

The Evolving Exploration of the Subsalt Play in the Offshore Gulf of Mexico*

Dwight “Clint” Moore¹ and Robert O. Brooks²

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*Adapted from presentation at GCAGS Convention, 1995, and accompanying article in GCAGS Transactions, v. 45, p. 7-12.

Authors’ note: Metric measurements were not utilized because all of the depth data is referenced from well log surveys that utilize English measurements.

¹Anadarko Petroleum Corporation, Houston, Texas; current address:

²TGS-Calibre Geophysical Company, Houston, Texas

Abstract

The co-existence of horizontal components of salt movement with subsalt traps in the south additions of the Louisiana and Texas shelf and slope has been recognized within the last decade (Brooks and Moore, 1993). Throughout the 1970's and 1980's hundreds of wells were drilled into salt on the outer shelf and slope of the northwestern Gulf of Mexico. These wells barely penetrated salt features that are now known to be laterally emplaced horizontal salt sheets. Drilling was typically stopped thousands of feet short of testing the potential sizable petroleum reservoirs of the subsalt exploration play, which is now being pursued and developed. It is apparent that the evolutionary vertical remobilization of portions of these sheets has structured many of the supra-salt giant fields discovered in younger, overlying sediments (Brooks and Denman, 1995; Brooks and Hall, 1995).

Horizontal emplacement of Gulf of Mexico salt sheets, and their effect on subsalt drilling results, can be demonstrated using 2-D time seismic sections, well logs, and biostratigraphy from over 30 wells drilled through varying thicknesses of the salt sheets. The presence of thick subsalt sands, such as those observed in SMI 200, are now also proven. Subsalt petroleum discoveries, announced in SS 349, ST 260, and MC 211, have confirmed the play and encourage future exploratory drilling. As advanced acquisition and processing techniques provide improvements in seismic image resolution, and subsalt well control refines geologic models and concepts, geoscientific integration will lead to additional significant discoveries in multiple-style traps beneath the horizontal-salt sheets of the offshore Gulf of Mexico.

The 1990's should be the "Decade of Discovery" for this significant subsalt petroleum potential, hidden by these salt sheets that have obscured subsalt seismic images for decades.

THE EVOLVING EXPLORATION OF THE SUB-SALT PLAY IN THE OFFSHORE GULF OF MEXICO

DWIGHT "CLINT" MOORE

ROBERT O. BROOKS



DISCOVERY

IS

SEEING WHAT EVERYBODY ELSE

HAS SEEN,

AND

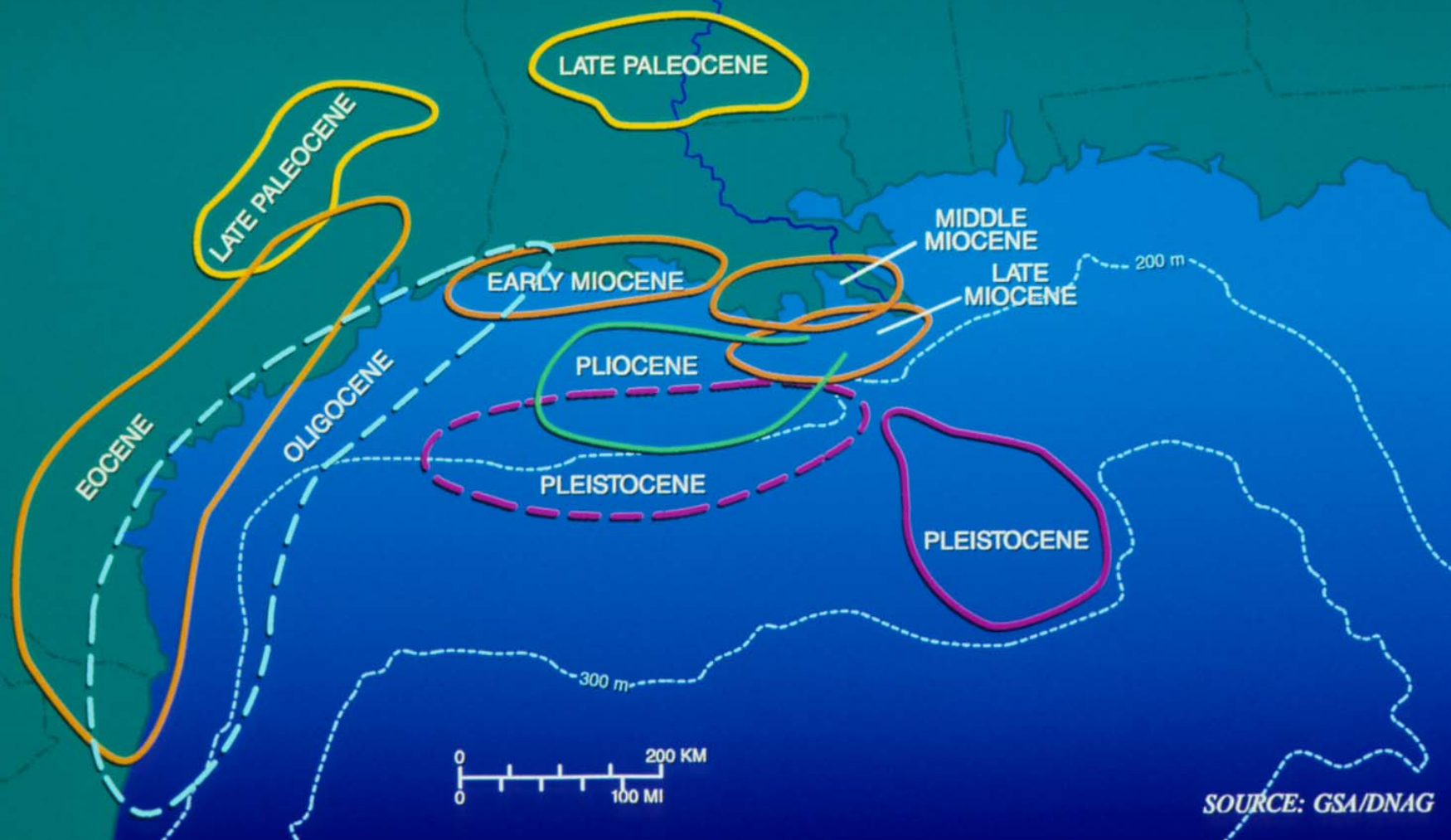
THINKING WHAT NOBODY ELSE

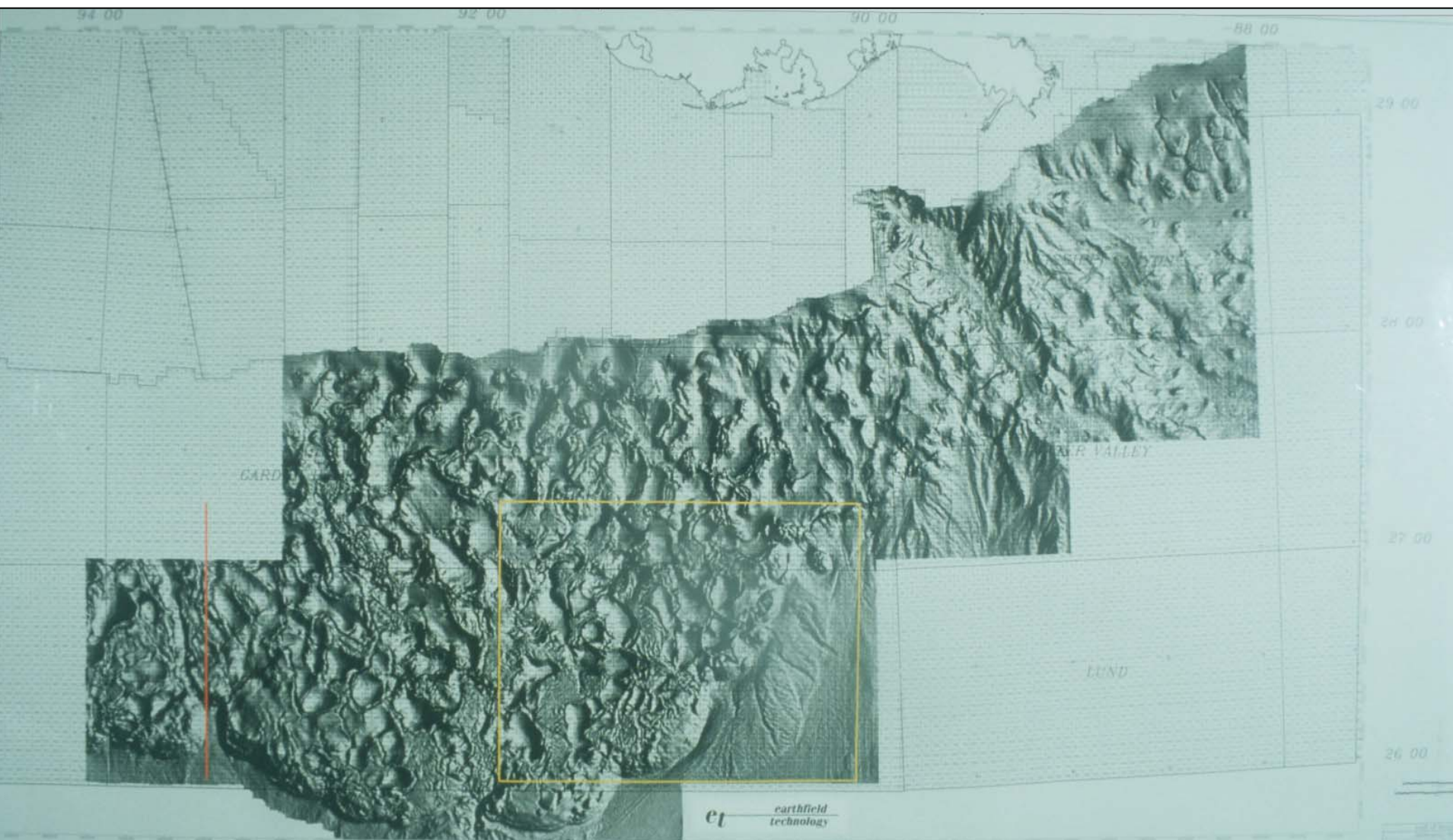
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Salt Provinces

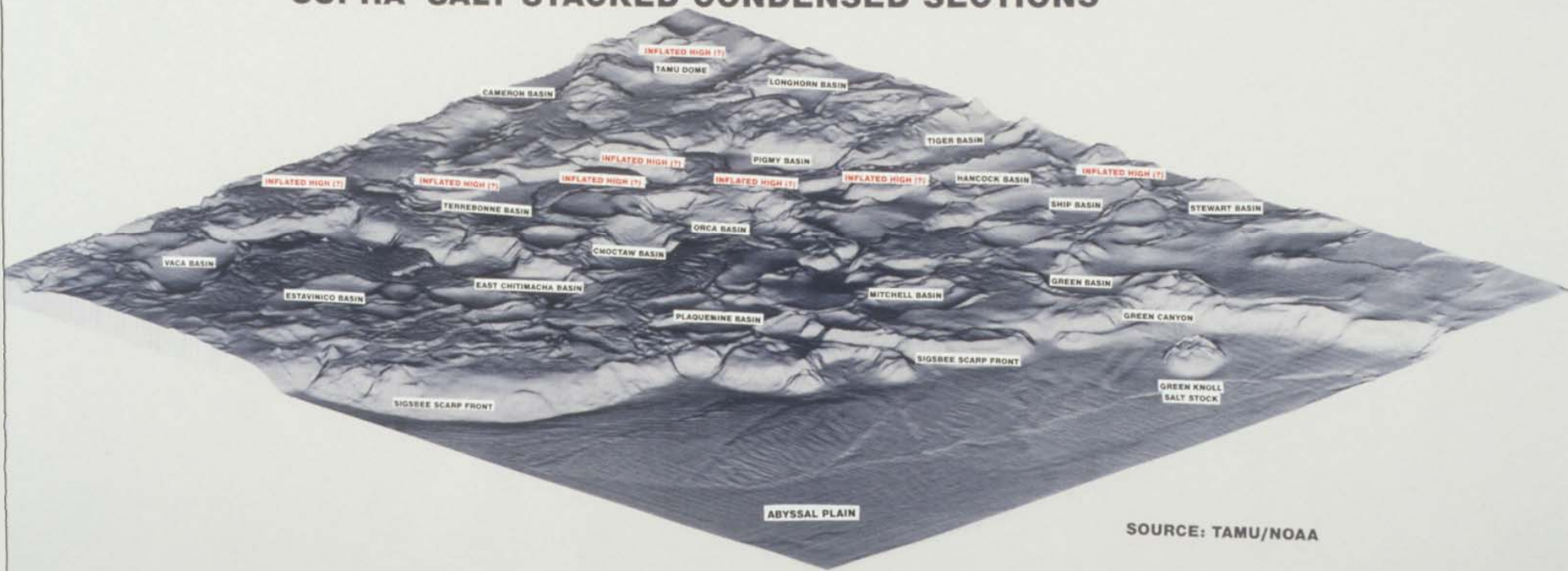


Cenozoic Depocenters

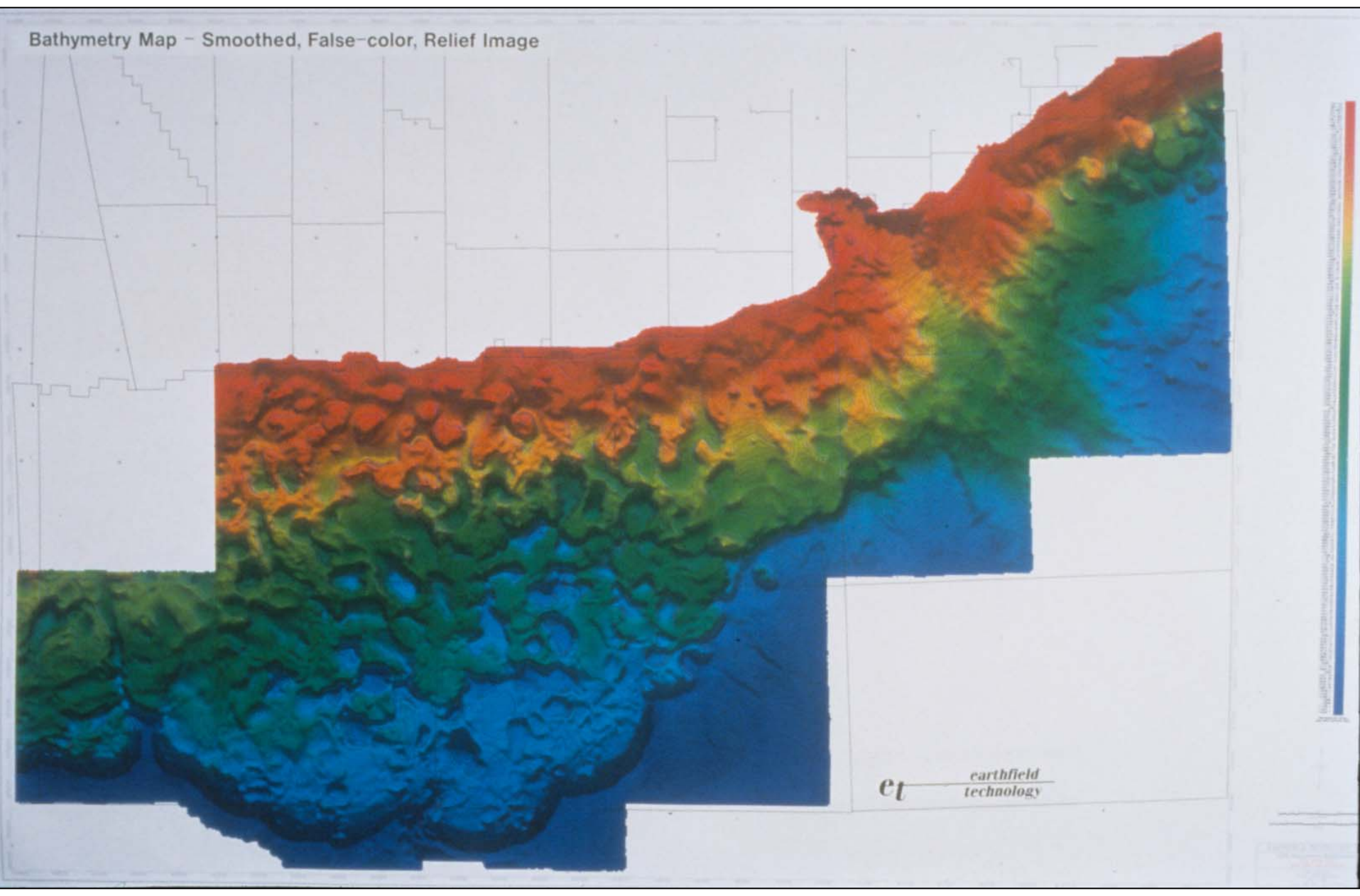




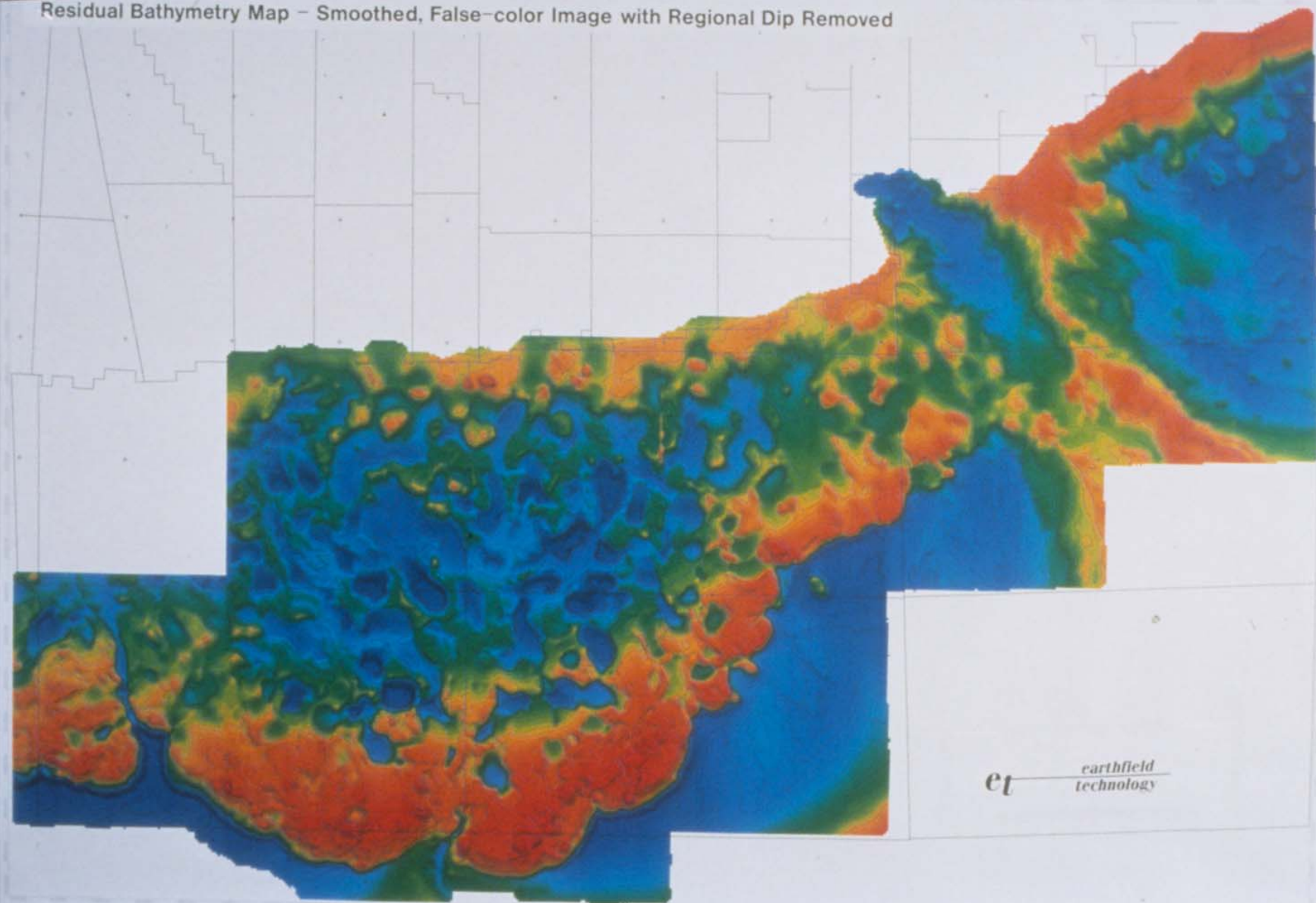
**OVERTHRUST SIGSBEE SALT SHEET / PLATFORM
PRESENT DAY – WALKER RIDGE/GREEN CANYON
INTRA-BASINAL SALT INFLATED HIGHS WITH POSSIBLE
SUPRA-SALT STACKED CONDENSED SECTIONS**



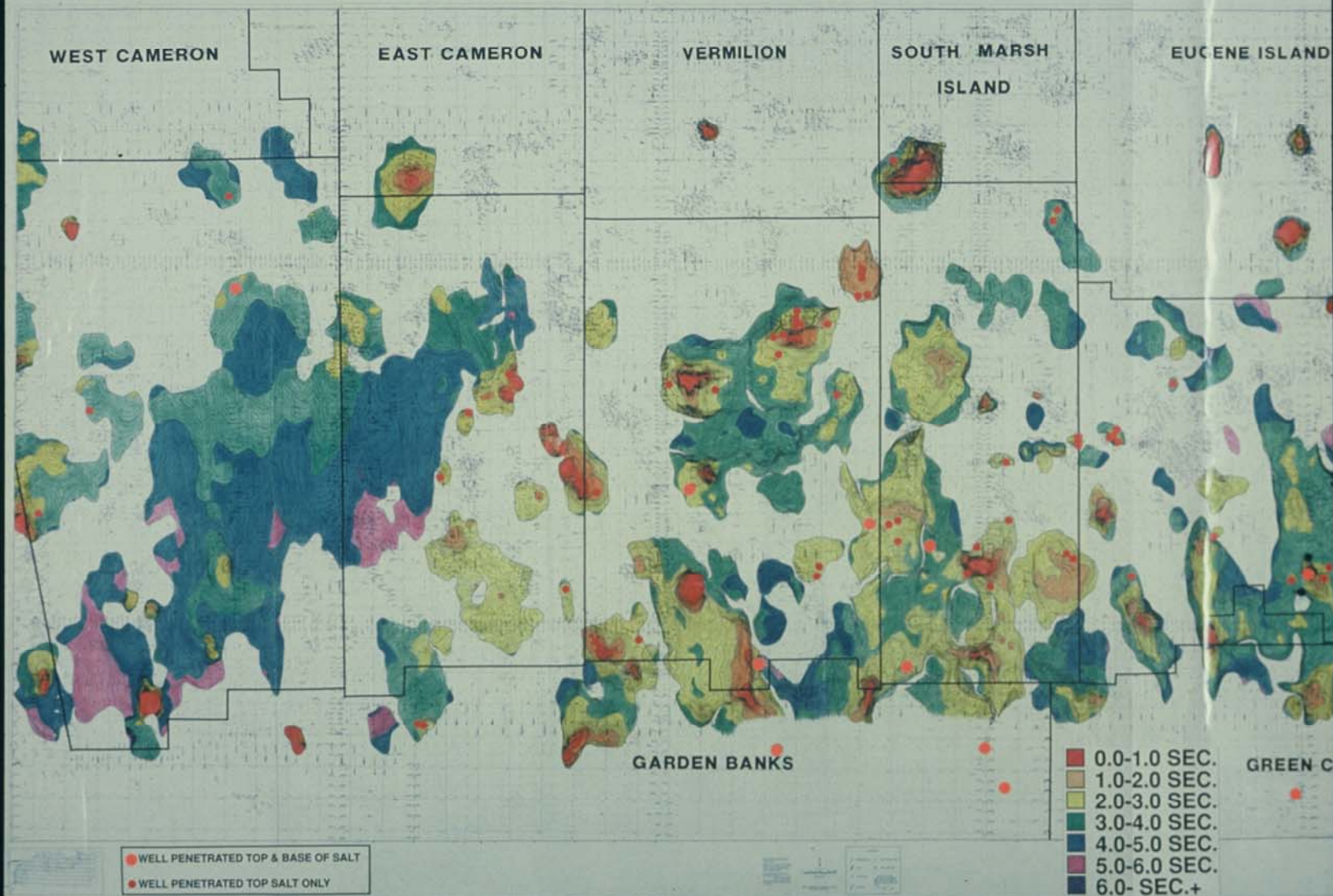
Bathymetry Map – Smoothed, False-color, Relief Image



Residual Bathymetry Map - Smoothed, False-color Image with Regional Dip Removed

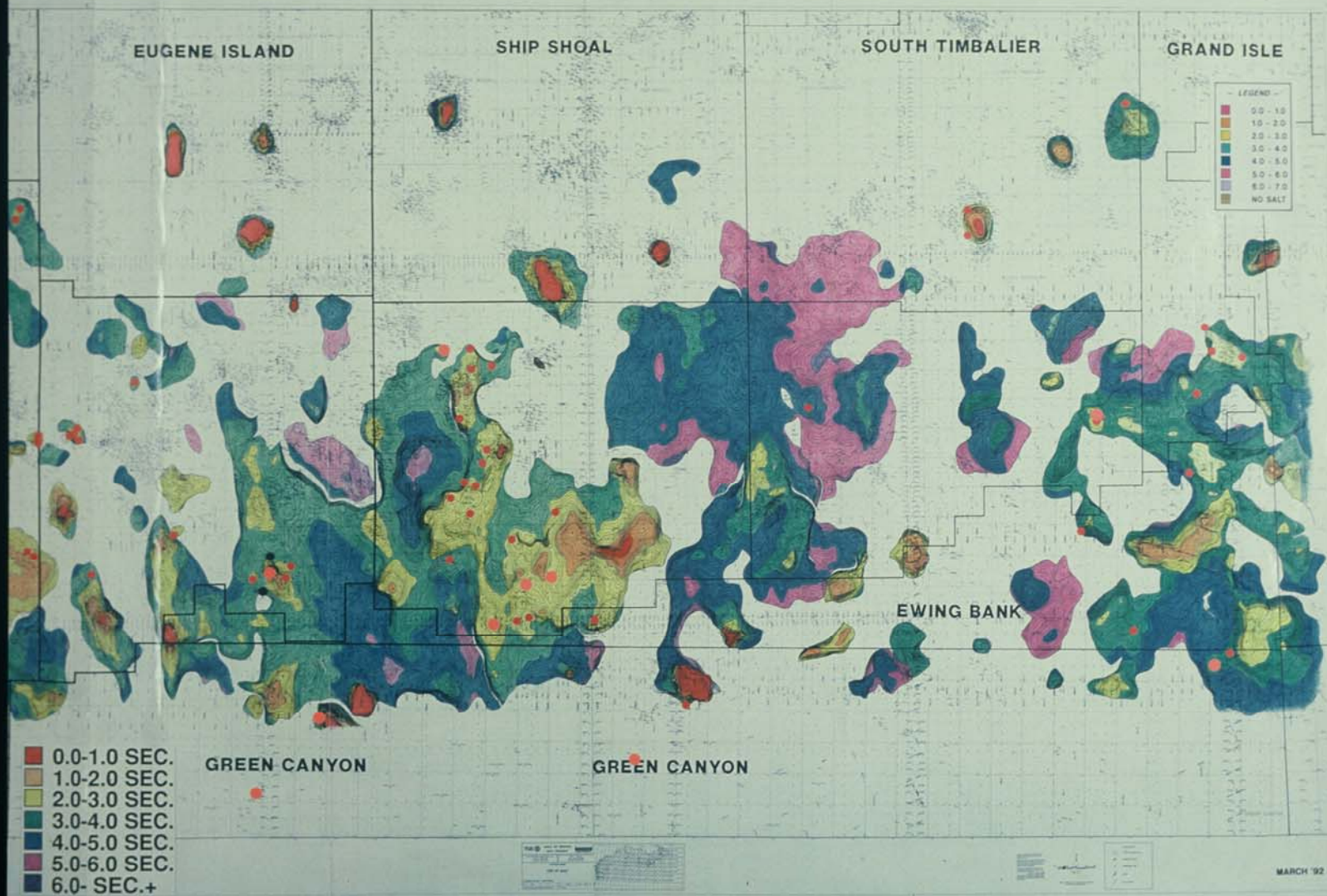


et — earthfield
technology

TOP OF SALT
SOUTH LOUISIANA SHELF

TOP OF SALT

SOUTH LOUISIANA SHELF

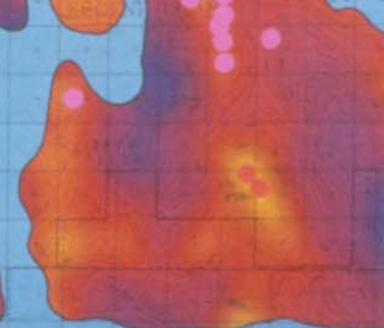
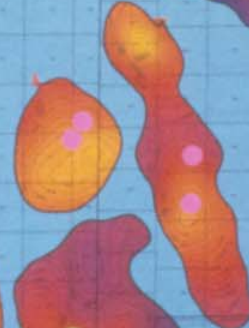
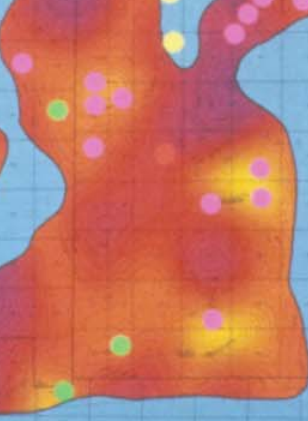
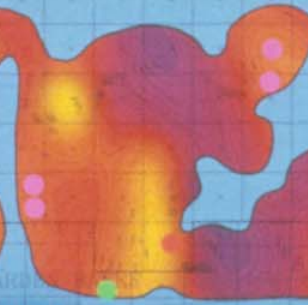
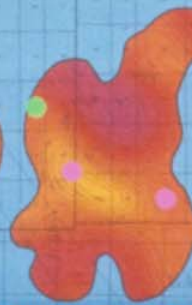
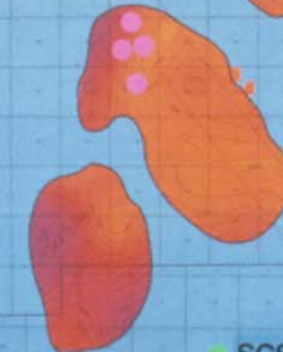
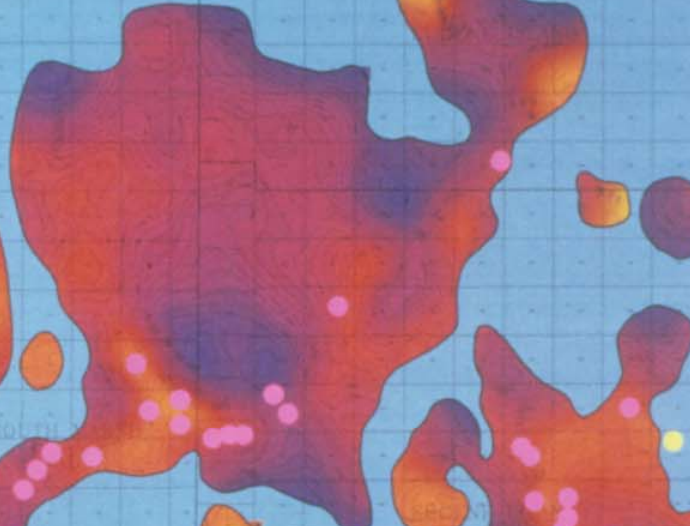
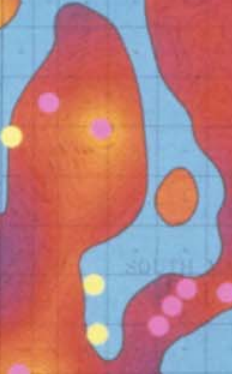
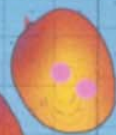
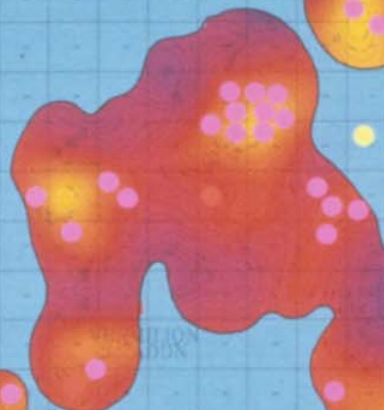
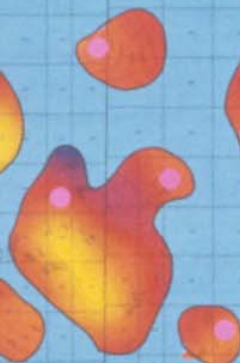
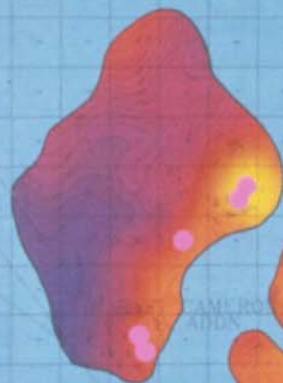
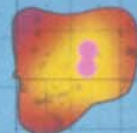
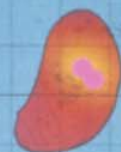


EAST CAMERON

VERMILION

SOUTH MARSH
ISLAND

EUGENE ISLAND



- SCS IN SALT TOP WELL
- SUBSALT WELL
- SUBWELD WELL
- SALT TOP WELL

SHIP SHOAL

SOUTH TIMBALIER

GRAND ISLE

MISSISSIPPI RIVER DELTA

SHIP SHOAL

SOUTH TIMBALIER

GRAND ISLE

MISSISSIPPI CANYON

SOUTH TIMBALIER

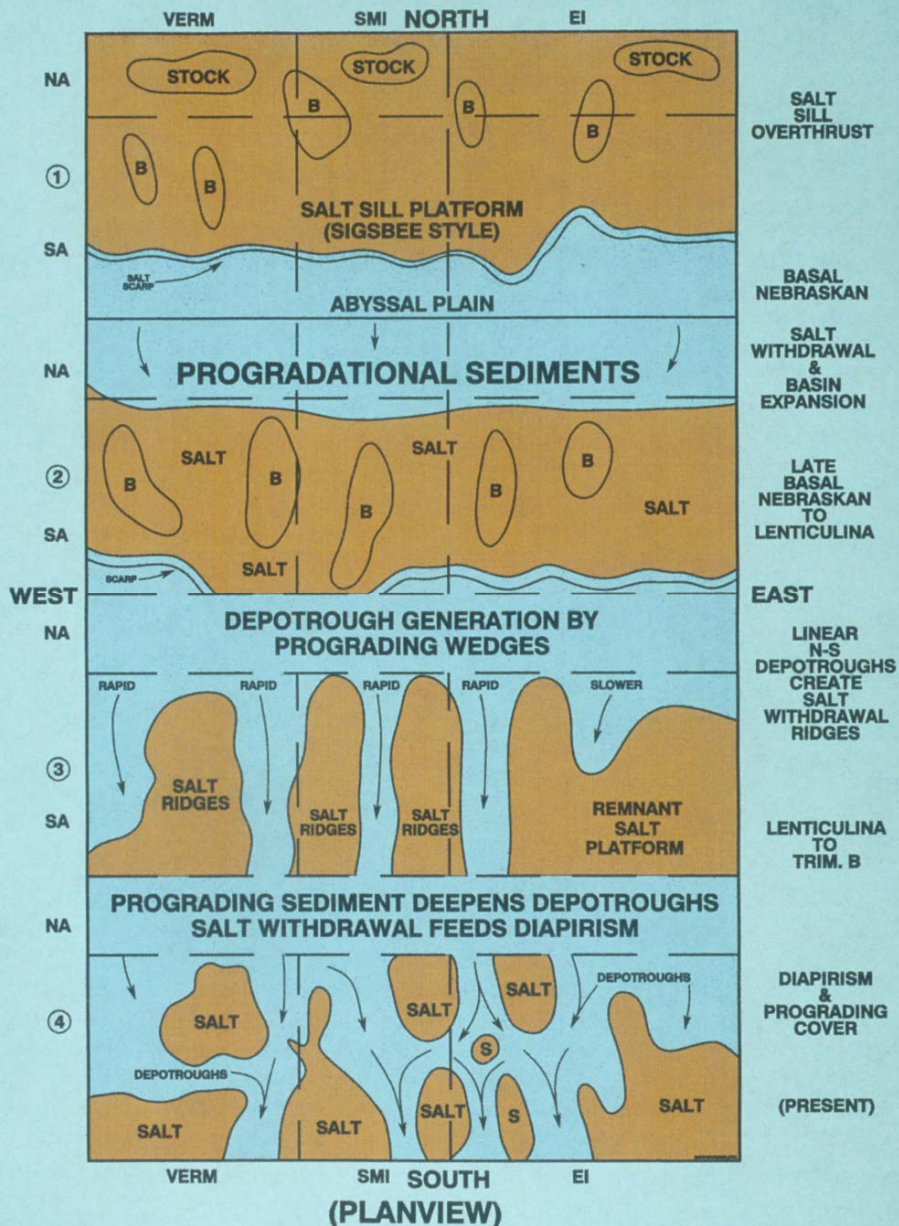
GREEN CANYON

ATWATER VALLEY

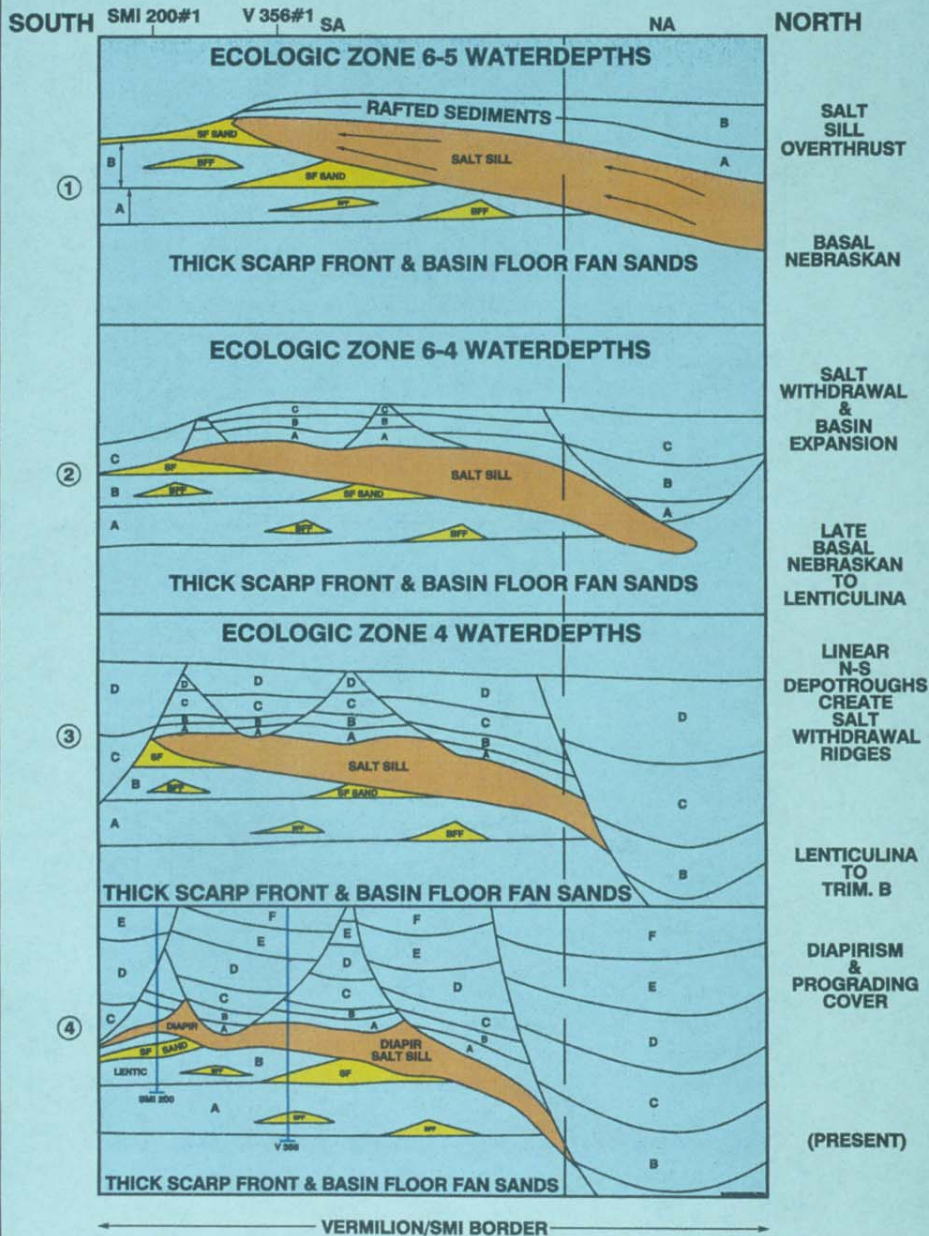
GREEN CANYON

- SCS IN SALT TOP WELL
- SUBSALT WELL
- SUBWELD WELL
- SALT TOP WELL

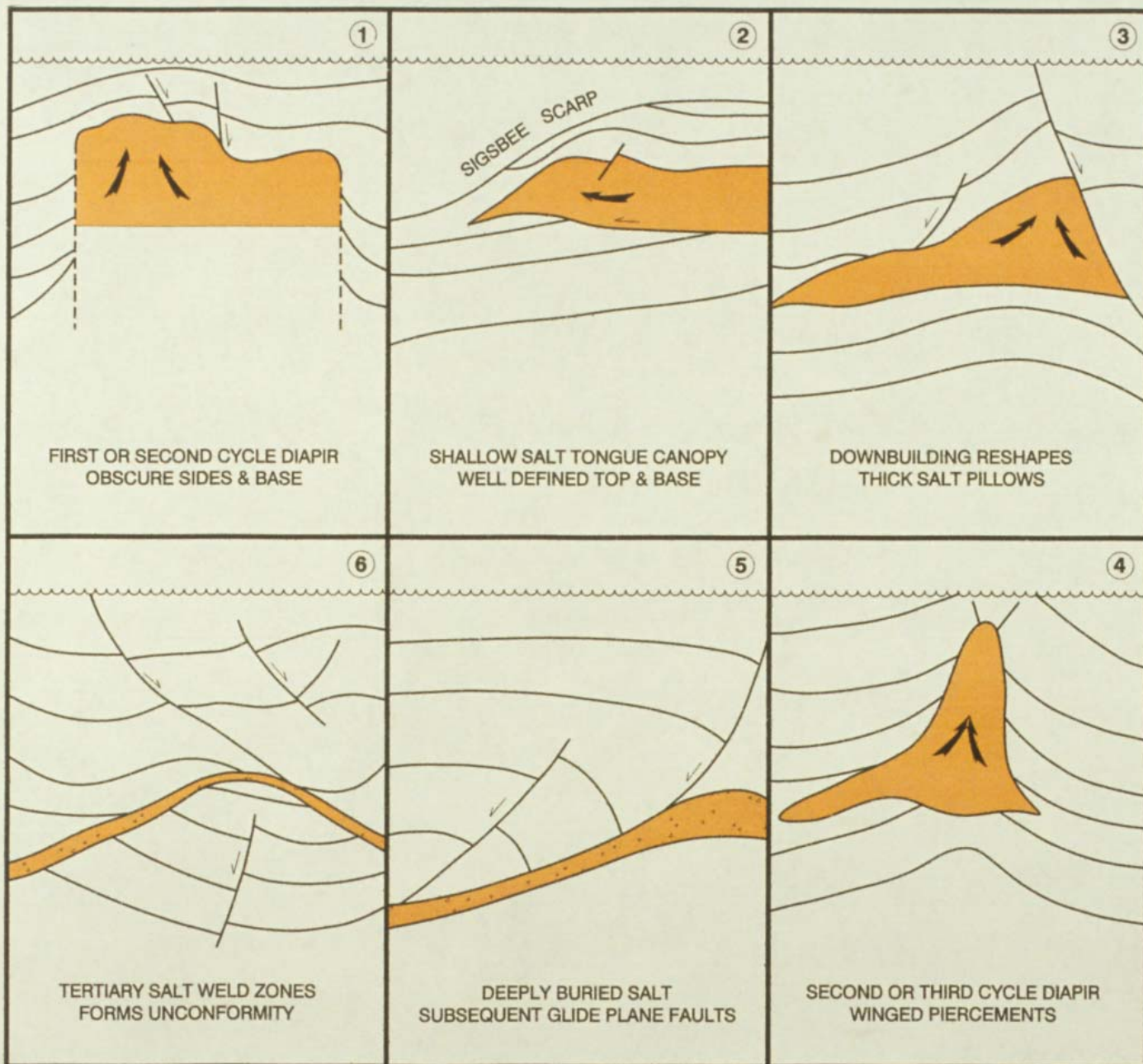
EVOLUTION OF SALT STYLES



EVOLUTION OF SALT STYLES

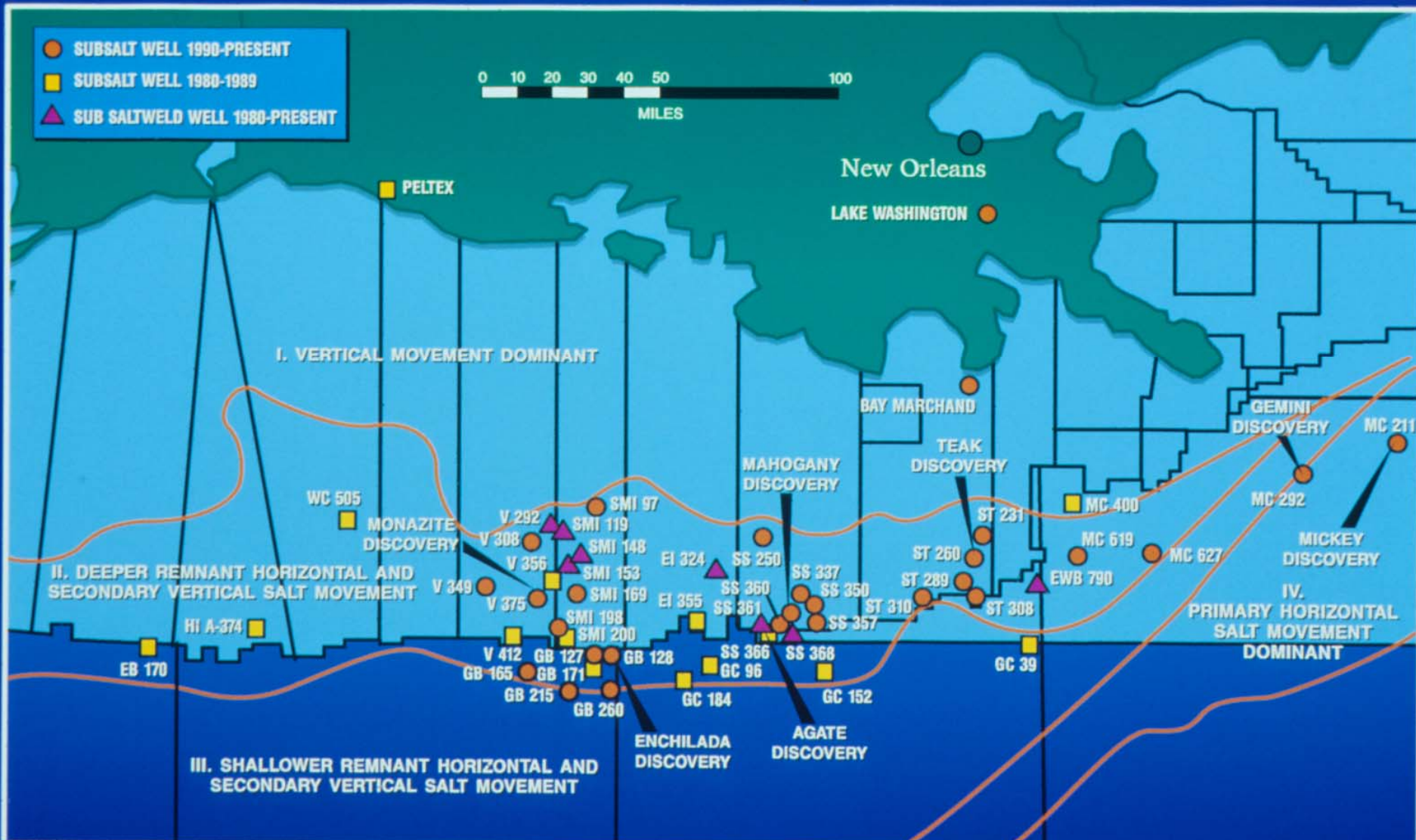


STRUCTURAL STYLES OF HORIZONTAL SALT FLOWAGE.



OFFSHORE GULF OF MEXICO

Subsalt Wells and Salt Style Distribution



SIGNIFICANT SUB-SALT WELLS - FEDERAL OFFSHORE GULF OF MEXICO

(MAJOR SHEET WELL PENETRATIONS)

WELL NAME	DATE DRLD (TD)	W.D.	TOP OF SALT	BASE OF SALT	TVD THICKNESS OF SALT	DRLD MD WELL (TD)	DRLD TVD SEDIMENT THICKNESS BELOW SALT
Garden Banks 171 #1, Marathon	05/84	670'	-8,400'	-9,510'	1,110'	10,597'	997'
West Cameron 505 #2, Gulf	09/84	138'	-13,900'	-15,590'	1,690'	18,500'	2,820'
S. Marsh Island 200 #1, Diamond Shamrock	02/86	475'	-8,730'	-9,720'	990'	13,500'	3,700'
Vermilion 356 #1, Amoco - "POOH"	12/87	265'	-8,400'	-10,500'	2,100'	17,000'	6,360'
Lake Washington #1, Amoco (Onshore)	04/90	LAND	-9,350'	-13,410'	4,075'	21,241'	7,781'
Miss. Canyon 211 #1, Exxon - "MICKEY"	06/90	4356'	-5,750'	-8,780'	3,030'	14,670'	5,820'
Bay Marchand 4 #1, Amoco	05/91	36'	-9,820'	-14,160'	4,340'	18,277'	4,260'
Garden Banks 165 #2, Chevron	04/92	724'	-5,765'	-12,715'	6,950'	18,000'	5,200'
South Marsh Is. 169 #1, Amoco - "MATTAPONI"	12/93	288'	-11,222'	-12,392'	1,170'	18,020'	5,520'
Ship Shoal 349 #1, Phillips - "MAHOGANY"	10/93	372'	-7,603'	-11,428'	3,825'	16,500'	4,990'
South Timbalier 260 #1, Phillips - "TEAK"	05/94	295'	-9,740'	-11,600'	1,860'	16,610'	4,920'
Vermilion 349 #1, Anadarko - "MESQUITE"	06/94	237'	-9,550'	-12,010'	2,460'	16,146'	4,046'
Ship Shoal 349 #2, Phillips - "MAHOGANY"	08/94	372'	-7,660'	-11,280'	3,620'	18,603'	7,243'
Ship Shoal 360 #2, Unocal - "RHINO"	08/94	397'	-8,335'	-10,745'	2,410'	19,000'	8,180'
Ship Shoal 250 #1, Japex	09/94	184'	-12,246'	-13,202'	956'	17,750'	4,447'
South Timbalier 289 #1, CNG - "CYPRESS"	11/94	397'	-12,078'	-13,003'	925'	18,034'	4,934'
Ship Shoal 359 #2, Phillips - "MAHOGANY"	04/95	372'	-7,440'	-11,516'	4,076'	18,308' TVD	6,715'
Garden Banks 127 #1, Shell - "CHIMICHANGA"	05/95	622'	-9,280'	-10,520'	1,240'	14,730'	4,110'
Vermilion 308 #1, Amoco - "SOUTH ANNA"	07/95	205'	-12,396'	-12,932'	536'	20,399'	7,333'
Mississippi Canyon 292 #1, Texaco - "GEMINI"	08/95	3393'	Confidential	Confidential	Confidential	17,976'	Confidential
Ship Shoal 361 #1, Phillips - "AGATE"	03/96	405'	Confidential	Confidential	Confidential	16,163'	Confidential
Ship Shoal 337 #1, Phillips - "ALEXANDRITE"	04/96	295'	Confidential	Confidential	Confidential	17,851'	Confidential
South Timbalier 308 #2, Marathon - "N. LOBSTER"	04/96	554'	Confidential	Confidential	Confidential	18,199' TVD	Confidential
Ship Shoal 359 #3, Phillips - "MAHOGANY"	05/96	372'	Confidential	Confidential	Confidential	17,924' TVD	Confidential
South Marsh Is. 198 #1, Amerada - "DONATELLO"	07/96	380'	-8,060'	-10,236'	2,176'	13,439'	3,100'
South Timbalier 231 #3, LL&E - "GOLDEN EAGLE"	08/96	235'	Confidential	Confidential	Confidential	19,609' TVD	Confidential
South Timbalier 310 #1, Marathon - "SISKIN"	08/96	447'	-7,503'	-9,631'	2,128'	16,570' TVD	6,840'
Mississippi Canyon 619 #1, Chevron - "KEWEENAW"	08/96	1334'	Confidential	Confidential	Confidential	21,000'	Confidential
Vermilion 375 #1, Anadarko - "MONAZITE"	08/96	318'	Confidential	Confidential	Confidential	14,368' TVD	Confidential
Ship Shoal 350 #1, Vastar - "KINGFISHER"	10/96	311'	Confidential	Confidential	Confidential	16,422'	Confidential
Garden Banks 128 #2, Shell - "ENCHILADA"	11/96	633'	Confidential	Confidential	Confidential	12,338' PTVD	Confidential
Mississippi Canyon 674 #2, BP - "BLOOD, SWEAT, TEARS"	11/96	2,711'	Confidential	Confidential	Confidential	23,088'	Confidential
Mississippi Canyon 292 #2, Texas - "GEMINI"	01/97	4,151'	Confidential	Confidential	Confidential	19,500'	Confidential
Ship Shoal 357 #3, LL&E - "PELICAN"	02/97	420'	Confidential	Confidential	Confidential	20,611'	Confidential
Mississippi Canyon 627 #1, Chevron - "VINCE"	02/97	2,560'	Confidential	Confidential	Confidential	20,076'	Confidential
Garden Banks 215 #4, Amerada Hess - "CONGER"	02/97	1,451'	Confidential	Confidential	Confidential	21,692'	Confidential
South Marsh Is. 97 #1, Pennzoil	04/97	180'	Confidential	Confidential	Confidential	16,672'	Confidential
South Timbalier 299 #1, BHP - "LION"	08/97	290'	Confidential	Confidential	Confidential	17,100' TVD	Confidential
Mississippi Canyon 167 #1, Exxon - "MICKEY"	08/97	4,274'	Confidential	Confidential	Confidential	15,840' TVD	Confidential
Mississippi Canyon 713 #1, Chevron - "ATLAS"	08/97	3,197'	Confidential	Confidential	Confidential	16,180' TVD	Confidential
Mississippi Canyon 212 #1, Exxon - "MICKEY"	Spud 03/97	4,274'	Confidential	Confidential	Confidential	16,585' PTVD	Confidential
Ewing Bank 829 #1, Marathon - "N. LOBSTER"	Spud 06/97	587'	Confidential	Confidential	Confidential	18,300' PTD	Confidential
Garden Banks 216 #3, Amerada Hess - "PENN STATE DEEP"	Spud 06/97	1,448'	Confidential	Confidential	Confidential	20,000' PTVD	Confidential
Garden Banks 215 #5, Amerada Hess - "CONGER"	Spud 08/97	1,464'	Confidential	Confidential	Confidential	22,000' PTD	Confidential

SIGNIFICANT SUB-SALT WELLS - FEDERAL OFFSHORE GULF OF MEXICO

(SHEET EDGE/FLANK AND SUB-WELD WELL PENETRATIONS)

WELL NAME	WELL TYPE	DATE DRLD (TD)	W.D.	TOP OF SALT	BASE OF SALT	TVD THICKNESS OF SALT	DRLD MD WELL (TD)	DRLD TVD SEDIMENT THICKNESS BELOW SALT
S. Marsh Isl. 153 #3, Phillips	W	08/73	249'	NA	NA	NA	14,000'	NA
Cameron Parish Peltex #1	R	10/79	N/A	-20,330'	-20,415'	85'	21,530'	1,085'
S. Marsh Isl. 119 #1, Shell	W	07/81	200'	NA	NA	NA	17,700'	NA
Vermilion 292 #1, Shell	W	03/83	193'	NA	NA	NA	16,000'	NA
Ship Shoal 366 #2, Placid	R	10/83	459'	-7,040' -7,329' -7,605'	-7,281' -7,355' TD in Salt	241' 26' 513' +	8,203'	305' Between Salts
Eugene Island 324 #1, Gulf	W	03/84	253'	NA	NA	NA	15,000'	NA
Green Canyon 98 #1, Conoco	E	06/84	853'	-10,320'	-11,700'	1,380'	12,151' TVD	350'
Green Canyon 39 #1 ST1, Placid	R	09/84	2004'	-11,675' -12,005'	-11,815' TD in Salt	140' 185' +	12,294'	190' Between Salts
Mississippi Canyon 400 #1, Amoco	E	01/85	1011'	-10,710'	-14,160'	3,450'	16,000'	1,840'
East Breaks 170 #1, Amoco	E	08/85	1199'	-16,075'	-16,325'	250'	17,500'	1,100'
Mississippi Canyon 400 #2, Amoco	E	09/85	856'	-14,230'	-15,220'	1,290'	17,010'	1,700'
High Is. A-374 #1, Mobil	R	09/85	362'	-7,575'	-7,825'	250'	15,000'	7,100'
Green Canyon 152 #1STH1, Marathon	E	12/85	1618'	-11,350'	-12,470'	1,130'	14,133' TVD	1,563'
Ewing Bank 790 #1, Placid Oil	W	06/86	930'	NA	NA	NA	15,143' TVD	NA
Vermilion 412 #1, Mobil	E	01/87	471'	-7,705'	-9,020'	1,315'	9,502'	402'
Eugene Is. 395 #A-12, Union Texas	E	07/88	430'	-12,450'	-12,510'	60'	14,104'	74'
Eugene Is. 371 #B-4, Union Texas	E	08/88	420'	10,650' MD	13,000' MD	1,875'	9,881' TVD	30'
S. Marsh Isl. 148 #1, Chevron/Tenneco	W	12/88	227'	NA	NA	NA	19,500'	NA
Green Canyon 184 #A-12, Conoco	E	12/90	1758'	-8,300'	-8,600'	300'	12,448' TVD	3,748'
Garden Banks 260 #1STH2, Amerada Hess	E	05/93	1648'	-14,098	-16,108'	2,010'	18,848' TVD	2,658'
Garden Banks 128 #1, Shell – "ENCHILADA"	?	07/94	718'	Confidential	Confidential	Confidential	17,477' TVD	Confidential
Ship Shoal 368 #1, Amerada Hess – "CITATION"	W	02/95	454'	NA	NA	NA	15,774' TVD	NA
Garden Banks 216 #1 STH1, Amerada Hess	?	05/95	1611'	Confidential	Confidential	Confidential	18,331' TVD	Confidential
Garden Banks 119 #1, Oryx	?	08/95	622'	Confidential	Confidential	Confidential	14,717' TVD	Confidential
S. Marsh Isl. 123 #1, Anadarko – "MALACHITE"	W	09/97	202'	Confidential	Confidential	Confidential	15,915' TD	Confidential

W = WELD

E = EDGE/FLANK

R = WITHDRAWAL REMNANT

NORTHWEST

PELTEX #1
PUMPKIN RIDGE

16878

SOUTHEAST

0.0

0.0

2.0

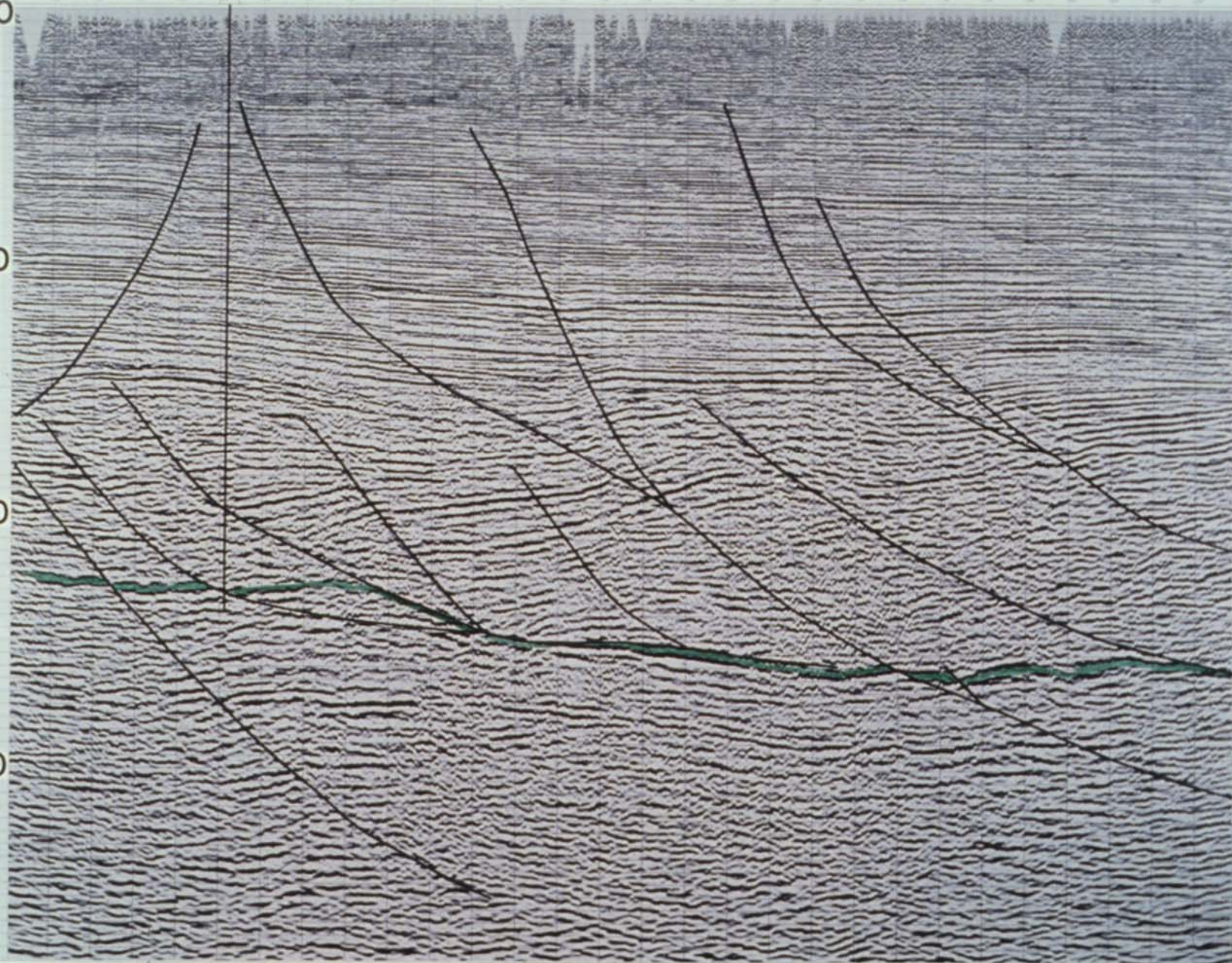
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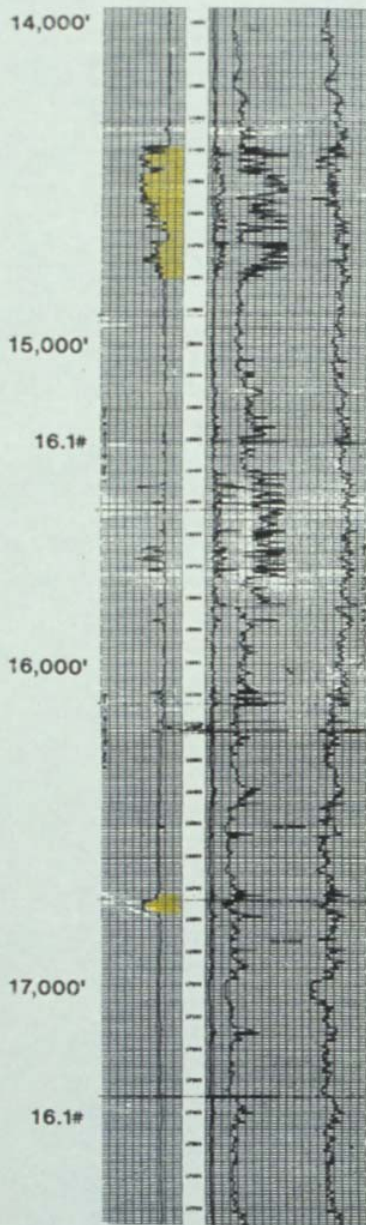
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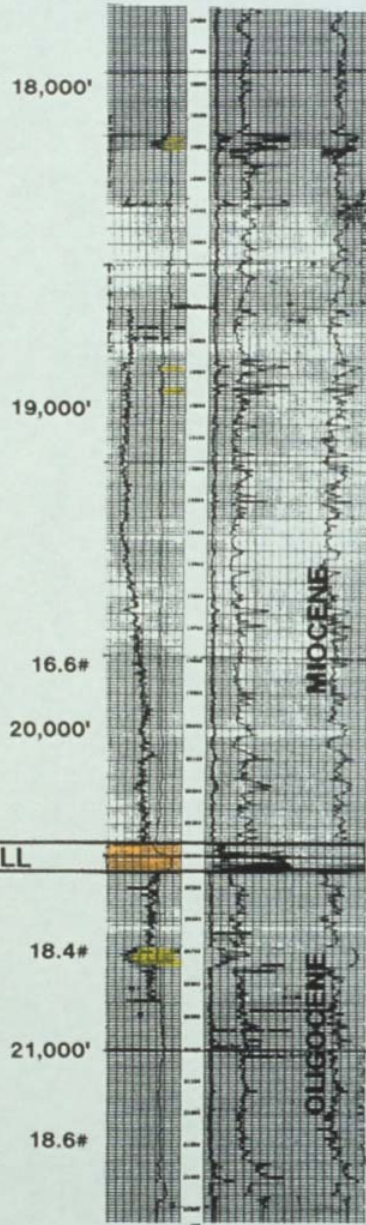
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**PELTEX #1
CAMERON PARISH
#1 MERMENTAU**

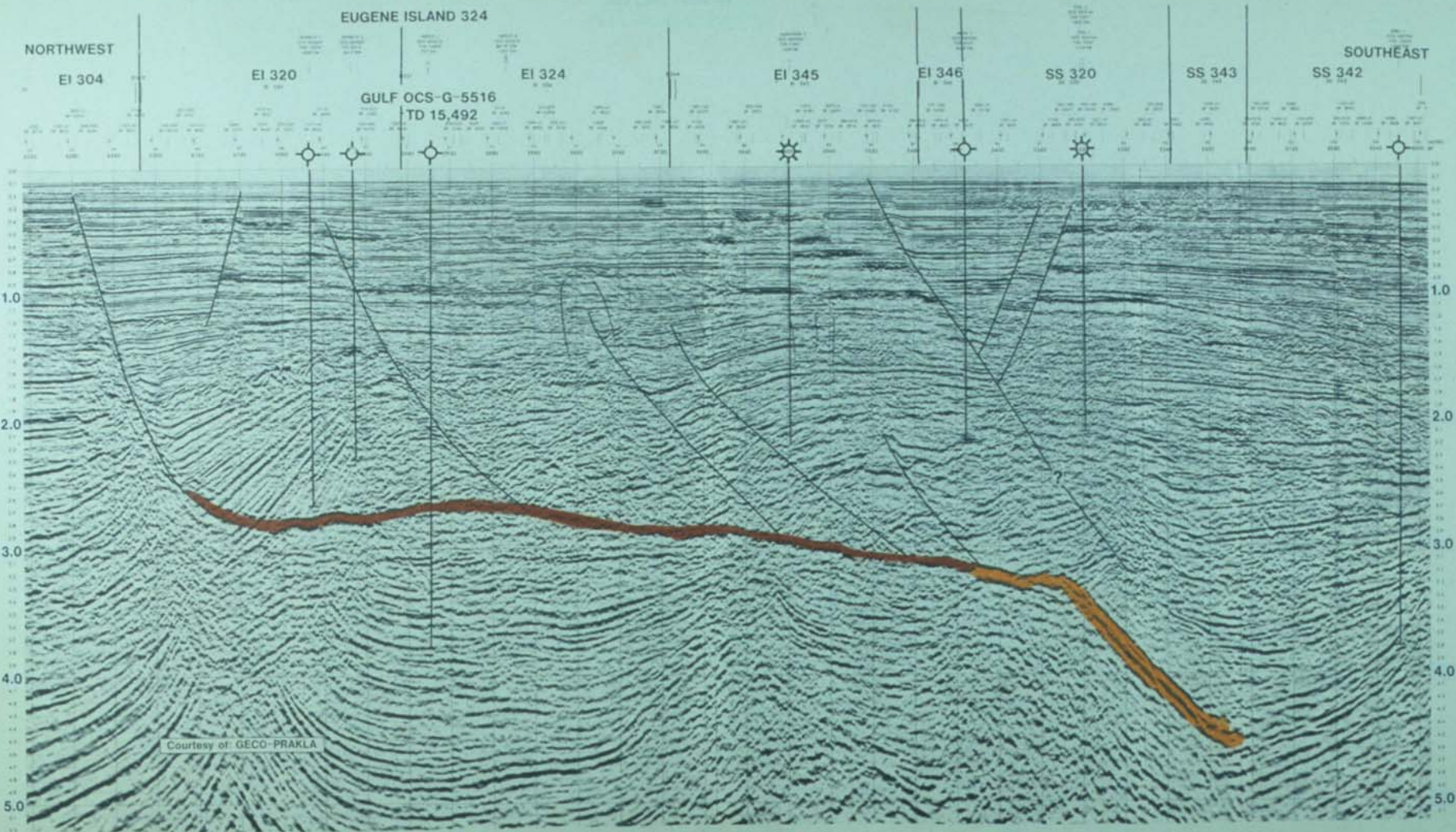


85' SALT SILL

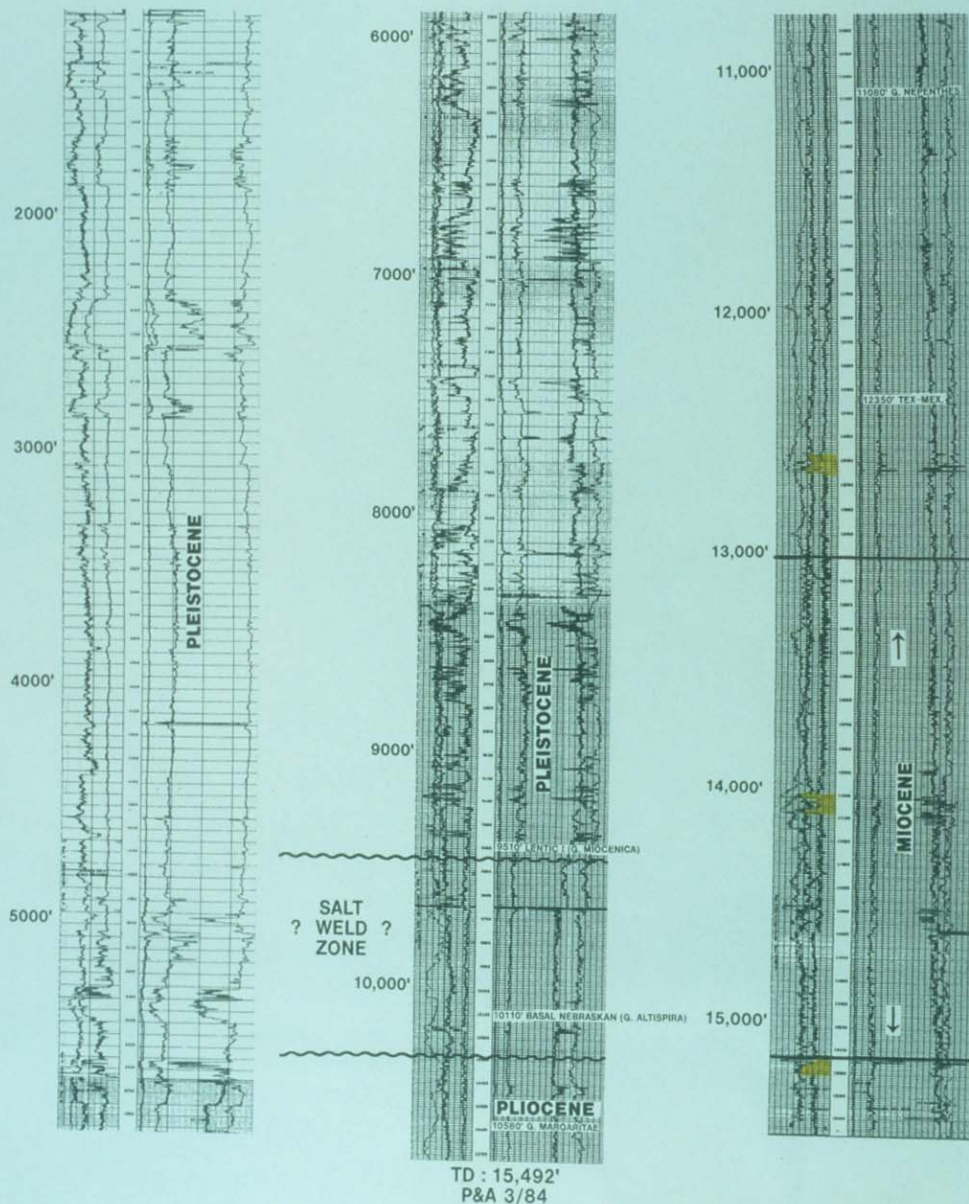


**TOP/SALT -20,330'
BASE/SALT -20,415'**

**DTD 21,500'
P&A 9/80**



GULF #1
OCS-G-5516
EUGENE ISLAND 324



TGS LINE 1560-20

SOUTH

NORTH

GARDEN BANKS 215

GARDEN BANKS 171

GARDEN BANKS 127

GARDEN BANKS 83

SOUTH MARSH
ISLAND 203

AMERADA HESS

OCS-G-14221 #1

TOP: BASE/SALT?

TVD 13,100' = 13,680' MD

SUSP. OPERS. 3/95

WATER DEPTH - 818'

LOG DATA NOT RELEASED

MARATHON

OCS-G-6353 #1

TOP/SALT - 8400'

BASE/SALT - 9510'

TD 10,300' TVD

WATER DEPTH = 670'

SHELL OFFSHORE

OCS-G-11455 #1

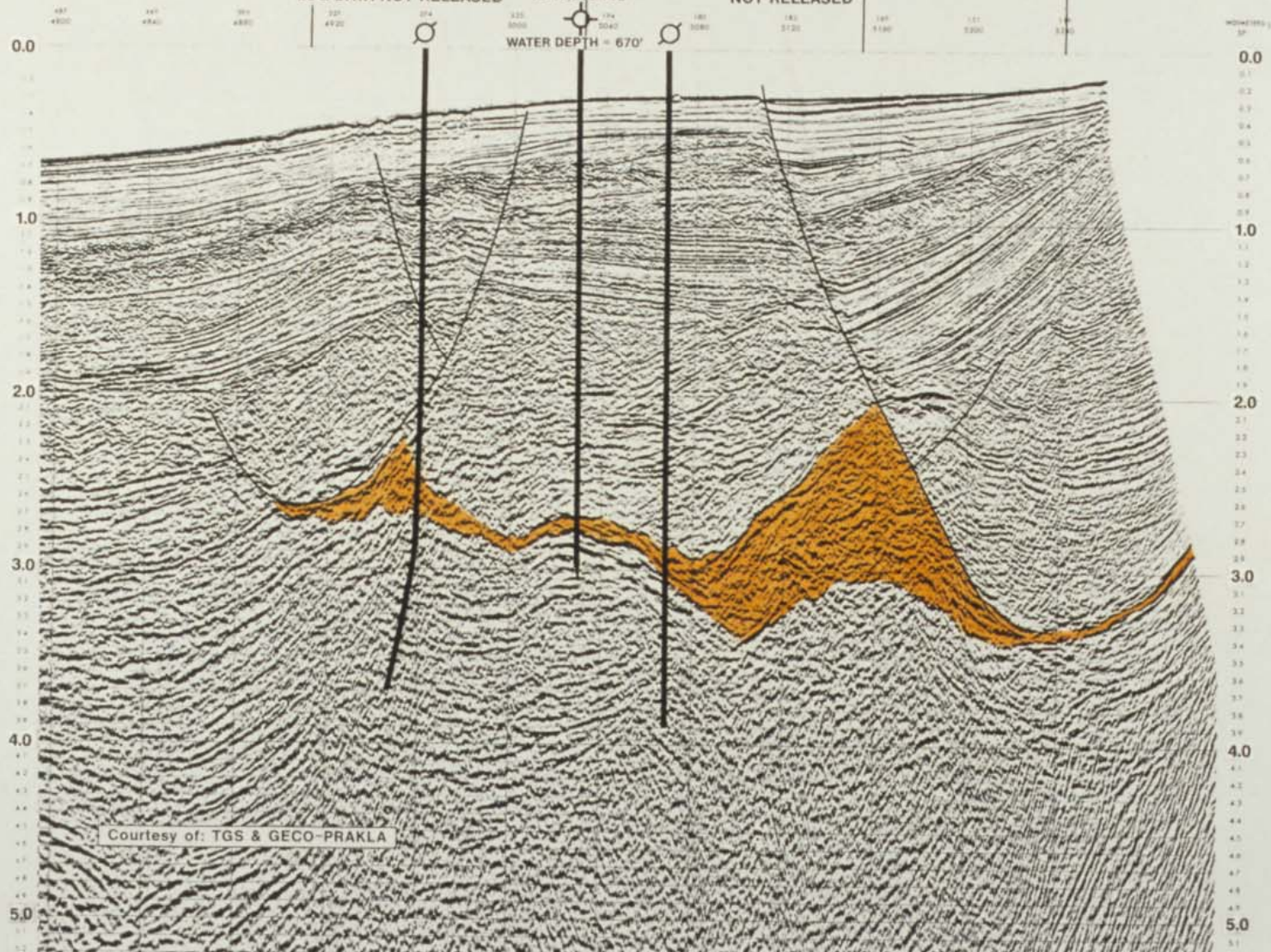
TOP: BASE/SALT?

TVD 17,477' = 18,454' MD

SUSP. OPERS. 7/94

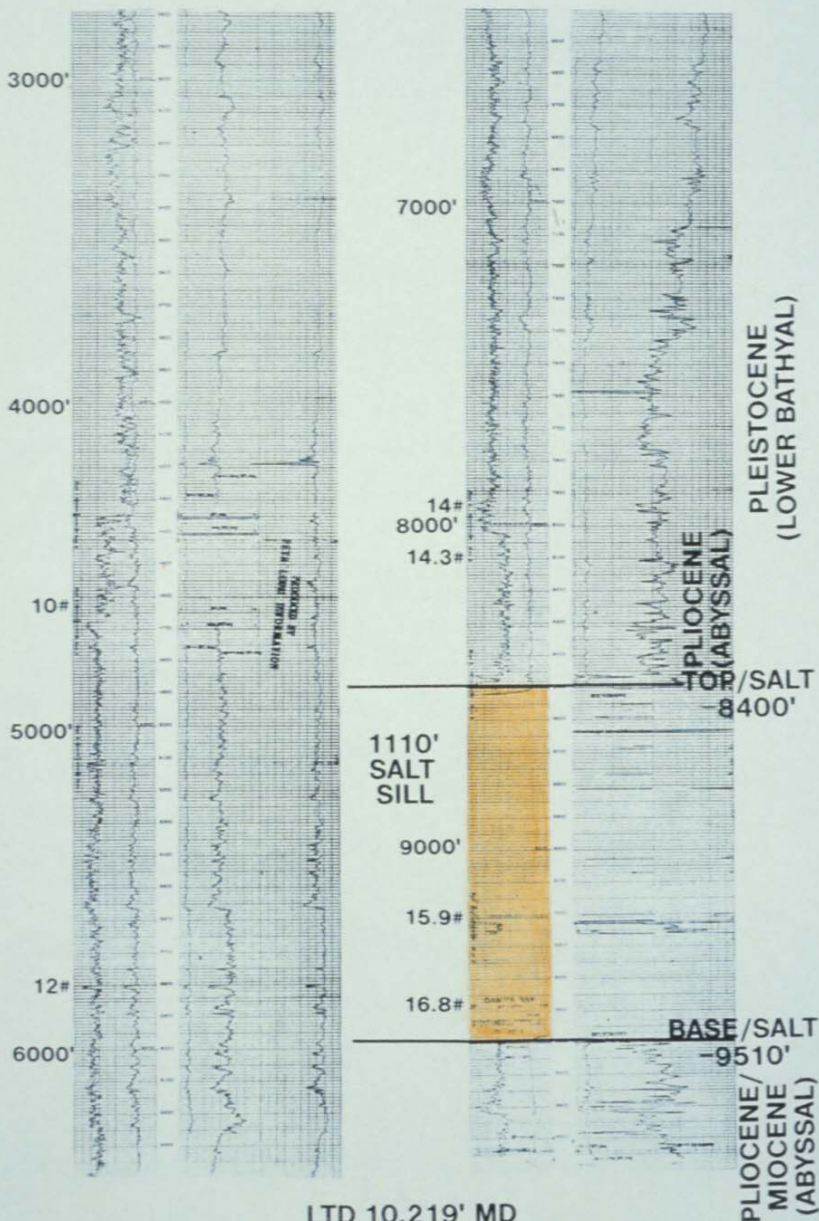
WATER DEPTH - 718'

LOG DATA
NOT RELEASED



Courtesy of: TGS & GECO-PRAKLA

MARATHON #1
OCS-G-6353
GARDEN BANKS 171



LTD 10,219' MD
 DTD 10,597' MD=10,300' TVD
 P&A 5/84

NORTHWEST

TGS LINE 1180-41

SOUTHEAST

WEST CAMERON 488

WEST CAMERON 505
GULF OCS-G-5337 #2
TOP/SALT -13,900'
BASE/SALT -15,590'

W
C
5
0
6

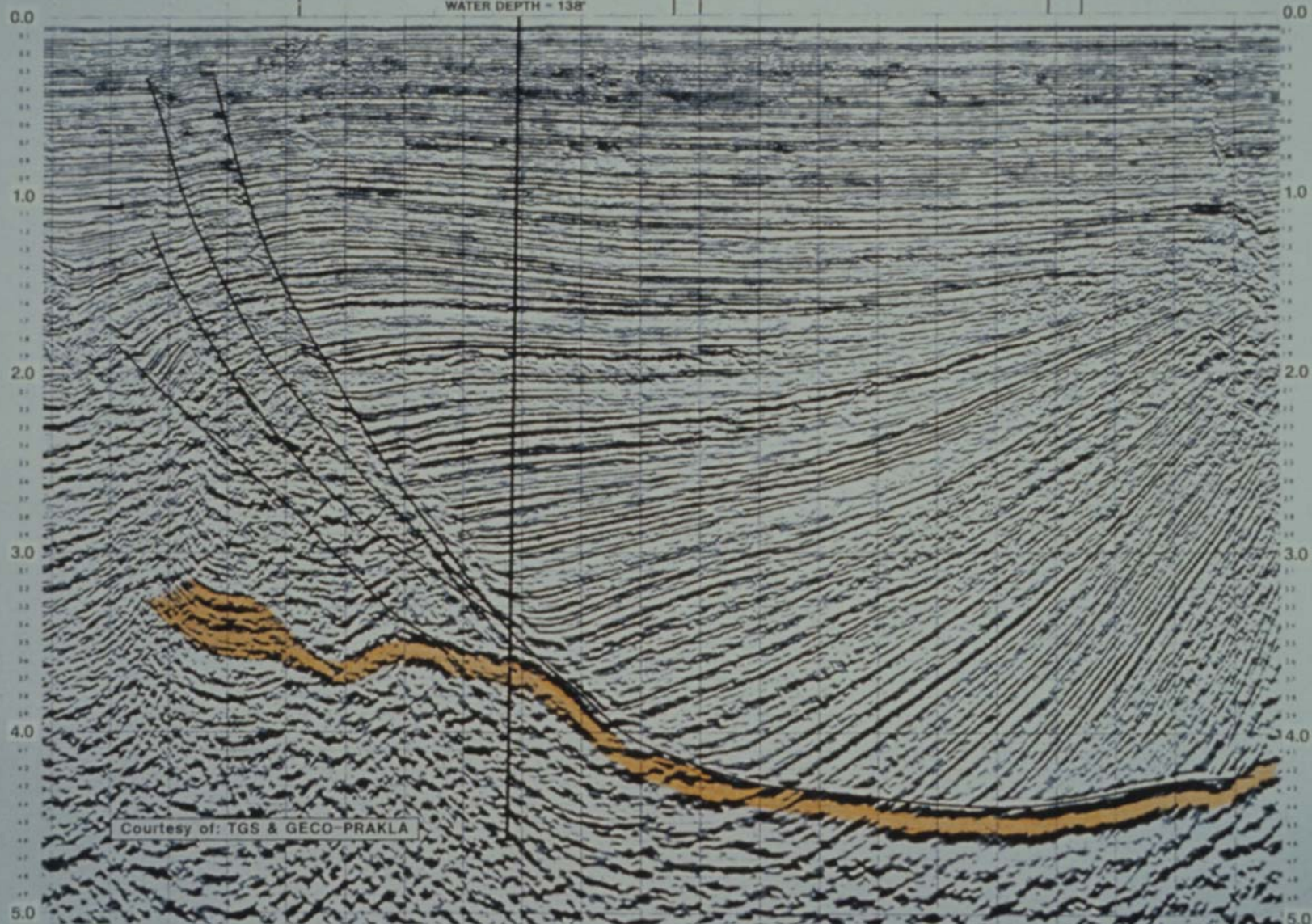
WEST CAMERON 511

W
C
5
1
0

WEST CAMERON 531

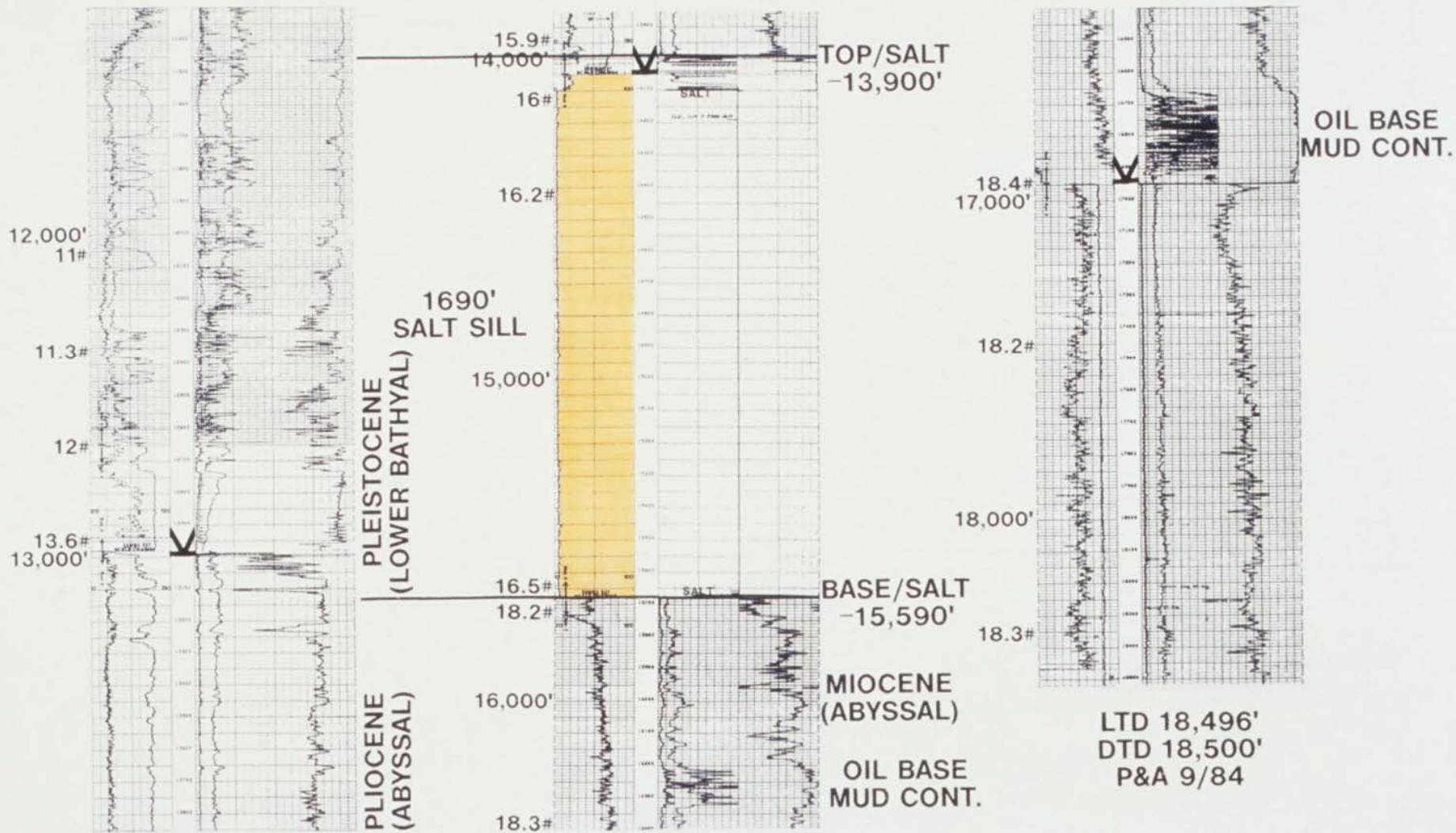
TD 18,500'

WATER DEPTH = 138'



Courtesy of: TGS & GECO-PRAKLA

**GULF #2
OCS-G-5337
WEST CAMERON 505**



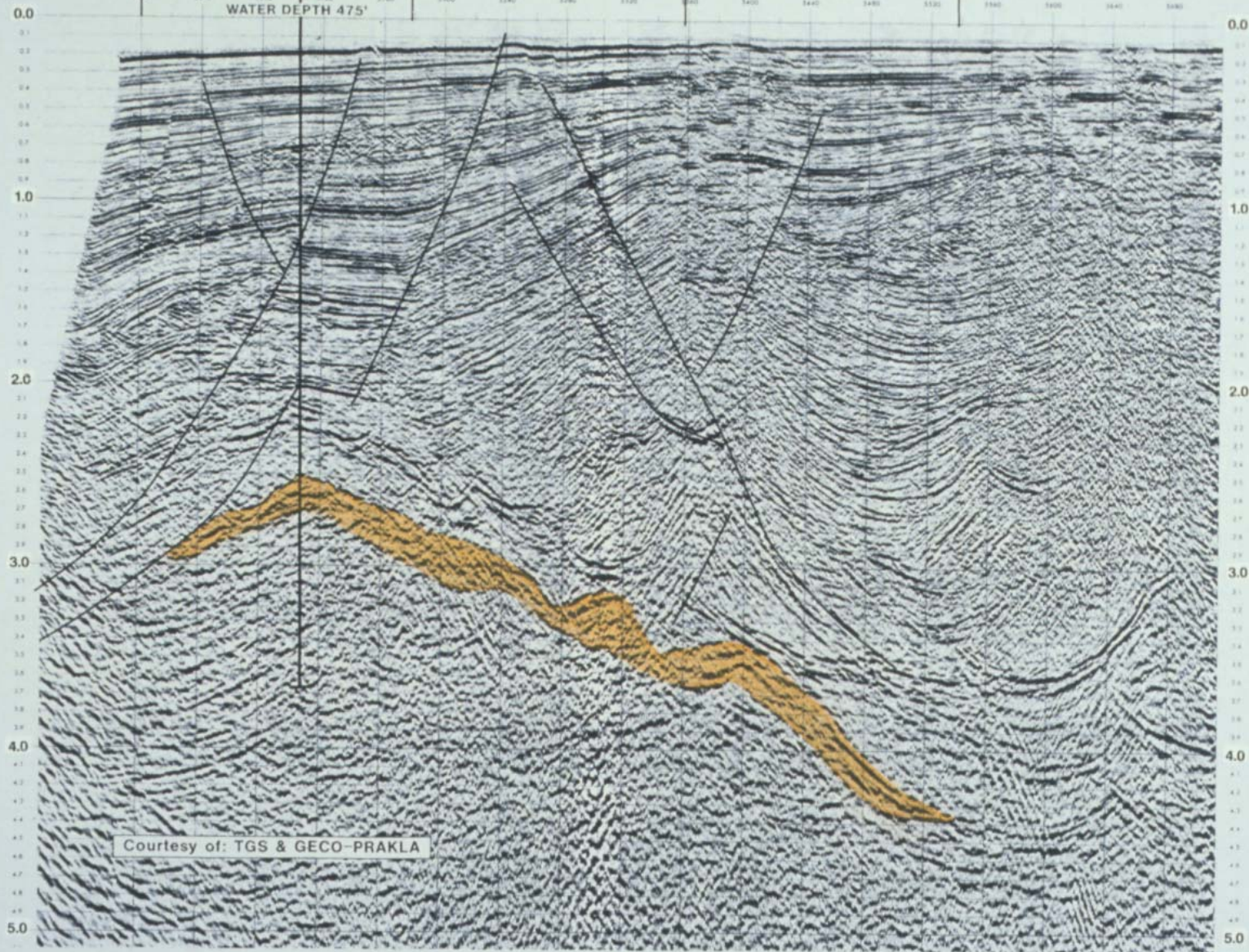
SOUTH

TGS LINE 7028M

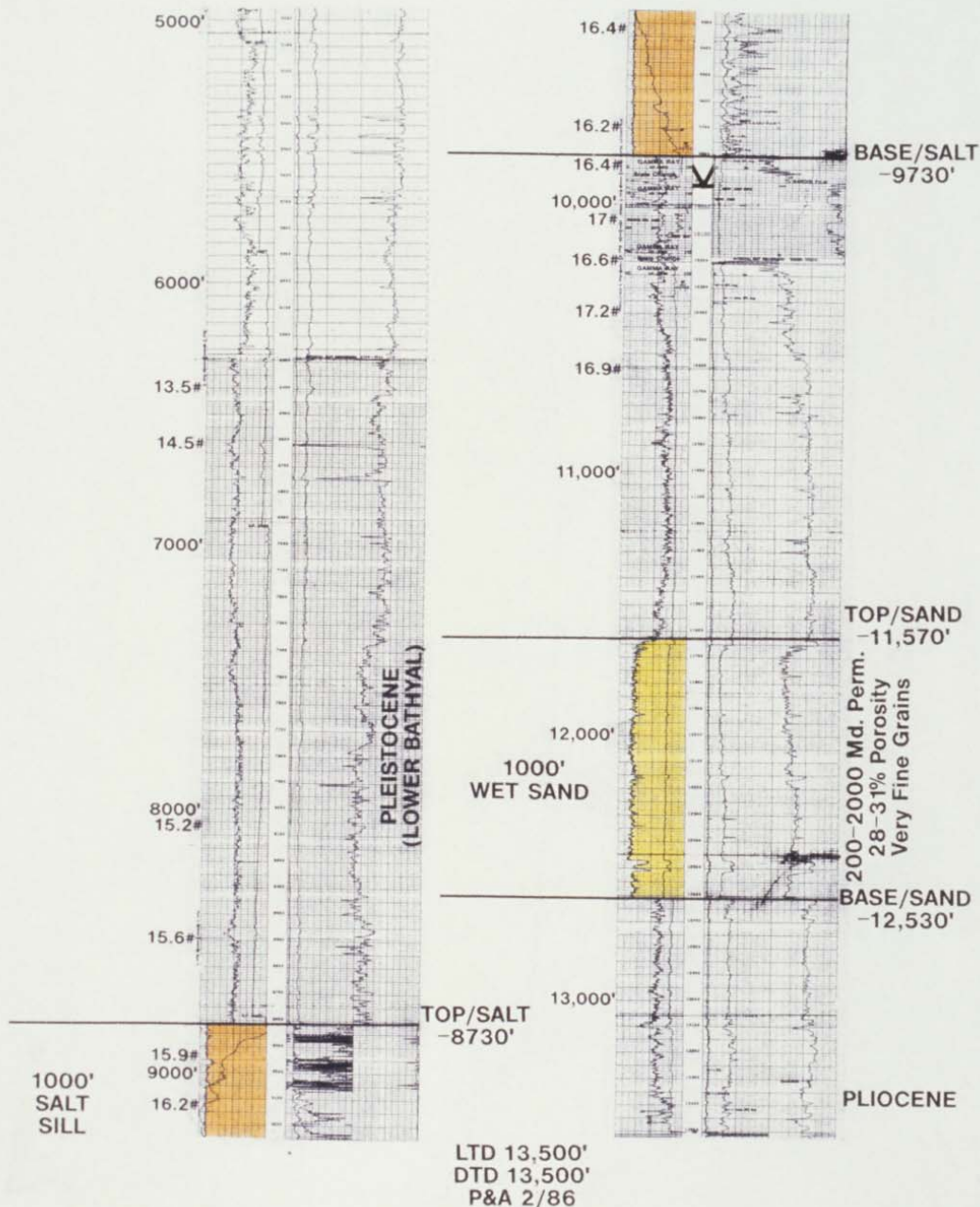
NORTH

GARDEN
BANKS
80SOUTH MARSH
ISLAND 200
DIAMOND SHAMROCK
OCS-G-7719 #1
TOP/SALT -8730'
BASE/SALT -9730'
TOP/SAND -11,570'
BASE/SAND -12,530'
TD 13,500'SOUTH MARSH
ISLAND 197SOUTH MARSH
ISLAND 184SOUTH MARSH
ISLAND 181

WATER DEPTH 475'



**DIAMOND SHAMROCK #1
OCS-G-7719
SOUTH MARSH ISLAND 200**



WEST

TGS LINE 185-052

EAST

VERMILION 357

VERMILION 356
AMOCO
OCS-G-7690#1
TOP/SALT-8400'
BASE/SALT-10,500'
TD 17,000'

SOUTH MARSH
ISLAND 166

SOUTH MARSH
ISLAND 165

SOUTH MARSH
ISLAND 164

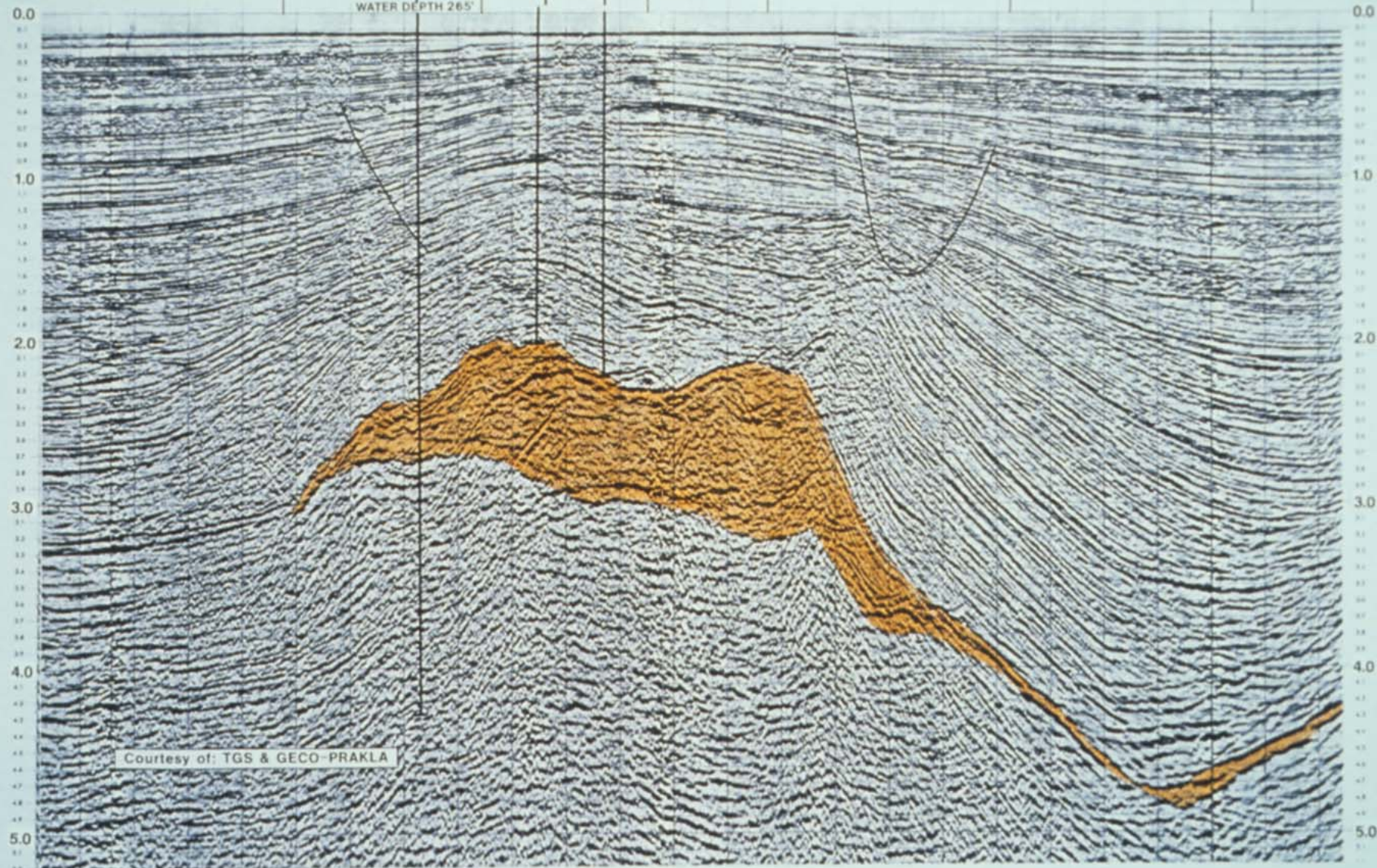
SOUTH MARSH
ISLAND 163

SOUTH MARSH
ISLAND 162

SUN #3
TOP/SALT-7950'
TD 8064'

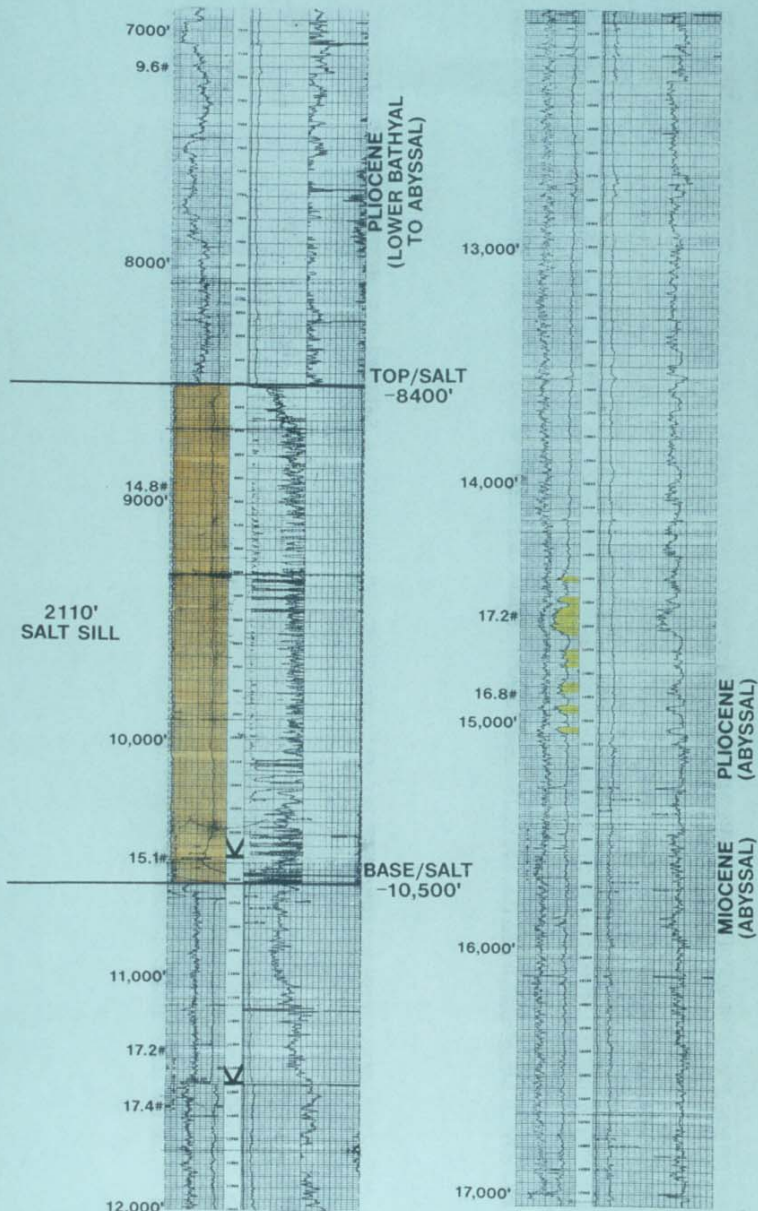
SUN #1
TOP/SALT-7160'
TD 7410'

WATER DEPTH 265'



Courtesy of: TGS & GECO-PRAKLA

AMOCO #1
OCS-G-7690
VERMILION 356



LTD 17,034'
DTD 17,000'
P&A 12/87

NORTHWEST

GECO LINE GDW-358

SOUTHEAST

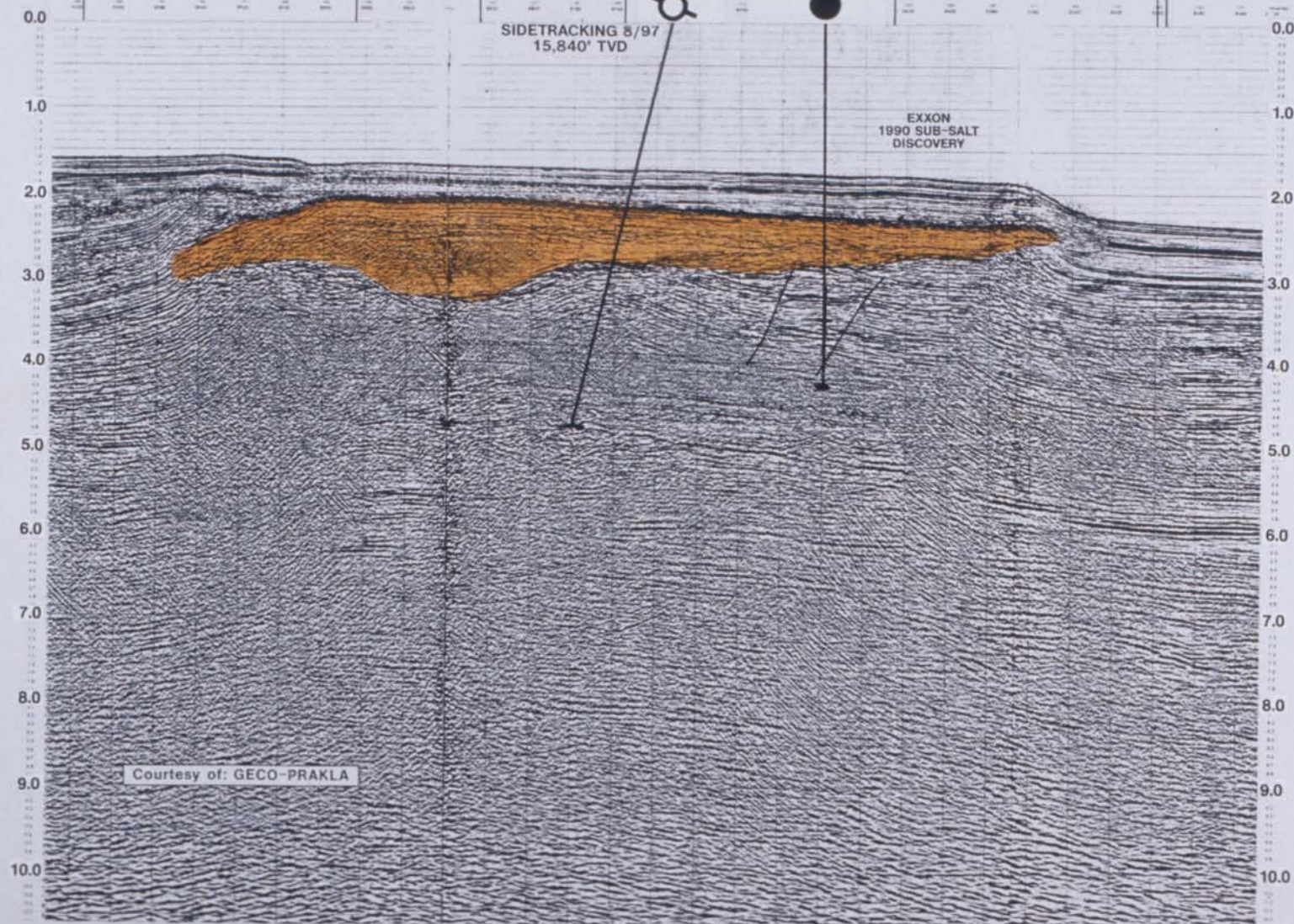
MISSISSIPPI CANYON 122

MISSISSIPPI
CANYON
166MISSISSIPPI
CANYON
167MISSISSIPPI CANYON 211
EXXON OCS-G-8803#1ST1
TOP/SALT -5760'
BASE/SALT -8774'

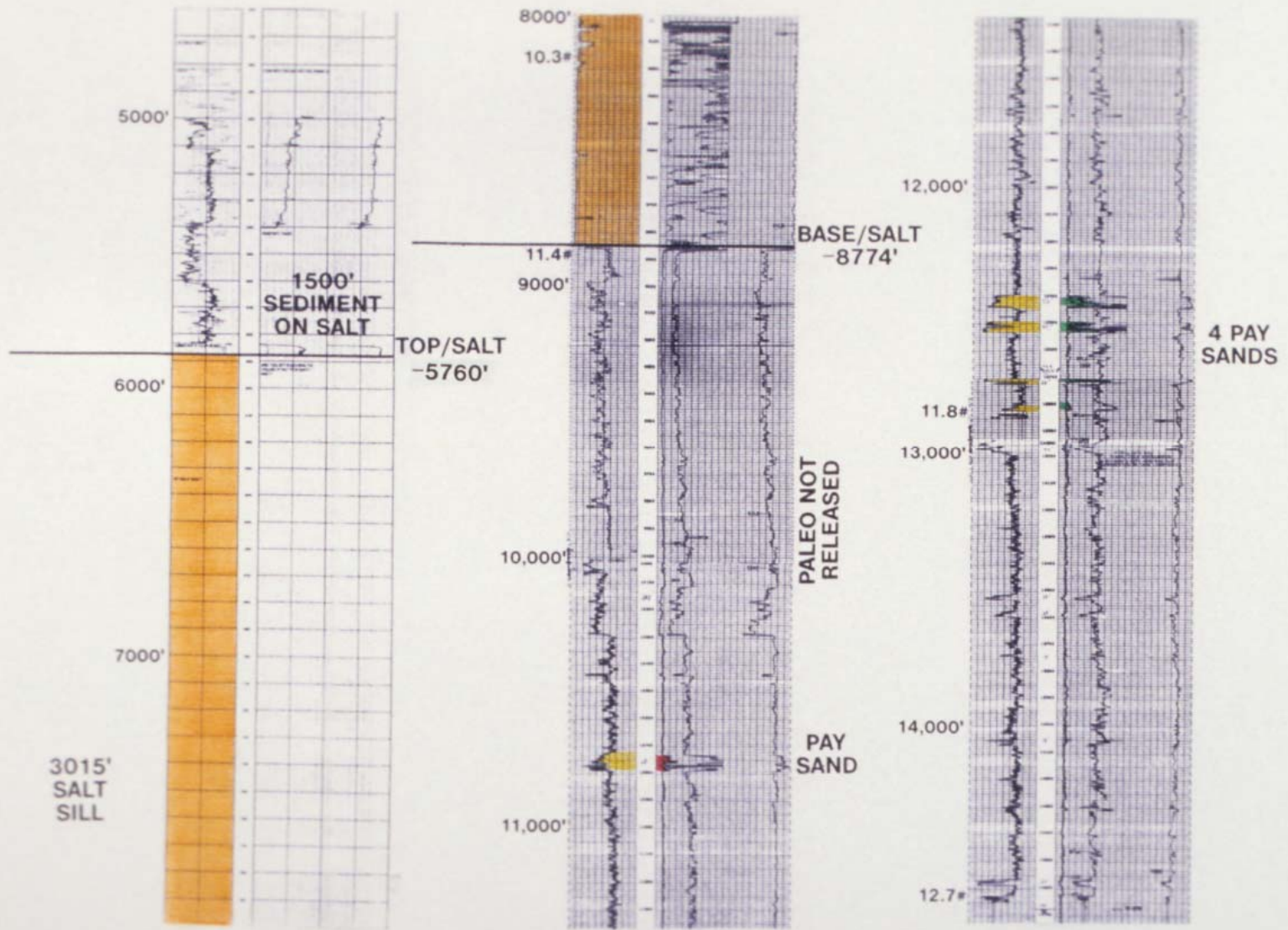
MISSISSIPPI CANYON 255

MISSISSIPPI
CANYON
300EXXON
MC 167 #1TD 14,670' STH
W.D. 4,356SIDETRACKING 8/97
15,840' TVDEXXON
1990 SUB-SALT
DISCOVERY

Courtesy of: GECO-PRAKLA



EXXON #1
OCS-G-8803
MISSISSIPPI CANYON 211

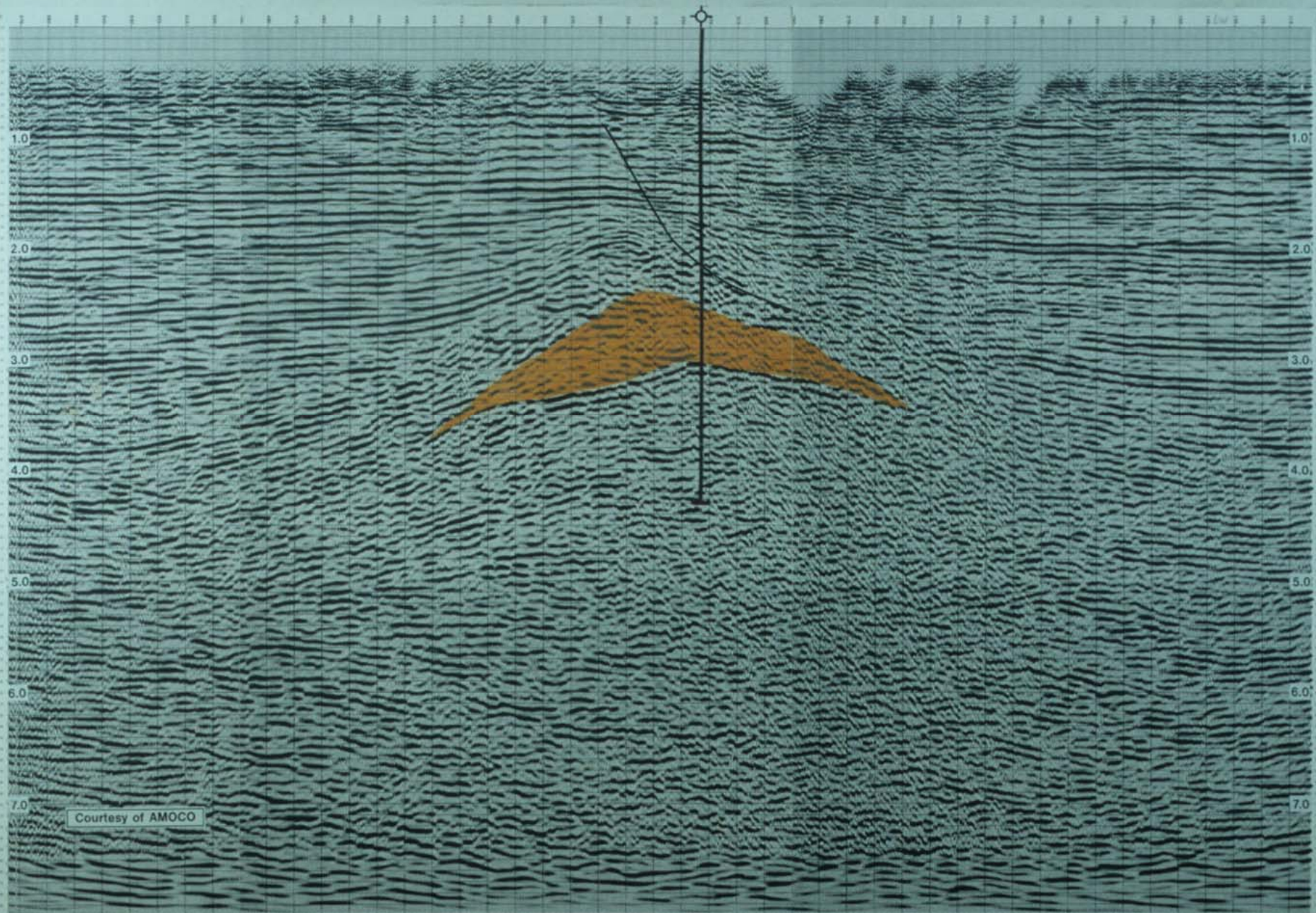


LTD 14,670'
DTD 14,670'
P&A 6/90

SOUTHEAST

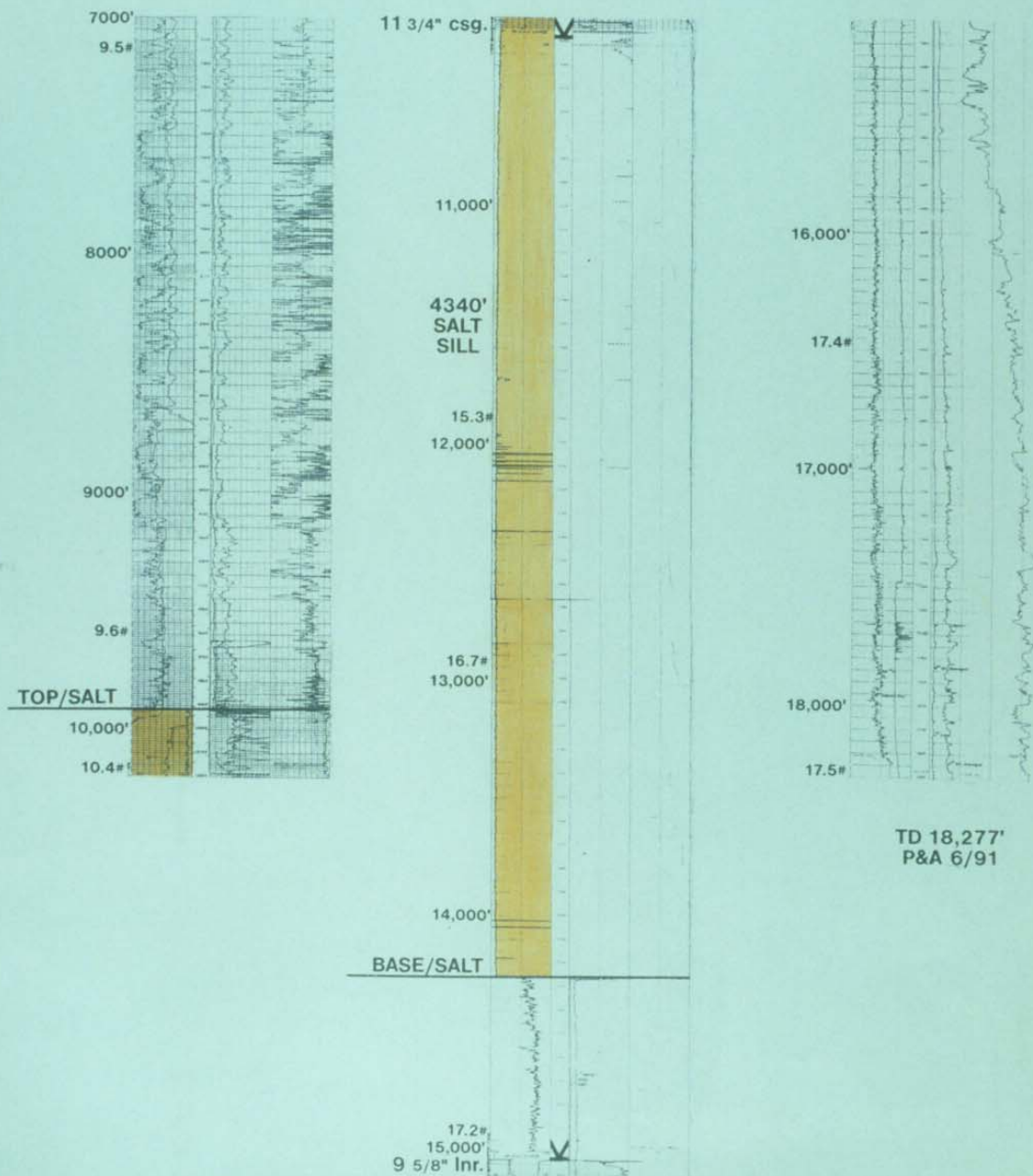
NORTHWEST

AMOCO #1
BAY MARCHAND
T/SALT -9820'
B/SALT -14,160'
DTD 18,277'

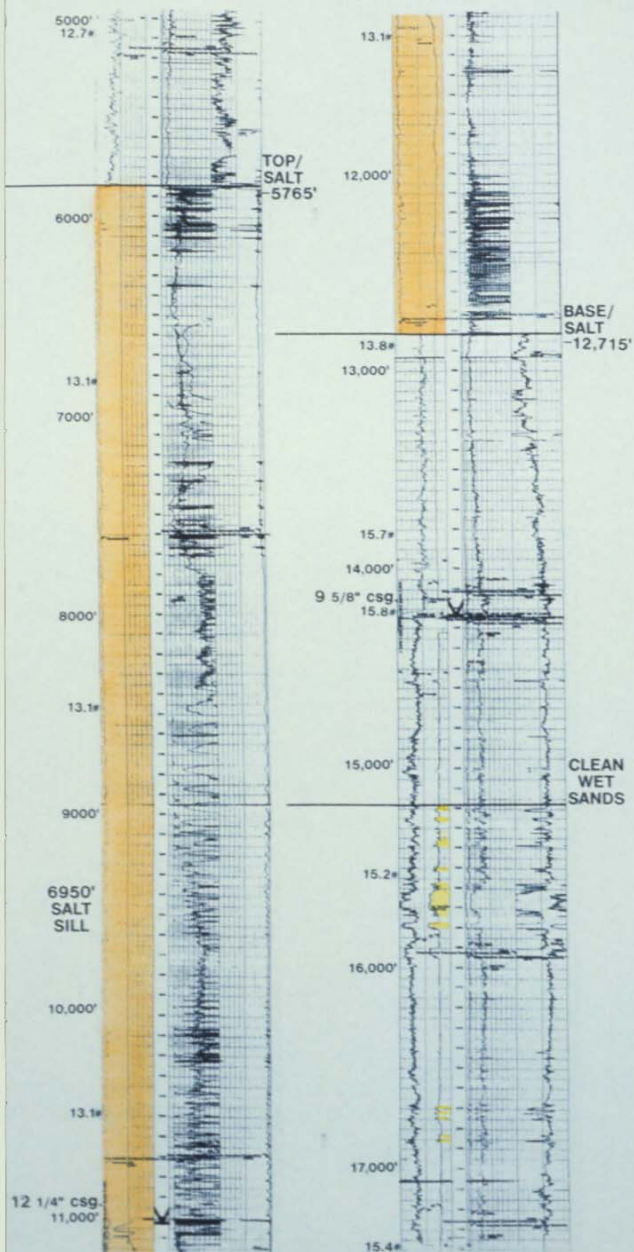


Courtesy of AMOCO

**AMOCO #1
S.L. 13456
BAY MARCHAND, LOUISIANA**



CHEVRON #2
OCS-G-12635
GARDEN BANKS 165



TD 18,010'
P&A 4/92

NORTHWEST

TGS LINE 1464-41

SOUTHEAST

S
S
3
2
4

SHIP SHOAL 339

S
S
3
4
8

"MAHOGANY"
SHIP SHOAL 349
PHILLIPS/ANADARKO/AMOCO
OCS-G-12008 #1
TOP/SALT ?
BASE/SALT ?

S
S
3
5
9

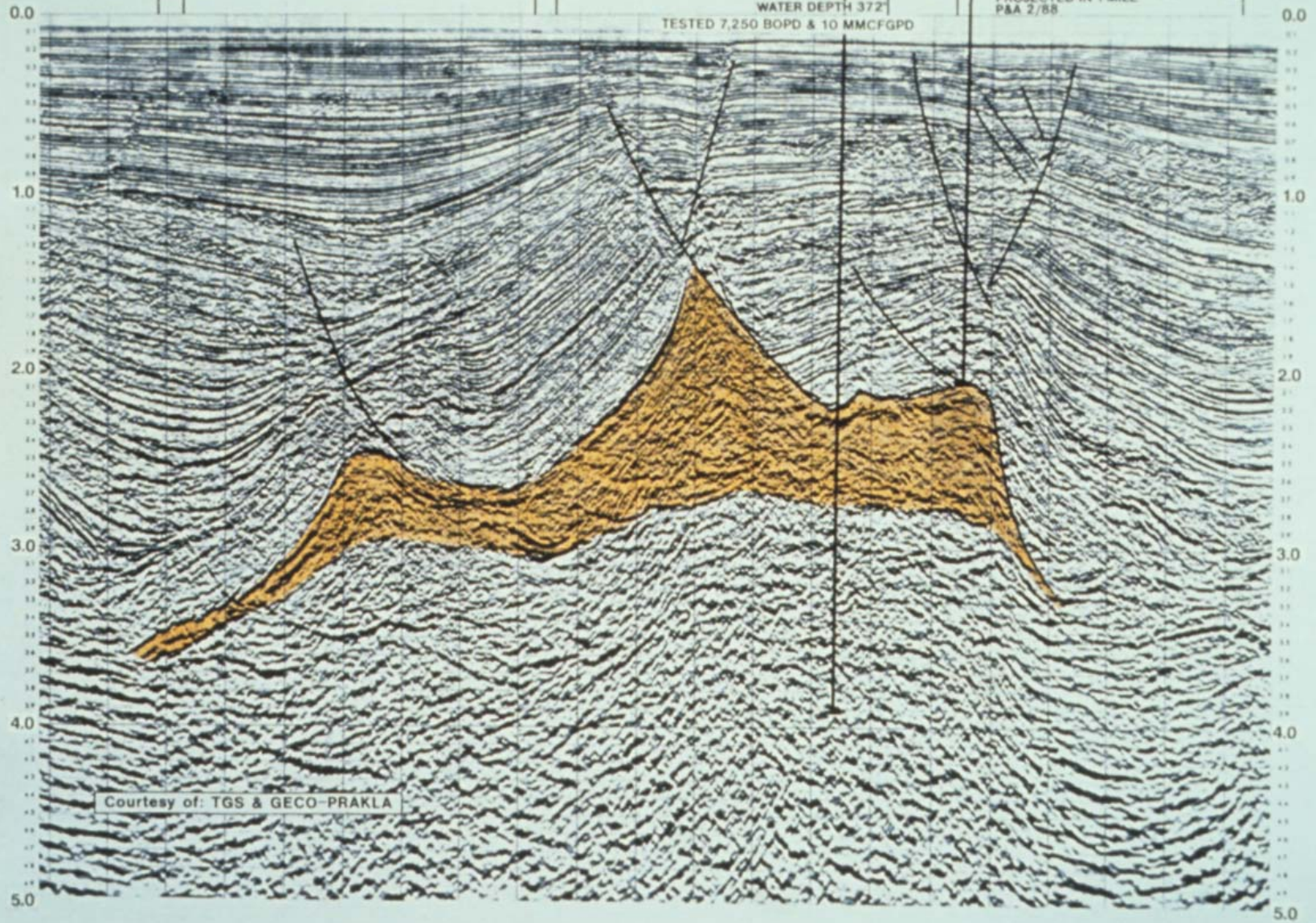
SHIP SHOAL 358
TOP/SALT -7230'
TD IN SALT
AT 7363'TVD

DTD 16,500'
WATER DEPTH 372'

TESTED 7,250 BOPD & 10 MMCFGPD

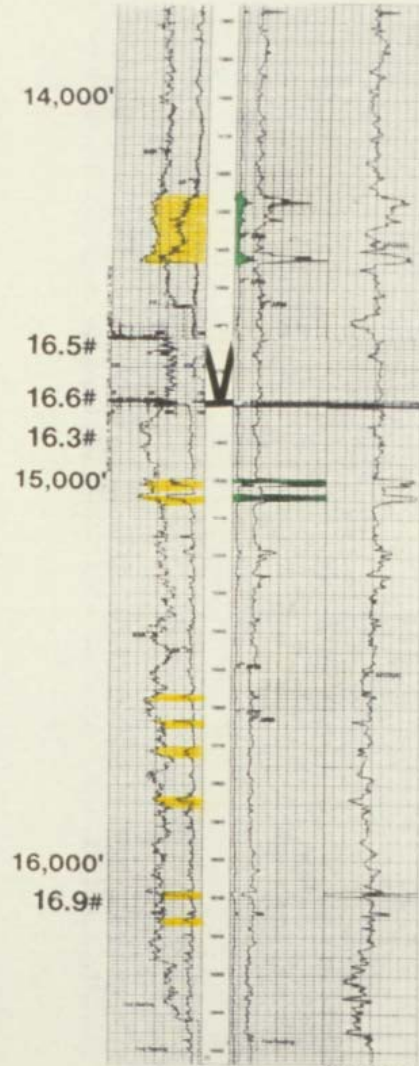
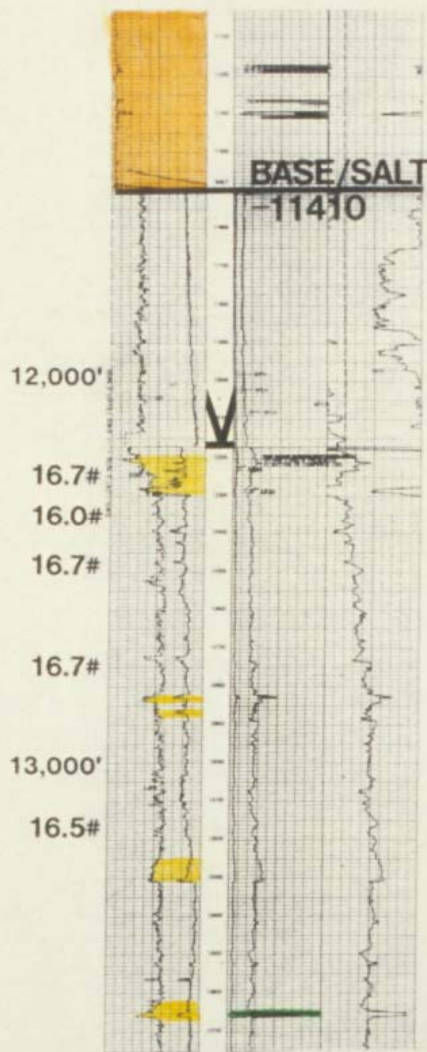
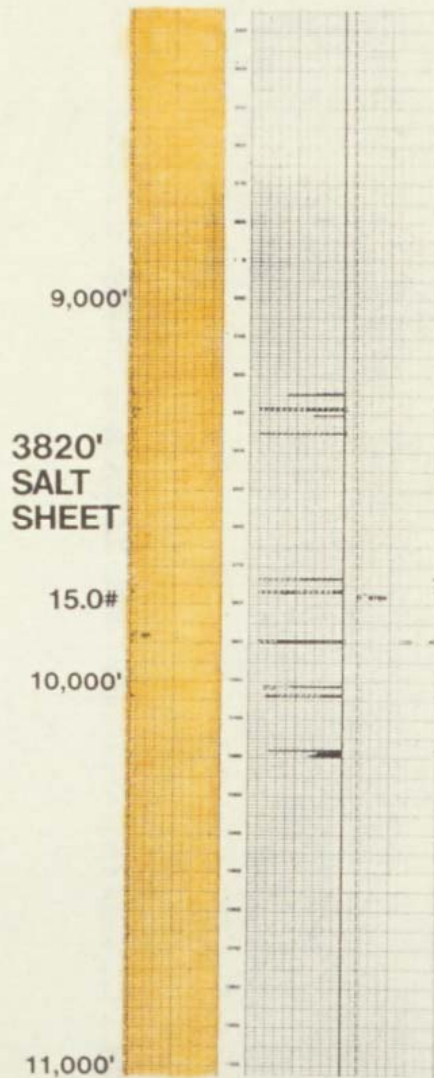


MOBIL #1
SS 359
PROJECTED IN 1 MILE
P&A 2/88



Courtesy of: TGS & GECO-PRAKLA

PHILLIPS
OCS-G 12008 #1
SHIP SHOAL 349



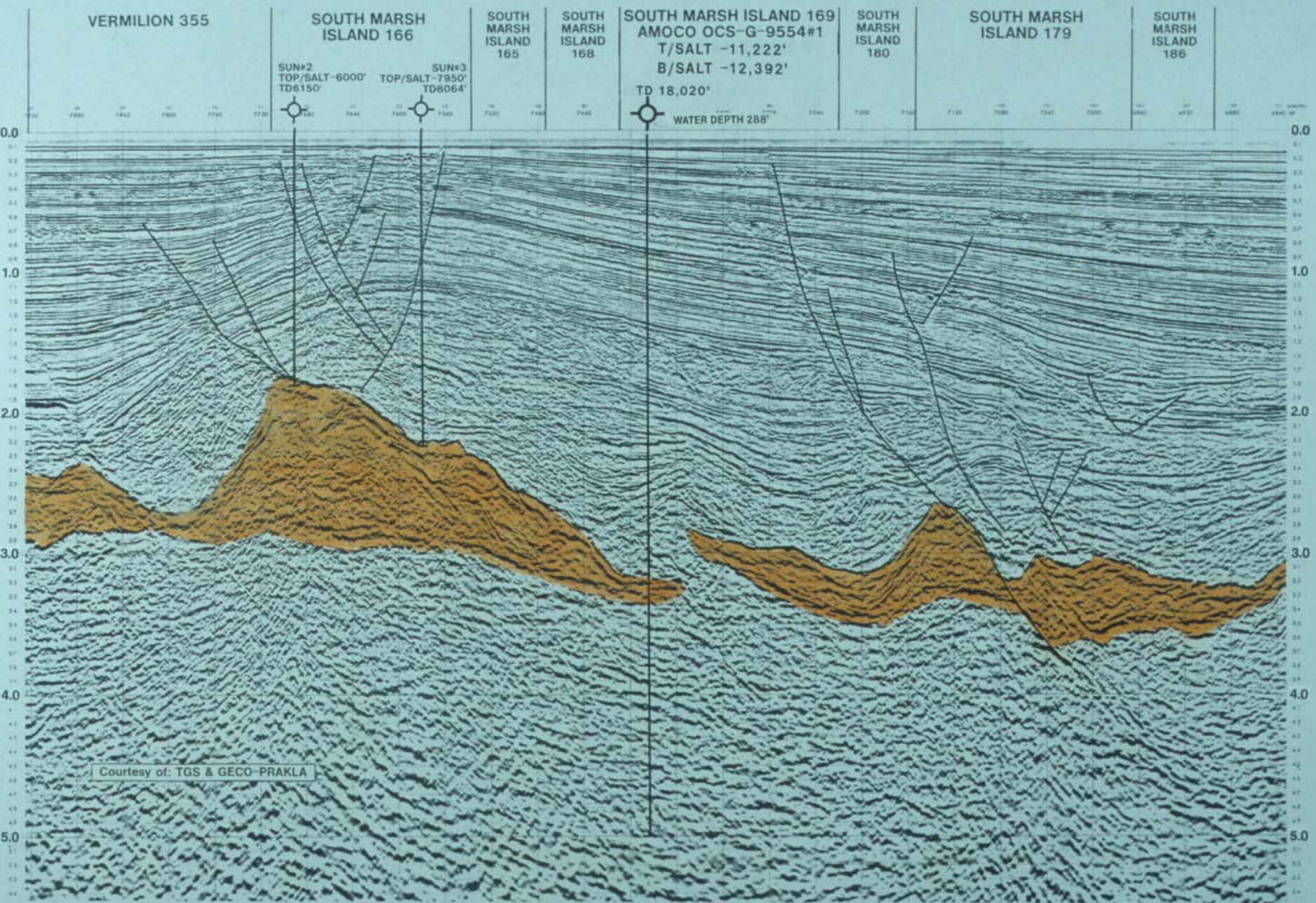
TD16,500'
SUSPENDED OPERS. 10/93

WELL FLOWED 3700 BOPD+559 MCFGPD 14/64" CK FTP 6800 #
7296 BOPD+9.9 MMCFGPD 32/64" CK FTP 7063 #

NORTHWEST

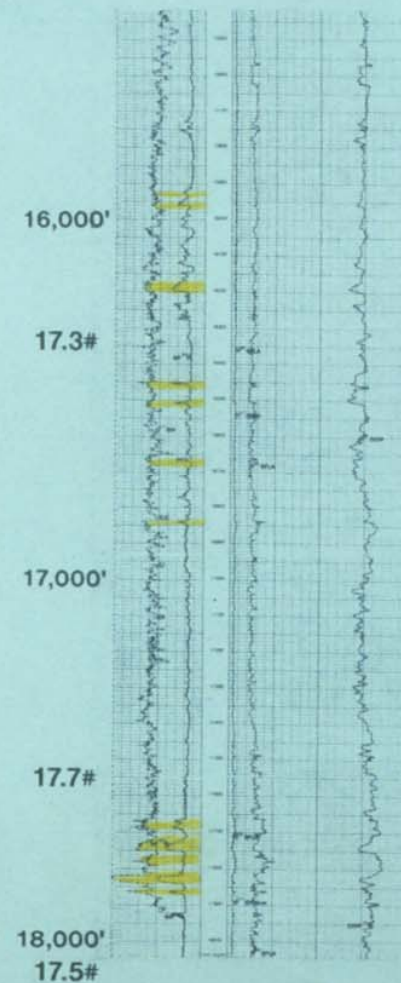
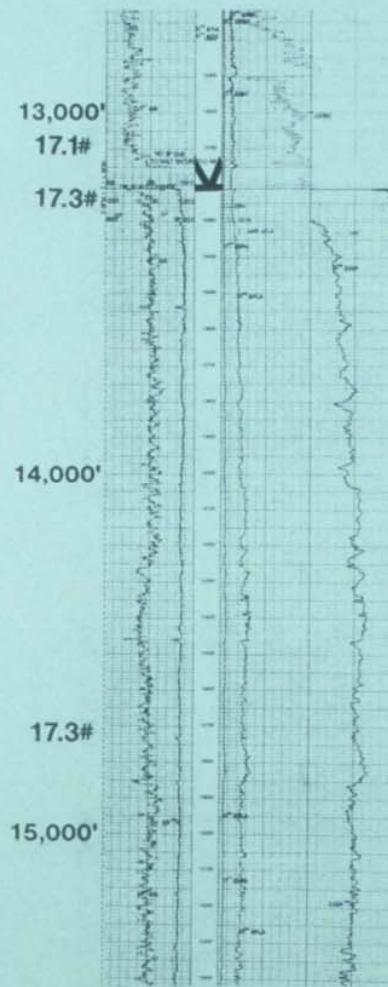
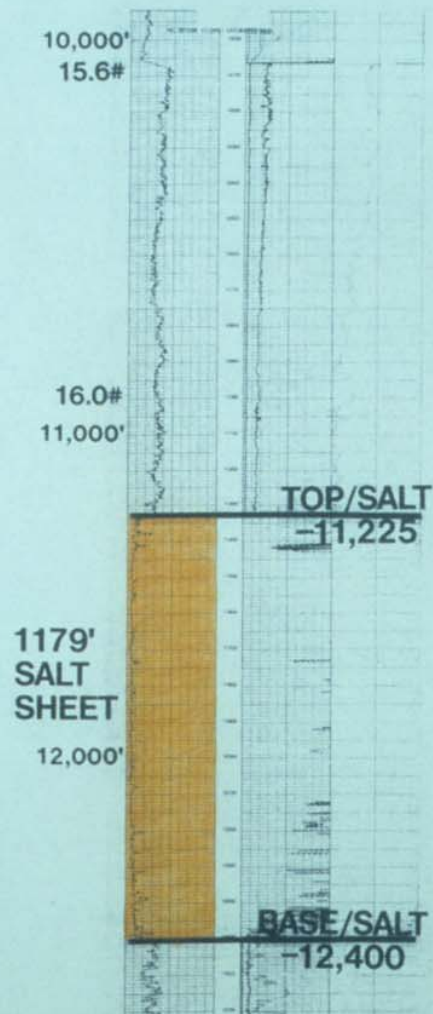
TGS LINE 1292-41

SOUTHEAST



Courtesy of: TGS & GECO-PRAKLA

AMOCO
OCS-G 9554 #1
SOUTH MARSH ISLAND 169



TD 18,020'
P&A 12/93

WEST

SOUTH TIMBALIER 260

EAST

SOUTH TIMBALIER 261

MOBIL
OCS-G-5632 #1
TOP/SALT -10,410'SOUTH
TIMBALIER 259

S.T. 258

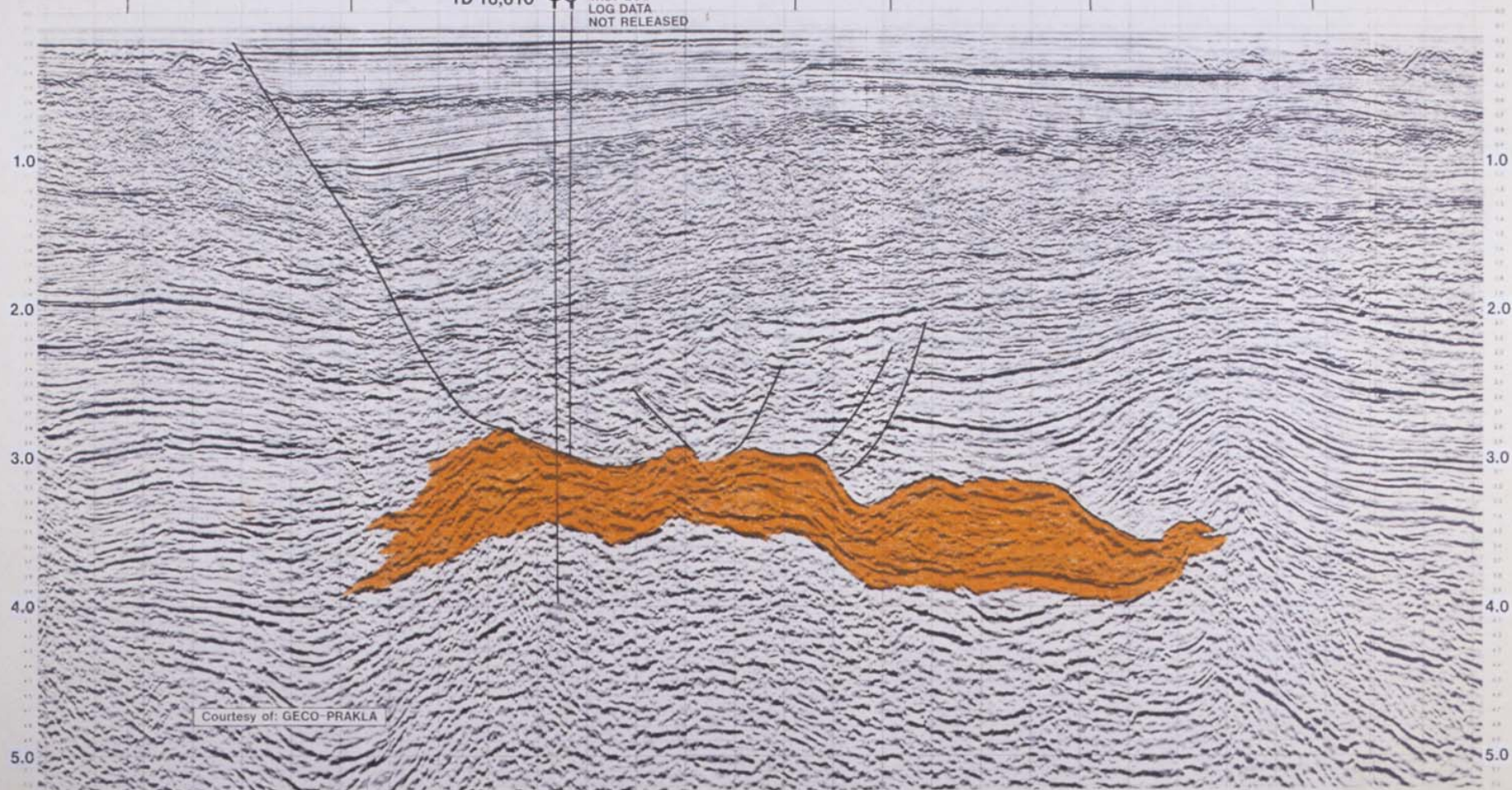
GRAND ISLE 117

GRAND ISLE 116

GRAND ISLE 115

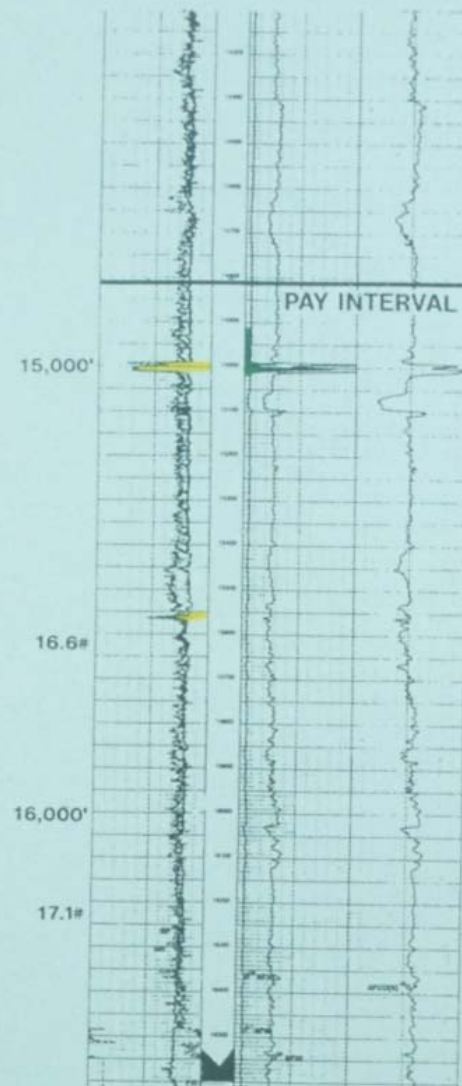
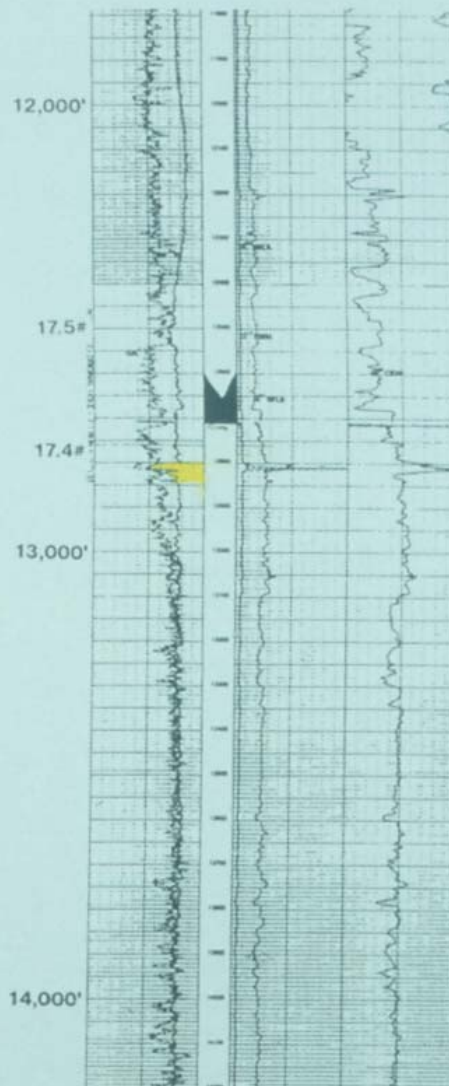
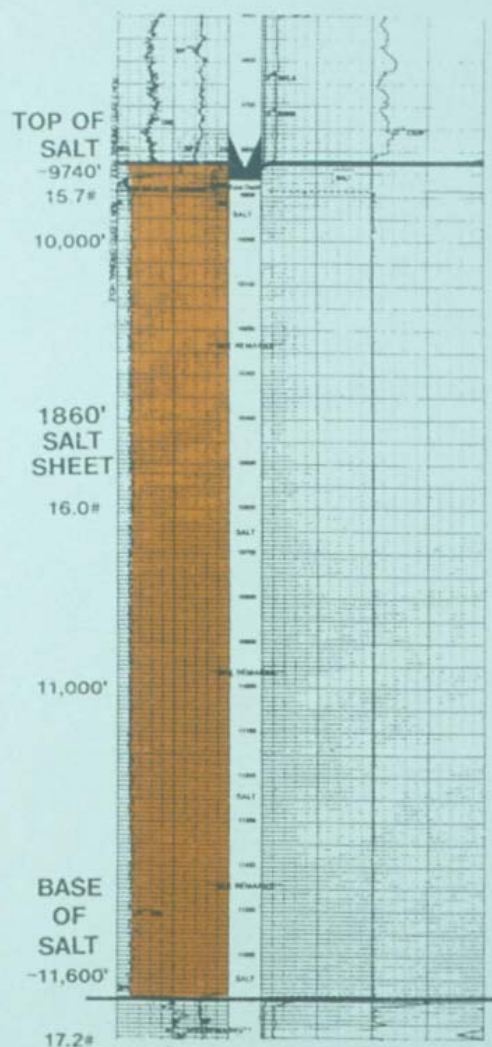
"TEAK"
PHILLIPS/ANADARKO #1
OCS-G-12037

TD 16,610'

W.D. -295'
LOG DATA
NOT RELEASED

Courtesy of: GECO-PRAKLA

PHILLIPS
OCS-G-12037 #1
SOUTH TIMBALIER 260



TD 16,610'
DISCOVERY 5/94
FLOWED FROM THREE ZONES AT RATE OF 4,431 BOPD & 7.7 MMCFGPD

NORTHWEST

TGS LINE 1248-41

SOUTHEAST

VERMILION 325

V 326

VERMILION 341

VERMILION
340

VERMILION 349

VERMILION
350

VERMILION 361

VERMILION
360

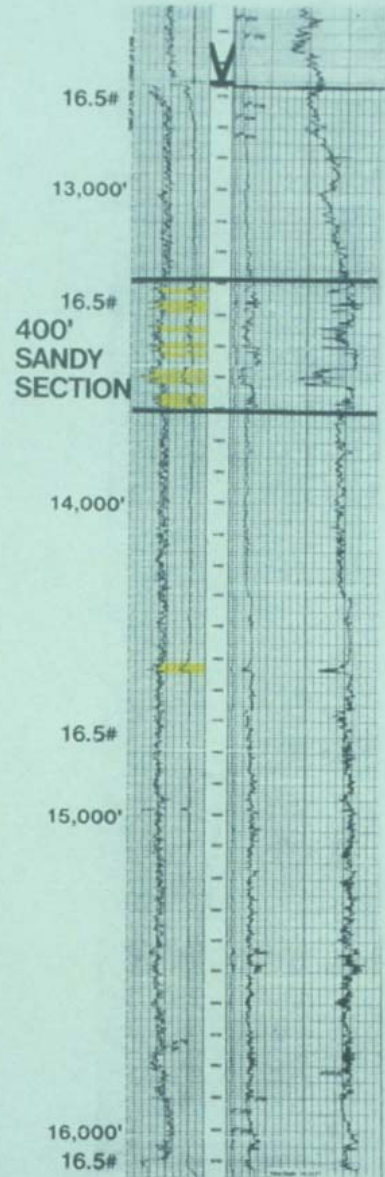
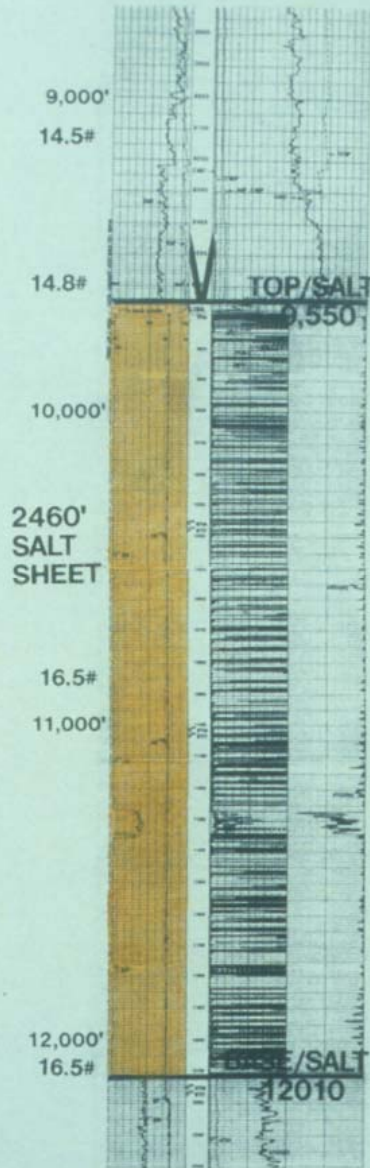
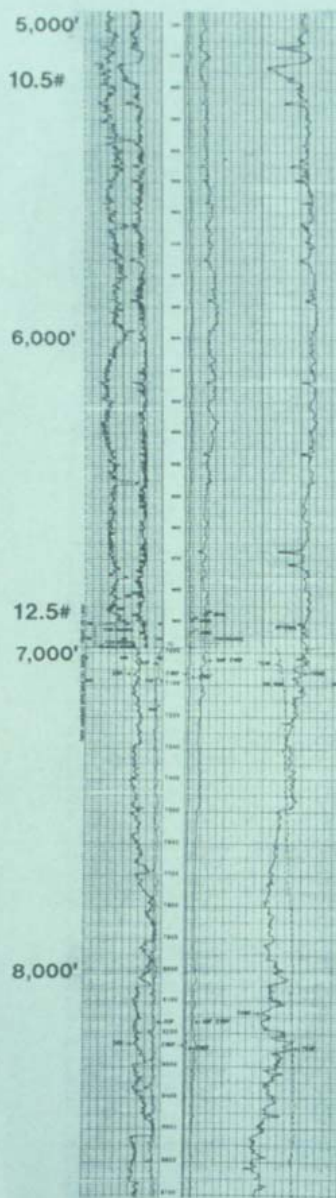
"MESQUITE"
ANADARKO/PHILLIPS #1
OCS-G-11898
DTD 16,114' P&A 6/94

WATER DEPTH 237'

LOG DATA
NOT RELEASED

Courtesy of: GECO-PRAKLA

ANADARKO PETROLEUM
OCS-G 11898 #1
VERMILION 349

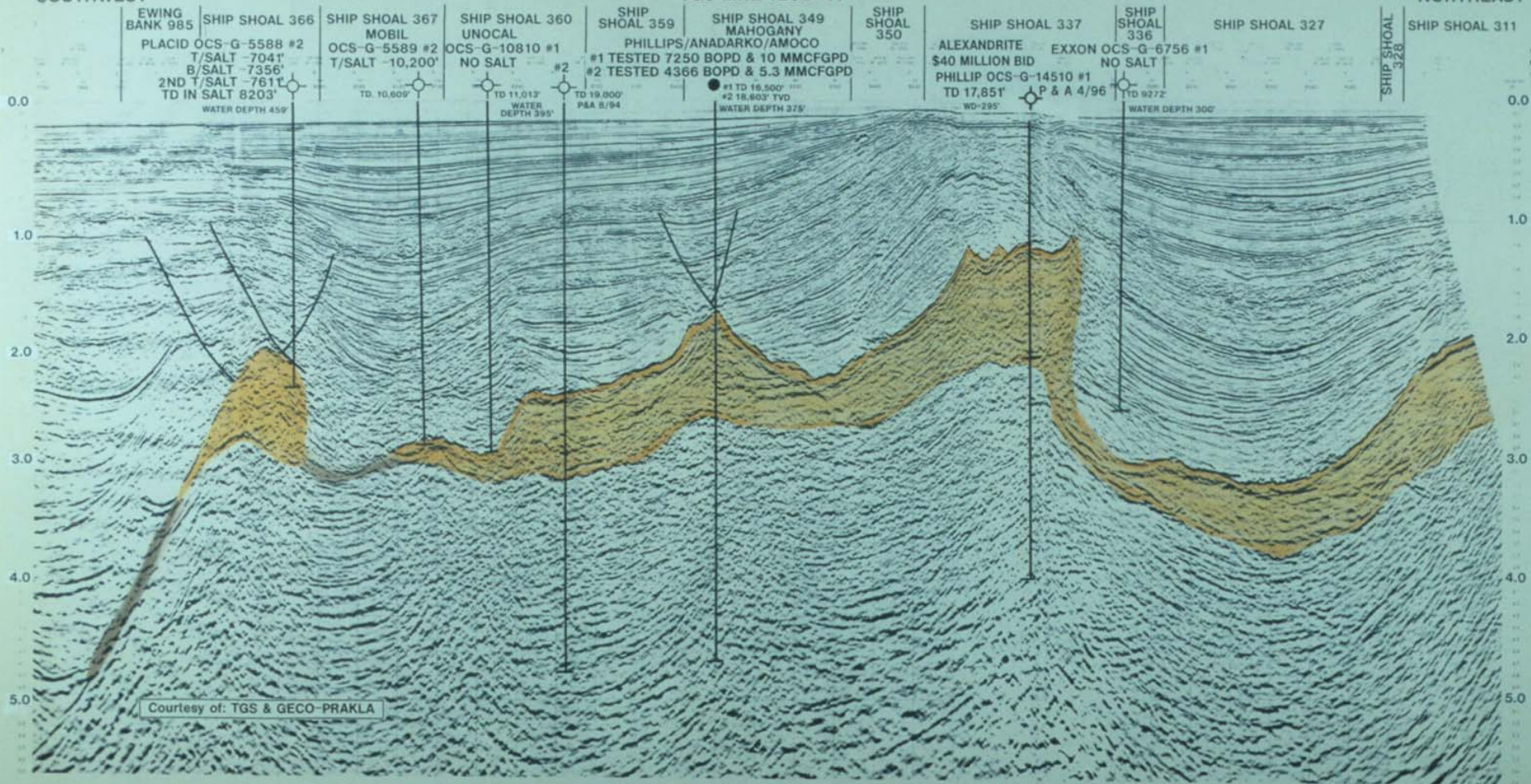


TD 16,146'
P&A 5/94

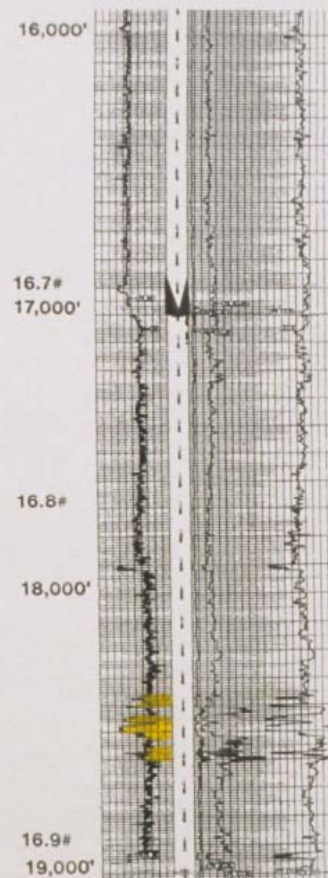
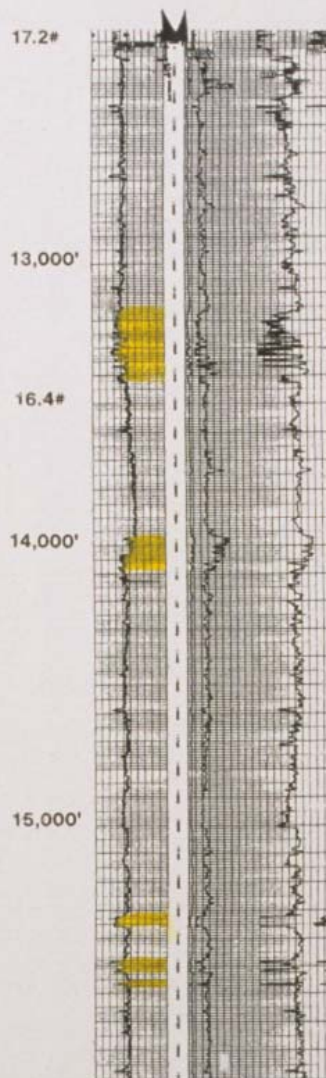
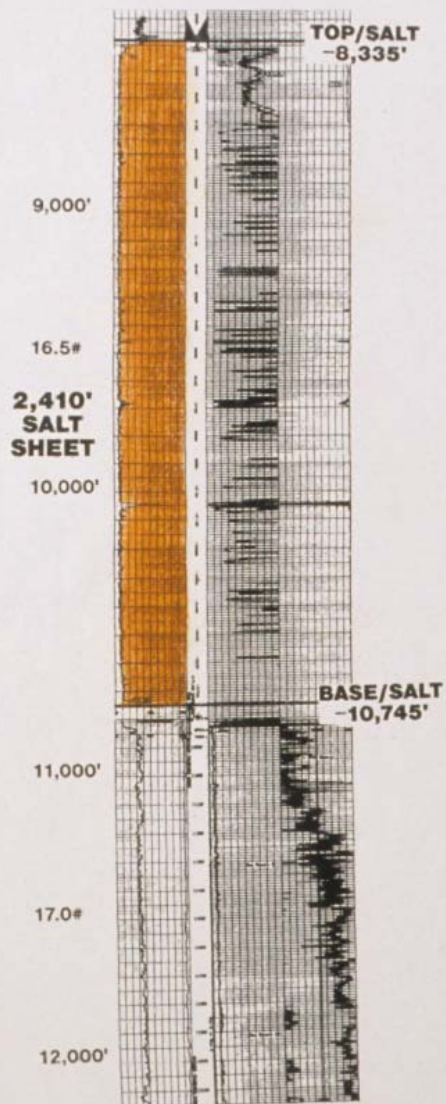
SOUTHWEST

TGS LINE 1209-41

NORTHEAST



UNOCAL
OCS-G-10810 #2
SHIP SHOAL 360



TD : 19,000'
P&A 8/94

SOUTH

TGS LINE 6292

NORTH

SHIP SHOAL 298

SHIP SHOAL 293

SHIP SHOAL 274

SHIP SHOAL 269

SHIP SHOAL 250

SHIP SHOAL 245

SHIP SHOAL 226

UNOCAL #4
OCS-G-1036
T/SALT -13,200'

CNG #1
OCS-G-4233
T/SALT -11,900'
JAPEX

CNG #2
OCS-G-4233
NO SALT

TD 13,377'
WATER DEPTH 185' P&A 9/94

TD 17,750'

TD 12,215'

TD 16,271'

0.0

1.0

2.0

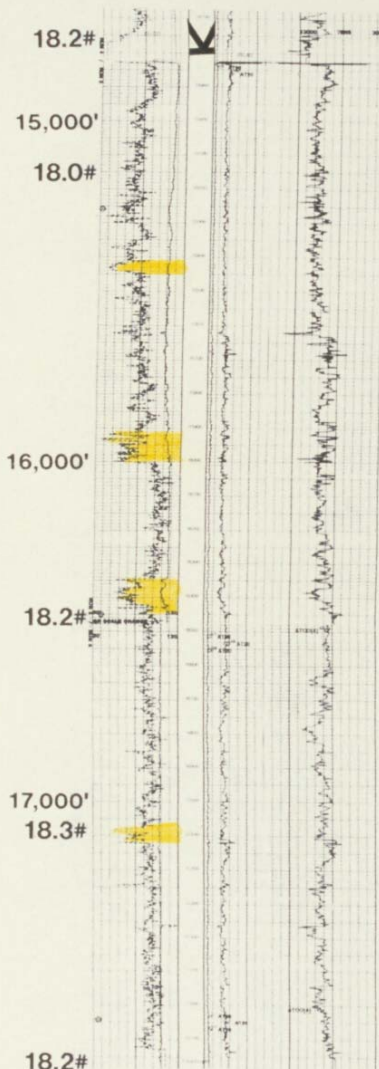
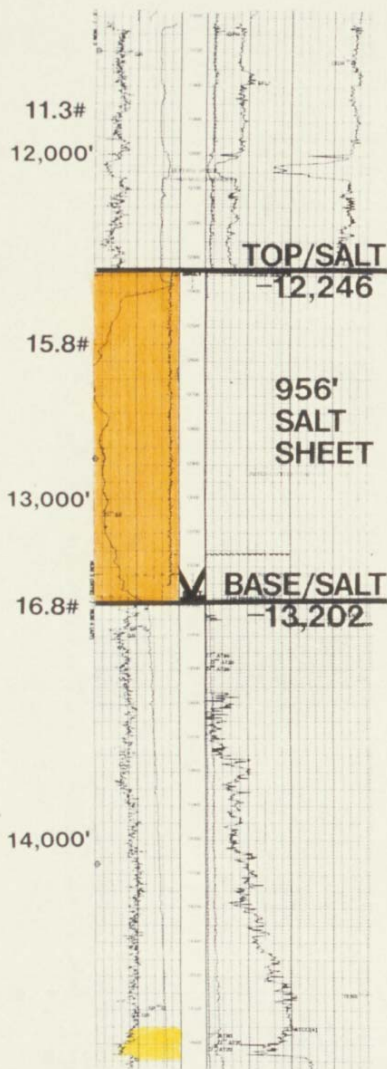
3.0

4.0

5.0

Courtesy of: TGS & GECO PRAKLA

JAPEX U.S.
OCS-G-10781 #1
SHIP SHOAL 250



TD 17750'
P&A 9/94

SOUTHWEST

TGS LINE 1097-41

NORTHEAST

EWING BANK
826

EWING BANK 827

EWING BANK
783SOUTH TIMBALIER
289SOUTH
TIMBALIER
288SOUTH TIMBALIER
283SOUTH
TIMBALIER
284SOUTH
TIMBALIER
259SOUTH
TIMBALIER
258

GRAND ISLE 117

GRAND ISLE
109

CNG #1

TOP/SALT -12,078'

BASE/SALT -13,003'

TD 18,034' P & A 10/94

WATER DEPTH 400'

PHILLIPS/ANADARKO #1

OCS-G-12037

TESTED 3 ZONES FLOWED

TOTAL 4431 BOPD & 7.7 MMFGPD

TD 16,610' J & A 6/94

WATER DEPTH 295'

0.0

1.0

2.0

3.0

4.0

5.0

0.0

1.0

2.0

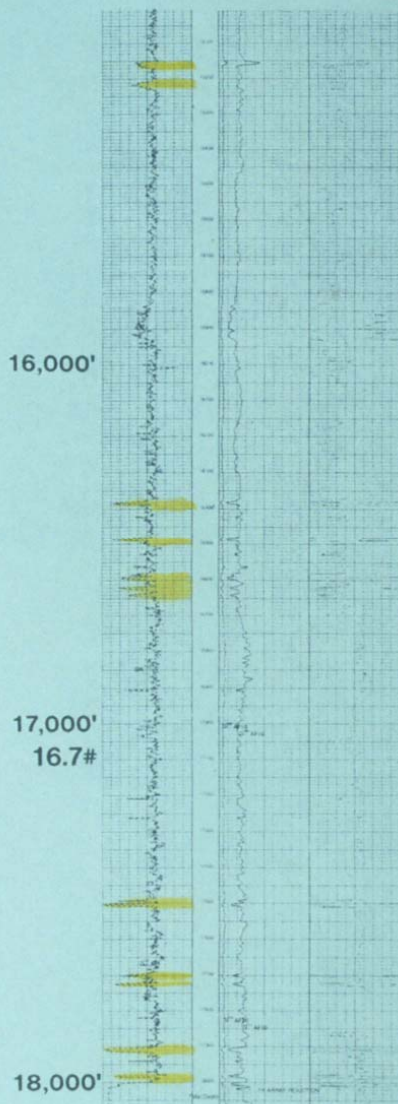
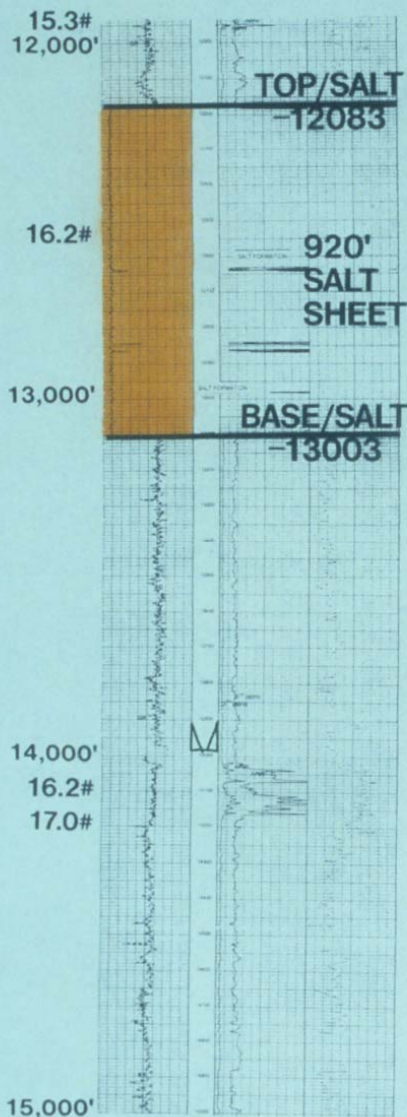
3.0

4.0

5.0

Courtesy of: TGS & GECO-PRAKLA

CNG PRODUCING
OCS-G 10857 #1
SOUTH TIMBALIER 289



TD 18,034'
P&A 10/94

SOUTH

TGS LINE 324-016

NORTH

GREEN CANYON 62

GREEN CANYON 18

EWING
BANK
988

SHIP SHOAL 368

SHIP SHOAL 359

"MAHOGANY"

SHIP SHOAL 349

SHIP SHOAL 338

SHIP SHOAL 325

SHIP SHOAL 314

AMERADA HESS
OCS-G-10814 #1PHILLIPS/ANADARKO/AMOCO
OCS-G-12008 #1&2
#1 TESTED 7250 BOPD + 10 MMCFGPD
#2 TESTED 4366 BOPD + 5.3 MMCFGPD

TD 15,774' TVD J & A 2/95

#1 TD 16,500'

#2 TD 18,600' TVD

WATER DEPTH 454'

WATER DEPTH 375'

0.0

1.0

2.0

3.0

4.0

5.0

0.0

1.0

2.0

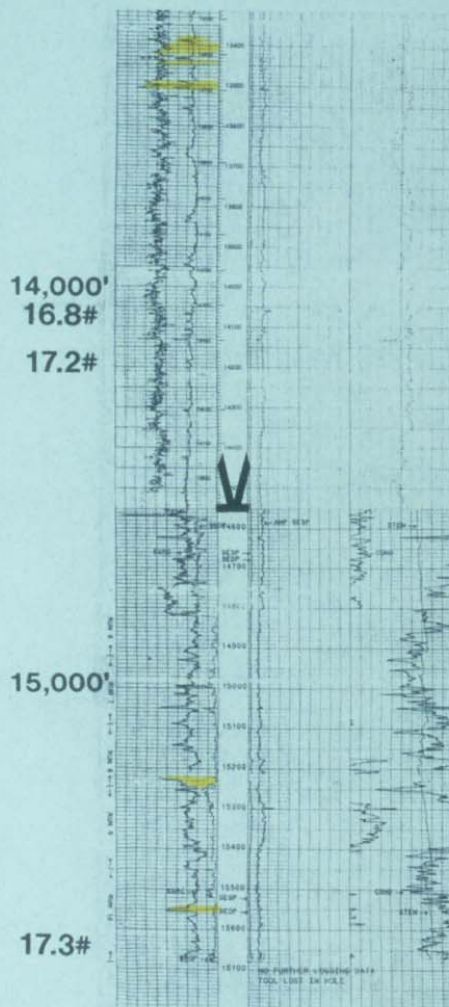
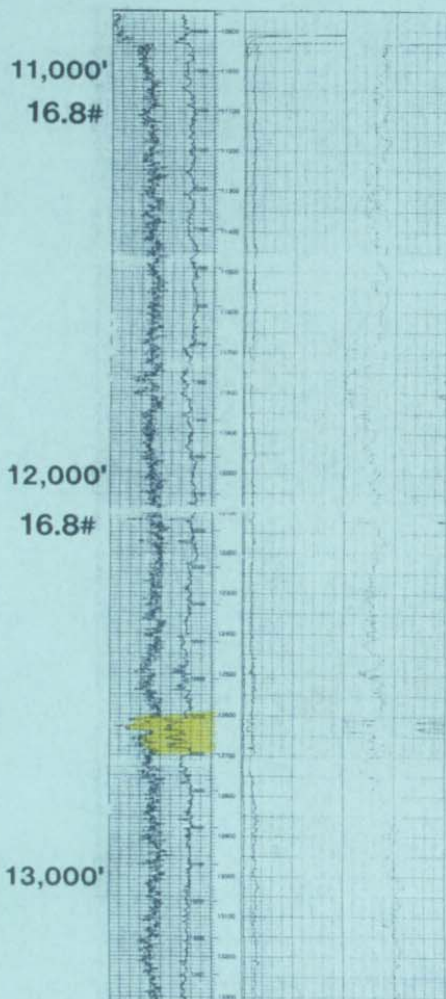
3.0

4.0

5.0

Courtesy of: TGS & GECO-PRAKLA

**AMERADA-HESS
OCS-G 10814 #1 S/T #2
SHIP SHOAL 368**



**TVD 15,774'=MD 16,400'
J&A 2/95**

WEST

GARDEN BANKS 125

GARDEN BANKS 126

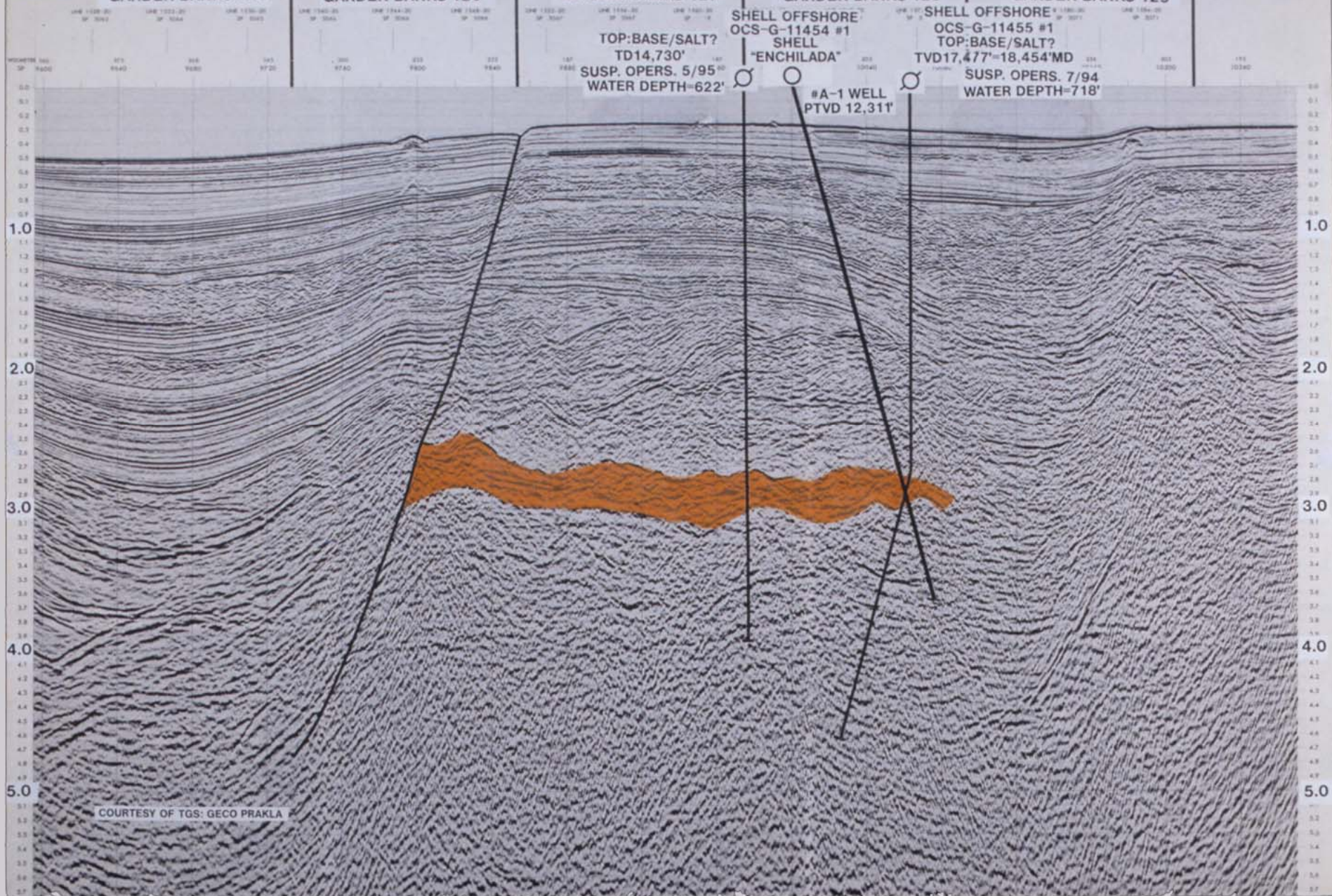
TGS LINE 2689-20

GARDEN BANKS 127

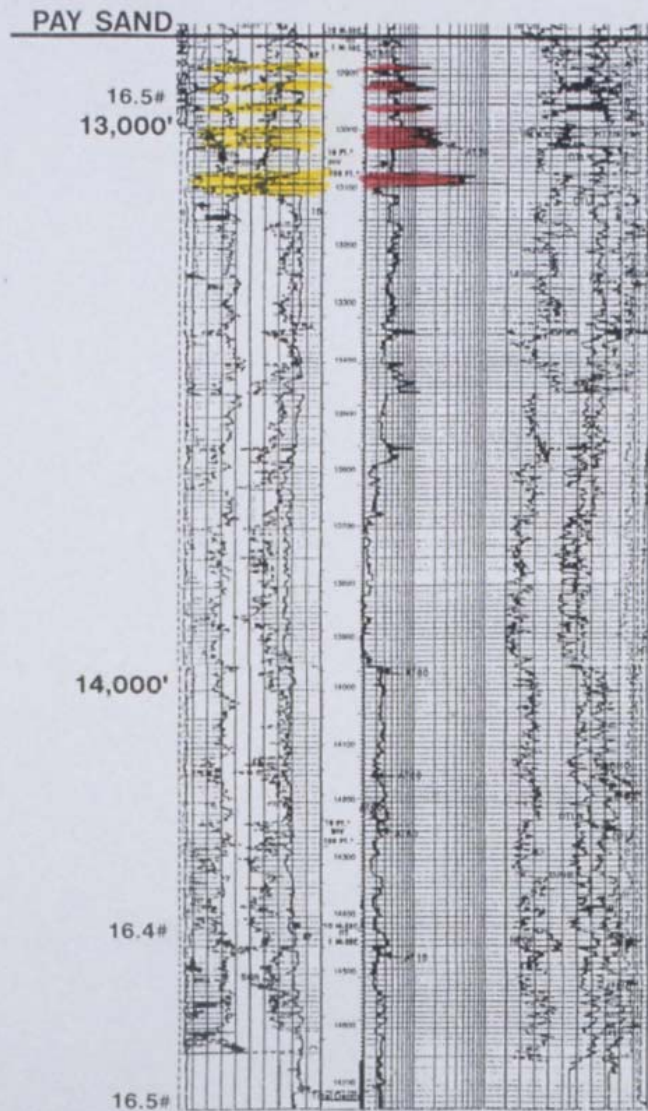
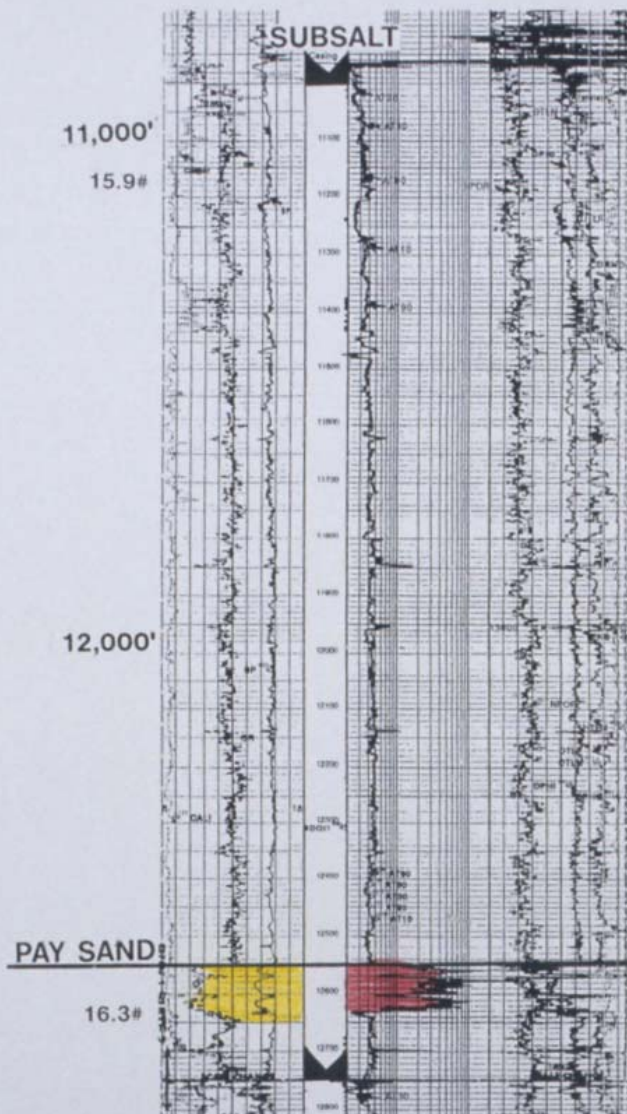
GARDEN BANKS 128

GARDEN BANKS 129

EAST

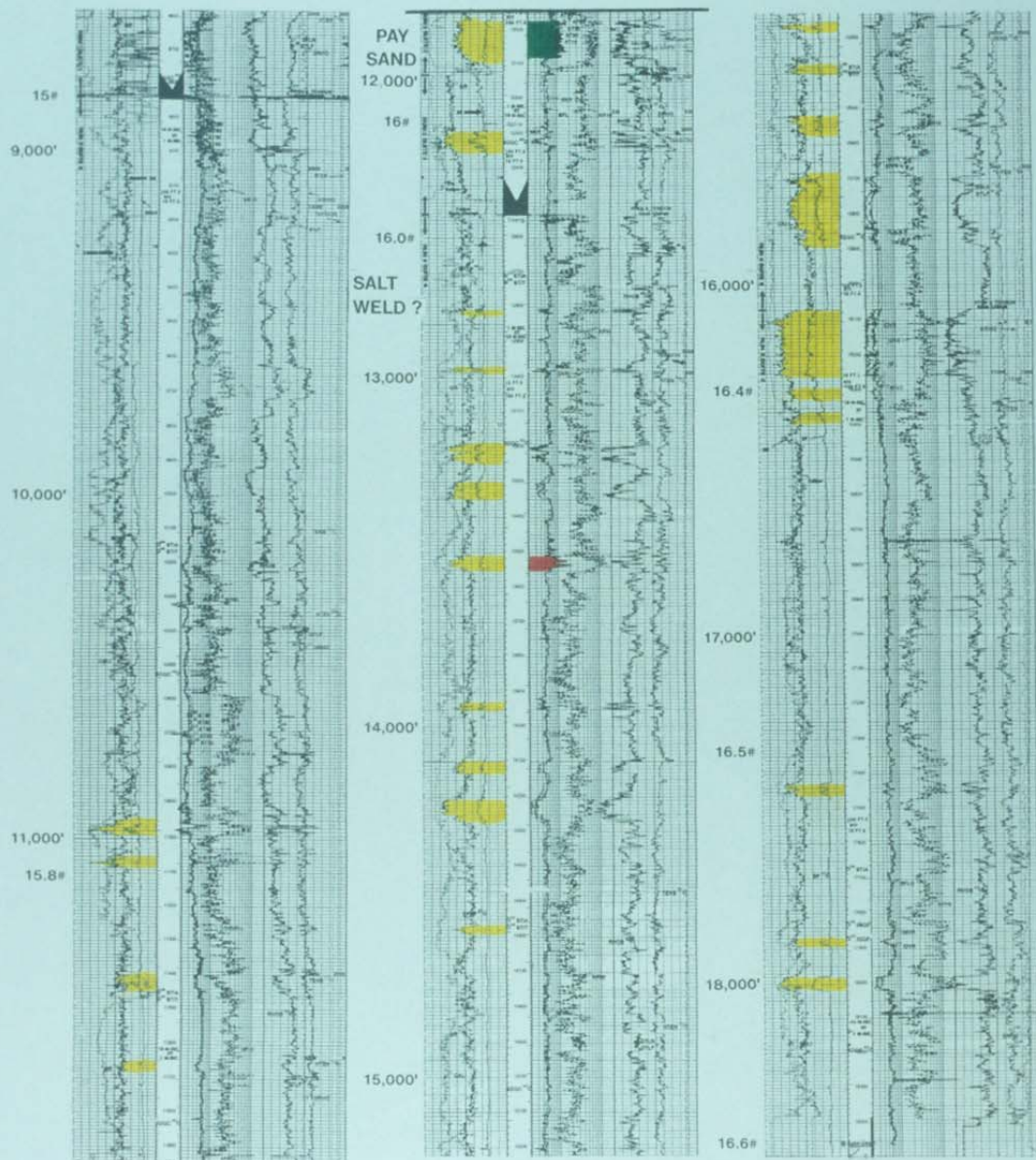


SHELL OFFSHORE #1
OCS-G-11454
GARDEN BANKS 127



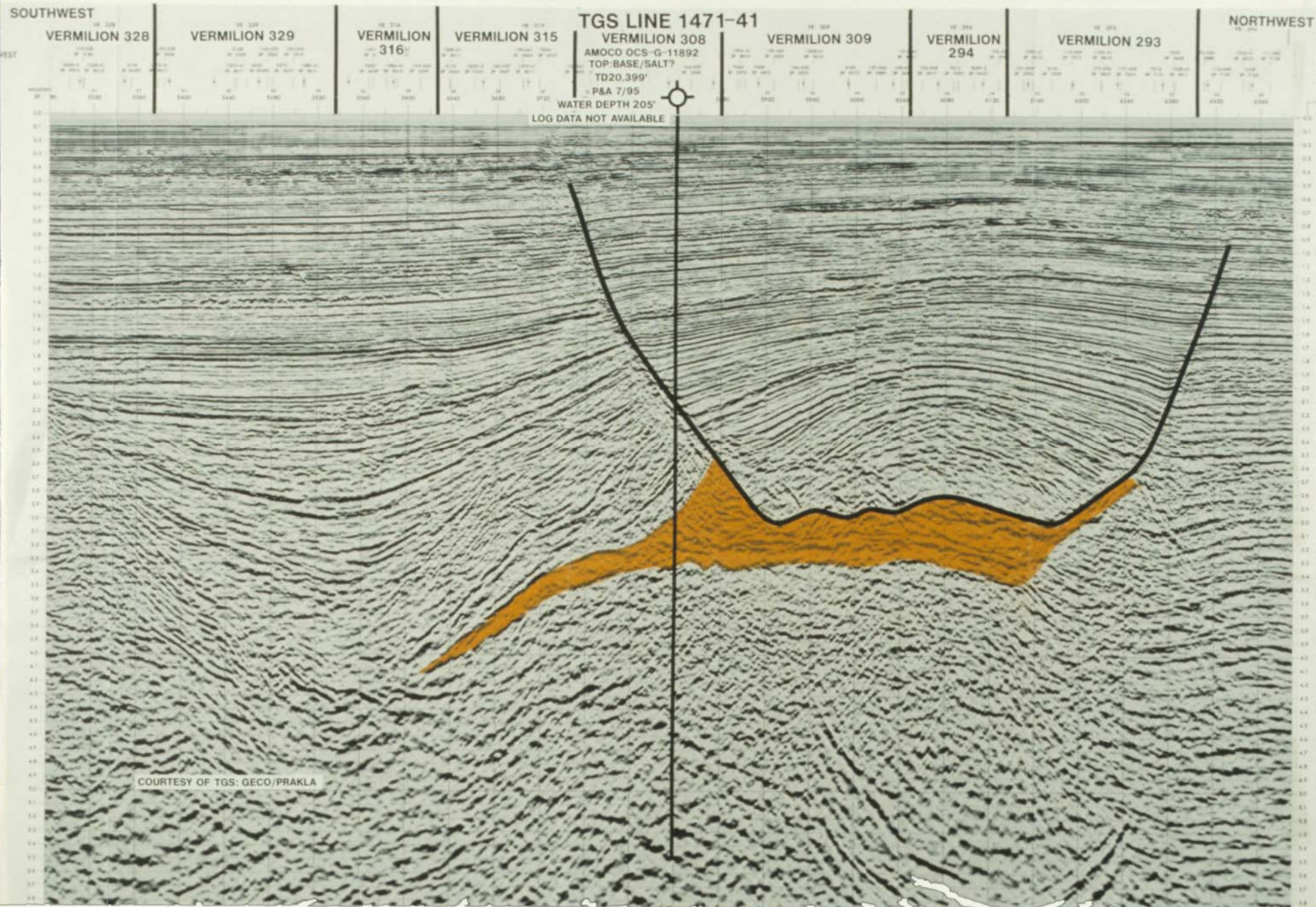
DISCOVERY 5/95
T.D. : 14,730'
"ENCHILADA/CHIMICHANGA"

SHELL
OCS-G-11455 #1
GARDEN BANKS 128

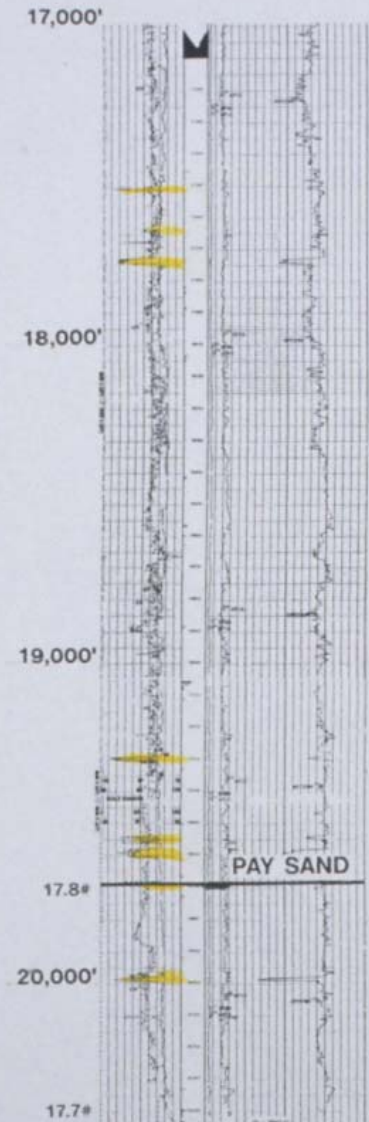
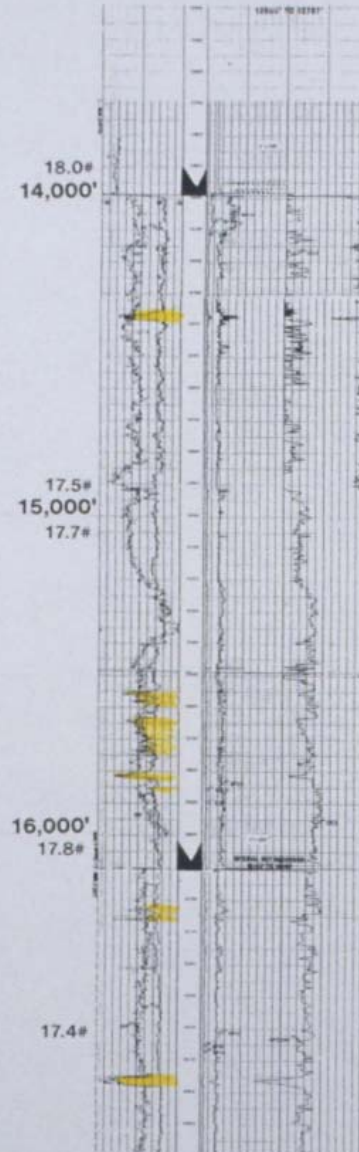
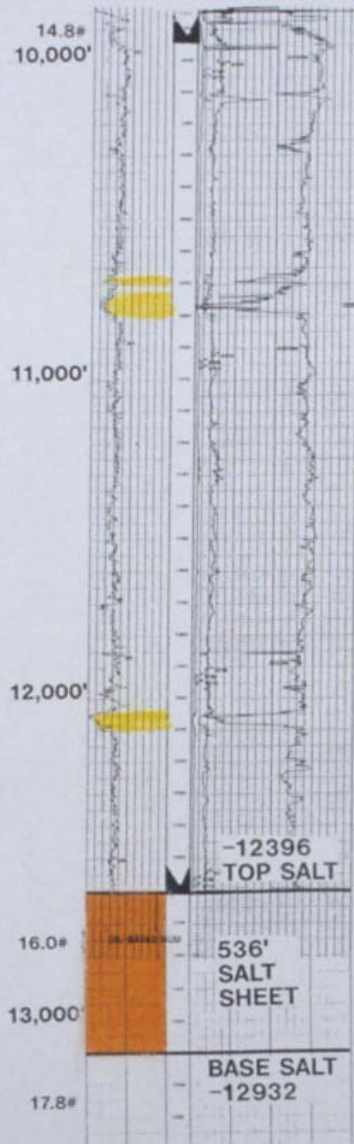


TD 18,454' MD = 15,476' TVD

DISCOVERY 6/94



AMOCO #1
OCS-G-11892
VERMILION 308

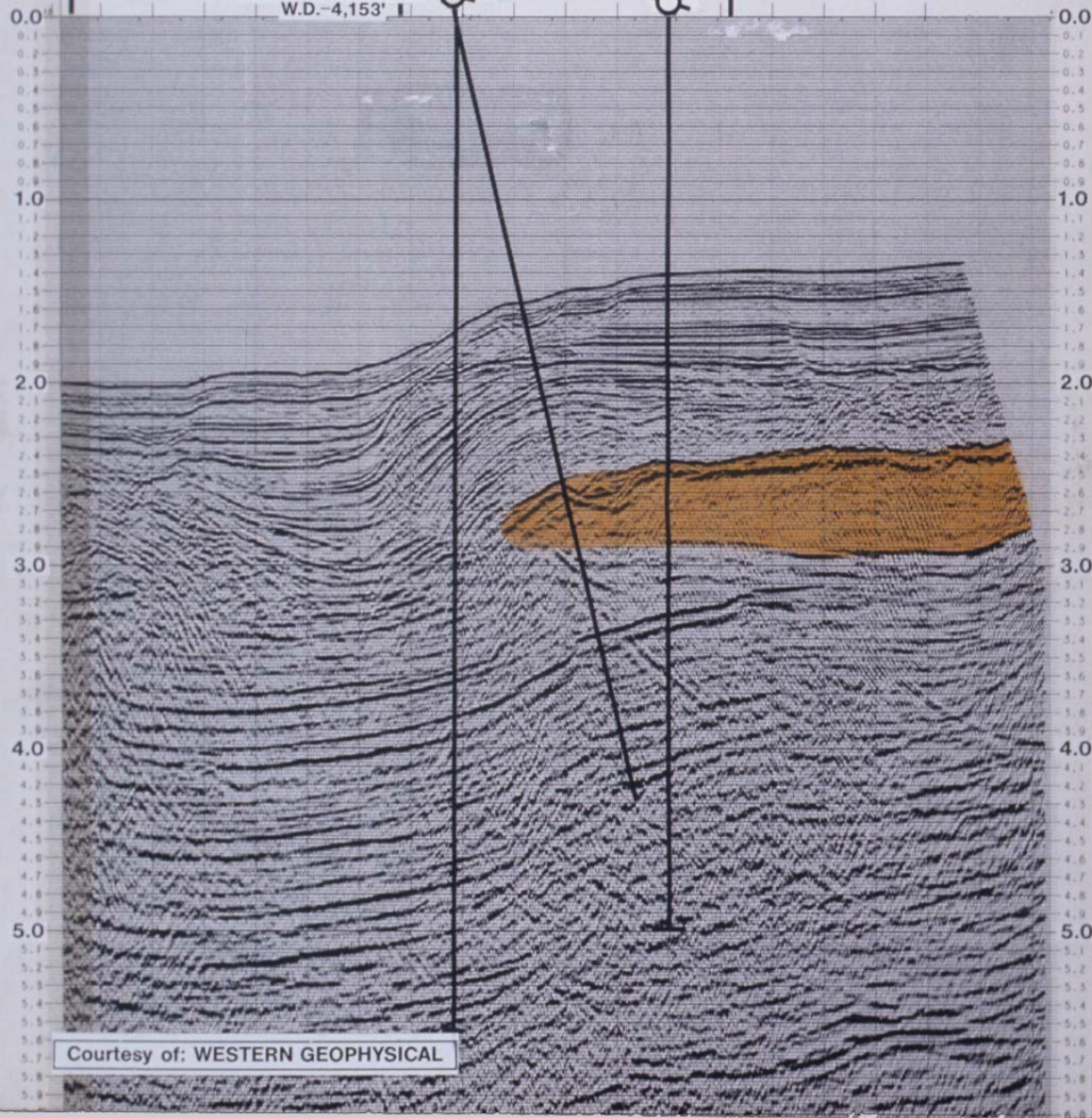


T.D. : 20,399'
P&A : 7/95

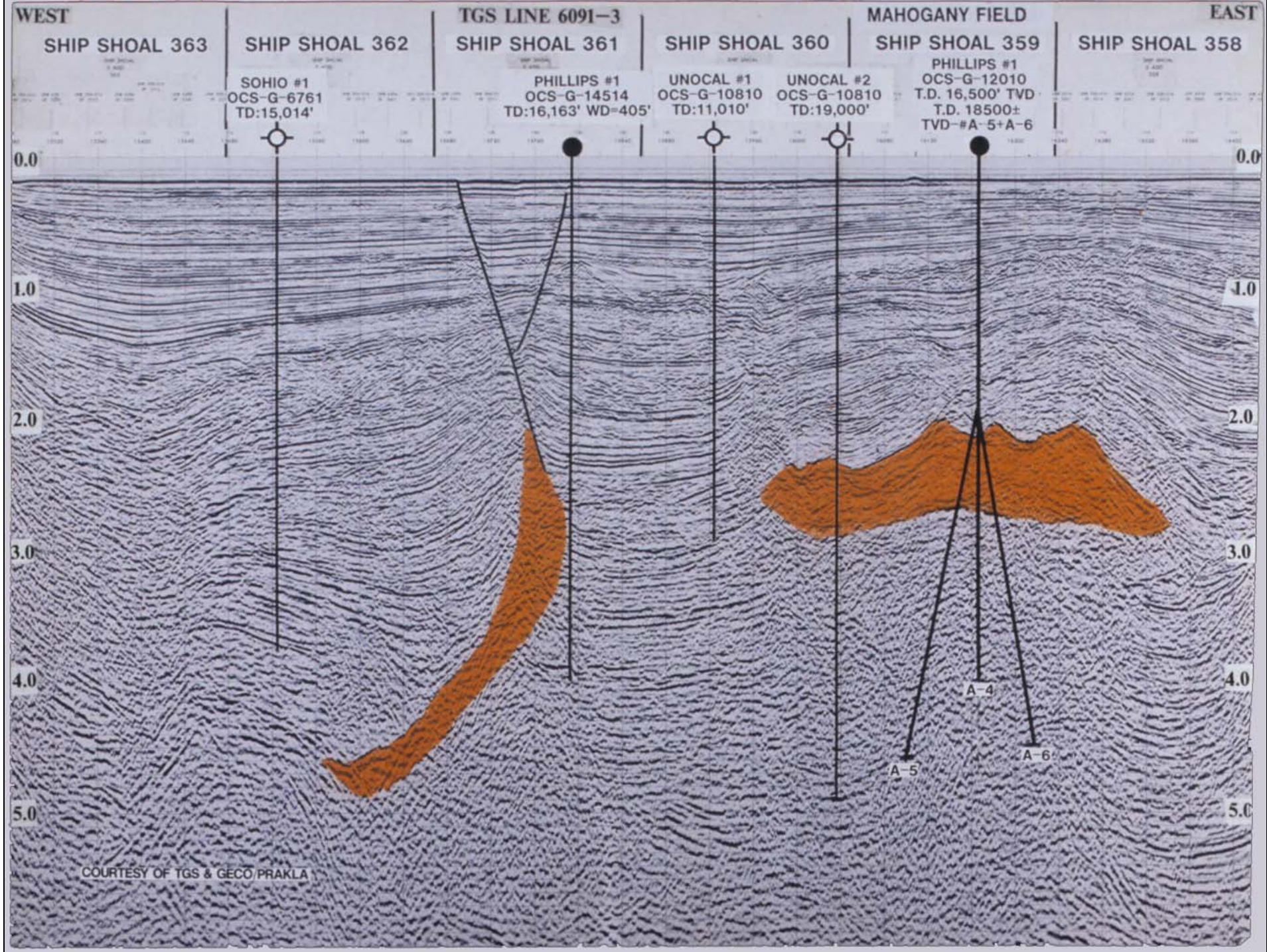
SOUTH

WESTERN LINE W-LS-596

NORTH

MISSISSIPPI CANYON
336MISSISSIPPI CANYON
292
"GEMINI"MISSISSIPPI CANYON
248TEXACO #25TH2
TVD 14,574'
SUSP. OPERS. 3/97
W.D. -4,153'TEXACO #20H
T.D. 19,500'
SIDETRACKTEXACO DISCOVERY
OCS-G-8806 #1
2,908' SALT
T.D. 17,976
SUSP. OPERS. 9/95

Courtesy of: WESTERN GEOPHYSICAL



SOUTH

TGS LINE 6424

NORTH

EWING BANK 917

"LOBSTER" FIELD

EWING BANK 873

EWING BANK
829

"NORTH LOBSTER"

SOUTH TIMBALIER 308

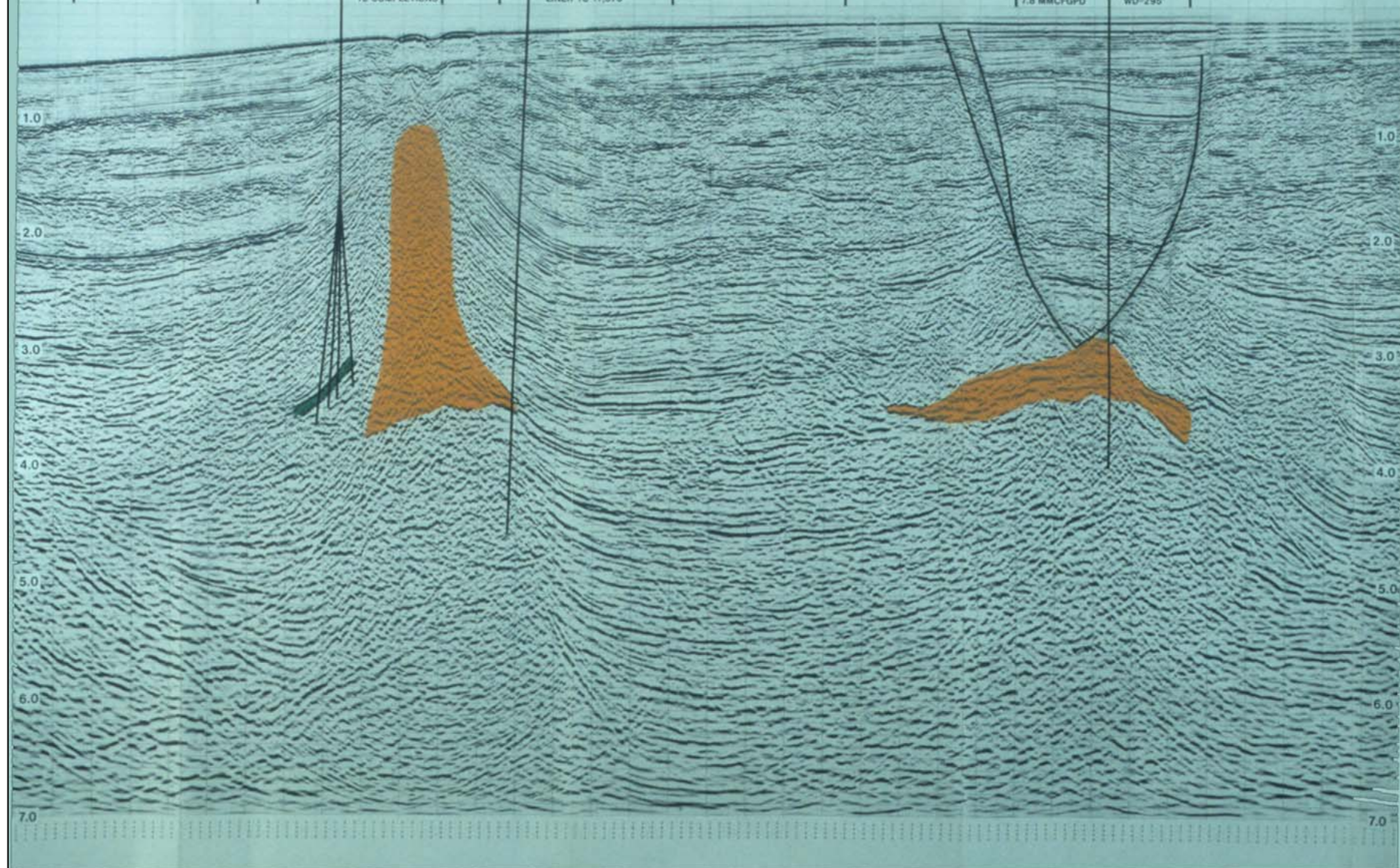
SOUTH TIMBALIER 288

SOUTH TIMBALIER 283

"TEAK" DISCOVERY

SOUTH TIMBALIER 260

SOUTH TIMBALIER 255

CUM. 13 MMSO
IN 1 YR. FROM
13 COMPLETIONSMARATHON #2 STH 1
OCS-G-12043
TD 18,735' MD-18,199 TVD
WD-554' SUSP. OPER. 5/96
LINER TO 17,673'COMBINED FLOW
4430 BOPO
7.8 MMCFGPDPHILLIPS #1
OCS-G-12037
TD 16,610'
WD-295'

NW

WESTERN LINE W-91-160

SE

VERMILION
398VERMILION
399VERMILION
400SOUTH MARSH
ISLAND 198
AMERADA HESS
OCS-G-12899 #1
TD 13,439' P&A 7/96SMI
199SOUTH MARSH
ISLAND 200
DIAMOND SHAMROCK
OCS-G-7719 #1
TD 13500' P&A 2/86SOUTH MARSH
ISLAND 201GARDEN BANKS
82

WD=380'

WD=475'

0.0

1.0

2.0

3.0

4.0

5.0

0.0

1.0

2.0

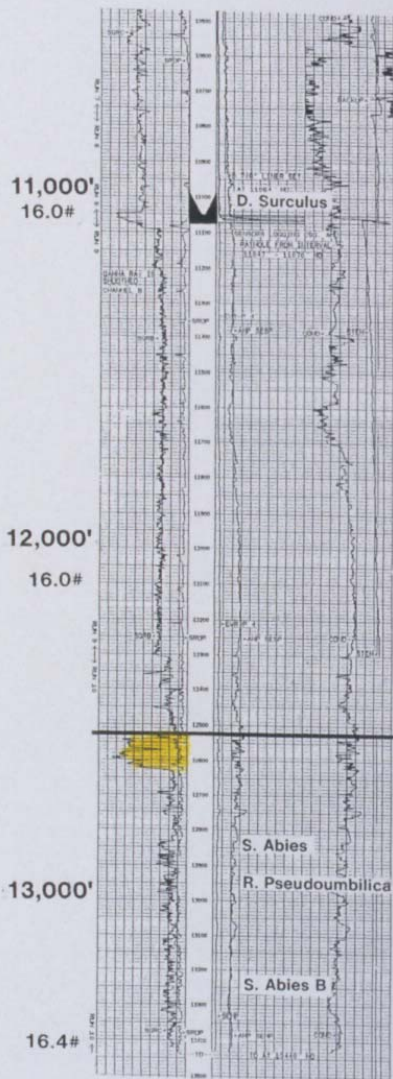
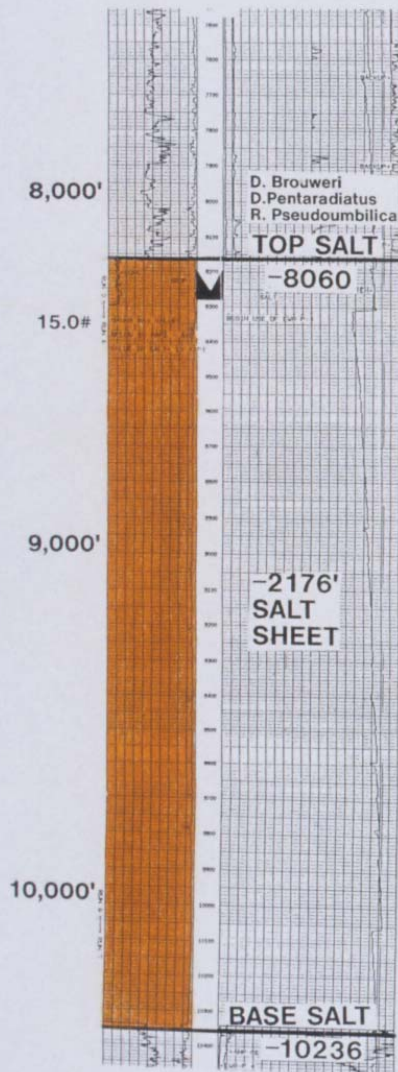
3.0

4.0

5.0

COURTESY OF
WESTERN GEOPHYSICAL

**AMERADA HESS #1
OCS-G-12899
SOUTH MARSH ISLAND 198**



T.D. : 13,439'
P&A : 7/96

SOUTH

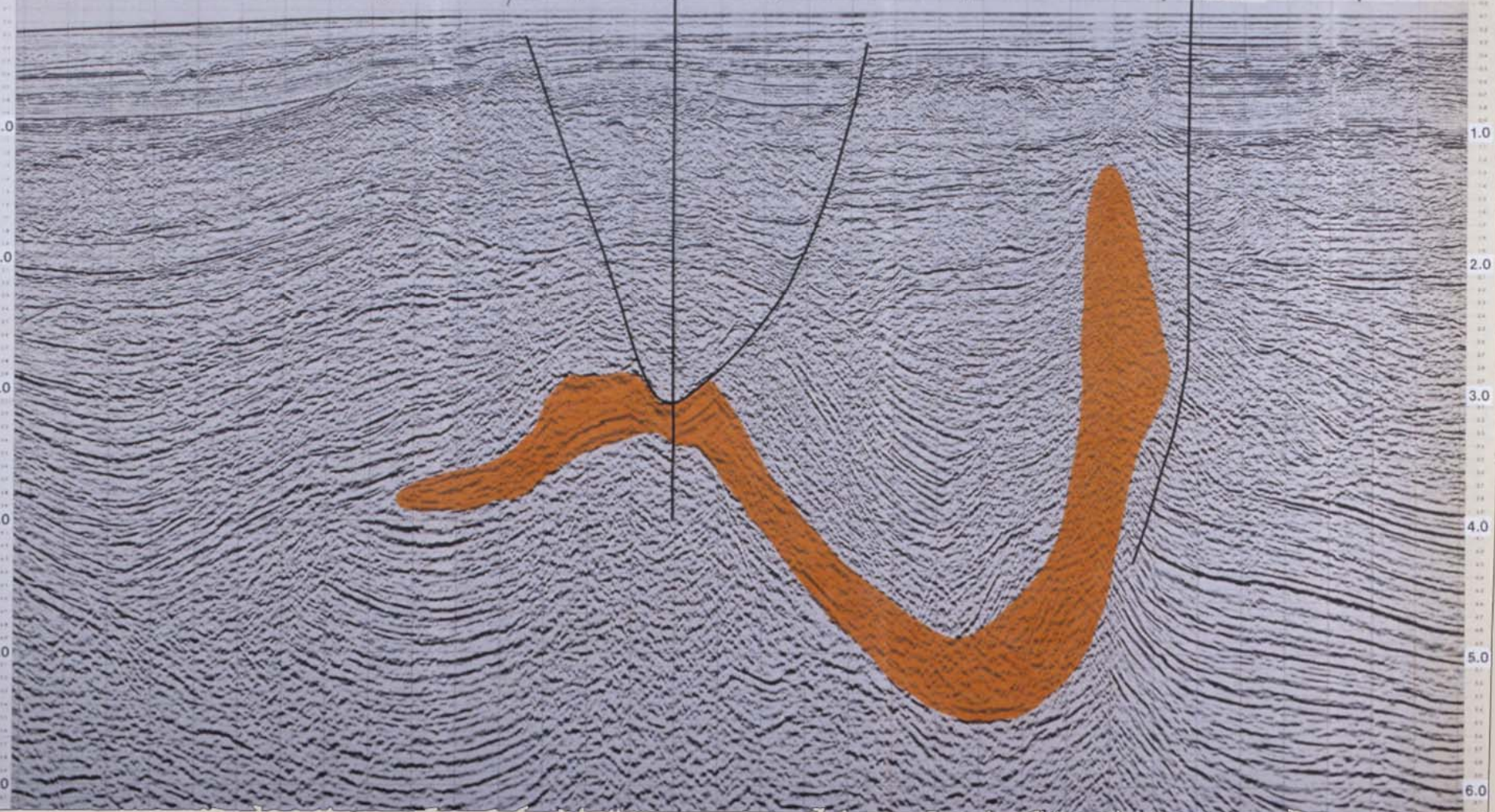
TGS LINE 440-016

NORTH

"TEAK"
DISCOVERY

"GOLDEN EAGLE"

SOUTH TIMBALIER 287		SOUTH TIMBALIER 284		SOUTH TIMBALIER 259		SOUTH TIMBALIER 256		SOUTH TIMBALIER 231		SOUTH TIMBALIER 228	
				COMBINED FLOW 4430 BOPD 7.8 MMCFGPD						LLAE #3 OCS-G-10,836' MTD 19,631' TVD 17,667' P&A 6/96 WD 235'	
				PHILLIPS #1 OCS-G-12037 TD 16,610' WD-295'							



SW

WESTERN LINE W-92-89

NE

MISS.
CANYON
661MISSISSIPPI
CANYON 662MISS.
CANYON
618MISSISSIPPI
CANYON 619M.C.
575MISSISSIPPI
CANYON 576M.
C.
552MISSISSIPPI
CANYON 533CHEVRON
OCS-G-13139 #1
TD: 21,000' WD=1334'
P & A 8/96

0.0

0.0

1.0

1.0

2.0

2.0

3.0

3.0

4.0

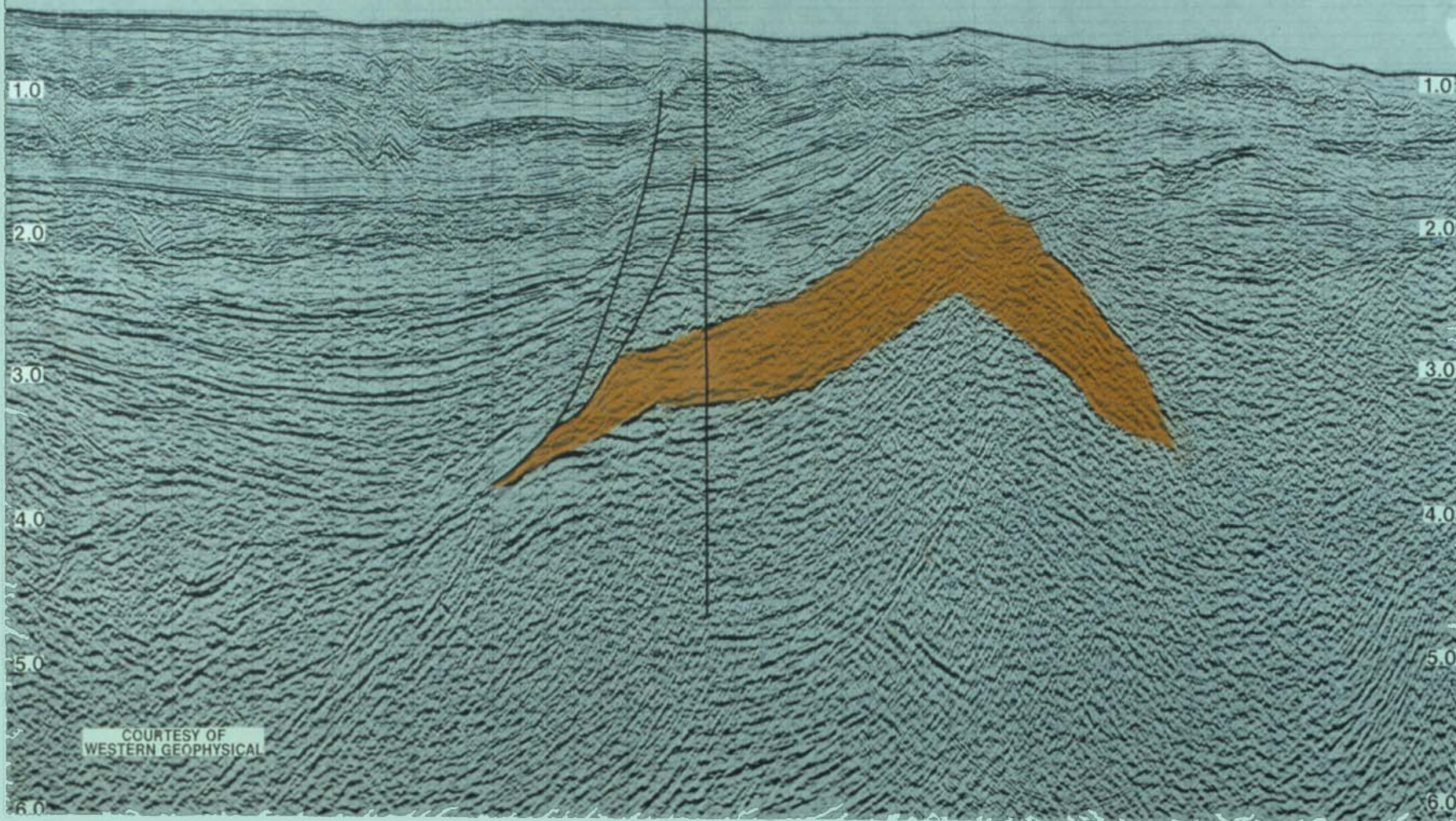
4.0

5.0

5.0

6.0

6.0

COURTESY OF
WESTERN GEOPHYSICAL

WEST

TGS LINE 6083-3

EAST

SOUTH TIMBALIER
312SOUTH TIMBALIER
311SOUTH
TIMBALIER
310SOUTH TIMBALIER
309EWB
868EWING BANK
869MARATHON
OCS-G-12892 #1
16,570' TVD P&A 8/96SHELL
OCS-G-6902 #1
TD:15,053' P&A 8/86

0.0

0.0'

1.0

1.0

2.0

2.0

3.0

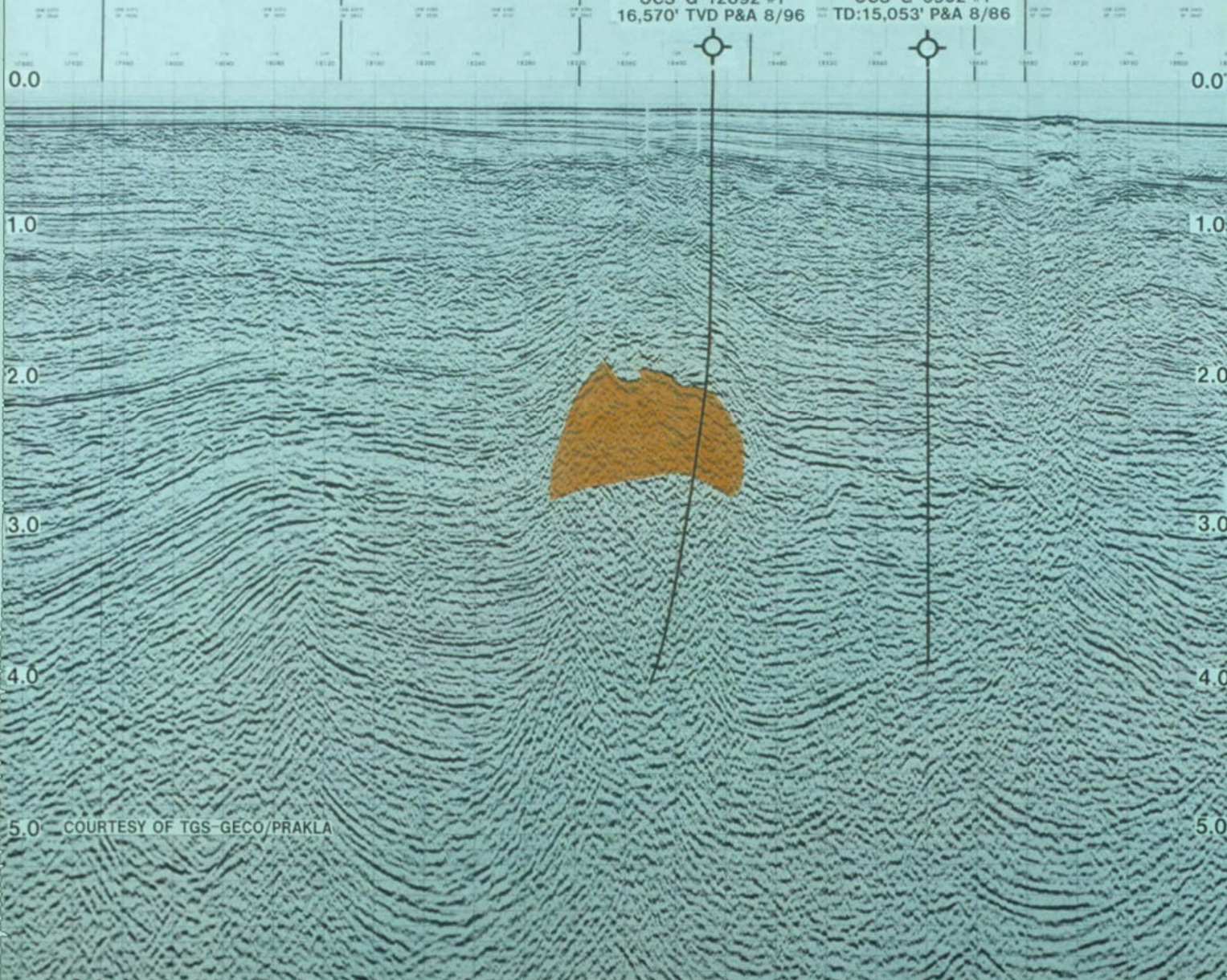
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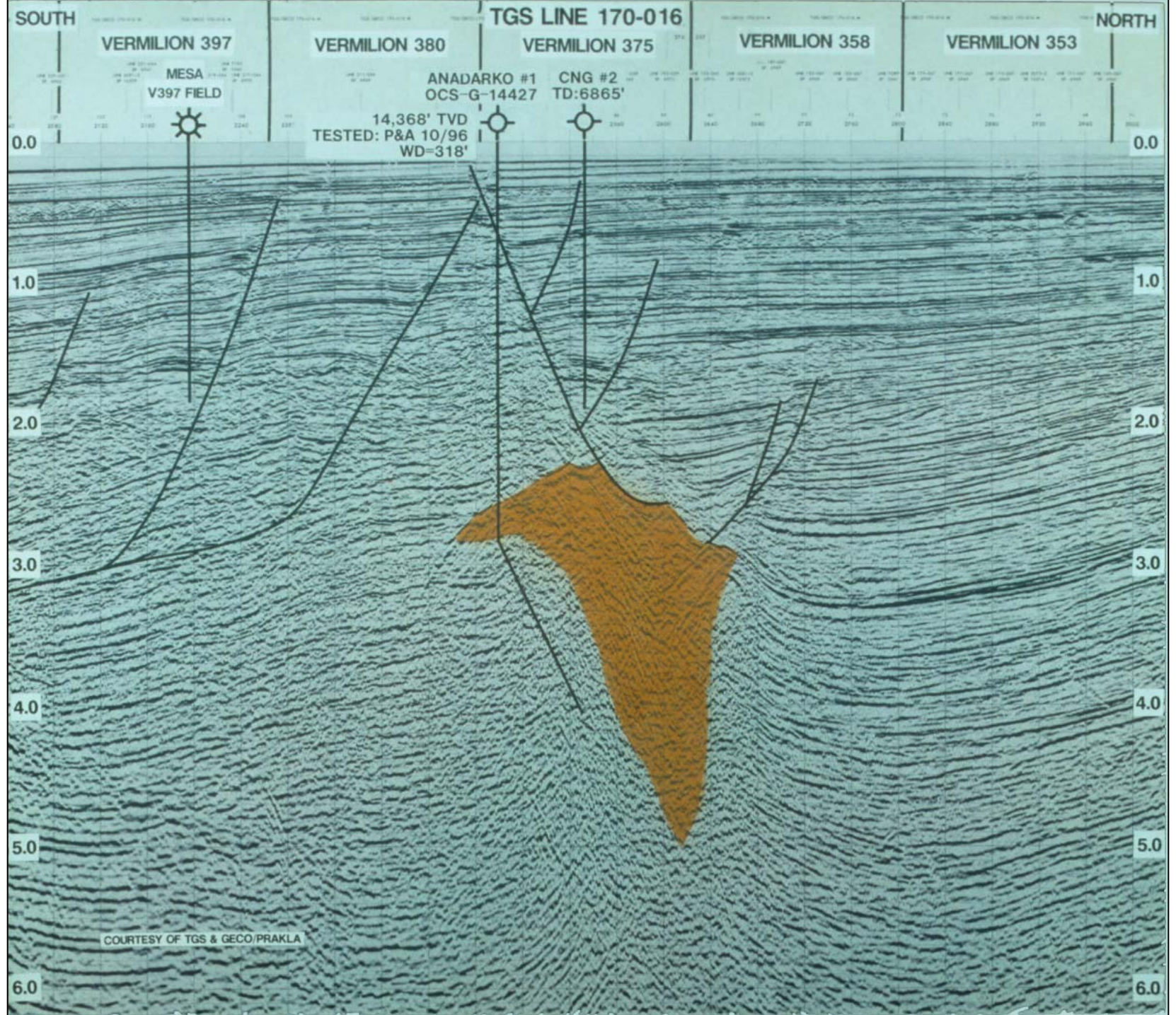
4.0

4.0

5.0 COURTESY OF TGS-GECO/PRAKLA

5.0





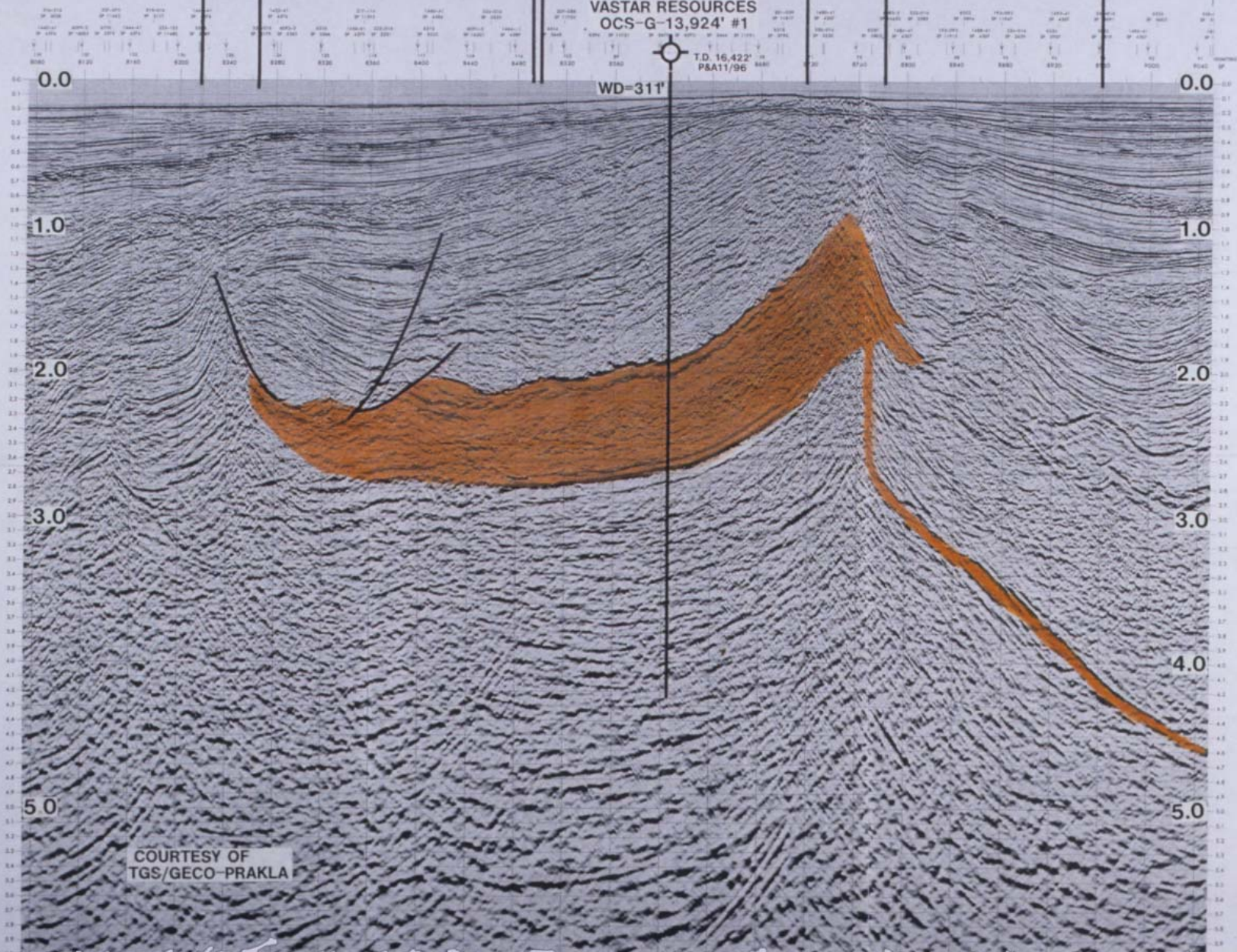
SW

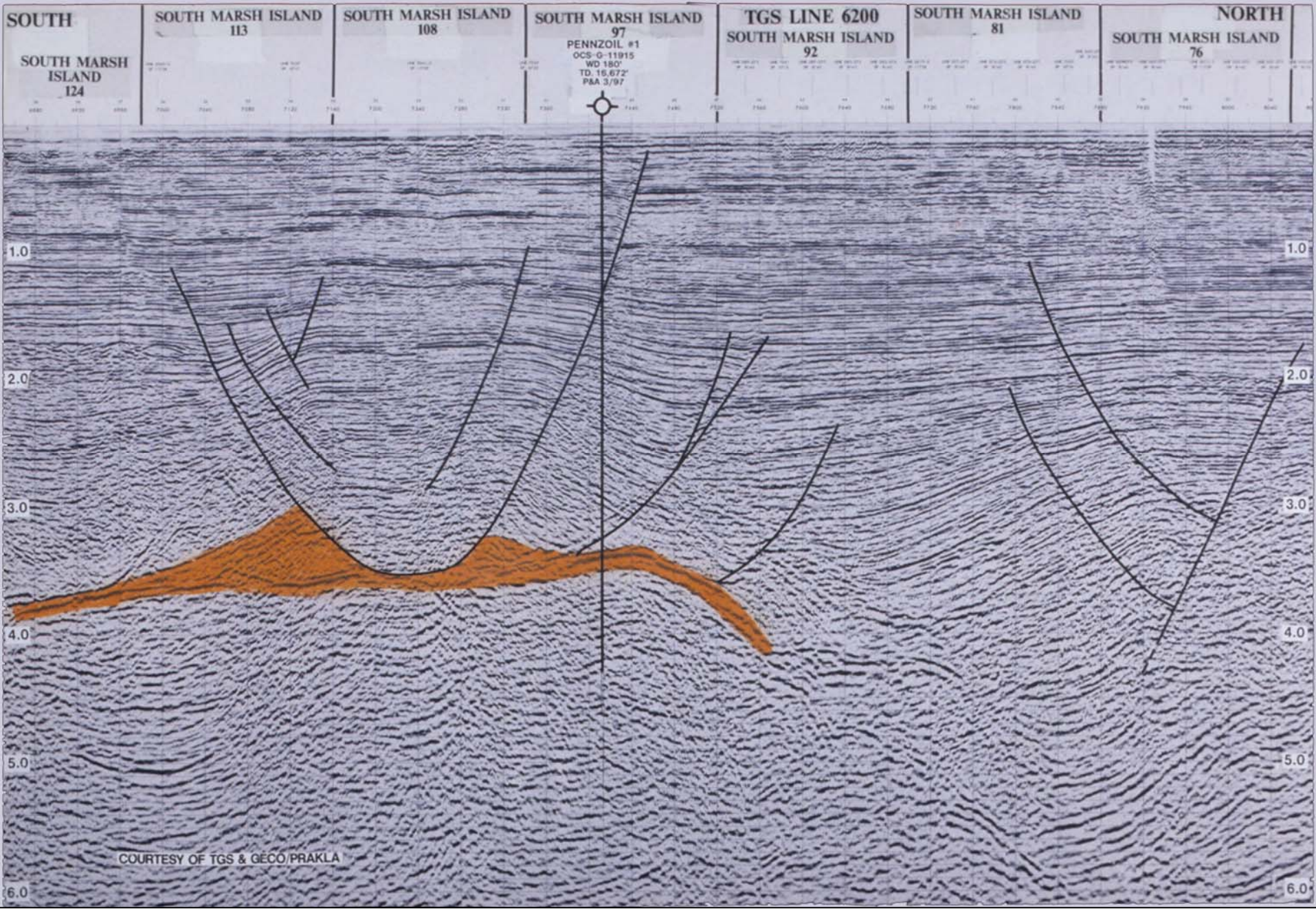
TGS LINE 1205-41

NE

SHIP SHOAL
367SHIP SHOAL
368SHIP SHOAL
359SHIP SHOAL
350SHIP SHOAL
337SHIP SHOAL
336SHIP SHOAL
327VASTAR RESOURCES
OCS-G-13,924' #1T.D. 16,422'
P&A11/96

WD=311'

COURTESY OF
TGS/GECO-PRAKLA



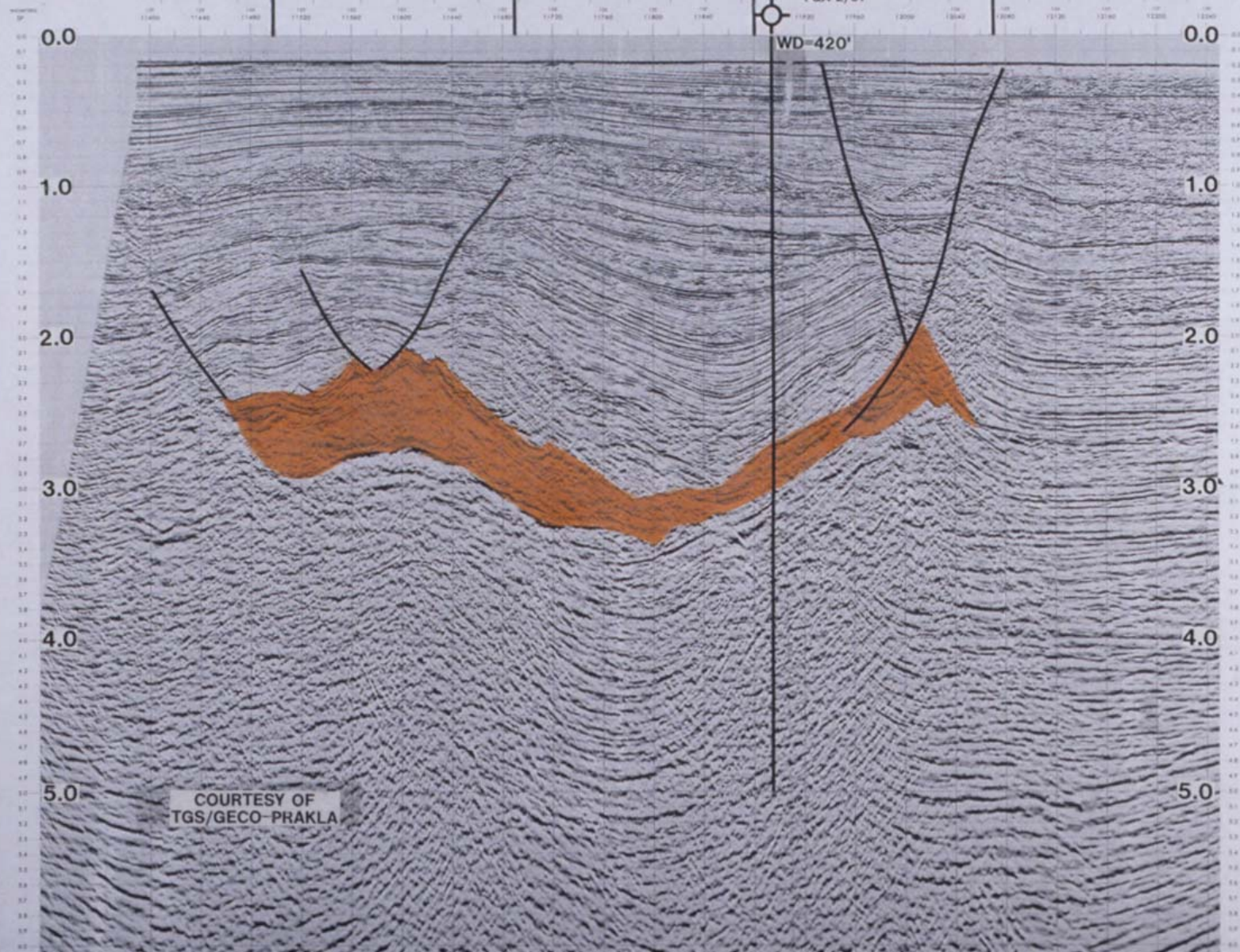
WEST

TGS LINE 217-114

EAST

SHIP SHOAL
360SHIP SHOAL
359SHIP SHOAL
358SHIP SHOAL
357SHIP SHOAL
356LL&E #3
OCS-G-12,960'
T.D. 20,611'
P&A 2/97

WD=420'

COURTESY OF
TGS/GECO-PRAKLA

TGS LINE 1059-43A

SW

NE

MISSISSIPPI
CANYON 669

MISSISSIPPI
CANYON 670

MISSISSIPPI
CANYON 626

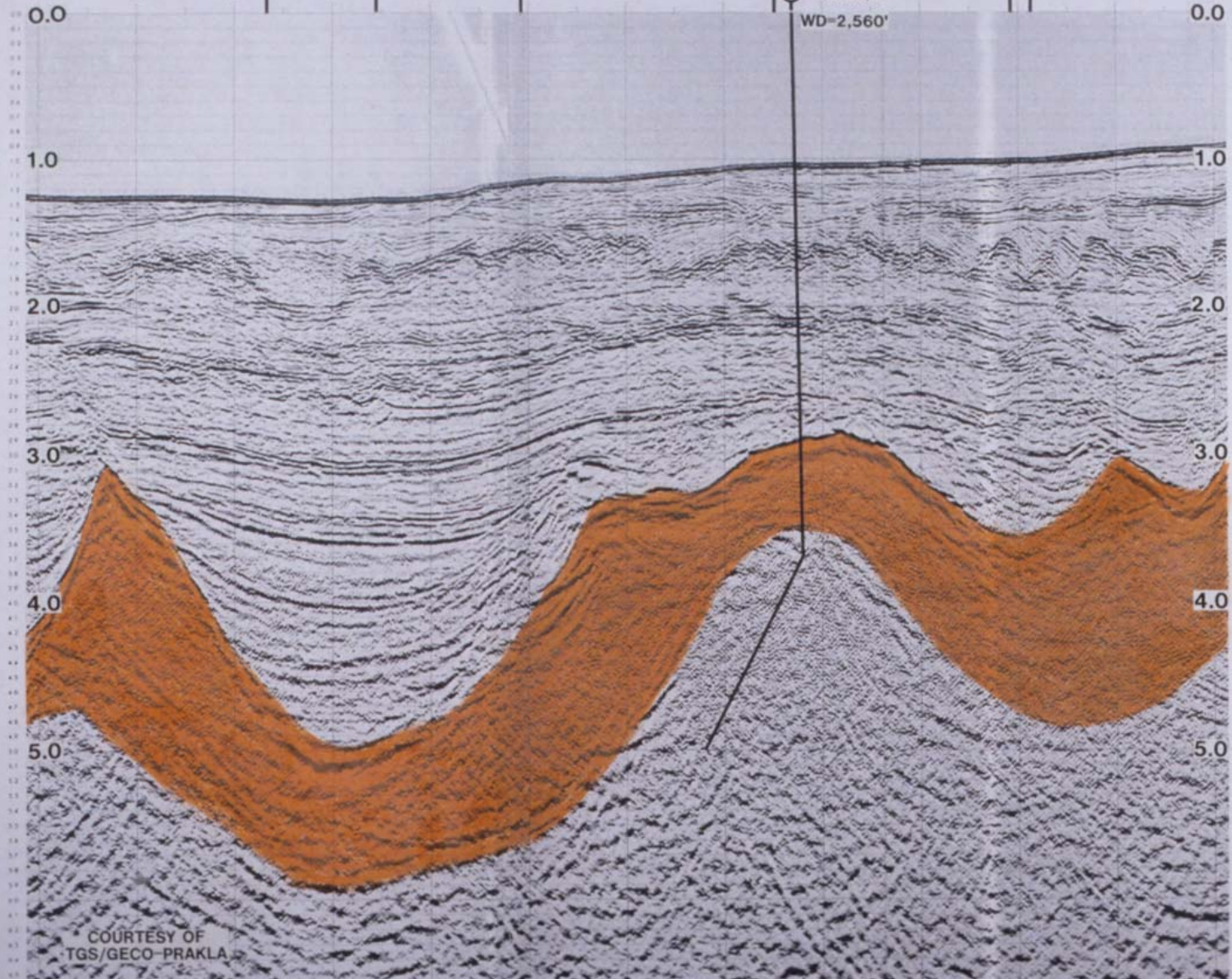
MISSISSIPPI
CANYON 627

MISSISSIPPI
CANYON 628

MISSISSIPPI
CANYON 585

CHEVRON #1
OCS-G-13,140'
MTD 20,076'
TVD 19,458'
P&A 2/97

WD=2,560'



NW

TGS LINE 1048-43A

SE

MISS.
CANYON
540MISSISSIPPI
CANYON 541MISSISSIPPI
CANYON 585MISSISSIPPI
CANYON 629MISS.
CANYON
630MISSISSIPPI
CANYON 674BP EXPL.
OCS-G-13,687' #2
T.D. 23,154'
P&A 11/96MISSISSIPPI
CANYON 718MISS.
CANYON
762MISSISSIPPI
CANYON 763NORTH SIDE OF
MARS SALT DOME

0.0

1.0

2.0

3.0

4.0

5.0

WD=2,711'

0.0

1.0

2.0

3.0

4.0

5.0

COURTESY OF
TGS/GECO-PROKLA

WEST

EAST

TGS/GECON LINE 169-123

SHIP SHOAL 309

SHIP SHOAL 308

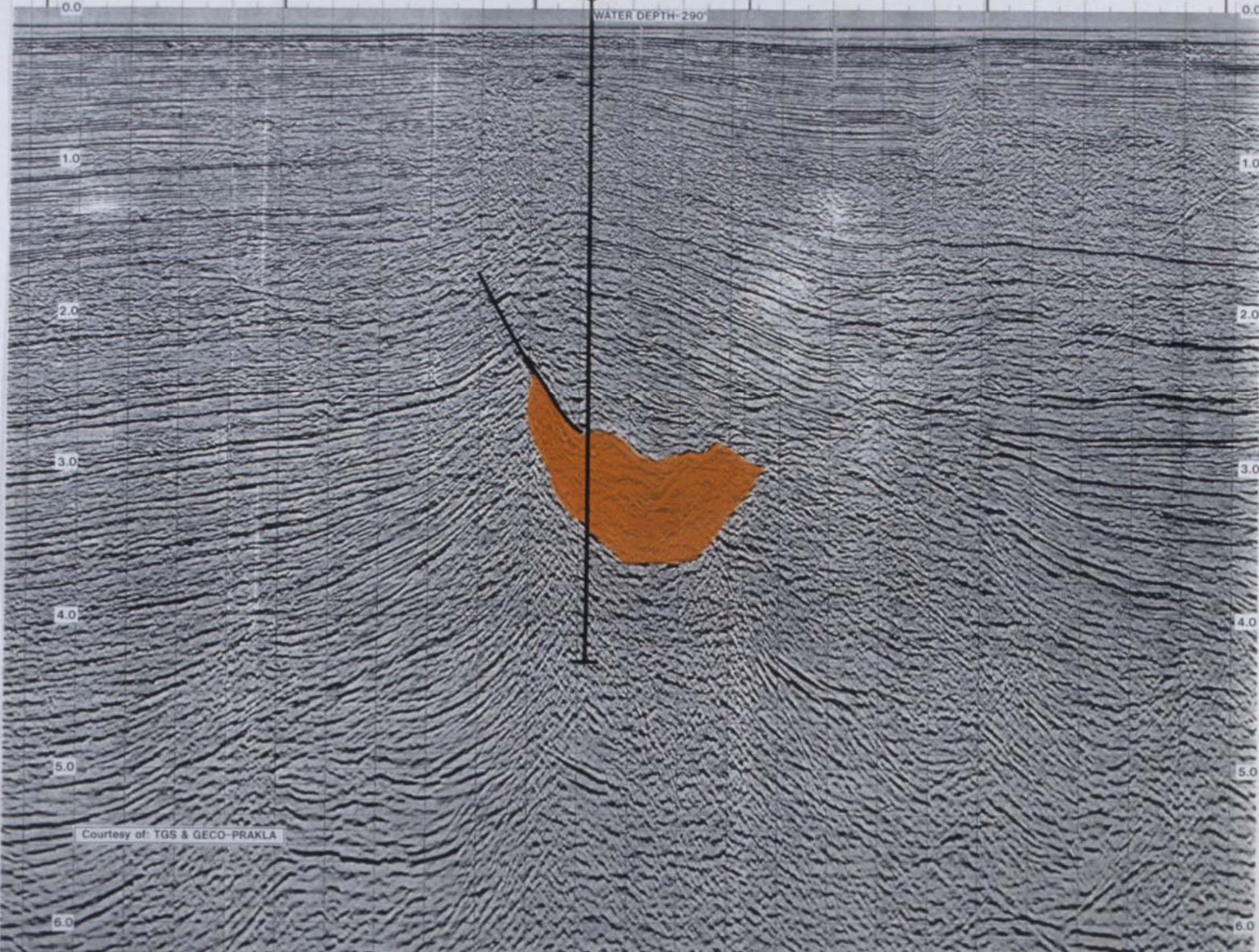
SOUTH TIMBALIER 299

SOUTH TIMBALIER 298

SOUTH TIMBALIER 297

"LION"
BHP PETROLEUM
OCS-G-14550 #
TVD 17,100'
P&A 8/97

WATER DEPTH-290'



Courtesy of: TGS & GECO-PRAKLA

NORTHWEST

TGS/GECO LINE 1034-43A

SOUTHEAST

MISSISSIPPI
CANYON 580MISSISSIPPI
CANYON 624MISSISSIPPI
CANYON 625

MISSISSIPPI CANYON 669

MISSISSIPPI CANYON 713

"ATLAS"
CHEVRON
OCS-G-148531 #1
TD 16,185'
P&A 8/97

MISSISSIPPI CANYON 758

MISSISSIPPI CANYON 802

MISSISSIPPI
CANYON 846

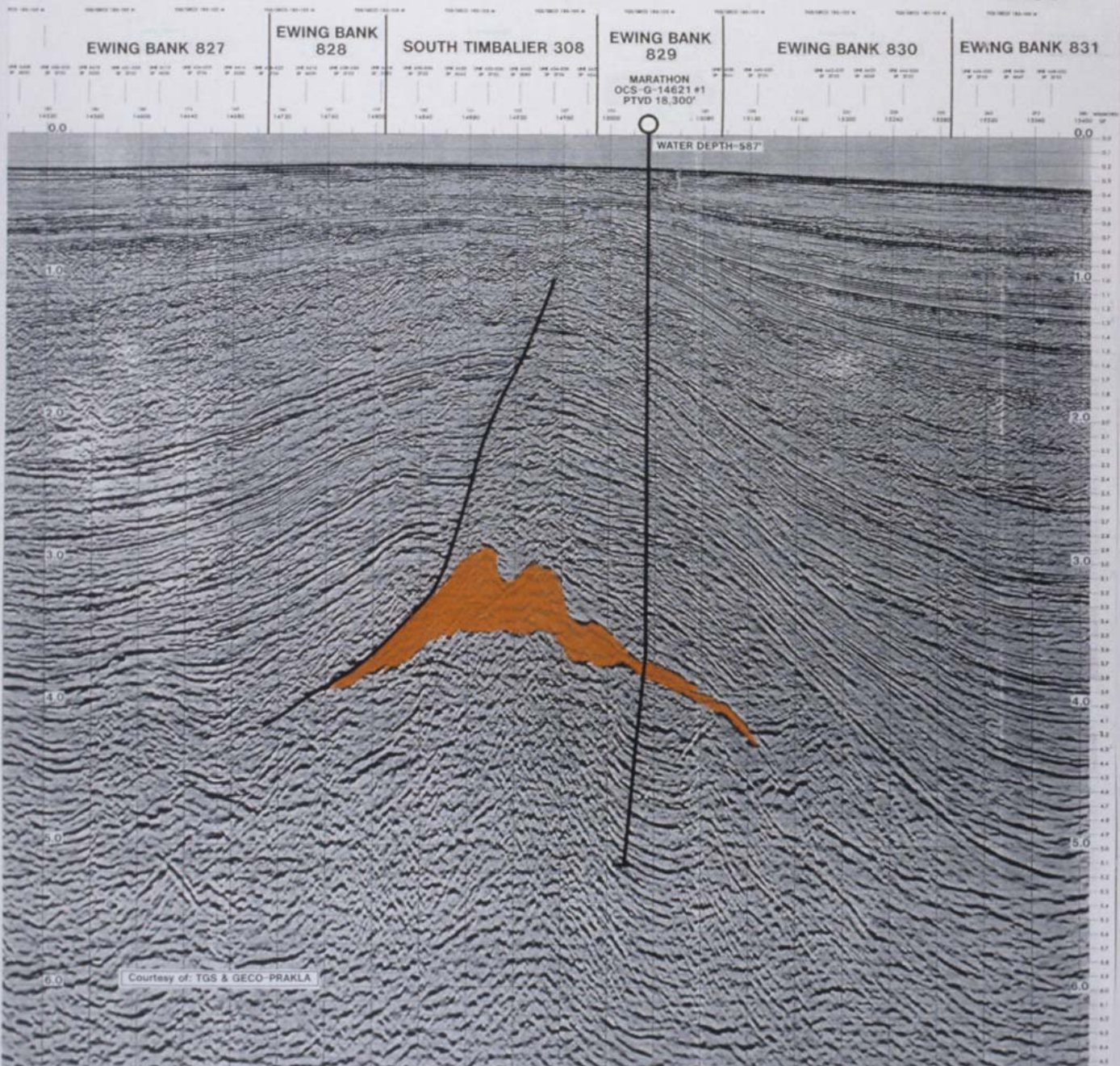
WATER DEPTH-3.197'

Courtesy of: TGS & GECO-PRAXLA

WEST

TGS/GECO LINE 185-105

EAST



NORTH

0000-0001-9000-0000

1000-0000-1111-20

494/1040

GARDEN BANKS 127

#5
22,000*

2008 2009 2010
2011 2012 2013

1998 2053-55
20 5477

1998-2017 - 2017
1998-2017 - 2017

1996	1997
1998	1999

ONE
O

A HESS
-9216

100-200-20
100-200-20

1946 2677-20
92-01574

1940 388-1-20
SP 9479

LINE 2483-20
SP 9870

1946 1949-50
1951 1952

194 2013-20
17 8420

1

600

575
576

1.0

1.0

20

2.0

23.0

3.0

4.0

40

50

50
444

60

6.0

7.0

7.0
m/s

Courtesy of: TGS & GECO-PRAKLA

SOUTH

TGS/GECO LINE 1560-20

NORTH

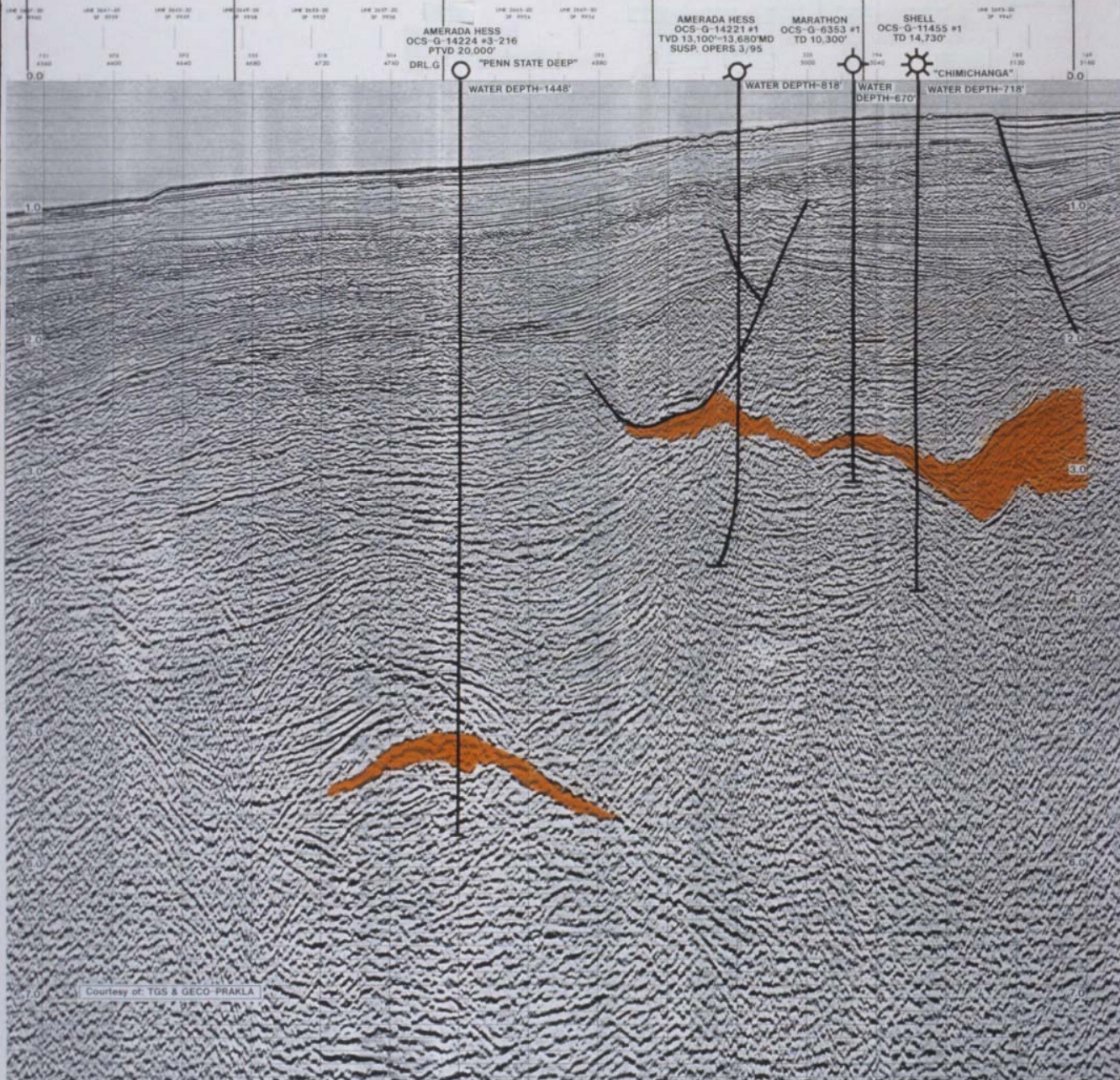
GARDEN BANKS 303

GARDEN BANKS 259

GARDEN BANKS 215

GARDEN BANKS 171

GARDEN BANKS 127



Courtesy of TGS & GECO-PRAKLA

Conclusions

- Giant reserve size, existence of offshore infrastructure, advancing technology, and moderate water depths, all combine to make the profit potential of this play very large.
- Subsalt reservoir sand quality in over 30 wells drilled to date, has repeatedly been found to be high porosity, high permeability, and high pressure, which suggests high sustainable production potential from subsalt discoveries.
- Most wells encountered roughly 1,000' of "non-competent" zone geopressured shales and silts immediately below the base of the overlying salt sheets. Nearly a dozen of the historical subsalt wells never drilled deep enough to drill out of this zone, primarily because they were not intended to be subsalt wells.

Conclusions (cont.)

- Thick sequences of primarily Pliocene, as well as some Miocene and Pleistocene, subsalt clastic sandstone sections confirm deepwater paleoenvironments and depositional models.
- Future subsalt wells should drill roughly 4,000'-5,000' below the base of the "non-competent" zone, so that multiple reservoir sandstones can be encountered as suggested by the predictive cycles of sequence stratigraphy.
- Formation evaluation programs with strong emphasis on wireline logging, rotary and percussion coring, biostratigraphy, and lithostratigraphy should also utilize image logging and rotary coring of the salt sheets and "non-competent" zone below, in order to maximize understanding of these elements of various subsalt trapping styles.

*THERE IS LIFE
IN THE
“DEAD SEA”
AFTERALL!!*

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