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**CARR - CARROLL - HALLOCK & ASSOCIATES**

415 PETROLEUM CLUB DENVER, COLORADO 80202 (303) 893-6895  
BOX 818 MCCOOK, NEBRASKA 69001 (308) 345-2480

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&  
Geologists

**GEOLOGICAL WELL REPORT****ROMAC EXPLORATION, ET AL****No. 20-1 Houston****C SW SW Section 20****Township 9 North - Range 52 West****Logan County, Colorado**

Prepared by:

Michael C. Hallock

DVR	
TRP	
H-HM	
JAM	✓
JJD	✓
RLS	
CGM	

7/23/80



STATISTICAL DATA

Operator: Romac Exploration Co., et al

Well Name: No. 20-1 Houston

Location: C SW SW Section  
Township 9 North, Range 52 West  
Logan County, Colorado

Elevation: 3980' GR; 3990' KB

Spud Date: June 14, 1980

Ceased Drilling: July 5, 1980

Status: Waiting on casing

Casing: 8-5/8" at 186' with 180 sacks

Log Program: Intermediate (J Sand) logs at 4760'  
Dresser-Atlas Compensated Densilog,  
Induction Electrolog;  
Final Logs at 7106'  
Dresser-Atlas Dual Laterolog, Compensated  
Neutron Densilog, Borehole Compensated  
Acoustilog

Drill Stem Tests: Six - DST #1 4702'-4708'  
DST #2 4662'-4668'  
DST #3 4634'-4642'  
DST #4 6200'-6252'  
DST #5 6307'-6383'  
DST #6 6526'-6545'

Total Depth: 7100' Driller; 7105' Logger

Contractor: Exeter Drilling, Rig #4

Sample Disposition: American Stratigraphic Co.  
6280 E. 39th Ave.  
Denver, Colorado

Wellsite Geologist: Michael C. Hallock



## CHRONOLOGICAL HISTORY

6-14-80 Moved in rotary tools, set casing, spudded.

6-15-80 Tripping for bit, PTD 3476.

6-16-80 4492' drilling.

6-17-80 4671' drilling.

6-18-80 PTD 4750', testing DST #1. Log tops:

Niobrara	3689'	+ 301
Ft. Hayes	4010'	- 20
Carlile	4065'	- 75
Greenhorn	4283'	- 293
Bentonite	4421'	- 431
"D" Sand	4520'	- 530
"J" Sand	4625'	- 635

6-19-80 PTD 4750', testing DST #3. Drill stem tests:

DST #1 (4702'-4708') "J" Sand. 15-30/90-60.

Open with weak blow, to 6". SI. Reopen with weak blow to 6". SI. Recovered 430' gas in pipe, 80' oil and slightly gas cut muddy water (80% muddy water, 12% oil, 8% solids). IHP 2448; IFP 52-26; ISIP 971; FFP 39-52; FSIP 1010; FHP 2343; BHT 152°F; Rw samples = 20 at 80°F = 2400 PPM.

DST #2 (4662'-4668') "J" Sand. 15-30/60-90.

Open with good blow, to bottom of bucket in 10 minutes. SI. Reopen with good blow, to bottom of bucket in 20 minutes. SI. Recovered 710' water with scum of oil. IHP 2468; IFP 93-159; ISIP 1058; FFP 198-331; FSIP 1045; FHP 2442; BHT 150°F.

DST #3 (4634'-4642') "J" Sand. 10-30/80-90. 1 1/4" choke.

Open with very strong blow, to 25 pounds (1421 MCF/day), gas to surface in 3 minutes. SI. Reopen with very strong blow, peak at 41 pounds (2029 MCF/day), finish at 38 pounds (1911 MCF/day), mud spray to surface in 50 minutes. Recovered 10' condensate, 30' condensate and gas cut mud, 651' gas cut H<sub>2</sub>O. IHP 2377; IFP 754-767; ISIP 979; FFP 775-807; FSIP 939; FHP 2363; BHT 152°F.

6-20-80 4974' drilling. "M" Sand. 4966' (-976) No show. Mud properties at 4965', mud wt. 9.4; vis. 37; GS 2/5; pH 8.0; WL 10.4; mud cake 2/32; Cl 900; Ca 160; Sd 1/4%; Sld 8%.



## CHRONOLOGICAL HISTORY

- 6-21-80 5258' drilling. Morrison 5184' (-1194). Mud properties at 5252', mud wt. 10.1; vis. 44; GS 5/22; pH 7.0; WL 9.8; mud cake 2/32; Cl 180,000; Ca 320; Sd Trace; Sld 2.0.
- 6-22-80 5431' drilling. Morrison, argillaceous; slightly limestone; dolomite, occasional thin siltstone; calcite sale; mud properties at 5416', mud wt. 10.6; vis. 40, GS 4/12; pH 7.0; WL 7.6; mud cake 2/32; Cl 197,000; Ca 620; Sd 1/4; Sld 17.
- 6-23-80 5461'. Reaming to botton. Pulled old bit with jets clogged. Very tight hole, many bridges. Pulled new button bit. Re-entered hole with conventional bit for reaming. Minor lost circulation problem.
- 6-24-80 5659' drilling. Red siltstone shales and anhydrite. Blaine 5540'. Cedar Hills 5555'. No lost circulation problem. Strap 5471.67. Board 5465.11 + 6.56 (deep). Mud properties at 5642', mud wt. 10.6; vis. 42, GS 3/10; pH 7; WL 7.5; mud cake 2/32, Cl 196,000; Ca 900; Sd 1/4; Sld 17 (4 1/2%), Salt 315,000 pym.
- 6-25-80 5907' drilling. Drilling in red shale and siltstone. Mud properties at 5895', mud wt. 10.6; vis. 44; GS 6/12; pH 7; WL 7.7; mud cake 2/32; Cl 196,000; Ca 1200, Sd 1/4; Sld 15.
- 6-26-80 6125' drilling. Drilling in brown dolomites. Tops: Big Blue (Wolfcamp) 5895' (-1905). Mud properties at 6114', mud wt. 10.4; vis. 52; GS 11/31; pH 7.0; WL 8.7; mud cake 2/32; Cl 198,000, Ca 1480; Sld 15, Sd 1/4.
- 6-27-80 6252'. Going in hole with DST #4. Fair show, appears tight in brown dolomite at 6232'. Mud properties at 6252', mud wt. 10.5; vis. 57; GS 11/31; pH 7.0; WL 8.8; mud cake 2/32; Cl 198,000; Ca 1500; Sd 1/4; Sld 15.
- 6-28-80 6329' drilling. DST #4 Minnekahta 6200'-6252'. 30-60/30-90. Open with weak blow, died in 25 minutes. Sl. No blow on FFP. Sl. Recovered 88' mud with occasional oil specks. IHP 3421; IFP 52-65; ISIP 2010; FFP 65-78; FSIP 2010; FHP 3382; BHT 171°F. Pipe strap at 6269.99; board 6281.26 - 11.27 uphole correction made. Mud properties at 6311', mud wt. 10.5; vis. 50; GS 10/28; pH 7; WL 8.0; mud cake 2/32; Cl 197,000; Ca 1920; Sd 1/4; Sld 15.7.
- 6-29-80 6406' drilling. DST #5 (6207'-6383') 30-60/60-120. Blow to botton of bucket in 2 minutes. Sl. To bottom in 1 1/2 minutes. Recovered 5301' freshwater. IHP 3504, IFP 1164-1802; ISIP 2386; FFP 1815-2360; FSIP 2386; FHP 3460; BHT 174°F. Mud properties at 6370', mud wt 10.6; vis. 50; GS 8/24; pH 7; WL 8.8; mud cake 2/32; Cl 197,000; Sd 1/4; Sld 16.5.
- 6-30-80 6446'. Coming out of hole with Core #1. Mud properties at 6646', mud wt. 10.3; vis. 50; GS 8/25; pH 7; WL 8; mud cake 2/32; Cl 197,000; Ca 1600; Sd 1/4; Sld 14.



### CHRONOLOGICAL HISTORY

- 7-1-80 6512' coring. Mud properties at 6508', mud wt. 10.1; vis. 70; GS 10/31; pH 7, WL 7.6; mud cake 2/32; Cl 198,000, Ca 1700; Sld 13; Sd 1/4.
- 7-2-80 6545'. On bank with DST #6. Good live show with vuggy porosity. Fracture and bleeding oil at 6525'-6530'. DST #6 (6526'-6545') 30-60/120-120. Fair blow, grew to bottom of bucket. Recovered 1320' fresh water. IHP 3445; IFP 51-217; ISIP 2630; FFP 281-574; FSIP 2360; FHP 3356; BHT 175° F. Mud properties at 6545', mud wt. 10.3; vis. 65; GS 8/25; pH 7; WL 7.5; mud cake 2/32; Cl 197,000; Ca 1500; Sld 14; Sd 1/4.
- 7-3-80 6705' drilling. Hard massive lime and calcareous red siltstone. No shows. Mud properties at 6692', mud wt. 10.1; vis. 45; GS 8/25; pH 7.0; WL 7.7; mud cake 2/32; Cl 197,000; Ca 1600; Sd 1/4; Sld 13.
- 7-4-80 6874' drilling. Fine grained limestone, argillaceous, earthy, black shale, chert. Mud properties at 6869', mud wt. 10.3; vis. 57; GS 7/24; pH 7.0; WL 7.2; mud cake 2/32; Cl 198,000; Ca 1600; Sd 1/4; Sld 14.
- 7-5-80 7031' drilling. Thin silty limes; soft variable shale. Mud properties at 7024', mud wt. 10.4; vis. 74; GS 12/31; pH 7.0; WL 6.8; mud cake 2/32; Cl 196,000; Ca 1570; Sd 1/4; Sld 15.



BIT RECORD

<u>No.</u>	<u>Size</u>	<u>Make</u>	<u>Type</u>	<u>Depth Out</u>	<u>Footage</u>	<u>Hours</u>	<u>Deviation</u>
1	7-7/8	Reed	411-S	3476	3286	18.50	3/4
2	7-7/8	STC	DT-J	4510	1034	17.25	1/2
3	7-7/8	Reed	Y21	4690	170	20.25	—
4	7-7/8	Reed	Y21	4750	70	5.50	—
5	7-7/8	STC	F-2	5461	710	61.25	—
6	7-7/8	Reed	Y-21-G	5543	82	8.50	—
7	7-7/8	STC	F-3	6252	709	63.25	—
8	7-7/8	STC	F-3	6383	131	17.75	—
8	RR	STC	F-3	6406	23	2.00	—
9	7-7/8	Diamond	MC-23	6446	40	8.25	—
8	RR	STC	F-3	6485	39	3.75	—
9	RR	Diamond	MC-23	6545	60	14.75	—
8	RR	STC	F-3	7100	555	88.00	1/4

MUD REPORT

Mud Report: 5642'

Wt. 10.6  
 Vis. 42  
 GS 3/10  
 pH 7  
 WL 7.5  
 MC 2/32  
 Cl 196  
 Ca 900  
 Sd 1/4  
 Sld 17%

Mud Report: 5895'

Wt. 10.6  
 Vis. 44  
 GS 6/12  
 pH 7  
 WL 7.7  
 MC 2/32  
 Cl 196  
 Ca 1200  
 Sd 1/4  
 Sld 15%

Mud Report: 6252'

Wt. 10.5  
 Vis. 57  
 GS 11/31  
 pH 7  
 WL 8.8  
 MC 2/32  
 Cl 198  
 Ca 1900  
 Sd 1/4  
 Sld 15%



# MUD REPORT

Mud Report: 6311'

Wt. 10.5  
Vis. 50  
GS 10/28  
pH 7  
WL 8  
MC 2/32  
Cl 197  
Ca 1920  
Sd 1/4  
Sld 15.7%

Mud Report: 6446'

Wt. 10.3  
Vis. 50  
GS 8/25  
pH 7  
WL 8  
MC 2/32  
Cl 197  
Ca 1600  
Sd 1/4  
Sld 14%

Mud Report: 6508'

Wt. 10.1  
Vis. 70  
GS 10/31  
pH 7.0  
WL 7.6  
MC 2/32  
Cl 198  
Ca 1700  
Sd 1/4  
Sld 13%

Mud Report: 6545'

Wt. 10.3  
Vis. 65  
GS 8/25  
pH 7.0  
WL 7.5  
MC 2/32  
Cl 197  
Ca 1500  
Sd 1/5  
Sld 14%

Mud Report: 6692'

Wt. 10.1  
Vis. 45  
GS 8/25  
pH 7  
WL 7.7  
MC 2/32  
Cl 197  
Ca 1000  
Sd 1/4  
Sld 13%

Mud Report: 6869'

Wt. 10.3  
Vis. 57  
GS 7/24  
pH 7.0  
WL 7.2  
MC 2/32  
Cl 158  
Ca 1600  
Sd 1/5  
Sld 14%

## DRILL STEM TESTS

- DST #1 (4702'-4708') "J" Sand. 15-30/90-60. Open with weak blow, to 6". SI. Reopen with weak blow, to 6". SI. Recovered 430' gas in pipe, 80' oil and slightly gas cut muddy water (80% muddy water; 12% oil, 8% solids). IHP 2448; IFP 52-26; ISIP 971; FFP 39-52; FSIP 1010; FHP 2343; BHT 152°F. Rw sample = 20 at 80°F - 2400 PPM.
- DST #2 (4662'-4668') "J" Sand. 15-30/60-90. Open with good blow, to bottom of bucket in 10 minutes. SI. Reopen with good blow, to bottom of bucket in 20 minutes. SI. Recovered 710' water with scum of oil. IHP 2468; IFP 93-159; ISIP 1058; FFP 198-331 FSIP 1045; FHP 2442; BHT 150°F.
- DST #3 (4634'-4642') "J" Sand. 10-30/80/90. 1 1/4" choke. Open with very strong blow, to 25# (1421 MCF/day), gas to surface in 3 minutes. SI. Reopen with very strong blow, peak at 41# (2029 MCF/day), finish at 38# (1911 MCF/day). Mud spray to surface in 50 minutes. Recovered 10' condensate, 30' condensate and gas cut mud, 651' gas cut H<sub>2</sub>O. IHP 2377; IFP 754-767; ISIP 979; FFP 775-809; FSIP 939; FHP 2363; BHT 152°F.
- DST #4 (6200'-6252') Permian (Minnekahta). 30-60/30-90. Open with weak blow, died in 25 minutes. SI. No blow in FSIP. SI. Recovered 88' mud with few specks very low gravity oil. IHP 3421; IFP 52-65; ISIP 2010; FFP 65-78; FSIP 2010; FHP 3382; BHT 171°F. Curves indicate very tight reservoir.



### DRILL STEM TESTS

DST #5 (6307'-6383') Permo-Penn Limestone and Dolomite. 30-60/60-120. Open with good blow, to bottom of bucket in 2 minutes. SI. Reopen with good blow, to bottom of bucket in 3 minutes. SI. Recovered 200' muddy H<sub>2</sub>O, 5101' H<sub>2</sub>O (3200 ppm). IHP 3504; IFP 1164-1802; ISIP 2386; FFP 1815-2360; FSIP 2386; FHP 3460; BHT 174°F.

DST #6 (6526'-6545') Pennsylvanian. 30-60/120-120. Open with weak blow, grew to 9" in 30 minutes. SI. Reopen with weak blow, to bottom of bucket in 44 minutes. SI. Recovered 1320' water, 6800 PPM. IHP 3445; IFP 51-217; ISIP 2360; FFP 281-574; FSIP 2360; FHP 3356; BHT 175°F.



FORMATION LOG TOPS

<u>Formation</u>	<u>Depth</u>	<u>Datum</u>
Niobrara	3689	+ 301
Ft. Hayes	4010	- 20
Carlile	4065	- 75
Greenhorn	4283	- 293
Bentonite	4421	- 431
"D" Sand	4520	- 530
"J" Sand	4625	- 635
"M" Sand	4946	- 956
"O" Sand	5004	-1014
Morrison	5180	-1190
Permian	5420	-1430
Permian Salt	5548	-1558
Big Blue Dolomite (Wolfcamp)	5860	-1870
Pennsylvanian	6282	-2292
Lansing-Kansas City	6408	-2418
Des Moines	6640	-2650
Atoka	6954	-2964



### SAMPLE DESCRIPTIONS

- 3630-3690 Shale, medium grey, soft, blocky, some pieces slightly calcareous, occasional Inoceramus prisms.
- 3690-3720 Shale, as above; Occasional piece shale, grey, blocky, soft, with calcareous cream spots.
- 3720-3750 Shale, grey, with cream spots as above.
- 3750-3810 Shale, grey, with calcareous cream spots, some white laminated appearance.
- 3810-3900 Shale, as above, some light grey, very calcareous.
- 3900-4020 Shale, as above; Marl, tan with argillaceous laminations, soft, very calcareous.
- 4020-4080 Shale, as above; Marl, as above, becoming more shaley.
- 4080-4170 Shale, as above; Limestone, cream, very fine grained, very chalky, no visible P&P, no show.
- 4170-4200 Shale, Limestone, as above; Predominantly shale, medium grey, platey, soft; Trace siltstone, grey, argillaceous, glauconitic, slightly calcareous; Occasional piece pyrite, massive.
- 4200-4290 Sample as above.
- 4290-4320 No sample caught.
- 4320-4350 Shale, as above; Limestone, tan, very finely crystalline, occasional pinpoint intercrystalline porosity, abundant aragonite needles.
- 4350-4410 No samples caught.
- 4410-4415 Shale, as above; Limestone, cream, massive, no visible P&P.
- 4415-4445 Shale, medium grey, platey, slightly calcareous; Inoceramus prisms.
- 4445-4455 Shale, medium grey, as above; Shale, black, carbonaceous, blocky, soft.
- 4455-4465 Shale, as above; Occasional piece siltstone, grey, very argillaceous, slightly pyritic; Occasional piece bentonite, light grey, very pyritic.
- 4465-4475 Sample as above, some pyritic; boring casts.



### SAMPLE DESCRIPTIONS

- 4475-4485 Sample as above; abundant shale, black, carbonaceous, pyritic, platey, soft.
- 4485-4500 Shale, grey, black, as above.
- 4500-4510 Shale, as above.
- 4510-4520 Uphole cavings from trip.
- 4520-4525 Shale, dark grey, platey, firm, slightly calcareous; Trace pyrite & Inoceramus as above; Siltstone, light grey, very fine grained, slightly shaley, occasional organic fleck, very weak fluorescence, cut, faint stain on few pieces, appears very low porosity, tight.
- 4525-4530 Sample as above, predominantly shale.
- 4530-4540 Sample as above.
- 4540-4545 Sample as above; Sandstone, white, fine grained, slightly glauconitic, well sorted, quartzose, very poor P&P, no show.
- 4545-4550 Sample as above.
- 4550-4565 Shale, dark grey, platey, as above; Sandstone, as above, apparently very thin shale & sandstone stringers; Siltstone, light grey, slightly argillaceous, with organic flecks, as above, no show.
- 4565-4575 Shale, grey-dark grey, soft, platey, slightly calcareous; Occasional piece sandstone, siltstone, as above.
- 4575-4580 Sample as above.
- 4580-4585 Shale, as above; Trace siltstone, light grey, slightly argillaceous, faint fluorescence, slight streaming cut, very minor show, poor reservoir.
- 4585-4590 Sample as above.
- 4590-4595 Shale, dark grey, slightly calcareous, platey, soft; Unconsolidated sand, medium grained, rounded, quartzose, no show.
- 4595-4600 Sample as above, less unconsolidated sand.
- 4600 Start Lagged Sample Description
- 4600-4615 Shale, medium grey, with occasional calcareous spot, platey, soft; Shale, dark grey, some white fissle, slightly calcareous, occasional piece pyrite.



### SAMPLE DESCRIPTIONS

- 4615-4620 Shale, as above; Trace sandstone, grey, very fine grained, quartzose, well sorted, porosity has clay infilling, sub-shaley, faint fluorescence, very faint cut, no visible oil, tight reservoir.
- 4620-4625 Shale, as above; Slightly more sandstone, as above, cleaner, fine grained.
- 4625-4645 Shale, dark grey, blocky-fissile, some with carbonaceous flecks; Trace sandstone, as above.
- 4645-4650 Shale, as above; Siltstone, light grey, very fine grained, very faint mineral fluorescence, shaley, no show; Shale, as above; Siltstone, as above, grading to very fine grained sandstone, light grey, quartzose, no visible P&P, faint fluorescence, very faint cut.
- 4650-4655 Shale, grey-dark grey, platey-blocky, soft; Trace sandstone, as above.
- 4655-4670 Shale, dark grey, some white fissile; Occasional piece sandstone, as above, probably cavings or very thin lenses.
- 4670-4675 Shale, as above; Sandstone, cream-light grey, very fine grained, quartzose, subangular, poorly sorted, no visible P&P, trace fluorescence, weak streaming cut, no visible oil.
- 4675-4695 No samples caught.
- 4695-4700 Shale, dark grey, blocky, soft.
- 4700-4710 Shale, as above; Sandstone, white-greywhite, fine grained, quartzose, poorly sorted, subangular, slightly calcareous, some with clay infilling, occasional piece with fair intergranular porosity, faint fluorescence, faint cut, no visible hydrocarbons.
- 4710-4715 Some sandstone, as above; Shale, dark grey, platey, calcareous.
- 4715-4720 Shale, as above, fissile.
- 4720-4725 Shale, as above; Clay white, very soft, blocky (possible mud additive?); Trace sandstone, as above.
- 4725-4730 Sandstone, light grey, fine grained fair-poor sorting, angular-subangular, quartzose, tight, no show; Shale, as above.
- 4730-4735 Trace sandstone, as above; Predominantly shale, grey-dark grey, platey.



### SAMPLE DESCRIPTIONS

- 4735-4740 Sandstone, white, very fine grained, slightly S&P, tight;  
Shale, as above.
- 4740-4745 Predominantly shale, as above; Trace siltstone, grey, argil-  
laceous.
- 4745-4750 Shale, dark grey, as above; Trace sandstone, siltstone, as  
above.

- - - - - Intermediate Log Depth - - - - -

- 4750-4755 Uphole cavings.
- 4755-4760 Shale, dark grey, blocky, soft; Sandstone, white, fine grained,  
well sorted, subangular, poor P&P, no show.
- 4760-4775 Shale, sandstone, as above; Unconsolidated sand, quartzose,  
medium grained, transparent, subangular.
- 4775-4780 Sample as above; Predominantly sandstone.
- 4780-4790 Sandstone, as above, becoming shaley; Shale, as above.
- 4790-4800 Sandstone, both clean & shaley, as above; Interbedded sand-  
stone & dark grey shale.
- 4800-4805 Sandstone, as above, clean; Shale, as above.
- 4805-4810 Sandstone, as above, shaley; Shale, as above.
- 4810-4815 No sample caught.
- 4815-4825 Sandstone, shaley, as above; Predominantly shale, dark grey,  
platey, soft.
- 4825-4850 Predominantly shale, as above.

#### Start 10' Samples

- 4850-4870 Shale, dark grey, black, platey-blocky; Minor siltstone,  
grey, very argillaceous.
- 4870-4880 No sample caught.
- 4880-4920 Samples as above.

#### Start 5' Samples

- 4920-4965 Shale, dark grey, black, as above.



### SAMPLE DESCRIPTIONS

- 4965-4970 Shale, as above; Trace sandstone, white, fine grained, quartzose, well sorted, subangular, poor porosity, no show.
- 4970-4980 Shale, as above, abundant sandstone, as above.
- 4980-5000 Shale, as above; Sandstone, as above, very tight.
- 5000-5010 Shale, grey, slightly silty, soft; Shale, dark grey, somewhat fissile, firm.
- 5010-5020 Samples as above. (Samples very poor - pump shut down)
- 5020-5025 Shale, as above; Trace sandstone, cream-white, very fine grained, quartzose, slightly calcareous, trace porosity infilled with clay, no show.
- 5025-5050 Shale, as above; Predominantly fissile; Sandstone, as above, with trace pinpoint intergranular porosity, no show.

#### Start 10' Samples

- 5050-5070 Shale, as above; Sandstone, grading to siltstone.
- 5070-5110 Mostly dark grey, blocky shale (Samples very poor due to change to salt-base mud program).
- 5110-5160 Shale, dark grey, blocky, firm; Siltstone, light grey, some pieces argillaceous, no visible P&P, no show; Pyrite, massive.
- 5160-5170 Shale, as above; Pyrite as above; Sandstone, grey, very fine grained, very argillaceous, "dirty" appearance.
- 5170-5180 Shale, as above; Sandstone, white, fine grained, quartzose, well sorted, subangular, tight.
- 5180-5200 Shale, sandstone, as above; Trace shale, light green, slightly silty, waxy; Trace sandstone, green, very fine grained, well sorted, very glauconitic.

#### Start 5' Samples

- 5200-5210 Shale, dark grey, as above; Shale, grey-green, subwaxy, some slightly silty; Trace siltstone, light maroon, very soft.
- 5210-5220 Shale, grey-green, as above, subwaxy, silty, very calcareous, firm.
- 5220-5235 Shale, as above; Limestone, massive, grey-brown, tan, very argillaceous, silty, no visible P&P, no show; Trace chert, tan, translucent.



### SAMPLE DESCRIPTIONS

- 5235-5240 Limestone, grey-brown, tan, as above; Trace limestone, dark brown, very finely crystalline, hard, dense, no visible P&P.
- 5240-5250 Predominantly limestone, grey-brown, tan, becoming very silty, slightly glauconitic to siltstone, tan, very calcareous, argillaceous; Shale, grey-tan, firm, very calcareous.
- Start 10' Samples
- 5250-5260 Limestone, tan, very silty, with light brown dolomitic blebs, no visible P&P, no show; Shale, grey-green, firm, very calcareous; Limestone, light brown, as above.
- 5260-5290 Limestone, light brown, very silty, some slightly glauconitic; Shale, as above.
- 5290-5300 Limestone, Shale, as above; Limestone, light brown with brown dolomitic grains, some with dark organic specks, some white oolitic appearance.
- 5300-5320 Limestone, cream with abundant black shale clasts, silty, argillaceous, some dolomitic; Sandstone, light grey, very fine grained, silty, slightly argillaceous, slightly dolomitic, trace pinpoint porosity, no show.
- 5320-5340 Sample as above.
- 5340-5350 Sample as above; Limestone, light brown, massive, hard.
- 5350-5360 Limestone, Shale, as above; Dolomite, brown, very finely crystalline, no visible P&P, very hard; Chert milky, translucent.
- 5360-5380 Sample as above; Siltstone, light grey, dolomitic, firm, no visible P&P; Occasional piece anhydrite, white, finely crystalline.
- 5380-5400 Sample as above, predominantly siltstone, becoming slightly glauconitic.
- 5400-5410 Sandstone, white, fine grained, tight, as above; Shale, dark grey, platy-blocky.
- 5410-5440 Sandstone, Shale, as above; Unconsolidated sand, quartzose, white-pink, medium grained, subround-round, transparent, frosted, no show.
- 5440-5450 Unconsolidated sand, as above; Siltstone, brick red, very shaley, slightly calcareous, soft.
- 5450-5460 No sample caught.



### SAMPLE DESCRIPTIONS

5460-5480	Shale, dark grey, red, as above, very poor samples.
5480-5510	Shale, brick red, silty, soft; Trace anhydrite, white.
5510-5540	Sample as above.
5540-5550	Shale, red, as above; Predominantly anhydrite, white finely crystalline.
5550-5560	Anhydrite as above; Shale, brick red, silty, soft; Siltstone, red with cream streaks, very argillaceous, soft.
5560-5590	Anhydrite, Shale, Siltstone, as above; Trace dolomite, brick red, very argillaceous, hard (fast drilling from 5555-5635', indicates a salt section - no salt in samples).
5590-5600	Sample as above, predominantly shale; Abundant gypsum, transparent, both free crystals and interbedded in shale.
5600-5620	Shale, brick red, waxy, soft; Gypsum, as above; Gypsum in cubic crystals.
5620-5650	Shale, as above, silty; Gypsum, as above.
5650-5680	Shale, Siltstone, brick red, some pieces sandy, abundant gypsum crystals; Traces anhydrite, microcrystalline, white-pink, soft.
5680-5720	Shale, Siltstone, as above; Anhydrite, microcrystalline, white-pink, firm; Sandstone, red, fine grained, quartzose, subangular, well sorted, very slightly calcareous, no visible P&P.
5720-5740	Shale, Siltstone, brick red, soft, as above, some pieces sandy; Scattered pieces anhydrite, as above.
5740-5790	Siltstone, brick red, very shaley, soft.
5790-5800	Shale, brick red, very soft, gummy; Siltstone, as above.
5800-5860	Siltstone, as above.
5860-5870	Shale, Siltstone, brick red, as above (poor samples).
5870-5880	Shale, Siltstone, as above; Trace dolomite, tan massive, very silty, interbedded with red siltstone (poor samples).
5880-5890	Siltstone, sandy dolomite as above.
5890-5900	Siltstone, as above; Dolomite, tan massive, with anhydrite inclusions, no visible P&P, no show.



## SAMPLE DESCRIPTIONS

### Start 5' Samples

- 5900-5905 Dolomite, light brown, microcrystalline, slightly anhydrite, no visible P&P; Trace anhydrite, white, chalky.
- 5905-5915 Dolomite, light brown, as above, some with dark shaley veins or flecks; Anhydrite, as above.
- 5915-5920 Dolomite, as above; Anhydrite, white, microsugrosic, dolomitic.
- 5920-5930 Samples as above.
- 5930-5990 Dolomite, Anhydrite, as above; Dolomite, dark grey-brown, massive, no visible P&P.
- 5990-6015 Dolomite, tan, microsugrosic, no visible P&P, no show; Dolomite, dark grey-brown, as above; Anhydrite, white, soft.
- 6015-6045 Dolomite, as above; Trace siltstone, light grey, slightly dolomitic, S&P, no visible P&P.
- 6045-6065 Dolomite, tan-buff, microcrystalline, hard, dense; Some brown microcrystalline, hard, dense.
- 6065-6085 Dolomite, light brown, microsugrosic-massive, no visible P&P.
- 6085-6100 Dolomite, as above; some grey, massive, slightly silty.
- 6100-6120 Dolomite, tan-light brown, microcrystalline, very hard, dense, no visible P&P; Trace anhydrite, white, soft; Some pieces dolomite somewhat limey.

### Start 10' Samples

- 6120-6150 Dolomite, as above; Anhydrite, as above, some microcrystalline, firm.
- 6150-6170 Dolomite, trace anhydrite, as above; Trace shale, red, waxy, soft.
- 6170-6200 Dolomite, as above; Dolomite, dark grey-brown, massive, hard, dense; Limestone, dark brown, massive, carbonaceous, hard, no visible P&P, no show

### Start 5' Samples

- 6200-6205 Sample as above.
- 6205-6210 Limestone, Dolomite, as above; Rare piece dolomite, grey, microcrystalline, no visible P&P, trace fluorescence, trace streaming cut, no visible live oil, poor stain.



SAMPLE DESCRIPTIONS

- 6210-6230 Limestone, Dolomite, as above; Dolomite, tan-brown, micro-crystalline, no visible P&P, no show; Some pieces anhydritic.
- 6230-6235 Limestone, Dolomite, light brown, microcrystalline, some pieces slightly earthy, occasional isolated pinpoint vug, gives up droplets low gravity dark brown oil when crushed - very poor fluorescence, fair streaming cut, good dark brown stain; Rare piece sandstone, light grey, very fine grained - silt, dolomitic, fair intergranular porosity, fair saturation with dark brown low gravity oil, stain and cut as above. Generally poor reservoir rock.
- 6235-6240 Dolomite, as above, spotty stain.
- 6240-6250 Dolomite, as above; Limestone, dark grey, massive, hard, very carbonaceous, no visible P&P.
- 6250-6320 Dolomite, Limestone, brown, light brown, microcrystalline, hard, some slightly fossiliferous, no visible porosity, abundant dead oil inclusions, weak cut, no live oil; Trace anhydrite, white, microcrystalline.
- 6320-6335 Limestone, light brown, as above, some slightly silty, no visible porosity, traces live low gravity oil, abundant dead oil inclusions, no fluorescence, fair cut, good stain, very poor reservoir; Trace limestone, cream, microcrystalline, hard, dense.
- 6335-6345 Limestone, light brown, as above; Trace limestone, cream, very fine grained, slightly chalky, with abundant dead oil inclusions; Trace anhydrite, white, microcrystalline, slightly dolomitic.
- 6345-6360 Limestone, cream, microcrystalline - very fine grained, chalky, abundant dead oil inclusions, some pieces slightly fossiliferous, no visible porosity; Occasional pieces slightly earthy or silty with spotty brown oil stain, good cut; Limestone, Dolomite, tan-light brown, as above; some pieces with oil stained fracture faces.
- 6360-6370 Limestone, cream, as above, barren, hard, dense, slightly fossiliferous in part.
- 6370-6380 Limestone, as above; Trace limestone, cream-light tan, crypto-crystalline, hard, dense, trace tar on apparent fracture faces.
- 6380-6390 Very poor samples after DST.
- 6390-6405 Limestone, cream, microcrystalline, trace pinpoint intercrystalline porosity, mostly hard, dense, no show.



## SAMPLE DESCRIPTIONS

### Core No. 1

- 6406-6407 Limestone, medium grey, microcrystalline, wispy organic laminations and occasional kerogen filled horizontal cracks, trace dead oil stain, very pyritic, large pyritic concretion.
- 6407-6408 Sample as above.
- 6408-6409 Dolomite, as above, massive.
- 6409-6410 Dolomite, light brown, massive, slightly pyritic.
- 6410-6411 Dolomite, grey-brown, massive.
- 6411-6412 Sample as above.
- 6412-6413 Dolomite, medium brown, limey.
- 6413-6414 Dolomite, medium brown, microcrystalline, limey, with closed vertical fractures.
- 6414-6415 Dolomite, cream, microcrystalline, as above with white anhydrite nodules and vertical fractures.
- 6415-6416 Sample as above.
- 6416-6417 Sample as above.
- 6417-6418 Dolomite, as above, cream & light grey mottled.
- 6418-6419 Dolomite, cream, microcrystalline, no visible P&P.
- 6419-6420 Dolomite, buff, microcrystalline, limey, loose anhydrite nodules.
- 6420-6421 Dolomite, buff, microcrystalline, limey.
- 6421-6422 Limestone, dolomitic, light brown, rare vuggy porosity.
- 6422-6423 Limestone, dolomitic, cream, microcrystalline, occasional pinpoint vugs.
- 6423-6424 Limestone, as above, with vertical fractures.
- 6424-6425 Limestone, as above, with vuggy porosity, slightly fossiliferous.
- 6425-6425.5 Limestone, cream, acicular anhydrite crystals.
- 6425.5-6426 Limestone, cream-tan, microcrystalline, pinpoint to 5mm (dia.) vugs, no show, slightly fossiliferous, mollusks and fusilinids.



### SAMPLE DESCRIPTIONS

- 6426-6427 Sample as above.
- 6427-6428 Sample as above.
- 6428-6429 Sample as above.
- 6429-6429.5 Sample as above.
- 6429.5-6430 Limestone, tan, occasional anhydrite nodules, echinoderm and mollusk fragments, stylolites with associates kerogen.
- 6430-6431 Sample as above.
- 6431-6432 Sample as above.
- 6432-6433 Sample as above.
- 6433-6434 Limestone, brown, as above.
- 6434-6435 Limestone, light brown, microcrystalline, with occasional fossil fragment.
- 6435-6436 Sample as above.
- 6436-6437 Limestone, cream, microcrystalline, with pinpoint vuggy porosity.
- 6437-6438 Limestone, as above, moldic porosity from dissolution of fusilinids.
- 6438-6439.5 Sample as above, with recrystallized fossil fragments.
- 6439.5-6440.5 Sample as above.
- 6440.5-6441 Limestone, cream, stylolites with kerogen, light brown.
- 6441-6442 Limestone, as above, becoming dolomitic.
- 6442-6443 Dolomite, light brown, limey, microcrystalline, extensive vertical fractures and microscopic unoriented fractures with anhydrite infilling.

6443-6446 Sample as above.

#### Start 5' Samples

- 6446-6460 Uphole cavings, very poor samples after core.
- 6460-6465 Limestone, cream, microcrystalline, some slightly silty, no visible P&P, no show.
- 6465-6485 Limestone, as above, some slightly chalky, fossiliferous.



## SAMPLE DESCRIPTIONS

### Core No. 2

- 6485-6486 Limestone, cream, massive, occasional pinpoint vug, stylolites; Limestone, grey-white, light grey, silty with chalky infilling, fossiliferous, hard; Abundant fusilinids.
- 6486-6487 Limestone, light brown, microcrystalline-cryptocrystalline, tight, kerogen filled stylolite.
- 6487-6488 Sample as above, anhydrite nodule at 6488.
- 6488-6489 Sample as above, tan-cream, microcrystalline.
- 6489-6490.5 Sample as above, tan-cream.
- 6490.5-6491 Limestone, cream, microcrystalline, trace pinpoint vuggy porosity, no show; Anhydrite nodules.
- 6491-6492 Limestone, as above.
- 6492-6493 Thin green calcareous shale, very hard, laminated with kerogen; Predominantly limestone, tan, hard, dense, massive, vertical fractures.
- 6493-6494 Limestone, as above, with kerogen filled stylolite.
- 6494-6495 Sample as above.
- 6495-6496 Sample as above.
- 6496-6497 Limestone, light brown, microcrystalline, hard, dense, slightly silty.
- 6497-6498 Limestone, grey-brown, microcrystalline, very hard, silty, with pyritic nodules.
- 6498-6499 Sample as above.
- 6499-6500 Sample as above.
- 6500-6501 Sample as above.
- 6501-6502 Sample as above.
- 6502-6503 Sample as above.
- 6503-6504 Sample as above.
- 6504-6505.5 Sample as above.
- 6505.5-6506 Limestone, red-brown, very argillaceous, with fine laminated grey-green shale, as above, mottled appearance.



### SAMPLE DESCRIPTIONS

6506-6507	Sample as above.
6507-6508	Sample as above.
6508-6509	Limestone, brown-red, argillaceous, as above, with occasional grey-green mottle.
6509-6510	Sample as above.
6510-6511	Sample as above.
6511-6512	Sample as above.
6512-6513	Sample as above.
6513-6514	Limestone, grey-green, massive, very argillaceous, as above, with limey blebs 1-3 cm. (bioturbated?)
6514-6515	Sample as above.
6515-6516	Sample as above.
6516-6517	Sample as above.
6517-6518	Sample as above.
6518-6519	Sample as above.
6519-6520	Limestone, medium grey, with abundant grey-green and dark grey laminations, shale.
6520-6521.5	Limestone, as above, Anhydrite filled diagonal fractures at 6521.
6521.5-6522.5	Limestone as above.
6522.5-6523	Limestone, light grey, lithographic, occasional vertical fracture system.
6523-6524	Limestone, as above, stylilyte and fractures at 6524 with traces bleeding dark brown oil.
6524-6525	Limestone, as above, with stylilyte, vertical fracture with live oil stain.
6525-6526.5	Sample as above.
6526.5-6527	Limestone, grey-brown, microcrystalline, very fossiliferous, good vuggy porosity in patches (some with isolated vuggy porosity) good saturation with low gravity live dark brown oil, excellent cut and stain in porous patches; Vertical fracture faces with oil stain, bleeding oil and oil saturated stylolites, faint odor.



### SAMPLE DESCRIPTIONS

- 6527-6528 Sample as above.
- 6528-6529 Sample as above.
- 6529-6530 Limestone, as above, less porosity, most porosity flushed of oil, isolated bleeding vugs; Some apparently barren, but with good streaming cut and fluorescence.
- 6530-6531 Sample as above.
- 6531-6532.5 Limestone, cream, microcrystalline, hard, tight, no visible P&P; Short vertical and horizontal fractures at 6532.5. with bleeding brown oil, good stain.
- 6532.5-6533 Limestone, light brown, microcrystalline, with pinpoint vuggy porosity, poor permeability, spotty oil stain, faint odor.
- 6533-6534.5 Limestone, as above, with trace dead oil inclusions, no visible P&P, occasional stylolite.
- 6534.5-6535 Sample as above.
- 6535-6536 Sample as above, with occasional kerogen filled stylolite, rare live oil stain around isolated vugs.
- 6536-6537 Sample as above.
- 6537-6538.5 Sample as above.
- 6538.5-6539 Very limey mudstone, grey-green and grey laminations, hard, dense, no visible P&P, slightly pyritic.
- 6539-6540 No show.
- 6540-6541 No show.
- 6541-6542 No show.
- 6542-6543.5 No show.
- 6543.5-6545 Missing.

### Start 5' Samples

- 6545-6555 Uphole cavings after core and DST No. 6.
- 6555-6560 Siltstone, red, very limey, firm; Siltstone, grey-green, very limey, somewhat firm, argillaceous; Limestone, cream, very chalky, with dead oil inclusions, no live oil.



### SAMPLE DESCRIPTIONS

- 6560-6575 Siltstone, red, as above; Limestone, chalky, as above; Limestone, cream-tan, cryptocrystalline, hard, dense, no visible P&P.
- 6575-6585 Limestone, cream-tan, hard, dense, cryptocrystalline, no visible P&P; Trace siltstone, red, very limey, firm.
- 6585-6600 Sample as above; Some limestone, white, chalky, with dead oil inclusions; Siltstone, grey-green, calcareous, firm.
- 6600-6625 Predominantly limestone, tan, hard, as above; Siltstone, red, calcareous, as above.
- 6625-6650 Limestone, tan, hard, dense, cryptocrystalline, occasional piece slightly cherty; Limestone, cream, very fine grained, chalky, with dead oil inclusions; Siltstone, red, grey-green, calcareous.
- 6650-6695 Predominantly limestone, as above; Trace chert, cream, maroon, amber.
- 6695-6700 Limestone, as above; Siltstone, dark red, very calcareous, argillaceous.
- 6700-6710 Limestone, cream-tan, cryptocrystalline, hard, dense; Chert, tan-dark amber.
- 6710-6720 Limestone, as above; Siltstone, red, as above.
- 6720-6730 Limestone, cream-tan, as above.
- 6730-6745 Limestone, as above; Limestone, cream, very fine grained, silty, slightly dolomitic, no visible P&P, some pieces subchalky.
- 6745-6750 Limestone, as above; Trace siltstone, red, as above.
- 6750-6760 Limestone, cream, very fine grained, subchalky in part, slightly silty; Trace chert, translucent, milky, with dark flecks.
- 6760-6765 Limestone, as above; Limestone, light tan, cryptocrystalline, hard, dense, slightly fossiliferous.
- 6765-6795 Limestone, cream, light tan, as above; Abundant chert, cream-tan, translucent, with dark flecks.
- 6795-6805 Limestone, as above; Limestone, cream-light grey, very fine grained, earthy, slightly silty, no visible P&P; Chert, as above.
- 6805-6815 Limestone, as above; Abundant chert, as above; Shale, black-brown, carbonaceous, firm, blocky, slightly calcareous.
- 6815-6820 Limestone & chert, as above; Shale, black as above; Limestone, light grey-brown, marly, silty with much soft clay, no visible P&P.