

**GEOLOGICAL REPORT**

**Month 2016**

Prepared for:

Prepared by:

per: Tallman Geological Consulting Ltd.

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STRIP LOGS AND WELLPATH IN BACK POCKET

# GENERAL WELL DATA

**WELL NAME**:

**UNIQUE WELL ID**:

**PRIMARY OBJECTIVE**:

**LICENSE NUMBER**:

**ELEVATIONS**: Ground:

Kelly Bushing:

**OPERATOR**: Crescent Point Energy Corp.

**CONTRACTOR**:

**SPUD DATE**: 2016/mm/dd at xxxx hrs

**ICP:** **ICP**: xxx.0 m

**Date and Time**: 2016/mm/dd at xxxx hrs

**TOTAL DEPTH**: **Leg #1**: xxx.0 m

**Date and Time**: 2016/mm/dd at xxxx hrs

**HOLE SIZE**: **Surface**: 349 mm

**Intermediate**: 222 mm

**Main**: 159 mm

**SURFACE CASING**: Ran 15 joints of 244.5 mm, 48.07 kg/m, H-40 casing.

Casing landed at xx.0 m. Plug down: 2016/mm/dd at xxxx hrs.

Drilled out: 2016/mm/dd at xxxx hrs.

**KICK-OFF POINT**: xxx m MD **Date and Time**: 2016/mm/dd at xxxx hrs

**INTERMEDIATE CASING**:Ran 33 joints of 177.8 mm, 34.23 kg/m, J-55 and 93 joints of 177.8 mm, 29.76 kg/m, J-55 casing. Casing landed at xxxx.0 m. Plug down: 2016/mm/dd at xxxx hrs.

Drilled out: 2016/mm/dd at xxxx hrs.

**MUD SYSTEM:** Water for 349 mm surface hole; Floc-water for 222 mm vertical hole; Polymer for 222 mm build section; Polymer for 159 mm Hz section.

**DITCH SAMPLES**: One set of five meter samples from xxxx m to xxxx m and ten meter samples from xxxx m to xxxx m washed and vialed for Crescent Point Energy Corp.

Two sets of five meter samples from xxxx m to xxxx m and ten meter samples from xxxx m to xxxx m washed and vialed for Saskatchewan Industry and Resources.

# GEOLOGICAL MARKERS

**K.B. ELEVATION:**  **m**

|  |  |  |  |
| --- | --- | --- | --- |
| **FORMATION** | **MEASURED DEPTH (m)** | **TRUE VERTICAL DEPTH (m)** | **MEAN SEA LEVEL**  **(m)** |
| **KOP** | - | - | - |
| **Mannville** | - | - | - |
| **Upper Vanguard** | - | - | - |
| **Middle Vanguard** | - | - | - |
| **Lower Vanguard** | - | - | - |
| **Upper Shaunavon** | - | - | - |
| **Upper Shaunavon ‘A’** | - | - | - |
| **Upper Shaunavon ‘B’** | - | - | - |
| **Upper Shaunavon ‘C’** | - | - | - |
| **Lower Shaunavon** | - | - | - |
| **ICP** | - | - | - |
| **Total Depth Leg #1** | - | - | - |

# SAMPLE DESCRIPTIONS - Build & Leg#1

**Interval** **Lithology & Comments**

# WELLPATH

# DRILLING SUMMARY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DATE** | **DEPTH m**  **2400 hrs** | **24 hr Progress** | **RATE m/hr** | **ROTATING HOURS** | **24 Hr ACTIVITY** |
| 2016-mm-dd | 179.0 | 179.0 | 44.7 | 4.00 | Spud and drill 349.0 mm surface hole to 179.0 m MD, wiper trip, POOH, rig to & run casing, cement, WOC. |
| 2016-mm-dd | 1162.0 | 983.0 | 80.2 | 12.25 | Pressure test, RIH, drill out float & shoe and begin to drill 222.0 mm vertical hole from 179.0 m to 1162.0 m MD. |
| 2016-mm-dd | 1444.0 | 282.0 | 23.0 | 12.25 | Drill 222.0 mm vertical section from 282.0 m to 1313.0 m MD, POOH to dial up mud motor and change bit, RIH, kick-off 222.0 mm build section at 1322.0 m MD and drill & survey 222.0 mm build section from 1322.0 m MD to 1444 m MD. |
| 2016-mm-dd | 14.0 | 317.0 | 20.8 | 15.25 | drill & survey 222.0 mm build section from 1322.0 m MD to 1444 m MD. |
| 2016-mm-dd | 1668.0 | - | - | - | POOH, lay down directional tools, wiper trip, rig to & run casing, cement, pressure test. |
| 2016-mm-dd | 2252.0 | 584.0 | 55.6 | 10.5 | RIH, WOC, drill out float & shoe, drill & survey 159.0 mm lateral section from 1668.0 m to 2252.0 m MD. |
| 2016-mm-dd | 3071.0 | 819.0 | 52.0 | 15.75 | Drill & survey 159.0 mm lateral section from 2252.0 m to 3071.0 m MD (TD). |

**TOTAL ROTATING HOURS: xx**

# BIT RECORD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **BIT #** | **MAKE** | **TYPE** | **SIZE mm** | **DEPTH IN** | **DEPTH OUT** | **DRILLED** | **HOURS** |
| 1 | - | - | 349.0 | 0.0 | - | - | - |
| 2 | - | - | 222.0 | - | - | - | - |
| 3 | - | - | 222.0 | - | - | - | - |
| 4 | - | - | 159.0 | - | - | - | - |

# DAILY MUD PROPERTIES

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **DATE** | **DEPTH(m MD)** | **DENSITY**  **(kg/m3)** | **VISCOSITY**  **(s/L)** | **WATER LOSS**  **(mL/30 sec)** | **FILTER CAKE**  **(mm)** | **pH** | **Calcium/**  **Chlorides**  **(mg/L)** |
| 2016-mm-dd | 179 | 1000 | 28 |  | - | 7.5 | 120/300 |
| 2016-mm-dd | 1055 | 1070 | 35 |  | 1.3 | 8.0 | 280/390 |
| 2016-mm-dd | 1426 | 1120 | 44 |  | 1.0 | 10.0 | 290/1100 |
| 2016-mm-dd | 1668 | 1160 | 65 |  | 1.0 | 10.0 | 150/1500 |
| 2016-mm-dd | 1668 | 1005 | 34 |  | 1.0 | 10.5 | 100/140 |
| 2016-mm-dd | 2560 | 1050 | 32 |  | 1.0 | 10.0 | 140/1100 |

# SURVEYS - Build & Leg #1

Job Number: 19677

Province/Country: Sask/Canada

Company: Crescent Point Energy Corp.

Well:

Location:

Rig Name:

KB:  m

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **MD** | **INC** | **AZM** | **TVD** | **MSL** | **N-S** | **E-W** | **VS** | **DogLeg** |
| **(m)** | **(°)** | **(°)** | **(m)** | **(m)** | **(m)** | **(m)** | **(m)** | **°/30m** |
| 179 | 0 | 0 | 179 | 440.2 | 0 | 0 | 0 | 0 |
| 191.62 | 0.8 | 161.6 | 191.62 | 427.58 | -0.08 | 0.03 | -0.08 | 1.9 |
| 293.43 | 0.8 | 43.4 | 293.42 | 325.78 | -0.24 | 0.74 | -0.22 | 0.4 |
| 395.2 | 1.2 | 16.8 | 395.18 | 224.02 | 1.29 | 1.54 | 1.34 | 0.18 |
| 496.9 | 0.5 | 306.4 | 496.87 | 122.33 | 2.58 | 1.49 | 2.62 | 0.33 |
| 600.43 | 1.3 | 181.4 | 600.39 | 18.81 | 1.67 | 1.1 | 1.7 | 0.47 |
| 703.64 | 1 | 107.1 | 703.59 | -84.39 | 0.24 | 1.93 | 0.29 | 0.41 |
| 806.86 | 0.5 | 65 | 806.8 | -187.6 | 0.16 | 3.2 | 0.25 | 0.21 |
| 910.18 | 0.4 | 89.3 | 910.11 | -290.91 | 0.36 | 3.97 | 0.47 | 0.06 |
| 1013.91 | 0.4 | 213.4 | 1013.84 | -394.64 | 0.06 | 4.13 | 0.18 | 0.2 |
| 1117.61 | 0.4 | 19.3 | 1117.54 | -498.34 | 0.1 | 4.05 | 0.21 | 0.23 |
| 1220.87 | 0.4 | 77 | 1220.8 | -601.6 | 0.52 | 4.52 | 0.65 | 0.11 |
| 1334 | 0.7 | 64.9 | 1333.92 | -714.72 | 0.9 | 5.53 | 1.06 | 0.08 |

# SUMMARY

was drilled as a one leg horizontal well to further develop the **Porosity** in the  region. Samples were described from xxx m to total depth. The Upper Shaunavon ‘B’ target was intersected at xxxx m MD (xxxx m TVD, -xxx m MSL). Intermediate casing was set approximately xx meters into the Upper Shaunavon ‘B’ at xxxx m MD (xxxx m TVD, -xxx m MSL). The lithology of the reservoir was comprised predominantly of very fine grained sandstone with occasional calcareous fossil and micritic grains. Cement was comprised of lower microcrystalline dolomite and occasionally lower microcrystalline and micritic limestone. Chip samples were observed as being moderately well cemented to loose. Leg #1 was drilled along an average azimuth of ~xxº to a total depth of xxxx m MD (xxxx m TVD, -xxxm MSL). Chip sample analysis, gas detection and free oil analysis were used to evaluate the reservoir potential of the well.

In addition to the primary Lower Shaunavon Target, the **Upper Shaunavon** was evaluated for potential future development. The Upper Shaunavon is further subdivided into two units, the A & B. The **Upper Shaunavon ‘A’** was intersected on the build section at 1493.0 m MD (1429.4 m TVD, -458.5 m MSL). The ‘A’ unit was comprised predominantly of sub-blocky to sub-fissile micromicaceous and calcareous shale. Samples also contained lesser amounts of cryptocrystalline to micritic mudstone, with common silt and very fine grained quartz sand inclusions. Samples were predominantly tight, with no visible oil staining. Gas values remained flat across this interval.

The **Upper Shaunavon ‘B’** was intersected on the build section at 1510.6 m MD (1434.1 m TVD, -463.2 m MSL). The Upper Shaunavon ‘B’ is well developed in this location, measuring roughly 7.0 m in thickness. The upper 2.5 m of the unit is comprised of a dolomite with abundant very fine and fine grained quartz sand inclusions. Porosity in the dolomite of the B is observed as poor to fair intercrystalline in nature. Tan brown to medium brown oil staining is observed on as much as 30% of drill cuttings associated with the dolomite reservoir. Gas counts peak at roughly 500 counts per 10000 units in the upper portion of the B horizon, with trace to minor free oil present on sample wash. The lower portion of the B unit grades into medium

**Geology Leg #1**

xxxx m MD: **Lower Shaunavon**: (xxxx m TVD, -xxx m MSL)

xxx m – xxx m (xxx m): This interval represents the top 1.8 m of the Lower Shaunavon formation, before intermediate casing is set. Samples are comprised of limestone; predominantly cryptocrystalline with rare suspended quartz and sandy inclusions. Samples are anhydritic, and are predominantly tight with trace very poor interfragmental porosity. Trace light tan to light brown oil staining is present. Gas values remain flat and average just 120 counts per 10 000. Gamma values decrease across the interval and average 30 API.

**Non-Reservoir**

xxxx m MD: **Intermediate Casing Point**: (xxxx m TVD, -xxxx m MSL)

xxxx m – xxxx m (xxx m): The interval begins with the wellbore dropping at roughly 87 degrees. A target is set to drop to -484.0 m MSL where a porosity streak is anticipated to be based on offsetting well data.

Samples for this interval are comprised of predominantly micritic mudstone with minor amounts of lower very fine grained biofragmental wackestone. Wackestone grains have abundant indistinct cryptocrystalline fossil fragments, as well was pellets and oolites. Mudstone grains are grading to cryptocrystalline, and are slightly anhydritic and chalky in part. Samples exhibit a reworked texture with common suspended grains and inclusions. Overall, porosity is observed to be tight to very poor and earthy, with rare poor interfragmental porosity in wackestone grains. Oil staining, typically tan to brown in color, is present on approximately 5-25% of drill cuttings. Gas values average 423 counts per 10 000 while gamma values average 10.2 API. No free oil is present on sample wash.

**Poor Reservoir**

1630.0 m – 1670.0 m (40.0 m): The wellbore flattens out at roughly -482.5 m MSL for this interval as a slide to slow the descent to -484.0 m MSL puts out more than anticipated.

Samples for this interval are comprised predominantly of chalky and cryptocrystalline and dense mudstone. Cuttings are predominantly anhydritic and porosity is observed as tight to very poor and entirely earthy in nature. Light tan oil staining is present on only about 2% of drill cuttings. Gas values decrease to average just 98 counts while gamma values increase slightly to average 13.3 API. Free oil is absent on sample wash.

**Very Poor Reservoir**

1670.0 m – 1810.0 m (140.0 m): The wellbore gradually drops to -483.0 m MSL across this interval. Samples are comprised of micritic mudstone grading to very fine grained biofragmental wackestone with micritic matrix. Cuttings are slightly argillaceous with laminations and inclusions. Cuttings are slightly anhydritic with rare crystals and inclusions. Even light tan oil staining is present on between 40 and 70% of drill cuttings. Porosity is primarily earthy, and commonly interfragmental as well. Overall porosity is very poor to trace poor. Gas values average 653 counts while gamma values average 10.3 API. Free oil is absent on sample wash.

**Poor Reservoir**.

1810.0 m – 2200.0 m (390.0 m): The interval begins as the wellbore drops down to -484.0 m MSL where the targeted porosity streak is encountered. The wellbore then tracks the porosity for the majority of the interval between -484.0 and -485.0 m MSL before climbing at the end of the interval back up to -483.0 m MSL.

Samples for this interval are comprised of very fine grained biofragmental wackestone with micritic to rare lower microcrystalline matrix. Biofragments include oolites, peloids and crinoids. Samples occasionally contain abundant indistinct cryptocrystalline fossil fragments as well. Occasional argillaceous laminations and inclusions are present, and samples are observed as having trace anhydrite inclusions. Overall porosity is observed as predominantly poor, and primarily interfragmental. Earthy, moldic and trace pin point vugs are also observed. Oil staining was present on between 50 and 80% of drill cuttings and was tan to dark brown in color. Gas values averaged 2340 counts per 10 000 while gamma values averaged 10.8 API. Trace free oil was present on sample wash.

**Fair Reservoir**

2200.0 m – 2360.0 m (160.0 m): The wellbore continues to climb slightly to a high of -482.5 m MSL where it is deemed to be above the target porosity.

Samples for this interval are similar to the interval above, but become increasingly micritic and chalky as the wellbore rises in section. Overall grain size drops, and is reflected in an overall decrease in porosity to predominantly very poor and earthy in nature. Oil staining is increasingly light in color but remains present on between 50 and 80% of drill cuttings. Gas values remain good and average 2350 counts while gamma values average 10.4 API. Free oil is absent on sample wash.

**Poor Reservoir**

2360.0 m – 2500.0 m (140.0 m): The interval begins as the wellbore re-intersects the target porosity at -484.0 m MSL. The wellbore drops slightly, then climbs back up to -484.0 m MSL at the end of the interval.

Samples are comprised of mudstone grading to very fine grained wackestone. Mudstone grains are increasingly cryptocrystalline with respect to TVD. Wackestone grains are comprised of oolites, peloids and crinoids, as well as abundant indistinct cryptocrystalline grains. Matrix material is micritic grading to increasingly dolomitic and lower microcrystalline with respect to TVD. Overall, porosity is observed as being tight to poor, and is predominantly earthy and interfragmental in nature. Tan to dark brown oil staining is present on between 40 and 70% of drill cuttings. Gas values average 2245 counts while gamma values average 9.9 API. Trace free oil is present on sample wash.

**Fair Reservoir**

2500.0 m – 2620.0 m (120.0 m): The wellbore climbs to a high of-483.5 m MSL in this interval where samples become increasingly micritic and anhydritic. The wellbore then descends back down to -484.7 m MSL and the end of the interval where reservoir quality improves.

Samples for this interval are similar to the 2200 – 2360 m interval where the wellbore climbs above the target porosity. Samples are predominantly grading to micritic mudstone, are anhydritic and increasingly chalky. Overall, porosity is very poor and predominantly earthy to rare interfragmental. Oil staining, typically light tan in color, is present on 15-40% of drill cuttings. Gas values decrease and average 1085 counts while gamma values average 11.0 API. Free oil is absent on sample wash.

**Poor Reservoir**

2620.0 m – 2670.0 m (50.0 m): The wellbore descends back to the target drill depth of -485.0 m MSL where reservoir quality improves. Samples are again predominantly comprised of very fine grained biofragmental wackestone with micritic to trace dolomitic matrix. Samples are slightly anhydritic with rare crystals and inclusions. Oil staining is present on between 40 and 70% of drill cuttings and is tan to light brown in color. Porosity is observed as being earthy to interfragmental with trace fractures and overall is observed as being very poor to poor. Gas counts average 2999 counts while gamma values average 8.8 API. Trace to minor free oil is present on sample wash.

**Fair Reservoir**

2670.0 m – 2775.0 m (105.0 m): Reservoir quality degrades immediately as the interval begins, and the wellbore begins to build in rotary. The formation was anticipated to rise at the tail end of the lateral section and the wellbore is allowed to climb.

Samples for this interval grade to predominantly mudstone, with minor very fine grained biofragmental wackestone as described above. Mudstone is chalky and slightly anhydritic. Occasional suspended ooids and peloids are observed. Overall porosity is observed as being very poor and predominantly earthy in nature. Oil staining, typically light tan in color, is present on approximately 25% of drill cuttings. Gas values average 1317 counts per 10 000 while gamma values average 10.8 API. Free oil is absent on sample wash.

**Poor Reservoir**

2775.0 m – 2923.0 m (148.0 m): The wellbore continues to climbs and eventually terminates at -482.7 m MSL.

Samples for this interval are comprised of mudstone grading increasingly to very fine to trace fine grained, biofragmental wackestone. Rare to abundant cryptocrystalline and indistinct fossil fragments are present, as well as crinoids, oolites and pellets. Samples have tan to dark brown oil staining, present on between 45 and 60% of drill cuttings. Porosity is observed as poor to increasingly fair across the interval, and is primarily interfragmental in nature with trace moldic and pin point vugs. Gas values average 2170 counts per 10 000 while gamma values average 9.8 API. Minor to moderate free oil is present on sample wash.

**Fair Reservoir**

xxxx m MD: **Total Depth Leg #1**: (xxxx m TVD, -xxxx m MSL)

# OPERATIONS

1) 2016-mm-dd-xxxx hrs: Spud 349.0 mm surface hole.

2) 2016-mm-dd-xxxx hrs: Reach surface casing point at xxxx.0 m MD.

3) 2016-mm-dd-xxxx hrs: Plug down on surface casing.

4) 2016-mm-dd-xxxx hrs: Drill out of surface casing & begin 222.0 mm vertical section.

5) 2016-mm-dd-xxxx hrs: Reach sample point at xxxx.0 m MD.

6) 2016-mm-dd-xxxx hrs: Kick-off 222.0 mm build section at xxxx.0 m MD.

7) 2016-mm-dd-xxxx hrs: Reach Intermediate Casing Point at xxxx.0 m MD.

8) 2016-mm-dd-xxxx hrs: Plug down on intermediate casing.

9) 2016-mm-dd-xxxx hrs: Drill out shoe & begin 159.0 mm lateral section.

10) 2016-mm-dd-xxxx hrs: Reach Total Depth of Hz Leg #1 at xxxx.0 m MD.

In terms of production values, using gas readings, free oil analysis, and oil staining, Leg #1’s xxx m horizontal section consisted of xxx m (xxx%) gross pay (wellbore within the Lower Shaunavon formation). This gross pay consisted of xxx m (xxx%) very poor reservoir, xxx m (xxx%) poor reservoir, and, xxx m (xxx%) fair reservoir. With this in mind,  should be a successful oil producer following a formation fracture procedure.