

Geological Report

Cooper Hiat #19-1
NW Quarter, Sec. 19, T31S;R8E
1320' FNL;2686' FWL
Cowley County, KS
API #15-035-24379-00-00

Operator: B-C Steel, LLC., C/O Bert Carleson, 209 North Fry, Yates Center, KS, 66783.

Drilling Contractor: Hat Drilling. Midway Mud Rotary Rig #2.

Wellsite Geologist: Mark Brecheisen.

Dates Drilled: January 3rd, 2011 to January 5th, 2011.

Size Hole: 8 1/4"

Total Depth: 2384'

Elevation: 1346'

Drilling Fluid: Freshwater bentonite and additives.

Surface Casing: 450' of 8-5/8" casing cemented with 230 sx of cement to surface.

Formation Tops: Formation tops were picked from the electric logs.

Field Name: Radcliff, Northeast.

Status: Oil/gas well.

Oil Shows: Sandstone from 1162'-1207', Hertha Limestone @2211'-2217'.

Gas Shows: Sandstone from 1162'-1207', Layton Sandstone @2006'-2040', Hertha Limestone @2211'-2217', Cleveland Sandstone @2286-2335'.

Water Encountered: No appreciable water encountered upon drilling.

On Location: January 3rd, 2011, 12:40 pm. Well Depth 692'; left location @ TD, Well Depth of 2384' @ 7:50am, January 5th, 2011.

Notes: Well cuttings were examined at rig and discarded. Samples of "zones of interest" were saved and examined with a binocular microscope and black light.

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- 0'-1150': Samples not examined.
- 1150'-1162': Shale, medium-dark to dark gray, slightly gritty to sandy. Few sand laminations, medium-gray, fine grained, sub-angular to sub-rounded grains. Friable, micritic, micaceous, argillaceous traces of pale brown to pale yellow-brown limestone present. Fine crystalline, friable, with good inter-crystalline porosity. Sample overall had 10% dull yellow mineral fluorescence.
- 1162'-1207': Sandstone, light to medium gray. Fine grained, well sorted with sub-angular to sub-rounded grains. Very friable, micaceous. Lots of samples have pinpoint to mottled hydrocarbon stain. Black bitumen in some samples. Best part of sand exhibited 60% dull, even to mottled hydrocarbon fluorescence. No real petroliferous odor, but slight free oil show in some samples. Slow, uneven, poor, milky blue cut. No residual oil show to tray after cut. Saturation overall is poor, slight gas kick of ten units exhibited in this formation once cut – hot wire soon settled to base line reading. Traces of limestone, pale brown to olive gray. Fine crystalline, fairly friable, some limestone samples exhibited mottled hydrocarbon stain with variegated hydrocarbon fluorescence. Few samples had fast, even, fair cut with slight residual oil show to tray after cut. Some shale partings scattered throughout this section. Good mud cake exhibited throughout this section. This sandstone should be considered for possible commercial production.
- 1207'-1260': Shale, medium-dark to dark gray, slightly silty to sandy in part, calcareous in part.
- 1260'-1264': Limestone, tan to grayish-brown. Fine crystalline, hard, dense, slightly sucrosic, no petroliferous odor/show.
- 1264'-1270': Shale, medium-dark to dark gray. Silty in part.
- 1270'-1314': Shale, medium-dark gray, slightly micaceous, silty, with few scattered sand laminae and limestone partings in section. Sandstone is light gray, very fine to fine grained, well sorted, with sub-angular to sub-rounded grains. Limestone is pale brown, fine crystalline, hard, slightly sucrosic. Sample overall exhibited trace of mineral fluorescence. No petroliferous odor/show. Sample quality very poor.
- 1314'-1332': Sandstone, light gray to light brown. Very fine to fine grained, well sorted, with sub-angular to well-rounded grains. Few shale partings present. No petroliferous odor/show. Sample mostly unconsolidated sand – sample quality very poor.
- 1332'-1343': Limestone, tan to pale brown, fine crystalline, fairly friable, slightly sucrosic with scattered shale partings. Very poor sample quality.
- 1343'-1406': Shale, medium-dark gray to dark gray with scattered traces of "red bed shale" in sample (probably wash out zones on E log). Few scattered sand partings, few limestone streaks scattered throughout section. Limestone is tan to olive gray, fine crystalline, slightly gritty texture with few traces of pinpoint oil stain on some samples. No petroleum odor detected, very slight oil show. Limestone exhibited trace amount of dull, even to mottled hydrocarbon fluorescence. No commercial value.
- 1380': Jet Pits.

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1406'-1410': Limestone, Grayish-brown, mottled, sucrosic, fairly hard. No petroliferous stain, odor, or show.

1410'-1446': Shale, medium-dark gray. Silty/sandy. Soft, scattered "red bed" samples showing up throughout this section. Scattered sandstone laminae (1431'-1437'), off-white to light gray, fine grained, friable, well sorted, well rounded. micacious in part, trace, pinpoint oil stain on few samples. Few scattered limestone partings. Overall, slight trace of mineral fluorescence. No petroliferous odor or show.

1446'-1556': Shale, medium to dark gray Silty to sandy, soft, scattered sandstone laminations. Off-white to light gray Very fine to fine grained, friable, argillaceous in part. No fluorescence, no petroleum odor/show, few traces of limestone and "red bed" scattered throughout.

Top of Iatan Limestone @1556'(-210'), top of the Pedee Group

1556'-1561': Limestone, tan to yellowish-brown to olive-gray. Fine, crystalline, mottled in appearance. Hard, dense, no visible porosity, no petroliferous odor/show. Trace, dull yellow mineral fluorescence.

1561'-1594': Shale, medium-dark gray Silty in part, calcareous in part. Several thin, limestone partings scattered throughout interval. Limestone is tan to yellowish-brown. Fine crystalline, mottled, fairly friable. Few scattered sandstone laminations. Off-white, fine grained, well sorted with sub-rounded to well-rounded grains. No fluorescence, no petroliferous odor/show.

1594'-1624': Stalnaker Sandstone. Off-white to light-gray to light-brown. Fine grained, well sorted and rounded. Friable, micacious, even brown oil stain on few rock samples and throughout freshly broken rock surfaces. Less than 5% medium, bright yellow hydrocarbon fluorescence. No cut. Few shale and limestone partings as well as traces of vitrain coal in interval No petroliferous odor, no gas response on hot wire.

1624'-1708': Shale, medium-dark gray to dark gray Silty, micacious Few scattered sand laminae. Few traces of brown oil stain, no real saturation, less than 3% bright yellow, hydrocarbon fluorescence within this interval. No cut, no commercial interest.

Top of Lansing Group @1708'(-362')

1708'-1728': Limestone, dark yellowish-gray to dark yellowish-brown. Mottled in part, fine crystalline. Fair to good friability. Good, inter-crystalline porosity. Fossiliferous in part. Traces of dull, even mineral fluorescence. Some inter-bedded shale. Dark gray, soft, greasy. Sample overall exhibited no stain, no petroliferous odor/show.

1728'-1778': Shale, dark gray Very soft, greasy, traces of thin, inter-bedded limestone. Tan to dark yellowish-brown. Fine crystalline, mottled in part, traces of pinpoint oil stain on few samples. Extremely slow cut, no real saturation. Traces of dull, even hydrocarbon fluorescence. No petroliferous odor detected.

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1778'-1786': Limestone, light to dark yellowish-brown, fine to medium crystalline, mottled, very friable. Good, inter-crystalline porosity. No fluorescence, no stain on rock samples, no petroliferous odor/show.

1786'-1799': Shale, dark gray, soft, greasy, calcareous in part.

1799'-1808': Limestone, tan to dark yellowish-brown, fine-medium crystalline, fair inter-crystalline porosity, fossiliferous. No fluorescence, no stain, no petroliferous odor/show.

1808'-1859': Shale, medium-dark gray to dark gray Soft, greasy, pyritic in part, silty in part, fissile, traces of limestone and sandstone present in minute quantities. No fluorescence, no show.

1859'-1872': Limestone, dark yellowish-brown to olive-gray Fine to medium crystalline. Hard, dense, sucrosic, very fossiliferous. Traces of dark gray shale. Calcareous, fairly hard. Sample overall had no fluorescence, no petroliferous odor/show.

Base of Lansing Group @1872'(-526')

1872'-1947': Shale, medium-dark gray Soft, slightly silty, traces of "red bed" shale present. micacious in part, fissile in part, carbonaceous in part. Sample overall exhibited no fluorescence, no petroliferous odor/show.

1947'-1950': Limestone, tan to olive-gray Mottled, fine to medium crystalline, fairly friable, fair inter-crystalline porosity. No show.

1950'-1971': Shale, medium-dark gray, soft, gritty, no fluorescence.

Iola Limestone @1971'(-625')

1971'-1974': Limestone, moderate brown to olive-gray, mottled, medium crystalline, fairly friable. No fluorescence or visible hydrocarbon stain. No petroliferous odor or show.

1974'-2006': Layton (A) Sandstone. Off-white to light gray, well sorted with sub-angular to sub-rounded grains. micacious, argillaceous in part. Glauconite observed in few samples. No oil stain, but traces of black bitumen on few sample surfaces. No gas observed popping out of rock samples, but a nine unit gas kick was observed at approximately 1988'. No fluorescence, no petroliferous odor or show. This sand section is very shaly, and is not of commercial value.

2006'-2042': Layton (B) Sandstone. Off white to light gray, very fine to fine grained. Well sorted with sub-angular to well-rounded grains. Extremely friable. Excellent inter-granular porosity. Gas bubbles were observed popping out of a select few rock samples. Overall, no visible petroleum stain. Few samples exhibited dull, mottled hydrocarbon fluorescence but had no cut, no petroliferous odor/show observed. It should be noted that a nineteen unit gas kick was observed at 2008' and the hot wire alarm went off at 2028' with a sixty-plus unit gas kick (off scale). This section has good permeability as attested by the mud cake throughout this section. This section should definitely be considered for commercial gas production.

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Top of Kansas City Limestone @2042'(-696')

2042'-2068': Limestone, pale brown to olive-gray Fine to medium crystalline, mottled, fair friability with fair, inter-crystalline porosity exhibited in some samples. Shale (15%) medium-dark gray, silty, micaceous Sample overall has approximately 60% variegated, even mineral fluorescence. No stain, no petroliferous odor or show.

2068'-2116': Limestone, grayish-orange-pink to yellowish-brown. Fine to medium crystalline, fairly friable with scattered, pinpoint to vugular porosity present. Very fossiliferous, pinpoint to mottled surface oil stain on few samples. Traces of light gray sandstone present, calcareous shale present throughout. Sample overall exhibited a 20-25% variegated, even to mottled mineral fluorescence. No petroliferous odor or show.

- Jet Pits @2110' (January 4th, 2011 @ 1:30pm. Resume drilling at 4:45pm).

2116'-2154': Limestone, dark yellowish-brown to olive-gray Fine crystalline, hard, to fairly friable, sucrosic. No visible inter-crystalline porosity. Few samples with pinpoint to mottled, medium-brown oil stain on surface. No saturation on interior of freshly broken sample surfaces. Shale approximately 20%, medium-dark gray to dark gray Soft, fissile in part, slightly carbonaceous, calcareous in part. Overall, trace of even, bright yellow mineral fluorescence. No cut, no petroliferous odor or show.

2154'-2156': Stark Shale. Dark gray to black, very carbonaceous with many calcite veins running throughout many individual rock samples.

2156'-2200': Limestone, pale yellowish-brown to olive-gray Fine crystalline, fair to good friability. Few samples with mottled, light brown oil stain on surface with some saturation inside freshly broken surfaces. Overall, saturation poor to fair, less than 2% dull, mottled hydrocarbon fluorescence. Very slow, poor, uneven milky blue cut. Slight petroliferous odor with very weak show. Shale, medium-dark gray Soft, fissile, scattered throughout section.

2200'-2204': Shale, dark gray, soft, fissile.

2204'-2206': Hushpuckney Shale. Dark gray to black, very carbonaceous, extremely fissile.

Top of the Hertha Limestone@2206'(-860')

2206'-2270': Limestone, pale yellowish-brown to olive-gray Fine crystalline, fair to excellent friability. Pinpoint vugular porosity on some sample surfaces. A drilling break was encountered at 2212'-2217'. Description of the interval is as follows:

Limestone, pale yellow brown to olive-gray, fine to coarse crystalline, two distinct oil show present within the lime. First show: Limestone, fine crystalline, excellent friability, pinpoint and vugular porosity exhibited on many samples. Light brown oil stain on many samples. Good to excellent saturation, good free oil show with wet hydrochloric acid cut. Second show: Good to excellent friability. Pinpoint and vugular porosity present, fine to coarse crystalline. Dark, heavier oil appearing in mottled patches on sample surfaces. Fair saturation. Cuts are as follows:

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Light oil sample exhibited fast, even milky blue cut with faint to fair residual oil show to tray after cut.

Second, heavier oil exhibited fairly fast, uneven milky blue cut with no residual oil to tray after cut. Overall, sample exhibited 20-25% variegated, even to mottled hydrocarbon fluorescence. Strong, petroliferous odor, fair show. This section also exhibited a ninety-plus unit gas kick when drilled and had good residual carry-over of the gas kick to TD. It should be noted that there appears to be a gas effect on the compensated density/neutron log from 2222'-2233'. This same zone exhibits good separation between the medium and deep induction curves, but nothing shows up on the micro log, so this may not represent a permeable zone, but some type of secondary porosity (such as fracture porosity). There was a show of oil in this zone which exhibited poor saturation and less than 7% hydrocarbon fluorescence, and poor, uneven cut in samples. Recommendation: Because of the oil and gas show and the permeability indications, as well as the overall appearance on the electric logs, I would complete the 2212'-2217' for commercial production. The 2222'-2233' interval probably needs to be examined further in an offset well before making any attempt to complete this zone, due to the problematic nature of its productive capabilities.

2270'-2288': Shale, medium-dark gray to dark gray to black. Fairly soft, very carbonaceous, very friable. Traces of pyrite and vitrain coal in sample. Limestone present, approximately 10% pale, yellowish-brown, fine crystalline, good friability. Pinpoint porosity on some sample surfaces. No oil stain on samples, no petroliferous odor or show.

Lenepah Limestone @2288'(-942')

2288'-2290': Limestone, olive-gray, fine to medium crystalline. Fairly hard, slightly sucrosic, no fluorescence, no petroliferous odor or show.

2290'-2296': Shale, medium-dark gray

2296'-2316': Cleveland (A) Sandstone. Light gray, very fine to fine grained. Well sorted with sub-rounded to well-rounded grains. Very friable, glauconitic, argillaceous in part with some shale laminations present. No fluorescence, no petroliferous odor/show.

2316'-2335': Cleveland (B) Sandstone. Light olive-gray, fine grained, extremely friable. Very clean, almost unconsolidated sand. micacious, glauconitic, few gas bubbles observed in samples. Overall, fair to good flash odor in samples. No stain, fluorescence, or petroliferous show. Recommendation: there was a forty-eight unit gas kick at the top of this section, which kept the hot wire pegged out to TD. Because of this, coupled with indicators from the electric logs, I would complete this zone for commercial gas production.

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2335'-2356': Shale, medium to medium-dark gray, slightly silty, soft, very friable, calcareous in part. Traces of inter-bedded limestone.

Top of Altamont Limestone @2356'(-1010')

2356'-2384': Limestone, pale yellow-brown to olive-gray Fine to medium crystalline. Hard, dense, sucrosic, tight, fossiliferous, no visible porosity. Traces of medium-dark gray shale present. Less than 10% variegated, even mineral fluorescence. No petroliferous odor/show.

TD 2384' @ 7:50am, January 5th, 2011.



(Mark D. Brecheisen)

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