

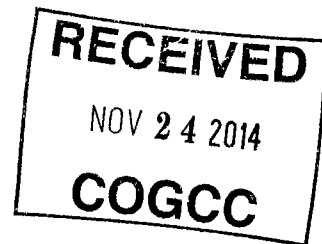


02235955

11.24.14

511 DOCUMENTS

BEFORE THE OIL & GAS CONSERVATION COMMISSION
OF THE STATE OF COLORADO



IN THE MATTER OF THE PROMULGATION)
AND ESTABLISHMENT OF FIELD RULES TO)
GOVERN OPERATIONS FOR THE CODELL)
AND NIOBRARA FORMATIONS, HEREFORD)
FIELD, WELD COUNTY, COLORADO)

CAUSE NO. 421

DOCKET NO. 1412-SP-2219

REQUEST FOR RECOMMENDATION OF
APPROVAL OF APPLICATION WITHOUT A HEARING

Anadarko E&P Onshore LLC ("Applicant"), by and through its undersigned attorneys, hereby requests pursuant to Rule 511.a. of the Rules and Regulations of the Colorado Oil and Gas Conservation Commission for the Director to recommend approval of its October 16, 2014 verified application ("Application") and the supporting exhibits without a hearing.

Applicant requests that the above-captioned matter be approved based upon: (i) the merits of the Application, and (ii) Applicant's sworn written testimony verifying sufficient facts along with exhibits that adequately support the relief requested in the Application. To Applicant's information and belief, no protests were timely filed in this matter.

WHEREFORE, Applicant requests that its request for a recommendation for approval of its Application without a hearing be granted.

DATED this 24th day of November, 2014.

Respectfully submitted,

ANADARKO E&P ONSHORE LLC

By: 

Robert A. Willis

Jillian Fulcher

Beatty & Wozniak, P.C.

Attorneys for Applicant

216 16th Street, Suite 1100

Denver, Colorado 80202

(303) 407-4499



Cause Nos. 421 & 535, Docket No. 1410-SP-2219

Anadarko Petroleum Corporation

Jason Rayburn – Land Testimony

Cause Nos. 421 and 535, Docket No. 1412-SP-2219

Request to establish two approximate 1,337.99-acre drilling and spacing units for certain portions of Section 17, and Sections 20 and 29, Township 12 North, Range 64 West, 6th P.M., and authorize one horizontal well within the proposed units, for production of oil, gas and associated hydrocarbons from the Codell and Niobrara Formations

My name is Jason Rayburn, and I am currently employed as a Landman for Anadarko Petroleum Corporation (“Anadarko”). I graduated from the University of Oklahoma in 2008 with a Bachelor of Science in Business Administration with an emphasis in Energy Management. I have over 8 years of experience in petroleum land management and administrative areas of the oil and gas business. I am familiar with the lands subject to, and the matters set forth in the October 16, 2014, verified application (the “Application”) filed herein. My resume/c.v. is attached to this submission. See Appendix.

In support of the Application, I am submitting two exhibits. The exhibits are attached to my sworn testimony and form the basis for the Application requesting to establish two approximate 1,337.99-acre drilling and spacing units for certain portions of Section 17, and Sections 20 and 29, Township 12 North, Range 64 West, 6th P.M. (the “Application Lands”), and authorize one horizontal well within the proposed units, for production of oil, gas and associated hydrocarbons from the Codell and Niobrara Formations.

1. Exhibit No. L-1

Exhibit No. L-1 is an overhead map which shows the location of the Application Lands within Weld County, Colorado.

2. Exhibit No. L-2

Exhibit No. L-2 is a map which demonstrates Anadarko’s mineral interest and leasehold interest in the Application Lands.

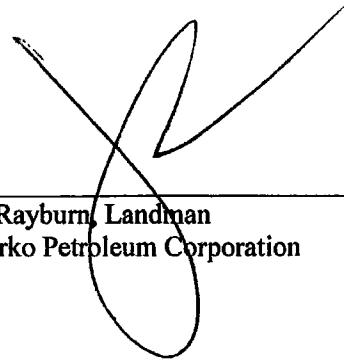
Testimony and Conclusions

Anadarko owns substantial mineral interests and leasehold interests within the approximate 1,337.99-acre drilling and spacing units proposed for the Application Lands.

Based on the examination of relevant contracts and records, the interested parties (owners within the proposed drilling and spacing units) have been duly served with the Application and associated Notice of Hearing. Further, as of the date of this testimony, Anadarko has not received any notice of objection or protest to the Application.

The matters described herein were devised under my direction and control. To the best of my knowledge and belief, all of the matters set forth herein, my testimony and the supporting exhibits, are true, correct and accurate.

DATED this 24th day of November, 2014.



Jason Rayburn, Landman
Anadarko Petroleum Corporation

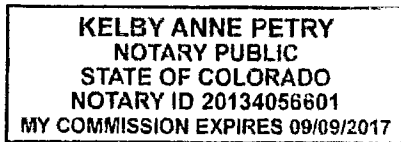
VERIFICATION

STATE OF COLORADO)
)ss.
CITY AND COUNTY OF DENVER)

The foregoing instrument was subscribed and sworn to before me this 24th day of November, 2014, by Jason Rayburn, Landman for Anadarko Petroleum Corporation.

Witness my hand and official seal.

My commission expires: 9/9/17.





Notary Public



For internal information only. Depicted information is subjective and its accuracy has not been verified. Printed or saved versions may be outdated. Depictions and information are intended to be confidential, and may be subject to legal restrictions or protections.

For questions regarding appropriate use, contact the GSC (x62900).

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Thomas. A. Berkman – Geologic Testimony

Docket Numbers:

1412-SP-2216

1412-SP-2217

1412-SP-2219

My name is Tom Berkman and I am currently employed as a Senior Project Geological Advisor for Anadarko Petroleum in Denver. I graduated from Colorado College in Colorado Springs with a B.A. Degree in Geology, and from Oregon State University in Corvallis, OR with an M.S. in Geoscience. I have over 27 years of experience in the oil and gas industry. I am familiar with the land subject to and the matters set forth in the October 16, 2014 verified Applications filed herein. My resume/cv is attached to this submission. See APPENDIX.

In support of the above-docketed Applications, I am submitting 5 exhibits. The exhibits are attached to my sworn testimony and form the basis of the Applications requesting an order to establish 3 - approximate 1280 acre drilling and spacing units for the Codell sandstone and/or Niobrara shale. They also authorize the drilling of 1 - horizontal well per spacing unit for the production of oil, gas and associated hydrocarbons.

Exhibit G-1

Exhibit G-1 is a Type Log of the Upper Cretaceous stratigraphy of the northern D-J Basin. The Niobrara Formation consists of 2 informal members, the Smokey Hill shale, and the Fort Hayes limestone, which directly overlies the Codell. The Pierre Shale overlies the Niobrara. The Carlisle shale is present below the Codell sandstone.

Exhibit G-2

Exhibit G-2 is a structure map on the top of the Codell/base Niobrara showing the proposed drilling and spacing units. The map shows the structure dipping gently to the west at approximately 50 ft / mile across the proposed units.

Exhibit G-3

Exhibit G-3 is a net pay isopach map of the Codell sandstone. Thickness of the Codell ranges from 16 ft in the south part of the map to approximately 20 ft along the Colorado – Wyoming border.

Exhibit G-4

Exhibit G-4 is a net pay isopach map of the Niobrara shale. Thickness of the Niobrara net pay ranges from less than 135 ft in the west to approximately 145 ft along the east portion of the map.

Exhibit G-5

Exhibit G-5 is a west to east stratigraphic cross-section across the proposed drilling and spacing units, hung on the top of the Codell sandstone. It is evident that the Codell sandstone and Niobrara shale exists under the Application Lands.

Conclusions

The Codell sandstone consists of a very fine-grained laminated sandstone, interbedded with bioturbated sands and silts which were deposited in a marine setting during the Cretaceous Western Interior Seaway. This tight sandstone has been producing oil and gas in the DJ Basin for dozens of years, and exists under all of the drilling and spacing units proposed in the Applications.

The Niobrara consists of 2 informal members, the Smoky Hill shale member and the Fort Hayes limestone member, deposited during a major marine transgression in the Cretaceous Western Interior Seaway. The Niobrara is a self-sourced resource play that is present throughout much of the Rocky Mountain region.

To the best of my knowledge, all of the matters set forth herein, my testimony and the supporting exhibits are true, correct and accurate.

VERIFICATION

To the best of my knowledge, all of the matters set forth herein, my testimony and the supporting exhibits are true, correct and accurate.

Tom Berkman

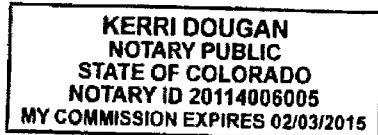
Thomas A. Berkman
Sr. Project Geological Advisor
Anadarko Petroleum

STATE OF COLORADO)
) SS.
CITY AND COUNTY OF DENVER)

The foregoing instrument was subscribed and sworn to before me this 20th day of November, 2014, by Thomas A. Berkman, Sr. Project Geological Advisor for Anadarko Petroleum.

Witness my hand and official seal.

My commission expires: 02/03/2015



Notary Public Kerri Dougan



Colorado Oil and Gas Conservation Commission Hearings
December 15th, 2014

Docket #'s

<i>1412-SP-2216</i>	<i>Niobrara</i>
<i>1412-SP-2217</i>	<i>Codell</i>
<i>1412-SP-2219</i>	<i>Codell & Niobrara</i>

Geological Exhibits

Tom Berkman
Sr Project Geological Advisor
Anadarko Petroleum
Denver, CO

Upper Cretaceous Type Log Northern DJ Basin

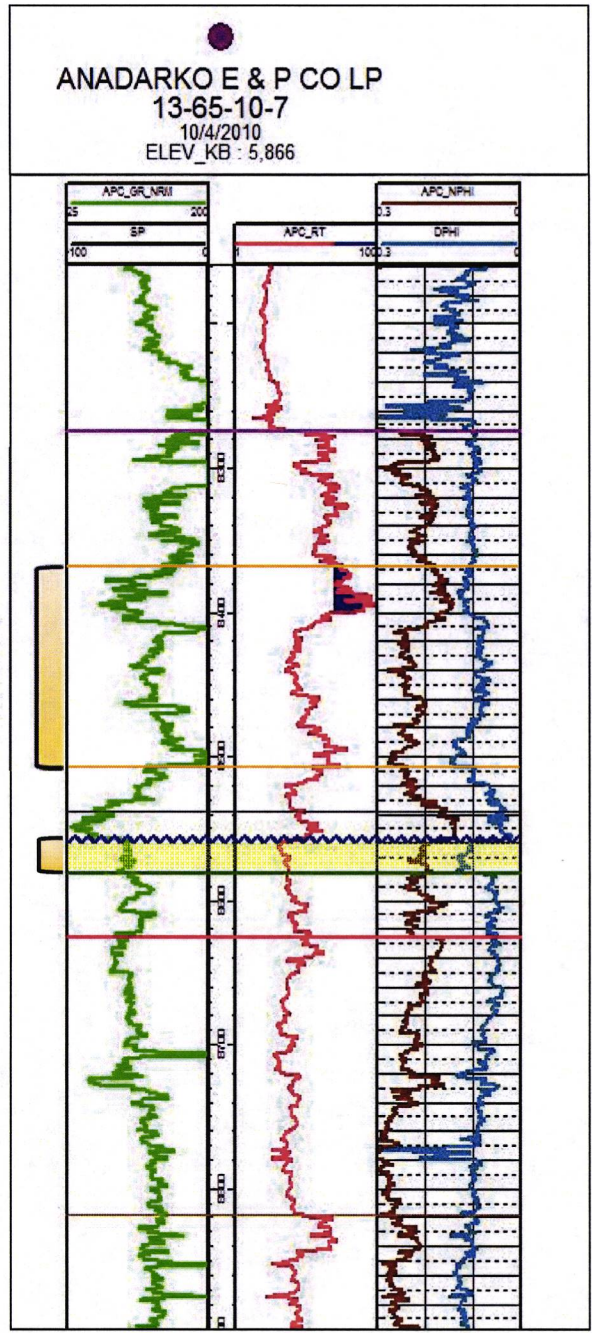
Upper Cretaceous

Niobrara

Greenhorn

Niobrara 'H'

Codell 'H'



Pierre Shale

Smoky Hill Shale
Member

Ft Hayes Ls

Codell Ss

Carlise Sh

Limestone mbr

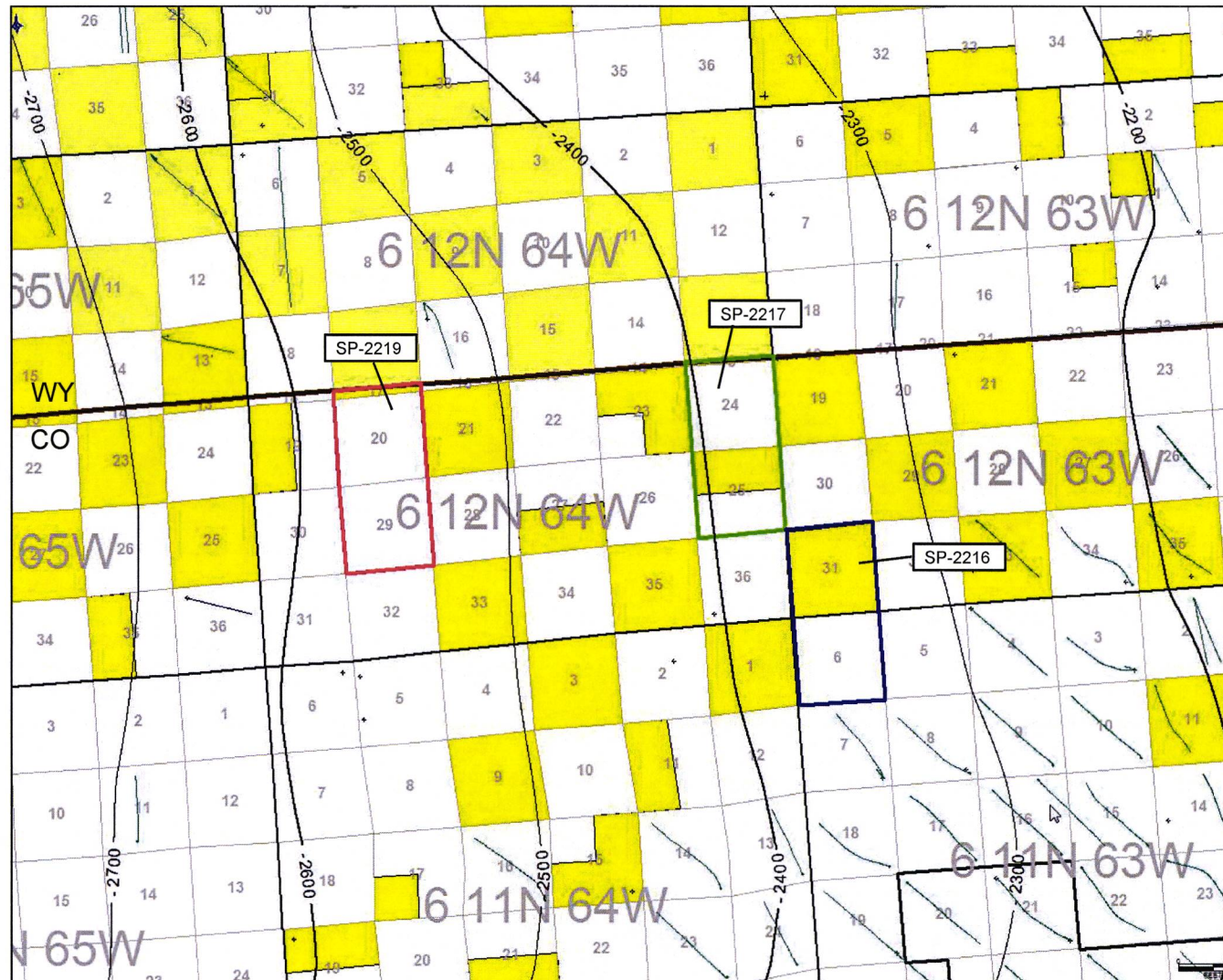
Geological Exhibit 1 Dockets:

1412-SP-2216	Niobrara
1412-SP-2217	Codell
1412-SP-2219	Codell & Niobrara



Top Codell (Base Niobrara) Structure Map (ss)

Geological Exhibit 2 Dockets:



- 1412-SP-2216 Niobrara
- 1412-SP-2217 Codell
- 1412-SP-2219 Codell & Niobrara

Anadarko Petroleum	
Northern DJ Basin	
Top Codell Structure Map	
Codell Spacing Applications	
WELL SYMBOLS	
	AFE's
	DRY AND ABANDON WITH OIL SHOWS
	DRY AND ABANDON
	Dry Hole
	Junked and Abandoned
	Microseismic Monitor Well
	OIL WELL
	PLUGGED & ABANDONED
	Waiting on Permit
	PILOT HOLE
	SERVICE WELL
	SPUD-A
	AT-TD
By: T. Berkman	
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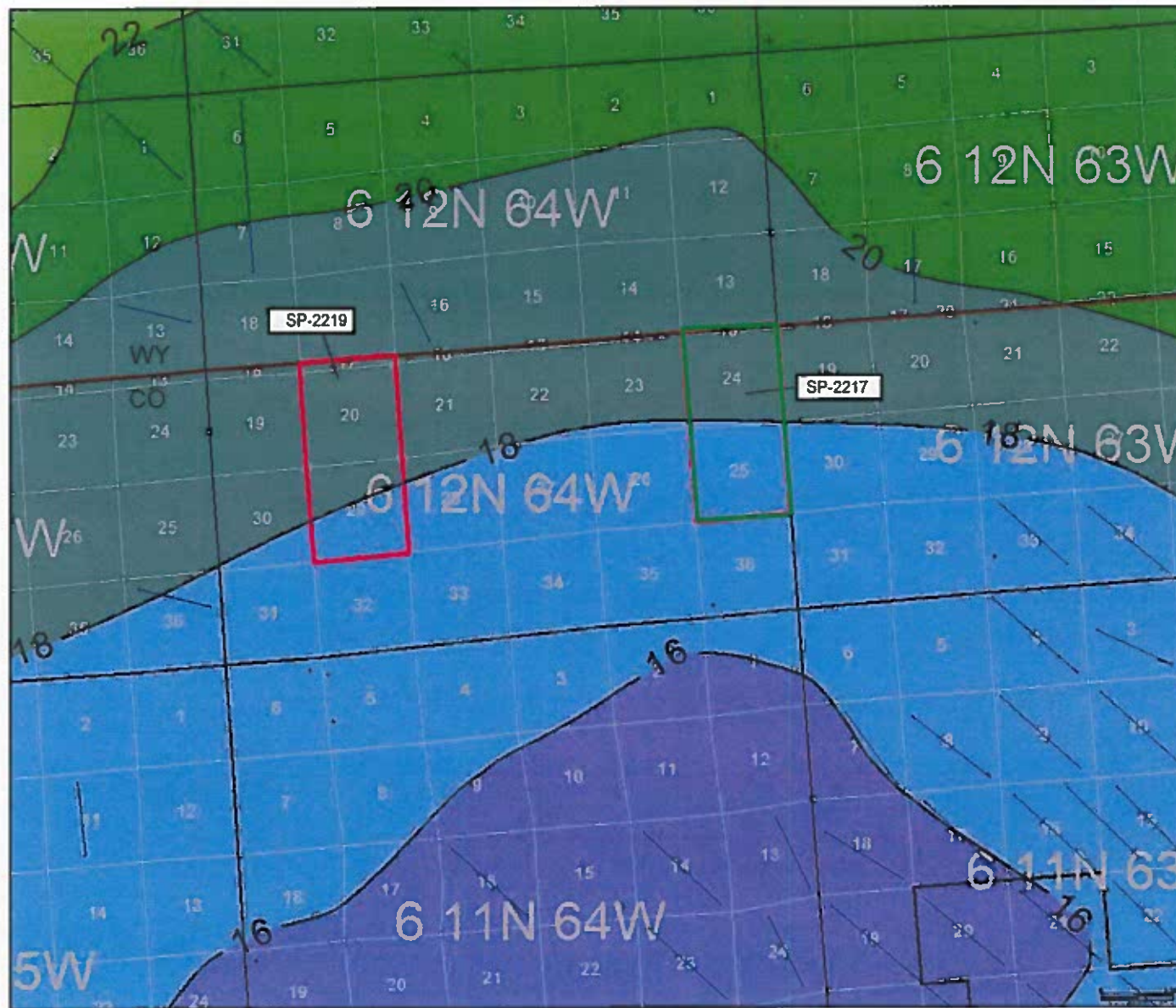
- Proposed Codell & Niobrara Spacing Units
- Proposed Codell Spacing Units
- Proposed Niobrara Spacing Units



Codell Net Pay Isopach Map (ft)

Geological Exhibit 3 Dockets:

1412-SP-2217 Codell
1412-SP-2219 Codell & Niobrara



Anadarko Petroleum

Northern DJ Basin

Codell Net Pay Isopach

Codell Spacing Applications

WELL SYMBOLS

- ▲ AFE'S
- ◆ DRY & ABANDON WITH OIL SHOWS
- ◇ DRY AND ABANDON
- Dry Hole
- ◇ Jailed and Abandoned
- Mesozoic Member Well
- OIL WELL
- ◇ PLUGGED & ABANDONED
- Waiting on Permit
- PILOT HOLE
- × SERVICE WELL
- ▲ SPUD-A
- ▲ AT-TO

By T. Borkman

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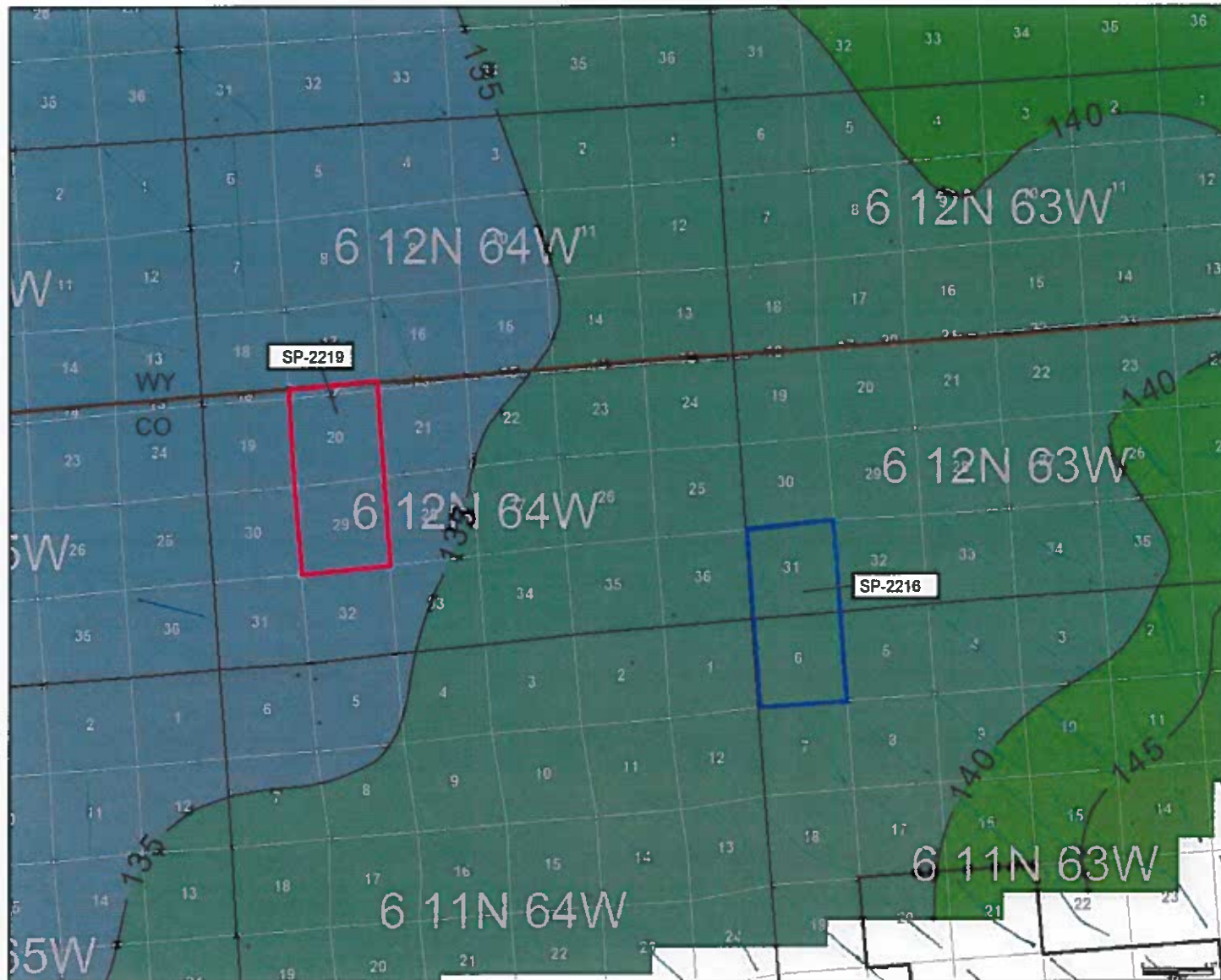
Proposed Codell & Niobrara Spacing Units

Proposed Codell Spacing Units



Niobrara Net Pay Isopach Map (ft)

Geological Exhibit 4 Dockets:



1412-SP-2216 Niobrara
1412-SP-2219 Codell & Niobrara

Anadarko Petroleum

Northern DJ Basin

Niobrara Net Pay Isopach
Codell - Niobrara Spacing Applications
December 15th, 2014

WELL SYMBOLS

- DRY & ABANDON WITH OIL SHOWS
- DRY AND ABANDON
- Dry Hole
- Microseismic Monitor Well
- OIL WELL
- PLUGGED AND ABANDON OIL WELL
- PILOT HOLE
- SERVICE WELL

By T. Bennett

0 10,000
FEET

Proposed Codell & Niobrara Spacing Units

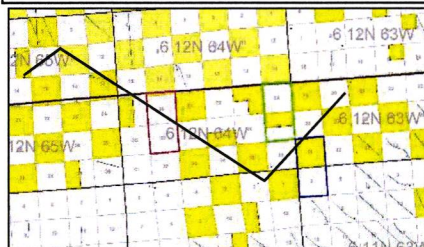
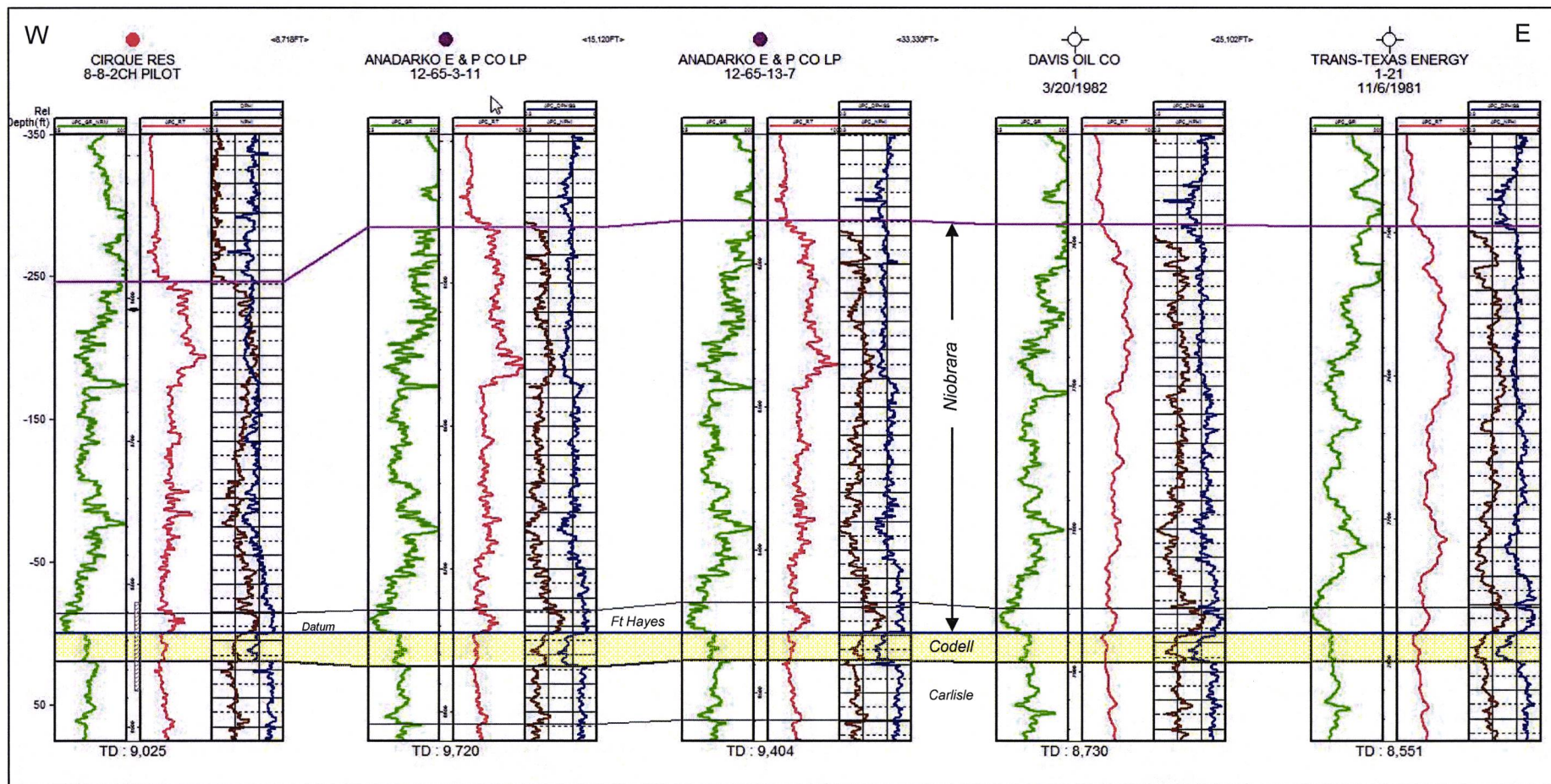
Proposed Niobrara Spacing Units



Geological Exhibit 5 Dockets:

1412-SP-2216 Niobrara
1412-SP-2217 Codell
1412-SP-2219 Codell & Niobrara

Codell - Niobrara Stratigraphic Cross Section



Location Map

THOMAS A. BERKMAN

Anadarko Petroleum
1099 18th St
Denver, CO 80202
(720) 929-6237
E-mail: Thomas.Berkman@anadarko.com

464 Sylvester Way
Highlands Ranch, CO 80129
(303) 975-6331
E-mail: TBerk51289@aol.com

CAREER SUMMARY

Skilled development and near-field exploration geoscientist with 27 years industry experience. Proven track record of finding, appraising, and developing oil and gas reserves both domestically and abroad. Comfortable with workstation mapping and 3D interpretation using Petra, Landmark and Geoframe platforms.

PROFESSIONAL EXPERIENCE

2004-Present **Anadarko Petroleum, Denver, CO**
Sr Project Geologic Advisor - Rockies

- Currently geoscientist for northern DJ Basin. Worked many of the important hydrocarbon-producing Laramide basins in Wyoming and Colorado for 8 yrs. Proposed and drilled exploration and development wells, both horizontal and vertical, and recommended data acquisition and development plans, land purchases, and spacing requirements with team.
- Proposed and drilled 3 exploitation wells for Gunnison Field, Garden Banks, Deepwater GoM. GB668#10 came in with over 350' TVT of pay and proved up additional 125 bcf recoverable in main reservoir. Well maintaining production for 1.5 years of 50 MMCF/D and 4000 BOPD, making it one of the biggest wells in Anadarko's portfolio.
- Generated 3 new low-risk, high-reward step-out exploration prospect opportunities in East Breaks, Deepwater GoM, providing 40 MMBOE reserve potential in structural traps adjacent to Nansen Field. Shackleton Prospect drilled in 2008 resulted in booking 15 MMBOE net to company.
- Mentor for Associate Geologists

1999-2004 **BP Exploration and Production Inc., & Vastar Resources, Inc., Houston, TX**
Principal Geologist – Deepwater GoM

- Interpreted multiple 3-D data volumes and mapped 5 pay zones to construct net pay maps and develop reservoir architecture for productive deepwater systems in Mississippi Canyon and Garden Banks areas, deepwater GoM. Integrated well and seismic data for reservoir description and time-depth conversion.
- Project Geologist responsible for planning drilling locations, generating prognoses, and expectations for 2001 - 10 well development program at Horn Mountain Field. Program results met or exceeded predrill expectations and completed without any geologic sidetracks. Field currently producing at sustained rate of 70,000 bopd.
- Evaluation of Kings Peak Field led to decision by management to retain under-performing, over-capitalized asset. Mapped 7 productive and potential horizons and

generated subsalt exploration play and 3 unrecognized development well locations. Appointed Kings Peak Project Manager for MM\$107 2-well development program.

- | | | |
|-------------------|--|--|
| 1990-1999 | ARCO INTERNATIONAL OIL & GAS CO., ARCO OIL & GAS CO., TX & CA
Staff Geologist | |
| | | <ul style="list-style-type: none">• Project Geologist for delineation drilling of 8-10 TCF gas discovery in Bolivia foldbelt.• Implemented program for 6 diverse exploration blocks in Ecuador, Peru, and Bolivia, an area encompassing 14 million acres.• Project Geologist for ARCO Middle East, reservoir description for plan of development and directed appraisal drilling of Al Rayyan Field. Directed geosteering of 5 medium-radius horizontal wells in Arab Fm carbonate reservoirs, resulting in 37,000 BOPD initial production.• Responsible for exploration discovery in 1995 adding 4.2 MMBO in economic reserves adjacent to Placerita Field in Ventura Basin, California.• As Development Geologist in multi-disciplinary teams, implemented, expanded and monitored several development projects resulting in 50% increase in oil production from turbidite reservoirs in San Joaquin and Ventura Basins, California over a 5 year period.• Expert witness testimony during Los Angeles County property tax appeal resulting in a 3 \$MM finding for ARCO in 1995. |
| 1982-1985
1988 | PHOENIX GEOPHYSICS, INC., Denver, CO
Geophysicist-Project Supervisor | |
| | | <ul style="list-style-type: none">• Recognized and solved all technical and logistical problems to ensure steady production of geophysical data acquisition in hydrocarbon and geothermal exploration. Directed field-client operations. Managed crew finances, payroll, and weekly expense and production reports.• Rejoined Phoenix in 1988 in capacity of Project Supervisor for 4 month, long-distance remote time-series survey in Japan. |
| 1988 | OREGON STATE UNIVERSITY, Corvallis, OR | Teaching Assistant |
| | | <ul style="list-style-type: none">• Taught 45 students per quarter basic geology for 2 quarters during graduate school. In charge of all class and lab preparation. |
| 1981
(Summer) | UNITED STATES BUREAU OF MINES | Physical Science Technician |
| | | <ul style="list-style-type: none">• Geological mapping of mines and surface exposures, geochemical sampling for precious and base metals, and performing helicopter reconnaissance in White Mountains of eastern California. |

EDUCATION

- 1986-1990 **Oregon State University**, Corvallis, OR
- M.S. in Geoscience, 1990. Major: stratigraphy, sedimentology. Minor: tectonics, geophysics.
- 1978 - 1982 **Colorado College**, Colorado Springs, CO
- B.A. Degree in Geology, 1982.
- 1990 - present Numerous industry, technical and financial schools and seminars

PUBLICATIONS

- Smith, K., Bottjer, R., Sterling, R., Nowak, H., and Berkman, T.A., 2015, (in press) Codell Sandstone, Northern DJ Basin, Wyoming and Colorado: Reservoir Characteristics in a Tight Oil Play: AAPG abstract, 2015 Annual Meeting, Denver, CO
- Ellis, L., Berkman, T.A., Uchytel, S., and Dzou, L., 2007, Integration of mud gas isotope logging (MGIL) with field appraisal at Horn Mountain Field, deepwater Gulf of Mexico: *Journal of Petroleum Science & Engineering*
- Berkman, T.A., Ellis, L., and Grass, D., 2002, Integration of mud gas isotope data with field appraisal at Horn Mountain Field, deepwater Gulf of Mexico: (Abst.) AAPG National Conv., Houston, TX
- He, Z., and Berkman, T.A., 1999, Interactive charge modeling of the Qatar Arch petroleum systems: (Abst.) AAPG Hedberg Conference "Multi-Dimensional Basin Modeling".
- Berkman, T.A., 1996, Structure and hydrocarbon exploration in the transpressive basins of southern California: AAPG Field Conference Guidebook 73, field trip contributor and author.
- Berkman, T.A., 1994, Placerita oilfield - A case study of steamflooding a complexly stratified reservoir: *The Pacific Petroleum Geologist*, AAPG Pacific Section. no.4
- Werner, K.S., Graven, E.P., Berkman, T.A., and Parker, M.J., 1991, Direction of maximum horizontal compression in northwestern Oregon as determined by borehole breakouts: *Tectonics*, v. 10, no. 5
- Berkman, T.A., 1991, Timing of structural growth at Northwest Stevens Field as evidenced by Stevens channel geometries: (Abst.) AAPG Bull. v. 75/2 p. 357
- Berkman, T.A., Niem, A.R., and Farr, L., 1991, Depositional environments, tectonic setting, and diagenesis of the gas-producing Eocene Cowlitz Formation, northern Oregon Coast Range: (Abst.) SEPM 1991 Meeting on Tectonics and Sedimentation
- Jackson, R.A., Berkman, T.A., and Dahleen, W.K., 1991, A depositional setting for the Mist Gas Field reservoir sands: (Abst.) AAPG Bull. v. 75/2 p. 368
- Moore, G.W., Berkman, T.A., and Sidlauskas, F.J., 1990, Geographic map of the Circum - Pacific region, Arctic sheet, Circum-Pacific Council for Energy and Mineral Resources (available through AAPG)

PROFESSIONAL ACTIVITIES

- Wyoming Licensed Professional Geologist #3675
- Texas Licensed Professional Geologist #2688
- Active member – Rocky Mountain Association of Geologists
- Active member - National AAPG



Cause No. 535, Docket Nos. 1412-SP-2217, 2216 and 2219

Anadarko Petroleum Corporation

Emily Boecking – Engineering Testimony

Cause 535, Docket Nos. 1412-SP-2217, 2216 and 2219

Request to establish four approximate 1,280-acre drilling and spacing units, and authorize one horizontal well within the proposed units, for production of oil, gas and associated hydrocarbons from the Codell and/or Niobrara Formations

My name is Emily Boecking, and I am currently employed as a Reservoir Engineer for Anadarko Petroleum Corporation (“Anadarko”). I graduated from the Duke University in 2007 with a Bachelor of Science in Mechanical Engineering. I have over 7 years of experience in the oil and gas industry of which 5 years have spent as a reservoir engineer. I am familiar with the lands subject to, and the matters set forth in the October 16, 2014, verified applications (the “Applications”) filed herein. My resume/c.v. is attached to this submission. See Appendix.

In support of the Applications, I am submitting five exhibits. The exhibits are attached to my sworn testimony and form the basis for the Applications requesting to establish an approximate 1,280-acre drilling and spacing units for the below-described lands (the “Application Lands”), and authorize one horizontal well within the proposed units, for production of oil, gas and associated hydrocarbons from the Codell and/or Niobrara Formations:

Docket No. 1412-SP-2217, Codell Formation

Township 12 North, Range 64 West, 6th P.M.

Section 13: Lots 1 through 4 (approximately 18.98 acres),
being that portion lying within the state of
Colorado
Section 24: All
Section 25: All

Docket No. 1412-SP-2216, Niobrara Formation

Township 12 North, Range 63 West, 6th P.M.

Section 31: Lot 1 (39.82 acres), Lot 2 (40.10 acres), Lot 3
(40.38 acres), Lot 4 (40.66 acres), E $\frac{1}{2}$ W $\frac{1}{2}$, E $\frac{1}{2}$
[All]

Township 11 North, Range 63 West, 6th P.M.

Section 6: Lot 1 (40.49 acres), Lot 2 (40.35 acres), Lot 3
(40.21 acres), Lot 4 (40.86 acres), Lot 5 (40.78
acres), Lot 6 (40.78 acres), Lot 7 (40.76 acres),
SE $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$ [All]

Docket No. 1412-SP-2219, Codell and Niobrara Formations

Township 12 North, Range 64 West, 6th P.M.

Section 17:	Lots 1 through 4 (approximately 57.99 acres), being that portion lying within the state of Colorado
Section 20:	All
Section 29:	All

1. Exhibit No. E-1

Exhibit No. E-1 is a table showing reservoir drainage area calculations for current producing wells in the Northern DJ Basin closest offsetting the proposed units. Wells included in this table are producing from the Codell formation with production for 5 months or more and have horizontal completed lateral lengths ranging from 8,500' - 9,500'.

2. Exhibit No. E-2

Exhibit No. E-2 shows the decline curves used to extrapolate estimated ultimate recovery for use in the drainage area calculations for the Codell.

3. Exhibit No. E-3

Exhibit No. E-3 is a table showing reservoir drainage area calculations and Joshi effective vertical drainage radii for current producing wells in the Northern DJ Basin closest offsetting the proposed units. Wells included in this table are producing from the Niobrara formation with production for 12 months or more and have horizontal completed lateral lengths ranging from 3,400- 5,800.

4. Exhibit No. E-4

Exhibit No. E-4 shows the horizontal well drainage area calculation for a well with a 9,000' completed lateral length producing from the Niobrara using the Joshi method.

5. Exhibit No. E-5

Exhibit No. E-5 shows the decline curves used to extrapolate estimated ultimate recovery for use in the drainage area and Joshi effective vertical drainage radii calculations for the Niobrara.

Testimony and Conclusions

Anadarko believes that drilling and completed horizontal wells in the Codell and/or Niobrara Formations underlying the Application Lands is the most efficient and economic method to develop the resource potential for these formations.

The calculated drainage areas for the wells drilling in the Codell Formation offsetting the Application Lands, with 8,500- 9,500' laterals, range from 90 to 259 acres. Therefore the calculated drainage area supports the initial drilling of one horizontal well for the Codell Formation underlying the Application Lands.

The calculated Joshi effective vertical drainage radius for the wells drilling in the Niobrara Formation offsetting the Application Lands, with 3,400-5,800' laterals, averages 354 feet. The estimated



Colorado Oil and Gas Conservation Commission Hearings
December 15th, 2014

Docket #'s

<i>1412-SP-2216</i>	<i>Niobrara</i>
<i>1412-SP-2217</i>	<i>Codell</i>
<i>1412-SP-2219</i>	<i>Codell & Niobrara</i>

Engineering Exhibits

Emily Boecking
Sr Reservoir Engineer
Anadarko Petroleum
Denver, CO

Exhibit E-1: Drainage Area Calculation

Codell Horizontal Well Drainage Area Calculation

API No	Lease	Well No	Reservoir	Operator	Section	Township	Range	Cumulative Oil (bbl)	EUR Oil (bbl)	Completed Interval	Average Porosity (phi, %)	Water Saturation (Sw, %)	Thickness (h, ft)	Drainage Area (acres)
49021210120000	JUBILEE	103-0433H	Codell	EOG Resources	4	13 N	65 W	147,397	361,853	9,313	12	50	24	259
49021210560000	JUBILEE	513-0820H	Codell	EOG Resources	8	13 N	65 W	89,657	290,784	9,401	12	51	22	229
49021210610000	JUBILEE	584-1705H	Codell	EOG Resources	17	13 N	65 W	56,053	188,114	9,400	12	51	23	141
49021210600000	JUBILEE	586-1705H	Codell	EOG Resources	17	13 N	65 W	53,217	159,399	9,086	12	51	23	120
49021210880000	JUBILEE	611-0706H	Codell	EOG Resources	7	13 N	65 W	44,558	115,541	8,511	12	51	22	90
49021209670000	REDSTONE	2-1-1CH	Codell	EOG Resources	2	13 N	65 W	67,142	179,494	9,467	12	50	24	128
49021210150000	WINDY	504-1806H	Codell	EOG Resources	18	13 N	64 W	103,736	251,420	9,116	12	53	22	201

Average Drainage Area: 167 Acres

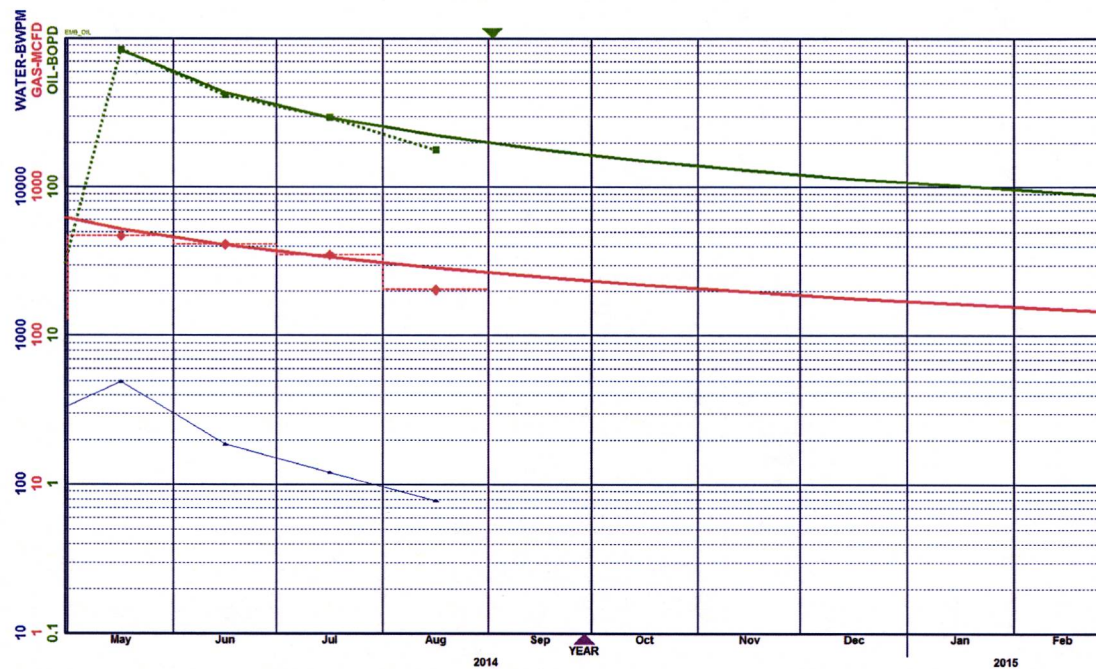
$$\text{Drainage area equation: } Area = \frac{EUR * B_o}{7758 * h * \phi * (1 - S_w) * R_F}$$

$$B_o = 1.4$$

$$R_F = 18\%$$

Exhibit E-2: Decline Curve Analysis

Jubilee 586-1705H	
49021210600000	
Codell	
EOG Resources	
17 13N 65W	
Cum Oil (BO)	53,217
Cum Gas (MMCF)	47,976
EUR Oil (BO)	159,399
EUR Gas (MMCF)	242,746



Jubilee 584-1705H	
49021210610000	
Codell	
EOG Resources	
17 13N 65W	
Cum Oil (BO)	56,053
Cum Gas (MMCF)	57,887
EUR Oil (BO)	188,114
EUR Gas (MMCF)	312,571

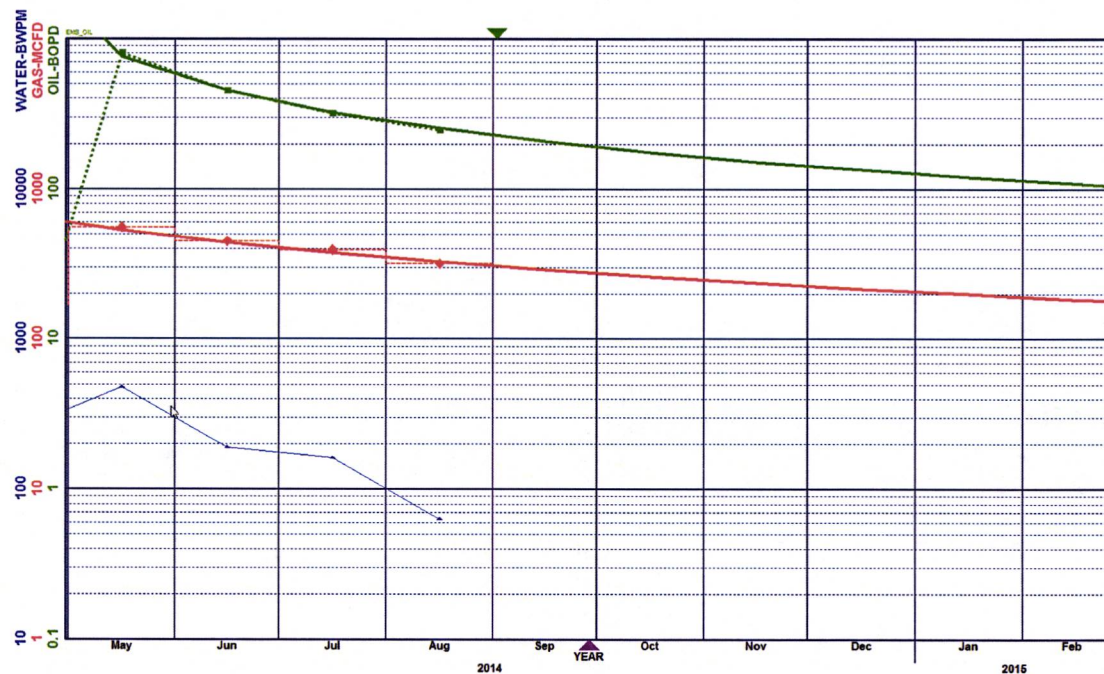
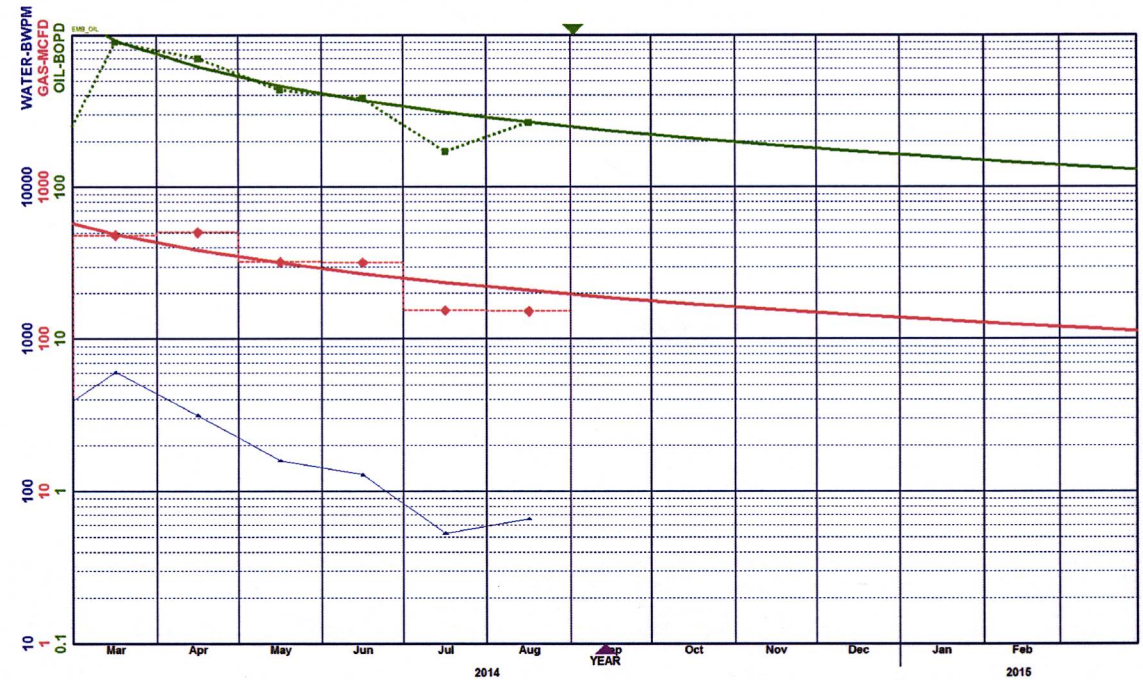


Exhibit E-2: Decline Curve Analysis

Jubilee 513-0820H	
49021210560000	
Codell	
EOG Resources	
8 13N 65W	
Cum Oil (BO)	89,657
Cum Gas (MMCF)	60,165
EUR Oil (BO)	290,784
EUR Gas (MMCF)	244,086



Jubilee 611-0706H	
49021210880000	
Codell	
EOG Resources	
7 13N 65W	
Cum Oil (BO)	44,558
Cum Gas (MMCF)	28,312
EUR Oil (BO)	115,541
EUR Gas (MMCF)	47,830

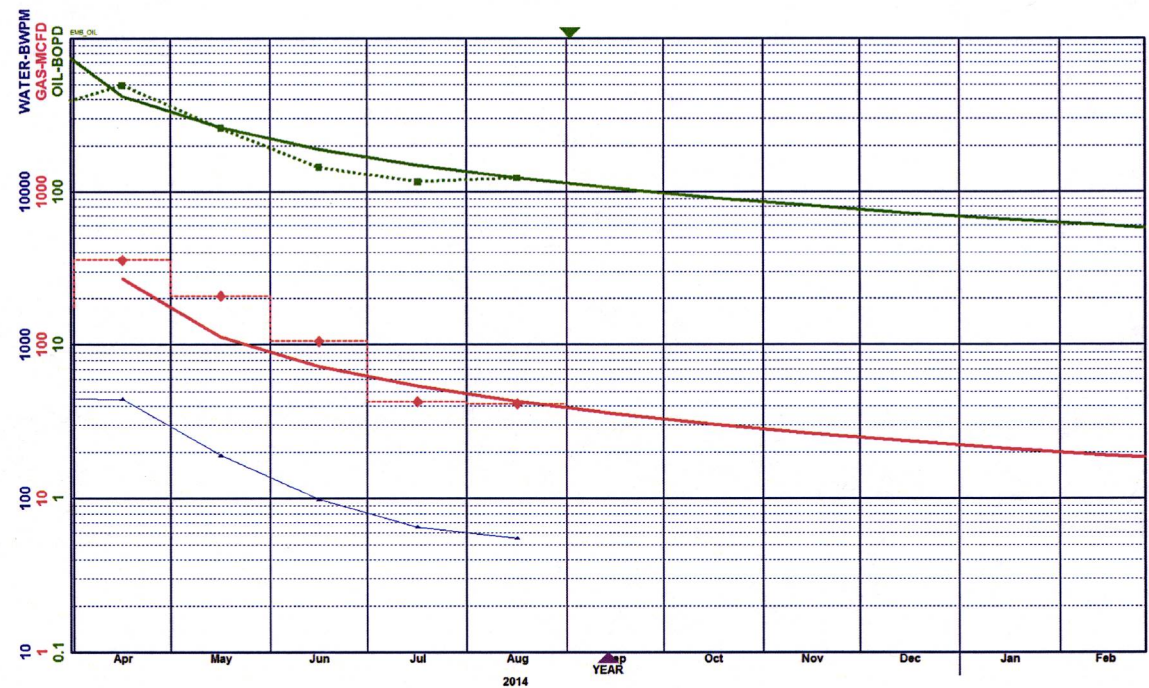
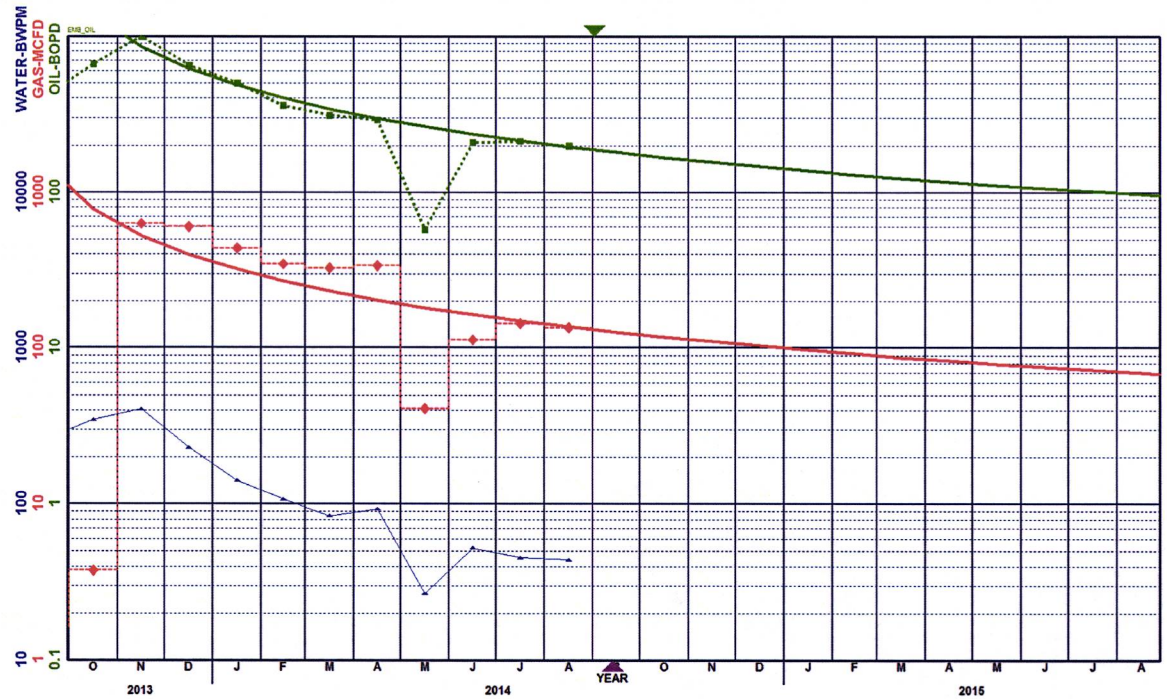


Exhibit E-2: Decline Curve Analysis

Jubilee 103-0433H	
49021210120000	
Codell	
EOG Resources	
4 13N 65W	
Cum Oil (BO)	147,397
Cum Gas (MMCF)	94,451
EUR Oil (BO)	361,853
EUR Gas (MMCF)	247,262



Windy 504-1806H	
49021210150000	
Codell	
EOG Resources	
18 13N 64W	
Cum Oil (BO)	103,736
Cum Gas (MMCF)	85,456
EUR Oil (BO)	251,420
EUR Gas (MMCF)	274,291

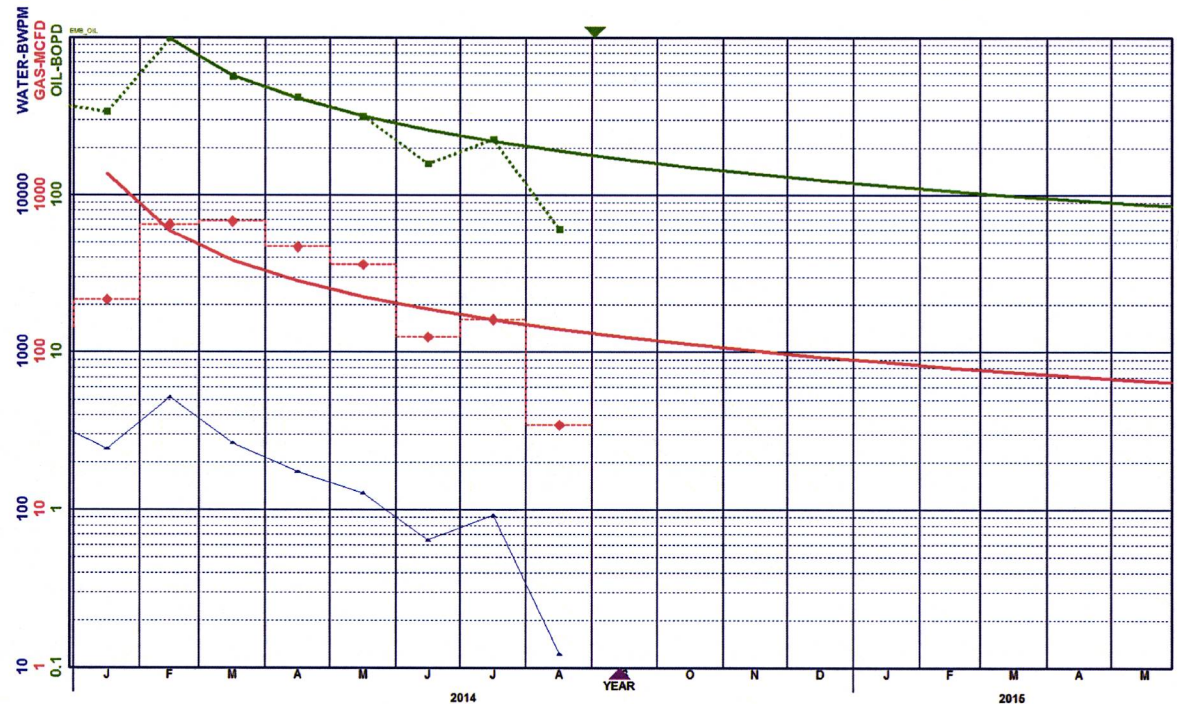


Exhibit E-2: Decline Curve Analysis

Redstone 2-1-1 CH	
49021209670000	
Codell	
EOG Resources	
2 13N 65W	
Cum Oil (BO)	67142
Cum Gas (MMCF)	61,843
EUR Oil (BO)	179,494
EUR Gas (MMCF)	192,085

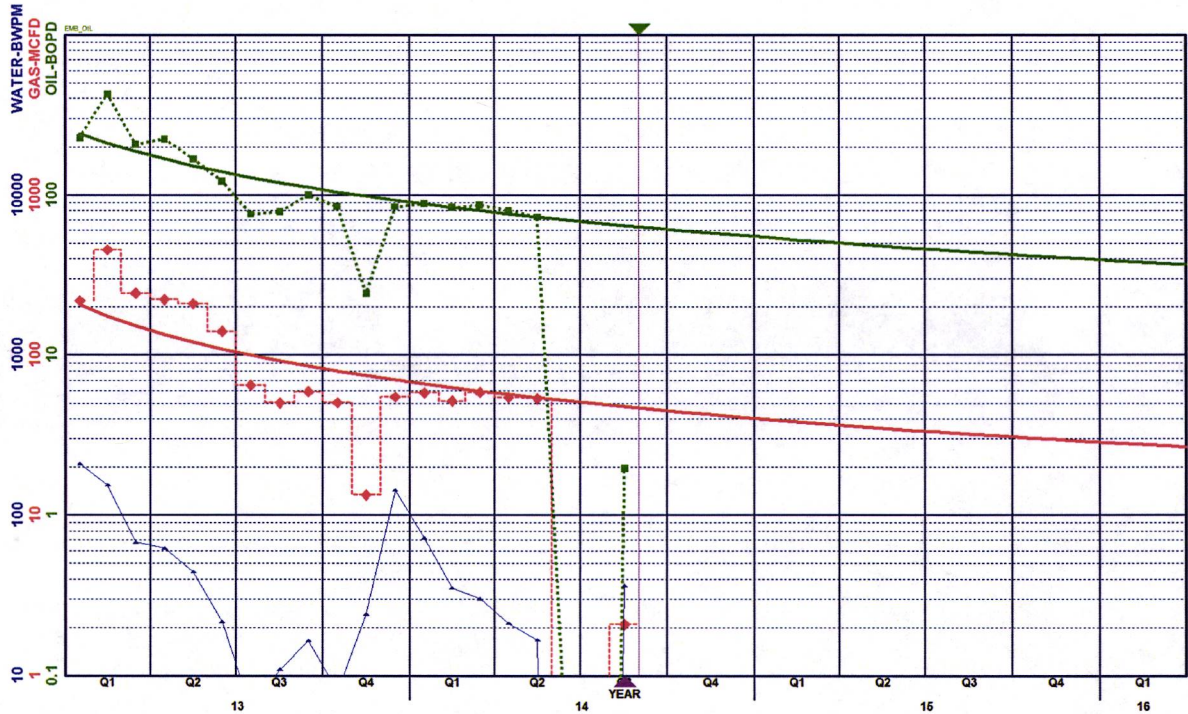


Exhibit E-3: Drainage Area Calculation

Niobrara Horizontal Well Drainage Area Calculation

API No	Lease	Well No	Reservoir	Operator	Section	Township	Range	Cumulative Oil (bbl)	EUR Oil (bbl)	Completed Interval	Average Porosity (phi, %)	Water Saturation (Sw, %)	Thickness (h, ft)	Drainage Area (acres)	Joshi Effective Vertical Drainage Radius (feet)
49021206490000	ATCHISON	13-65-35-4H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	35	13 N	65 W	24,606	39,412	5,713	10	45	133	34	124
49021206650000	ATCHISON	12-65-13-4H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	13	12 N	65 W	26,133	42,770	3,851	10	45	134	36	189
49021207500000	PATRIOT	1-19H	Niobrara	EOG RESOURCES INCORPORATED	19	14 N	64 W	23,966	45,662	4,216	9	45	146	37	179
49021206810000	ATCHISON	12-65-1-4H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	1	12 N	65 W	38,857	54,231	5,748	10	45	134	46	167
49021206630000	STATE	13-64-16-4H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	16	13 N	64 W	38,833	69,099	5,480	10	45	136	58	218
49021207610000	MARLIN	12-65-3-4H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	3	12 N	65 W	49,696	80,101	4,203	10	45	134	64	297
49021206520000	SHATTO	13-65-10-4H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	10	13 N	65 W	57,880	93,268	5,225	10	45	132	77	294
49021208720000	JUBILEE	69-04H	Niobrara	EOG RESOURCES INCORPORATED	4	13 N	65 W	71,574	113,263	3,540	10	45	136	91	463
49021209810000	BIG SANDY	7-33H	Niobrara	EOG RESOURCES INCORPORATED	33	14 N	65 W	42,153	139,739	3,541	10	45	136	113	557
49021207560000	MARLIN	12-65-3-2H	Niobrara	ANADARKO E & P COMPANY LIMITED PRTNR	3	12 N	65 W	88,634	144,389	4,407	10	45	134	117	493
49021209800000	JUBILEE	30-07H	Niobrara	EOG RESOURCES INCORPORATED	7	13 N	65 W	56,422	152,245	3,836	10	45	133	123	567
49021208750000	WINDY	01-18H	Niobrara	EOG RESOURCES INCORPORATED	18	13 N	64 W	68,721	163,414	3,401	9	45	132	144	699
AVERAGE									94,799	4,430	10	45	135	78	354

$$\text{Drainage area equation: } Area = \frac{EUR * B_o}{7758 * h * \phi * (1 - S_w) * R_F}$$

$$B_o = 1.4$$

$$R_F = 3\%$$

Exhibit E-4: Estimated Drainage for Proposed 9000' Niobrara Horizontal Well

Horizontal Well Drainage Area
Joshi Method

r = effective drainage radius from vertical well, ft

L = lateral length, ft

A = drainage area for horizontal well

$$A = \frac{\pi r^2 + 2rL}{43560}$$

$$r = 354 \text{ ft}$$

$$L = 9,000 \text{ ft}$$

$$A = 155 \text{ acres}$$

Exhibit E-5: Decline Curve Analysis

	ATCHISON 13-65-35-4H
	49021206490000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTNR
	35 13 N 65 W
Cum Oil (BO)	24,606
EUR Oil (BO)	39,412

	ATCHISON 12-65-13-4H
	49021206650000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTNR
	13 12 N 65 W
Cum Oil (BO)	26,133
EUR Oil (BO)	42,770

	PATRIOT 1-19H
	49021207500000
	Niobrara
	EOG RESOURCES INCORPORATED
	19 14 N 64 W
Cum Oil (BO)	23,966
EUR Oil (BO)	45,662

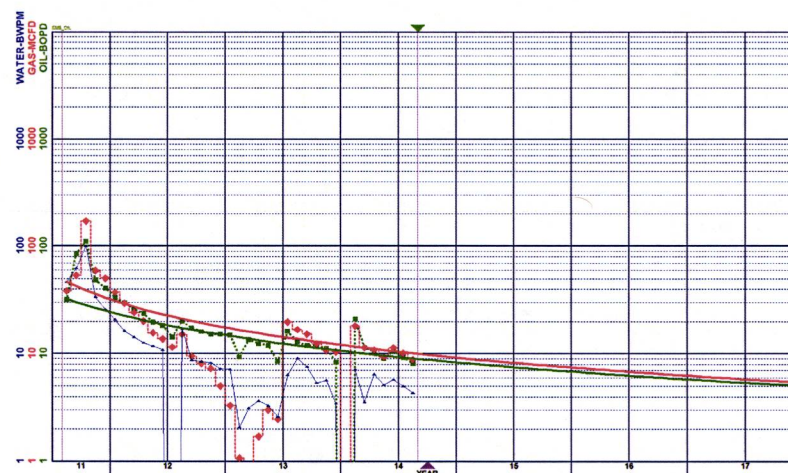
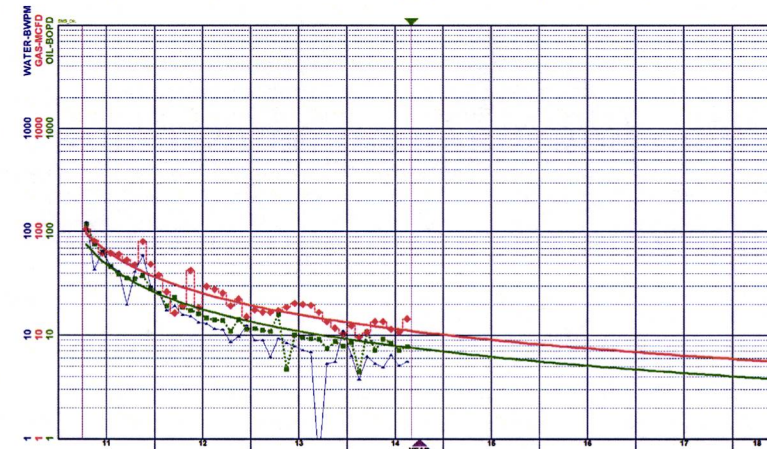
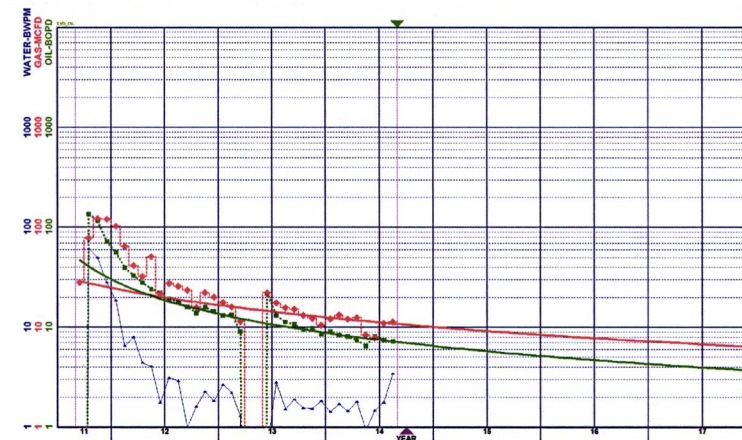


Exhibit E-5: Decline Curve Analysis

	ATCHISON 12-65-1-4H
	49021206810000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTR
	1 12 N 65 W
Cum Oil (BO)	38,857
EUR Oil (BO)	54,231

	STATE 13-64-16-4H
	49021206630000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTR
	16 13 N 64 W
Cum Oil (BO)	38,833
EUR Oil (BO)	69,099

	MARLIN 12-65-3-4H
	49021207610000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTR
	3 12 N 65 W
Cum Oil (BO)	49,696
EUR Oil (BO)	80,101

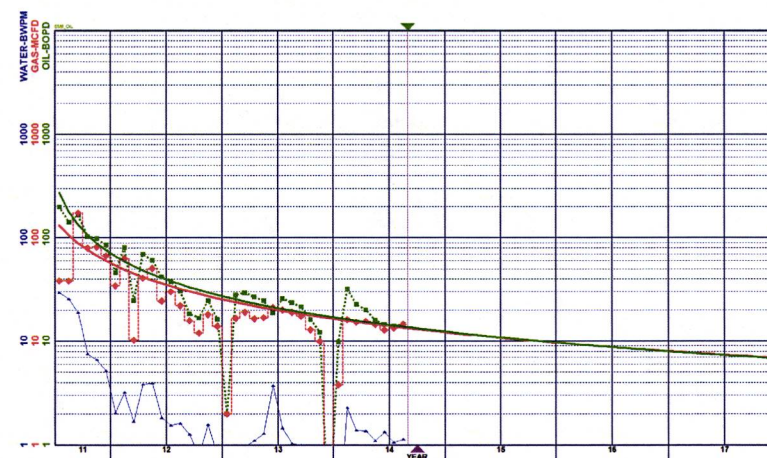
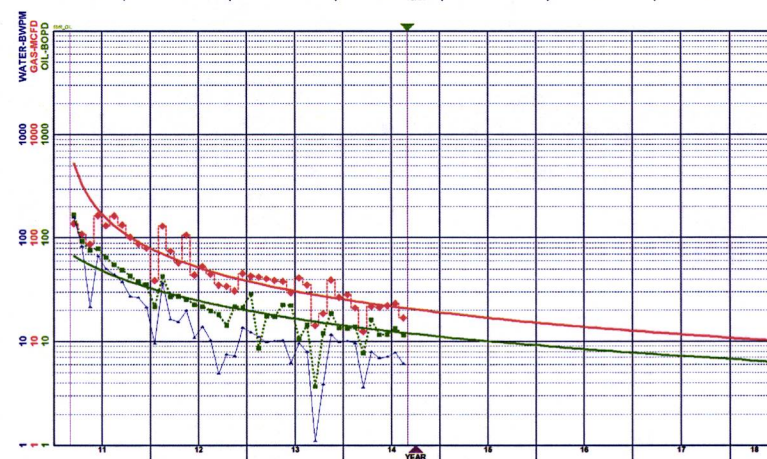
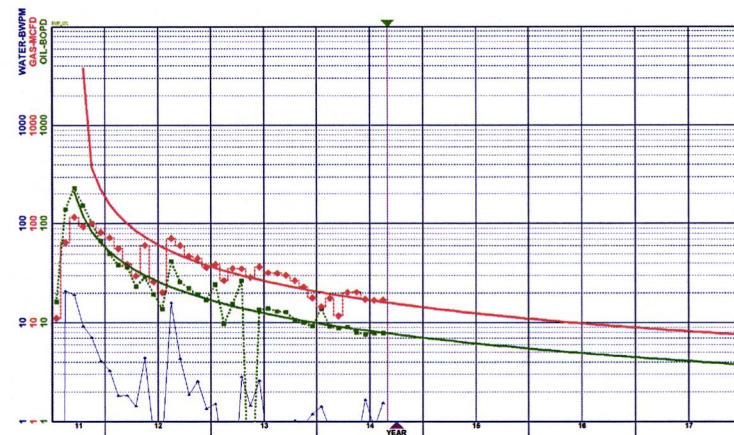
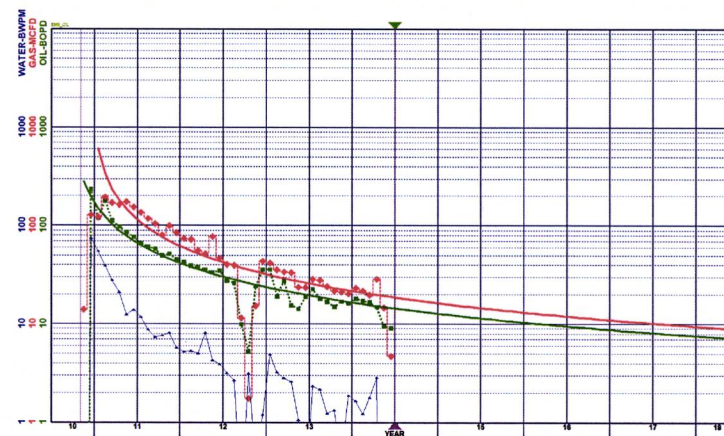
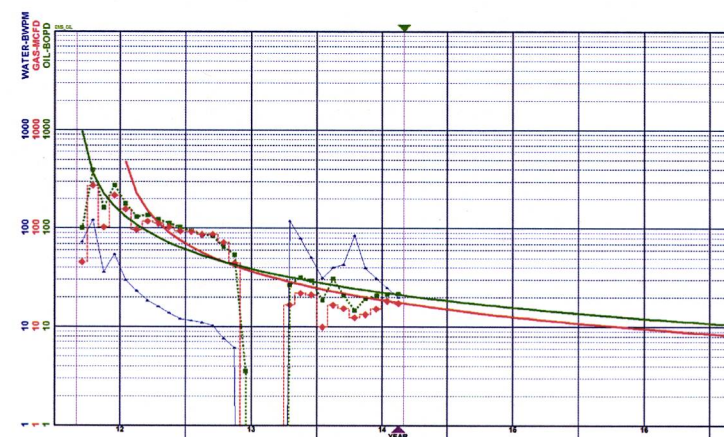


Exhibit E-5: Decline Curve Analysis

	SHATTO 13-65-10-4H
	49021206520000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTR
	10 13 N 65 W
Cum Oil (BO)	57,880
EUR Oil (BO)	93,268



	JUBILEE 69-04H
	49021208720000
	Niobrara
	EOG RESOURCES INCORPORATED
	4 13 N 65 W
Cum Oil (BO)	71,574
EUR Oil (BO)	113,263



	BIG SANDY 7-33H
	49021209810000
	Niobrara
	EOG RESOURCES INCORPORATED
	33 14 N 65 W
Cum Oil (BO)	42,153
EUR Oil (BO)	139,739

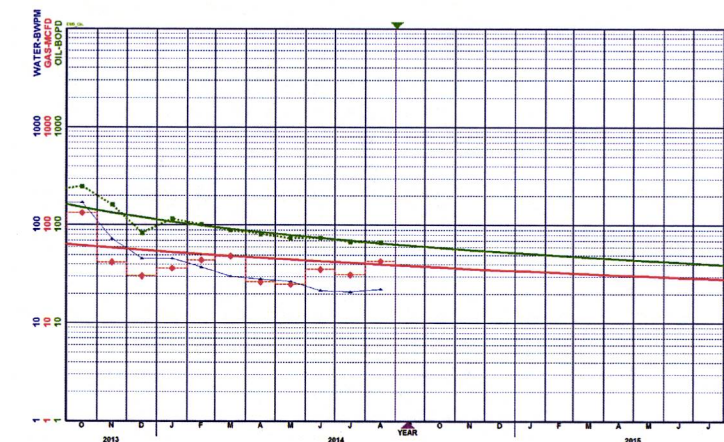
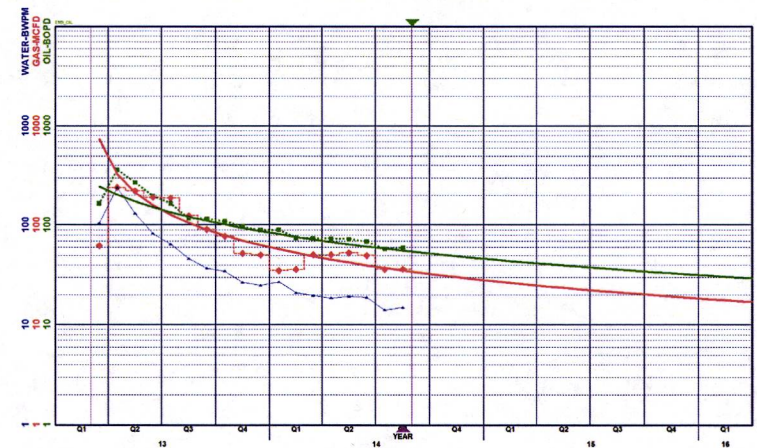
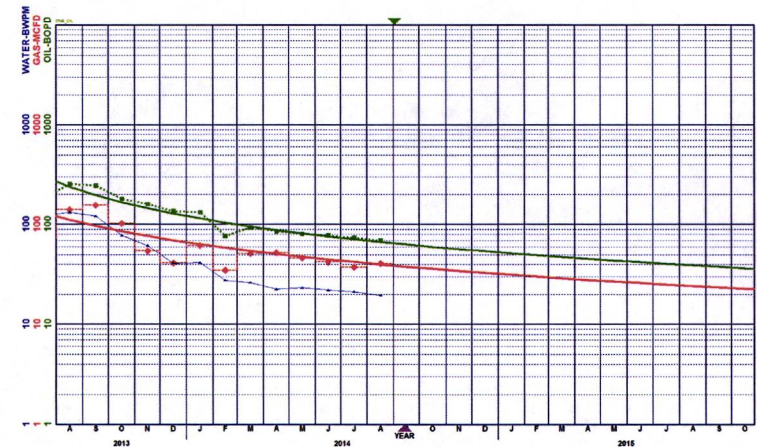
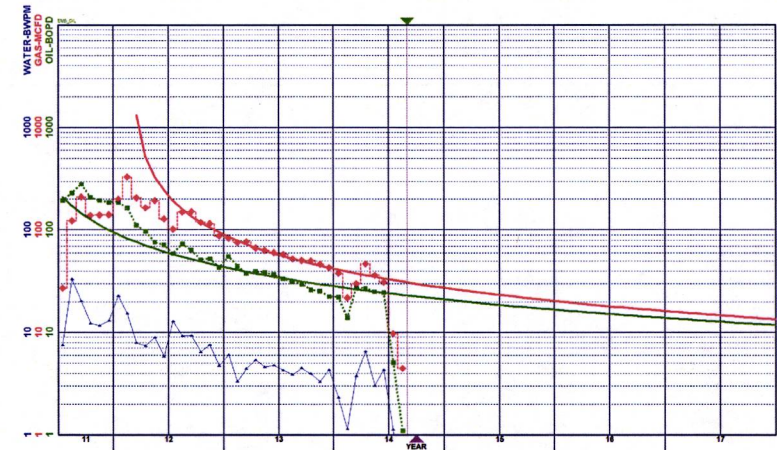


Exhibit E-5: Decline Curve Analysis

	MARLIN 12-65-3-2H
	49021207560000
	Niobrara
	ANADARKO E & P COMPANY LIMITED PRTNR
	3 12 N 65 W
Cum Oil (BO)	88,634
EUR Oil (BO)	144,389

	JUBILEE 30-07H
	49021209800000
	Niobrara
	EOG RESOURCES INCORPORATED
	7 13 N 65 W
Cum Oil (BO)	56,422
EUR Oil (BO)	152,245

	WINDY 01-18H
	49021208750000
	Niobrara
	EOG RESOURCES INCORPORATED
	18 13 N 64 W
Cum Oil (BO)	68,721
EUR Oil (BO)	163,414



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EDUCATION

Duke University —Durham, North Carolina	2007
B.S.E., Dual Major: Mechanical Engineering & Biomedical Engineering	
Heritage Hall High School —Oklahoma City, Oklahoma	2003

WORK EXPERIENCE

Anadarko Petroleum —Denver, Colorado— <i>Senior Reservoir Engineer</i>	Aug 2013 – Present
Responsible for all reservoir engineering practices for assets in vertical gas field of Wamsutter as well as horizontal exploration and development of Codell and Niobrara in Laramie County, WY. Conducted analysis and economic evaluation for divestiture of company non-operated position in Pinedale/Jonah field. Primary tasks include management of asset budget and portfolio, evaluation of well performance in relation to geologic/reservoir properties as well as completion practices, and technical evaluation of asset field.	
Comstock Resources —Frisco, Texas— <i>Corporate Development Engineer</i>	May 2013 – Aug 2013
Conduct appraisals of oil & gas prospects for potential acquisition consisting of engineering evaluations of reservoir quality, expected ultimate recovery of reserves, and economic value. Determine the potential acquisitions that would best augment current business portfolio as well as the potential divestiture packages of company's current assets that would best benefit overall business model of the company. Work with geoscience, operations, and drilling to provide feedback for optimization of well results and economic return.	
Chesapeake Energy —Oklahoma City, Oklahoma— <i>Reservoir Engineer I</i>	2010 - 2013
Responsible for all reservoir engineering practices for major company oil & gas assets including horizontal development in the Woodford Shale & Mississippi Lime as well as multi-zone vertical well fields. Analysis methods included decline curve reserve estimations, volumetric calculations, analytical material balance and type curve analysis, well test analysis, and reservoir fluid properties analysis. Performed economic evaluation and optimization for field development and exploration. Coordinated with geoscience, drilling, operations, and land disciplines to optimize project development. Mentored associate reservoir engineers in reservoir engineering practices.	
Chesapeake Energy —Oklahoma City, Oklahoma— <i>Associate Reservoir Engineer</i>	2008 - 2010
Member of the company reservoir Corporate Reserves team charged with creating and evaluating best practices using stochastic methods for booking reserves in compliance with revised SEC reserve booking guidelines. Methods incorporated statistical analysis to meet the standard of reasonable certainty for booking proven undeveloped reserves at distances greater than one legal offset location from existing producing wells in with particular focus in the Barnett Shale, Fayetteville Shale, and Haynesville Shale.	
Chesapeake Energy —Lindsey, Oklahoma— <i>Field Engineer</i>	2007 - 2008
Worked as an onsite field engineer out of the company field office, overseeing completion and workover procedures including horizontal multi-stage fracture stimulations, uphole vertical well recompletions, and artificial lift installation and repair. Also completed a one month drilling rig rotation observing and learning horizontal drilling practices.	