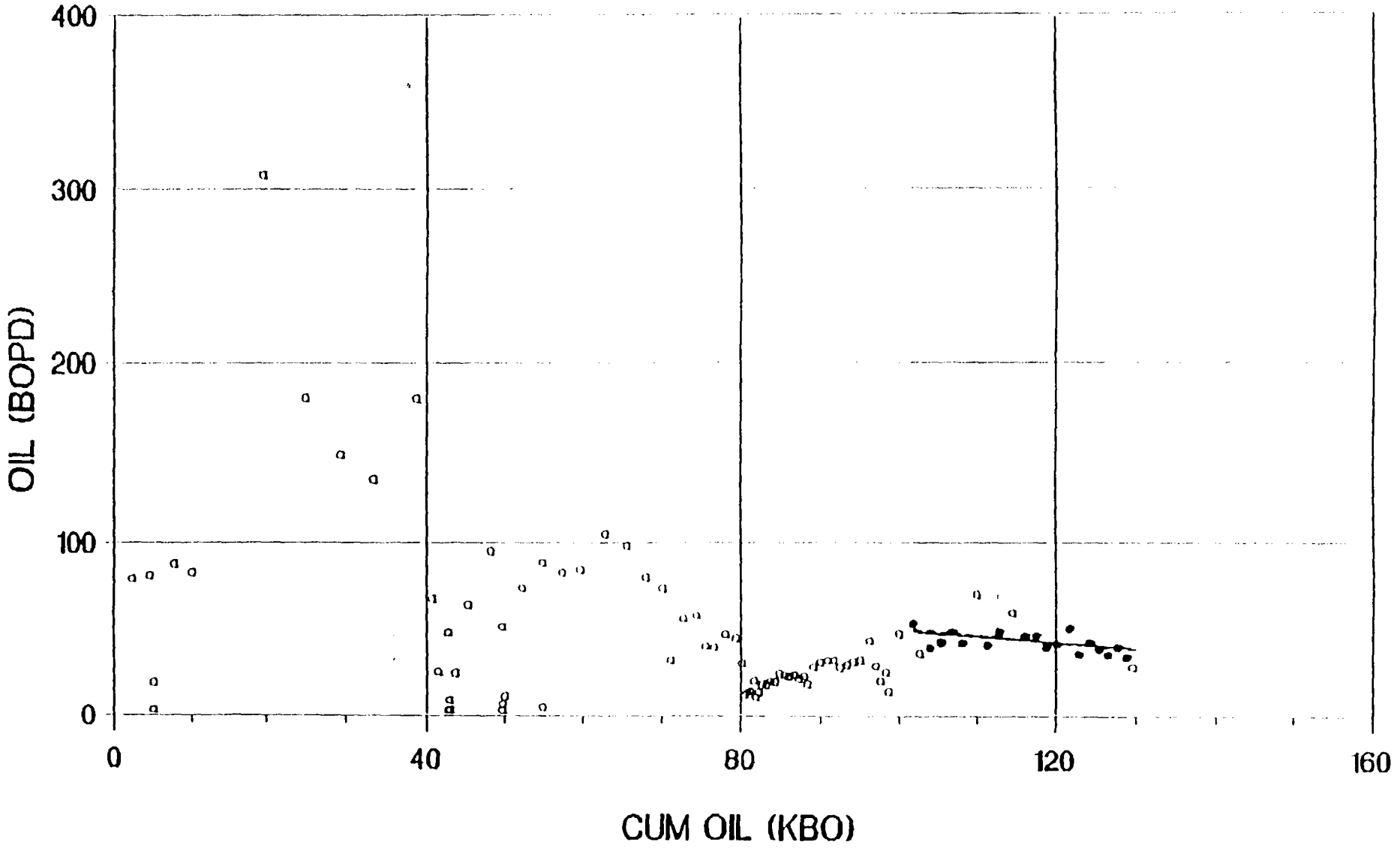
WELL = STONEWALL EP STATE #05 (1311)



10/96 - 1/12

AVALON FIELD DECLINE CURVES

WELL = STONEWALL EP STATE #05 (1311)



10/90 - 1/92

AVALON FIELD DECLINE CURVES

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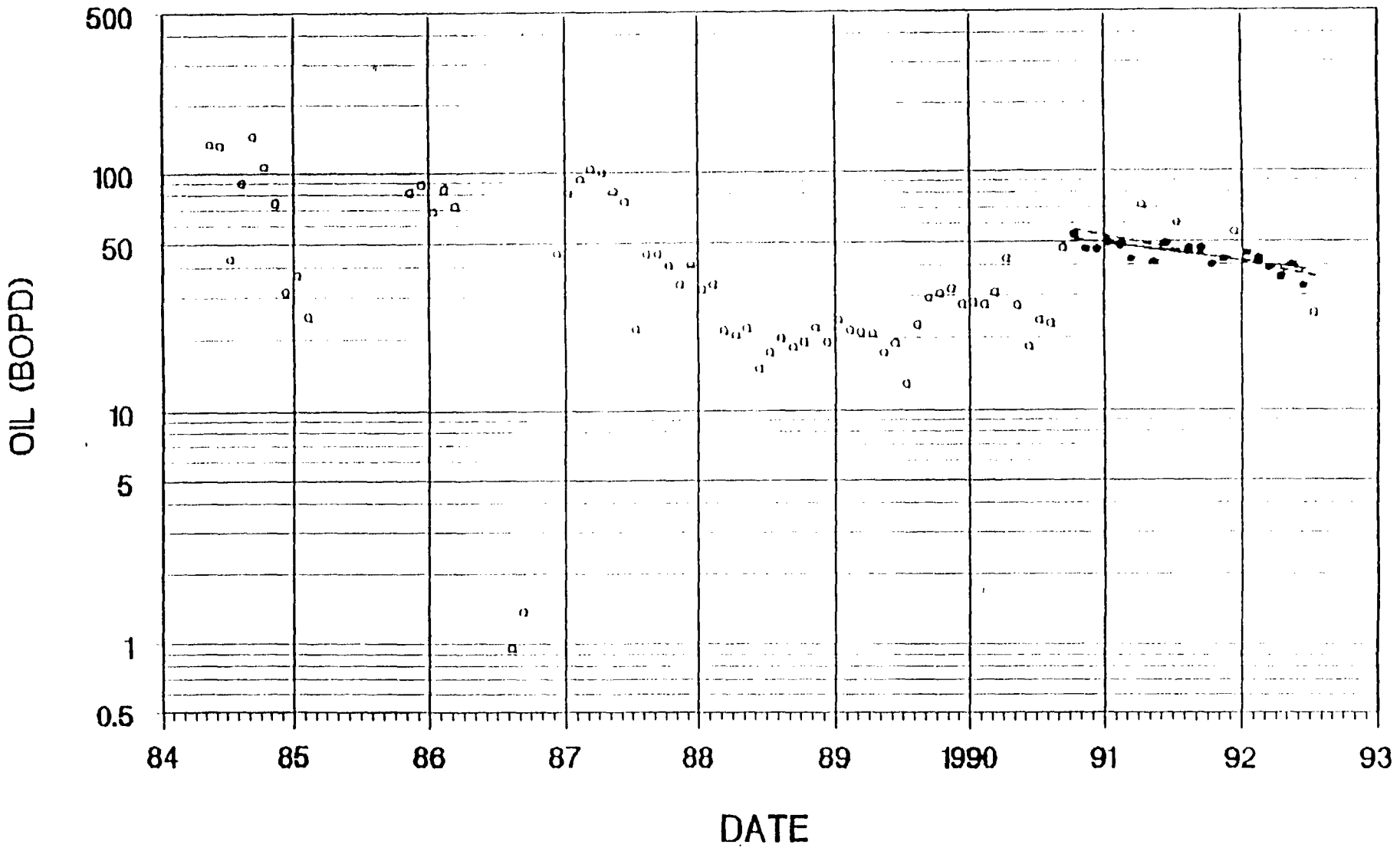
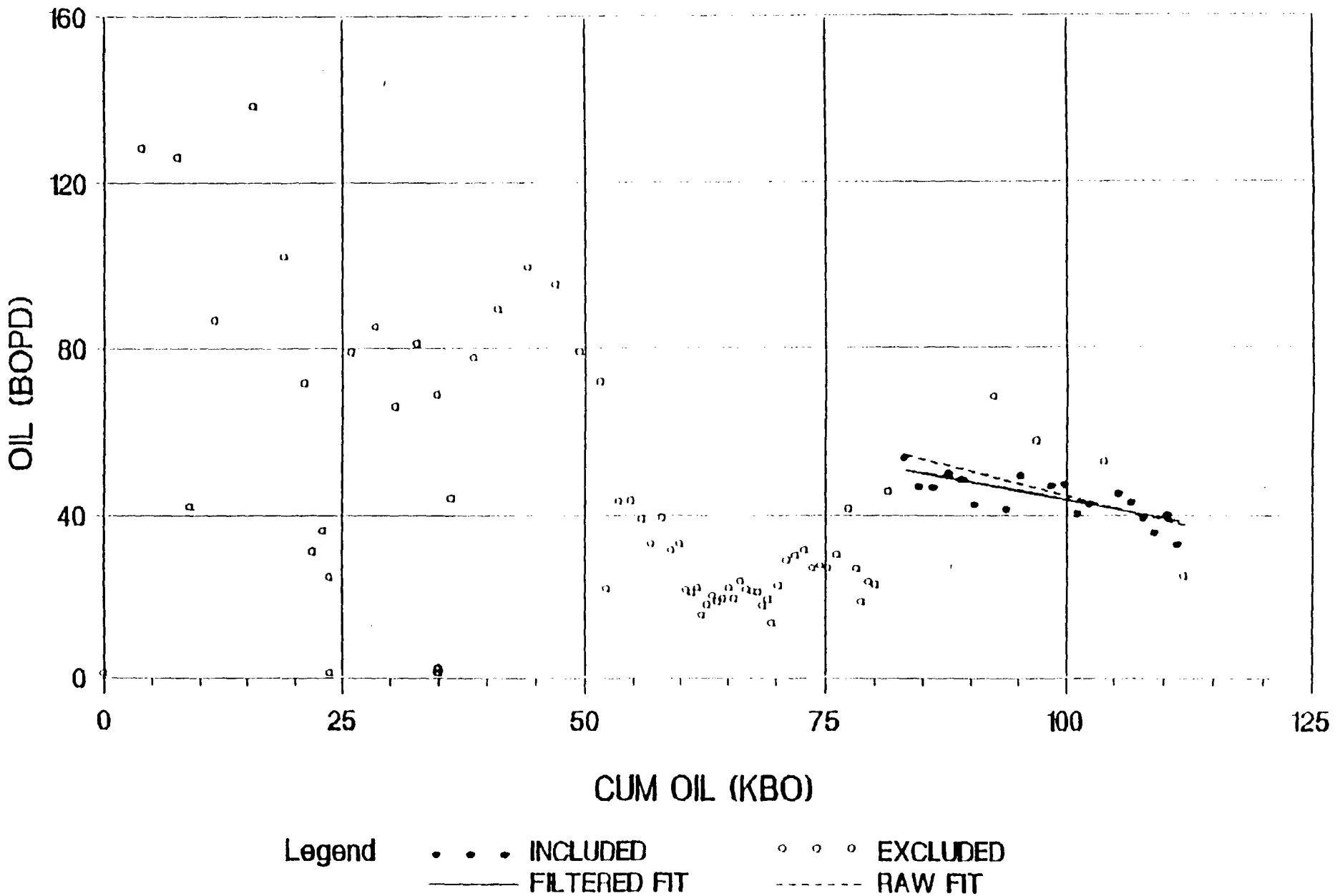


AVALON FIELD DECLINE CURVES

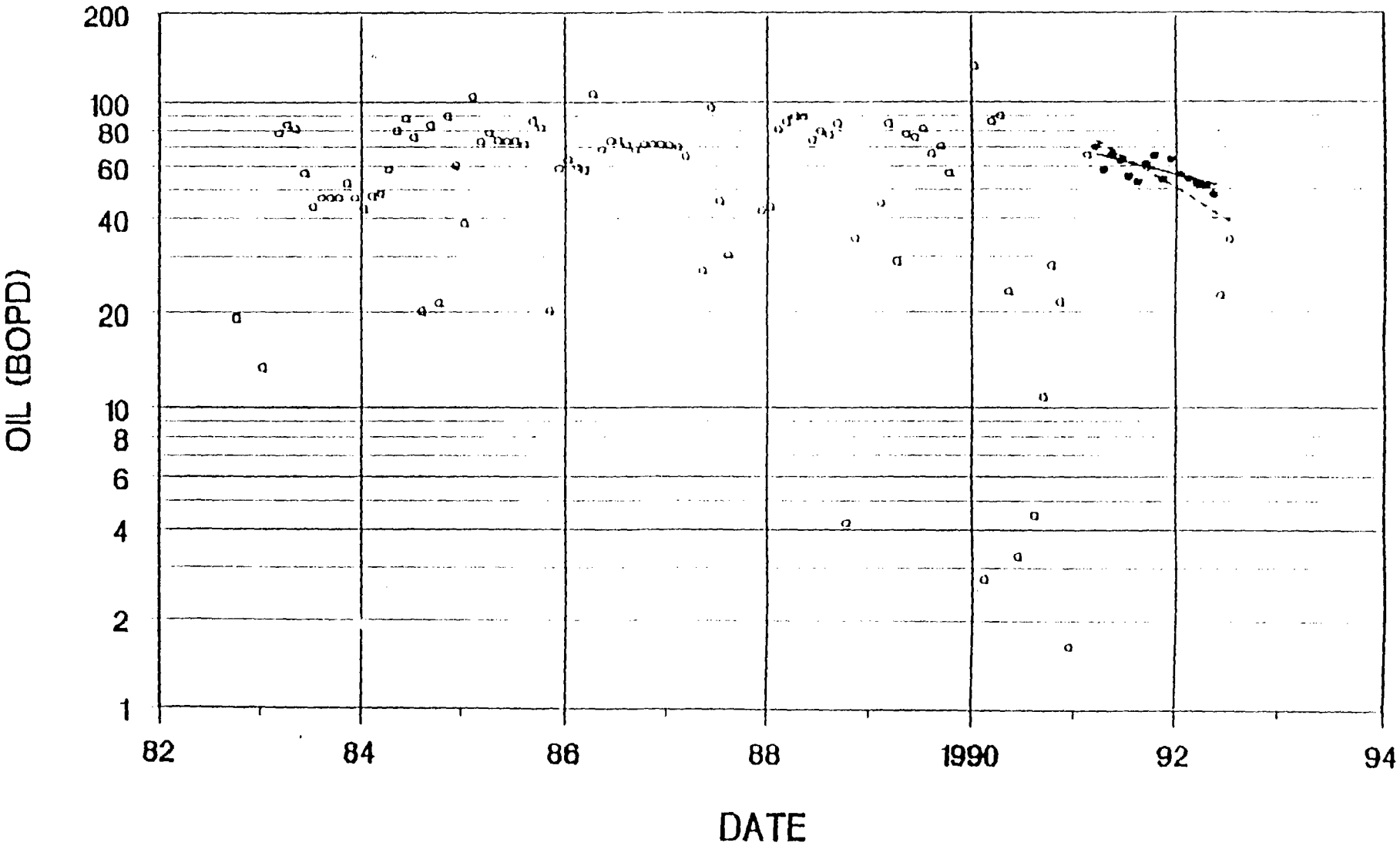
WELL = STONEWALL EP STATE #08 (1313)



AVALON FIELD DECLINE CURVES

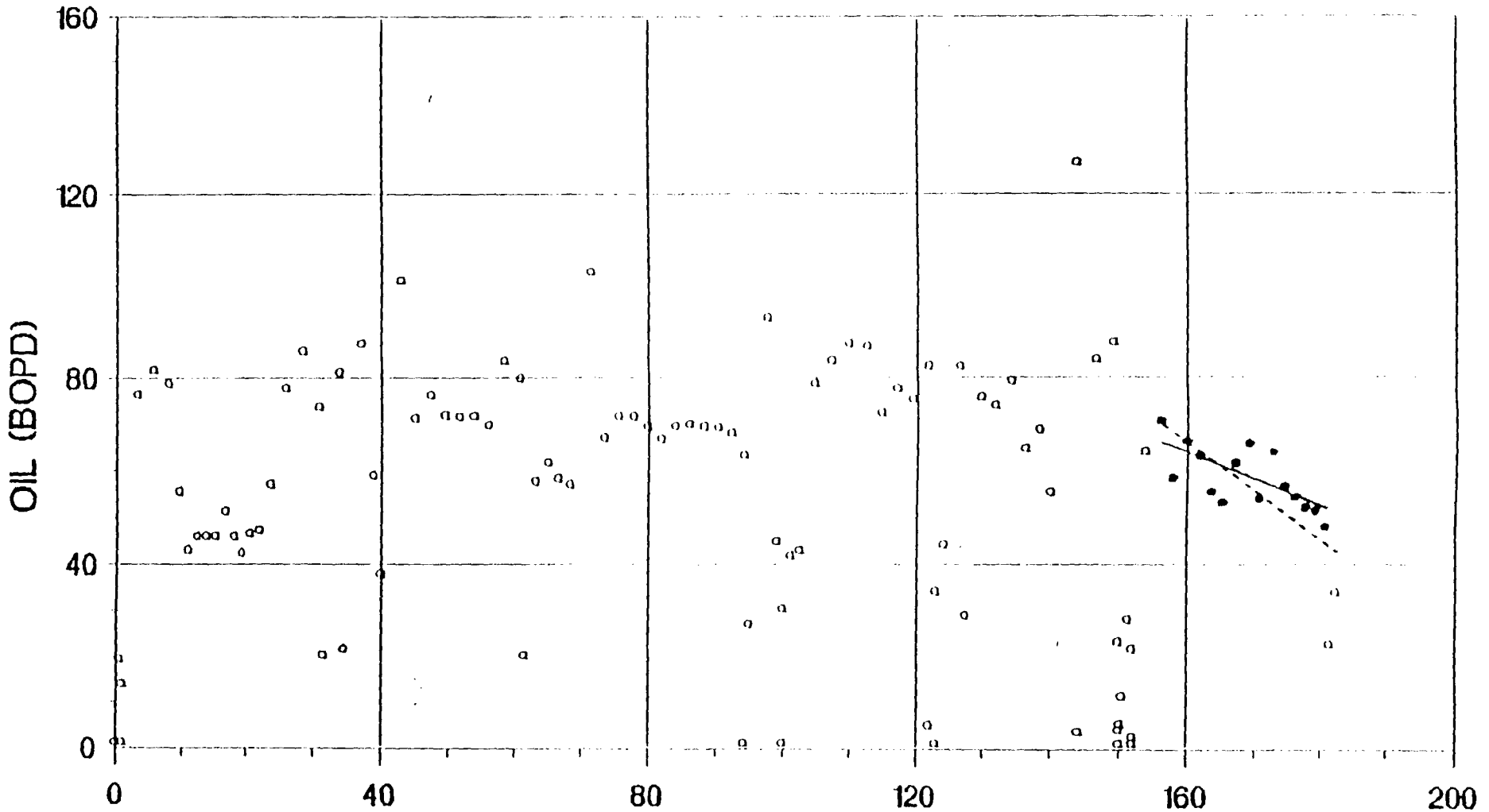
WELL = YATES C FEDERAL #03 (1915)

3/11 1/92



AVALON FIELD DECLINE CURVES

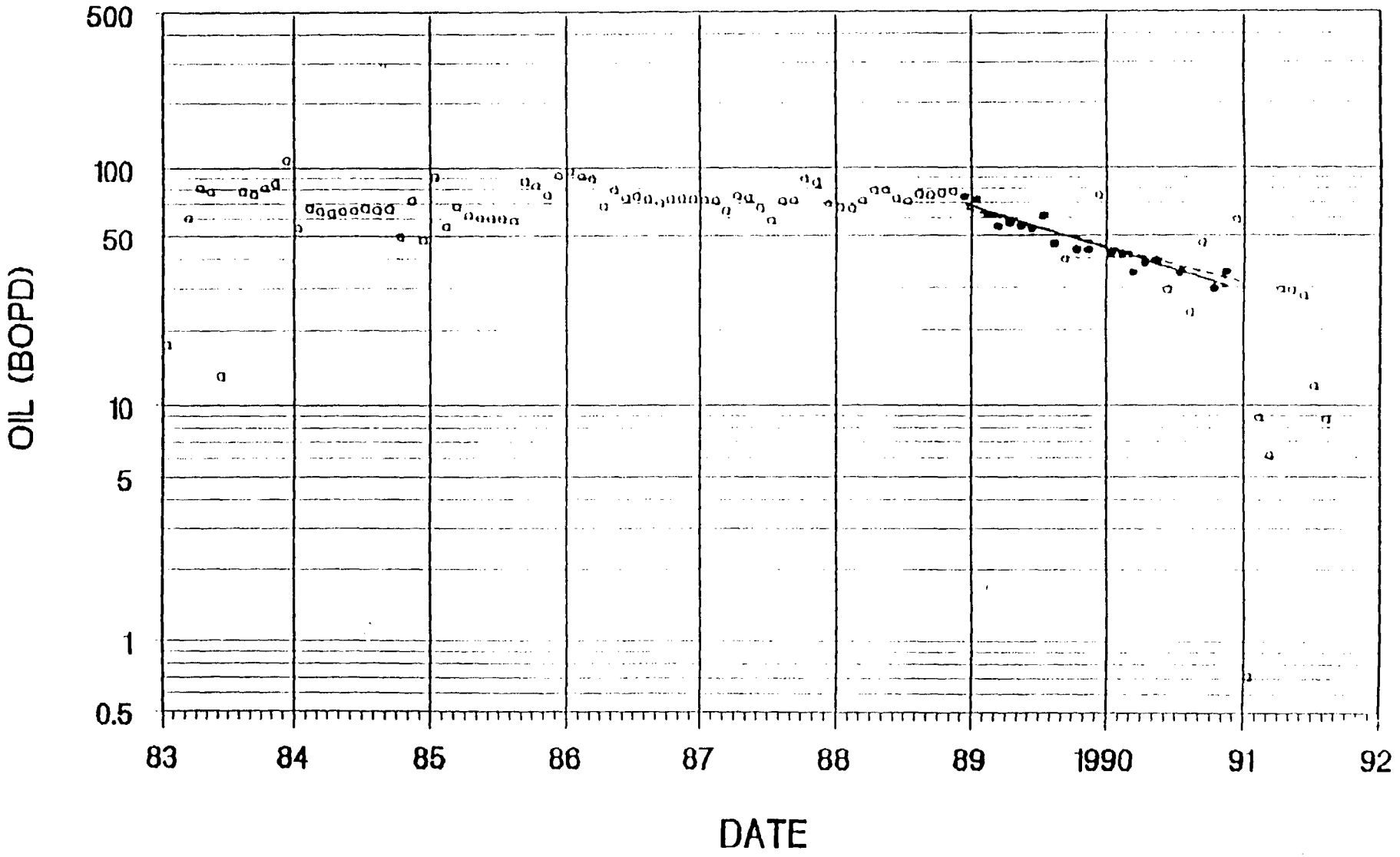
WELL = YATES C FEDERAL #03 (1915)



AVALON FIELD DECLINE CURVES

WELL = YATES C FEDERAL #04 (1917)

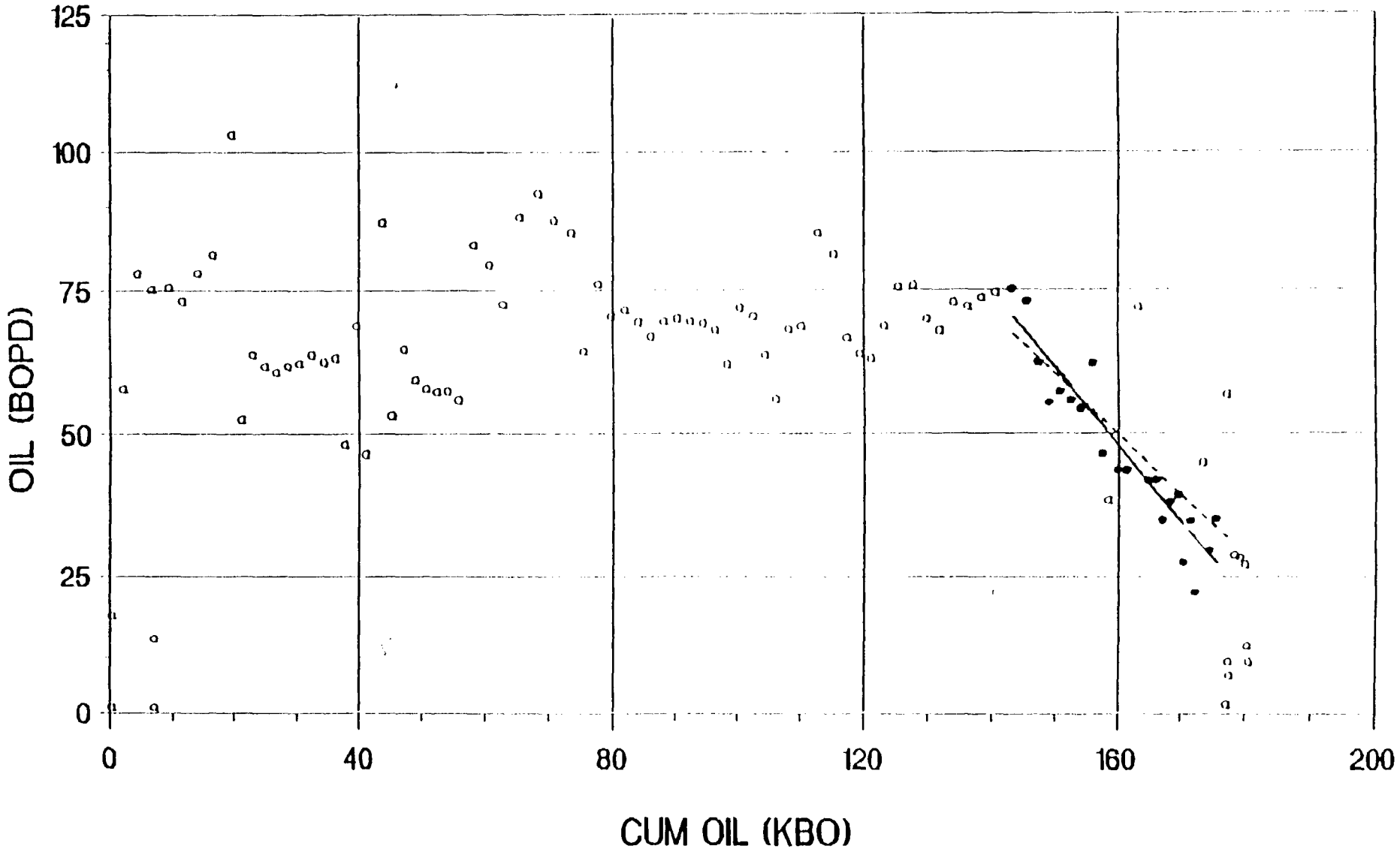
12/88 - 12/90



(5

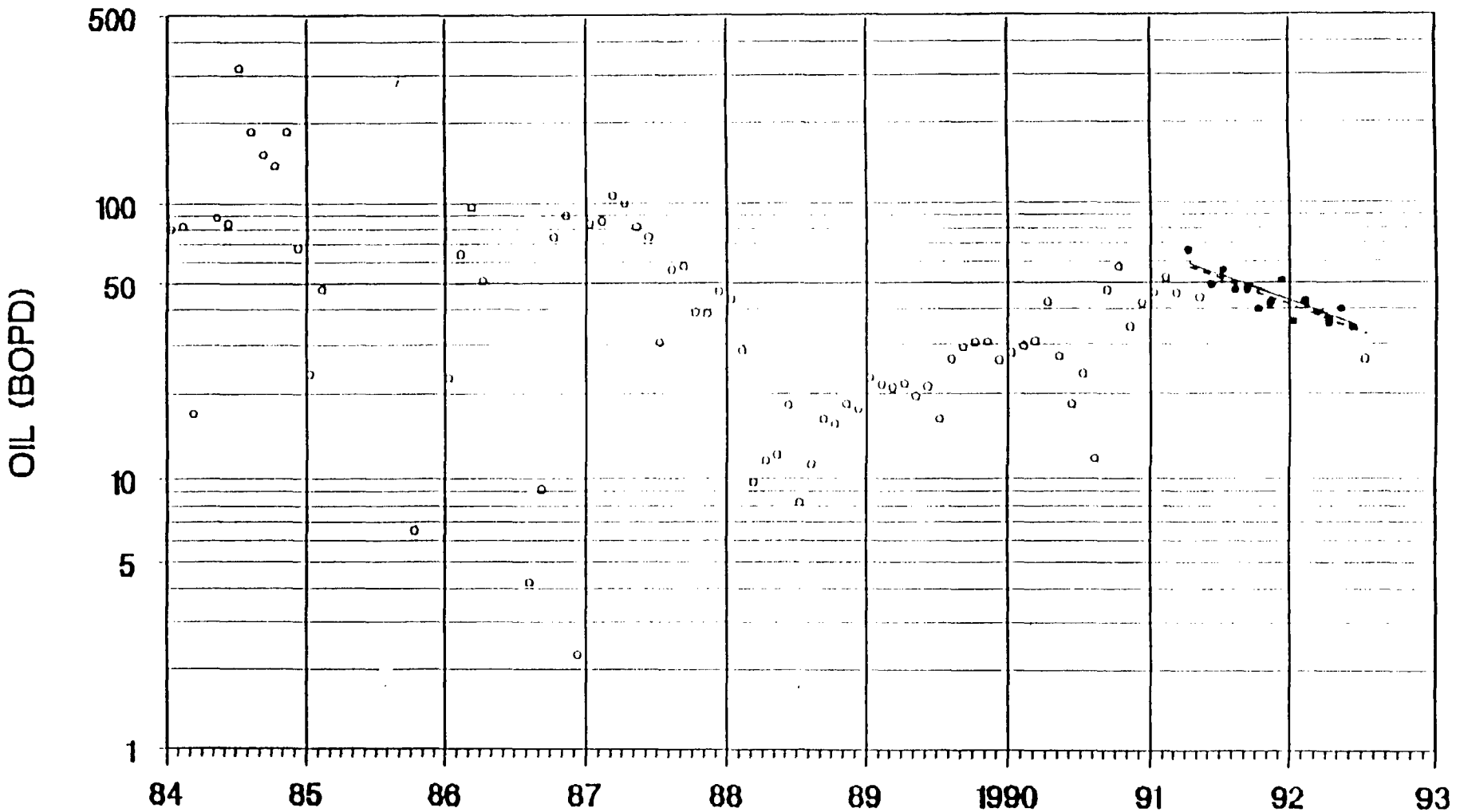
AVALON FIELD DECLINE CURVES

WELL = YATES C FEDERAL #04 (1917)



AVALON FIELD DECLINE CURVES

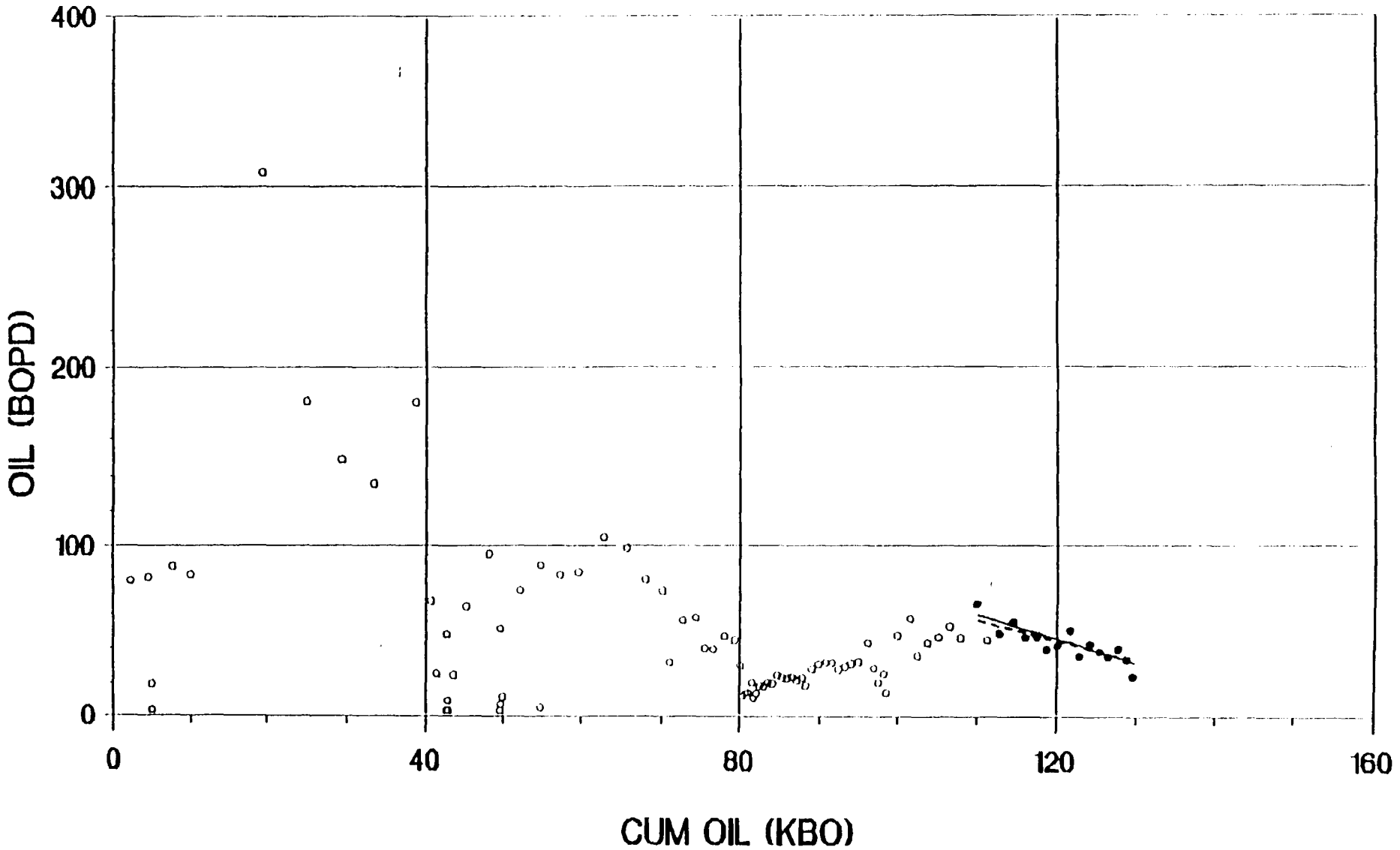
WELL = STONEWALL EP STATE #05 (1311)



AVALON FIELD DECLINE CURVES

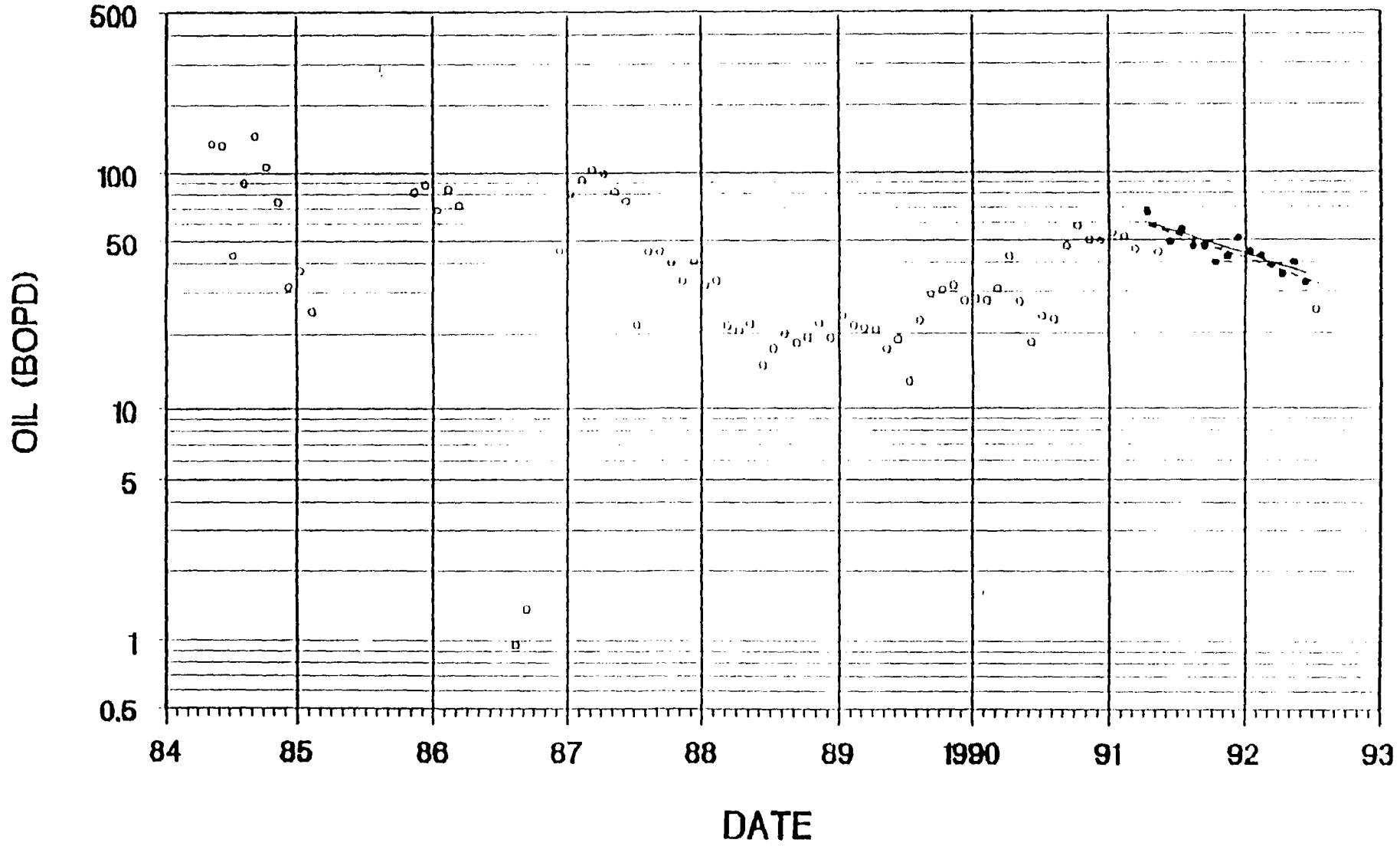
WELL = STONEWALL EP STATE #05 (1311)

4/91 7/92



AVALON FIELD DECLINE CURVES

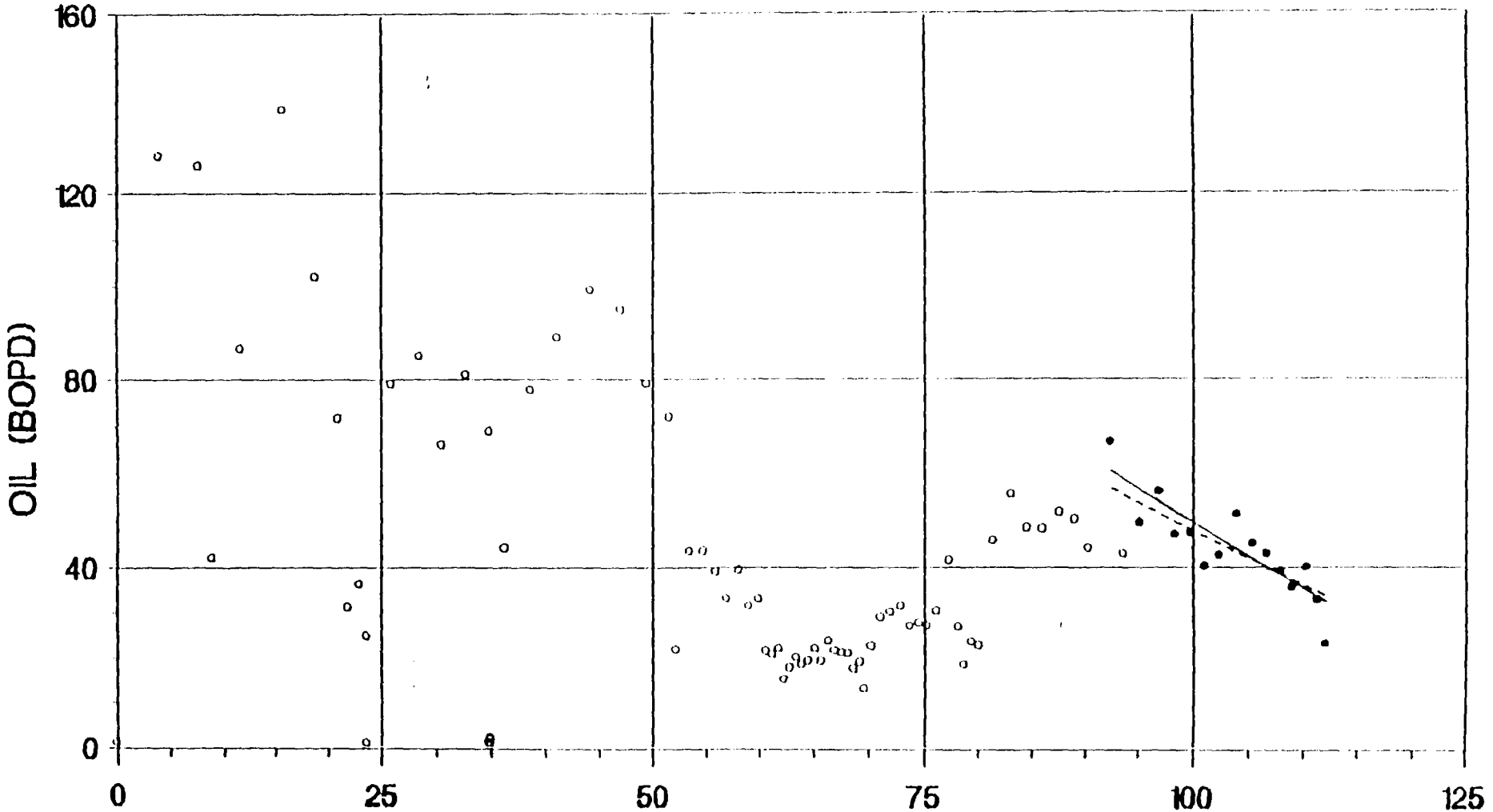
WELL = STONEWALL EP STATE #08 (1313)



AVALON FIELD DECLINE CURVES

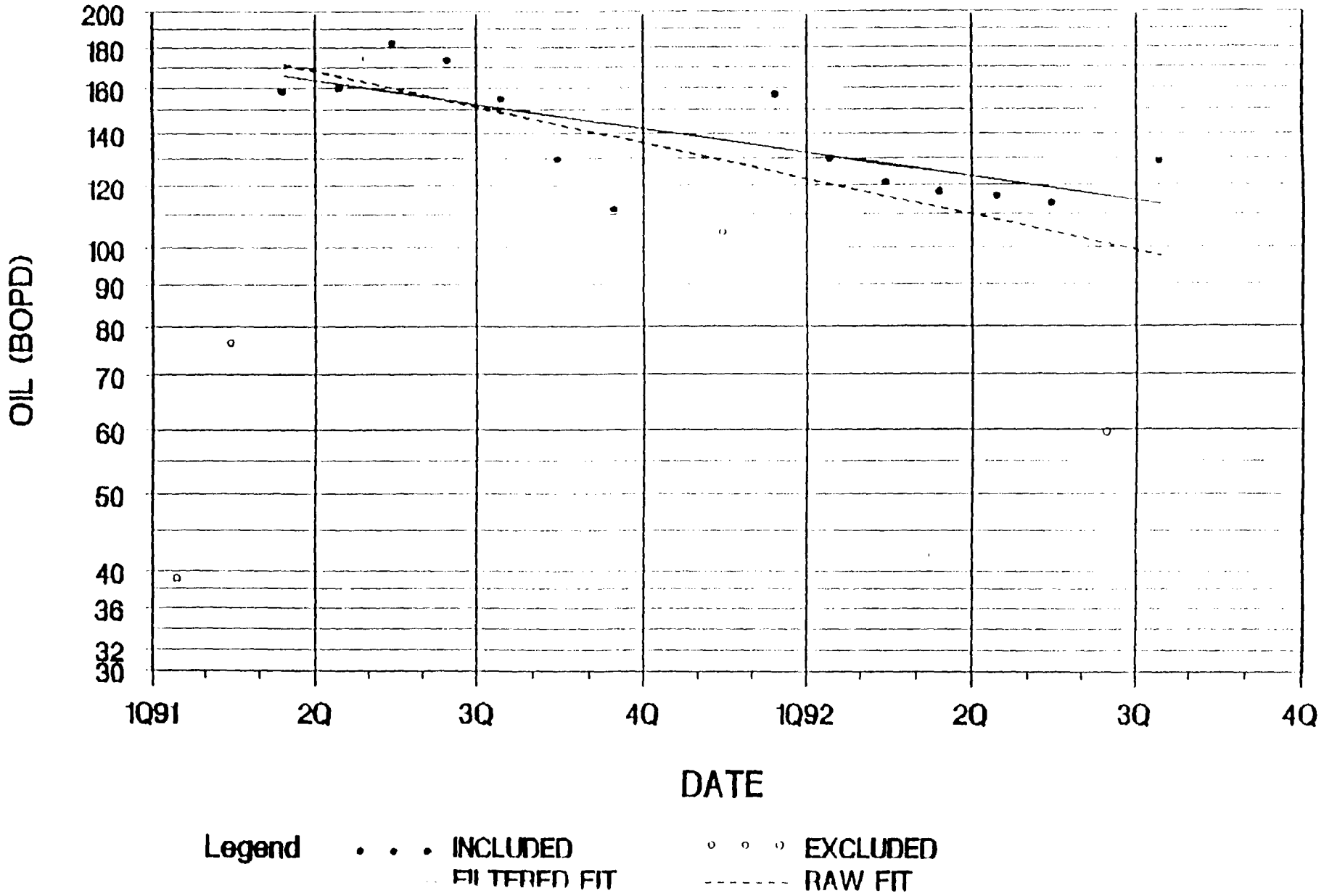
WELL = STONEWALL EP STATE #08 (1313)

1/91 - 7/92



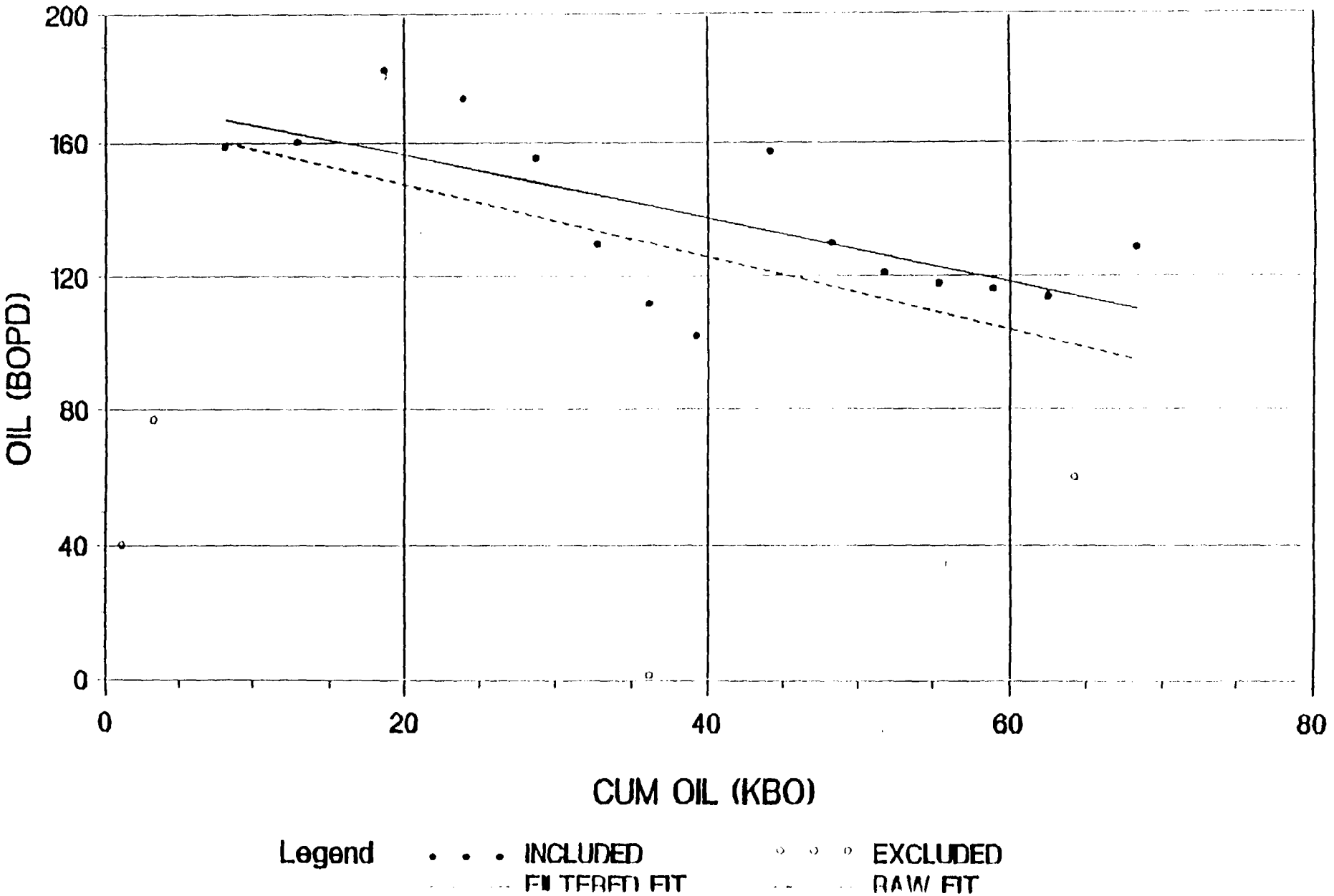
AVALON FIELD DECLINE CURVES

WELL = YATES C FEDERAL #36 (2016)



AVALON FIELD DECLINE CURVES

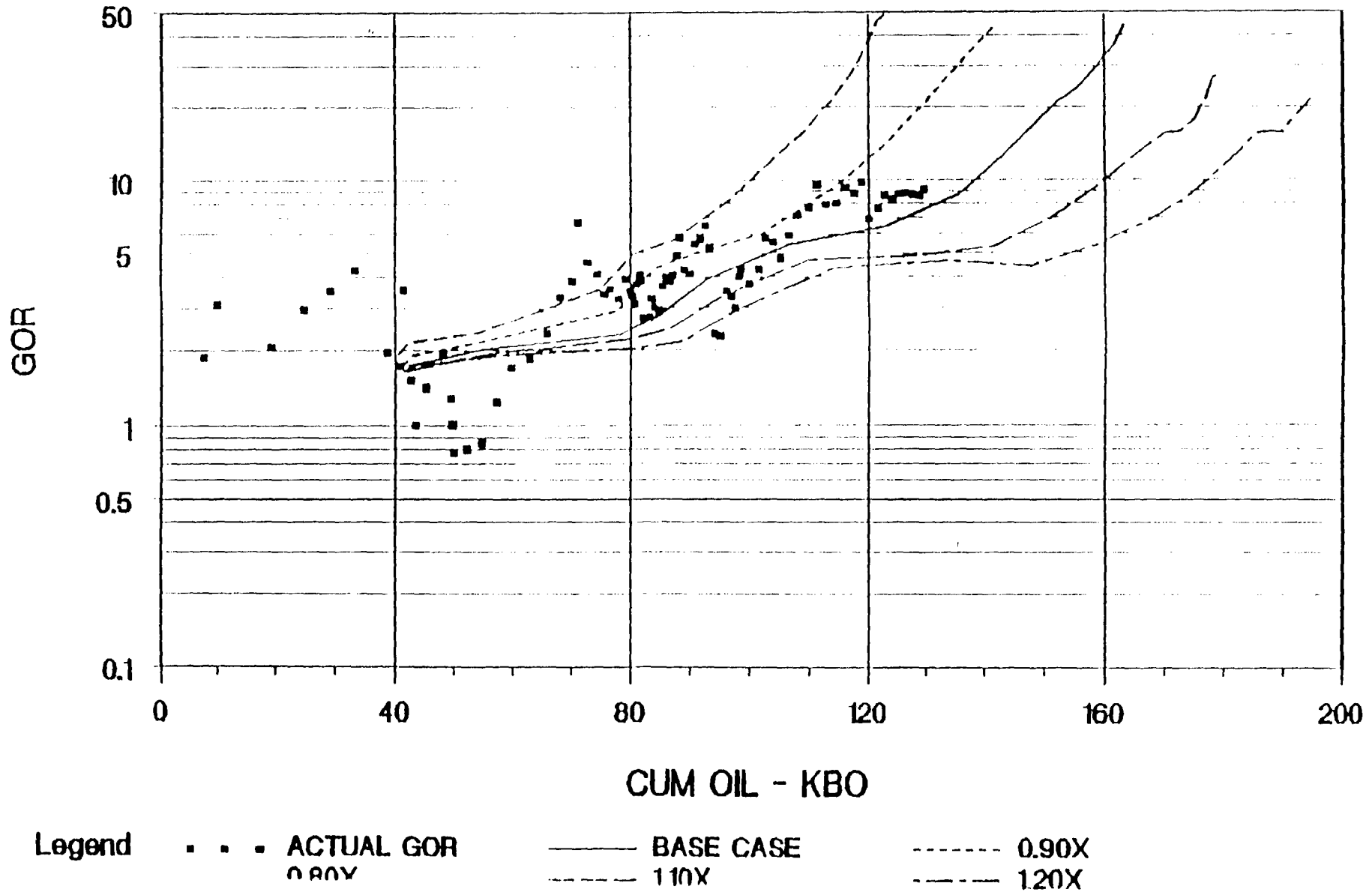
WELL = YATES C FEDERAL #36 (2016)



AVALON FIELD

PRIMARY HISTORY MATCH

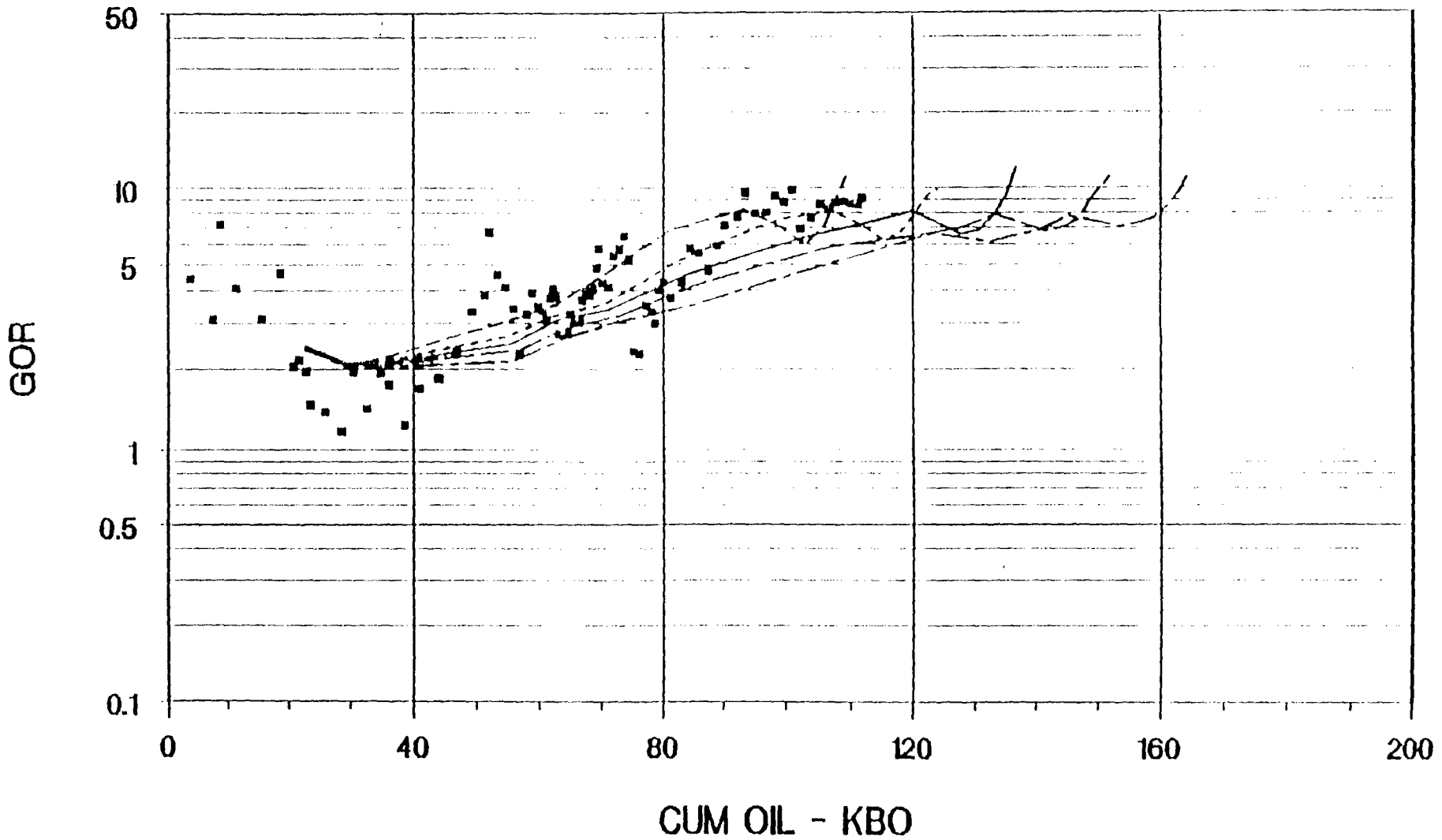
WELL - STONEWALL EP STATE #05 (1311)



AVALON FIELD

PRIMARY HISTORY MATCH

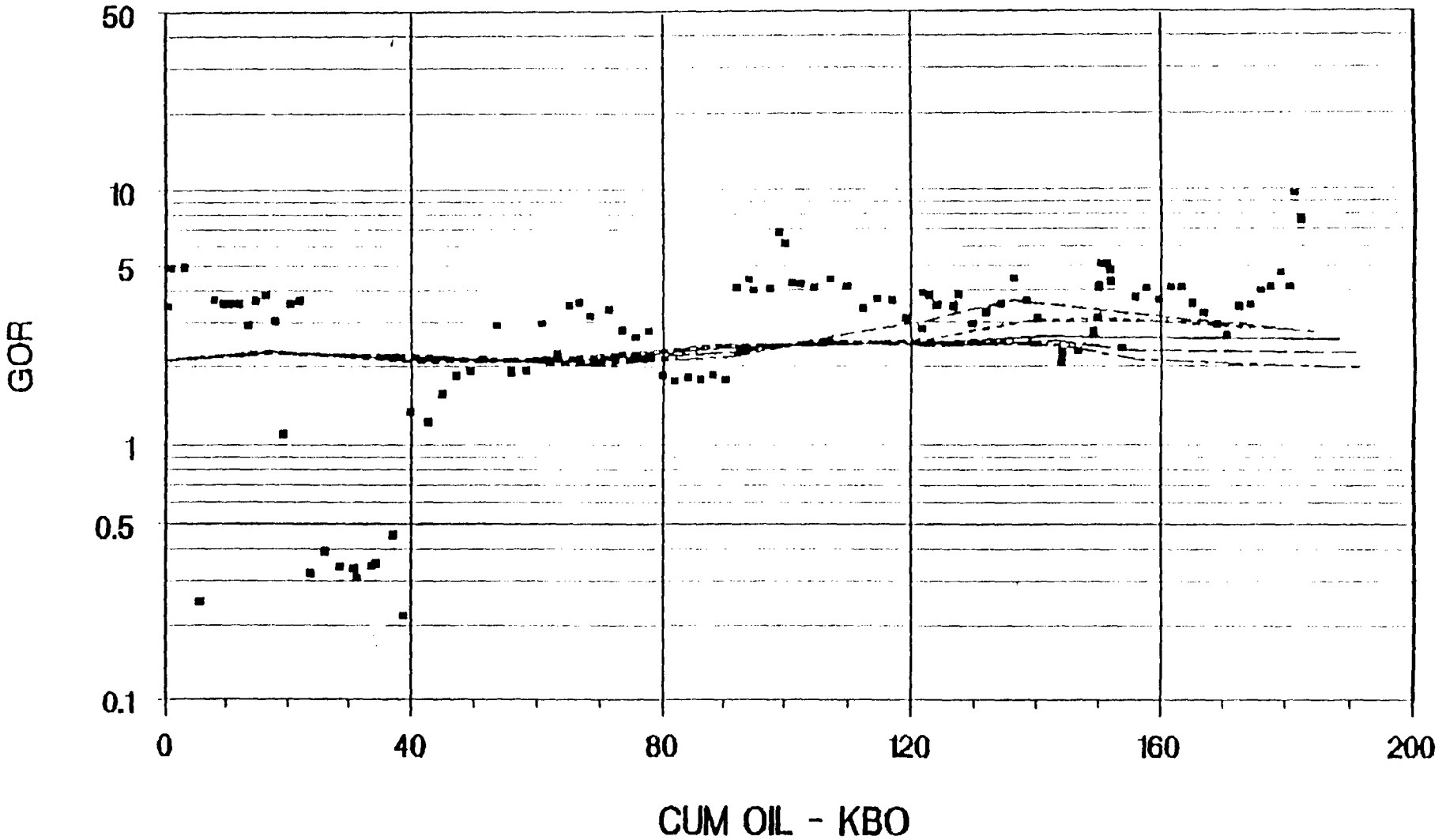
WELL - STONEWALL EP STATE #08 (1313)



AVALON FIELD

PRIMARY HISTORY MATCH

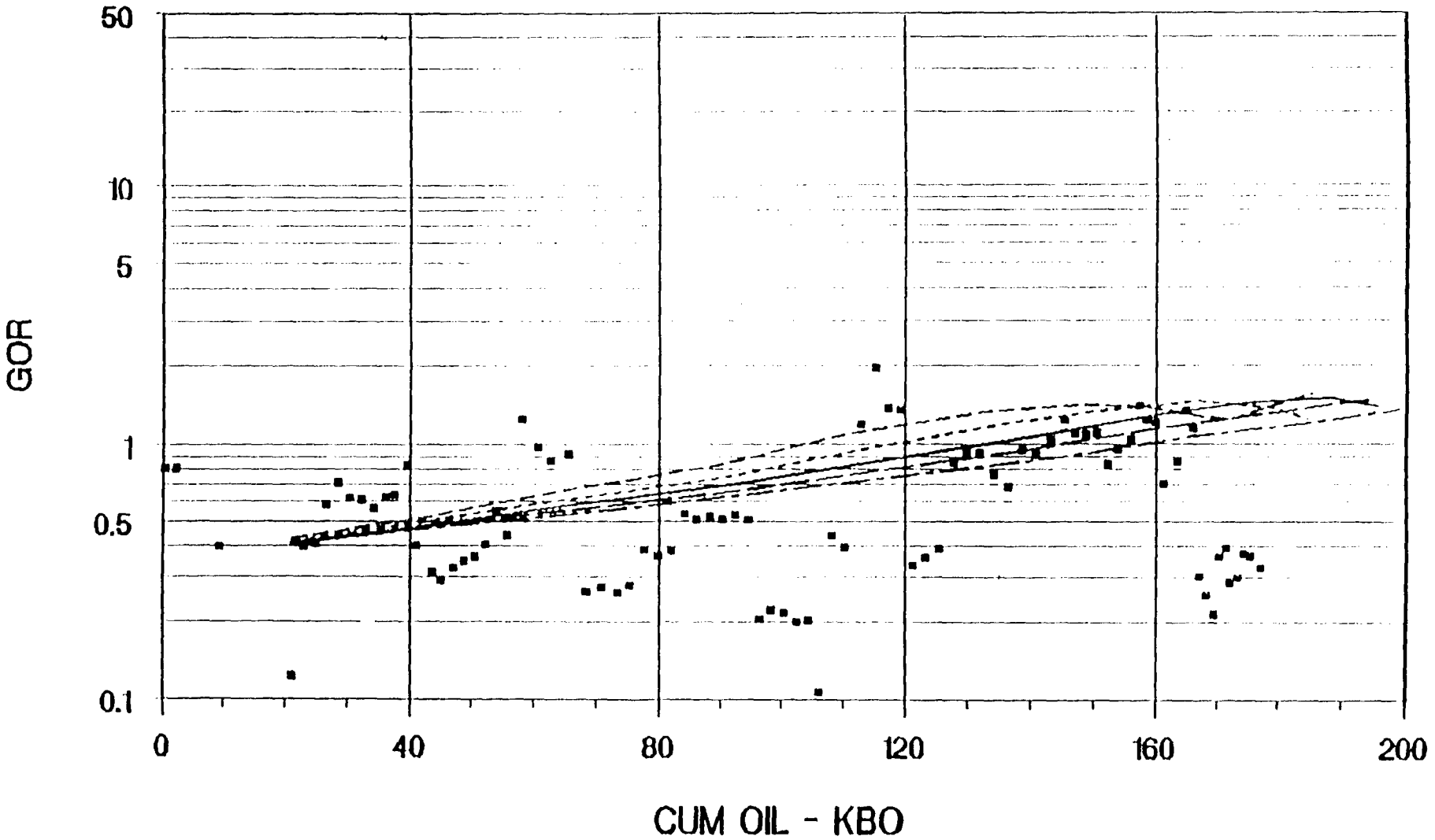
WELL - YATES C FEDERAL #03 (1915)



AVALON FIELD

PRIMARY HISTORY MATCH

WELL - YATES C FEDERAL #04 (1917)



CAUTRELL (WORKOVERS)
12-9-92

FORMATION EVALUATION AND PETROPHYSICS

METHODOLOGY AND CALCULATION PARAMETERS

(Continued)

Water Saturation Calculation

- Utilized all resistivity curves available to calculate Rt

  DLL : corrected for invasion — 12 wells
  DIL : no invasion correction needed — 8 wells
  ↑ deeper tool

- Input parameters included:

Rt	:	from resistivity logs
Rw @ BHT	:	averaged from 15 produced water analyses (Rw average for Upper Cherry Canyon = 0.0471 ohm-meters @ 105°F Rw average for Upper Brushy Canyon = 0.0459 ohm-meters @ 105°F)
a	:	determined from special core analysis (SCAL) work on Yates "C" Federal #6, used 1.0
m	:	determined from SCAL work, used 1.9
n	:	determined from SCAL work, used 1.84
Rwb	:	calculated resistivity of bound water in clays, used 1.93 ← bound water in track

5-15% clay from X-ray

- Used "Dual Water" model to calculate foot-by-foot clay corrected water saturations

Cutoffs

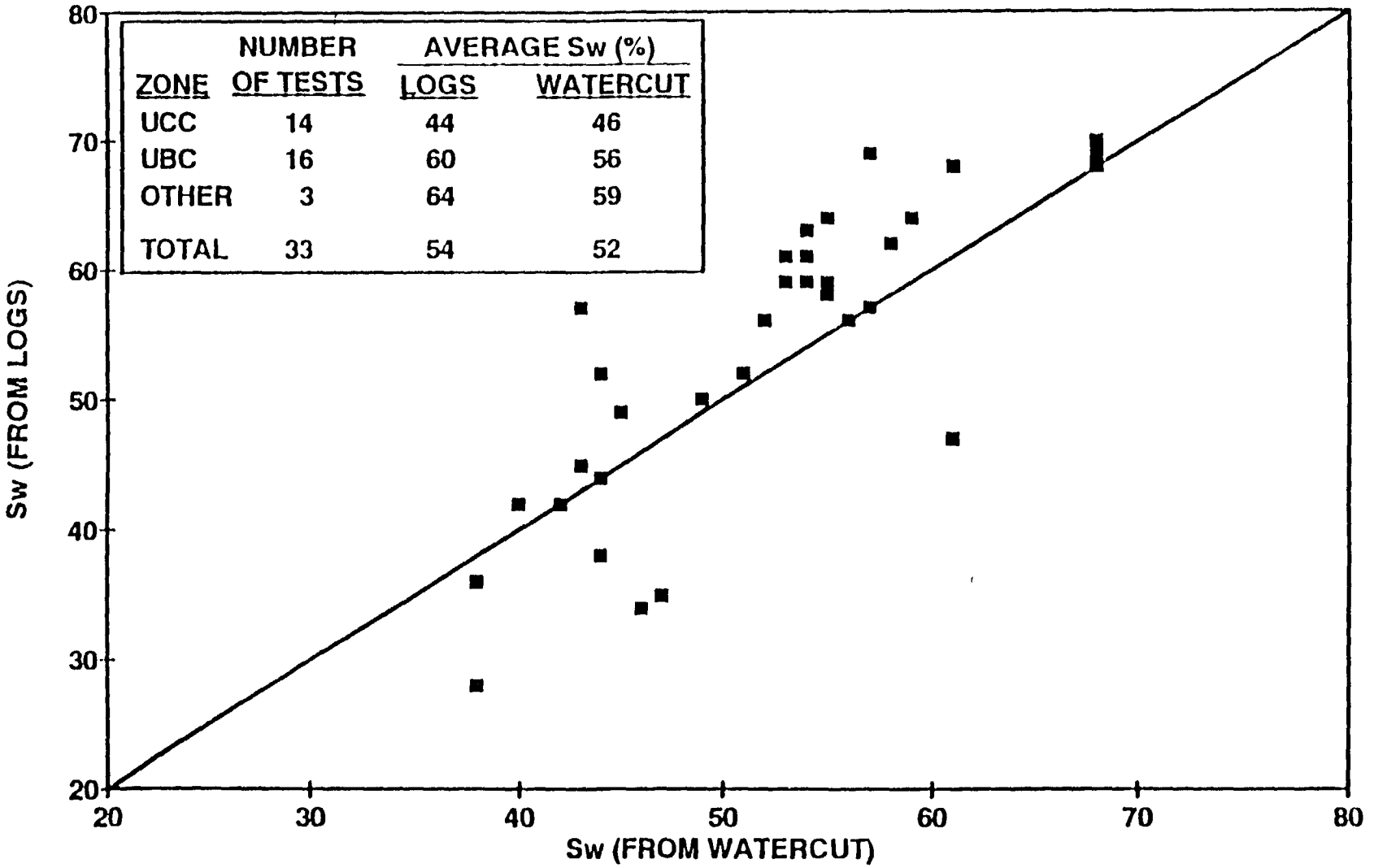
- Applied porosity cutoffs to foot-by-foot porosity data to net out non-pay section
- Different cutoffs used in each zone:

  Upper Cherry Canyon cutoff = 10% PHI_{ec}
  Upper Brushy Canyon cutoff = 11% PHI_{ec}

- Allows calculation of net thickness, average porosity and average water saturation by zone

AVALON (DELAWARE) FIELD
Sw CHECK

ZONE	NUMBER OF TESTS	AVERAGE Sw (%) LOGS	AVERAGE Sw (%) WATERCUT
UCC	14	44	46
UBC	16	60	56
OTHER	3	64	59
TOTAL	33	54	52



Fractional flow from relative perm curves

AVALON (DELAWARE) FIELD
RECENT WORKOVER RESULTS

Well	Year	Depth	S_w	HC Pore-Thickness	Test Results
YFC#7	1989	3105-3113	0.587	0.656 ft	Swabbed tr oil
YFC#7	1989	2574-2755	0.710	4.70 ft	P/42/420
YFC#9	1989	2538-2788	0.629	9.71 ft	F/71/277 (Commingled UCC + UBC)
YFC#36	1990	4708-4736	0.702	1.22 ft	P/0/268
YFC#36	1990	3406-3624	0.571	10.7 ft	P/142/261
YFC#36	1991	3038-3189	0.586	6.02 ft	P/104/500
YFC#36	1991	2546-2810	0.440	10.9 ft	P/200/200
EP#7	1992	2558-2572	0.260	1.92 ft	P/10/100

good relation

EP#7 Summary:

2796-2836 S_w = 0.422, HC Pore-Thickness = 3.86
Acidized with 15% NEFE.
No frac.
Swab tested for less than 2 days, swabbed dry, small show of gas - no oil.

2662-2686 S_w = 0.350, HC Pore-Thickness = 2.50
Acidized with 15% NEFE.
No frac.
Swab tested for less than 2 days, did not recover load. Swabbed dry, no show of gas or oil.

2558-2572 S_w = 0.260, HC Pore-Thickness = 1.92
Acidized with 15% NEFE (with clay stabilizer)
Pre-frac swab tests (84 bbls load to recover):

(1) Recovered 14 bbls, swabbed dry.
(2) 1½ hours later, made swab run in barrel, recovered 8 gal. oil/20 gal. water, swabbed dry.
(3) 1½ hours later, recovered 13 gal. oil/23 gal. water, swabbed dry. Small gas show.
(4) Next day, recovered 1 bbl oil/5½ bbls water.

Fraced (357 bbl load).
Recovered (swabbed?) 9 bbl oil/301 bbl water.
Recovered 13 BO/117 BW.
PWOP.

Model prediction for zone CDCM = 11 BOPD.