

# Robert L. Milford

PETROLEUM GEOLOGIST  
Wichita, Kansas

## GEOLOGIST'S REPORT

DRILLING TIME AND SAMPLE LOG  
OPERATOR Murfin Drilling Company, Inc.  
LEASE Cilwell #1-20  
LOC SPOT C E2 NW

ELEVATIONS  
KB 3418'  
GL 3413'

MEASURED STRIKE  
CASING RECORD  
CONDUCTOR

LOC FOOTAGE 1,320' FNL 1,980' FWL  
SEC. 20 TMSB 2S RING 3W

COUNTY Cherokee STATE Kansas  
DATE 15-02-21 TIME 21:47Z 00-00

CONTRACTOR Murfin Drilling Co., Inc. RFD NO. 24  
DRILLING STARTED 11-6-2017 COMPLETED 11-16-2017  
MUD/FLUID 3568 MUD TYPE Chemical  
DRILLING TIME KEPT FROM 4:01:00 TO 4:01:00  
SAMPLES EXAMINED FROM 4:01:00 TO 4:01:00  
SAMPLES SKIPPED FROM 4:01:00 TO 4:01:00  
GEOLOGICAL SUPERVISION FROM 4:01:00 TO 4:01:00

| FORMATION NAME     | LOG TOP | LOG DATUM | LOG BOTTOM | SAMPLE DATE | SAMPLE DATUM |
|--------------------|---------|-----------|------------|-------------|--------------|
| Stone Corral       | 3295'   | +123      | 3299'      | +119        |              |
| Brown Stone Corral | 3330'   | +885      | 3334'      | +884        |              |
| Topeka             | 4103'   | -685      | 4106'      | -688        |              |
| Oread              | 4250'   | -832      | 4254'      | -836        |              |
| Landis             | 4325'   | -907      | 4329'      | -911        |              |
| Stark              | 4352'   | -1134     | 4356'      | -1138       |              |
| Fort Scott         | 4734'   | -1316     | 4738'      | -1320       |              |
| Oakley             | 4806'   | -1388     | 4810'      | -1392       |              |
| Mississippian      | 5041'   | -1623     | 5045'      | -1627       |              |
| Total Depth        | 5100'   | -1682     | 5100'      | -1682       |              |

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| DATE     | 7:00 AM DEPTH | REMARKS  |
|----------|---------------|--|
| 11-6-17  | 1.00'         | Spud @ 9:00 am. Plug down @ 4:15 pm. Drilled out plug at 12:15 am on 11/7/17 w/ PDC bit. |
| 11-7-17  | 1.00'         | Cut 1100' in last 24 hrs.  |
| 11-8-17  | 3.317'        | Cut 2217' in last 24 hrs; 22.5 hrs drlg. Bit trip @ 3912' (ran button bit)               |
| 11-9-17  | 4.020'        | Cut 703' in last 24 hrs; 15.5 hrs drlg. DST #1 @ 4130'                                   |
| 11-10-17 | 4.135'        | Cut 115' in last 24 hrs; 7 hrs drlg. DST #2 @ 4286'                                      |
| 11-11-17 | 4.286'        | Cut 151' in last 24 hrs; 9.75 hrs drlg. DST #3 @ 4355'                                   |
| 11-12-17 | 4.394'        | Cut 108' in last 24 hrs; 7.25 hrs drlg. DST #4 @ 4425'                                   |
| 11-13-17 | 4.473'        | Cut 79' in last 24 hrs; 6 hrs drlg. DST #6 @ 4560'                                       |
| 11-14-17 | 4.560'        | Cut 87' in last 24 hrs; 6.25 hrs drlg. DST #6 @ 4560'                                    |
| 11-15-17 | 4.692'        | Cut 132' in last 24 hrs; 9.25 hrs drlg. DST #7 @ 4846'                                   |
| 11-16-17 | 4.846'        | Cut 154' in last 24 hrs; 10.5 hrs drlg. Ran in PDC bit @ 4846'. RTD 5100' @ 7:41 pm      |
| 11-17-17 | 5.100'        | Cut 254' in last 24 hrs; 5 hrs drlg. Ran production casing.                              |

**Remarks**

The electric log measurements correlate from 3' to 4' higher to the drilling measurements.

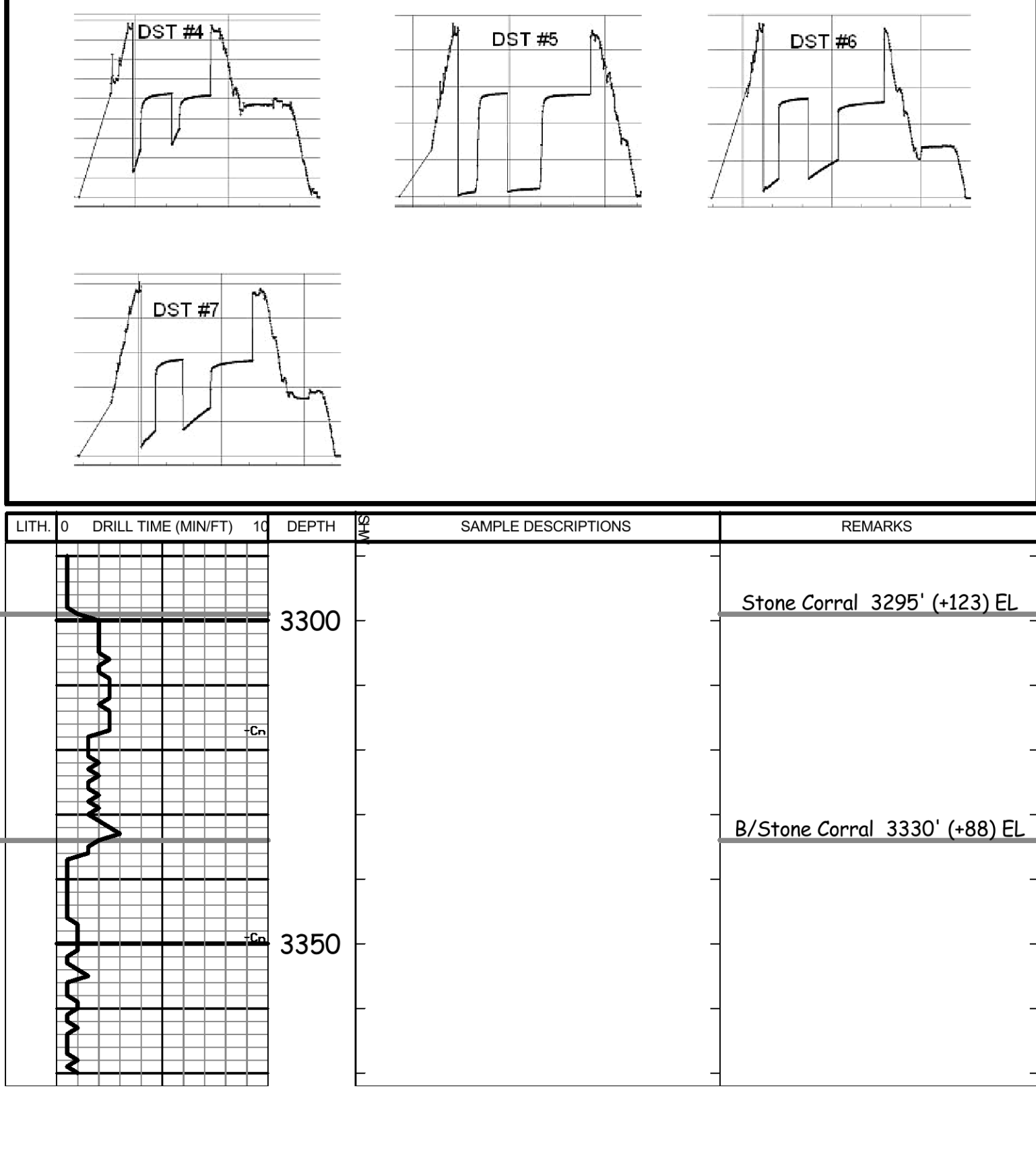
Formation tops and lithology on this report have been corrected to the electric log.

The drilling samples were deposited at the Kansas Geological Survey office in Wichita.

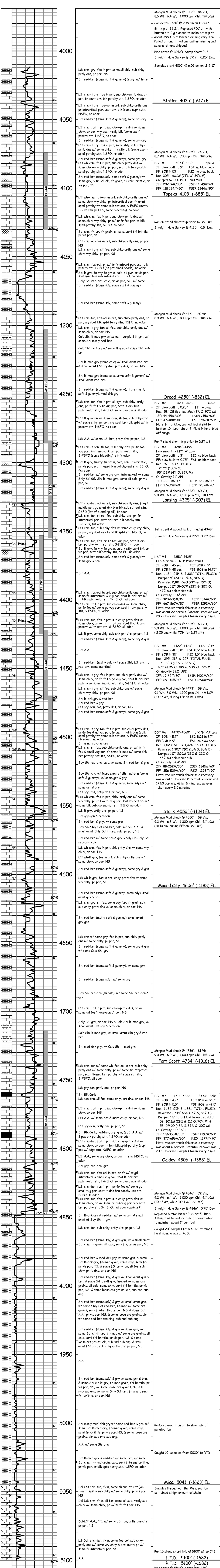
Respectfully submitted,

Robert L. Milford

### Drill Stem Test Charts



| LITH | DRILL TIME (MIN/FT) | DEPTH | SAMPLE DESCRIPTIONS | REMARKS                       |
|------|---------------------|-------|---------------------|-------------------------------|
|      |                     | 3300  |                     | Stone Corral 3295' (+123) EL  |
|      |                     | 3350  |                     | B/Stone Corral 3330' (+88) EL |



| LITH | DRILL TIME (MIN/FT) | DEPTH | SAMPLE DESCRIPTIONS | REMARKS   |
|------|---------------------|-------|---------------------|---|
|      |                     | 4000  |                     | Morgan Mud check @ 3602': 84 Vis, 8.7 Wt, 6.4 WL, 1000 ppm Chl, 2# LCM<br>Call depth 3720' @ 2:15 pm on 11-8-17<br>Bit trip at 3912'. Replaced PDC bit with button bit. Rig planned to make bit trip at about 3950' but started drilling very slow. Pulled bit and it had one cutter missing and several others chipped.<br>Pipe Strap @ 3912': Strap short 0.16'<br>Straight Hole Survey @ 3912': 0.25' Dev.<br>Samples start 4010' @ 6:09 am on 11-9-17   |
|      |                     | 4050  |                     | Stotler 4035' (-617) EL   |
|      |                     | 4100  |                     | Morgan Mud check @ 4085': 74 Vis, 8.7 Wt, 6.4 WL, 700 ppm Chl, 3# LCM<br>DST #1 4074'-4130' Topeka<br>IF: blow built to 9"<br>FF: BOB in 53"<br>Rec: 305' HMWC (71% W, 29% M)<br>Chl ppm: 67,000 DST: 700 Mud<br>IFP: 20-114#/30" ISIP: 1249#/60"<br>FFP: 118-184#/60" FSP: 1244#/90"   |
|      |                     | 4150  |                     | Topeka 4103' (-685) EL  |
|      |                     | 4250  |                     | Morgan Mud check @ 4192': 80 Vis, 8.9 Wt, 6.4 WL, 800 ppm Chl, 3# LCM<br>DST #2 4203'-4286' Oread<br>IF: blow built to 0.25"<br>FF: BOB in 45 sec<br>ISIP: 1314#/60"<br>FFP: 44-48#/30" ISIP: 715#/60"<br>FFP: 47-48#/30" FSP: 567#/60"<br>Note: Hit bridge, opened tool & slid to bottom 10'. Lost about 6' fluid in hole, bled off surge.<br>Ran 7 stand short trip prior to DST #2   |
|      |                     | 4350  |                     | Stark 4352' (-1134) EL  |
|      |                     | 4450  |                     | Morgan Mud check @ 4425': 63 Vis, 9.0 Wt, 6.0 WL, 1200 ppm Chl, 3# LCM (11:25 am, while TOH for DST #4)<br>DST #3 4284'-4355' LKC 'A' zone<br>IF: blow built to 3"<br>ISIP: no blow back<br>FF: BOB in 53"<br>Rec: 305' HMWC (71% W, 29% M)<br>Chl ppm: 67,000 DST: 700 Mud<br>IFP: 20-114#/30" ISIP: 1249#/60"<br>FFP: 118-184#/60" FSP: 1244#/90"   |
|      |                     | 4550  |                     | Mound City 4606' (-1188) EL   |
|      |                     | 4650  |                     | Morgan Mud check @ 4736': 81 Vis, 9.0 Wt, 6.0 WL, 1000 ppm Chl, 4# LCM (11:40 am, during FFP on DST #6)<br>DST #4 4353'-4425' LKC A prime - LKC D Prime zones<br>IF: BOB in 45 sec<br>ISIP: BOB in 9"<br>FF: BOB in 45 sec<br>ISIP: BOB in 14.75"<br>Rec: 1134' 61P & 2303' TOTAL FLUID:<br>Dumped 5' CGO (19% G, 81% O)<br>Reversed 2.181' CGO (21% G, 79% O)<br>Dumped 117' GHOCM (23% G, 73% O, 47% M) below circ sub.<br>Oil Gravity 33.6° API<br>IFP: 320-606#/15" ISIP: 1314#/60"<br>FFP: 667-667#/15" ISIP: 1292#/60"<br>Note: vacuum truck driver said recovery was about 22 barrels. Potential recover was 29.79 barrels. Samples taken every 5 min. |
|      |                     | 4750  |                     | Morgan Mud check @ 4846': 72 Vis, 9.2 Wt, 6.0 WL, 1000 ppm Chl, 4# LCM (10:45 am, while TOH w/ DST #7)<br>DST #5 4422'-4473' LKC 'G' zn<br>IF: blow built to 8"<br>ISIP: BOB in 8.7"<br>FF: BOB in 5.5"<br>ISIP: BOB in 42.5"<br>Rec: 1134' 61P & 1861' TOTAL FLUID:<br>Reversed 1.744' CGO (14% G, 86% O)<br>Dumped 117' Total Fluid below circ sub:<br>59' GMSO (28% G, 2% O, 70% M) & 58' GMCO (48% G, 32% O, 20% M)<br>Oil Gravity 34.4° API<br>IFP: 119-358#/30" ISIP: 1397#/90"<br>FFP: 377-696#/60" FSP: 1377#/90"<br>Note: vacuum truck driver said recovery was about 6 barrels. Potential recover was 23.66 barrels. Samples taken every 5 min      |
|      |                     | 4850  |                     | Oakley 4806' (-1388) EL   |
|      |                     | 4900  |                     | Morgan Mud check @ 4937': 81 Vis, 9.0 Wt, 6.0 WL, 1000 ppm Chl, 4# LCM<br>DST #6 4470'-4560' LKC 'H'-J' zns<br>IF: BOB in 4.2"<br>ISIP: BOB in 12.8"<br>FF: BOB in 5.5"<br>ISIP: BOB in 42.5"<br>Rec: 1134' 61P & 1424' TOTAL FLUID:<br>Reversed 1.307' CGO (15% G, 85% O)<br>Dumped 117' GMCO (33% G, 22% O, 45% M) below circ sub.<br>Oil Gravity 34.4° API<br>IFP: 88-252#/30" ISIP: 1345#/60"<br>FFP: 256-509#/60" FSP: 1393#/90"<br>Note: vacuum truck driver said recovery was about 13 barrels. Potential recover was 17.53 barrels. FFP in 5 minutes, samples taken every 2.5 minutes   |
|      |                     | 4950  |                     | Morgan Mud check @ 5041': 81 Vis, 9.0 Wt, 6.0 WL, 1000 ppm Chl, 4# LCM (11:40 am, during FFP on DST #6)<br>DST #7 4714'-4846' Ft Sc - Celina<br>IF: BOB in 4.2"<br>ISIP: BOB in 12.8"<br>FF: BOB in 5.5"<br>ISIP: BOB in 42.5"<br>Rec: 1134' 61P & 1861' TOTAL FLUID:<br>Reversed 1.744' CGO (14% G, 86% O)<br>Dumped 117' Total Fluid below circ sub:<br>59' GMSO (28% G, 2% O, 70% M) & 58' GMCO (48% G, 32% O, 20% M)<br>Oil Gravity 34.4° API<br>IFP: 119-358#/30" ISIP: 1397#/90"<br>FFP: 377-696#/60" FSP: 1377#/90"<br>Note: vacuum truck driver said recovery was about 6 barrels. Potential recover was 23.66 barrels. Samples taken every 5 min     |
|      |                     | 5000  |                     | Morgan Mud check @ 5041': 81 Vis, 9.0 Wt, 6.0 WL, 1000 ppm Chl, 4# LCM (11:40 am, during FFP on DST #6)<br>DST #7 4714'-4846' Ft Sc - Celina<br>IF: BOB in 4.2"<br>ISIP: BOB in 12.8"<br>FF: BOB in 5.5"<br>ISIP: BOB in 42.5"<br>Rec: 1134' 61P & 1861' TOTAL FLUID:<br>Reversed 1.744' CGO (14% G, 86% O)<br>Dumped 117' Total Fluid below circ sub:<br>59' GMSO (28% G, 2% O, 70% M) & 58' GMCO (48% G, 32% O, 20% M)<br>Oil Gravity 34.4° API<br>IFP: 119-358#/30" ISIP: 1397#/90"<br>FFP: 377-696#/60" FSP: 1377#/90"<br>Note: vacuum truck driver said recovery was about 6 barrels. Potential recover was 23.66 barrels. Samples taken every 5 min     |
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|      |                     | 5100  |                     | Morgan Mud check @ 5041': 81 Vis, 9.0 Wt, 6.0 WL, 1000 ppm Chl, 4# LCM (11:40 am, during FFP on DST #6)<br>DST #7 4714'-4846' Ft Sc - Celina<br>IF: BOB in 4.2"<br>ISIP: BOB in 12.8"<br>FF: BOB in 5.5"<br>ISIP: BOB in 42.5"<br>Rec: 1134' 61P & 1861' TOTAL FLUID:<br>Reversed 1.744' CGO (14% G, 86% O)<br>Dumped 117' Total Fluid below circ sub:<br>59' GMSO (28% G, 2% O, 70% M) & 58' GMCO (48% G, 32% O, 20% M)<br>Oil Gravity 34.4° API<br>IFP: 119-358#/30" ISIP: 1397#/90"<br>FFP: 377-696#/60" FSP: 1377#/90"<br>Note: vacuum truck driver said recovery was about 6 barrels. Potential recover was 23.66 barrels. Samples taken every 5 min     |