

**OPERATOR**

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

Contact Geologist: TOM DENNING  
 Contact Phone Nbr: 785-628-2593  
 Well Name: ENGEL NORTH # 2  
 Location: NE SW SW NE, SEC.21-T15S-R18W  
 API: 15-051-26,726-00-00  
 Pool:  
 State: KANSAS

Field: SCHOENCHEN  
 Country: USA



Scale 1:240 Imperial

Well Name: ENGEL NORTH # 2  
 Surface Location: NE SW SW NE, SEC.21-T15S-R18W  
 Bottom Location:  
 API: 15-051-26,726-00-00  
 License Number: 4787  
 Spud Date: 9/24/2014 Time: 1:00 PM  
 Region: ELLIS COUNTY  
 Drilling Completed: 9/29/2014 Time: 10:05 PM  
 Surface Coordinates: 2015' FNL & 2225' FEL  
 Bottom Hole Coordinates:  
 Ground Elevation: 2021.00ft  
 K.B. Elevation: 2031.00ft  
 Logged Interval: 2900.00ft To: 3725.00ft  
 Total Depth: 3725.00ft  
 Formation: ARBUCKLE  
 Drilling Fluid Type: CHEMICAL/FRESH WATER GEL

**SURFACE CO-ORDINATES**

Well Type: Vertical  
 Longitude: -99.3272203  
 Latitude: 38.7349064  
 N/S Co-ord: 2015' FNL  
 E/W Co-ord: 2225' FEL

**LOGGED BY**

Company: SOLUTIONS CONSULTING, INC.  
 Address: 108 WEST 35TH STREET  
 HAYS, KANSAS 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: 9/24/2014 Time: 1:00 PM  
 TD Date: 9/29/2014 Time: 10:05 PM

**ELEVATIONS**

K.B. Elevation: 2031.00ft  
K.B. to Ground: 10.00ft

Ground Elevation: 2021.00ft

**NOTES**

RECOMMENDATION TO RUN PRODUCTION CASING BASED ON FAVORABLE RESULTS OF DST # 1 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: ONE (1) STRADDLE TEST


**FORMATION TOPS COMPARISON**

	ENGEL NORTH #2 NE SW SW NE SEC.21-15S-18W 2021'GL 2031'KB	ENGEL #6 E2 SW NE SEC.21-15-18W KB 1997'	ENGEL # 1 SW SW SE NE SEC.21-15-18W KB 1987'
<u>FORMATION</u>	<u>LOG TOPS</u>	<u>LOG TOPS</u>	<u>LOG TOPS</u>
Anhydrite	1191+ 840	+ 841	+ 840
B-Anhydrite	1227+ 804	+ 803	+ 806
Topeka	3009 - 978	- 967	- 965
Heebner Sh.	3273-1242	-1235	-1232
Toronto	3294-1263	-1252	-1252
LKC	3323-1292	-1285	-1282
BKC	3546-1515	-1511	-1507
Rework Arbuckle	3606-1575		
Arbuckle	3622-1591	-1585	-1578
RTD	3725-1694	-1690	-1663

**SUMMARY OF DAILY ACTIVITY**

9-24-14 RU, spud 1:00 PM  
 9-25-14 1177', set 8 5/8" surface casing to 1194' w/ 375 sxs SMD, slope 3/4 degree, plug down 3:45PM, WOC 12 hrs  
 9-26-14 1200', rig repair  
 9-27-14 1806', drilling  
 9-28-14 2750', drilling, displaced 2850'-2885'  
 9-29-14 3375', drilling, CFS 3375', RTD 3725' @ 10:05 PM, CCH, short trip  
 9-30-13 3725', TOWB, slope 1 degree, logs, Straddle DST # 1 3520' to 3634' Arbuckle, TIWB, LDDP, run production casing  
 10-01-14 3725' finish running casing and cementing. PD

**DST # 1 TEST SUMMARY**

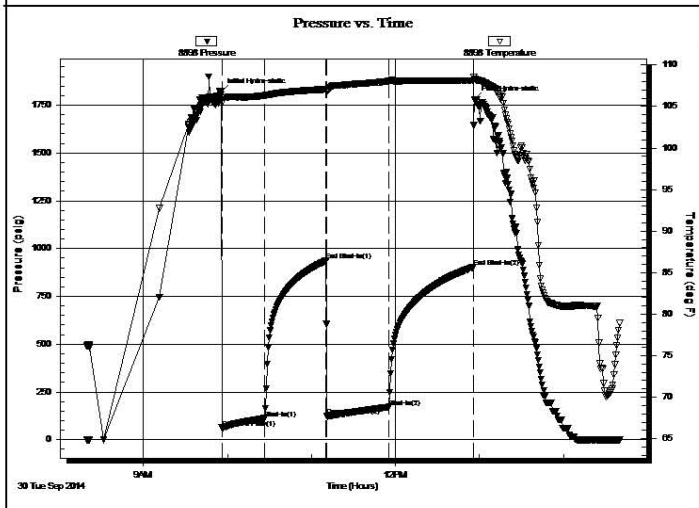
	<b>DRILL STEM TEST REPORT</b>	
	TDI INC 1310 Bison Rd. Hays KS 67601 ATTN: Herb	<b>21-15s-18w-Ellis Co</b> <b>Engel North #2</b> Job Ticket: 60520 <b>DST#: 1</b> Test Start: 2014.09.30 @ 08:19:38

**GENERAL INFORMATION:**

Formation: <b>Arbuckle</b>	Test Type: Conventional Straddle (Initial)
Deviated: No Whipstock: ft (KB)	Tester: Tate Lang
Time Tool Opened: 09:55:58	Unit No: 77
Time Test Ended: 14:40:17	Reference Elevations: 2031.00 ft (KB)
Interval: <b>3530.00 ft (KB) To 3634.00 ft (KB) (TVD)</b>	2021.00 ft (CF)
Total Depth: 3634.00 ft (KB) (TVD)	KB to GR/CF: 10.00 ft
Hole Diameter: 7.88 inches Hole Condition: Good	

<b>Serial #: 8898</b>	<b>Outside</b>	Capacity: 8000.00 psig
Press@RunDepth: 170.95 psig @ 3527.00 ft (KB)	End Date: 2014.09.30	Last Calib.: 2014.09.30
Start Date: 2014.09.30	End Time: 14:40:18	Time On Btm: 2014.09.30 @ 09:55:48
Start Time: 08:19:39		Time Off Btm: 2014.09.30 @ 12:56:38

**TEST COMMENT:** 30-B.O.B. in 15 mins  
 45-Weak surface blow  
 45-B.O.B. in 19 mins  
 60-Weak surface blow



PRESSURE SUMMARY			
Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1821.26	106.38	Initial Hydro-static
1	63.18	105.42	Open To Flow (1)
31	112.57	106.31	Shut-In(1)
75	935.67	107.06	End Shut-In(1)
75	123.37	106.75	Open To Flow (2)
120	170.95	108.06	Shut-In(2)
180	902.38	108.13	End Shut-In(2)
181	1781.37	108.31	Final Hydro-static

Recovery		
Length (ft)	Description	Volume (bbl)

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














136.00	GO 25%G 75%O	1.91
126.00	MCO 50%M 50%O	1.77
63.00	MCOGO 10%M 30%G 60%O	0.88
0.00	175 GIP	0.00

Trilobite Testing, Inc

Ref. No: 60520

Printed: 2014.09.30 @ 15:36:45

**ROCK TYPES**

 Clystgy	 Dolsec	 shale, grn	 shale, red	 Lscongl
 Chtcongl	 Lmst fw<7	 shale, gry	 Shcol	
 Dolprim	 Lmst fw>7	 Carbon Sh	 Slst	

**ACCESSORIES**

**MINERAL**

- ▲ Chert, dark
- P Pyrite

**FOSSIL**

- ⊕ Oolite
- ⊕ Oomoldic
- ⊕ Fossilinid

**OTHER SYMBOLS**

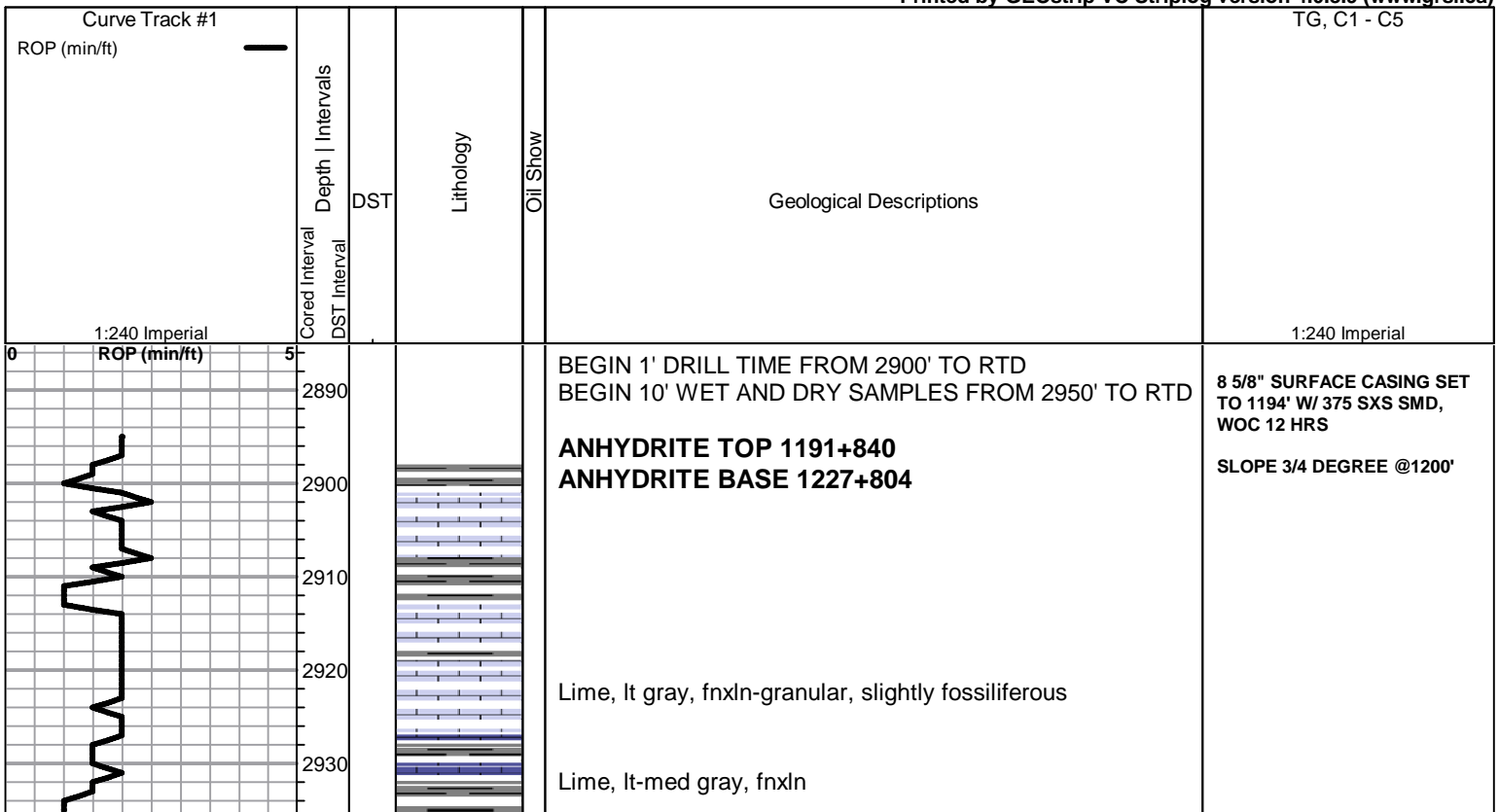
**Oil Show**

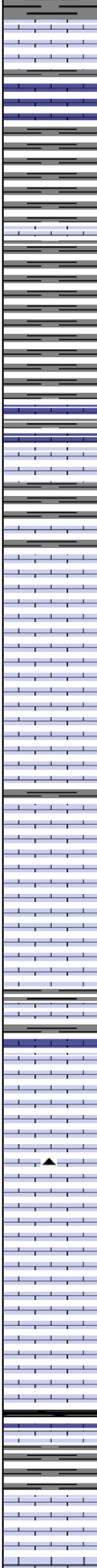
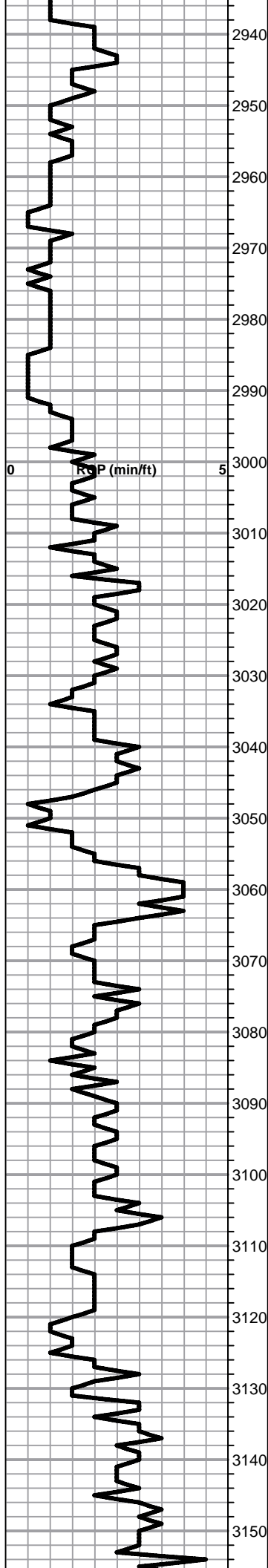
- Good Show
- Fair Show
- Poor Show
- Spotted or Trace
- Questionable Stn
- D Dead Oil Stn
- Fluorescence
- \* Gas

**DST**

- DST Int
- DST alt
- Core
- tail pipe

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Lime, med brn-gray, fnxln-granular, gray mottling in part

Shale, lt-med gray, soft mud to soft blocky

Shale, dove gray-med gray, soft mud to soft blocky

Lime, med-dark brn, fnxln becoming lt-med brn, fnxln with depth

**TOPEKA ELog 3009-978**

Lime, lt-med brn, fnxln, thin fossil beds in part

Lime, lt brn, fnxln, chalky matrix with white chalk wash

Lime, lt-med brn, fnxln-granular, chalk matrix with white chalk matrix, slightly fossiliferous

Lime, lt brn, fnxln, slight bedded chalk, slightly fossiliferous-fusulinids

Lime, lt brn-lt grayish brn, fnxln-granular,lt chalk matrix in part with bedded chalk, NS

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

Lime, lt-med brn-lt grayish brn, fnxln-granular in part, slight bedded chalk

Lime, lt-med brn, fnxln, lt chalk wash in bedded chalk

Lime, crm-lt brn, granular with chalk matrix with bedded chalk in part

Lime, lt-med brn, fnxln-granular, slight bedded chalk, slightly fossiliferous  
 Chert, lt gray, fresh, sharp

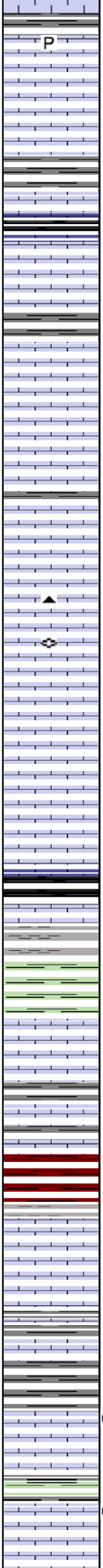
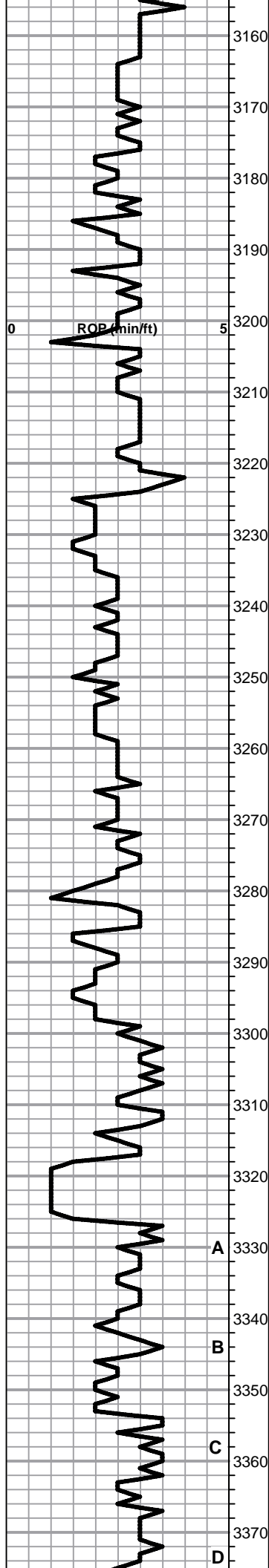
Lime, lt brn, granular, bedded chalk with sticky clumping, slightly fossiliferous

Lime, lt-med brn, fn-micro xln

Shale, gray-black carbonaceous, blocky

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

Lime, crm-tan with graving tinting near shale boundary.



Lime, crm-tan with grayish tinting near shale boundary, fnxln

3160 P  
Lime, crm-lt brn, fnxln, slightly fossiliferous, slight bedded chalk, scattered xln pyrite

3170  
Lime, lt-med brn, fnxln, slight bedded chalk

3180  
Lime, lt-med brn, fnxln  
Shale, black carbonaceous, blocky

3190  
Lime, lt-med brn, fnxln-granular, bedded chalk

3200  
Lime, lt brn-med grayish brn, fnxln

3210  
Lime, lt brn-lt grayish brn, fnxln, slight bedded chalk

3220  
Lime, lt brn, fnxln, bedded chalk with white chalky wash

3230  
Lime, tan-lt brn, granular, bedded chalk with lt chalk wash

3240 ▲  
○  
Lime, tan-lt brn, granular, chalk matrix with bedded chalk, scattered fusulinids

3250  
Lime, tan-lt-med brn, fnxln-granular, bedded chalk

3260  
Lime, tan-lt brn, fnxln-granular, slight bedded chalk

3270

**HEEBNER SHALE SPL 3277-1246 ELog 3273-1242**

3280  
Shale, black carbonaceous, fissile, blocky  
Lime, med brn, fn-vfxln

3290  
Shale, dove gray-lime green, soft mud

**TORONTO SPL 3298-1267 ELog 3294-1263**

3300  
Lime, crm, fn-vfxln, slight bedded chalk, NS

3310  
Lime, crm-lt brn, fn-vfxln, slight bedded chalk in part

3320  
Shale, red-med brn, soft mud with lt red wash

**LKC SPL 3225-1294 ELog 3323-1292**

A 3330  
Lime, crm-lt brn, fn-micro xln slight bedded chalk, NS

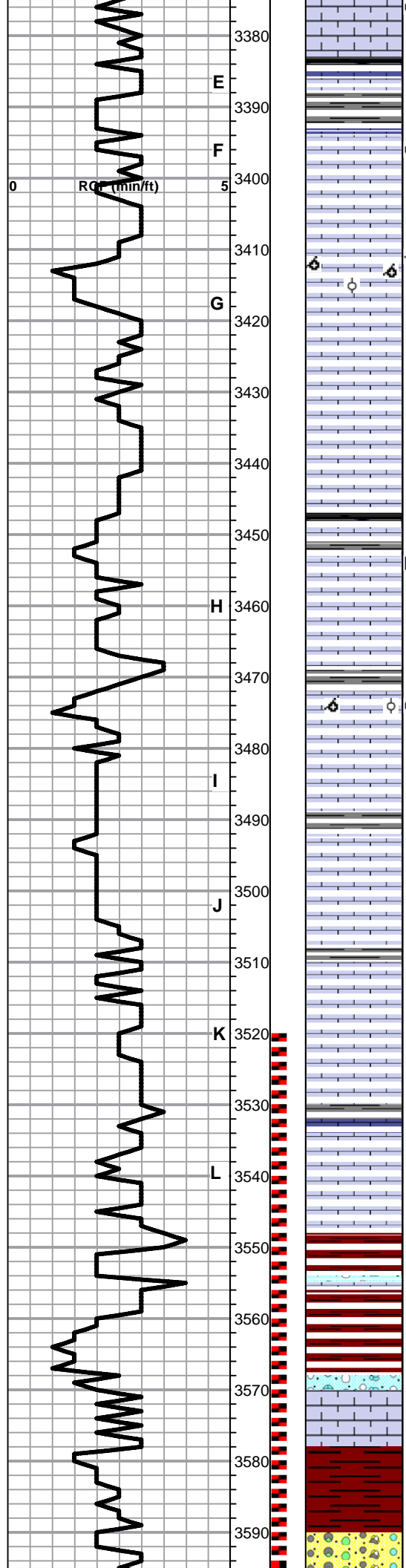
3340  
Lime, lt-med brn, fnxln-vfxln  
B  
Shale, med gray with gray wash

3350  
○ Lime, tan-crm, fnxln, lot of bedded chalk, few chips with trace of lt staining, NFO, No Odor

C 3360  
Lime, crm-tan-lt brn, fnxln  
Shale, med green, soft sticky clumps

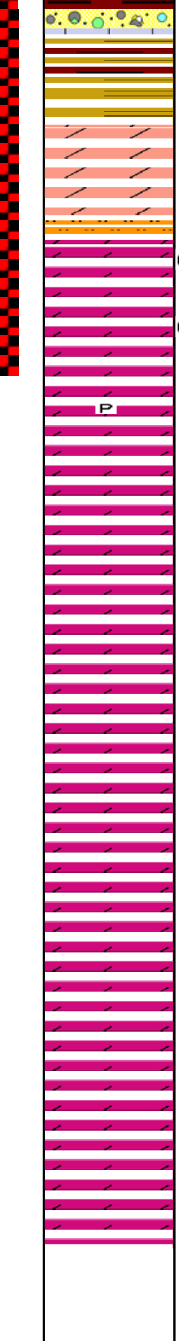
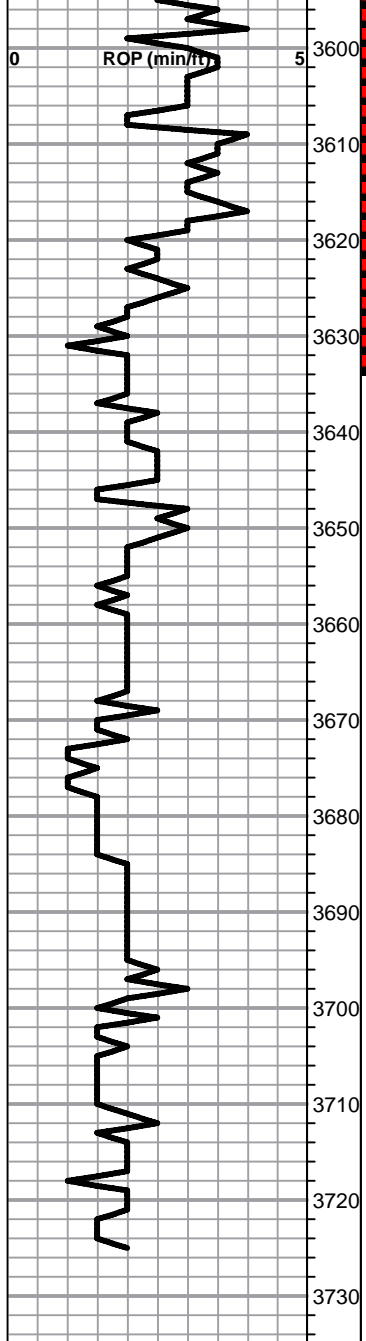
3370  
○ Lime, tan-lt brn, fnxln-granular in part, bedded chalk trace of lt spotty stain, NFO, No Odor in poorly developed porosity zone

D



Lime, tan, fnxln, trace of staining, NFO, VLT Odor, spotty staining in fossil casts and fine vug porosity  
 Shale, black carbonaceous  
 Lime, lt brn with lt gray tint, fnxln  
 Lime, tan-lt gray, fnxln, few chips with trace of stain, NFO, No Odor  
 Lime, crm-tan, fnxln, moderate bedded chalk, NS  
 Lime, crm-tan, fnxln, slight bedded chalk  
 Lime, crm-tan, oomoldic in part, no detected staining or SFO but had lite odor, most chips barren of staining  
 Lime, tan-lt brn, fnxln, slight bedded chalk  
 Lime, crm-lt brn, fn-vfxln, moderate bedded chalk  
 Lime, crm-lt brn, fn-micro xln, slight bedded chalk  
 Lime, tan-lt brn with increasing darker brn near shale boundary  
 Lime, med-dark brn, fnxln  
 Lime, crm-tan, fnxln, slight bedded chalk, scattered flaky gilsonitic deposits, NFO, No Odor  
 Lime, crm-tan, fn-micro xln, slight bedded chalk  
 Lime, crm-tan, fnxln, thin oomoldic zone with saturated staining, NFO, No Odor  
 Lime, tan-lt brn, fnxln, slight bedded chalk  
 Lime, crm-tan, fnxln, moderate bedded chalk ,NS  
 Lime, crm-tan, fn-micro xln, slight bedded chalk  
 Shale, gray-black, soft blocky  
 Lime, crm, fn-vfxln-slightly granular in part, NS, No Odor  
 Lime, crm-lt brn, fnxln, slight bedded chalk, NS  
 Shale, brn-gray, sot-firm blocky  
 Lime, crm-tan, fn-micro xln, slight bedded chalk, NS  
 Lime, lt brn with gray tint, vf-micro xln  
**BKC SPL 3550-1519 ELog 3546-1515**  
 Shale, red-brn, soft with lt red wash  
 Shale, vari color, soft-sticky clumping in part  
 Lime, lt brn, granular, moderately chalky with white chalk wash, clastic lime mix in part  
 Shale, reds, browns, maroon, soft-firm blocky  
 Shale, vari color with chert nodules

**DST # 1 STRADDLE TEST  
 3520' TO 3634' SEE HEADER  
 FOR TEST SUMMARY**



Cherts, vari color, fresh sharp, scattered flaky gilsonitic deposits, NFO, No odor, lt red shale wash

**REWORKED ARBUCKLE ELog 3606-1575**

Dolomite, ivory-crm, granular but lacking visible porosity, very lt odor, clumps of white sticky clay and siltstone

**ARBUCKLE SPL 3620-1589 ELog 3622-1591**

Dolomite, lt brn, granular, euhedral in part, good odor with lt saturated staining,

Dolomite, lt brn, granular, med to coarse xln rhombic, fair odor with saturated staining

Dolomite, ivory, med-coarse granular, lt odor, lt chalky wash, scattered xln pyrite

Dolomite, ivory-crm, granular, scattered quartz grain inclusions in part

Dolomite, lt brn, fnxln-granular, soft sticky clumps of dolomitic chalk,

Dolomite, crm-lt brn, granular, scattered sucrosic chips

Dolomite, ivory-crm, granular, fn-med grained, chalky white wash

Dolomite, crm-lt brn, fnxln-granular, white chalk wash

Dolomite, crm, fnxln-granular, sticky chalk clumping

Dolomite, crm, fnxln-granular, bedded sticky dolomitic chalk,

Dolomite, crm, granular, white chalk wash

Dolomite, crm, granular, white chalk wash

**RTD 3725-1694 LTD 3723-1692**

5 1/2" 14# PRODUCTION CASING SET TO 3708' W/ 175 SXS EA2, MH W/ 20 SXS, RH W/ 30 SXS

SLOPE 1 DEGREE @ 3725'