

Received  
OCS District Office

DEC 17 1985

RECEIVED  
Minerals Management Service  
Anchorage, Alaska

DEC 18 1985

Reservoir Fluid Study  
Unocal Science & Technology Division  
~~"California Oil"~~  
"HAMMER HEAD OIL"  
RFL-CA 85109

REGIONAL SUPERVISOR  
FIELD OPERATION  
MINERALS MANAGEMENT SERVICE

CONFIDENTIAL

RESERVOIR FLUIDS

CORE

AREA FILE 6.18.2

Y084411

COPY 1 OF 4



UNION OIL COMPANY  
Hammerhead #1

Breakdown of Delivery and Returns Goods Tickets

<u>Product</u>	<u>Quantity</u>	<u>Cost</u>	<u>Amount</u>
<u>Ticket No. 431954 - 08/27/85</u>			
Gel	525	21.95	11,523.75
Poly RX	160	88.95	14,232.00
Maxpac SL	135	177.80	24,003.00
Soltex	150	130.60	19,590.00
KCl	280	31.77	8,895.60
Calcium Chloride	70	52.20	<u>3,654.00</u>

Total Cost of Ticket No. 431954 \$81,898.35

Ticket No. 431955 - 09/04/85

Salt, 80#	1,611	34.74	55,966.14
Safe Link	110	66.61	7,327.10
Lube 106	20	129.75	2,595.00
Defoam L	19	221.49	4,208.31
Safe Dense	65	35.60	2,314.00
Safe Block	80	48.40	<u>3,872.00</u>

Total Cost of Ticket No. 431955 \$76,282.55

Ticket No. R 104952 - 09/10/85

KCl	-280	31.77	<u>-8,895.60</u>
-----	------	-------	------------------

Total Cost of Ticket No. R 104952 -\$8,895.60

Ticket No. R 110677 - 09/24/85

Gelex	-100	20.15	-2,015.00
Gel	-595	21.95	-13,060.25
Maxpac SL	-189	177.80	-33,604.20
Soda Ash	-71	40.50	-2,875.50
Poly RX	-138	88.95	-12,275.10
Soltex	-15	130.60	-1,959.00
Lube 106	-45	129.75	-5,838.75
Sodium Nitrate	-44	45.08	-1,983.52
Sulf-X ES	-134	140.10	-18,773.40
Safe Link	-40	66.61	-2,664.40
Safe Dense	-35	35.60	-1,246.00
Safe Block	-50	48.40	-2,420.00
Defoam L	-19	221.49	-4,208.31
Salt, 80#	-88	34.74	<u>-3,057.12</u>

Total Cost of Ticket No. R 110677 -\$105,980.55

**IMCO Services**

A Halliburton Company

4454 Business Park Blvd • Anchorage, Alaska 99503 • (907) 562-2255

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UNION OIL COMPANY  
Hammerhead #1

Breakdown of Delivery and Returns Goods Tickets

<u>Product</u>	<u>Quantity</u>	<u>Cost</u>	<u>Amount</u>
<u>Ticket No. 367400 - 07/15/85</u>			
Poly RX	80	88.95	7,116.00
Lube 106	10	129.75	1,297.50
Soda Ash	30	40.50	1,215.00
Soltex	60	130.60	7,836.00
Gelex	100	20.15	2,015.00
Aluminum Stearate	5	77.80	389.00
Sulf-X ES	134	140.10	<u>18,773.40</u>

Total Cost of Ticket No. 367400 \$38,641.90

<u>Ticket No. 431951 - 08/13/85</u>			
Bar	2,970	20.89	62,043.30
Gel	350	21.95	7,682.50
Maxpac SL	54	177.80	9,601.20
Poly RX	160	88.95	14,232.00
XC Polymer	40	425.18	17,007.20
Sodium Nitrate	77	45.08	<u>3,471.16</u>

Total Cost of Ticket No. 431951 \$114,037.36

<u>Ticket No. 431953 - 08/13/85</u>			
Maxpac SL	90	177.80	<u>16,002.00</u>

Total Cost of Ticket No. 431953 \$16,002.00

<u>Ticket No. 431952 - 08/21/85</u>			
Bar	1,375	20.89	28,723.75
Soda Ash	60	40.50	<u>2,430.00</u>

Total Cost of Ticket No. 431952 \$31,153.75

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UNION OIL COMPANY

Hammerhead #1

Summary of Mud Material Usage

IMCO PRODUCTS

<u>Product</u>	<u>Sacks</u>	<u>Cost</u>	<u>Total</u>
Aluminum Stearate	2	77.80	155.60
Bar	4,345	20.89	90,767.05
Gel	280	21.95	6,146.00
Lube 106	5	129.75	648.75
Maxpac SL	90	177.80	16,002.00
Poly RX	262	88.95	23,304.90
Safe Block	30	48.40	1,452.00
Safe Dense	30	35.60	1,068.00
Safe Link	70	66.61	4,662.70
Salt, 80#	1478	34.74	51,345.72
Soda Ash	19	40.50	769.50
Sodium Nitrate	33	45.08	1,487.64
Soltex	195	130.60	25,467.00
XC Polymer	40	425.18	17,007.20
Eng. Services	69	400.00	27,600.00
Total			\$267,884.06

UNION PRODUCTS

<u>Product</u>	<u>Sacks</u>	<u>Cost</u>	<u>Total</u>
Bulk Barite	7163	19.45	139,320.35
Bentonite	1434	21.62	31,003.08
Bicarbonate	21	41.93	880.53
Caustic Soda	48	35.63	1,710.24
Drispac, r.	118	128.42	15,153.56
Drispac SL	44	177.80	7,823.20
KCl Potash	1722	12.12	20,870.64
Kelzan XCD	12	329.79	3,957.48
Nut Plug	10	15.48	154.80
Soda Ash	14	40.50	567.00
Technisperse	30	34.90	1,047.00
Total			\$222,487.88

TOTAL COST OF MATERIALS AND SERVICES

\$490,371.94

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# SUMMARY OF MUD MATERIAL USAGE - UNION Products (Canmar II)

PAGE 2b OF 2



COMPANY  
Union Oil Company

LOCATION  
BL 624, Lease Sale #87

FIELD  
Beaufort Sea

WELL  
Hammerhead #1

COUNTY  
North Slope

STATE  
Alaska

WAREHOUSE  
Prudhoe Bay

DATE	DEPTH	DAILY COST	CUMULATIVE COST	Bulk Bar 19.45	Bentonite 21.62	Technisperse 34.90	Drispac, r. 128.42	Drispac SL 177.80	Soda Ash 40.50	Kelzan XCD 329.79	Nut Plug 15.48	Bicarbonate 41.93	Caustic Soda 35.63	KCl 12.12						
1985																				
9/4				1553		4														
9/5													7	168						
9/6														63						
9/7														42						
9/8																				
9/9														150						
9/10					91									96						
9/11							14													
9/12																				
9/13																				
9/14							1				10			294						
9/15														377						
9/16																				
9/17																				
9/18																				
9/19																				
9/20																				
9/21																				
9/22																				
9/23										8				12						
'24																				
TOTAL PRODUCTS (UNION Products)				7163	1434	30	118	44	14	12	10	21	48	1722						

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# SUMMARY OF MUD MATERIAL USAGE - IMCO Products

PAGE 2a OF 2



COMPANY				LOCATION										FIELD							
Union Oil Company				BL 624, Lease Sale #87										Beaufort Sea							
WELL				COUNTY										STATE		WAREHOUSE					
Hammerhead #1				North Slope										Alaska		Prudhoe Bay					
CUMULATIVE COST				Bar 20.89	Gel 21.95	Aluminum Stearate 77.80	Calcium Chloride 52.20	Lube 106 129.75	Maxpac SL (Drispac SL) 177.80	Poly RX 88.95	Safe Block 48.40	Safe Dense 35.60	Safe Link 66.61	Salt, 80# 34.74	Soda Ash 40.50	Sodium Nitrate 45.08	Soltex 130.60	XC Polymer 425.18		Engineering Services 400.00	
7	395,616	71																		1	
6	412,961	67				1		1						416						1	
6	420,031	03												170						1	
6	423,649	79												78						1	
0	424,049	79																		1	
8	436,420	97						1			10	10	35	185				1		1	
0	442,473	87												70		2				1	
0	450,624	27																14		1	
9	463,097	36									10	10	35	244				1		1	
	463,097	36																			
8	476,252	34							6					225				1			
4	481,661	58									10	10									
	481,661	58																			
0	482,061	58																		1	
0	482,461	58																		1	
0	482,861	58																		1	
0	483,261	58																		1	
	483,261	58																			
4	486,933	62												90						1	
2	489,971	94																		1	
0	490,371	94																		1	
S (IMCO Products)				4345	280	2	0	5	90	262	30	30	70	1478	19	33	195	40		69	
rd: 5,450 70						3	70							45							

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## SUMMARY OF MUD MATERIAL USAGE - UNION Products (Canmar II)

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## COMPANY

Union Oil Company

## LOCATION

BL 624, Lease Sale #87

## FIELD

Beaufort Sea

## WELL

Hammerhead #1

## COUNTY

North Slope

## STATE

Alaska

## WAREHOUSE

Prudhoe Bay

DATE	DEPTH	DAILY COST	CUMULATIVE COST	Bulk Bar 19.45	Bentonite 21.62	Technisperse 34.90	Drispac, r. 128.42	Drispac, SL 177.80	Soda Ash 40.50	Kelzan XCD 329.79	Nut Plug 15.48	Bicarbonate 41.93	Caustic Soda 35.63	KCl 12.12						
1985																				
8/7				1631	602	10			10				2							
8/8				731	120	9			2											
8/9																				
8/10				1333			73		2											
8/11				1050	27		7							128						
8/12													4							
8/13				865	152		6													
8/14																				
8/15							3													
8/16					63		7					6	1							
8/17							4													
8/18														128						
8/19																				
8/20					136								2							
8/21																				
8/22					32		2													
8/23					91									264						
8/24							1					1	1							
8/25								23				7								
8/26					92			15												
8/27					78					4										
8/28					16			1					8							
8/29								5					14							
8/30																				
8/31					(66)**	7*						3*	9*							
9/1																				
9/2																				
9/3																				

IMCO FORM NO. 132 (Rev. 11/79)

\* Inventory Correction listed on Inventory Control dated 8/31/85.

\*\*Inventory Correction is less than listing on Inventory Control dated 8/31/85.

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## SUMMARY OF MUD MATERIAL USAGE - IMCO Products

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## COMPANY

Union Oil Company

## LOCATION

BL 624, Lease Sale #87

## FIELD

Beaufort Sea

## WELL

Hammerhead #1

## COUNTY

North Slope

## STATE

Alaska

## WAREHOUSE

Prudhoe Bay

DATE	DEPTH	DAILY COST	CUMULATIVE COST	Bar 20.89	Gel 21.95	Aluminum Stearate 77.80	Calcium Chloride 52.20	Lube 106 129.75	Maxpac SL (Driscap SL) 177.80	Poly RX 88.95	Safe Block 48.40	Safe Dense 35.60	Safe Link 66.61	Salt, 80# 34.74	Soda Ash 40.50	Sodium Nitrate 45.08	Soltex 130.60	XC Polymer 425.18	Engineering Services 400.00
1985																			
8/7	Wildcat	46,363.45	46,363.45																2
8/8	-	18,007.45	64,370.90																2
8/9	-	800.00	65,170.90																2
8/10	-	37,938.51	103,109.41		80														2
8/11	-	24,337.54	127,446.95												2				2
8/12	-	3,731.72	131,178.67		116										6				2
8/13	-	23,015.26	154,193.93							15									2
8/14	-	1,511.20	155,705.13						4										2
8/15	-	10,516.69	166,221.82	437											5				2
8/16	-	11,794.56	178,016.38	330						17					1				2
8/17	-	9,436.68	187,453.06	330	28					6					2				2
8/18	-	1,951.36	189,404.42																1
8/19	-	400.00	189,804.42																1
8/20	-	10,042.60	199,847.02	288						6					2				1
8/21	-	800.00	200,647.02																2
8/22	-	12,200.41	212,847.43	462						9									2
8/23	-	10,609.04	223,456.47	86					10	12									2
8/24	-	16,354.65	239,811.12	369					19	14					1			7	2
8/25	-	22,944.43	262,755.55	488	56					32						2		8	2
8/26	-	22,450.70	285,206.25	491						37						1		8	2
8/27	-	21,051.31	306,257.56	336					25	65									2
8/28	-	31,539.53	337,797.09	449		1		2		6					2	150			2
8/29	-	9,523.44	347,320.53	114						40					2	10			2
8/30	-	5,767.60	353,088.13					1		3						35			2
8/31	-	9,215.41	362,303.54	165					26*							24*			2
9/1	-	800.00	363,103.54																2
9/2	-	800.00	363,903.54																2
9/3	-	800.00	364,703.54																2

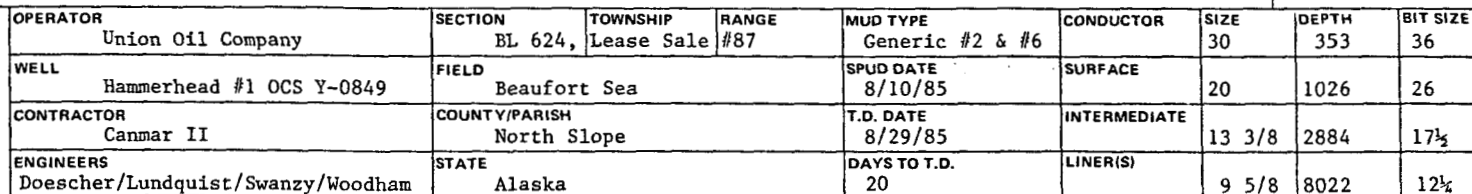
IMCO FORM NO. 132 (Rev. 11/79)

\* Inventory Correction listed on Inventory Control dated 8/31/85.

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IMCO FORM No. 131 (Rev. 1/79)

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## SUMMARY OF DRILLING FLUID OPERATIONS

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**IMCO Services**  
A Division of HALLIBURTON Company  
2400 West Loop South, P.O. Box 22805  
Houston, Texas 77027 A/C 713 871-4800

OPERATOR Union Oil Company	SECTION BL 624,	TOWNSHIP Lease Sale	RANGE #87	MUD TYPE Generic #2 & #6	CONDUCTOR	SIZE 30	DEPTH 353	BIT SIZE 36
WELL Hammerhead #1 OCS Y-0849	FIELD Beaufort Sea	SPUD DATE 8/10/85	SURFACE	20	1026	26		
CONTRACTOR Canmar II	COUNTY/PARISH North Slope	T.D. DATE 8/29/85	INTERMEDIATE	13 3/8	2884	17 1/2		
ENGINEERS Doescher/Lundquist/Swanzy/Woodham	STATE Alaska	DAYS TO T.D. 20	LINER(S)	9 5/8	8022	12 1/2		

DATE	DEPTH	MUD WT. PPG. PCF.	VIS. SEC/ QT.	MUD TEMP. F.L. SMPL Co/Fo	PV	YP	GELS 10 SEC 10 MIN	PH STRIP METER	API FLUID LOSS	HT-HP FLUID LOSS TEMP	CAKE	ALKALINITY			SALT NaCl Cl- PPM Gr./Gal	CALCIUM PPM ION	SAND % VOL.	OIL % VOL.	WATER % VOL.	CEC	Solids %
9/4 1985	8034	10.7	40		12	8	6/18	9.4	11.0	-	2	.2	1.4	.4	10500	800	1/2	0	86	17.5	25
Set EZSV @ 5620' w/wireline. Perf 9 5/8". Set another EZSV @ 5560'. Pump cmt thru perfs to just below liner lap. Reverse out DP. POH to just above																					
liner lap & braidenhead cmt down lap. Reverse out.																					
9/5	8034	10.4	52		15	16	9/24	11.7	12.8	-	2	.6	1.1	1.0	11000	560	1/2	0	-	-	-
POH after squeeze. TIH w/12 1/2" bit & drl 80' cmt. POH. TIH w/8 1/2" bit & 9 5/8" csg. Scraper to top of 1st EZSV @ 5560'. Circ BU. Test liner top. Displ &																					
clean out csg w/seawater. Displ seawater w/9.2 ppg NaCl + 3% KCl. (Generic mud #1).																					
9/6	8034	9.2					/								94000						
POH. Run CET log. TIH w/test string.																					
9/7	8034	9.2+					/								103000						
Raise KCl from 3% to 5% per Union. TIH w/test string. Perforate one set of perfs. Run in second gun but won't pass Otis tool. Circ 3 hrs. Still won't																					
go. POH from Otis up to look at tool. Work on tool. TIH.																					
9/8	8034	9.2					/								90000						
TIH. Perforate. Start DST.																					
9/9	8034	9.2					/								94000						
Build 150 bbls. Finish DST. Reverse circ. DP back to Noralco unit. Pump 50 bbl Safe Link pill. POH.																					
10/10	8034	9.1+					/								88000						
TIH. Squeeze off testing perfs. POH. Perforate above initial EZSV & then set another EZSV @ 5200'. TIH. Squeeze off perfs. POH. TIH.																					
9/11	8034	9.2+	40		11	16	5/14								103000						
TIH. Drl 30' green cmt & top EZSV @ 5275'. Circ 2 hrs. Tag & drl hard cmt to 5390'. POH. TIH w/test string. Perforate.																					
9/12	8034	9.3+	39		9	6	/								101000						
Test.																					
9/13	8034	9.3	41		10	8	2/7								102000						
DST.																					
9/14	8034	9.3	43				/								115000						
Mix new vol.																					

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# SUMMARY OF DRILLING FLUID OPERATIONS

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DATE		DEPTH	MUD WT. PPG	VIS. SEC/QT	MUD TEMP. F	PV	YP	GELS 10 SEC / 10 MIN	PH STRIP METER	API FLUID LOSS	HT - HP FLUID LOSS TEMP	CAKE	ALKALINITY PI MI PM			SALT NaCl CaCl2 PPM Gr./Gal	CALCIUM PPM ION	SAND % VOL.	OIL % VOL.	WATER % VOL.	CEC	Solids %
8/21		2357	10.5+	47	58	19	9	6/23	9.3	9.0	30	2	.2	.7	.7	7800	400	1	0	87	20	13
Wait on ice.																						
8/22		2357	10.4+	64	32	18	18	6/28	9.1	8.8	32	2	.2	.5	.3	8700	640	1	0	88	20	12
Working pipe to bot after waiting on ice.																						
8/23		2903	10.5	70	36	18	22	12/32	9.0	8.8	38	2	.1	.4	tr	11000	840	3/4	0	87	18.75	13
Drlg to TD w/no prblms other than high sand content. Running all solids equip. Reduced to 3/4%. Drispac tend to clog mud coolers.																						
8/24		2903	9.9	50	51	25	29	6/26	8.6	6.1	19	2	tr	.7	.1	10000	640	1/2	0	91	15	9
Cmtd 13 3/8". Got KCl pre flush back to surface & discharged same through dilution sys. 20:1 ratio. Mixed new vol to specs for drlg out.																						
8/25		3743	10.0	62	52	25	21	5/33	10.8	6.0	24.0	213	.1	.4	1.1	9900	640	1 1/2	0	89.5	15	10.5
Drlg cmt. Run leak off test. POH to change BHA. DA. POH for ice alert. RIH. DA.																						
8/26		5350	10.0	58	61	19	20	7/36	9.6	7.0	24	213	tr	.4	.4	9500	680	1/2	0	89.5	17.5	10.5
Some drag on connections. Increased additions of fresh Gel & continued additions of Poly RX & Drispac.																						
8/27		6300	10.3	70	69	23	24	12/41	9.0	5.8	21.6	213	tr	.4	.4	9500	640	1/2	0	88	20.0	12
No more tight spots on connections. Trip out & back in w/no prblms.																						
8/28		7200	10.6	66	65	22	23	14/44	8.6	6.0	19.9	213	.05	.5	.3	9000	800	1/2	0	86	22.5	14
POH for bit. Hole tight. Added Soltex & raised mud wt per Co. orders. DA. Short trip. DA. POH for bit.																						
8/29		8034	10.7	54	75	19	19	5/31	9.2	6.5	19.6	213	.1	.7	.5	9000	640	1/2	0	85	22.5	15
Back on bot after trip (no drag POH). DA w/no prblms. POH to log.																						
8/30		8034	10.7	78	70	24	28	18/44	8.5	6.4	18.1	213	.1	1.0	.4	9900	720	1/2	0	85	25.0	15
Logs did not go to bot. Log from stopping pt. RIH & circ & cond mud. POH to log.																						
8/31		8034	10.7	55	72	19	15	5/24	8.4	7.0	21.6	213	tr	1.0	.3	9500	600	1/2	0	85	25.0	15
Logging. No prblms.																						
9/1		8034	10.6+	66	72	20	21	8/36	8.2	7.2	20.4	213	.05	.9	.4	9500	760	1/2	0	85	22.5	15
Log w/no prblms. TIH for clean out run. Circ +2 hr. Added fresh prehydrated Gel & water to lower hi vis (+150)@ BU. POH to log.																						
9/2		8034	10.6+	66	65	19	23	9/36	8.1	8.2	16.4	213	tr	1.1	.3	10000	800	1/2	0	85	22.5	15
Finish log. TIH. Circ & Cond mud. Added prehydrated Gel & water. POH to run liner. Hole not taking mud right. TIH. Circ & cond mud.																						
9/3		8039	10.7	62	65	18	19	6/30	8.0	8.4	16.6	213	tr	1.0	.3	10000	760	1/2	0	85	22.5	15
POH. Run liner to 12' off bot. Stuck pipe. Circ mud around. Start pumping cmt. Cmt unit broke. Abort cmt job. Circ out cmt.																						

## SUMMARY OF DRILLING FLUID OPERATIONS

PAGE 1 OF 4



**IMCO Services**  
A Division of HALLIBURTON Company  
2400 West Loop South, P.O. Box 22805  
Houston, Texas 77027 A/C 713 671-4800

<b>OPERATOR</b> Union Oil Company		<b>SECTION</b> BL 624,		<b>TOWNSHIP</b> Lease Sale		<b>RANGE</b> #87		<b>MUD TYPE</b> Generic #2 & #6		<b>CONDUCTOR</b>		<b>SIZE</b> 30		<b>DEPTH</b> 353		<b>BIT SIZE</b> 36	
<b>WELL</b> Hammerhead #1 OCS Y-0849		<b>FIELD</b> Beaufort Sea		<b>SPUD DATE</b> 8/10/85		<b>SURFACE</b>						20		1026		26	
<b>CONTRACTOR</b> Canmar II		<b>COUNTY/PARISH</b> North Slope		<b>T.D. DATE</b> 8/29/85		<b>INTERMEDIATE</b>						13 3/8		2884		17 1/2	
<b>ENGINEERS</b> Doescher/Lundquist/Swanzy/Woodham		<b>STATE</b> Alaska		<b>DAYS TO T.D.</b> 20		<b>LINER(S)</b>						9 5/8		8022		12 1/2	

DATE	DEPTH	MUD WT. PPG. PCF.	VIS. SEC/QT.	MUD TEMP. F.L. SMPL Co/Fo	PV	YP	GELS 10 SEC 10 MIN	PH STRIP METER	API FLUID LOSS	HT - HP FLUID LOSS TEMP	CAKE	ALKALINITY			SALT NaCl Cl- PPM Gr./Gal	CALCIUM PPM ION	SAND % VOL.	OIL % VOL.	WATER % VOL.	CEC	Solids %
												Pf	Mf	Pm							
8/7	-0-	Building Spud Mud					/														
8/8	-0-	10.3	300	38	38	126	81/97	8.3	9.4	-	2	.1	.3	.3	5500	260	1 1/2	0	90.5	25	9.5
8/9	-0-	10.2	300	38	40	126	75/104	8.5	9.2	-	2	.1	.3	.3	5500	260	1	0	91	25	9
Reduced mud temp to 31°F w/heat exchanger.																					
8/10	1059	10.2	121	48	24	63	21/34	8.2	9.0	-	2	.1	.3	.1	9000	1000	1/2	0	88	17.5	12
Under reaming 17 1/2" hole to 26".																					
8/11	1063	10.6	64	44	22	34	8/34	8.2	9.4	-	2	.1	.3	tr	11000	1080	1/2	0	87	15	13
8/12	1063	9.2	64	45	12	24	12/-	-	9.1	-	2	.5	1.4	.6	8000	960	1/2	0	91	22.5	9
Mixing new vol. Pull riser to run csg.																					
8/13	1063	10.2	61	28	16	26	8/26	9.1	9.1	-	2	.2	.6	.4	9000	680	1/2	0	90	20	10
Testing stack.																					
8/14	1063	10.2	48	39	16	12	4/17	9.1	8.0	-	2	.2	.7	.3	9000	640	1/2	0	90	20	10
Wait on repair parts for BOP.																					
8/15	1073	10.1	55	40	13	16	18/24	12.1	15.4	-	3	.2	.4	2.0	10500	400	3/4	0	90	20	10
Tag cmt @ 937'. Test csg. Drl float collar & cmt to 1000'. Test csg. Drl to 1073' & test formation.																					
3/16	1970	10.6	76	37	21	28	11/41	9.4	9.1	24.5	2	.1	.3	.4	8000	240	1	0	87	20	13
Raise mud wt per Co man to 10.6. Running water to maintain vol & prehydrated Gel for vis.																					
9/17	2357	10.5+	75	40	23	22	15/45	9.0	8.5	25.0	2	.05	.3	.5	9000	420	1	0	87	20	13
DA. Trip for bit #5. Running water & adding Barite to maintain vol. 0830. Ice Alert. Stop drlg & secure well.																					
8/18	2357	10.4+	44	52	14	9	4/20	9.0	10.0	38	2	.05	.3	.5	9000	400	1 1/2	0	87	20	13
Wait on ice.																					
8/19	2357	10.2+	40	94	15	5	2/12	9.0	11.0	44	2	.05	.3	.5	9000	400	1 1/2	0	87	20	13
Wait on ice.																					
8/20	2357	10.5+	49	46	21	13	8/25	9.7	9.1	30	2	.2	.6	.8	8000	400	1	0	87	20	12
Wait on ice. Build vol.																					

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A Halliburton Company  
5950 N. Course Dr., P.O. Box 721110  
Houston, TX 77272 A/C 713 561-1300

## WELL DATA SUMMARY

COMPANY <b>Union Oil Company</b>		CONTRACTOR <b>OCS District Office</b> <b>Canmar Explorer II</b>	
ADDRESS <b>P.O. Box 6247; Anchorage, AK 99502</b>		ADDRESS <b>DEC 17 1985</b>	
REPORT FOR <b>J. Callender</b>		REPORT FOR	
WELL NAME & NO. <b>Hammerhead #1, OCS Y-0849</b>		FIELD <b>Minerals Management Service</b> <b>Beaufort Anchorage, Alaska</b>	
STATE <b>Alaska</b>	COUNTY <b>North Slope</b>	DESCRIPTION OF LOCATION <b>BL 624, Lease Sale #87</b>	
IMCO WAREHOUSE			

## WELL DATA

DATE SPUDDED	CSG. SIZE	O.D.	FROM	TO	HOLE SIZE	FROM	TO
8/7/85							
TOTAL DEPTH	CSG. SIZE	O.D.	FROM	TO	HOLE SIZE	FROM	TO
Wildcat							
DATE TO REACHED	CSG. SIZE	O.D.	FROM	TO	HOLE SIZE	FROM	TO
TOTAL DAYS	CSG. SIZE	O.D.	FROM	TO	HOLE SIZE	FROM	TO

BITS: NUMBER AND SIZE

MUD UP DEPTHS

TYPE MUD

Generic Muds #2 &amp; #6

## COMMENTS

Tight Hole

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Doescher/Lundquist/Swanzy/Woodham/t1  
IMCO REPRESENTATIVE

HAMMERHEAD TOOLS

DEC 17 1985

Line and Management Service  
Anchorage, Alaska

<u>Vendor</u>	<u>Description</u>	<u>Used</u>
Smith Tool	26" BJ4658 - ReRun Bit	Run 1
Smith Tool	17 1/2" DSJ EW1413	Run 2
Dome-Hammerhead	-2 Sets Extra Cutters 26" Underreamer	UR Run-1
Smith Tool	17 1/2" DSJ EW1427	Run 3
Smith Tool	17 1/2" DSJ EW1376	Run 4
Smith Tool	17 1/2" DSJ EW1422	Run 5
Hughes Tool	12 1/4" X3A HP359	Run 6
Hughes Tool	12 1/4" J1 KX936	Run 7
Smith Tool	12 1/4" SDS EW3703	Run 8
Smith Tool	12 1/4" SDS EW3661	Run 9
Hughes Tool	12 1/4" R1 KC936	Run 10
Hughes Tool	12 1/4" MX3A HR782	Run 11
Hughes Tool	12 1/4" R2 HR072	Run 12
Hughes Tool	8 1/2" J2 JP572	Run 13

RECEIVED  
Anchorage, Alaska

DEC 18 1985

REGIONAL SUPERVISOR  
FIELD OPERATION  
MINERALS MANAGEMENT SERVICE

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*Petroleum Reservoir Engineering*  
ANAHEIM, CALIFORNIA

Page 11 of 11

File RFL-CA 85109

Well "California Oil"  
"HAMMERHEAD OIL"

SEPARATOR TESTS OF      Reservoir Fluid      SAMPLE

<u>Separator Pressure PSIG</u>	<u>Temp. °F</u>	<u>Gas/Oil Ratio (1)</u>	<u>Gas/Oil Ratio (2)</u>	<u>Tank Oil Gravity °API @ 60°F</u>	<u>Formation Volume Factor(3)</u>	<u>Separator Volume Factor(4)</u>	<u>Gas Gravity</u>
0	67	254	255	19.9	1.098	1.003	0.576

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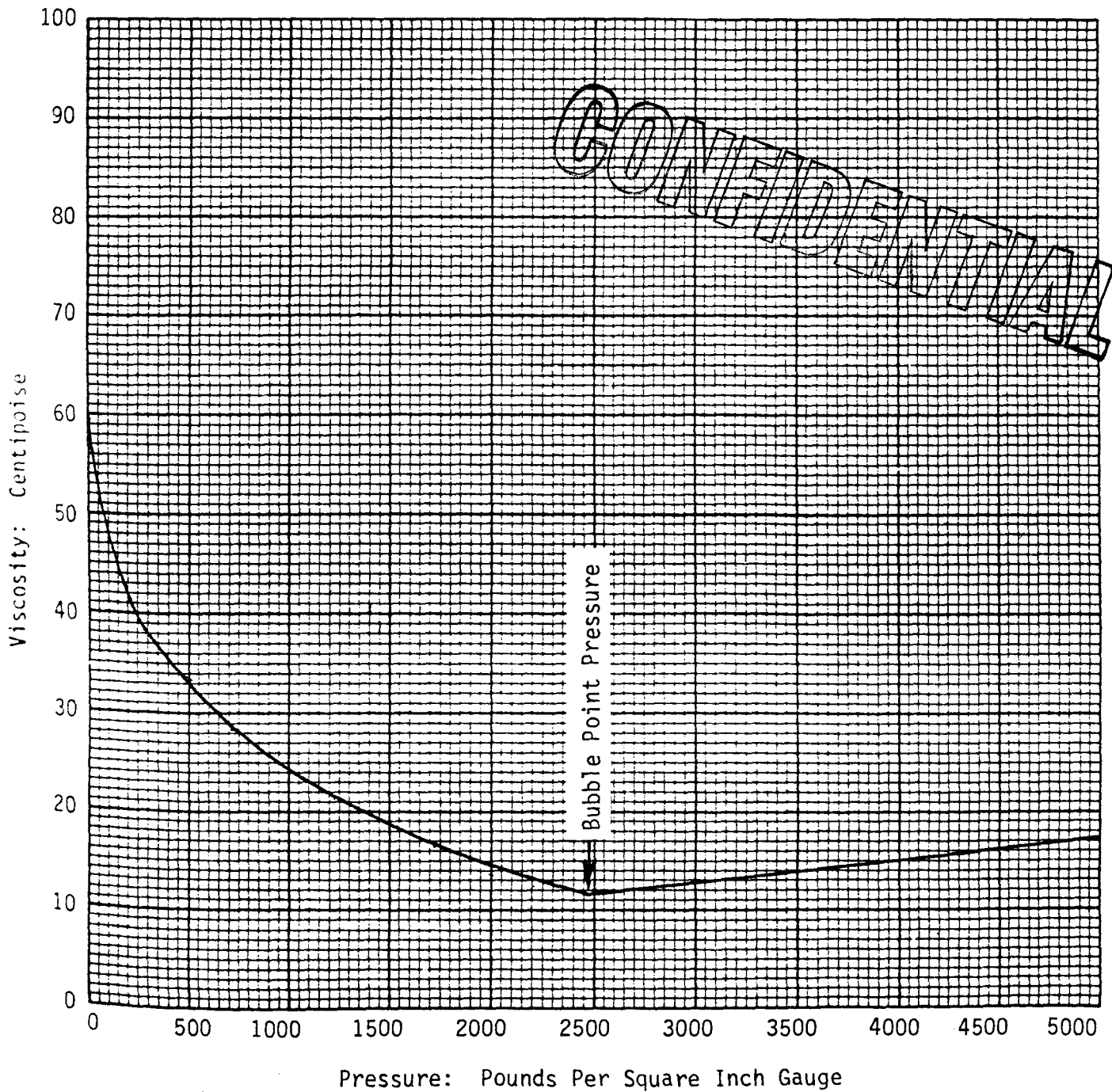
- (1) Gas/Oil Ratio in cubic feet of gas at 14.73 psia and 60°F. per barrel of oil at indicated pressure and temperature.
- (2) Gas/Oil Ratio in cubic feet of gas at 14.73 psia and 60°F. per barrel of stock tank oil at 60°F.
- (3) Formation Volume Factor is barrels of saturated oil at 2391 psig and 100°F. per barrel of stock tank oil at 60°F.
- (4) Separator Volume Factor is barrels of oil at indicated pressure and temperature per barrel of stock tank oil at 60°F.

CORE LABORATORIES, INC.  
Petroleum Reservoir Engineering  
DALLAS, TEXAS

Page 10 of 11  
File RFL-CA 85109

Company Unocal Science & Tech Division Formation \_\_\_\_\_  
Well "California Oil" County \_\_\_\_\_  
Field "HAMMERHEAD OIL" State \_\_\_\_\_

Viscosity of Reservoir Fluid at 120°F.





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ANAHEIM, CALIFORNIA

Page 9 of 11

File RFL-CA 85109

Well "California Oil"  
"HAMMERHEAD OIL"

VISCOSITY OF RESERVOIR FLUID AT 120 °F.

<u>Pressure</u> <u>PSIG</u>	<u>Viscosity</u> <u>Centipoise</u>
5000	17.3
4000	15.0
3500	13.9
3000	12.8
2600	11.9
2471*	11.6
2250	12.9
2000	14.5
1750	16.4
1500	18.7
1250	21.4
1000	24.1
750	28.3
500	33.5
250	40.8
0	59.5

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\*Bubble point pressure calculated from data at 100°F.:  
four pounds per degree rise in temperature

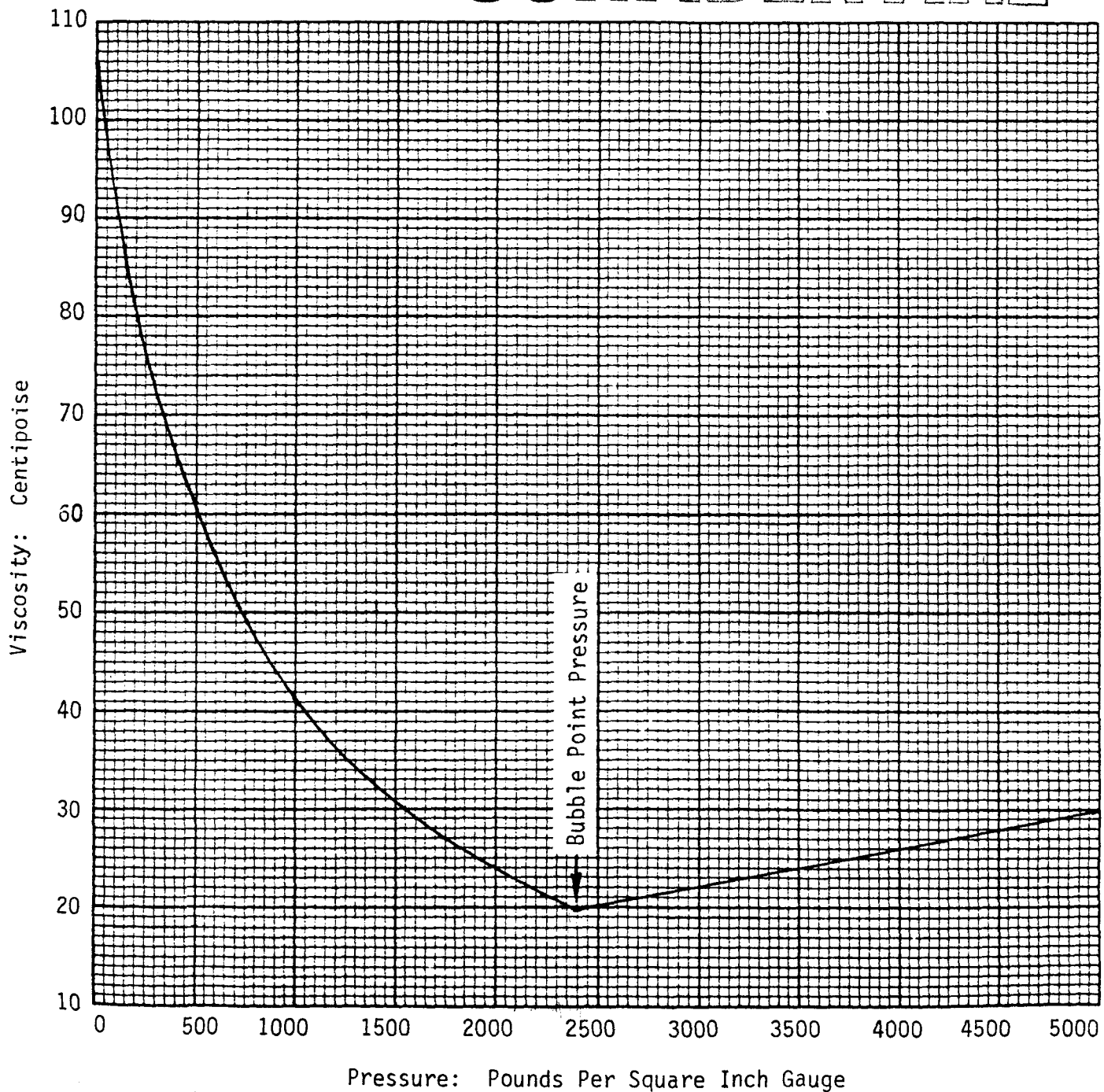
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Petroleum Reservoir Engineering  
DALLAS, TEXAS

Page 8 of 11  
File RFL-CA 85109

Company Unocal Science & Tech Division Formation \_\_\_\_\_  
Well "California Oil" County \_\_\_\_\_  
Field "HAMMERHEAD OIL" State \_\_\_\_\_

Viscosity of Reservoir Fluid at 100°F.

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VISCOSITY OF RESERVOIR FLUID AT 100°F.

Page 7 of 11  
File RFL-CA 85109  
Well "California Oil"  
"HAMMERHEAD OIL"

<u>Pressure</u> <u>PSIG</u>	<u>Viscosity</u> <u>Centipoise</u>
5000	29.9
4000	26.0
3500	24.1
3000	22.1
2500	20.2
2391	19.7
2250	21.2
2000	24.1
1750	27.0
1500	30.6
1250	35.6
1000	41.8
750	50.0
500	61.5
250	78.3
0	106.0

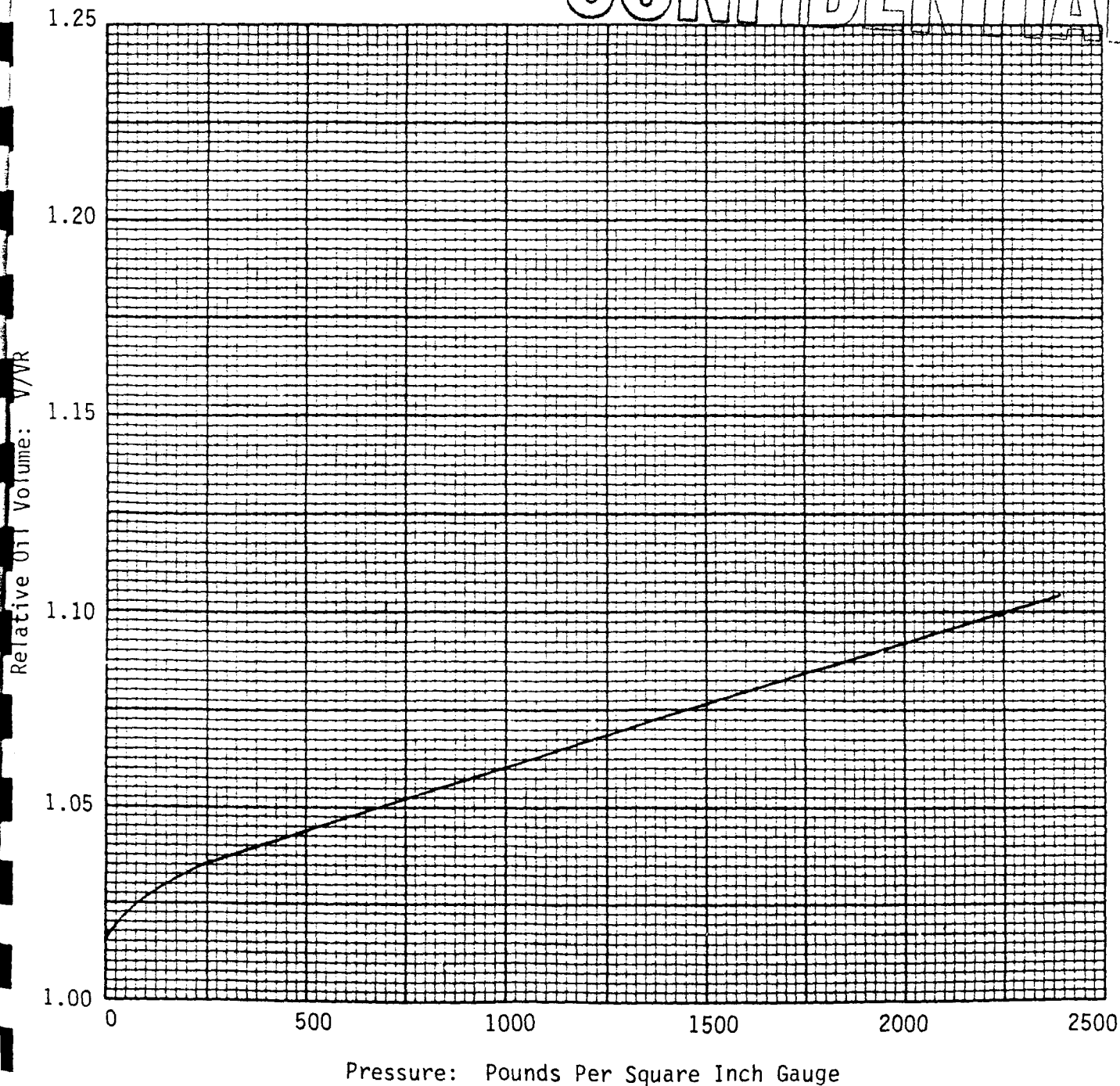
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DALLAS, TEXAS

Page 6 of 11  
File RFL-CA 85109

Company Unocal Science & Tech Division Formation \_\_\_\_\_  
Well "California Oil" "HAMMERHEAD OIL" County \_\_\_\_\_  
Field \_\_\_\_\_ State \_\_\_\_\_

Differential Vaporization of Reservoir Fluid at 100°F

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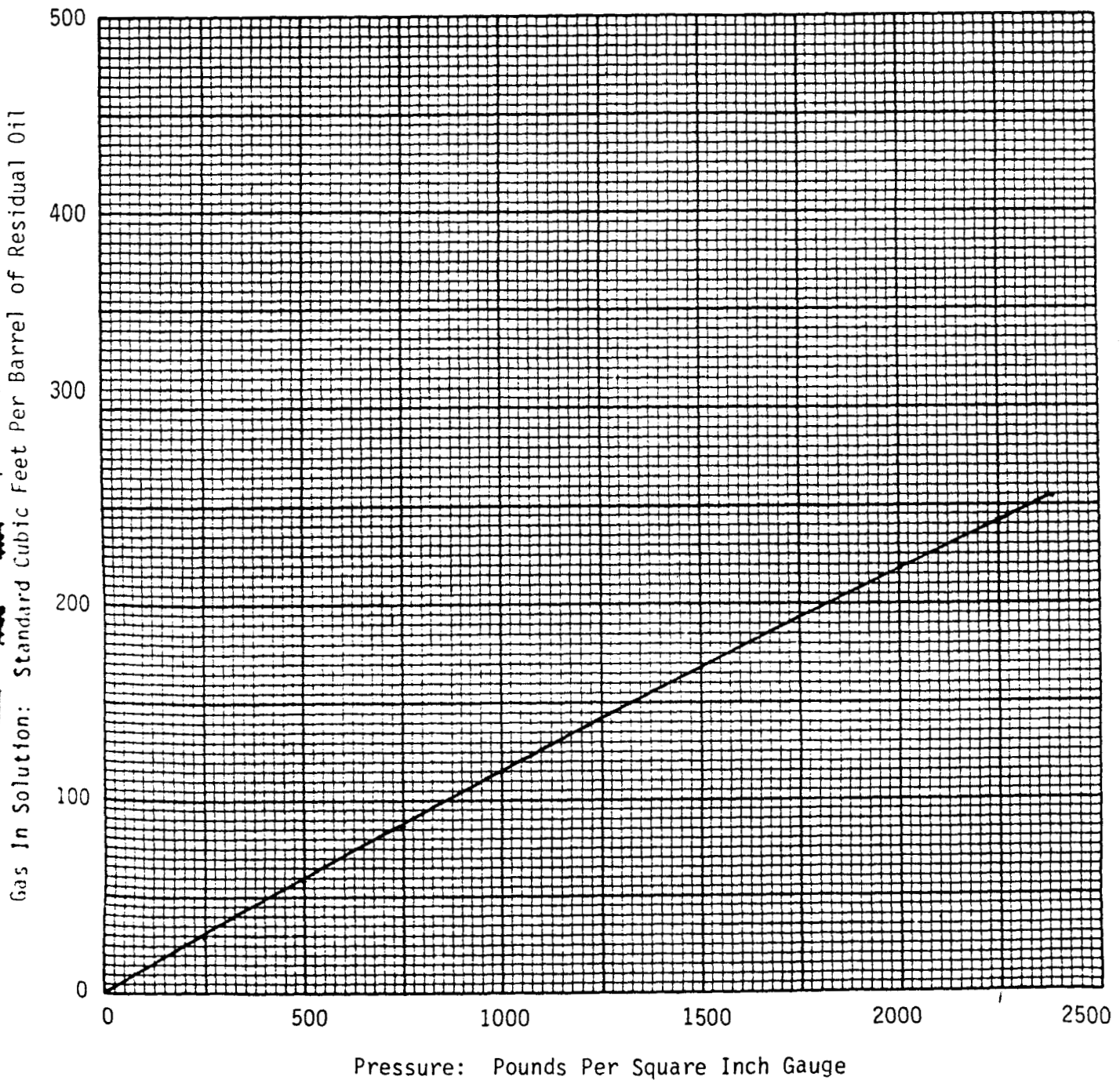
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Page 5 of 11  
File RFL-CA 85109

Company Unocal Science & Tech Division Formation \_\_\_\_\_  
Well "California Oil" "HAMMERHEAD OIL" County \_\_\_\_\_  
Field \_\_\_\_\_ State \_\_\_\_\_

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Differential Vaporization of Reservoir Fluid at 100°F.



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File RFL-CA 85109

Well "California Oil"  
"HAMMERHEAD OIL"

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DIFFERENTIAL VAPORIZATION AT 100 °F.

<u>Pressure</u> <u>PSIG</u>	<u>Solution</u> <u>Gas/Oil</u> <u>Ratio(1)</u>	<u>Relative</u> <u>Oil</u> <u>Volume(2)</u>
2391	255	1.104
2250	242	1.099
2000	217	1.091
1750	193	1.084
1500	167	1.076
1250	141	1.068
1000	114	1.060
750	86	1.052
500	58	1.043
250	29	1.035
0	0	1.016
		@ 60°F. = 1.000

Gravity of Residual Oil = 19.7°API at 60°F.

- (1) Cubic feet of gas at 14.73 psia and 60°F. per barrel of residual oil at 60°F.
- (2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60°F.

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Page 3 of 11

File RFL-CA 85109

Well "California Oil"  
"HAMMERHEAD OIL"

PRESSURE-VOLUME RELATIONS AT 100 °F.

Pressure PSIG	Relative Volume(1)	Y Function(2)
5000	0.9881	
4500	0.9902	
4000	0.9925	
3500	0.9949	
3000	0.9973	
2800	0.9982	
2700	0.9986	
2600	0.9990	
2500	0.9995	
2400	0.9999	
2391	1.0000	
2363	1.0015	
2318	1.0041	
2224	1.0100	
2087	1.0204	7.093
1879	1.0413	6.548
1592	1.0836	5.951
1322	1.1475	5.424
1092	1.2332	5.031
904	1.3407	4.751
714	1.5131	4.479
558	1.7505	4.262
400	2.1823	4.058
280	2.8311	3.908
184	3.9081	3.812

(1) Relative Volume:  $V/V_{sat}$  is barrels at indicated pressure per barrel at saturation pressure.

(2) Y Function =  $\frac{(P_{sat}-P)}{(P_{abs})(V/V_{sat}-1)}$

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ANAHUIM, CALIFORNIA

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File RFL-CA 85109

Well "California Oil"  
"HAMMERHEAD OIL"

VOLUMETRIC DATA OF RESERVOIR FLUID      SAMPLE

1. Saturation pressure (bubble-point pressure)      2391 PSIG @ 100 °F.
2. Specific volume at saturation pressure: ft<sup>3</sup>/lb      0.01824 @ 100 °F.
3. Thermal expansion of saturated oil @ 5000 PSI =  $\frac{V @ 100 \text{ }^{\circ}\text{F}}{V @ 67 \text{ }^{\circ}\text{F}} = \underline{1.01169}$
4. Compressibility of saturated oil @ reservoir temperature: Vol/Vol/PSI:

From 5000 PSIG to 4000 PSIG =  $4.43 \times 10^{-6}$

From 4000 PSIG to 3500 PSIG =  $4.57 \times 10^{-6}$

From 3500 PSIG to 3000 PSIG =  $4.67 \times 10^{-6}$

From 3000 PSIG to 2700 PSIG =  $4.75 \times 10^{-6}$

From 2700 PSIG to 2391 PSIG =  $4.80 \times 10^{-6}$



**CORE LABORATORIES, INC.**

*Petroleum Reservoir Engineering*

ANAHEIM, CALIFORNIA

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Page 1 of 11

File RFL-CA85109

Well "~~California Oil~~"  
"HAMMERHEAD OIL"

HYDROCARBON ANALYSIS OF RESERVOIR FLUID SAMPLE

Component -----	Mol Percent -----	Weight Percent -----	Density Gm/cc @60°F -----	oAPI @60°F -----	Molecular Weight -----
Hydrogen Sulfide	0.00	0.00			
Carbon Dioxide	0.00	0.00			
Nitrogen	0.00	0.00			
Methane	43.15	3.21			
Ethane	0.03	trace			
Propane	0.02	trace			
iso-Butane	0.00	0.00			
n-Butane	0.00	0.00			
iso-Pentane	0.00	0.00			
n-Pentane	0.00	0.00			
Hexanes	trace	trace	0.685	74.9	84
Heptanes	trace	trace	0.772	64.3	96
Octanes	0.01	trace	0.745	58.3	107
Nonanes	0.03	0.02	0.764	53.5	121
Decanes	0.32	0.20	0.778	50.2	134
Undecanes plus	<u>56.44</u>	<u>96.57</u>	0.935	19.7	369
	100.00	100.00			
Heptanes plus	56.80	96.79	0.934	19.9	367

Page two

Unocal Corporation

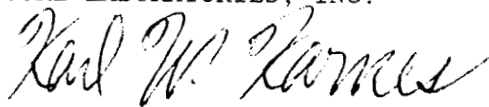
"California Oil" "HAMMERHEAD OIL"

The reservoir fluid was subjected to a single-stage separator test at atmospheric pressure and ambient temperature to determine gas-oil ratio, stock tank oil gravity and formation volume factor. These data are presented on page eleven.

Thank you for the opportunity to perform this study for Unocal Corporation. If any questions arise or if we may be of further service in any way, please do not hesitate to contact us.

Very truly yours,

CORE LABORATORIES, INC.



Karl W. Karnes  
Laboratory Supervisor  
Reservoir Fluid Analysis

KWK:kk

7cc: Addressee

CORE LABORATORIES, INC.



November 18, 1985

Unocal Corporation  
Unocal Science & Technology Division  
P. O. Box 76  
Brea, CA 92621

**CONFIDENTIAL**

Attention: Mr. Edward Huang

Subject: Reservoir Fluid Study  
"California Oil" "HAMMERHEAD OIL"  
RFL-CA 85109

Gentlemen:

On October 31, 1985, a sample of stock tank oil from the subject well was brought to our laboratory in Anaheim, California for use in a reservoir fluid study. The results of this study are presented on the following pages.

The stock tank oil sample was charged to a PVT cell and heated to the reported reservoir temperature of 100°F. Pure methane gas was then injected in the amount to yield a saturation pressure of 2400 psig at 100°F. as requested.

The hydrocarbon composition of the recombined reservoir fluid was determined through decanes with an undecanes plus residual fraction by a combination of low temperature fractional distillation and high temperature distillation. These data are presented on page one in terms of both mol percent and weight percent.

A portion of the reservoir fluid was charged to a visual cell and thermally expanded to the reported reservoir temperature of 100°F. During the constant composition expansion, the fluid exhibited a bubble point pressure of 2391 psig. The pressure-volume relations of the fluid are presented on pages two and three.

During the differential vaporization at 100°F., the fluid evolved a total of 255 standard cubic feet of gas per barrel of residual oil at 60°F. The corresponding relative oil volume was 1.104 barrels of saturated fluid per barrel of residual oil. These data are summarized on page four.

Viscosity data were performed over a wide range of pressures at 100°F. There was a variation in the viscosity from 19.7 centipoises at bubble point pressure to a maximum of 106.0 centipoises at atmospheric pressure. Viscosity measurements were also performed on the reservoir fluid at 120°F. These data ranged from 11.6 centipoises at bubble point pressure to 59.5 centipoises at atmospheric pressure. The viscosity data at 100°F. can be found on page seven in tabular form and in graphic form on page eight. Viscosity data at 120°F. is presented on pages nine and ten.



UNION OIL COMPANY  
Hammerhead #1

Breakdown of Delivery and Returns Goods Tickets

<u>Product</u>	<u>Quantity</u>	<u>Cost</u>	<u>Amount</u>
<u>Ticket No. 432052 - 10/11/85</u>			
Lube 106	20	129.75	<u>2,595.00</u>

Total Cost of Ticket No. 432052 \$2,595.00

GRAND TOTAL \$245,734.76

COST SUMMARY

<u>Product</u>	<u>Sacks</u>	<u>Cost</u>	<u>Total</u>
Aluminum Stearate	5	77.80	389.00
Bar	4,345	20.89	90,767.05
Calcium Chloride	70	52.20	3,654.00
Defoam L	0	221.49	0.00
Gel	280	21.95	6,146.00
Gelex	0	20.15	0.00
KCl	-0	31.77	-0.00
Lube 106	5	129.75	648.75
Maxpac SL	90	177.80	16,002.00
Poly RX	262	88.95	23,304.90
Safe Block	30	48.40	1,452.00
Safe Dense	30	35.60	1,068.00
Safe Link	70	66.61	4,662.70
Salt, 80#	1,523	34.74	52,909.02
Soda Ash	19	40.50	769.50
Sodium Nitrate	33	45.08	1,487.64
Soltex	195	130.60	25,467.00
Sulf-X ES	0	140.10	0.00
XC Polymer	40	425.18	17,007.20
Total			<u>\$245,734.76</u>

Eng. Services 69 400.00 27,600.00

Sub Total 273,334.76

Air Travel 7 257.00 1,799.00

Material Handling Charges 419.73

GRAND TOTAL \$275,553.49

**IMCO Services**

A Halliburton Company

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