

BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS

IN THE MATTER OF THE APPLICATION
OF BEREXCO LLC, FOR AN ORDER
AUTHORIZING UNITIZATION AND UNIT
OPERATION OF THE JUNE UNIT IN
NESS COUNTY, KANSAS

) DOCKET NO. 19-CONS-3324-CUNI
)
) CONSERVATION DIVISION
)
) LICENSE NO. 34318

PREFILED TESTIMONY

OF

DANA G. WREATH
VICE PRESIDENT
ON BEHALF OF
BEREXCO, LLC
MAY 16, 2019

1 Q Would you please state your name, title, and business address?

2 A My name is Dana G. Wreath. My position is Vice President of Engineering with
3 BEREXCO LLC. Our office is at 2020 N. Bramblewood, Wichita, Kansas 67206.

4 Q How long have you practiced your profession?

5 A Since 1989.

6 Q Have you appeared before this commission on prior occasions and been qualified as
7 an expert Petroleum Engineer to give testimony regarding applications being held by
8 this commission?

9 A Yes, I have appeared before the KCC and have been qualified as an expert in
10 petroleum engineering a number of times. I have testified with respect to various
11 applications before this commission.

12 Q Are you familiar with the application filed by BEREXCO LLC, for the Unitization
13 and Unit Operation of the June Unit?

14 A Yes.

15 Q As an engineer working for BEREXCO, is Ness County part of your area of
16 responsibility?

17 A Yes.

18 Q Have you made or supervised the engineering studies and the exhibits regarding this
19 Application to prepare yourself to testify today in support of this Application?

20 A Yes, I have reviewed all of the drilling reports, drill stem tests, electric logs,
21 completion reports, and production reports in preparation for this hearing.

22 Q Have you prepared or caused to be prepared under your supervision and direction,
23 exhibits prefled in this docket?

1 A Yes, a number of Exhibits were prepared under my supervision. These include a map
2 showing the two tracts within the proposed June Unit boundary (Exhibit 1). Exhibit 1
3 also shows the spud dates of the wells in the June Unit area. Exhibit 2 is a type log
4 showing the Cherokee Formation top and base and the Cherokee interval being
5 unitized. Also included is a Ft. Scott Formation Structure Map (Exhibit 3). The Ft.
6 Scott formation top marker can be found in all wells in the June Unit area, even when
7 the Cherokee Sand is not found in a wellbore. Exhibit 4 is a Cherokee Sand Net Pay
8 Isopach Map in the proposed unit area. Exhibit 5 is a decline curve for the leases in
9 the proposed June Unit showing the total oil production performance of the field from
10 1981 through May 31, 2018, the estimated remaining oil production and projected
11 secondary recovery to be recovered as a result of unit operations. The proposed June
12 Unit injection pattern, waterflood facilities, and the planned pipeline layout are shown
13 in Exhibit 6.

14 Q Would you please explain Exhibit 1?

15 A Exhibit 1 is a plat that shows the area of the proposed June Unit and the two Tracts
16 that we propose to put into this Unit. It includes the following land in Ness County,
17 Kansas:

18 The SW/4 NE/4, the NE/4 SW/4 and the SE/4 of Section 14, in
19 Township 16 South, Range 22 West.

20 Q Would you briefly explain the history of this area?

21 A The discovery well for the Brownell North Field Cherokee oil production was the
22 June #1, located in the SE NW SE Section 14-16S-22W in Ness County, Kansas.
23 This well was drilled by Beren Corporation in October 1981. It was completed in the
24 Cherokee Sand with an initial potential of 70 BOPD and a trace of water. A

1 Cherokee Sand drill stem test recovered 3,330' gassy oil with a FSIP of 1,1261 psi.

2 The second Brownell North Field Cherokee oil producer was the June #2 well at NW

3 SE SE Sec 14-16S-22W. Beren Corporation drilled this well in October 1983. The

4 June #2 was completed in the Cherokee Sand with an initial potential of 65 BOPD +

5 trace water. A Cherokee Sand drill stem test recovered 2,118' gassy oil with a FSIP

6 of 925 psi. The drop in pressure of 336 psi after approximately 2 years of production

7 from the June #1 gives strong indication the June #2 is in pressure communication

8 with #1. The June #2 was converted to injection in late 2011, and injection began in

9 March 2012 at low rates - approximately 15 BWIPD. Injection continued at these

10 low rates until September 2016 when injection rates were increased to an average of

11 125 BWIPD. Waterflood response from this injection caused an oil response in the

12 June #1, but this injection increased recovery from only a small area due to the close

13 well spacing.

14 Additional drilling by Berexco in 1984 failed to extend the field to the northeast or

15 northwest yielding dry holes with no Cherokee Sand present and further defined the

16 productive area. In 2009 Pintail drilled the Bisagno #1 in N/2 SW NE Sec 14 and

17 recovered 90' muddy oil on drill stem test in the Cherokee Sand with FSIP of 123 psi.

18 The drill stem pressure gives a clear indication this well is in pressure communication

19 with the June wells in the SE/4. The Bisagno well was plugged as a dry hole.

20 Berexco later washed this well down in 2017. These wells help establish the

21 productive boundaries of the Cherokee reservoir.

22 This development drilling established the June Unit area Cherokee Sand oil

23 production to be from a relatively small pod of sand. It is believed that the existing

1 wells completely delineated the limits of the Cherokee Sand oil reservoir in the June
2 Unit area.

3 Q Please explain Exhibit 2.

4 A Exhibit 2 is an electric log from the June #1 well in the proposed June Unit. The
5 Cherokee Sand formation is Pennsylvanian in age and is a bar sand interval with an
6 average depth of 4,300' in the Brownell North Field, as shown on the type log. The
7 unitized formation that is proposed to be unitized in the June Unit is the subsurface
8 portion of the Unit area described as the stratigraphic equivalent of the Cherokee
9 Formation as same is encountered between 4,287' to 4,346', inclusive, below the
10 surface (KB) in the June #1. The Cherokee sand is generally high permeability, clean
11 sand with average thickness of 8'.

12 Q Please explain Exhibit 3.

13 A Exhibit 3 is a structure map of the Ft. Scott Formation. The Ft. Scott is a good
14 regional marker and its structural position is consistent with the Cherokee Sand.
15 Since the Cherokee Sand is not always present in every well, the Ft. Scott is a good
16 formation to use to map structure. The Cherokee Sand reservoir is a stratigraphic trap
17 in the June Unit area, however there is a direct linkage between structure and
18 productive well locations. This may be due to differential compaction resulting in a
19 higher structural position where sand is present.

20 Q Please explain Exhibit 4.

21 A Exhibit 4 is a Cherokee Sand Net Pay Isopach Map. The Cherokee Sand pay in each
22 well was determined using 8% porosity and 50% water saturation cutoffs. The
23 Gamma Ray log was used to exclude shale volumes. This map documents all wells

1 within the 0' contour boundary of the sand shown on the map produce from the same
2 reservoir and the same common source of supply.

3 Deposition of the Cherokee Sand reservoir pay is controlled mostly by stratigraphic
4 mechanisms in this area. Lateral variations in the porosity and permeability are
5 related to depositional facies changes. Parameters which best indicate productive
6 trends are log derived porosities greater than 8% and SP deflection, which indicate
7 fluid content and permeability.

8 Q Please explain the total June Unit performance curve shown in Exhibit 5.

9 A This decline curve represents the total production performance from the Cherokee
10 Sand producing wells in the proposed June Unit area. These wells peaked at
11 approximately 70 BOPD in 1984, and have declined down to approximately 7 BOPD
12 currently. Total cumulative oil production was 129,108 bbl oil as of June 1, 2018.
13 Remaining oil reserves are 7,759 bbl oil. The Cherokee Sand produces under fluid
14 expansion and solution gas drive. This is evidenced by rapidly declining initial
15 production rates and pressures along with very little water production.
16 Exhibit 5 also shows the projection of the estimated incremental secondary oil that we
17 believe will be recovered over approximately 15 years by the installation of this
18 waterflood. Peak production is estimated at approximately 16 BOPD. It is estimated
19 that installing the June Unit waterflood will increase the total recovery by about
20 41,000 bbl oil. This is additional recovery beyond the oil that can be recovered with
21 existing operations.

22 Q How was the estimate of secondary oil recovery determined?

1 A The secondary recovery estimate was determined through utilization of a ratio of
2 secondary to primary recovery and analogy. This method is a well recognized and
3 reasonable approach to calculating secondary recovery. The secondary recovery
4 estimate represents 33% of primary recovery, which is consistent with conservative
5 estimates of other Kansas units. Due to the limited nature of the unit area we cannot
6 expect as high a recovery as in larger waterfloods.

7 Q Would the estimated 41,000 bbl of secondary oil be recovered if the Unit were not
8 formed and the proposed plan of injection was not carried out?

9 A No.

10 Q What does Exhibit 6 show?

11 A Exhibit 6 shows the planned waterflood pattern, injection and producing lines, and the
12 location of the consolidated tank battery and injection plant. The pattern will involve
13 the conversion of the Bisagno #1 to water injection.

14 Q In the proposed operations, what injection rates and pressures do you recommend?

15 A Target rates for initial injection are 150 BWIPD. The injection rates may be later
16 increased up to 400 BWIPD depending on performance. It is anticipated that the
17 injection pressure would be 1500 psi or below at the wellhead. In no event would the
18 injection pressure exceed the fracture gradient of the Cherokee formation in this area.

19 Q What is the estimated investment required to install the proposed June Unit
20 waterflood, and does the estimated incremental secondary oil recovery justify this
21 investment?

1 A It is estimated that it will cost \$87,000 to install this project. Economic runs indicate
2 the waterflood project will result in a net undiscounted BFIT income that totals over
3 \$1,000,000.

4 Q Is it your further testimony that the proposed operations are economically feasible,
5 and are necessary to prevent waste and protect correlative rights?

6 A Yes.

7 Q Have you reviewed the Unit Agreement and Unit Operating Agreement which have
8 been filed with this Commission?

9 A Yes.

10 Q In your opinion, do these agreements provide fair, reasonable and equitable
11 provisions for the efficient unitized management and control of the further
12 development and operation of the proposed June Unit area for the recovery of oil
13 from the common source of supply?

14 A Yes.

15 Q How was the tract participation determined?

16 A A two phase participation formula was devised in order to effect an equitable
17 distribution of secondary recovery. Phase 1 Participation was based 50% on Current
18 Oil Production from June 1, 2017 through May 31, 2018 and 50% on remaining
19 reserves. Phase 2 Participation was based 33.3334% on the Cumulative Oil
20 Production through May 31, 2018, 33.3333% on the Net Pay reservoir volume (from
21 the Cherokee Sand Isopach Map) and 33.3333% on Useable Wellbores.

22 Q Is the participation formula consistent with participation formulas for other
23 waterfloods?

1 A Yes. Berexco has formed other waterflood units in the mid-continent region with
2 similar formulas.

3 Q Do you know what percentage of the interests have executed these agreements?

4 A It is my understanding that 100% of the working interest owners and 98.71% of the
5 royalty owners for Phase 1 and 83.23% of the royalty owners for Phase 2 have
6 signed.

7 Q Is it your opinion that the provisions of these agreements are fair and equitable to all
8 working interest owners and royalty owners in the proposed June Unit area?

9 A Yes.

10 Q Based on all of your studies, the exhibits you have provided, and your testimony here
11 today, are you recommending that the Commission grant this application?

12 A Yes

13 Q I have no further questions for Mr. Wreath.

Exhibit #1

DOCKET NO. 19-CONS-3324-CUNI

LICENSE NO. 34318

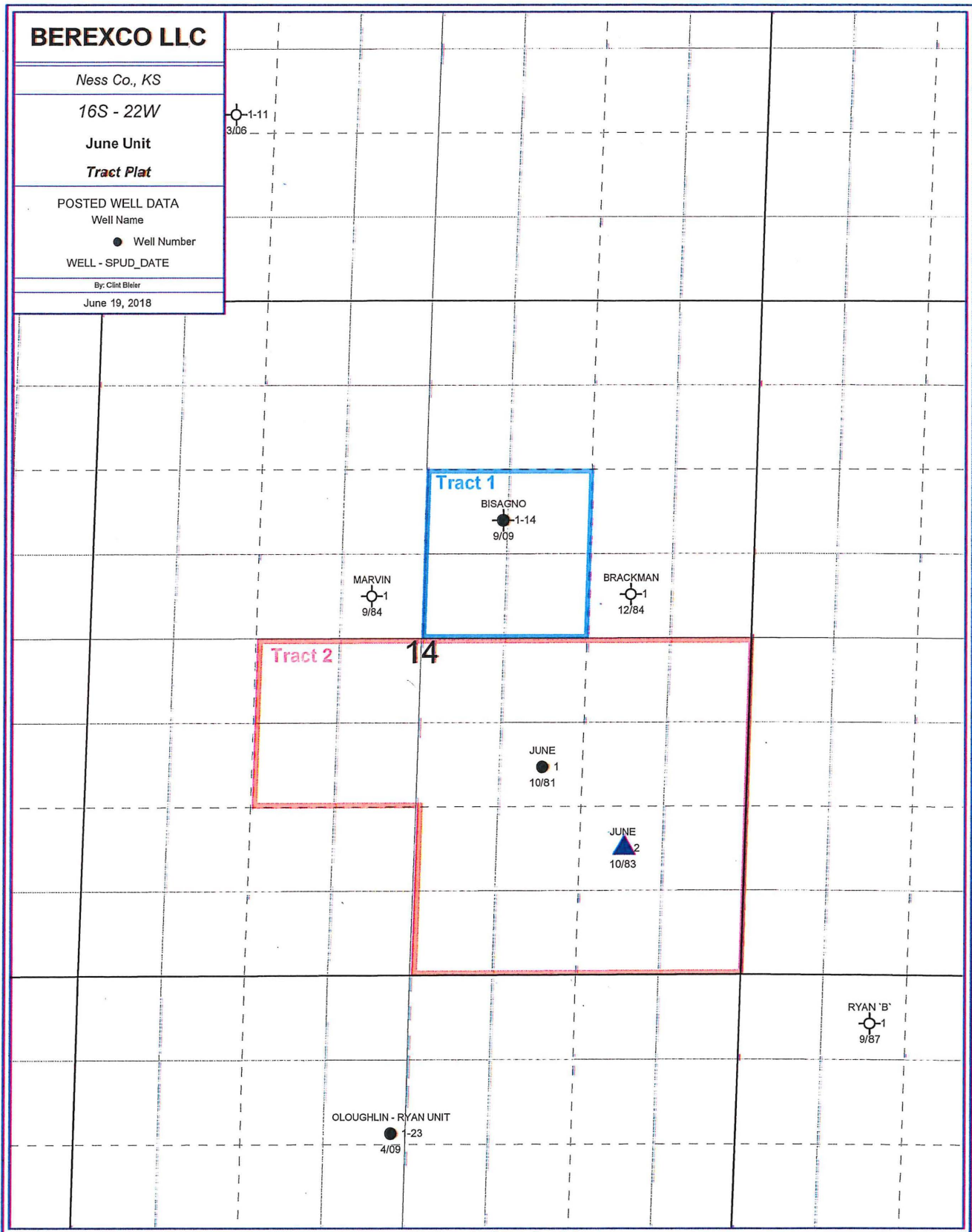


Exhibit #2

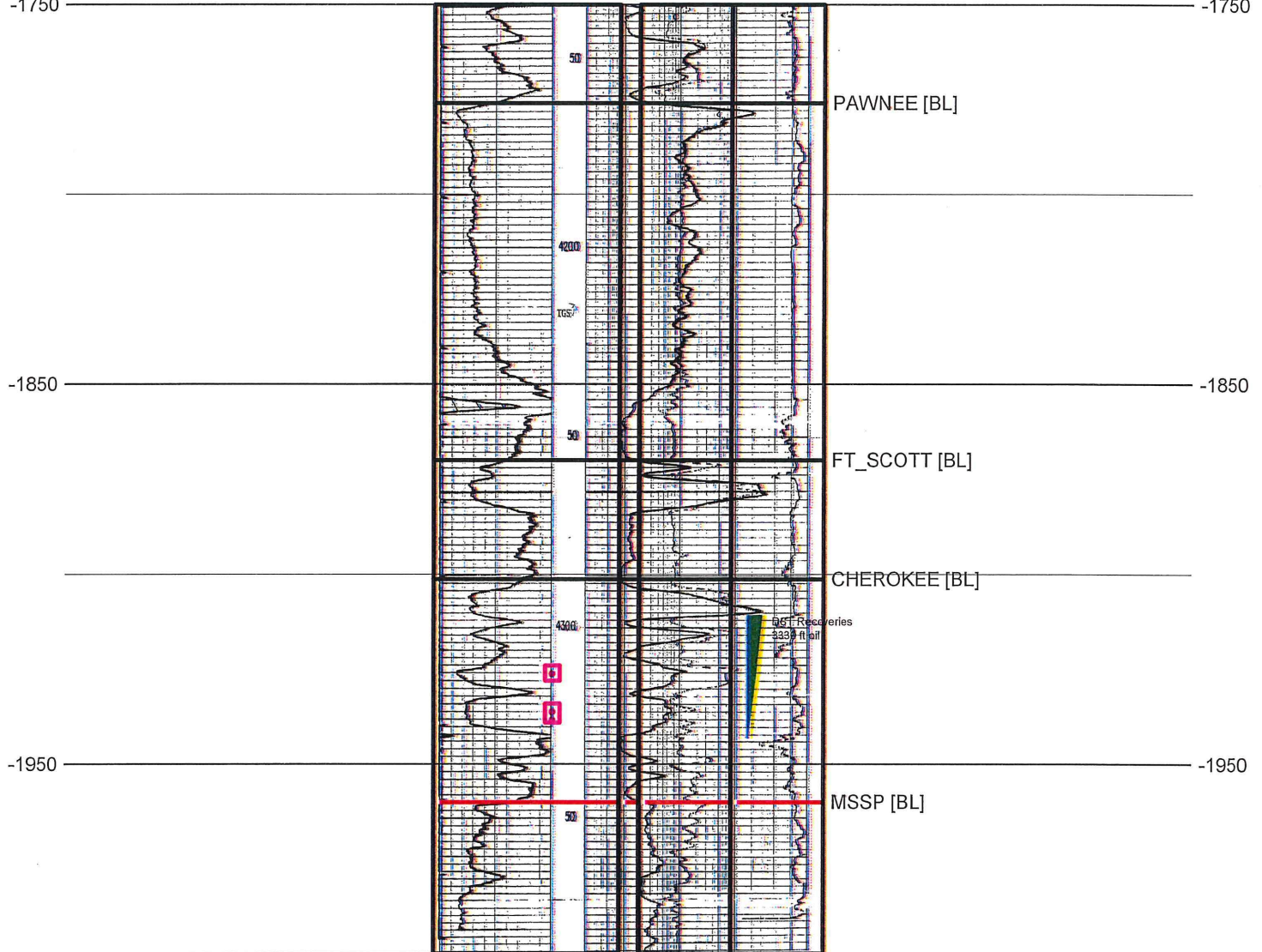
DOCKET NO. 19-CONS-3324-CUNI

LICENSE NO. 34318

JUNE
1
Beren Corp
SE NW SE
T16S R22W S14
2,386
4,390

Subsea
Depth(ft)
-1750

Subsea
Depth(ft)
-1750



Berexco LLC

Well Name
Well Number
Operator
Spot Codes
Twin-Rge-Sec
Datum Elevation
WELL - TD

June 18, 2018 10:54 AM

HS=1

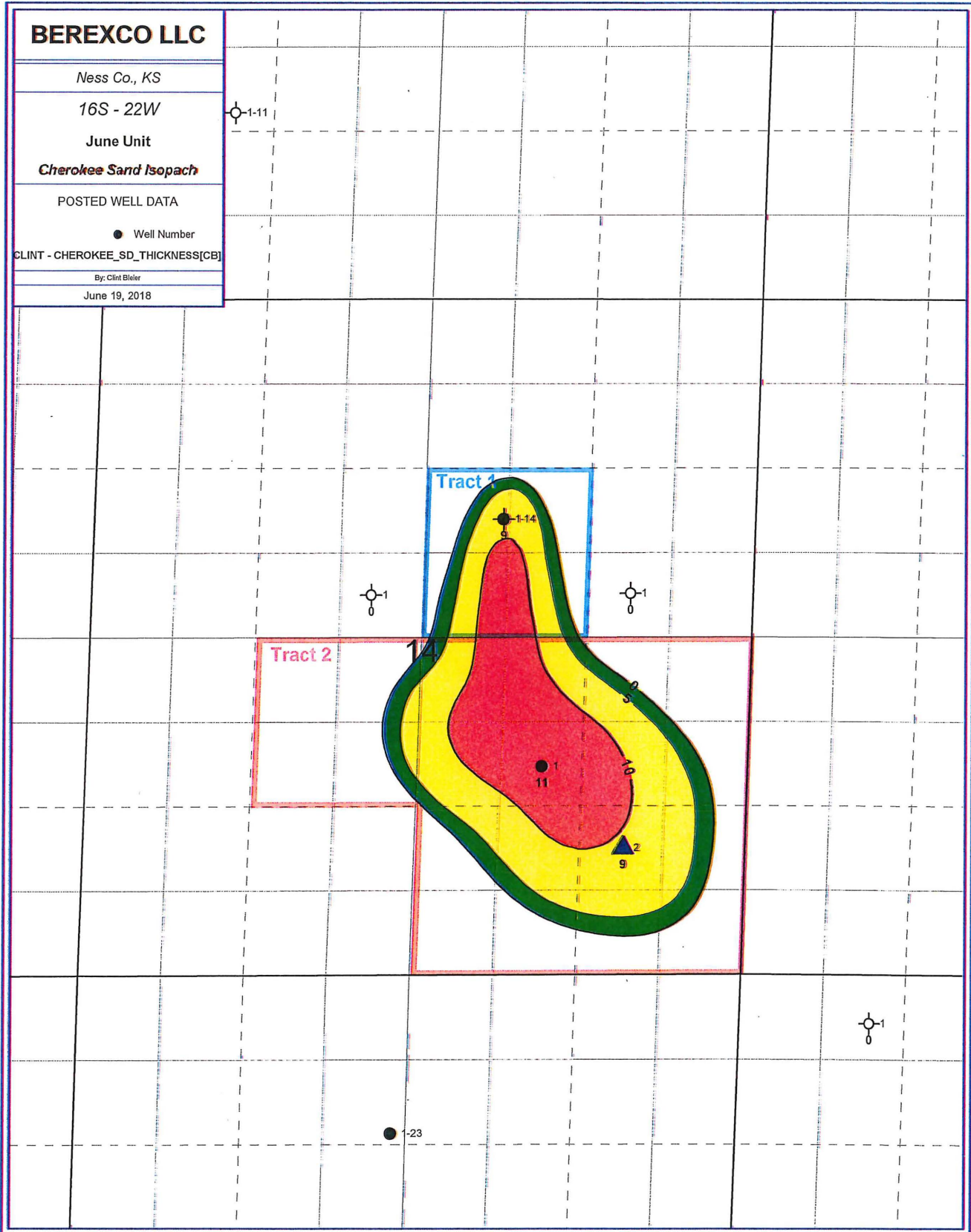
LICENSE NO. 34318



LICENSE NO. 34318

DOCKET NO. 19-CONS-3324-CUNI

LICENSE NO. 34318



June Unit Production

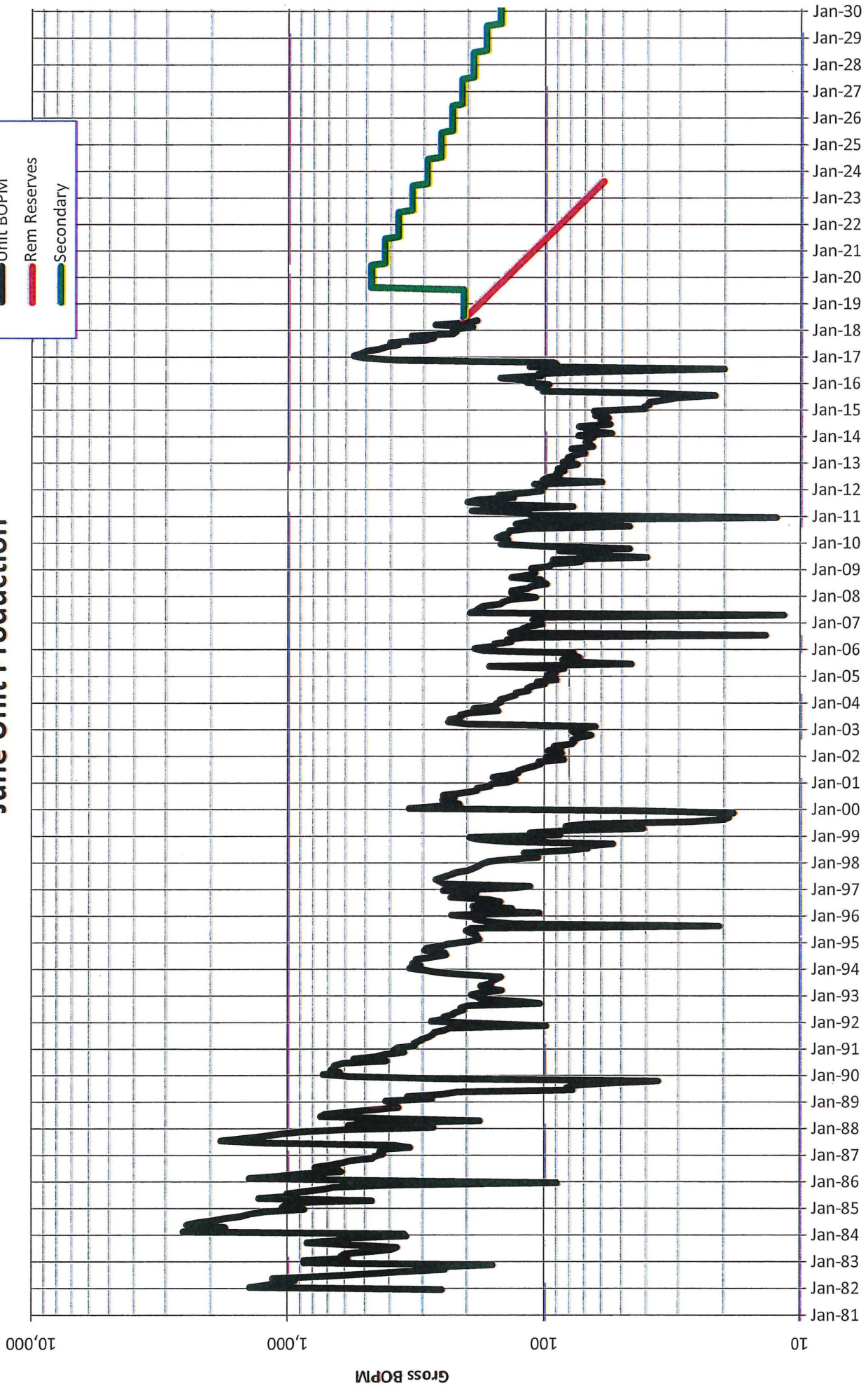


Exhibit #6

DOCKET NO. 19-CONS-3324-CUNI

LICENSE NO. 34318

