

**OPERATOR**

Company: TDI, INC.  
 Address: 1310 BISON ROAD  
 HAYS, KANSAS 67601-9696

Contact Geologist: TOM DENNING  
 Contact Phone Nbr: 785-628-2593  
 Well Name: WILLIE # 2  
 Location: S2 NW NE SE SEC.9-T15S-R19W  
 API: 15-051-26,877-00-00  
 Pool: IN FIELD  
 State: KANSAS

Field: VIRGINIA  
 Country: USA



Scale 1:240 Imperial

Well Name: WILLIE # 2  
 Surface Location: S2 NW NE SE SEC.9-T15S-R19W  
 Bottom Location:  
 API: 15-051-26,877-00-00  
 License Number: 4787  
 Spud Date: 6/30/2017 Time: 4:30 PM  
 Region: ELLIS COUNTY  
 Drilling Completed: 7/7/2017 Time: 2:57 AM  
 Surface Coordinates: 2260' FSL & 990' FEL  
 Bottom Hole Coordinates:  
 Ground Elevation: 2028.00ft  
 K.B. Elevation: 2038.00ft  
 Logged Interval: 2700.00ft To: 3750.00ft  
 Total Depth: 3750.00ft  
 Formation: LANSING-KANSAS CITY  
 Drilling Fluid Type: CHEMICAL/FRESH WATER GEL

**SURFACE CO-ORDINATES**

Well Type: Vertical  
 Longitude: -99.4334539  
 Latitude: 38.7610241  
 N/S Co-ord: 2260' FSL  
 E/W Co-ord: 990' FEL

**LOGGED BY**

Company: SOLUTIONS CONSULTING, INC.  
 Address: 108 W 35TH  
 HAYS, KS 67601

Phone Nbr: (785) 639-1337  
 Logged By: GEOLOGIST

Name: HERB DEINES

**CONTRACTOR**

Contractor: SOUTHWIND DRILLING INC.  
 Rig #: 1  
 Rig Type: MUD ROTARY  
 Spud Date: 6/30/2017  
 TD Date: 7/7/2017

Time: 4:30 PM  
 Time: 2:57 AM

**ELEVATIONS**

K.B. Elevation: 2038.00ft  
 K.B. to Ground: 10.00ft

Ground Elevation: 2028.00ft

**NOTES**

RECOMMENDATION TO RUN PRODUCTION CASING BASED ON POSITIVE RESULTS TO LAST TWO DRILL STEM TESTS AND LOG ANALYSIS.

OPEN HOLE LOGGING BY PIONEER ENERGY SERVICES: DUAL INDUCTION LOG, DUAL COMPENSATED POROSITY LOG, MICRORESISTIVITY LOG.

DRILL STEM TESTING BY TRILOBITE TESTING INC: THREE (3) CONVENTIONAL TESTS

	<b>WILLIE # 2</b>	<b>WILLIE # 1</b>	<b>REICHERT # 1</b>
	<b>S2 NW NE SE</b>	<b>NW SE SE SE</b>	<b>N2 S2 SE NE</b>
	<b>SEC.9-15S-19W</b>	<b>SEC.9-15-19W</b>	<b>SEC.9-15-19W</b>
	<b>2038'KB</b>	<b>KB 2043'</b>	<b>KB 2044'</b>
<u>FORMATION</u>	<u>LOG TOPS</u>	<u>LOG TOPS</u>	<u>LOG TOPS</u>
<b>Anhydrite</b>	<b>1259 +779</b>	<b>+ 785</b>	<b>+ 775</b>
<b>B-Anhydrite</b>	<b>1297 +741</b>	<b>+ 749</b>	<b>+ 738</b>
<b>Topeka</b>	<b>3014 - 976</b>	<b>- 969</b>	<b>- 978</b>
<b>Heebner Sh.</b>	<b>3290-1252</b>	<b>-1246</b>	<b>-1257</b>
<b>Toronto</b>	<b>3314-1276</b>	<b>-1268</b>	<b>-1284</b>
<b>LKC</b>	<b>3338-1300</b>	<b>-1293</b>	<b>-1306</b>
<b>BKC</b>	<b>3578-1540</b>	<b>-1540</b>	<b>-1548</b>
<b>Arbuckle</b>	<b>3670-1632</b>	<b>-1620</b>	<b>-1639</b>
<b>RTD</b>	<b>3750-1712</b>	<b>-1707</b>	<b>-1710</b>

**SUMMARY OF DAILY ACTIVITY**

**6-30-17** Spud 4:30 PM, set 8 5/8" surface casing to 215' w/ 150 sxs 60/40 POS 2%gel 3%CC, WOC 8 hrs, slope 1 degree.

**7-01-17** 215', drill plug at 7:30AM

**7-02-17** 1675', drilling

**7-03-17** 2583', drilling, displaced 2658' to 2689'

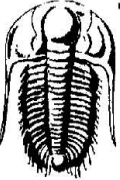
**7-04-17** 3196', drilling, CFS 3330', short trip 25 stands, CFS 3375', CFS 3400', DST # 1 3352' to 3400' "C" and "D", survey 3/4 degree @ 3400'

**7-05-17** 3400', finish DST # 1, TIWB, drilling, CFS 3530', DST # 2 3462' to 3530' "H to J"

**7-06-17** 3555', finish DST # 2, TIWB, drilling, CFS 3662' DST # 3 3630'-3662' Conglomerate sand.

7-07-17

3750', RTD @ 2:57AM, TOWB, logs, TIWB, LDDP, run production casing top and bottom stages.

 <p><b>TRILOBITE TESTING, INC.</b></p>	<b>DRILL STEM TEST REPORT</b>	
	TDI, Inc. 1310 Bison Rd Hays KS 67601+9696  ATTN: Herb Deines	<b>9-15S-19W Ellis KS</b>  <b>Willie #2</b> Job Ticket: 62984 <b>DST#: 1</b> Test Start: 2017.07.05 @ 00:12:00

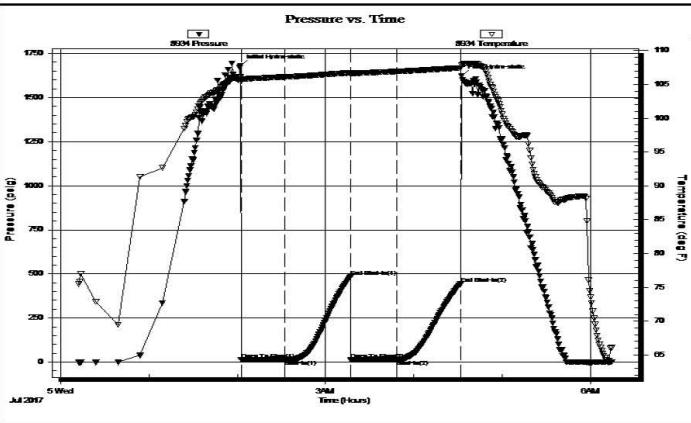
**GENERAL INFORMATION:**

Formation: <b>LKC "C-D"</b>	Test Type: Conventional Bottom Hole (Initial)
Deviated: No Whipstock: ft (KB)	Tester: Spencer J. Staab
Time Tool Opened: 02:02:30	Unit No: 84
Time Test Ended: 06:14:30	Reference Elevations: 2038.00 ft (KB)
<b>Interval: 3352.00 ft (KB) To 3400.00 ft (KB) (TVD)</b>	2029.00 ft (CF)
Total Depth: 3400.00 ft (KB) (TVD)	KB to GR/CF: 9.00 ft
Hole Diameter: 7.88 inches Hole Condition: Fair	

**Serial #: 8934 Inside**

Press@RunDepth: 15.37 psig @ 3353.00 ft (KB)	Capacity: 8000.00 psig
Start Date: 2017.07.05	Last Calib.: 2017.07.05
Start Time: 00:12:15	End Date: 2017.07.05
End Time: 06:14:30	Time On Btm: 2017.07.05 @ 02:02:15
	Time Off Btm: 2017.07.05 @ 04:32:15

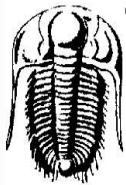
**TEST COMMENT:** 30-IF-Weak Blow ; Built to 1/4"; died back to surface  
 45-ISI-No Return  
 30-FF-No Blow  
 45-FSI-No Return



PRESSURE SUMMARY			
Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1678.43	106.12	Initial Hydro-static
1	13.67	105.52	Open To Flow (1)
31	15.08	106.13	Shut-In(1)
75	485.16	106.74	End Shut-In(1)
75	14.34	106.52	Open To Flow (2)
106	15.37	106.92	Shut-In(2)
150	445.44	107.44	End Shut-In(2)
150	1623.82	107.86	Final Hydro-static

Recovery		
Length (ft)	Description	Volume (bbl)
3.00	Mud 100%M	0.04

Gas Rates		
Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



**TRILOBITE TESTING, INC.**

**DRILL STEM TEST REPORT**

TDI, Inc.  
1310 Bison Rd  
Hays KS 67601+9696  
ATTN: Herb Deines

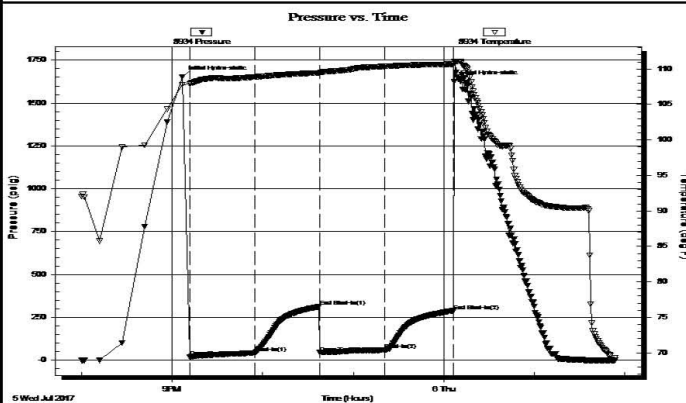
**9-15S-19W Ellis KS**  
**Willie #2**  
Job Ticket: 62985 **DST#: 2**  
Test Start: 2017.07.05 @ 20:00:15

**GENERAL INFORMATION:**

Formation: **LKC "H-I-J"**  
Deviated: No Whipstock: ft (KB)  
Time Tool Opened: 21:12:00  
Time Test Ended: 01:53:30  
Test Type: Conventional Bottom Hole (Reset)  
Tester: Spencer J. Staab  
Unit No: 84  
Interval: **3462.00 ft (KB) To 3530.00 ft (KB) (TVD)**  
Total Depth: 3530.00 ft (KB) (TVD)  
Reference Elevations: 2038.00 ft (KB)  
Hole Diameter: 7.88 inches Hole Condition: Fair  
KB to GR/CF: 9.00 ft  
2029.00 ft (CF)

**Serial #: 8934 Inside**  
Press@RunDepth: 58.70 psig @ 3463.00 ft (KB) Capacity: 8000.00 psig  
Start Date: 2017.07.05 End Date: 2017.07.06 Last Calib.: 2017.07.06  
Start Time: 20:00:00 End Time: 01:53:15 Time On Btm: 2017.07.05 @ 21:06:45  
Time Off Btm: 2017.07.06 @ 00:07:00

**TEST COMMENT:** 45-IF-Fair Blow ; BOB in 30 mins  
45-ISI-No Return  
45-FF-Fair Blow ; BOB in 31 mins  
45-FSI-No Return



**PRESSURE SUMMARY**

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1652.18	107.80	Initial Hydro-static
5	18.88	107.89	Open To Flow (1)
48	41.24	108.86	Shut-In(1)
91	311.66	109.44	End Shut-In(1)
91	43.52	109.32	Open To Flow (2)
135	58.70	110.35	Shut-In(2)
180	288.01	110.67	End Shut-In(2)
181	1625.01	111.04	Final Hydro-static

**Recovery**

Length (ft)	Description	Volume (bbl)
15.00	WGOCM 2%W 5%G 15%O 78%M	0.21
10.00	WGOCM 2%W 5%G 25%O 68%M	0.14
25.00	GWOCM 5%G 20%W 30%O 45%M	0.35
40.00	GWOCM 5%G 5%W 5%O 85%M	0.56

\* Recovery from multiple tests

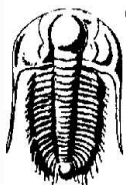
**Gas Rates**

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)

Trilobite Testing, Inc

Ref. No: 62985

Printed: 2017.07.06 @ 07:01:02



**TRILOBITE TESTING, INC.**

**DRILL STEM TEST REPORT**

TDI, Inc.  
1310 Bison Rd  
Hays KS 67601+9696  
ATTN: Herb Deines

**9-15S-19W Ellis KS**  
**Willie #2**  
Job Ticket: 62986 **DST#: 3**  
Test Start: 2017.07.06 @ 14:46:00

**GENERAL INFORMATION:**

Formation: **Conglomerate Sand**  
Deviated: No Whipstock: ft (KB)  
Test Type: Conventional Bottom Hole (Reset)

Time Tool Opened: 16:22:00  
 Time Test Ended: 21:01:30

Tester: Spencer J. Staab  
 Unit No: 84

Interval: 3630.00 ft (KB) To 3662.00 ft (KB) (TVD)  
 Total Depth: 3662.00 ft (KB) (TVD)  
 Hole Diameter: 7.88 inches Hole Condition: Fair

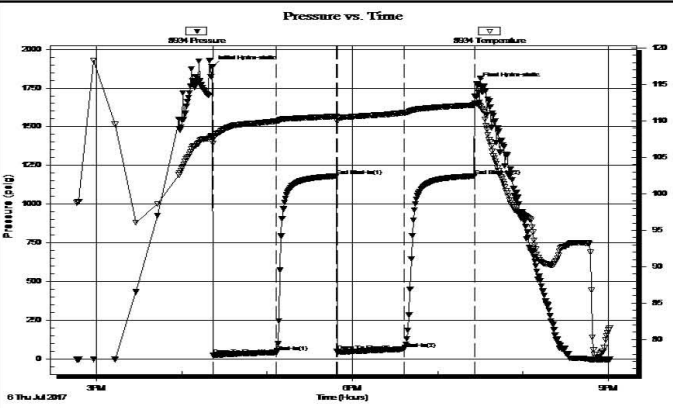
Reference Elevations: 2038.00 ft (KB)  
 2029.00 ft (CF)  
 KB to GR/CF: 9.00 ft

**Serial #: 8934 Outside**

Press@RunDepth: 65.02 psig @ 3631.00 ft (KB)  
 Start Date: 2017.07.06 End Date: 2017.07.06  
 Start Time: 14:46:15 End Time: 21:01:30

Capacity: 8000.00 psig  
 Last Calib.: 2017.07.06  
 Time On Btm: 2017.07.06 @ 16:21:45  
 Time Off Btm: 2017.07.06 @ 19:27:45

TEST COMMENT: 45-IF-Weak Blow ; Built to 6"  
 45-ISI-No Return  
 45-FF-Weak Blow ; Built to 5&3/4"  
 45-FSI-No Return



PRESSURE SUMMARY			
Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1888.10	107.95	Initial Hydro-static
1	23.12	106.92	Open To Flow (1)
45	44.00	109.97	Shut-In(1)
88	1181.22	110.63	End Shut-In(1)
88	49.02	109.95	Open To Flow (2)
135	65.02	111.12	Shut-In(2)
185	1181.39	112.17	End Shut-In(2)
186	1778.73	112.39	Final Hydro-static

Recovery		
Length (ft)	Description	Volume (bbl)
40.00	Clean Oil 100%O	0.56
90.00	MCO 40%M 60%O	1.26

Gas Rates			
	Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)

\* Recovery from multiple tests

Trilobite Testing, Inc

Ref. No: 62986

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**ROCK TYPES**

- Dolprim
- Lmst fw>7
- shale, gry
- Shcol
- Dol Lime
- Lscongl
- Carbon Sh
- Ss
- Lmst fw<7
- shale, grn
- shale, red

**ACCESSORIES**

**MINERAL**

- ▲ Chert, dark
- P Pyrite
- Sandy

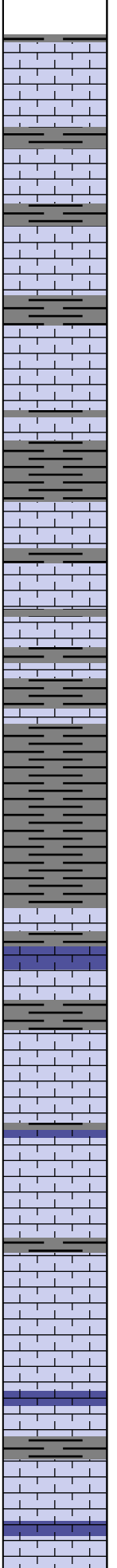
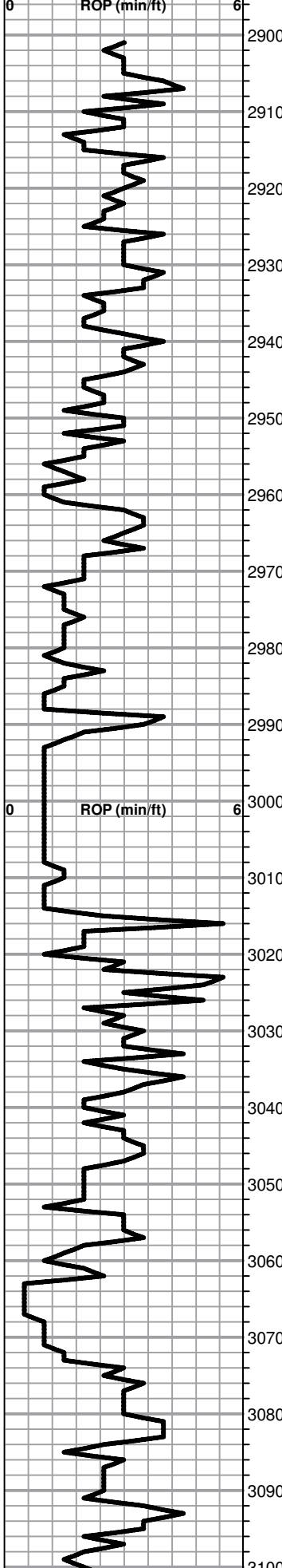
Printed by GEOstrip VC Striplog version 4.0.8.15 (www.grsi.ca)

Curve Track #1 ROP (min/ft)	—	Depth   Intervals	DST	Lithology	Oil Show	Geological Descriptions	Curve Track #3
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Cored Interval  
DST Interval

1:240 Imperial  
ROP (min/ft)

1:240 Imperial



BEGIN 1' DRILL TIME FROM 2900' TO RTD  
 BEGIN 10' WET AND DRY SAMPLES FROM 3000' TO RTD

**ANHYDRITE TOP 1259+779**  
**ANHYDRITE BASE 1297+741**

8 5/8" SURFACE CASING SET TO 215' W/ 150 SXS 60/40 POS 2%GEL 3%CC

SLOPE 1 DEGREE @ 215'

Lime, lt-med brn-gray, fnxln, slightly fossiliferous

Lime, lt brn, fnxln, slight bedded chalk

Lime, med brn, fn-vfxln

Shale, lt-med gray, soft blocky

**TOPEKA 3014-976**

Lime, lt brn, fn-vfxln

Lime, crm-lt brn, fn-vfxln

Lime, crm-lt brn, fn-vfxln, slight bedded chalk

Lime, crm-lt brn-lt gray, fn-vfxln

Lime, crm-lt brn, fnxln, increasing chalk, NS

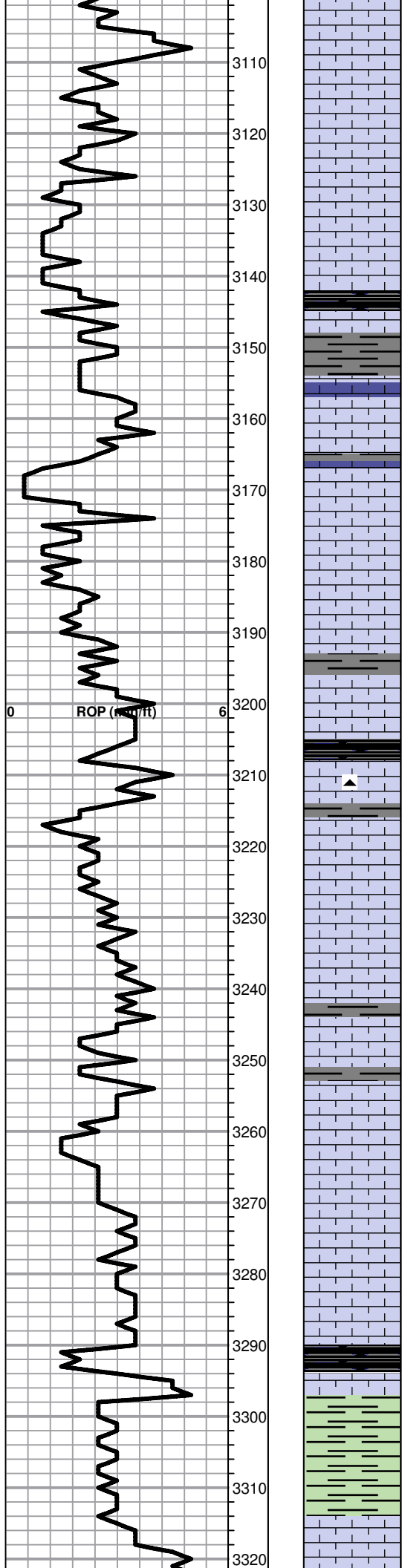
Lime, lt-dark brn, fn-vfxln

Lime, lt brn, fnxln-slightly granular in part, NS, chalk matrix in part

Lime, lt-med brn, fn-micro xln, slightly fossiliferous

Lime, lt-med brn, fn-vfxln, slightly fossiliferous

Lime, lt-med brn, fnxln, soft chalk matrix in part, NS



Lime, lt brn, fn-vfxln

Lime, lt brn, fnxln, lot of bedded chalk

Lime, lt brn, fn-vfxln, bedded soft chalk

Lime, lt brn-crm, granular with soft chalk, few fusulinids

Shale, black carbonaceous, blocky  
Lime, lt brn, fn-vfxln

Lime, crm-lt brn, fn-micro xln

Lime, crm-lt brn, fn-vfxln

Lime, lt brn, fn-micro xln

Lime, lt-med brn, fn-vfxln, slight bed chalk

Lime, crm-lt brn, fnxln

Shale, black carbonaceous, blocky

Lime, crm-lt brn, fn-micro xln

Lime, crm-lt brn, fnxln, soft on crush, chalky, NS

Lime, lt brn, fnxln-granular in part, no odor, NFO, light wet cut in few chips

Lime, crm-lt brn, fnxln-slightly granular in part

Lime, tt brn fn-vfxln

Lime, crm-lt brn, fnxln with bedded chalk, NS

Lime, lt-med brn, fnxln-slightly granular in part

Lime, lt-med brn, fn-vfxln

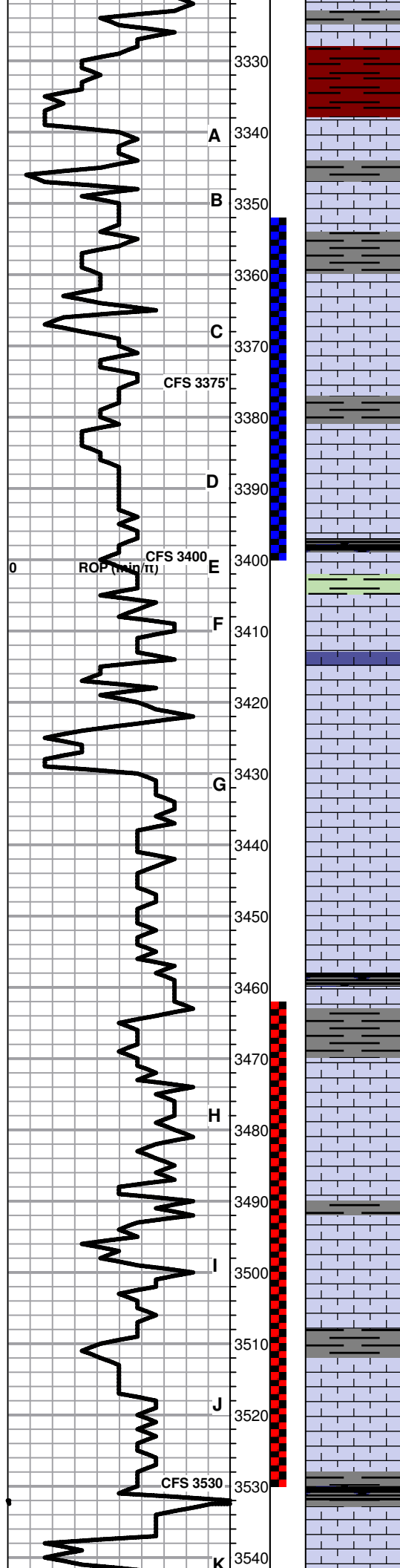
**HEEBNER SHALE 3290-1252**

Shale, black carbonaceous, fissile, blocky  
Lime, med brn, fn-micro xln

Shale, lime green, soft sticky mud clumps

**TORONTO 3314-1276**

Lime, lt brn, fnxln, NS



Lime, crm-lt brn, fn-micro xln

Shale, reddish brn, soft blocky with light red wash

**LKC 3338-1300**

Lime, lt-med brn, fn-micro xln

Lime, lt gray, fn-vfxln, slightly fossiliferous

Lime, crm-lt brn, fnxln with zone of soft chalky lime. Spotty stain, NFO, no odor and very little oomoldic material

Lime, crm-lt brn-med gray, fnxln with thin cemented oolitic beds, NS

Lime, lt-med brn, fn-vfxln, spotty staining, NFO, lt odor in fine pinpoint vuggy porosity. Does not appear to be well developed

Shale, black carbonaceous, blocky

Lime, lt grayish green, fn-vfxln

Lime, crm, fn-vfxln, slight bedded chalk, NS

Lime, crm-lt brn, fnxln, bedded chalk, NS

Lime, crm-lt brn, chalk in soft matrix, NS

Lime, lt-med grayish brn, fn-vfxln

Lime, crm-lt brn, fn-vfxln

Lime, crm-lt brn, fn-vfxln

Shale, black carbonaceous, blocky

Lime, crm-lt brn, fn-vfxln, fine staining in microfossil casts, NFO, very lt odor, not well developed

Lime, crm-tan, fn-micro xln

Lime, white - crm, fn-micro xln, scattered staining in spotty fine vuggy porosity, NFO, no odor, some gilsonitic dead oil staining in part

Lime, offwhite-crm, fn-vfxln

Lime, crm, micro xln and brittle on crush

Lime, crm, micro xln

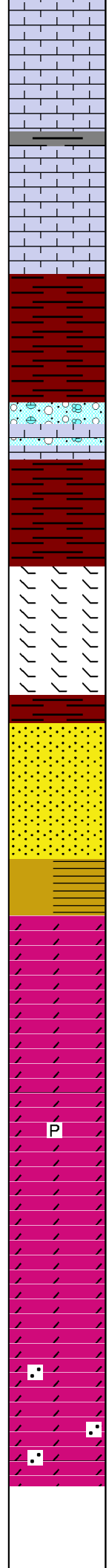
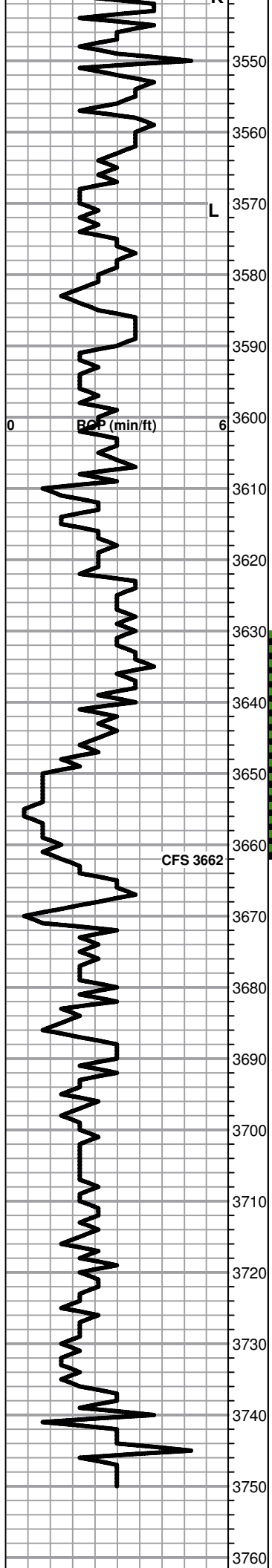
Lime, white-crm, fnxln-granular in part with spotty dead oil staining, NFO, no odor

DST # 1 3352' TO 3400' SEE HEADER FOR TEST SUMMARY

SLOPE 3/4 DEGREE @3400'

DST # 2 3462' TO 3530' SEE HEADER FOR TEST SUMMARY





Lime, buff, fn-micro xln, bedded chalk  
 Lime, white-crm, fnxln to granular in part  
 Lime, crm-lt brn, fn-micro xln

Lime, lt brn, fn-micro xln, bedded chalk

**BKC 3578-1540**

Shale, reddish brn, soft-firm blocky

Lime, crm-lt brn, red shale staining in part, appears to be clastic in composition

Shale, reddish brn, soft blocky

Lime, crm-lt brn, fn-vfxln, orange chert, fresh sharp

Lime, crm-lt brn, fnxln, dolomitic, NS

**CONGLOMERATE SAND 3643-1605**

Sandstone, quartz, poor to fair sorting of fine grained material, white clay cementing in part, scattered to saturated staining in better sorted sandstone absent white clays, friable, no reaction to acid test.

Shales and clays, vari colored, soft blocky

**ARBUCKLE 3670-1632**

Dolomite, crm, fnxln, NS, scattered gilsonitic specks in part

Dolomite, crm, fnxln-fine granular, slight gilsonite content, NFO, no odor

Dolomite, crm, fnxln-fine granular, slightly pyritic

Dolomite, white-crm, fnxln-fine granular

Dolomite, crm, fnxln-fine granular

Dolomite, crm, fn-vfxln, few quartz clusters and inclusions

Dolomite, white-crm, fn-vfxln with increasing quartz inclusions

**RTD 3750-1712 LTD 3750-1712**

DST # 3 3630' TO 3662' SEE HEADER FOR TEST SUMMARY

RAN 5 1/2" 15.5#  
 PRODUCTION CASING SET TO 3745' W/ 150 SXS COMMON. DV SET AT 1239' W/ 300 SXS 60/40 POS 6% GEL

SLOPE 1 DEGREE@ RTD

