

Supplemental Material

“New Reservoir Model from an Old Oil Field— Garfield Conglomerate Pool, Pawnee County, Kansas”

by James P. Rogers, 2007

This Kansas Geological Survey open-file report includes supplemental material not included in the publication Rogers, J. P., 2007, New reservoir model from an old oil field—Garfield conglomerate pool, Pawnee County, Kansas: AAPG Bulletin, v. 91, p. 1,349–1,365.

NOTE, For space reasons, the following text was omitted from Rogers, J. P., 2007, New reservoir model from an old oil field—Garfield conglomerate pool, Pawnee County, Kansas: AAPG Bulletin, v. 91, p 1,349-1,365. These paragraphs were originally intended to be included in the section marked “Stratigraphy, Sequences and Boundaries” (p. 1,353), but were deleted to conform to the standards of AAPG’s “E & P Notes” format. They are reproduced here (Kansas Geological Survey OF 2008-3) for use by those who have day-to-day needs to work with the subject formations in detail.

Defining the Lower Boundary of the PBC

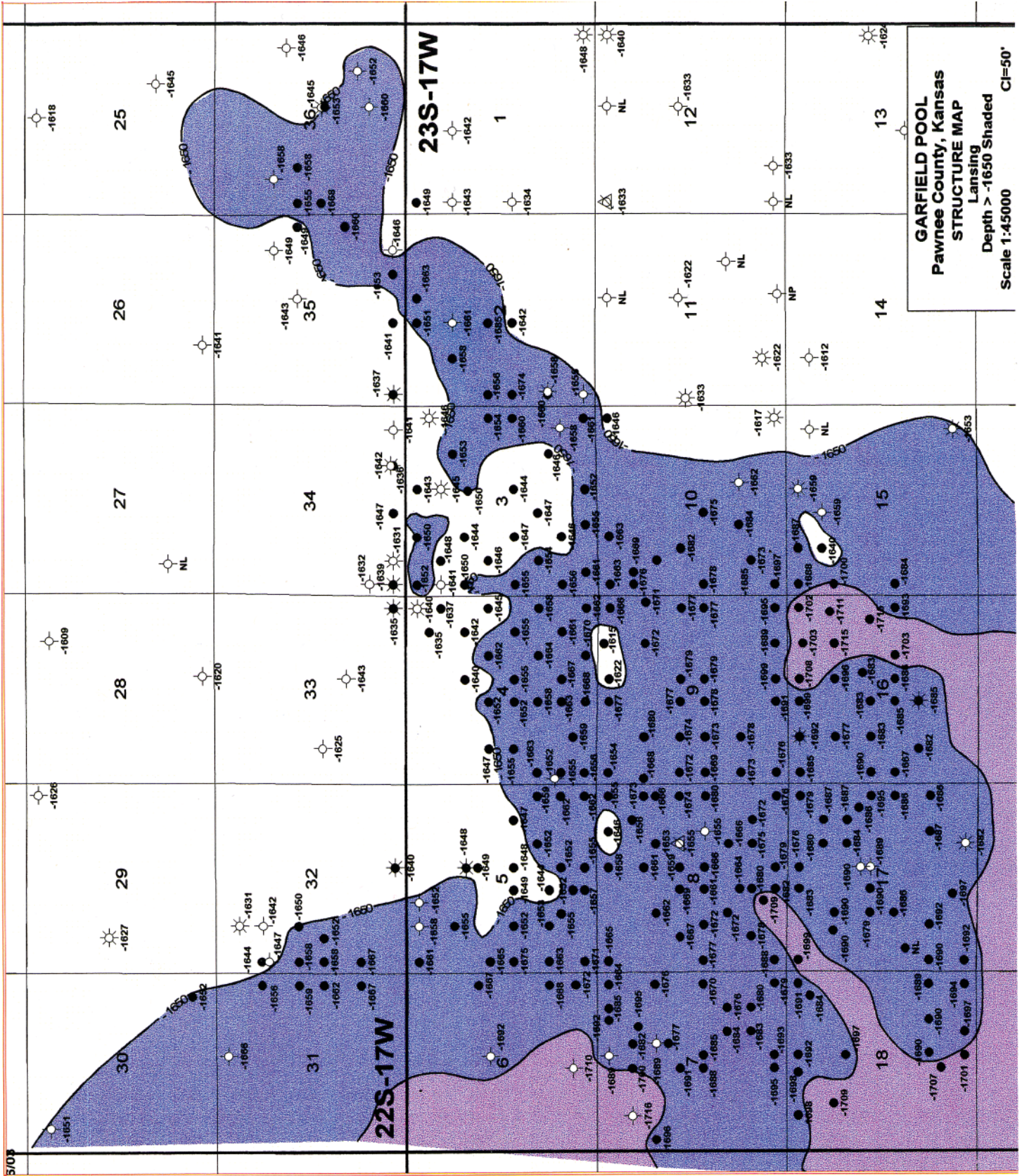
Rocks of Mississippian, Ordovician and Precambrian age were exposed and truncated prior to regional Pennsylvanian transgression in western Kansas, and this irregular surface forms the base of the PBC in this immediate area. At Garfield Pool identifying this boundary is a great challenge because:

1. The average “congressional” section at Garfield Pool contains twenty five producing wells, and (on average) only one of these boreholes in each section has drilled through the complete section of lower Pennsylvanian, Mississippian and Ordovician strata.
2. Many of the boreholes at Garfield Pool have (a) reached total depth within the Conglomerate (PBC) interval, just a few feet above the unconformity, or (b) have penetrated so little of the Pre-Pennsylvanian section that Mississippian and older strata are not adequately represented on wireline logs.
3. There is always uncertainty about weathered and brecciated rubble at the unconformity surface. Is the rubble simply collapsed within the space in which it was originally deposited (in which case it is Mississippian in age), or has it been moved horizontally by erosion and/or fluvial processes (in which case it is Pennsylvanian in age)?
4. Where penetrated near total depth, the lithologic distinction between a few feet of Osage Mississippian rocks or a few feet of Viola Ordovician strata is almost impossible because Mississippian and Ordovician cherts and carbonates are very similar in this area.

To compound these problems, the ancient topographic surface of the pre-Pennsylvanian unconformity in Pawnee County is very irregular due to variations in resistance to erosion of truncated strata and due to karst processes. As a result the local pattern of subcrop distribution is completely unpredictable, unlike some other areas in western Kansas. To deal with these complex issues on a well-by-well basis, the following somewhat *arbitrary rules* for local subsurface log correlation have been used in this study:

1. In most Garfield boreholes where cuttings (tied to log depth) and Mississippian log signatures are distinctive (Figure 6, page 1356), the Osage and/or Misener formation tops are marked as the position of the unconformity surface (and the base of the conglomerate) with some confidence. Often these correlation “anchors” have been used in the interpretation of adjacent boreholes, even where log tops are less obvious.
2. In other boreholes at and near Garfield, cuttings in conglomerate intervals contain distinctive chips of porous, oil-stained sandstone (matrix) along with the usual collection of chert-pebble chips and clear, coarse, well-rounded quartz grains. It is not uncommon to find a few chips where the oil-stained sandstone matrix is still adhering to the chert/limestone fragment. (Photomicrographs from petrographic sections of these sandstone chips are attached for the interested reader.) By itself, the presence of oil-saturated, sandstone chips in cuttings from a questionable interval is a strong indicator that a particular bed is conglomerate and not (Osage) bedded chert/limestone.
3. From observation of rare, “full” penetrations of Mississippian strata near Garfield, it is usually the case that where preserved, the Osage consists of thick limestone and chert beds, interrupted by only one (or perhaps two) thin (Osage) calcareous shale beds. A reported “Osage” bed sequence that includes several, substantial beds of shale are immediately suspect. In almost every case, careful cuttings examination suggests that the “Osage” chert beds in this circumstance are in fact beds of cherty conglomerate, documented by the presence of fine-grained sandstone as described in “2”, above. In these and other cases, for the purposes of this study (and usually based on careful cuttings study), it has been necessary to overrule some operator’s Osage tops.
4. In the common case where recognizable log signatures of the Mississippian Osage cherty limestone and Kinderhookian sandstone *are clearly absent*, we have concluded that erosion has removed all Mississippian beds and deposited conglomerate to total depth in their place. Limited study of cuttings has not disputed these interpretations. On several occasions this situation requires ignoring published pre-Pennsylvanian tops, which may have been based solely on the operator/wellsite geologist finding chert fragments in the cuttings.
5. Near the eastern and northern boundaries of the field, many operators or wellsite geologists have called (Ordovician) Viola tops *below* the base of the (wire-line) logged interval, at locations where all Mississippian strata should have been removed. When consistent with (confirmed) Conglomerate intervals in adjacent locations, most of these Ordovician tops have been honored as the position of the unconformity and the base of the Conglomerate, even lacking confirmation from cuttings.

The foregoing methods may lead to miscorrelation in rare cases, but are practicably supportable when used with consistency. The reader may review all subsurface data and tops collected from about 350 wells in preparation of this study by opening the data-table pdf included in this open-file report from the Kansas Geological Survey.



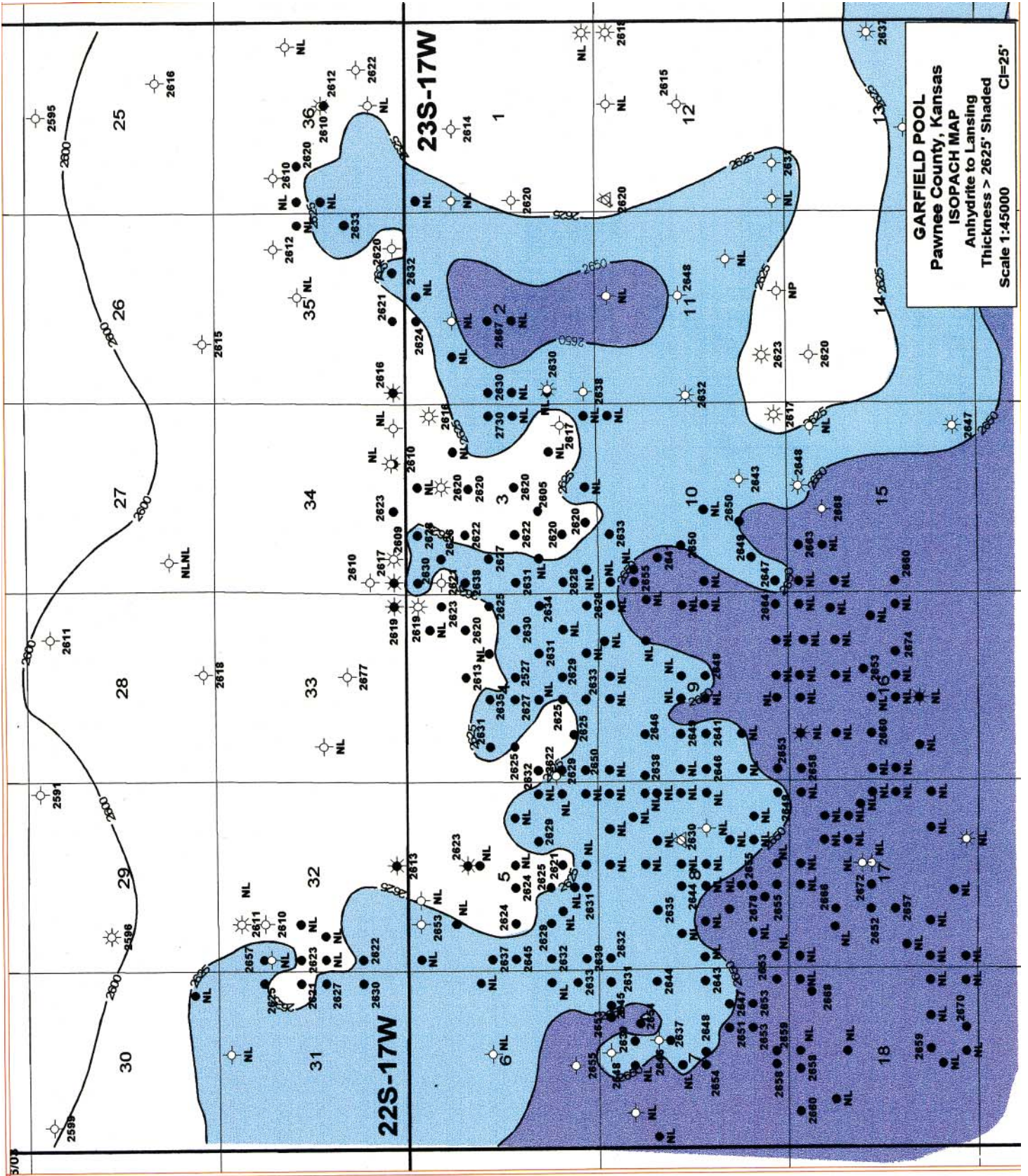
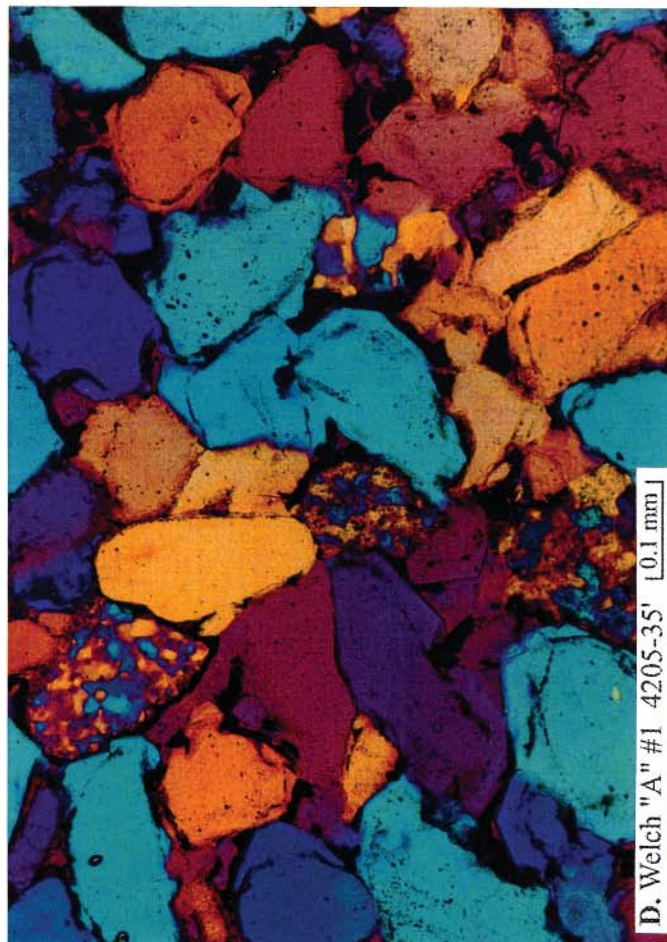
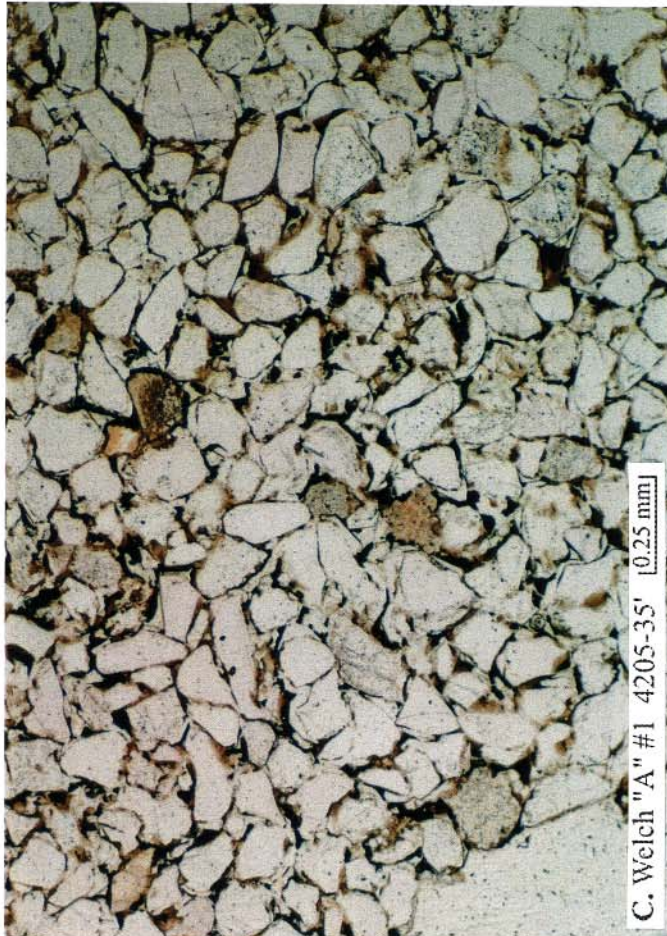
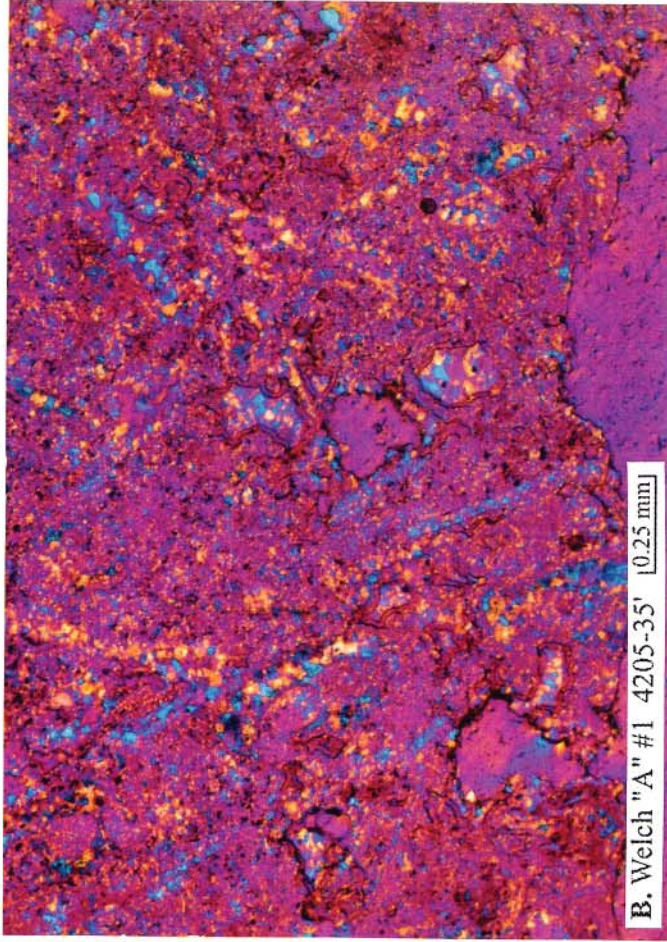
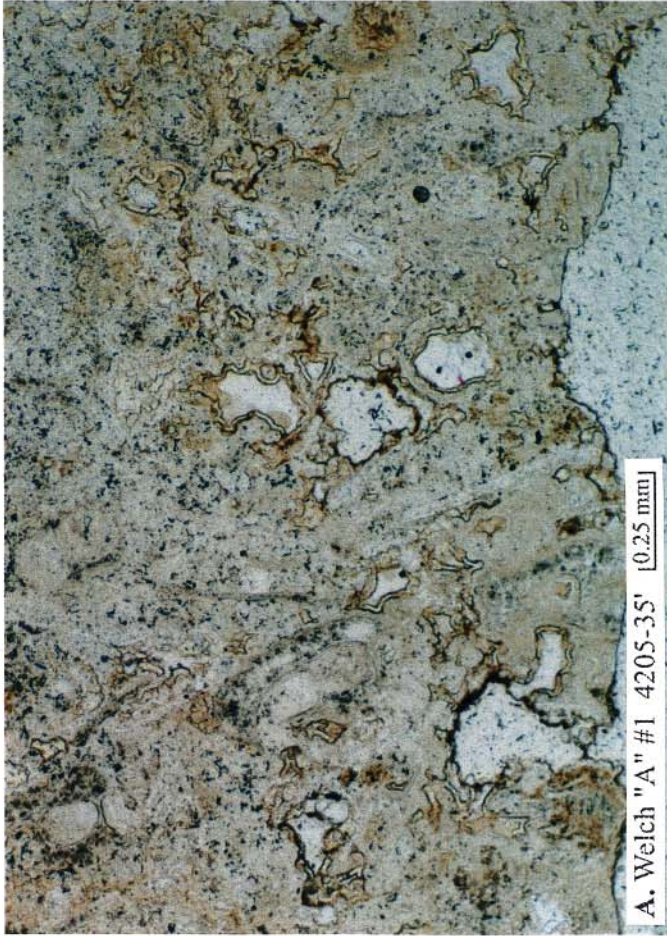
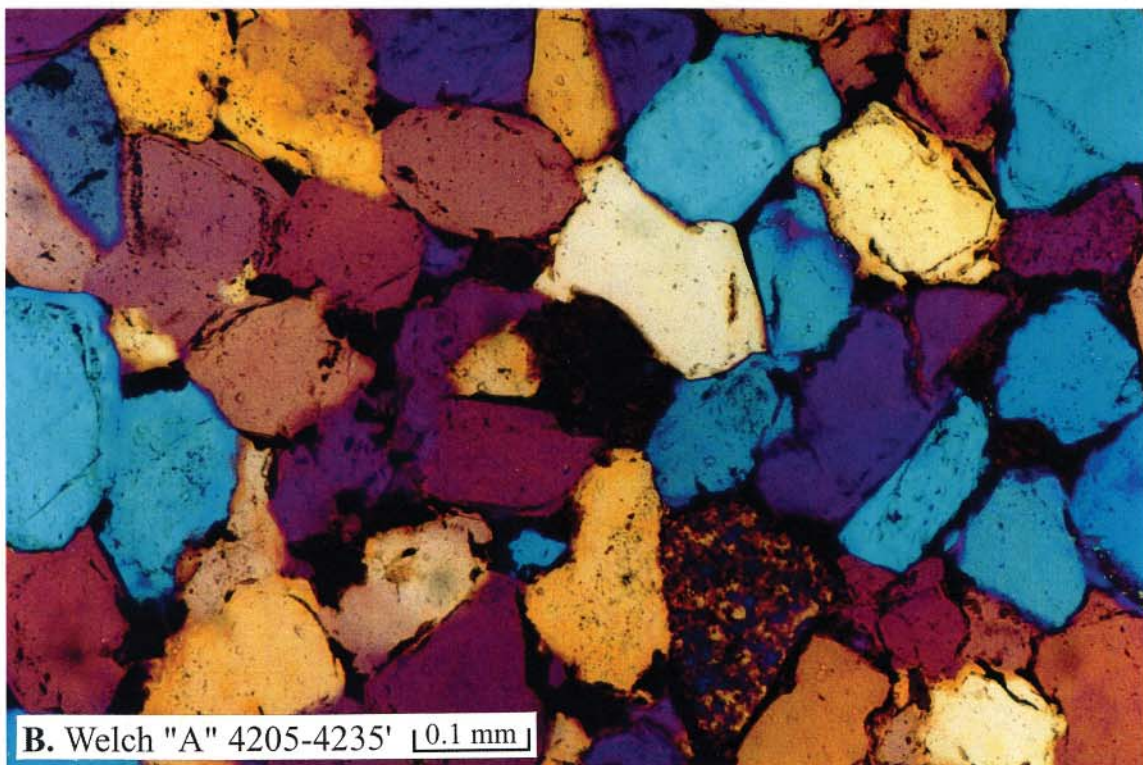
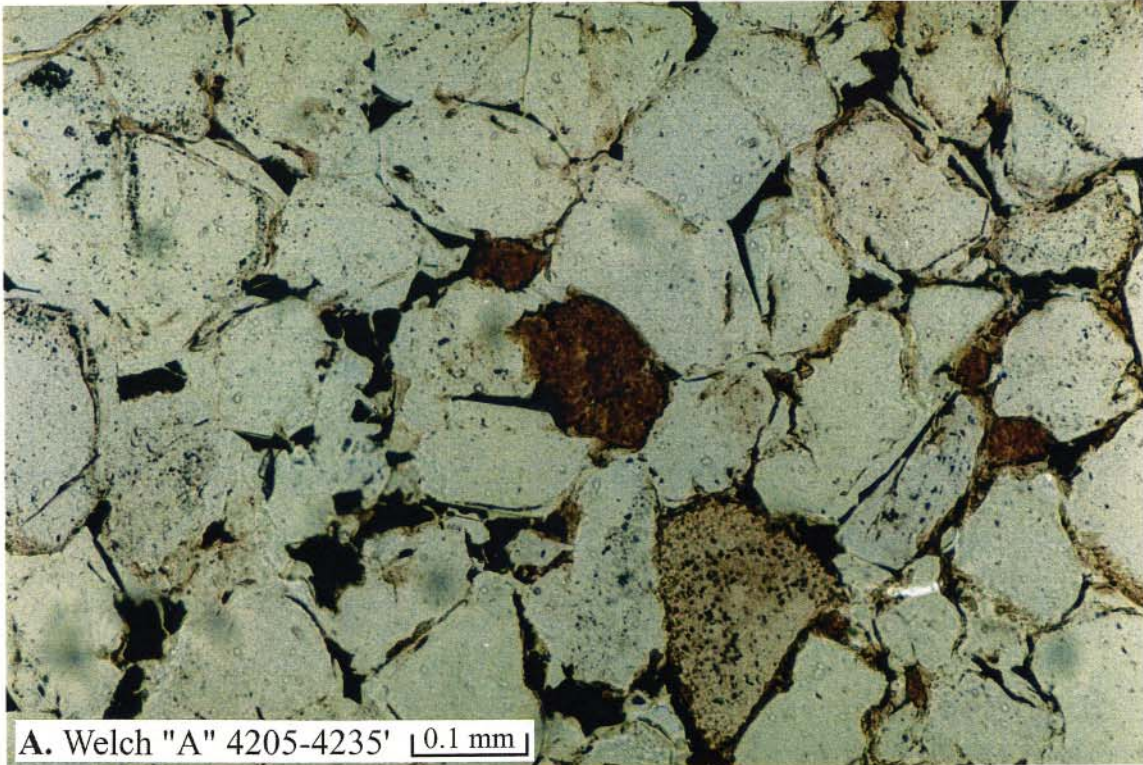


Plate 1. Welch "A" #1, 4205-35 ft. Vugs in Spiculitic Chert and Oil Residue in Cherty Quartz Sandstone

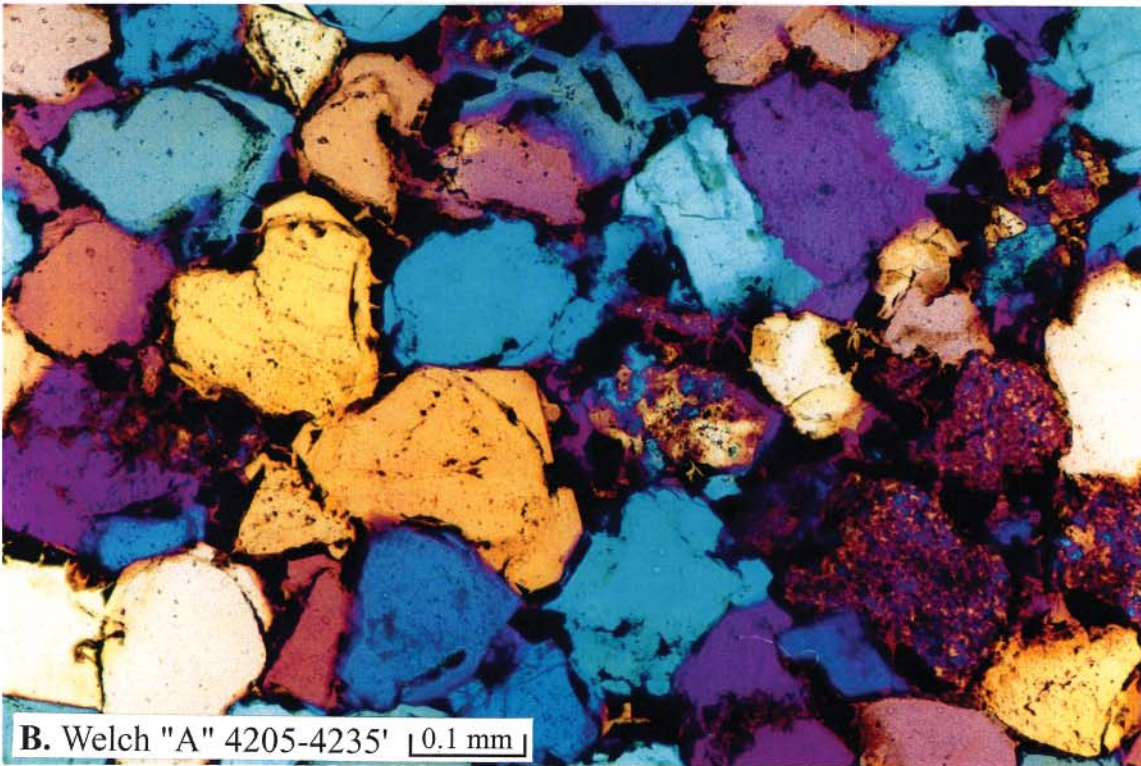
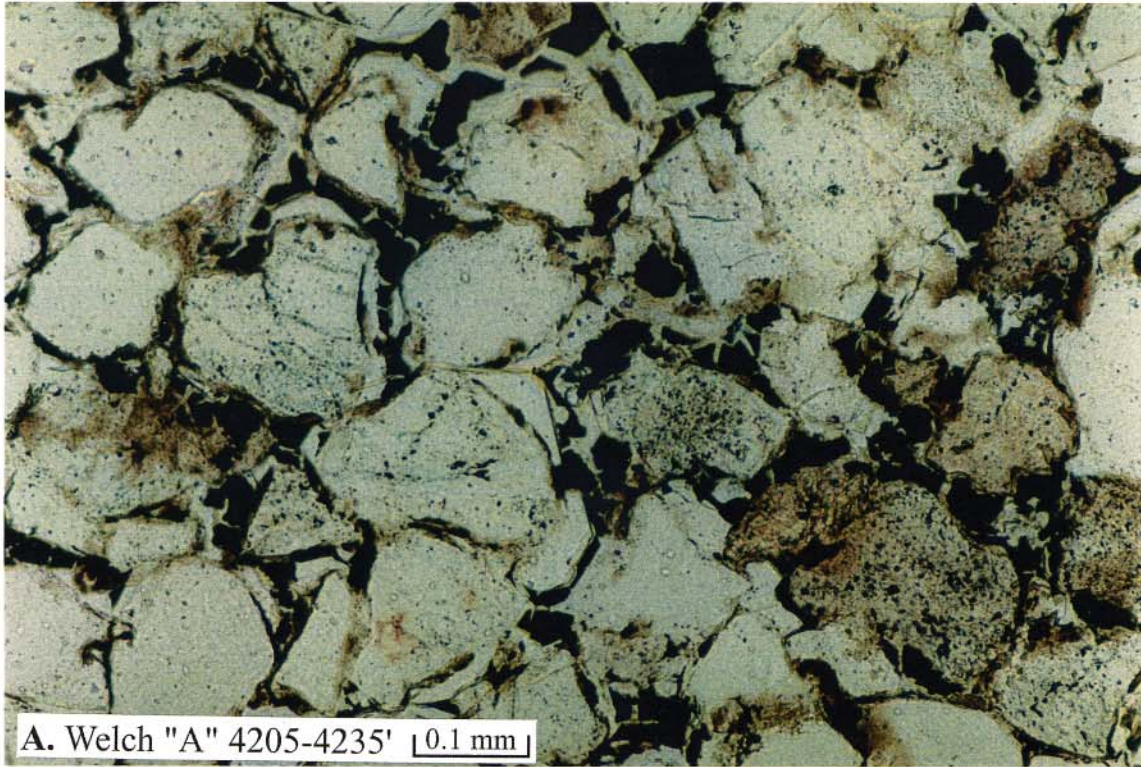


**PLATE 1. WELCH "A" 4205-4235 ft: Quartz Sandstone at Unconformity
Well-Sorted Very Fine to Fine-Grained Quartz Sandstone with Chert Grains**



This cutting from the chert-rich sandstone at the Mississippian/Pennsylvanian unconformity is a sublitharenite with about 5% chert grains (brownish in Photo A) and 95% common quartz grains. The grains average about 0.125 mm in diameter on the boundary between very fine and fine grained. They are mostly well rounded with well-developed quartz overgrowths that fill most of the intergranular pore space (note that the sample was not impregnated with blue epoxy so porosity also appears white in Photo A). Common black bitumen residue also partly fills the intergranular pores. Photo A taken with plane light; Photo B with crossed polarized light and a gypsum filter.

**PLATE 2. WELCH "A" 4205-4235 ft: Cretaceous Dakota Silt
Well-Sorted Very Fine to Fine-Grained Quartz Sandstone with Overgrowths**



This is another cutting from the chert-rich sandstone at the Mississippian/Pennsylvanian unconformity. It is also sublitharenite with about 5% chert grains ("dirty" in Photo A) and 95% common quartz grains. The grains average about 0.15 mm in diameter and are mostly fine grained. They are subrounded to rounded with well-developed quartz overgrowths. Some intergranular pores are still present, although the sample was not impregnated with blue epoxy so pore space appears white in Photo A. Common black bitumen residue also partly fills the intergranular pores. Photo A taken with plane light; Photo B with crossed polarized light and a gypsum filter.

Plate 1. #4 Welch, 4205-4235 ft: Hematitic and Oily Quartz Sandstone, Vuggy Chert, and Spiculitic Chert

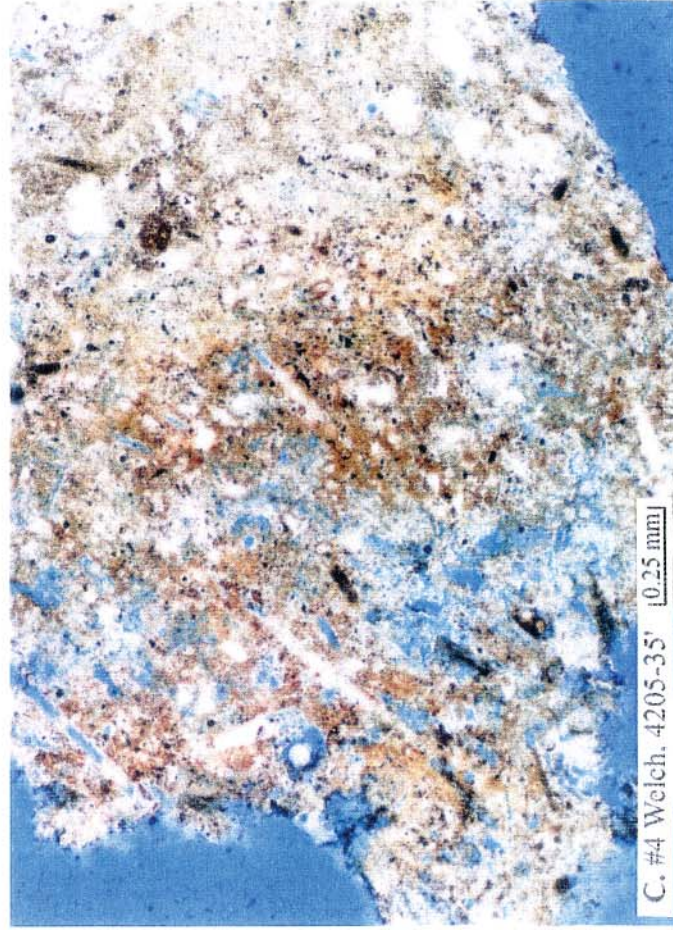
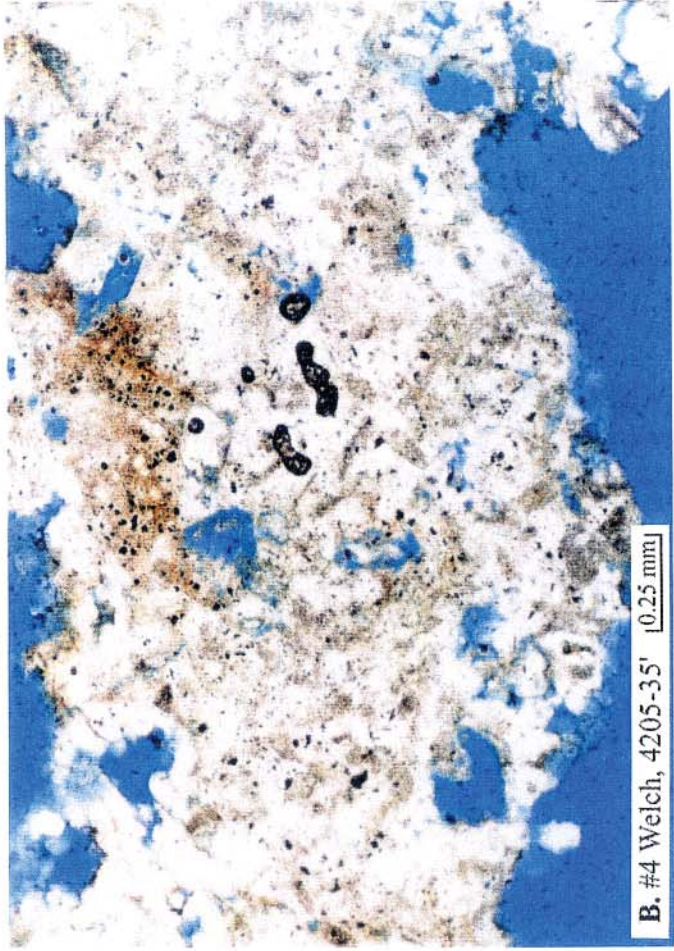
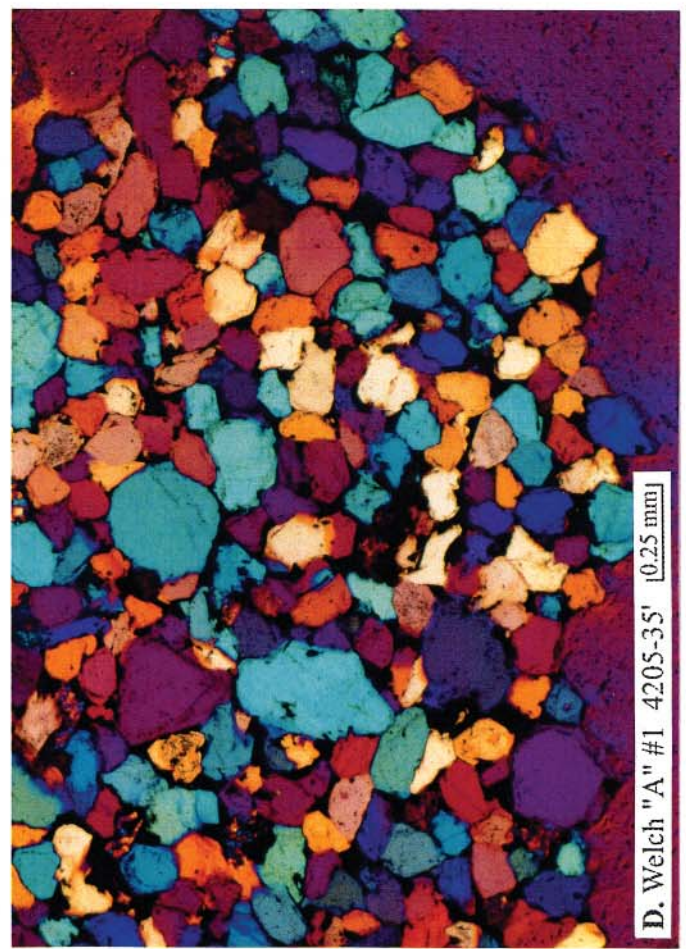
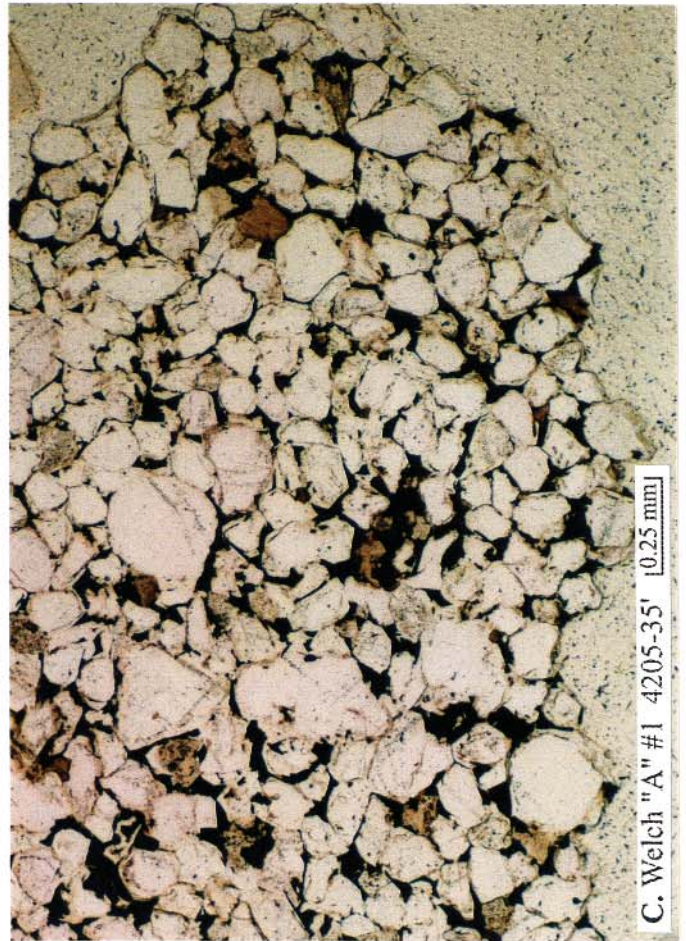
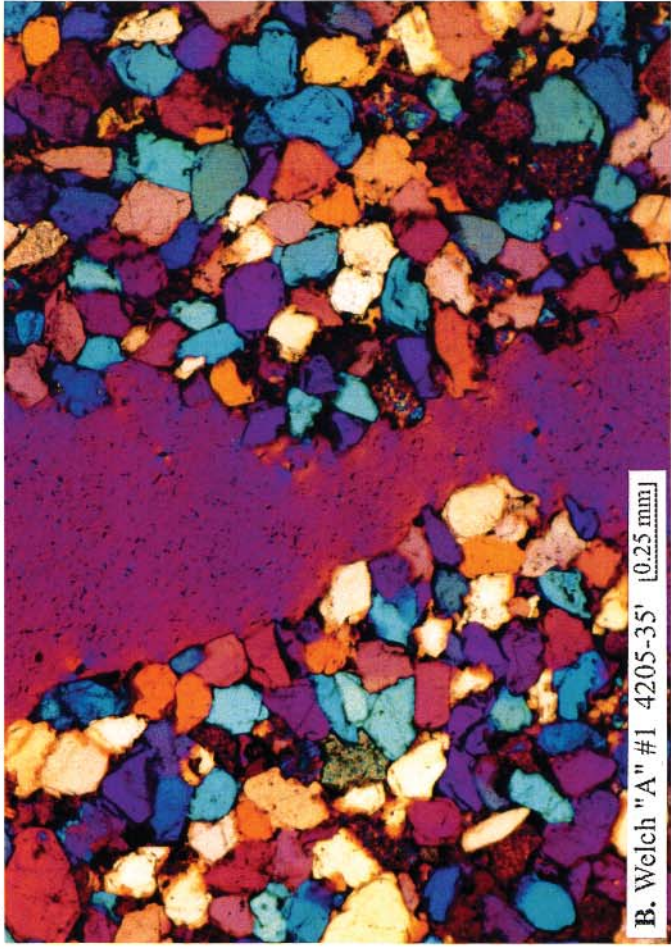
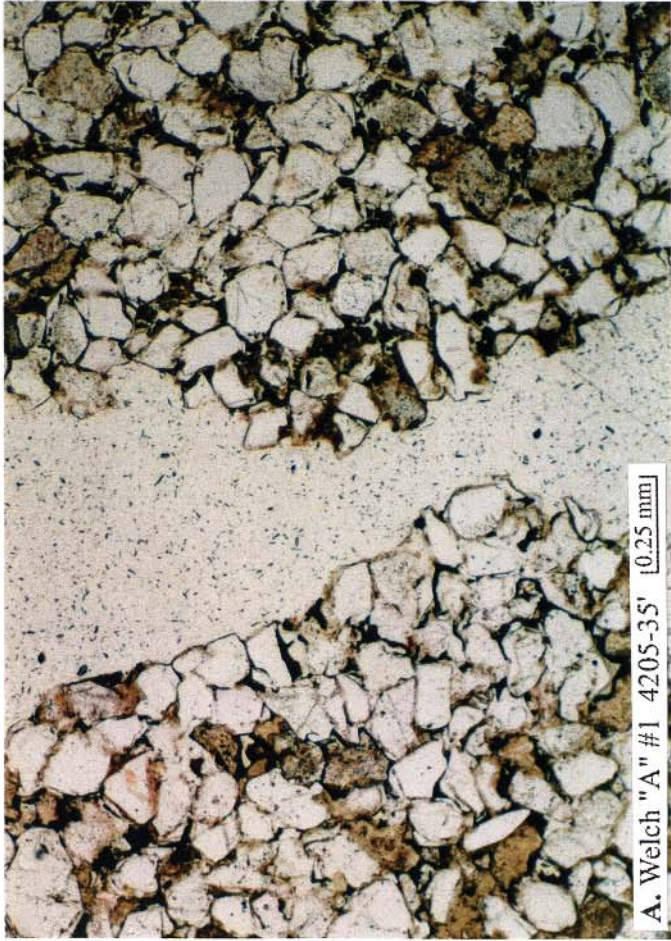


Plate 2. Welch "A" #1, 4205-35 ft. Oil Residue and Quartz Overgrowths in Cuttings of Quartz Sandstone

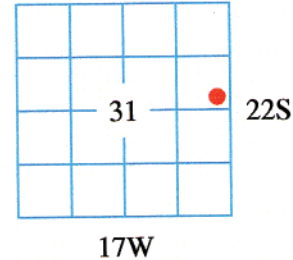




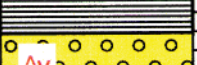
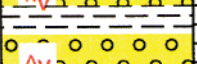



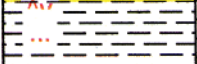


1 WELCH A

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: EARL F. WAKEFIELD
 'Farm'/Owner: #1 WELCH "A"
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 31
 Well Spot: SE SE NE
 Elevation: 2103
 Reference (kb/gl): KB
 Total Depth: 4305
 Completion Date: 9-23-55
 Logged By: Jim Rogers
 Logging Date: 10-9-05



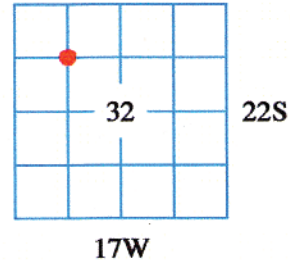
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm			percent				
		0	1	2	0	10	20		
	4120								
								PAWNEE LIMESTONE	
	4160							4144-4159. 4144:pl.gy.-crm.-tn., uf-med., pel. & skel. wkstn.; sli. chlky. Por: nvp	
								4159-4173. 4159:dk.gy.& mar.,plty.-splnty.,sli. micro-micac. shale.	
								4173-4182. 4173:tn.-pl.gy.-cm.,skel. mdstn.& wkstn.w/ crs. foss. fragments.. Por: nvp	
	4200							PENN BASAL CONGLOMERATE	
								4182-4193. 4182:v.dk.gy.-blk.& mar.,splnt. sh.; black shale ends at 4186.	
	4240							4193-4200. 4193:(4199 circ.); lt.gy.-gy.,semi-trl. cht.& l.med.-v.crs., clr.-pnk. qtz. pbls.in lt.gy.-bf., uvf. sub-ang. ss. matx.; pyrite.. Por: intgran small	
								4200-4206. 4200:gy.-dk.gy.& mar., splnty.-plty. soapy to mic.-micac., shale.	
	4240							4206-4235. 4206:salm.-lt.gy., sub-op.,cht.pbls. & clr., crs.-f.crs., rdd. qtz. pbls. in gy., uvf-lf., sub-rdd. qtz. ss. matx.; fair ix. por. in matx.. Por: intgran small	
								4235-4243. 4235:(4240 circ.)wht.,op.,ptly.trip. cht. cbls. w/rdd. margins (pitted & vgy., w/adhg.matx.), in shly. ss. matx. as above.. Por: nvp	
	4280							4243-4247. 4243: shale as above.	
								4247-4252. 4247:cgl. as above.. Por: nvp	
								4252-4265. 4252:gy.-dk.gy.,splty.-blk.,dull- sub-silv. shale w/stks. cgl. as ab. (no clean sandstone).	
								4265-4305. 4265: samples useless to TD @ 4305 (all identical sh.: "boilerhoused"?).	

4 WELCH

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: EARL WAKEFIELD
 'Farm'/Owner: WELCH 4
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 32
 Well Spot: C NW
 Elevation: 2073
 Reference (kb/gl): KB
 Total Depth: 4270
 Completion Date: 01-27-56
 Logged By: Jim Rogers
 Logging Date: 06-24-02

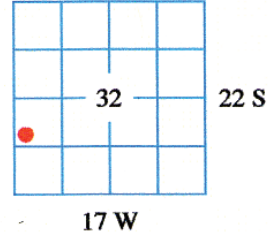


Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		0	1	20	0	10	20		
	4080							4080-4095. dk.,v.dk.gy.& mar.,blky.-plty.shale. Por: nvp	
F	m							4095-4110. driller's top @ 4095: lt.gy.-buf., dns.mdstn.w/rare wkstn.,fos.frgs.. Por: nvp	
	4120							4110-4120. sh.as at 4080,w/com.mar.,splnt.sh.. Por: nvp	
p								4120-4131. lt.gy.-buf.,dns.mdstn.w/beds crm.-buf.,f.pel.-ool.pkstn.;tr.mldc.por. . Por: mol small	
^v								BASAL PENN CONG. 4131-4145. DRILLER'S TOP:mar.-gy.sh.w/tr.mar. trl.cht.(@ top),& crm.,vf.calc.ss. . Por: nvp	
^v	4160							4145-4155. red-cm.,f-med.,arg.ss.matx.w/buf., pnk.& motl.-tan.sub-op.,foss.cht.& lm.mdstn.pebs.;tr.pyr.;POOR SAMPLES. Por: nvp	
^v	4200							4155-4205. mar.,grn-gy.& gy.,plty.-splnty.sh. w/thin beds cht.cngl.as above.. Por: nvp	
I	4240							4205-4235. bf.-cm.,bn.-mot.,op.vgy.,cht.cbls. w/com.,pp.vugs;bn.ostn.,com.live, yel.& wht.cut.flur.;yel.flur.resid; tr.cm.-tn.,vf.Ff.,w.srtd.ss.matx.; tr.i.g.por.,tr.tn.ostn . Por: mol medium	●
m								VIOLA DOLOMITE 4235-4270. lt.gy.-tn.,dns.,calc.dol.mdstn.w/ abnt.,wht.-pale gy.,op.-sli.chlky. cht.& ostn.cht.as ab (cave?). Por: chalky small	●

3 JORDAAN Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: COLORADO OIL & GAS COMPANY
 Farm/Owner: 3 JORDAAN
 State: KANSAS
 County: PAWNEE
 Township: 22 S
 Range: 17 W
 Section: 32
 Well Spot: SW NW SW
 Elevation: 2076
 Reference (kb/gl): KB
 Total Depth: 4314
 Completion Date: 09-14-56
 Logged By: Jim Rogers
 Logging Date: 07-11-02



Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm	1	20	percent	10	20		
4040									
4080									
4120									
4160									
4200									
4240									
4280									

4050-4103. SAMPLE DEPTH AND DRILG.-TIME DEPTH ARE 20-22 FEET LOWER (DEEPER) THAN WIRELINE LOG DEPTH.

4103-4129. =sample depth 4130-4150:dk.gy.-mar. splint.-flky.,micro-miac. shale..

4129-4144. =smpls.50-70: cm.-bf.-bn.,dns.mdstn.-wkstn.w/fus.. Por: nvp

4144-4158. gy.-brn.-mar.,plty.-flky.dull sh..

4158-4166. =smpls.70-90:as at 4129; some pkstn..

PENN BASAL CONGLOMERATE
 4166-4176. mar.-brn.,flky.-plty.shale. Por: nvp
 4176-4185. =4190-4205 smpl.;flsh.-pnk.,op.cht. pbs.& crs.,clr.,rdd.qtz.gns.;matx= f.,w-srtd.suban.ss.;spty.por.&ostn. Por: intgran small
 4185-4198. shale as at 4166.

4198-4224. =4220-35 smpl.:orng.-bf.-p.gy.,bn.-mot.,op.-chlky.,vugy cht.cbils.& clr.-bf.rdd.-qtz.pebs.;bn.ostn on vuggy cht.;matx.=lf-uf.w-srtd.ss.w/ poor ig.por.:(see 4235,15 min.smpl.). Por: mol medium

4224-4240. =4240-60 smpl.:cgl. as ab.w/v.com. wht.-bf.trip.& vgy.cht.cbils.;matx. ss.is glassy.,less por.. Por: mol medium

4240-4254. =4265 smpl.:dk.-v.dk.gy.-mar.flky.-splint.,micro.miac. sh.w/clr.gyp.. Por: nvp

OPERATOR'S MISENER?
 4254-4272. samples 4270-95 worthless; 90% sh. as ab.w/sps.,vgy.,ostn.cht. as ab; sli.tr. ss.(one chip/smpl.) as ab. Por: nvp

VIOLA LIMESTONE
 4272-4304. =smpls.4290-4315; lt.gy.-lt.brn., dns., sli.dotc.lm.mdstn.w/com. wht.-pl.gy.op.-vgy.cht.; beds dk. gy.-mar, splint.-plty.,dull shale.

P: 1130
581
DAY

SEE
TES

SEE
TES

GCM
690#

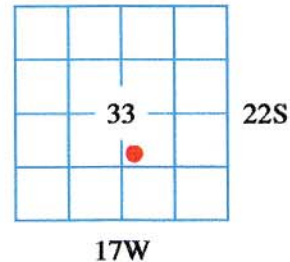
.46
BOP

1 SCHARTZ

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: HONAKER-DAVIS DRILLING CO.
 'Farm'/Owner: #1 SCHARTZ
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 33
 Well Spot: SW NW SE
 Elevation: 2054
 Reference (kb/gl): KB
 Total Depth: 4222
 Completion Date: 05-10-57
 Logged By: Jim Rogers
 Logging Date: 06-05-03



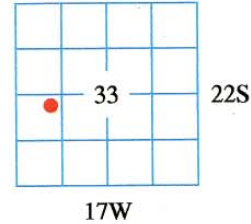
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perf
		mm			percent				
		0	1	2	0	10	20		
4040								4043-4070. mar.-dk.gy.,ply.,sub-silv.sh.. Por: nvp	
4080								4070-4080. lt.bn.-cm.,skel.-pel, pkstn/wkstn. w/tr.vugs,(com.clr.calet.fil); ns. Por: vug medium 4080-4089. shale as at 4043. Por: nvp	
4120								4089-4098. brn.& bf.mott.mdstn.-wkstn.w/lg. foss.frag; chky in pt.,ns. Por: chalky small BASAL PENN CONGLOMERATE 4098-4102. shale as at 4043. Por: nvp 4102-4105. gy.-brn.-cm.,vf.,vws.ss.; poor-fair ig.por.;tn.ostn; spty.yel.cut.flur. Por: intgran small 4105-4112. v.dk.gy.,spty.,sub-slv,shale. Por: nvp 4112-4142. clr.-orng.,semi-trl.,cht.congl.w/tn.-lt.gy.f.,vws.ss.matx.; cht. @ 4128 is pnk.-wht.,trip.& vgy, w/ live brn.,ostn.;yw.cut.flur.. Por: vug medium 4142-4160. gy.,gnh.-gy.& mar.,blky.-splnty sh.. Por: nvp	10' M
4160								4160-4182. wht.& pk.,gy.-mot.,part trip. cht. cgl.w/gy.-bn.,uvf-lf.,arg.ss matx.; rare dol.cbls.; poor vug.por.. Por: vug medium	960 GAS 90' GCM
4200								OSAGE MISSISSIPPIAN 4182-4196. cm.-wht.,skel.-ool.pkstn.& wkstn., w/ abnd.cm.-bf.,ckhy.cht.nods.; more porous trip. @ 4190-96.. Por: chalky small VIOLA 4196-4222. cm.-bf.,f-gnlr.dol.mdstn.,w/abnd. wht.-bf.,op.cht.;chky.in part. Por: chalky small	

#1 BENNETT

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: K.C.EXPLORATION, INC.
 Farm/Owner: # 1 BENNETT
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 33
 Well Spot: NE NW SW
 Elevation: 2056
 Reference (kb/gl): KB
 Total Depth: 4376
 Completion Date: 1-25-81
 Logged By: Jim Rogers
 Logging Date: 8-25-01



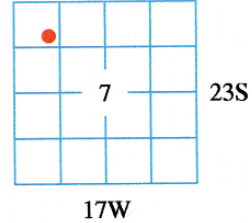
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Peris
		0	1	2	0	10	20		
	4000							4020-4040. POOR SAMPLES (poor bed definition). Por: nvp	
	4040							4040-4055. gy.-dk.gy.plty.-splint.,sub-silv.sh. w/com.,fltg.,m-crs.,subrdd.,qtz.gns. Por: nvp	
								4055-4070. lt.gy.-bf.,den.-chlky.mudstn.. Por: nvp	
								4070-4080. sh.,as at 4040 . Por: nvp	
	4080							BASAL PENN CONGLOMERATE 4080-4090. SAMPLE MISSING: TOP CONG.?(sdy.sh.?). Por: nvp	
								4090-4100. wht.,sub-op.cht.-pebs.;mott.sh.matx. . Por: nvp	
								4100-4115. lt.gy.-bf.,calc.,lvf.ss(matx.)w/ abnd. crs.,clr.rdd.qtz.grains; tr. cht.as ab.; poor.,ig.por.;n/s. Por: intgran small	
	4120							4115-4135. gy.-grn.-gy.sh w/ss.& pebs.as ab.. Por: nvp	
								4135-4145. lvf.ss w/cht.& qtz.cbls.as at 4100; poor-fair i.g.por.. Por: intgran small	
								4145-4165. bf.-lt.brn.cht.peb.cgl.;tr.grnh-gy. sdy.sh.matx.;tr.rdd/clr.qtz.cobl.. Por: nvp	
	4160							OSAGE CHERT 4165-4185. crm.,mar.& org.-mott.,foss.cht.;tr mott.,calc.,mudstn. matx w/tr.ppv.. Por: vug small	○
								4185-4205. mott.org.& gy.skel./ool.packstn.w/ com.bf.-gy,mott.,foss.,trp./vgy.cht. w/fair,spotty brn.ostn.. Por: vug small	●
	4200							VIOLA LIMESTONE 4205-4256. pl.gy.,dolc.lime mudstn.w/com.bf.- pl.gy.& wht.op.cht.;ppv.& brn.ostn.. Por: vug small	●
	4240							4256-4300. ADDITIONAL WELLSITE SAMPLE TOPS: Simpson Shale 4285 Simpson Sandstone 4296 Arbuckle 4376 TOTAL DEPTH 4376 (in Arbuckle). Por: nvp	
	4280								

#1 GARFIELD "A"

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: BENNETT & ROBERTS
 'Farm'/Owner: #1 GARFIELD "A"
 State: KANSAS
 County: PAWNEE
 Township: 23S
 Range: 17W
 Section: 7
 Well Spot: SE NW NW
 Elevation: 2071
 Reference (kb/gl): KB
 Total Depth: 4437
 Completion Date:
 Logged By: Jim Rogers
 Logging Date: 10-5-05



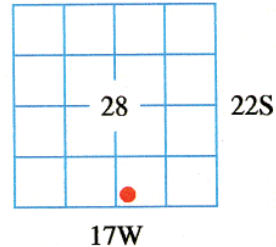
Lithology	1 inch = 40 ft	Grain Size	Porosity	Description	Tests Shows Cores Perfs
		mm 0 1 2	percent 0 10 20		
	4160				
	4200			PAWNEE LIMESTONE 4182-4198. NOT LOGGED. ALL DEPTHS ARE LOG DEPTHS EXCEPT AS NOTED. 4198-4214. NOT LOGGED.	
	4240			4214-4224. 4214(ld): cm.-pl.gy. bn.-mott., f-m. skel.-pell. pkstn.-wkstn., den.-sli. chlk.. Por: nvp	
	4240			PENNSYLVANIAN BASAL CONGLOMERATE 4224-4226. v.dk.gy.-blk., splnt., dull to micro-micac. shale.	
	4240			4226-4240. lt.gy., grnh.-gy. & mar., mott., soapy sh. w/tr.v-col., op.cht. pbls. & stks. l.med., sub-rdd., slty. ss. Por: nvp	
	4280			4240-4250. 4240: pbls. & cbls. bf.-tn. & pnk., sub-op. cht. & dns., lm. mdstn., in gy., uf-lm., tite, arg. sandstone matx. Por: nvp	
	4280			4250-4255. 4250: shale as above.	
	4280			4255-4262. 4255(see 4267 circ.): crm.-salm., op. cht. cbls. & cir., rd. qtz. pbls. in gy., vf., argil. sandstone matx.. Por: nvp	
	4280			4262-4266. 4262: shale as above.	
	4280			4266-4274. 4266(see 4275 circ.): cht. cbls. & pbls. as ab., part banded., in lt. gy. lf., ss matx.; poor ig. por.; osth.. Por: intgran small	
	4280			4274-4282. 4274: shale as above.	
	4320			4282-4294. 4282(see 4285 circ.): crm., salm. & brn., op. cht. cbls. in pl.gy., tn. & crm., lf., sub-rdd. sandstone matx.; sps. ig. por., ft. osth. Por: intgran small	
	4320			4294-4308. 4294: sh. as ab. w/tr. cgl. at base.	
	4360			OSAGE MISSISSIPPIAN 4308-4362. 4308(see 4340 circ. smpl.): cm.-lt. gy., skel. lm. mdstn. w/com., "fresh", cm.-pl.gy., op. cht.; trip. in part. Por: chalky small	
	4360			4362-4367. 4362: dark gray, splntery shale.	
	4400			MISENER - KINDERHOOK 4367-4380. 4367: porous sandstone. Por: intgran small 4380-4437. 4380: LOG ENDS TD @ 4437. Por: nvp	

1 EWING

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: HARMS & BURT DRILLING COMPANY
 'Farm'/Owner: 1 EWING
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 28
 Well Spot: SW SW SE
 Elevation: 2050
 Reference (kb/gl): KB
 Total Depth: 4178
 Completion Date: 08-19-55
 Logged By: Jim Rogers
 Logging Date: 08-05-01



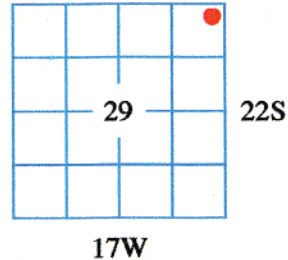
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm			percent				
		0	1	2	0	10	20		
	3960								
	4000							TOP LOGGED INTERVAL 3990-4010. SEVERE PENN. LIME CAVING: POOR SMPLS. Por: nvp	
M								4010-4030. gy.-dk.gy.& brn.,splint.-blk. shale shale;micro-micac.;tr.greasy lustre; bed of blk.,greasy sh. @4014-4020. Por: nvp	
F	4040							PAWNEE LIMESTONE 4030-4042. lt.gy.-bf.,med.crs.skel.pack.& wack; den, tite, n/s. Por: nvp	
w								4042-4046. dk. gy. shale as at 4010. Por: nvp	
Q								4046-4052. pl.gy. wack.-mudstn.den. Por: nvp	
	4080							PENN BASAL CONGLOMERATE 4052-4056. v.dk.gy.-blk.plty.-splint.soapy sh. Por: nvp	
								BASAL PENN CONGLOM 4056-4070. dmar.-org.& gy.,silty.shale w/abund. crs.,rdd.,trl.,qtz.& cht. grns. Por: nvp	
								4070-4078. mar.-gy.,flky.,soapy shale. Por: nvp	
								4078-4087. tn.-lt.gy.,lvf.matx.;com.grnls.of pk.,mar.& trl.cht.& qtz.;nvp.p.spl. Por: nvp	
	4120							4087-4092. shale as at 4070;mostly mar.& bn. Por: nvp	
								4092-4104. cm.-gy.,dk.-spkld,rdd.,cal.ss w/pebs. Por: nvp	
								4104-4108. bn.-gy.,dul.shale w/mar.-bf.cht.pebs. Por: nvp	
								4108-4131. matx.=cm.-bf.,f.arg.& calc.,sub-ang. chlky. ss.w/tr.ig.por.;com.,var-col. cht.pebs.; clay matx.@ 4120. Por: intgran small	
								4131-4136. brn.,mar. & gy., soapy, sli.silty.sh. Por: nvp	
	4160							4136-4144. cong.as.ab.w/gy.-bn.vf.arg.ss.matx. Por: nvp	
								VIOLA DOLOMITE 4144-4156. wht.pl.gy.& bf.,v.calc.dol.mudstn.w/ abnd.wht.-pl.gy.op.-trip.cht. Por: chalky small	
								4156-4160. dk.-v.dk.gy.,splint.-plty. shale. Por: nvp	
								4160-4178. TD: v.calc. dol. mudstn.w/abnd. cht. as at 4144. Por: chalky small	

1EWINGXA

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: EARL F. WAKEFIELD
 'Farm'/Owner: 1 EWING
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 29
 Well Spot: NE NE NE
 Elevation: 2055
 Reference (kb/gl): KB
 Total Depth: 4367
 Completion Date: 11-11-60
 Logged By: Jim Rogers
 Logging Date: 08-11-01



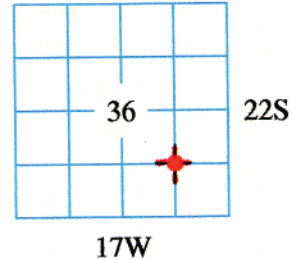
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		0	1	2	0	10	20		
	4000								
	4040						4030-4052. GOOD SAMPLES. Por: nvp		
m							4052-4063. pl.gy.-bf.,den.lime.mudstn.. Por: nvp		
M							4063-4071. v.dk.gy.,splint.,sub-silv.shale.. Por: nvp		
F							4071-4080. bf.-v.lt.gy.,skel.wack.-mudstn.,den. Por: nvp		
w	4080						BASAL PENN CONGL. BASE PENN LM.		
#							4080-4084. mar.-v.dk.gy.,splint, soapy shale. Por: nvp		
#							4084-4088. wht.-pl.gy.uvf.,glssy ss w/lmd.pebs. Por: intgran small		
#							4088-4092. gnh.gy.-mar.,splint-blky.,soapy sh.. Por: nvp		
#							4092-4108. sh.as ab.,w/abnd.,rdd.uvf.sd.grains. Por: nvp		
#	4120						4108-4116. shale as at 4088, silty. Por: nvp		
#							4116-4127. bf.-orng.cht.pebs.w/brn.-mar.sh.matx. Por: nvp		
#							4127-4131. gr.& mar.-dk.gy.,plty.,soapy shale.. Por: nvp		
#							4131-4141. wht.-pl.gy,CPC w/trp.-vug.por.& blk. DOS; mar.,gy.& grn.waxy shale matx. Por: vug	○	
#							4141-4148. shale as at 4127. Por: nvp		
#							4148-4154. CPC as at 4131; no vis.por./no DOS. Por: nvp		
#	4160						4154-4160. shale as at 4127. Por: nvp		
m							VIOLA LIMESTONE	○	
							4160-4180. bf.-brn.,den.mudstn.,w/abnd.wht.cht.. Por: chalky small		

1 FRICK

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: HALLIBURTON OIL
 'Farm'/Owner: 1 FRICK
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 36
 Well Spot: C SE
 Elevation: 2066
 Reference (kb/gl): KB
 Total Depth: 4270
 Completion Date: 6-9-79
 Logged By: Jim Rogers
 Logging Date: 6-28-05



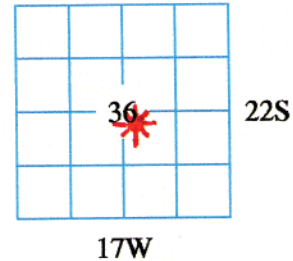
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		0	1	2	0	10	20		
p	4080							PAWNEE LIMESTONE 4085-4090. bn. & lt. gy. mot' d., m.-crs. skel. lm. pkstn. w/fos. as ab.; tr. pyr. Por: vug 4090-4116. mar.-gy., soapy.-blky. sh. w/com., med., sub-ang., fltg., qtz. grms. Por: nvp	
lw	4120							4116-4120. lt. gy.-bf., skel. lm. whstn.-mdstn. Por: nvp PENN BASAL CONGLOMERATE 4120-4137. mar.-gy., soapy-blky. sh w/rare, med. rdd., "flot'g" qtz. & mar. cht. gns. Por: nvp 4137-4150. cm., ong. & salm., rdd., sli. trip. cht. pbls.; IN lt. gy.-crm., arg., uf., rdd. arg. ss. matx.; both w/p.p. vugs, dos. Por: vug 4150-4166. shale as above w/more chert pbls. Por: nvp	o
v	4160							4166-4172. cgl. as above. Por: vug 4172-4199. dk. gy.-mar., splty. sh. w/thin beds cht. cgl. as above. Por: nvp	o
v	4200							OSAGE MISSISSIPPIAN 4199-4230. pl. gy., wht. & crm, sub-op.-vitr. cht. w/sli. trip. beds, rare vugs; no carbonate. Por: vug	o
m	4240							4230-4270. wht.-cm., f.xtn., doltc. lm. mdstn. & skel. lm. wkst. w/cht. as ab. Por: chalky	

1 KELL

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: JONES, SHELBURNE & FARMER
 'Farm'/Owner: KELL #1
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 36
 Well Spot: NW NW SE
 Elevation: 2064
 Reference (kb/gl): KB
 Total Depth: 4200
 Completion Date: 12-2-55
 Logged By: Jim Rogers
 Logging Date: 7-2-05



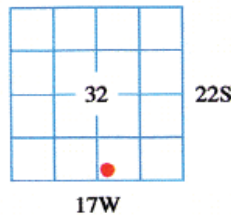
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		0	1	2	0	10	20		
w	4080	.	.	.	.	.	.	.
p	4120	.	.	.	.	.	.	.
o	4160	.	.	.	.	.	.	.	o
o	4200	.	.	.	.	.	.	.	o

1KLEPPER"B"

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: WELCH & OLSSON DRILLING CO.
 'Farm'/Owner: 1 KLEPPER "B"
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 32
 Well Spot: SW SW SE
 Elevation: 2065
 Reference (kb/gl): KB
 Total Depth: 4222
 Completion Date: 10-19-56
 Logged By: Jim Rogers
 Logging Date: 06-18-02



Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm	0	1	2	0	10			20
	4000								
	4040								
M									
	4080								
m									
	4120								
	4160								
L									
	4200								
	4240								
p									
	4280								
	4320								

4030-4060. LOG DEPTH BASED ON DRILLING TIME LOG FROM 4060-4130, START OF CORE. Por: nvp

4060-4078. dk-v.dk.gy.,blky-pty.,mic-miac.sh.. Por: nvp

4078-4096. cm.-p.gy.,lm.mdstn.,dens.;no sho. Por: nvp

4096-4108. v.dk.gy.-mar.,blky.-pty.,soapy sh.. Por: nvp

4108-4120. cir.@20:lt.brn.-bf.-cm.,dns.lm.mdstn.. Por: nvp

BASAL PENN CONGLOMERATE

4120-4130. cir.@30:mar.-v.dk.gy.,blky.-spint., dull sh.w/tare.crs.rdd.sd.gms. Por: nvp

start core

4130-4132. WELL SITE CORE DESCRIPTION:crs.-med. ss.;soft,poorly cemented;show gas.. Por: intgran small

4132-4138. tn.-buf.,f-med.ss.;p.-fair por.;sg. Por: intgran small

4138-4142. tn.-grn.,f.shly.ss;tite;sl.o-stn.. Por: intgran small

4142-4144. tn.-buf.,f-med.ss;spotty o-stn.. Por: intgran small

4144-4156. gy.-mar.,pty.sh.w/slickensides. Por: nvp

chert conglomerate

4156-4157. tn.-buf.,op.cht.in gn.-mar.sh.mtx.; BASE OF CORE #1. Por: nvp

4157-4180. pl.gy.-red.op.cht.cobbles in mar.-dk.gy.,pty.-spint.,soapy sh matx. . Por: nvp

4180-4213. CORES #2 & #3;mar.-gm.,sh.matx.w/abnt.tn.-buf.,op.cht.cbls.;lenses brn.arg.ls.; END CORE #3.

VIOLA

4213-4322. wht.-pnk.-buf.,dotc.lm.pkstn.w/abnt pl.gy.-mar.,op.& trip cht. TD 4222. Por: nvp

1080 + 4.2 BUWD
+ 500 MCFGPD

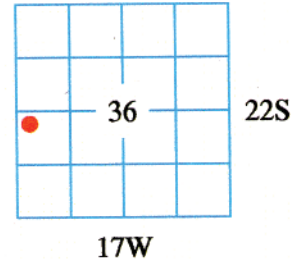
35 GCM
350 CF
1300 #

70' GCM
+ MW
840 #

1 MacDonnel Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: HONAKER DRILLING COMPANY, INC
 'Farm'/Owner: MacDONNEL #1
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 36
 Well Spot: NW NW SW
 Elevation: 2057
 Reference (kb/gl): KB
 Total Depth: 4247
 Completion Date: 10-21-55
 Logged By: Jim Rogers
 Logging Date: 07-04-05

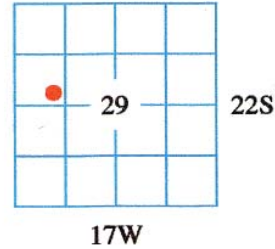


Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm	0	20	percent	0	10			20
4080									
4120							PAWNEE LIMESTONE 4092-4097. lt.gy.-bf., skel. wkstn. & pkstn.. Por: nvp 4097-4112. dk.-v.dk.gy. splty.-blky. shale. Por: nvp 4112-4123. bf.-tn. skel. lm. wkstn.. Por: nvp		
4160							PENN BASAL CONGLOMERATE 4123-4143. mar.-dk.gy., soapy-blky. sh. w/rare "ftg.", unsort., rdd. qtz. grms.. Por: nvp 4143-4158. cgl.; wht.,pnk.& ong.,sub-op. wthd. cht. pbls.& cbls.in uf.-l.med.,sub- rd. ss. matx. w/ig por.& blk. ostn.. Por: intgran small 4158-4162. shale as above.. Por: nvp 4162-4179. cm.,tan & salm.,op.-trip.& vgy. cht. pbls.in gy.,vf.f., v.arg. ss. matx. w/poor ig. por. & tn. ostn.. Por: intgran small 4179-4192. mar.-dk.gy., splty.-soapy shale.. Por: nvp	○	
4200							4192-4202. cgl. as ab., w/mar.-ong. shale matx.. Por: nvp 4202-4208. shale as at 4182. Por: nvp 4208-4229. cgl.; mar. sh. matrix as at 4192. Por: nvp		
4240							4229-4244. shale as at 4202. Por: nvp VIOLA 4244-4247. cm.-pale gy., bf.-mott., sub-op. to vitr., faintly foss.-pel. cht. to TD.. Por: nvp small		

1MAYERA Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: AMERICAN ENERGIES CORP.
 'Farm'/Owner: #1 MEYER "A"
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 29
 Well Spot: SE SW NW
 Elevation: 2070
 Reference (kb/gl): KB
 Total Depth: 4282
 Completion Date: 09-19-96
 Logged By: Jim Rogers
 Logging Date: 08-14-01



Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm			percent				
		0	1	2	0	10	20		
	4040							4051-4071. gy.-mar., blk. - pty., dull shale. Por: nvp	
F	m							4071-4086. lt. gy.-bf., mudstn. w/lams. bn.-gy. mott f-med. skel. pack.; tr. vugs. Por: nvp	
F	w							4086-4092. shale as at 4051; tr. blk. shale. Por: nvp	
	4120							BASAL PENN CONGLOMERATE 4107-4112. gnh.-gy., dk. gy. & mar., sopy., blk. sh. Por: nvp 4112-4129. poor smpls.; ?cht. pebl. congl.?. Por: nvp 4129-4145. bf.-pl. gy., lf., mod. srt. ss. matx., w/ abnd. bf.-wht., sub-op. cht. cobs.. Por: nvp	
	4160							4145-4148. shale as at 4107. Por: nvp 4148-4156. cht. pebl. cgl.; gnh.-gy.-mar. soapy sh. matx., tr. ss as above (matx.?). Por: nvp 4156-4158. shale as at 4107. Por: nvp	
								VIOLA LIMESTONE 4158-4182. bf.-wht., grnlr. dol. (pack.?) w/abnd. wht.-lt. gy., foss., op. & trip. cht.; com. p.p. vugs & blk. DOS in 4168 cir.. Por: vug small	

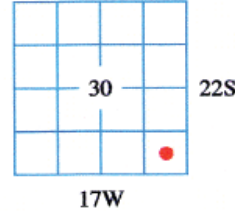
S.G. ↗
 52
 MCF
 1286
 1276
 293
 GCM
 GTS
 1.5
 MIN

1-30 WELCH

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: T.D.R. EXPLORATION
 Farm/Owner: 1-30 WELCH
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 30
 Well Spot: SE SE
 Elevation: 2085
 Reference (kb/gl): KB
 Total Depth: 4460
 Completion Date: 12-04-83
 Logged By: Jim Rogers
 Logging Date: 07-18-02



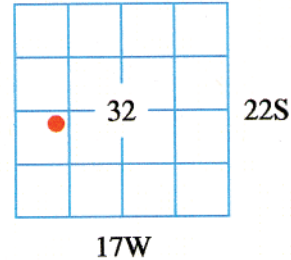
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm	1	2	percent	10	20		
4080								4102-4126. gy.-mar., blk., micro.-micac.sh..	
4120								4126-4141. lt.brn.-pl.gy.dns.mdnts., part brec..	
4160								4141-4145. dk.gy.-mar.shale as ab. 4145-4152. lt.brn.-pl.gy.-mot.dns.wkstn..	
4200								PENN BASAL CONGLOMERATE 4152-4169. dk.gy., brn. & mar. blk. splint.sh. w/tr.flotg.orgm., sub-op.cht.cbls.. 4169-4176. mar.-orgm., sub.op.cht.cbls.w/tr./lt.gy., v.argil., tite, vf.ss.mtx.. 4176-4190. sh.w/flotg.mar.-orgm.cht.cbls.as ab.	
4240								4190-4197. mar.-orgm., sup-op.cbls.w/lt.gy., vf., arg., sltstn.matx.; tr.f.ss w/ poor, ig. por. & blk.dostn.. Por: intgran 4197-4203. sh.as at 4176; beds blk. grsy. sh.. 4203-4226. cm.-lt.brn.-mar., cht.cbls.w/lt.gy.-tn., dolc.sltstn.matx & beds gn. & gy.-brn., soapy sh.; tr.vugs in cht..	○ NO TEST
4280								MISSISSIPPIAN LIMESTONE 4226-4239. bf. & pnk.mott., pel.wkstn. & mdstn. w/com.-abnt., whit.-pl.gy.op.cht.. Por: nvp 4239-4244. dk.gy., splint., dull sh.; tr.grn.sh.. 4244-4290. lm. & cht.as ab; beds tn.vgy. & trip. cht.w/fair por. & scat.tn ostn.. Por: vug small	● H BC 50 B DAY
4320								4290-4295. gm.-grh.gy.-brn., splint., soapy sh.. Por: nvp	
4360								VIOLA LIMESTONE 4295-4376. wht.-cm.-pl.gy., chlky.lm.mdstn.w/ abnt.whit.-bf.dns., op.-gmlr.cht.. Por: chalky small	

2 JORDAAN

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: COLORADO OIL & GAS
 'Farm'/Owner: #2 JORDAAN
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 32
 Well Spot: NE NW SW
 Elevation: 2075
 Reference (kb/gl): KB
 Total Depth: 4265
 Completion Date: 3-15-56
 Logged By: Jim Rogers
 Logging Date: 6-3-03



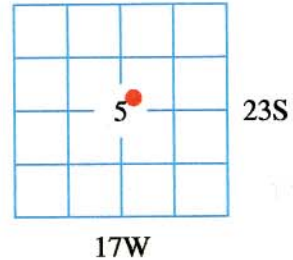
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm	0	1	2	0	10			20
M	4080							4082-4107. POOR SAMPLES v.dk.gy.,gnh-gy.& mar.,splnt.-blky. & soapy, micro-mic.sh. Por: nvp	
F	4120							PAWNEE LIMESTONE 4107-4120. bf.-pl.gy.,skel.-pel.wck.-pkstn., tr.pp vugs. . Por: vug small	
M								4120-4134. shale as at 4082. Por: nvp	
m								4134-4144. bf.=lt.brn.,mdstn.-wkstn.,dns.. Por: nvp	
	4160							PENN.BASAL CONGLOMERATE 4144-4154. gy.-lt.gy.& mar.,blky.-plty. sh. w/tr.qtz.pbls.. Por: nvp	
								4154-4169. lt.gy.,lm mdstn in smpls? tr.clr. qtz.& cm.-wht.,sub-op.cht. . Por: nvp	
^v								4169-4171. shale as at 4144.. Por: nvp	
	4200							4171-4188. TRACE lt.gy.-tn.,uvf,vws.ss w/rare ong.-clr.,trl.cht.pebs. Por: nvp	
								4188-4212. trl.-ong.,rdd.qtz.pebs & v.crs.sd. gms.w/pl.gy.-ong.,semi-trl.cht. pebs.;tr.ss. matx.in smpl.@ 4205; (uf-crs,sub-ang, tr ig.por.,ostn.). Por: nvp	
								4212-4218. shale as at 4144; tr.foss.stems. Por: nvp	
								4218-4224. pl.gy.-crm.-ong.,sub-op.-trip.cht. pebs.in f.-crs.,sub.amg.ss.matx.; f.-good ig.& vug. por.,brn. ostn.. Por: vug medium	
	4240							4224-4230. dk.gy.-mar.,blky.-splty.,sopv sh.. Por: nvp	
								VIOLA LIMESTONE 4230-4255. crn.-lt.gy,dns.mdstn.w.abnd.wht.-gy.mott.vugy-trip.,op.cht.; (ostn.ss.caving from 4218-24) LAST SAMPLE 4250-4255.. Por: vug medium	

2 MORROW "B"

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: WELCH & OLSSON
 'Farm'/Owner: #2 MORROW "B"
 State: KANSAS
 County: PAWNEE
 Township: 23S
 Range: 17W
 Section: 5
 Well Spot: SW SW NE
 Elevation: 2063
 Reference (kb/gl): KB
 Total Depth: 4270
 Completion Date: 03-02-56
 Logged By: Jim Rogers
 Logging Date: 08-08-05



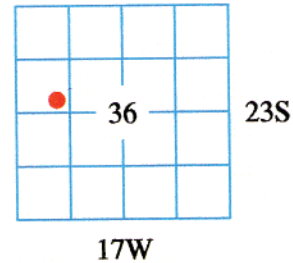
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		0	1	20	0	10	20		
F	p	0	1	20	0	10	20	PAWNEE LIMESTONE 4091-4106. DEPTHS FROM RAG LOG UNLESS NOTED. 4091: pl.gy.-cm., f., skel.-pel. pkstn. -wkstn., dns.-sli. chiky. . Por: nvp 4106-4116. 4106: v.dk.gy., splty.,sub-mic. sh. w/rare mar., wxy. sh. beds.. Por: nvp 4116-4127. 4116: bn.& bf.mott., f-m., skel.- pell. pkstn. w/tr. prtcl. coating.. Por: nvp	○
F	p	0	1	20	0	10	20		
...		0	1	20	0	10	20	PENN BASAL CONGLOMERATE 4127-4140. 4127: dk.gy.-mar.,splty.-blky. sh. w/rare, clr.,crs. rdd. qtz. grns.. Por: nvp 4140-4160. 4140 (see circ.@ 4150): bf.,ong. & salm.,op. cht. cbls. & crs., clr. rdd. gtz. gns. IN mar.,grn. & gy., wxy, sh. matx.; cbls.w/vugy & trip. por. & rare dos . Por: vug medium 4160-4172. 4160: cgl. as ab. w/rare,f.,subang. ss. matx.. Por: intgran small 4172-4180. 4172 (poor smpls): cgl.as ab., shly. . Por: nvp 4180-4195. 4180: cm.-tn.-pnk.,op.-wthrd. cht. cbls. IN tn.-bf.,vf., subang., mod- srted. ss. matx. w/ por.& tn.ostn.. Por: intgran small 4195-4237. 4195: dk.gy.-brn.& mar.,plty.-blky. sh. w/thin bds. sandy cgl. as ab.. Por: nvp	○
...		0	1	20	0	10	20		●
...		0	1	20	0	10	20	OSAGE MISSISSIPPIAN LIME 4237-4251. 4237(poor smpl.); bf.skel. wkstn. w/ abnd., fresh, bf.-cm. mot.,sub-op., foss. cht. LOG TD=4251 . Por: nvp	○
W	w	0	1	20	0	10	20		

3 McDONNELL

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: COLORADO OIL & GAS
 'Farm'/Owner: 3 McDONNELL
 State: KANSAS
 County: PAWNEE
 Township: 23S
 Range: 17W
 Section: 36
 Well Spot: SE SW NW
 Elevation: 2058
 Reference (kb/gl): KB
 Total Depth: 4244
 Completion Date: 7-13-56
 Logged By: Jim Rogers
 Logging Date: 6-28-05



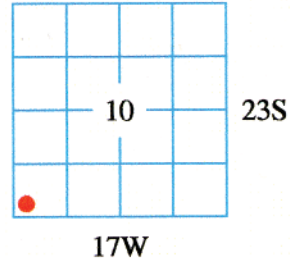
Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		0	1	2	0	10	20		
p	4080	|							
F		|					PAWNEE LIMESTONE 4084-4092. lt.gy.-bf., med.,skel. pkstn.-wkstn. w/ com. coated grns. & lg. fusil.. Por: nvp 4092-4112. mar.-v.dk.gy.,splnty, sh. w/com.m.- crs., rdd., fltg., clr. qtz. grns.. Por: nvp 4112-4118. lt.gy., den. mdstn.-wkstn.. Por: nvp		
m	4120	|					BASAL PENN CONGLOMERATE 4118-4136. blk.& mar. plty.-splty. sh. w/rare, m.-crs.,rdd., clr. qtz. grns.. Por: nvp 4136-4151. (circ.@ 48):lt.gy., uf.-l.med. ss. (matx.) w/abnd. cm.-salm.-ong., op. cht. pbls.& cbls.; por. & osth in matx.. Por: intgran small 4151-4177. v.dk.gy.-mar. sh. w/thin bds. cgl. as ab.. Por: nvp	●	
^v	4160	|			■		4177-4184. cht.pbls.-cbls.as ab., in lt.gy. vf.,sli.-arg., ss. matx.. Por: intgran small 4184-4199. shale & chert as at 4150. Por: nvp		
^v	4200	|			■		4199-4244. com. salm.-bf.-ong.,sup-op. cht. in mar.-dk.gy. sh. matx.; same @ TD.. Por: nvp		
^v	4240	|			■				

ANDERSON #1

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: COLORADO OIL & GAS COMPANY
 'Farm'/Owner: ANDERSON #1
 State: KANSAS
 County: PAWNEE
 Township: 23S
 Range: 17W
 Section: 10
 Well Spot: SW SW SW
 Elevation: 2096
 Reference (kb/gl): KB
 Total Depth: 4378
 Completion Date: 5-25-55
 Logged By: Jim Rogers
 Logging Date: 2-9-06



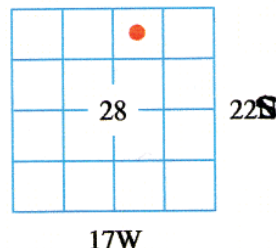
Lithology	1 inch = 40 ft	Grain Size	Porosity	Description	Tests Shows Cores Perfs
		mm 0 1 2	percent 0 10 20		
PAWNEE LIMESTONE	4160			4162-4174. limestone.. Por: nvp 4174-4189. Shale.. Por: NVP 4189-4199. Limestone.. Por: nvp	
PENNSYLVANIAN BASAL CONGLOMERATE	4200			4199-4204. black shale.. Por: nvp 4204-4211. mar.& gnh.-gy. mot. sh. w/silty. beds. Por: nvp 4211-4218. TOP CORE:4211=4211cd: sh.as ab.,w/ common bioturbation & root marks.. Por: nvp 4218-4224. =4218cd:pl.grnh.gy.& mar., vf-f.,v. arg.ss w/wispy lam.& biotb. as ab.. Por: nvp 4224-4226. =4223cd: mar.& gm.motd.,sdy. sh. w/rar. fltg.,mult-col., op.cht.pbs. . Por: nvp 4226-4231=4225cd: mult.-col.cgl; op.,ang.cht. pbls./cbls. in sand & shale matx.; most core lost (matx washout).. Por: nvp 4231-4234. =4229cd:mar., sdy.sh. w/com.,fltg., sub-ang.-rdd. cht. & lm pbls.;thin beds. sdy. congl. as ab.. Por: nvp 4234-4248. =4237cd:cht.cbls.in sh.& ss.matx.; pl.gy.-bf, rdd.,op., cotd.cht.cbls. in ss.& red shale matx.; most core #3 lost (matx.washout). Por: nvp 4248-4251. core lost: ? shale?. Por: nvp	●
MISENER KINDERHOOK SANDSTONE	4240			4251-4160. =4152cd:bn., f-vf.,well-srtd., sli. calc. ss.w/poor por., sli oil stn. END CORE DESCRIPTION. Por: intgran small	

BARGER 1-28

Lithologic Log

Jim Rogers. National Geological Services. Denver, Colorado.

Operator/Driller: CLEARY PETROLEUM CORPORATION
 'Farm'/Owner: BARGER 1-28
 State: KANSAS
 County: PAWNEE
 Township: 22S
 Range: 17W
 Section: 28
 Well Spot: NW NE
 Elevation: 2045
 Reference (kb/gl): KB
 Total Depth: 4190
 Completion Date: 2004
 Logged By: Jim Rogers
 Logging Date: 5-26-05



Lithology	1 inch = 40 ft	Grain Size			Porosity			Description	Tests Shows Cores Perfs
		mm			percent				
		0	1	2	0	10	20		
	4000								
	4040							PAWNEE LIMESTONE 4025-4036. DESCRIPTIONS FROM CUTTINGS 4025 ld(log depth):gy.dns.lm.wkstn. Por: nvp	
								BASE PENN LIME 4036-4042. (=36ld) blk.-v.dk.gy., splnty, dull "hot" sh. (see 20 min circ @ 4040).. Por: nvp	
								4042-4050. (=42ld):mar.,gy.& gm.,doltc., slty. shale.. Por: nvp	
								4050-4059. TOP OF CORE (CD 3' HI TO LOG DEPTH) 4050 cd(=47ld):mar.& gm. mott.,v arg. doltc. sltstn. w/abnd. bioturb. & vadose-filled vert. frags.. Por: nvp	
	4080							4059-4061. (=56ld): lt.gn.-buf.,vf. doltc. ss w/ com. bur.& wspy, sub-hor.lam.. Por: nvp	
								4061-4075. (=58ld): mar.-gnh.gy. plty. sh.. Por: nvp	
								4075-4081. (=72ld):gy.-gn.to bn. doltc.& arg. sltstn.; w/wvy.-lam. & sps.bur.. Por: nvp	
	4120							4081-4082. (=78ld):maroon shale as above.. Por: nvp	
								4082-4084. (79ld):cgl.;pl.gy, sub-op.,fos. cht. cbls.in gm.-mar.,waxy sh. matx.. Por: nvp	
								4084-4091. (=81ld):lt.gy.-gy.,den. silic. "clotd" mdstn.w/alg.lam.& lg.pisol.; rar wht.fos.cht.nods.;tr.oal.gnsth.. Por: nvp	
	4160							4091-4097. (=88ld):lt.gy.-buf.,lime wkstn. & pkstn. bldrs./cbls.in wxy gm.-mar. sh.matx.;rar wht.,sub-op. cht.cbls.. Por: nvp	
								4097-4120. (=94ld):50% of core recoved: wht.- gy. cht.& doltc.lm. cbls. in mar.to gnh.-gy. sh. matx. <u>END CORE @4120.</u> Por: chalky small	
	4200							4120-4148. (=17ld):(Described from Cuttings): wht.-crm. cht.cbls in clr.,med.,rdd. qtz. ss and mar.-gy. sh. matx. (see below). Por: nvp	
								MISSISSIPPIAN OSAGE 4148-4190. (=48ld):crm.-lt.gy., sli.chlky. lm. mdstn. w/abnd., wht.-lt.gy., sub-op. & trip.cht. nod.; patches of ppv & blk.dos <u>DRILLER'S TOTAL DEPTH=4190(81 LD).</u> Por: vug	
								4190-4220. Detailed CORE descriptions: 4091-97 cbls.of vf-fxtn.,skel.-pel. lm. wkstn. & pkstn.(part bre.) in sh. matx.;some ss matx. lost while coring? (see common med.-crs. clr., w.rdd. quartz grains in cuttings) 4097-4120 cbls of wht.-pl.gy.,lam. ("banded"),op. cht.;part replacing f.,skel.-ool. lm pkstn.-gnsth.; com patches of trip.& pp. vuggy por. w/ blk. do stain (cuttings 4105-20); note partial recovery cores #3 & 4; most matx.(as ab)lost during coring. Por: nvp	