

**KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 2003-63**

CORE DESCRIPTION OF AMOCO #1 REBECCA K. BOUNDS SAUK
AND TIPPECANOE STRATIGRAPHIC SECTION

by

Lee C. Gerhard

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**Core Description of Amoco #1 Rebecca K. Bounds
Sauk and Tippecanoe Stratigraphic Section**

Lee C. Gerhard

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Kansas Geological Survey Open File Report #2003-63

Amoco #1 Rebecca K. Bounds

API #1507120446 1754 fnl, 30 fel
 NE/4 SE/4 NE/4, S. 17, T. 18 S., R. 42 W., Greeley County, Kansas
 GL 3824, KB 3836
 Logged 11 April 1988

TD 5956, logged depth 5733 (pulled tight)

Section described: 5607 through 5955.5.
 Described by Lee Gerhard, September, 2003. Core is mostly unslabbed.
 Redescription to done when core is slabbed.

AMOCO called tops:

T/Gilmore City (M): 5530
 T/Viola: 5620
 T/Arbuckle: 5715
 T/Reagan Ss: 5886
 T/Cambrian?: 5928

Gerhard called tops:

5608: Top, Hunton? (could be top, Viola, or in the Mississippian) T/Tippecanoe?
 5619.8 Unconformity, top of Viola
 5715.3 Top of Arbuckle (top, Sauk)
 5885.9 Top of Cambrian (Gunter?)
 5902: Top of Bonneterre
 5934: Top of Reagan?
 5948.7 Top of unknown dolomite unit.
 5955.5 Base of core.

Additional calls based on Walters' descriptions of Arbuckle subdivisions on the Central Kansas Uplift are included as suggestions, subject to revision.

Notes: There is an apparent discrepancy in the stratigraphy since no carbonate is supposed to be below the Reagan. This implies that the sandstone called Reagan is in fact a younger unit (perhaps basal Gunter), or there is sandstone below the last carbonate, but unpenetrated. If so, that unit might better be called Lamotte. Until the core is slabbed, it will not be possible to solve this enigma, and perhaps not even then. Revisions to the stratigraphic calls will be made when diagnosis is possible. Comparison to other Precambrian wells in the vicinity does not suggest that two sandstones occur in elsewhere.

Reference:

Walters, Robert F., 1991, Gorham Oil Field, Russell County, Kansas: Kansas Geol. Survey Bulletin 228, 111 p.

Amoco #1 Rebecca Bounds Thin Section Descriptions

- 5955.1 Fine-grained micritic dolomite with pellets, both small and large. Fine-grained sand, angular, and full size qtz sand grains rounded. Thin lens of fine-grained sand. Ghosts of finely comminuted skeletal debris. Sandy pelletal wackestone.
- 5955.2 Pelletal glauconitic sandy (qtz) micrite overlain by micrite with algal mat fragments and glauconitic algal mat fabrics. Epibiont frags.?
- 5954.8 Dolomite. Broken and burrowed algal mats with some quartz sand. Micritic threads, perhaps strings of cells? Looks a lot like encrusting bryozoans broken and redeposited. Likely epibionts on algal mats.
- 5954.7 Dolomite. Base of section is silty algal mat, overlain by 4 fining upwards < 0.5 cm. Units, capped by broken algal mat and skeletal packstone, VFG, nothing identifiable. Dolomite is finegrained, broken beds, shrinkage cracks propagating upwards if the section is oriented correctly.???
- 5954.2 Silty dolomite, algal mats, micrite intraclasts. Upper portion is cross-bedded silty dolomite.
- 5953.9 Slightly silty dolomite, laminated micrite intraclasts broken in situ, some algal mat fragments, upper portion is coarser, uppermost contains some unidentifiable debris.
- 5953.2 Laminated micrite with interbedded fine-grained quartzose sand, Cross-bedded?
- 5952.5 Euhedral dolomite with stringers of bright dolomite and quartz silt, upwards coarser dolomite to very large crystals of white secondary dolomite
- 5952.2 Coarse dolomite, upper is silicified? Brown pelletal "calci-silty" algal mat.
- 5951.7 Coarse dolomite overlain by finer-grained dolomite, contact is ancient stylolite or silty/clay layer partially replaced by dolomite.

- 5950.0 Micrite, with dessication cracks, shelter effects, overlain by algal mats including pellets, intraclasts, broken algal mat fragments, and scattered quartz sand grains. Several grains have glauconite rims or contain glauconite in the mat portion.
- 5948.9 VFG dolomite with large patch of silica-cemented tightly packed quartz sandstone. Sand grains range from exceptionally well rounded to very angular. Some overgrowth.
- 5712.5 Viola. Crinoidal grainstone, very highly developed micrite rims and very rounded grains.

Rebecca Bounds core study, Description of Sauk and Tippecanoe Sequences

5607. Black fossiliferous silicified limestone, Mississippian.

5608. Small breccia zone, of brown limestone clasts overlain by cherty black limestones, typical of the Mississippian Gilmore City? (Amoco call) Some quartz grains, churned fabric. Some silicification. Heavily stylitized at 5607.

Top of Tippecanoe/base of Lower Kaskaskia (Gerhard call)

(5608-5616: perhaps this is Hunton)

5608-5612.5: Brown laminated lime mudstone.

5612.5-5613: Quartz sandstone over thin mud layer, with scattered sand grains.

5954.9 : Brown muddy limestone with inclusion of stylolite-bounded quartz gravelstone Penetrative stylolites.

5613-5616: Looks like Viola, brown muddy limestone.

Missing core from 5616-5619

Top of Viola (AMOCO call)

5619-5619.8 Black intraclastic black shaly limestone, intraclasts appear to be from underlying unit. This is the called (Amoco) unconformity with Mississippian.

5619.8-5620.3: Apparent stromatolites, Irregular contact with overlying unit.

5720.3-5627.4: gray limestone, featureless in core, grading upwards to breccia and subaerial fabrics.

5627.4-5629: Stromatolites

5629-5630.7: Thinly laminated limestone with black stylitic contacts, to 5629. This unit may be stromatolitic.

5635 to 5636 is shaly limestone, then back to lime mudstone to 5630.7. Stylolites abundant, parallel to bedding.

5636-5715.4: Brown limestone, crinoidal grainstone at base, muddier to mudstone at top. Shale break occurs just above 5636.

5637.7 Top of major unit? Eroded surface, followed by stromatolite or laminated contorted limestone.

5948.10 Lofelite at top of a cycle

5658.7 Top of cycle.

5658.7-5664 Birdseye muds, capped by apparent dessication surface.

5664: Top of cycle (breccia)

5664-5714.5: Brown grainstone, (Thin section: 5712.5) Crinoidal grainstone, very highly developed micrite rims and very rounded grains.

5714.5–5715.3: Base of overlying unit (Simpson or Viola), gray sandy crinoidal grainstone. Grades upwards to muddier shelly wackestones with crinoids. Limestone, not dolomitized. Grains are crinoidal and rounded brown amorphous in hand specimen. (See thin section 5712.5) Viola is heavily fractured, vertical, to 5700, unfractured to 5682, then fractured to 5670. Massive to 5650, fractured to 5643.

Top of ARBUCKLE; Top/Sauk, Base/Tippecanoe

5715.3 -5739.5: Uppermost Arbuckle. All of unit is partly silicified, mottled dolomite, with some vugs. Many dessication marks or geopetal structures, some brecciation. Cherts are featureless, no grains in most, although one possible silicified coral at 5736.3. Weathering rind at contact, which is very sharp, and very high relief.

Much of upper 10 feet is mottled and churned. Geopetal vug filling at 5740.1. Uppermost layer is about 2-3 inches of loferite, with horizontal partings and gaps. Upper layer of unit is silicified, could have been algal mat based on geometry. Clearly is an exposure surface.

5739.5- 5762: Dark gray medium to fine grained dolomite with many vugs, Several of the vugs have strongly developed geopetal features, including layered fillings over printed by crystalline dolomite, some anhydrite. Best developed: 5759.5 - 5760. Some vug filling appears to be silt, or carbonate mud/silt that has been dolomitized. Some floating masses of dolomite in vugs, like a breccia filling (5746.9). Minor chert near top of unit, no grains identifiable.

5762-5777: Light gray dolomite, very grainy. Ghost textures suggest that entire unit is dolomitized skeletal sands or ooids, with short mudstone or wackestone breaks. One break at 5768 has dessication cracks, overlain by stylolite. Anhydrite-filled vug at 5768.8. Dolomite is massive, unfractured. There may be some silt-sized quartz scattered in this unit. Porosity great, mostly pinpoint and

larger small sand-size open spaces, some quite round. Two large vugs; upper one at 5763 has large clear selenite crystal.

5777 - 5793: Lightcolored gray-tan dolomite, with abundant chert and stylolites. Ghost fabrics appear coarser in upper portion.

Mollusk in chert at 5786.3. Above this the chert becomes much more micritic, fewer shell fragments. At 5780.2 chert contains more hash, dolomite is coarser and has shell hash-shaped tiny vugs. Above, back to micritic cherts. At 5777.8 coarse ghost zone, looks like crinoids originally. Above, the last of the chert to 5777 is mostly replaced by dolomite, except for remaining rinds. Much pinpoint to tiny vugular porosity.

5793 - 5799.5: Dolomite, 5796.1 is a bed of finegrained dolomite stirred as lumps into the gray coarse dolomite. Section is very vuggy, up to 1.5 inch vugs, lined with euhedral dolomite. 5793 has fractures, filled, with floating clasts; apparent disrupted fabric at 5799 (base). 5793-5791.3 is coarsegrained, 5791.3 - 5791 very fine-grained. Chert at 5791.3 is very sparse wackestone.

5799.5 - 5805.4: Lightcolored gray-tan dolomite. Recemented fractures in this section, looks like white dolomite cements. Chert at 5803.4 contains sparse to abundant wackestone, with crinoid plates, other thin and delicate skeletal hash. Top is first very large vug with crystals of dolomite.

Roubidoux/Jefferson City? (Walters)

5805.4-5808.4 Gray-brown fine-grained dolomite, topped by a rubble /intraclastic bed, 2-3 inches.

5808.4 - 5819 Gray-brown fine-grained dolomite, ghosts of fossil fragments at 5810. Coarse zone at 5808.4, perhaps stromatolite?

Chert at 5815.7: abundant skeletal wackestone. Crinoid fragments?

White chert at 5819 replaces sparse skeletal wackestone, looks like some bryozoa, small foraminifera, delicate skeletal debris.

5819 - 5830 Gray-brown fine-grained dolomite, apparent interbedded mud fabrics and grain fabrics, with a few fillings of either anhydrite or crystalline dolomite. No original fabrics preserved.

First chert is at 5819.

Few stylolites, one at 5819.9.

(5820-5823 is slabbed, but no precursor fabrics can be identified.)

5830 - 5844: Finegrained dolomite grading upwards to medium grained dolomite, with large crystal-lined vugs, appear to be skeletal, likely packstones with uppermost grainstone layer, then rubble clasts (5830-30.5)

5844: contact between Roubidoux and Jefferson City? (Walters)

5844 - 5847.4 Dark gray laminated dolomite, few vugs, filled, silicification at 5846.3, breccia zone at 5845.5, Apparent dessication cracks in remaining upper core. Slight amount of quartz sand in base of unit - angular to sub angular.

5847.4 - 5849: medium grained dolomite, capped by 1 inch chalk/breccia (disconformity).

Gasconade/Roubidoux boundary? (Walters)

5849 - 5851.1: Silicified and dolomitized micrite grading upwards into medium-grained dolomite. Disconformity with 6 inch relief at 5849.

5851.1 - 5851.5: clastic carbonate zone, with stromatolite.

5851.5 - 5852.1: complete "sequence" sediment/pebble unconformity, with 1.5 inch relief in this core section. Pink dolomite at base above previous pebble zone, gray medium grained dolomite, then pebble zone, gray, not black.

5852.1 - 5853.1: Lower half is coarse dolomite, gray, with many small vugs, looks like replaced shell hash. Upper portion fine-grained, terminated by pebble zone, black angular pebbles.

5853.1 - 5854.3: Stromatolites and rubble, ovoid large stromatolite (5854) with others growing on rubble above. Inclined bedding persists to top of unit, transition to medium grained dolomite.

5854.3 - 5858.7: Patchy light and dark brown/gray dolomite, probably burrowed.

5858.7 -5861.2: Medium-grained light-colored dolomite, disrupted, perhaps burrowed, fabric, 5859-5858.9 is disrupted, looks weathered. 5858.7 is chalk, 1.5 inches thick, irregular base.

5953.3 -5869.8 Interleaved (.5 inch?) fine and medium dolomite, fine at base, coarsening upwards. Flat pebble bed at 5861.2 Vugs parallel to bedding, apparent coarse lime sands originally. Bladed anhydrite crystals at 5861.

5869.8- 5885.9 General: Light-colored dolomite, with admixtures of dolomite-filled vugs. Dolomite is fine-grained and coarse-grained, and probably reflects primary lime fabrics – fine-grained dolomite = mud based, coarser-grained are

sand and grain based; most porosity is in the coarser fabrics. Many oolites, especially in the 5874.6 - 5869.8 portion. Skeletal sands are also probable, interpreted.

5870.5 - silicified oolite, proving thesis that the lower part of this is highly oolitic.

Possible Gasconade Member of Arbuckle 5848.5 - 5886

5885.9 is top of disrupted bed. BASE OF ARBUCKLE (Gerhard call)

5886 Amoco called top of Reagan/top of Cambrian? - base of Arbuckle

5886 -5895: Rubble zone with large masses of euhedral dolomite, followed upwards by dolomite, medium-grained, apparently replacing granular limestone. Vugs parallel to bedding common upwards, alternating between coarsely crystalline dolomite and finer grained dolomite, apparently reflecting original fabrics. Vugs are dolomite filled, chert in middle portion, Flat pebbles at 5887.5, 5886.5, and 5886

Shale break at 5889, upwards are clasts and filled porosity, disrupted fabrics.

5895: Top of Gunter? (Walters - ref)

Unconformity

5895 - 5900.9: Quartz sandstone and dolomite interbedded, much of dolomite is sandy or silty. More upper portion has apparent dolomitized packstones, with very small vugular porosity. Sand is in thin dark and light bands in middle of section. Disrupted bedding at 5898.

5900.9 - 5901.9: Gray dolomite, flat pebble thin bed at 5901.7.

5901.9 - 5902: Basal conglomerate, dolomite cemented sand with clasts of dolomite, perhaps some ooids. Overlying dolomite appears to contain shelter porosity that is in-filled with white crystalline dolomite. Probable replaced mud?

Should be thin-sectioned.. Fracture displaces shelter on one side, healed.

Unconformity (lithologically, a significant unconformity) T/Bonneterre?

5902 - 5905: Base is rubbly, appears slightly weathered, upwards silty or slightly sandy dolomite, apparent replaced grainstones and packstones, many small (up to 1 inch vugs), loferite?, more vuggy upwards. Terminates in a highly weathered chalky zone at 5902.4.

5905 - 5908.5. Lower section alternating apparent dolomitized grainstones and

fine-grained dolomite, grades upwards to dolomitized wackestones? and mudstones. Massive euhedral dolomite at 5907, vug filling. A few styolites.

5908.5 - 5912.8: Ooids and carbonate sand grading upwards into massive fine-grained dolomite. Last identifiable grains at about 5912. Base is disrupted bedding with flat pebbles.

5912.8 - 5915.66: Ooids sometimes appear to be sand grains with ooid coatings. Oolitic and perhaps sandy dolomite, vugular, current-bedded, larger vugs euhedral dolomite lined, vugs increasing in size upwards. Clasts of ooids and muddy clasts randomly distributed throughout section. Top is clasts of sand-nucleated ooids, apparent inclined bedding.

(5913-5924.5 has huge amounts of vuggy porosity.)

5915.66 - 5917.4: Sandy dolomite to 5917, sharp sand/no sand at base, then abruptly to finegrained dolomite to 5915.05, then pebble conglomerate/weathering residue, top of which is at 5915.66.

5917.4 - 5918.8 Ooids in dolomite matrix. Vugular porosity, apparent dissolved clasts, pinpoint porosity from dissolved ooids.

5918.8 - 5919.5 Dolomite, flat pebble conglomerate at base, disrupted bedding, perhaps more flat pebbles at top. Overlain by ooids.

5919.5 - 5922: Partly chertified dolomitic sandstone with sand decreasing upwards, some fractures and vugs.

5922 - 5922.25: Silicified disrupted material. Hard to tell what it was originally.

5922.25-5924.6: Sucrosic medium-grained dolomite with pinpoint to small vugular porosity, vugs largely parallel to bedding. Some disrupted fabric and dolomite fills some fractures.

5952.6 - 5924.6: Dolomite, silty near top, pinpoint porosity.

AMOCO called t/Cambrian at 5928.

5925.8 -5929.33: Dolomite, medium to fine-grained, sucrosic, top of unit is dolomite lined vug, and fracture fillings. Vugs start at 5926.2.

5929.33-5930.2: Fine-grained sandstone with dolomite matrix, cement. 50% sand, 50% dolomite. Cut and fill bedding?

5930.2-5931.7: Dolomite, with basal portion with clasts, fracture filling, large vug that cuts core, sucrosic; upwards very fine grained dolomite, with shale break at

5930.5. Above shale parting, some silt in dolomite, top is wispy laminated, like disrupted stromatolites, then shale parting at 5930.2.

5931.7 - 5934: Dolomitic sandstone, sandy oolitic dolomite, with pinpoint porosity and small vugs parallel to assumed bedding; rip up clasts, dolomite cements around apparent clasts, etc. Full of ooids and sand.

5934.0 - 5934.2: Euhedral white dolomite-cemented breccia.

5936.9 - 5934.2: Dolomitic sandstone or sandy dolomite, with 1 " vugs, partly filled or lined with euhedral dolomite.

5936.9- 5938: Dolomitic sandstone, dolomite-lined vugs, breccia. Vugs are large, core broken up.

5938-5939.7: Dolomitic sandstone.

5939.7-.8 Unconformity **Top, Reagan**

5939.8-5945.7 : interbedded sandstone, clear rounded to sub-angular grains, fine to medium grade, and dolomite stringers (sucrosic, with floating sand grains), and dolomite cemented sands, sometimes with the grains not firmly packed in the dolomite. Occasional thin stringer of coarse sand, subangular to subrounded. Shale break at 5943.8.

5945.7-5946.3: Burrowed white and black sandstone. Irregular top surface.

5946.3-5947.2: massive pinkish orthoquartzite. Inclined bedding at base.

5947.2-5948.7: Pink sandstone, (orthoquartzite), with intraclasts of dolomite, mostly flat or slightly inclined. Red sandstone marker at top., irregular surface.

Base of Reagan / Top, Pre-Reagan carbonates

5948.7-5952: Dolomite with sand grains and sand patches, dolomite secondary vugs, distorted bedding, looks very karst-like, or rubble zone with concurrent carbonate. Sand increase to top. Top is greenish shale break. Some reddish color. Shale break is inclined.

5952.2.1 More finely-bedded dolomite, a few floating sand grains. Dessication features, i. e. broken in situ intraclasts, fenestral at 5953.8, chert-preserved oolites at 5953.7. These are preserved whereas the rest of the bed seems to be dissolved. Shale break at 5953. Cross-bedded granular dolomite in upper portion, terminated by a 2-inch chert breccia at 5952.

Contact with next unit and eroded and irregular surface, with clasts of underlying dolomite.

5554-5955.5: Dolomite with much sand at base, less upwards, few floating sand grains near top. Fenestral fabric (loferite) in part, with a few intraclasts. Interpretation: intertidal. Lower contact sharp against the lower sand unit. Flat bedding.

(Note: Wherever there is apparent sand in dolomite, when slabbed look to see if sand grains are quartz or if they are ooids.)

AMOCO Tops:

TD: 5956

T/Cambrian?: 5928

T/Reagan ss: 5886

T/Arbuckle: 5715 (170 feet)

T/Viola: 5620

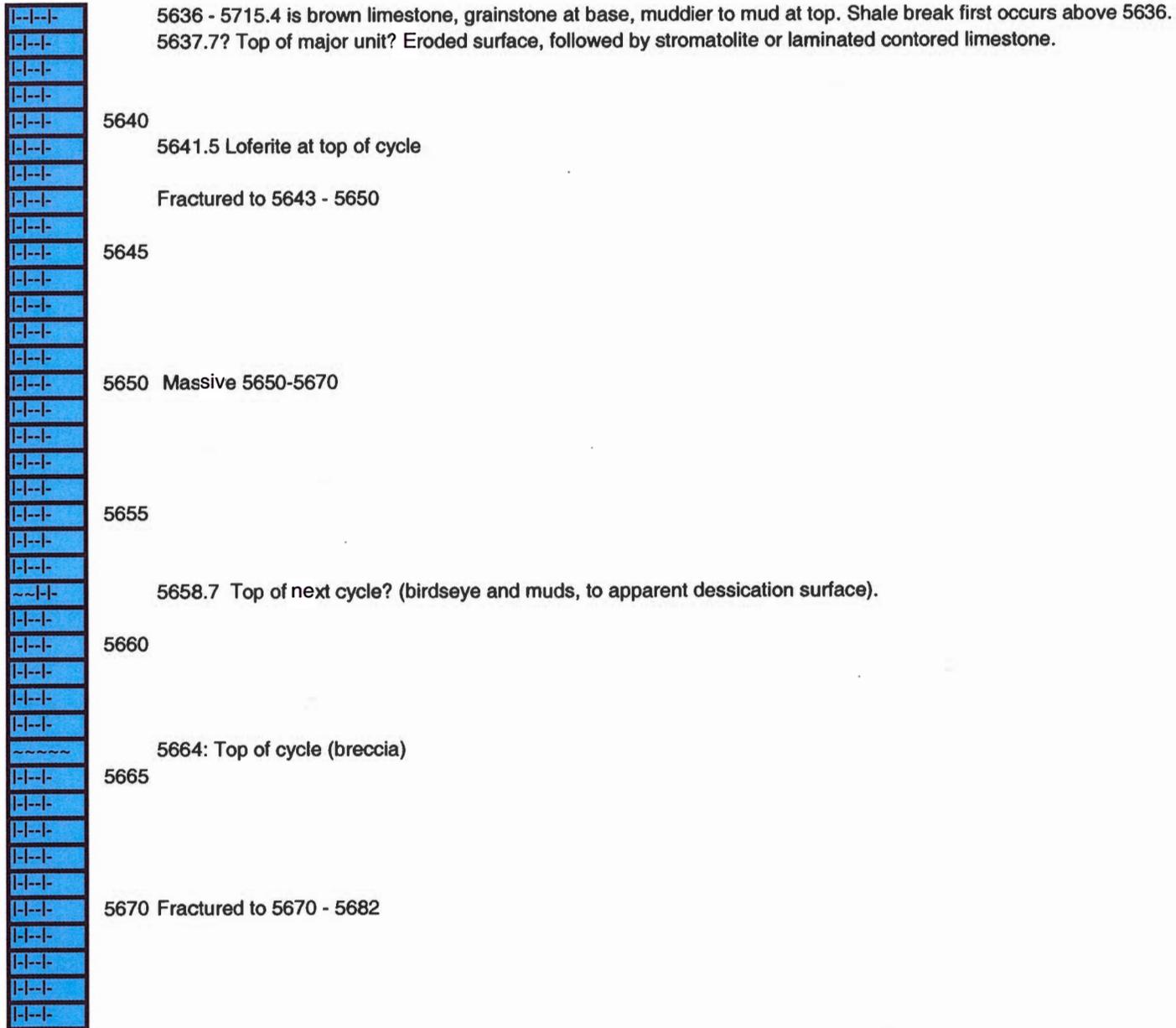
T/Gilmore City (M): 5530

Rebecca Bounds Core Graphic

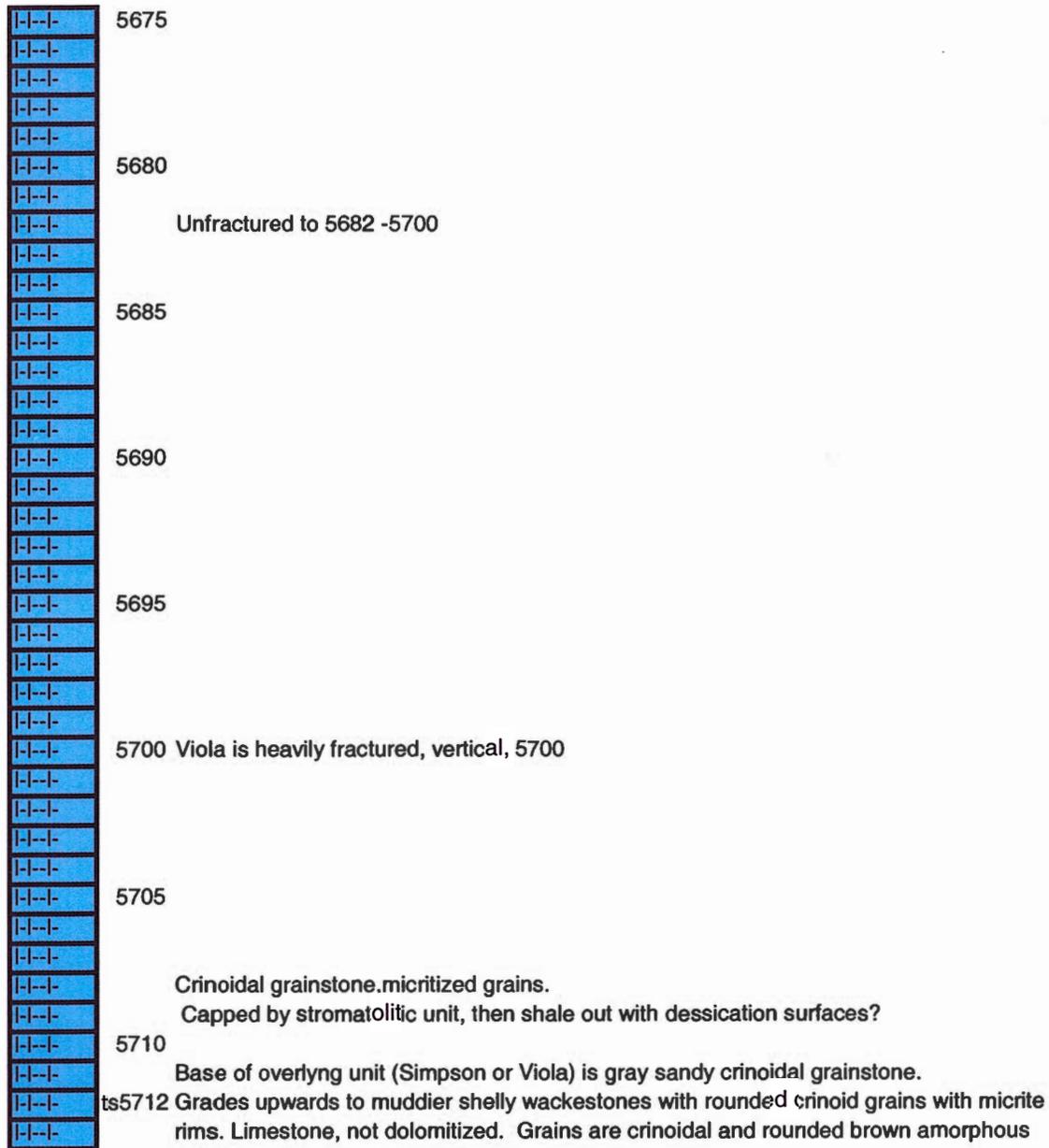
Explanation		
	oooooo	Conglomerate
	---	Limestone
	---	Dolomite
	Sandstone
	-----	Shale
]]]]]]	Stromatolite
	~~~~~	Unconformity
	***	Chert

--- *	5607	5607 Is clearly black silicified limestone, Mississippian.
~~~~~	5608	Unconformity; Small breccia zone, of brown limestone clasts overlain by cherty black limestones, typical of the Mississippian Gilmore City? (Amoco call)
---		Some quartz grains, chumed. Some silicification. Heavily stylitized at 5607.3
--- ..		Top of Tippecanoe: Gerhard call/baseof Lower Kaskaskia
---	5608 - 5612.5:	Brown laminated mudstone.
.....	5621.5 - 5613	Quartz sandstone over thin mud layer, with scattered sand grains.
---	5613.5	Inclusion of stylolite-bounded quartz gravelstone Penetrative stylolites.
---	5615	
	5613-5616	Looks like Viola, Brown muddy limestone.
	5619	Missing core from 5616-5619
~~~~~	5620	Top of Viola? AMOCO call.
]]]]]]	5619.8 - 5620.3:	Apparent stromatolites, contact with overlying unit is intraclastic black shaly limestone, intraclasts appear to be from underlying unit.
---		This is the called unconformity with Mississippian, however.....
---		
---	5625	
---		
---	5627	5720.3 - 5627.4 Gray limestone, featureless in core, grading upwards to breccia and subaerial fabrics
]]]]]]	5627.4 - 5629	Stromatolites
]]]]]]		
--- ]	5630	5629 - 5630.7: Thinly laminated carbonate with black stylitic contacts, to 5629.
---		This unit may be stromatolitic.
---		
---		
---		
-----	5635	5635 to 5636 Is shaly, then back to mud to 5630.7. Stylolites abundant, parallel to bedding.

Rebecca Bounds Core Graphic



Rebecca Bounds Core Graphic





in hand specimen.

**ARBUCKLE-VIOLA CONTACT**

5715 5715.3 -5739.5: Uppermost Arbuckle. All of unit is partly silicified, mottled dolomite, with some vugs. Many dessication marks or geopetal structures, some brecciation. Cherts are featureless, no grains in most, although one possible coral silicified at 5736.3. Weathering rind at contact, which is very sharp, and very high relief.

5720

5725

5730

5735

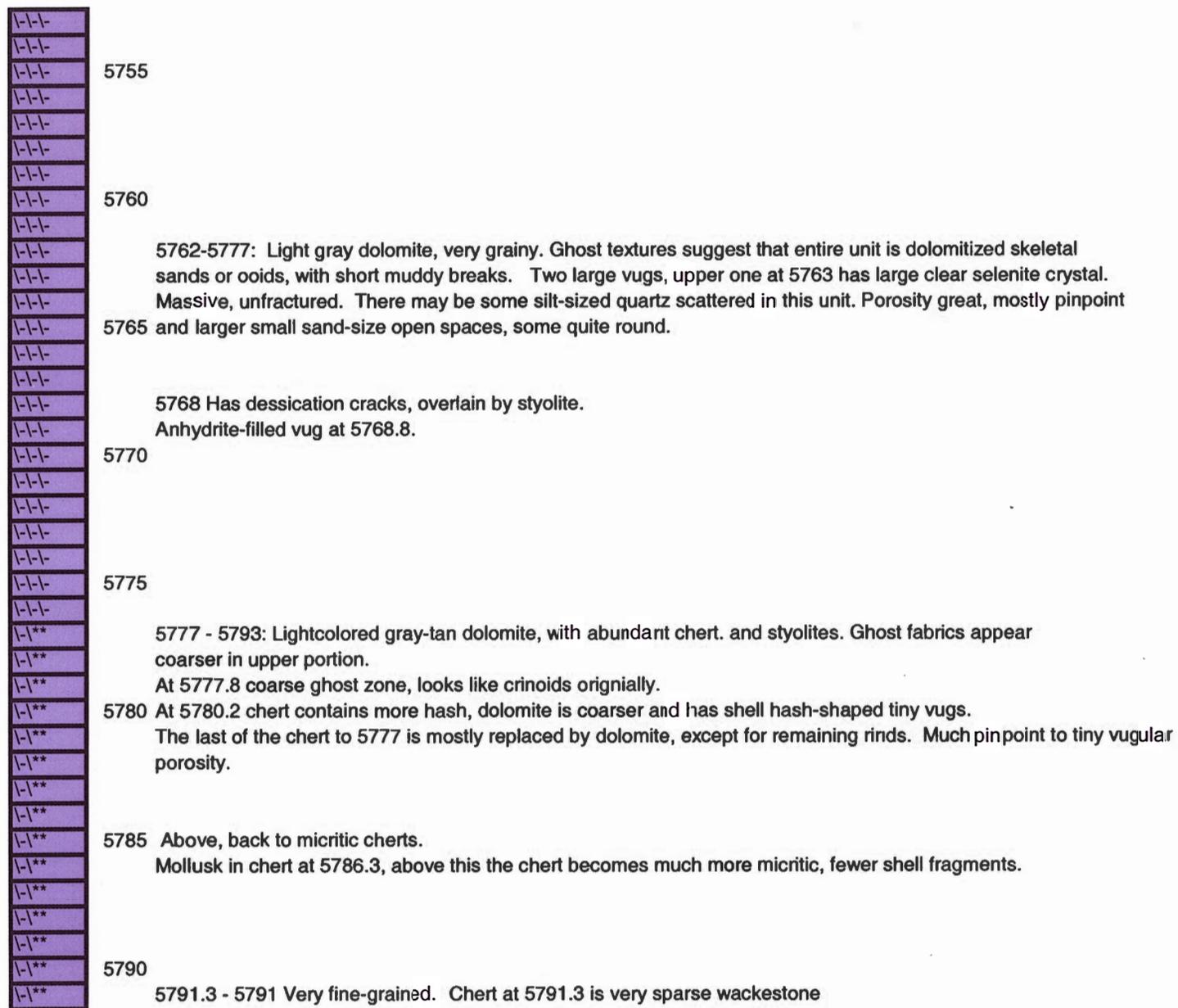
5739.5- 5762: Darker gray medium to fine grained dolomite with many vugs. Several of the vugs have strongly developed geopetal features, including layered fillings over printed by crystalline dolomite, some anhydrite. Best developed :5759.5 - 5760. Some vug filling appears to be silt, or carbonate mud/silt that has been dolomitized. Some floating masses of dolomite in vugs, like a breccia filling ((5746.9). Minor chert near top of unit, no grains.

5740

5745 Much of upper 10 feet is mottled and chumed-appearing. Geopetal vug filling at 5740.1. Uppermost layer is about 2-3 inches of loferite, with horizontal partings and gaps. Upper layer of unit is silicified, could have been algal mat based on geometry, Clearly an exposure surfac

5750

Rebecca Bounds Core Graphic



Rebecca Bounds Core Graphic

- **	5793-5791.3 Is coarse-grained.
- **	5793 - - 5799.5: Same. Section is very vuggy, up to 1.5 inch vugs, lined with euhedral dolomite.
- **	5793 Has fractures, filled, with floating clasts; apparent disrupted fabric at 5799 (base).
-   -	5795
-   -	5796.1Is a bed of finegrained dolomite stirred as lumps into the gray coarse dolomite.
-   -	
-   -	
-   -	5799.5 - 5805.4: Recemented fractures in this section, looks like white dolomite cements. Other wise the same
-   -	5800 as below. Top is first very large vug with crystals of dolomite
-   -	
-   -	
- *	Chert at 5803.4 contains the sparse to abundant wackestone, with crinoid plate, other thin and delicate skeletal hash.
- *	
~ - -   -	5805 Roubidoux/Jefferson City? 5805.4 - 5808.4: Abundant skeletal wackestone, topped by a rubble /intraclastic bed, 2-3 inches.
-   -	
-   -	
-   -	5808 .4 - 5819 Skeletal wackestone, ghosts of fossil frags at 5810. Coarse zone at 5808.4, perhaps stromatolite?
-   -	
-   -	5810
-   -	
-   -	
-   -	
-   -	
-   -	
- **	5815 Chert at 5815.7: abundant skeletal wackestone. Crinoid frags?
-   -	
-   -	
-   -	
**   -	5819 - 5830 White chert at 5819 replaces sparse skeletal wackestone, bryozoa, small forams, delicate skeletal debris?
-   -	5820 (5820-5823 is slabbed, but not precursor fabrics can be identified.)
-   -	5819 - 5830 Gray-brown fine-grained dolomite, apparent interbedded mud fabrics and grain fabrics, with a few fillings of either anhydrite or crystalline dolomite. No original fabrics preserved. First chert is at 5819. Few stylolites, one at 5819.9.
-   -	
-   -	
-   -	5825
-   -	
-   -	
-   -	
-   -	
- - -   -	5830 5830 - 5844: Fine-grained dolomite grading upwards to medium grained dolomite, with large crystal-lined vugs,





Rebecca Bounds Core Graphic

- - -	at about 5912. Base is disrupted bedding with flat pebbles.
- - -	5910
- - -	
- - -	5912.8 - 5915.66: Ooids sometimes appear to be sandgrains with ooid coatings. Oolitic and perhaps sandy dolomite, vugular, current bedded, larger vugs euhedral dolomite lined, vugs increasing in size upwards. Clasts of ooids and muddy clasts randomly distributed throughout section. Top is clasts of sand-nucleated ooids, apparently inclined bedding.
- - -	5915
- - -	5915.6 - 5917.4: Sandy dolomite to 5917, sharp sand/no sand at base, then abruptly to finegrained dolomite to 5915.05, then pebble conglomerate/weathering residue, top of which is at 5915.66.
- - -	5917.4 - 5918.8 Ooids in dolomite matrix. Vugular poro., apparent dissolved clasts, pinpoint poro. from dissolved ooids.
- - -	5918.8 - 5919.5 Dolo., flat pebble congl. at base, disrupted bedding, perhaps more flat pebbles at top. Overlain by ooids.
- - -	5920 5919.5 - 5922: Partly chertified dolomitic sandstone with sand decreasing upwards, some fractures and vugs. (5913-5924.5 has huge amounts of vuggy porosity.)
- - -	5922 - 5922.25: Silicified disrupted material. Hard to tell what it was originally.
- - -	5922.25 - 5924.6: Sucrosic medium-grained dolomite with pinpoint to small vugular porosity, vugs largely parallel to bedding. Some disrupted fabric and dolomite fills some fracture
- - -	5925 5924.6-5925.8: Dolomite, silty near top, pinpoint porosity.
- - -	5925.8-5929.33: Dolomite, medium to finegrained, sucrosic, top of unit is dolomite lined vug, and fracture fillings. Vugs start at 5926.2.
- - -	AMOCO called t/Cambrian at 5928. No idea why.
- - -	5929.33-5930.2: Fine-grained sandstone with dolomite matrix, cement. 50% sand, 50% dolomite. Cut and fill bedding
- - -	5930 5930.2-5931.7: Dolomite, with basal portion with clasts, fracture filling, large vug that cuts core, sucrosic; upwards very fine grained dolomite, with shale break at 5930.5. Above shale parting, some silt in dolomite, top is wispy laminated like disrupted stromatolites, then shale parting at 5930.2.
- - -	5931.7 - 5934: Dolomitic sandstone, sandy oolitic dolomite, with pinpoint porosity and small vugs parallel to assumed bedding; rip up clasts, dolomite cements around apparent clasts, etc. Full of ooids and sand
- - -	5935 5934.0 - 5934.2: Euhedral white dolomite cemented breccia.
- - -	5934.2-5936.9: Dolomitic sandstone or sandy dolomite, with 1" vugs, partly filled or lined with euhedral dolomite
- - -	5936.9- 5938: Dolomitic sandstone, dolomite-lined vugs, breccia. Vugs are large, core broken up.
- - -	5938-5939.7: Dolomitic sandstone
- - -	5939.7-.8 Unconformity
- - -	5940 5939.8-5945. : Interbedded sandstone, clear rounded to sub-angular grains, fine to medium grade, and dolomite stringers (sucrosic, with floating sand grains), and dolomite cemented sands, sometimes with the grains not firmly packed in the dolomite. Occasional thin stringer of coarse sand, subangular to subrounded. Shale break at 5943.8.
- - -	
- - -	5945 5945.7-5946.3: Burrowed white and black sandstone. Irregular top surface.
- - -	5946.3-5947.2: massive pinkish orthoquartzite. Inclined bedding at base.
- - -	5947.2-5948.7: Pink sandstone, (orthoquartzite), with intraclasts of dolomite, mostly flat or slightly inclined.

Rebecca Bounds Core Graphic



Red sandstone marker at top., irregular surface. Base, Reagan

5948.7-5952 : Dolomite with sand grains and sand patches, dolomite secondary vugs, distorted bedding, looks very karst-like, or rubble zone with concurrent carbonate. Sand increase to top. Top is greenish shale break. Some reddish color. Shale break is inclined.

5952-5954.5 More finely-bedded dolomite, a few floating sand grains. Dessication features, i. e. broken in situ intraclasts, fenestral at 5953.8, chert-preserved oolites at 5953.7. These are preserved, the rest of the bed seems to be dissolved. Shale break at 5953. Cross-bedded granular dolomite in upper portion, terminatead by a 2 inch chert breccia at 5952. 5954-5955.5: Dolomite with much sand at base, less upwards, few floating sand grains near top. Fenestral fabric (loferite) in part, with a few intraclasts - interpretation: intertidal. Lower contact sharp against the lower sand unit. Flat bedding.

5956: 0 .5 ft silicified carbonate?, with sand grains, inclined and distorted bedding, recemented breccia. Pre-Reagan carbonates, near basement?



May 18, 2005

Dr. Bill Harrison  
Kansas Geological Survey  
Lawrence, Kansas

Dear Bill:

The semester has ended, final examinations are behind us, and my grades for the semester have been recorded. The students have stopped calling me to either ask for their grades or to grovel in hope of getting me to reconsider. I can now turn back to conodonts, including a report on what I found in the five residues from the Rebecca Bonds Well that you sent to me.

I screened each of the residues in nested screens (40, 50, 80, 100, 140, and 200 mesh sieves) and picked each fraction separately. I found conodonts in two of them. A few monaxon sponge spicules are present in one of them but they are of no value for stratigraphic interpretation. All of the samples contained significant amounts of vitreous quartz sand with frosted surfaces as well as occasional small specimens of pyrite. Examination at highest magnification afforded by my microscope showed that the frosting is the result of secondary overgrowths on the sand grains.

Sand is particularly abundant in the sample labeled 5933, and the overgrowths are especially heavy. This residue contains numerous hemispherical quartz bodies that puzzled me initially; I finally realized that these were overgrowths that had been separated from the quartz grains that were their hosts. The quartz crystallites that make up these overgrowths are arranged radially and thus cannot have been in crystalline continuity with the sand grain on which they grew. Indeed they are organized like the crystals in a geode where the growth is centripetal. In situations where the overgrowth is only partially removed and the sand grain is still within it, it appears that a gap exists between the terminal ends of the crystallites and the surface of the sand grain. Perhaps the sand grains had a coating of clay or something and the overgrowth was added around that, which would explain

why the quartz in the overgrowth is not in crystalline continuity with the sand grain it is coating. I have not seen this kind of thing previously.

Residue 5890 yielded eight albid coniform elements and eight hyaline elements as well as three unidentifiable fragments, all with color alteration index (CAI) values of 1.0 or slightly higher. The albid elements are very similar to the most common components of the conodont faunas of the lower Cool Creek Formation in outcrops in the Arbuckle and Wichita Mountains in southern Oklahoma, and they occur in lesser abundance through the higher parts of that formation. I have considered forms like these to represent one or more species of *Oneotodus* Lindström and to be evolutionary descendants of *Oneotodus simplex* (Furnish) which occurs in Oklahoma in the McKenzie Hill Formation.

The associated hyaline elements are somewhat battered and I am unable to identify them with confidence. I believe that most of them are fragments of *Colaptoconus quadraplicatus* (Branson and Mehl), but one may be a basal part of an element of *Scolopodus floweri* Repetski. Only *C. quadraplicatus* has been identified (Russ Dresbach, MU dissertation, 1998) in the Arbuckle Group in Oklahoma where it is present in the upper half of the Cool Creek. If the specimen really is *S floweri*, the known range of that species in the El Paso Group is consistent with its potential presence in mid to upper Cool Creek equivalents.

So, in summary of the above, I am convinced that residue 5890 indicates that this level in the Rebecca Bounds well is Lower, but not lowest, Ordovician and has equivalents in the Cool Creek Formation of southern Oklahoma. It may be as young as middle Cool Creek. However, I also note that in both the Arbuckle and Wichita Mountains the lower part of the Cool Creek is quite sandy and the appearance of this sand has been used to identify the bottom of the formation and top of the underlying McKenzie Hill Formation in the somewhat monotonous dolomitic carbonate sequence of the lower Arbuckle Group.

While picking residue 5890, I also found four elements whose CAI is of the order of 3.0; one is a multicostate coniform element that almost certainly represents *Protopaneroodus gradatus* Serpagli and the other three are elements of *Oepikodus communis* (Ethington and Clark). These species are present in the Arbuckle of Oklahoma beginning near the top of the Kindblade Formation and continuing up-section. Perhaps these specimens

are contaminants introduced when I sieved the samples, although I took particular caution to clean the screens before I began. The CAI is similar to that of conodonts from western Utah that I have studied in the past, but that was long enough ago that any caught in the screens should have worked their way out long ago. If the material that was processed to produce this residue came from cuttings, these conodonts could have come from higher in the well, but their high CAI is not consistent with that conclusion. In any case, I believe their occurrence in this sample is spurious.

Residue 5898 yielded a single coniform element that is another example of the albid coniform elements of which I found four in sample 5890. One element is not enough to provide a confident assessment as to the stratigraphic position, but it is reasonable to assume that these two samples from the well both represent the same part of the Lower Ordovician.

No conodonts were found in residues 5933, 5950, and 5953.

Do you want me to return the conodont specimens and the residues to you?

Sincerely yours,

A handwritten signature in black ink, appearing to read 'R. L. Ethington', with a horizontal line extending to the right from the end of the signature.

R. L. Ethington  
Prof. Emeritus of Geology