



RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

OIL AND GAS DOCKET NO. 08-0306954

APPLICATION OF APACHE CORPORATION TO AMEND FIELD RULES FOR THE ALPINE HIGH (CONS) FIELD, REEVES, CULBERSON AND PECOS COUNTIES, TEXAS

PROPOSAL FOR DECISION

EXAMINERS: Robert Musick – Technical Examiner
Kristi M. Reeve – Administrative Law Judge
Austin Gaskamp – Technical Examiner

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CASE SUMMARY¹

Apache Corporation ("Apache") (Operator No. 027200) seeks to amend the current oil and gas field rules in effect for the Alpine High (Cons) Field ("Field") in Reeves, Culberson and Pecos Counties, Texas. Apache requests a permanent gas well classification rule for all wells with an initial gas-oil ratio ("GOR_i"), also referred to as gas-liquid ratio, ("GLR_i")² of 3,000 standard cubic feet per stock tank barrel ("cf/bbl") or greater without the need of further administrative review.³ Notice of the hearing was sent to all operators in the Field and to those entitled to notice more than 10 days before the hearing. The Application was not protested.

Soon after the December 12, 2017 hearing, it was determined that additional wells were needed to be completed in the Field to supplement the hearing record. At Apache's request, four wells were severed from the original docket and assigned Oil and Gas Docket No. 08-0311748, to reclassify the oil wells to gas wells and cancel overproduction.⁴ Final Order No. 08-0311748, dated August 21, 2018, established the four specified wells in the Field as gas wells.

Severing the wells with overproduction eliminated a time-sensitive issue that needed resolution quickly, therefore allowing the hearing to concentrated on gas classification criteria to establish a GOR_i for a field. Apache also presented Field-specific evidence which included data from 99 wells, including heptanes plus (C7+) data for 12 of the 99 producing wells.

The Technical Examiners and Administrative Law Judge (collectively, "Examiners") concur with Apache's assessment that the Field is a retrograde gas reservoir and is a perched ancestral shelf with no other geologically equivalent formation in the vicinity. The Examiners do not concur with Apache's assessment that the Field meets the GOR_i of 3,000 to 3,200 cf/bbl.

Apache's evidence is inconsistent with the request to establish a GOR_i at values lower than observed in the Field's gas classification testing data. Apache did not demonstrate through the use of gas classification testing that the hydrocarbon reservoir was congruous with a reservoir near the oil-gas transitional boundary (i.e., 3,200 cf/bbl).

¹ The audio for the hearing held on December 12, 2017 is referred to as "Hearing on 12/12/2017 Audio: Min. [Minute and Second(s)]." The transcript for the post-hearing conference held on June 28, 2018 is referred to as "PHC on 6/28/2018 Tr. [page: line(s)]." The transcript for the hearing held on October 17, 2018 is referred to as "Hearing on 10/17/2018 Tr. [page: line(s)]." Applicant's exhibits are referred to as either "Hearing on 12/12/2017 Applicant Ex. [exhibit no]" or "Hearing on 10/17/2018 Applicant Ex. [exhibit no]."

² The Statewide Rules refer to initial GOR for hydrocarbon reservoirs. Research conducted by William D. McCain (identified in testimony as a gas reservoir authority by Apache in the hearing) for condensates and leaner gas are referred to as the initial Gas-Liquid Ratio (GLR_i): McCain, William, D., Spivey, John, and Lenn, Christopher P., Petroleum Reservoir Fluid Properties Correlations, PennWell Corporation, 2011.

³ Hearing on 10/17/2018 Tr. Pg. 10, Lns. 8-11.

⁴ Hearing on 10/17/2018 Tr. Pg. 10, Lns. 8.

The Examiners recommend denial of the 3,000 and 3,200 cf/bbl GOR_i proposed by Apache. Apache's evidence supports a GOR_i for the hydrocarbon reservoir at 10,065 cf/bbl or greater. The Examiners recommend an amended field rule with a GOR_i of 10,065 cf/bbl, or greater.

APPLICABLE LAW

The Natural Resources Code §86.002(5) defines a gas well as one that:

- A. Produces gas not associated or blended with oil at the time of production;
- B. Produces more than 100,000 cubic feet of gas to each barrel of oil from the same producing horizon; or
- C. Produces gas from a formation or producing horizon productive of gas only encountered in a well bore through which oil also is produced through the inside of another string of casing.

Similarly, a gas well is defined in Statewide Rule 3.79(11) ⁵ as any well:

- A. Which produces natural gas not associated or blended with crude petroleum oil at the time of production;
- B. Which produces more than 100,000 cubic feet of natural gas to each barrel of crude petroleum oil from the same producing horizon; or
- C. Which produces natural gas from a formation or producing horizon productive of gas only encountered in a wellbore through which crude petroleum oil also is produced through the inside of another string of casing or tubing. A well which produces hydrocarbon liquids, a part of which is formed by a condensation from a gas phase and a part of which is crude petroleum oil, shall be classified as a gas well unless there is produced one barrel or more of crude petroleum oil per 100,000 cubic feet of natural gas; and that the term "crude petroleum oil" shall not be construed to mean any liquid hydrocarbon mixture or portion thereof which is not in the liquid phase in the reservoir, removed from the reservoir in such liquid phase, and obtained at the surface as such.

⁵ Statewide Rule 3.79(11) refers to 16 Tex. Admin. Code § 3.79(11).

DISCUSSION OF THE EVIDENCE

Relief Sought by Apache

The top oil allowable for the Field is 287 barrels of oil per day ("BOPD") with a gas limit of 574 thousand cubic feet per day ("MCF/Day"). Apache is seeking relief through a Railroad Commission of Texas ("Commission") Order to address its expectation that the gas volumes will exceed the allowances and will result in noncompliance with Statewide rules.

Apache proposed to add the following rule language to the existing field rules to establish permanent gas well classification:

All wells completed with a gas-oil ratio of 3,000 standard cubic feet per barrel and above in the Alpine High (Cons.) Field, Reeves and Culberson Counties, Texas, are permanently classified as gas wells without the need of further administrative review, effective the date of initial completion.⁶

Notice and Hearing

Apache requested a hearing in a letter sent to the Commission dated September 19, 2017.⁷ Notice of the hearing ("Notice") was sent to all operators in the Field and to those entitled to notice more than 10 days before the December 12, 2017 hearing. The Application was not protested.⁸

In addition to the hearing on December 12, 2017,⁹ a post-hearing conference was held on June 28, 2018,¹⁰ and the record was reopened to enter additional evidence at a hearing held on October 17, 2018.¹¹

Severing Out of Wells and Over-production

In the hearing held on December 12, 2017, Apache requested that four Apache wells in the Field be permanently reclassified as gas wells effective the date of first production and that accumulated overproduction on these leases be cancelled. In order to expedite the issues associated with the four wells while Apache completed more wells and collected more Field-specific data, the Examiners severed the four wells from the

⁶ Apache's Application language as proposed in the Notices dated October 25, 2017 and November 21, 2017.

⁷ Hearing on 12/12/2017 Applicant Ex. 6.

⁸ Hearing on 12/12/2017 Applicant Ex. 7.

⁹ Hearing on 12/12/2017 Audio: 0 min. to 2 hrs., 24:30 min.

¹⁰ PHC on 6/28/2018 Tr. Pg. 1-35.

¹¹ Hearing on 10/17/2018 Tr. Pg. 1-149.

original docket. On August 21, 2018, Final Order No. 08-0311748, established the four wells as gas wells and cancelled overproduction for the four leases.¹²

Alpine High (Cons) Field

The Field was discovered on June 7, 2016, at a depth of 12,100 feet in Reeves County, Texas.¹³ The Field (No. 01942500) and temporary field rules were formed through Final Order No. 08-0302080, adopted on February 14, 2017.¹⁴ These temporary field rules were made permanent by Final Order No.08-0312263, dated October 16, 2018 ("2018 Final Order").

Apache asserts the Field is one of the largest onshore discoveries in the United States in the last 30 years.¹⁵ Apache maintains the Field is about 65 miles long by about 20 to 30 miles wide and is estimated to be about 2,000 square miles within a four-county area: Reeves, Culberson, Pecos and Jeff Davis Counties, Texas.¹⁶

The 2018 Final Order establishes the correlative interval for the Field from 10,425 feet to 12,245 feet, a thickness of 1,820 feet, established using Mont Blanc Well No. 1H (API 42-389-35184) and currently identified as 101BH Well.¹⁷

Apache has leased approximately 307,000 acres in the Field. The evidence indicates Apache had 59 wells in the Field at the time of the hearing held on December 12, 2017, with about seven wells out of the 59 wells with heptanes plus (C7+) and API gravity data to assist with the gas classification.¹⁸ At the time of the October 17, 2018 hearing, 111 wells had been completed with production data available on 99 wells. A total of 12 compositional analyses data sets were available for review at the October 17, 2018 hearing to address Apache's requests to amend the Field Rules based on gas classification criteria.¹⁹

Field Geologic Description and Characteristics

Apache's geologist, Mr. Timothy Samson, asserts the Field is a perched ancestral shelf with no other geologically equivalent formation in the vicinity.²⁰ Mr. Samson

¹² Hearing on 10/17/2018 Tr. Pg. 8, Lns.12-18.

¹³ Hearing on 12/12/2017 Applicant Ex.2.

¹⁴ Hearing on 12/12/2017 Applicant Exs. 2, 3, 4, 18, 26.

¹⁵ Hearing on 12/12/2017 Audio: 4:57 min. to 5:10 min.

¹⁶ Hearing on 12/12/2017 Applicant Ex. 26.

¹⁷ Hearing on 12/12/2017 Applicant Ex. 2 and Hearing on 12/12/2017 Audio:10 min, 17 sec. to 10 min. 40 sec.

¹⁸ Hearing on 10/17/2018 Tr. Pg.10, Lns.11-16; Hearing on 12/12/2017 Applicant Ex. 4; Hearing on 12/12/2017 Audio:11 min. 20 sec. to 12 min. 10 sec.

¹⁹ Hearing on 10/17/2018 Tr. Pgs. 10, 17-23.

²⁰ Hearing on 12/12/2017 Applicant Ex. 29 and Hearing on 12/12/2017 Audio:1 hr: 10 min. 45 sec. to 1 hr. 13 min. 5 sec.

maintains the Field is bound between a large fault to the northeast, a large uplift to the south and west, and a series of faults on the southwestern boundary of the Field.²¹ Apache contends that vertical stratigraphic displacement has occurred across the faults, resulting in down-thrown stratigraphic horizons and the development of the Delaware Basin in close proximity to the stable perched ancestral shelf defined as the Alpine High (Cons) Field.²² Attachment A to this PFD is Exhibit No. 30, which illustrates the geology and faulting associated with the Alpine High (Cons) Field and adjacent Delaware Basin.

Apache asserts the discovery of the Field came about as a result of a re-interpretation of the geology in the Delaware Basin.²³ Testimony by Mr. Samson contends industry has long held that the Field was part of the Delaware Basin and exhibited sediments with high clay content.²⁴ Apache's initial exploration demonstrated: (1) the area contains sediments with very low clay content; (2) an area with stable paleo-high structural history; and (3) intermediate thermal maturity (i.e., high pressure and high temperature) to produce wet gas.²⁵ Apache emphasizes that the entire Field's correlative interval is hydrocarbon saturated in the wet gas phase,²⁶ indicating a high pressure and high temperature reservoir.²⁷ Attachment B to this PFD is Exhibit No. 27R, which illustrates the stratigraphic column of the index well, the Mont Blanc 1H well, and illustrates Apache's conclusion that the stratigraphic column in the Field is primarily wet gas.

Mr. Samson maintains the Field is composed of five stratigraphic formations consisting of the Pennsylvanian Formation (shallowest), Barnett Formation, Mississippian Lime Formation, Woodford Formation and the Devonian Formation (deepest).²⁸

Mr. Samson also references the Bone Springs formation and the Wolfcamp formation, encountered at about 6,900 and 8,800 feet deep, respectively, which are oil producing formations, but are not part of the Field.²⁹ Evidence shows the Bone Springs formation and the Wolfcamp formation, have a lower thermal maturity, which results in the hydrocarbon being oil.³⁰ Attachment C to this PFD is Exhibit No. 17R, which illustrates the stratigraphic column and geologic formations associated with the Field.

At the hearings held on December 12, 2017 and October 17, 2018, Apache

²¹ Hearing on 12/12/2017 Audio:1 Hr., 3 min. to 1 Hr. 5. Min, 13 Sec.; Hearing 12/12/2017 Applicant Ex. 26; January 25, 2018 Letter; Hearing on 12/12/2017 Audio:1 hr:24 min to 1 hr. 25 min.

²² Hearing on 12/12/2017 Applicant Exs. 29, 30 and Hearing on 12/12/2017 Audio:1 hr, 10:45 min. to 1 hr, 13:05 min.

²³ Hearing on 12/12/2017 Applicant Exs. 26, 27, 28,29.

²⁴ Hearing on 12/12/2017 Applicant Exs. 4, 27, 28, 29.

²⁵ Hearing on 12/12/2017 Applicant Exs. 27 and 29.

²⁶ Hearing on 12/12/2017 Applicant Exs. 30 and 32.

²⁷ Hearing on 12/12/2017 Applicant Ex. 27 and Hearing on 12/12/2017 Audio:1 hr. 5 min, 14 sec. to 1 hr. 9 min.

²⁸ Hearing on 12/12/2017 Applicant Ex. 27 and Hearing on 12/12/2017 Applicant Ex. 32; Hearing on 10/17/2018 Applicant Ex. 18R.

²⁹ Hearing on 12/12/2017 Applicant Exs. 12, 14, 16.

³⁰ Hearing on 12/12/2017 Applicant Ex. 54.

introduced as evidence a cross-section oriented from northwest to southeast across several counties. The cross-section depicts the longest spans of the Field, which is about 65 miles.³¹ Four cross-sections were used to span the field with eight transects perpendicular to the cross-sections. Wells at each intersection of cross-section and transect demonstrate the stratigraphy of the correlative interval across the Field. The stratigraphy across the Field is constant and continuous based on the well completion data in the Field.³² Attachment D to this PFD is Exhibit No. 18R, which illustrates the cross-sections and associated transects that were used to characterize the Field.

Apache presented a series of well logs and production graphs for the producing wells which correlated to the major formations in the Field.³³ Apache indicates, out of the 111 wells completed in the Field, that three percent of the wells were completed in the Pennsylvanian formation (shallowest part of the Field); 16 percent wells were completed in the Barnett formation (near the middle of the Field); and 80 percent of the wells were completed in the Woodford formation (near the bottom of the Field). No wells were completed in two of the five stratigraphic formations within the correlative interval, the Mississippian Lime and Devonian formations. Apache developed a structure map of the Field, and assessed the reservoir using well log data and gamma ray signatures, API degree signatures, and induction or resistivity log signatures to support its argument that the Field has characteristics which establish it as a gas field.³⁴ Evidence supports the 65-mile long spans of the Field represents a transgressive source interval which is conducive to development of wet gas or retrograde gas in the reservoir.³⁵

Mr. Samson testified that the great depths and increased temperature of the reservoir, the hydrocarbons are expected to be gaseous. The deposition and subsequent tectonic³⁶ activity associated with the entire correlative interval of the Field will cause the hydrocarbons in the Field to border on a wet gas/dry gas interval.³⁷ Independent geologic analysis presented to a 2016 conference of the American Association of Petroleum Geologists ("AAPG") concluded that the Field is in a gaseous/condensate interval.³⁸ The AAPG presentation shows that even a shallow Barnett well, near the top of the correlative interval of the Field, was completed in a gaseous interval. Mr. Samson testified that the deeper portions of the Field, which include the Woodford formation and the Devonian formation, would be expected to be even more likely to be gaseous because of increased temperature and pressure. Apache claims the Field's (correlative interval) formations are

³¹ Hearing on 12/12/2017 Applicant Exs. 26 and 32 and Hearing on 10/17/2018 Applicant Ex. 18R.

³² Hearing on 10/17/2018 Tr. Pg. 47. Lns. 21-24, Pg. 69. Lns 11-20.

³³ Hearing on 10/17/2018 Applicant Exs. 40R, 41R, 42R, 43R.

³⁴ Hearing on 12/12/2017 Tr. Pgs. 63-90 and Applicant Exs. 19R - 32R.

³⁵ Hearing on 12/12/2017 Applicant Exs. 26 and 30.

³⁶ Tectonic as defined by Merriam-Webster is consequential, major geologic event; a process that controls the structure and properties of the Earth's crust and its evolution through time; the process of mountain building.

³⁷ Hearing on 12/12/2017 Applicant Ex. 30.

³⁸ Hearing on 10/17/2018 Applicant Ex. 16R.

conductive to a quality petroleum reservoir.³⁹

RRC Gas Classification Guidelines

Current Commission guidelines for well classification is based on the August 3, 2006 Commission's memorandum ("2006 Commission Memo") from Richard A. Varela, Director of Oil and Gas, to the Commissioners' Offices.⁴⁰ Guidance indicates a well may be administratively classified as a gas well if: ⁴¹

- The GOR is 100,000 cf/bbl or more as defined by Statewide Rule 79 (11); ⁴²
- It is determined that a well satisfies certain criteria on an American Society for Testing and Materials (ASTM) Test submitted on Form G-5;
- A pressure, volume, temperature (PVT) test (a.k.a. Visual Cell PVT test) for a reservoir shows that the GOR exceeds 100,000 cf/bbl, or it is above dew point at reservoir conditions;
- The heptanes plus (C7+) mole percent of a compositional analyses is less than 11% [mole percent]. ⁴³

Gas Classification Research

The 2006 Commission Memo outlines the major paths to reach a gas well classification, including demonstrating the GOR_i for a reservoir under natural initial conditions. These procedures are supported by the research published by Mr. Phillip L. Moses, who was employed by Core Laboratories, Inc. and by Dr. William McCain, petroleum engineering professor at Texas A&M University.⁴⁴ Both of these studies and scientific publications have been used in the past in developing guidance with regard to individual well classification and in adopting field rules governing individual well classification at the Commission. Both authors, Mr. Moses and Dr. McCain, studied the correlation between heptanes plus (C7+) composition of fluid and fluid phase in the reservoir and described the correlations between GOR_i, fluid composition, and fluid phase in the reservoir.

In a 1986 *Journal of Petroleum Technology* paper, Mr. Moses concluded the following for a reservoir:

³⁹ Hearing on 12/12/2017 Applicant Ex. 27.

⁴⁰ Hearing on 12/12/2017 Applicant Ex. 1 and Hearing on 12/12/2017 Audio:1 min. to 8 min. 15 sec.

⁴¹ Hearing on 10/17/2018 Applicant Ex. 1R.

⁴² Statewide Rule 3.79(11) refers to 16 Tex. Admin. Code § 3.79(11).

⁴³ Hearing on 12/12/2017 Applicant Ex. 24 and 25; Audio: 6 min. to 8 min. 15 sec; Hearing on 10/17/2018 Applicant Ex. 1R; Hearing on 10/17/2018 Tr. Pg. 24., Ln. 14-18.

⁴⁴ Hearing on 12/12/2017 Audio: 42 min.to 43 min; Hearing on 10/17/2017 Tr. Pg. 23, Ln 1-10.

There is a fairly sharp dividing line between oils and condensates from a compositional standpoint. Reservoir fluids that contain heptanes and are heavier in concentrations of more than 12.5 mole percent are almost always in the liquid phase in the reservoir. Those with less than 12.5 mole percent are almost always in the gas phase in the reservoir.⁴⁵

More recently, Dr. McCain's 2011 book, *Petroleum Reservoir Fluid Property Correlations*, summarized additional fluid property studies for a reservoir and determined that the transition between volatile oils and gas condensates is a composition of 12.9 mole percent heptanes plus (C7+) in the reservoir fluid.⁴⁶ In the 2011 publication, McCain described the initial characteristics of a reservoir with a GLR_i of 3,200 cf/bbl, declaring the reservoir transitions to the condensate phase using a data set containing 1,451 different reservoir fluid studies from across the world.⁴⁷ In the publication, McCain clarifies that an initial producing GLR_i of 3,200 cf/bbl represents a transition from gas condensate liquid (from 3,200 to 15,000 cf/bbl) to volatile oil (less than 3,200 cf/bbl) in a reservoir under natural initial conditions.⁴⁸

In 2017, Dr. McCain published, *The Properties of Petroleum Fluids*, Third Edition.⁴⁹ In this textbook, he states:

Gas condensates exhibit dew points when pressure is reduced at reservoir temperature. The heptanes plus [C7+] fraction of the composition of a gas condensate will be less than 12.9 mole percent.⁵⁰ and, The lower limit of initial producing gas-liquid ratio for gas condensate is 3,200 cf/bbl. The upper limit is not well defined: gases with initial producing gas liquid ratios greater than 3,000,000 scf/stb [standard cubic feet/stock tank barrel] have been observed in the laboratory to have dew point pressures at reservoir temperatures, and thus are gas condensates.⁵¹

Based on testimony in the hearings using Mr. Moses' research (from 1986) and Dr. McCain's research (from 1990 and 2017), a heptanes plus (C7+) fraction of less than 12.9 mole percent will correlate to a reservoir GLR_i at 3,200 cf/bbl, using data with worldwide origins. Hence, Apache's testimony indicates measuring the GLR_i for a

⁴⁵ Moses, Phillip L. Moses, Engineering Applications of Phase Behavior of Crude Oil and Condensate Systems, Core Laboratories Inc., Journal of Petroleum Technology, July 1986 at 715-723; Hearing on 12/12/2017 Applicant Ex. 24.

⁴⁶ McCain, William, D., Spivey, John, and Lenn, Christopher P., Petroleum Reservoir Fluid Properties Correlations, PennWell Corporation, 2011; Hearing on 12/12/2017 Applicant Ex. 25.

⁴⁷ McCain, William, D., Spivey, John, and Lenn, Christopher P., Petroleum Reservoir Fluid Properties Correlations, PennWell Corporation, 2011 at 195-196.

⁴⁸ McCain, William, D., Spivey, John, and Lenn, Christopher P., Petroleum Reservoir Fluid Properties Correlations, PennWell Corporation, 2011.

⁴⁹ Hearing on 10/17/2018 Applicant Ex. 46R.

⁵⁰ McCain, William, D., The Properties of Petroleum Fluids Third Edition, PennWell Corporation, 2017 at 122.

⁵¹ McCain, William, D., The Properties of Petroleum Fluids, PennWell Corporation, 2017, at 122.

reservoir instead of the heptanes plus (C7+) or a PVT test, will allow a well to meet gas classification criteria established in the 2006 Commission Memo.⁵²

Apache's Gas Classification Assessment of the Field

Mr. Buddy Richter, a petroleum engineer, entered into evidence production graphs for the 99 wells producing in this Field.⁵³ The production graphs indicate that some of the wells have no liquid production and produce as dry gas wells. Other wells in the Field produced liquids initially and then dry up with the condensate dropping off. Mr. Richter asserts that even the wells with somewhat lower GLR_i's increased their GLR_i as the well stabilized and the condensate dropped off. During Mr. Richter's testimony, Apache submitted into evidence the Forms G-1 and G-5 for wells in the Field that produced liquid, pointing out that the light to clear color and high API liquid gravity is consistent with classification as a gas well.

In the October 17, 2018 hearing, Mr. Buddy Richter testified that based on the interpretation of the standard G-5 Form comments, the Barnett and the Woodford formation wells have API liquid gravities greater than 50 degrees, which justify the administrative gas well classification based on the G-5 Form.⁵⁴ Mr. Richter indicates to define a reservoir as a gas field, it must be reasonably anticipated that the wells will meet the gas definition based on the classification criterion.⁵⁵ This demonstration requires a good representative sampling from one end of the Field to the other end, with a reasonable assumption the reservoir is continuous and will meet classification criteria.⁵⁶

Dr. Mazher Ibrahim, Apache's reservoir engineer, presented compositional analyses (i.e., heptanes plus results), GLR_i, and liquid gravities for 12 wells tested across the Field. These compositional analyses were conducted by Core Lab, an independent testing company. Compositional data from the Field was collected from the Pennsylvanian, Barnett and Woodford formations, showing consistently low heptanes plus (C7+) values, lower than the 11 mole percent administrative cutoff for gas well classification established by the 2006 Commission Memo. Dr. Ibrahim, asserts that all the producing wells in the Field with heptanes plus (C7+) less than 11 mole percent met or exceeded a GLR_i of 10,065 cf/bbl for the reservoir, which demonstrates the hydrocarbons are primarily gas in the reservoir.⁵⁷ Apache did not present any compositional data in the hearings with a corresponding GLR_i less than the 10,065 cf/bbl, which would suggest the reservoir is not a condensate liquid at initial conditions and is reasonably anticipated to be a retrograde gas reservoir. Attachment E to the PFD, which is Exhibit No. 34R, uses

⁵² Hearing on 12/12/2017 Audio: 7: to 8: min.

⁵³ Hearing on 10/17/2018 Applicant Ex. 43R.

⁵⁴ Hearing on 10/17/2018 Applicant Ex. 1R.

⁵⁵ Hearing on 10/17/2018 Tr. Pg. 28, Lns. 8-15.

⁵⁶ Hearing on 10/17/2018 Tr. Pgs. 28-29.

⁵⁷ Hearing on 10/17/2018 Applicant Ex. 46R.

a histogram to illustrate the heptane plus (C7+) data set compared to the well's initial production GOR values.

Gas Classification in Field Rules

Since 2011, a GOR_i -based permanent gas well classification field rule has been adopted for several fields, including several fields nearby the Alpine High (Cons) Field. Below is a table showing the different fields that have an administrative permanent gas well classification based on a GOR_i of 3,000 cf/bbl, the same value being sought by Apache for the Fields:

Fields With 3,000 GOR_i	O&G Docket No.	Date
Briscoe Ranch (Eagleford) Field	01-0270024	05/24/2011
Sugarkane (Eagle Ford) Field	02-0272551	01/10/2012
Hawkville (Eagleford) Field	02-0272550	01/10/2012
DeWitt (Eagle Ford) Field	02-0272549	01/10/2012
Ford, West (Wolfcamp) Field ¹	08-0283648	10/22/2013
Derby (Bone Spring) Field ¹	08-0282091	08/06/2013
Sandbar (Bone Spring) Field ¹	08-0275393	06/12/2012
Newark, East (Barnett Shale) Field	09-0277581	12/11/2012
Eagleville (Eagle Ford-1) Field	01-0297472	02/28/2017
Eagleville (Eagle Ford-2) Field	01-0297714	02/28/2017
Phantom (Wolfcamp) Field ¹	08-0295559 08-0303885	08/01/2017
¹ Field located near the Alpine High (Cons) Field = Nearby Field		

Apache assessed a five-county area proximal to the Alpine High (Cons) Field to determine if any of the "Nearby Fields" have a field rule that classified the well based on the GOR_i. The results of the search established four Nearby Fields with a 3,000 cf/bbl GOR_i field rule. Apache's testimony indicates that the proposed 3,000 cf/bbl GOR_i field rule for classifying wells as gas wells is consistent with the field rules in other shale fields.⁵⁸ These Nearby Fields are: the Derby (Bone Spring) Field; the Ford West (Wolfcamp) Field; the Phantom (Wolfcamp) Field; and, the Sandbar (Bone Spring) Field.⁵⁹ At the hearings, testimony indicated common factors between the Nearby Fields were reservoir depths of about 12,000 feet, with the reservoir being under high pressure and high temperature causing the hydrocarbons to be primarily retrograde gas with an API liquid gravity ranging from 40 to 60 degrees.⁶⁰

⁵⁸ Hearing on 10/17/2018 Tr. Pg. 27, Lns. 8-11.

⁵⁹ Hearing on 12/12/2017 Applicant Ex. 18.

⁶⁰ Hearing on 12/12/2017 Applicant Exs. 20, 21, 22, 23, 24.

EXAMINERS ANALYSIS

Apache is seeking to amend the field rules for the Alpine High (Cons) Field. Apache requested in its Application to classify newly completed wells in the Field based on an GOR_i of 3,000 cf/bbl, or higher, without further administrative review. The Examiners reviewed the evidence presented at the hearings and recommend the Commission deny the requests by Apache. The Examiners also recommend the Commission amend the Field Rules by adding permanent gas well classification language to classify an oil well to a gas well based on a corresponding GOR_i of 10,065 cf/bbl or greater. The Examiners provide a brief analysis of their recommendation.

Apache failed to prove its case for a 3,000 to 3,200 cf/bbl GOR_i

Apache did not establish a GOR_i of 3,000 cf/bbl for the Field's hydrocarbon reservoir under initial conditions, as proposed in its Application.⁶¹ Nor did Apache prove the GOR_i to be 3,200 cf/bbl for the reservoir as proposed in the October 17, 2018, hearing. Apache's Field-specific evidence established the lowest proven GOR_i for the reservoir to be 10,065 cf/bbl, which suggested this reservoir is thermally mature and different than most other Fields in the vicinity and also in the Eagle Ford play in south Texas. The Examiners recommend an GOR_i for the hydrocarbon reservoir to be 10,065 cf/bbl. The recommendation is supported by the 99 wells producing in the Field, along with 12 samples of heptanes plus (C7+) compositional data entered into evidence and is consistent with the 2006 Commission Memo. In summary, Apache failed to prove their case for a 3,000 to 3,200 cf/bbl, GOR_i for the Field.

The Examiners' concur the Alpine High (Cons) Field is a gas reservoir

From the evidence, the Examiners can reasonably determine the Field is a retrograde gas or wet gas reservoir. The reservoir data indicates it can be reasonably anticipated that wells in the Field will meet the gas well criteria established by the 2006 Commission Memo. The data presented at the hearings is not definitive in establishing the Field as a lean retrograde or wet gas reservoir, but the evidence and testimony indicates the reservoir is under high pressure and high temperature and will meet permanent gas well classification criteria throughout the Field with a GOR_i of 10,065 cf/bbl, or greater. A review of all 99 wells producing in the Field at the time of the October 17, 2018 hearing, establishes that permanent gas well classification criteria will be met within the first six months (180 days) of initial production.

⁶¹ McCain, William, D., Spivey, John, and Lenn, Christopher P., *Petroleum Reservoir Fluid Properties Correlations*, PennWell Corporation, 2011, at 193: "The term initial means 'at a time when average reservoir pressure is above the dew point pressure or bubble point pressure of the reservoir fluid.'" And Phillip L. Moses, *Engineering Applications of Phase Behavior of Crude Oil and Condensate Systems*, Core Laboratories Inc., Journal of Petroleum Technology, July 1986, at 717; Moses states, "As is the case with oil reservoirs, gas-condensate reservoirs should be sampled early in their life before significant pressure loss has occurred. Once reservoir pressure has declined below the original dew point, it is no longer possible to get samples that represent the original reservoir fluid." Hearing on 12/12/2017 Applicant Ex. 24.

In a post-hearing letter from the Hearings Division, the Examiners clarified its position based on the evidence. In response to the Examiners recommendation, Apache does not find gas classification of all the 99 wells producing in the Field sufficient relief. The GOR_i recommended by the Examiners is close to a 90% reduction of the gas to oil ratio compared to the statutory requirement of 100,000 cf/bbl outlined by Statewide Rule 79 (11).⁶² Again, the Examiners concur the Field is most likely a retrograde gas reservoir based on testimony and compositional analyses data, but the hearing record does not support the amendment request of a 3,000 or 3,200 cf/bbl GOR_i .

Data Review Process

The Examiners recognize the 2006 Commission Memo outlines the process to classify an oil well to a gas well, but the guidance does not address a process to extrapolate the gas classification principles from individual wells to a reservoir. For the most part, the Commission utilizes the research conducted by Moses and McCain to assess a reservoir at initial conditions to establish if a reservoir meets the gas classification criteria. As to the importance of McCain's research, Apache went in depth in the hearing outlining the gas classification criteria developed by McCain for a reservoir.

In order to understand the process to classify an oil well to a gas well, the differences between the Commission's definition compared to McCain's research and interpretation should be clarified. In general, the Commission's definition can be determined using a binary definition for hydrocarbon in the reservoir under initial conditions. Oil is defined as liquid phase and gas is hydrocarbon not in the liquid phase, both under initial reservoir conditions.⁶³ The transition point from oil to a retrograde gas is not always known based upon Commission regulatory definitions. It should be noted, the Commission's guidance typically refers to the ratio between the gas phase and oil phase as a gas-oil ratio (GOR). In this PFD, a GOR for a reservoir at initial natural conditions is identified as GOR_i . These definitions do not apply under potentially altered conditions such as hydrocarbons in the well bore and at surface conditions.

McCain's classification of oil and gas uses a tertiary definition for hydrocarbons in the reservoir. McCain defines oil as a hydrocarbon liquid typically below a gas-liquid ratio (GLR_i) of 3,200 cf/bbl. It is estimated that a GLR_i of 3,200 cf/bbl, is associated with a very rich retrograde gas mixture of condensed liquids and a gas phase. The transition to a

⁶² Statewide Rule 3.79(11) refers to 16 Tex. Admin. Code § 3.79(11).

⁶³ Texas Natural Resources Code § 86.002(5) defines a gas well as one that: "(A) produces gas not associated or blended with oil at the time of production; (B) produces more than 100,000 cubic feet of gas to each barrel of oil from the same producing horizon; or (C) produces gas from a formation or producing horizon productive of gas only encountered in a well bore through which oil also is produced through the inside of another string of casing." Statewide Rule 79(11) states that a well which produces hydrocarbon liquids, a part of which is formed by a condensation from a gas phase and a part of which is crude petroleum oil, shall be classified as a gas well unless there is produced one barrel or more of crude petroleum oil per 100,000 cubic feet of natural gas; and that the term "crude petroleum oil" shall not be construed to mean any liquid hydrocarbon mixture or portion thereof which is not in the liquid phase in the reservoir, removed from the reservoir in such liquid phase, and obtained at the surface as such.

single-phase gas is on the upper boundary of the retrograde range at 15,000 cf/bbl. In a scenario where retrograde liquids are forming in the reservoir and flowing, the transition point between oil and gas is unknown.

McCain typically refers to the ratio between the oil phase, retrograde liquid (mixture of oil and gas) and single-phase gas (e.g., dry gas) as a gas-liquid ratio (GLR_i). When describing the tertiary definition of hydrocarbons under initial reservoir conditions based on McCain's research, the Examiners' analysis will utilize the (GLR_i), which denotes McCain's interpretation of gas-liquid ratios at initial reservoir conditions.

Although McCain is referenced in most gas classification documents and in many Commission gas classification hearings, it is noted that he states in his book:

Do not attempt to compare fluid types as defined here with the reservoir descriptions as defined by the state regulatory agencies which have jurisdiction over the petroleum industry. The legal and regulatory definitions of oil, crude oil, gas, natural gas, condensate, etc., usually do not bear any relationship to the engineering definitions given here. In fact, the regulatory definition is often contradictory.⁶⁴

McCain also states:

Stock-tank liquid produced from reservoirs containing gas condensates is usually called condensate (but very often is reported as "oil"). In fact, the quantity of oil production reported in the U.S. is approximately 50% by volume "condensate".⁶⁵

In Summary, the Examiners utilized the Commission's binary definition for oil and gas, and also utilized the basic principles established by Moses and McCain for gas classification to establish a recommendation consistent with the 2006 Commission Memo.

Apache failed to provide the regulatory standard data to support its Application

During the hearings and post-conference meeting, the Examiners requested PVT test data (a.k.a., Visual Cell PVT test) to generate bubble or dew point information to confirm the testimony of Apache's experts and support its GLR_i request in the Application. The Examiners were following the 2006 Commission Memo, which suggests a laboratory-derived dew point be submitted to prove a well is a gas well. This PVT data can be used to establish a GOR_i/GLR_i for fluids. Apache failed to supply the requested information.

⁶⁴ McCain, William, D., *The Properties of Petroleum Fluids, Second Edition*, PennWell Corporation, 1990, at 149.

⁶⁵ McCain, William, D., *The Properties of Petroleum Fluids*, PennWell Corporation, 2017, at 123.

It should be noted, that the Visual Cell PVT testing data is the regulatory standard to establish gas classification criteria for a reservoir and meets the criteria established by the 2006 Commission memo and practice.

Moses states:

The reservoir fluid study should include a measurement of the retrograde dew point, the fluid compressibility above the dew point, and the gas and liquid volumes below the dew point during a constant composition expansion.⁶⁶

Also, McCain states:

Reservoir fluid types can only be confirmed by observation in the laboratory.

Often the initial pressure of a gas condensate reservoir is equal to the dew point pressure of the gas. This implies that there is an oil zone in the reservoir, a volatile oil often with very small volume.⁶⁷

Therefore, the lack of dew point pressure established using a laboratory PVT test as outlined by the 2006 Commission Memo precludes the Examiners from determining the reservoir conditions below the GOR_i value (i.e., 10,065 cf/bbl) with the exception of the values of heptanes plus (C7+), which suggests the reservoir is potentially dry gas.

In addition, Apache submitted several nearby fields' PFDs. Several of these PFDs were written by Mr. Richter, a former examiner at the Commission, who represented Apache in the hearings. In the PFD's, the well reclassification proposal was based on a specific fluid dew point, initial reservoir pressure, current reservoir pressure and its relation to the specific dew point. As with the PFDs submitted by Apache to establish a baseline for a technical review, the Examiners strive to evaluate the unique properties of this Field with the same testing data provided to Mr. Richter, while he was a Commission examiner, so decisions can be reached with certainty and consistency. Apache failed to provide the regulatory standard data, the Visual Cell PVT test data, to support their requests of a 3,000 or 3,200 cf/bbl GOR_i .

Secondary Lines of Evidence

Apache provided secondary lines of evidence to prove the Field is a lean gas reservoir. Field-specific compositional data, including heptanes plus (C7+), API gravity and liquid color was submitted in the hearings to support Apache's request of a GOR_i of 3,000 cf/bbl; or 3,200 cf/bbl proposed in the October 17, 2018 hearing.

⁶⁶ Phillip L. Moses, Engineering Applications of Phase Behavior of Crude Oil and Condensate Systems, Core Laboratories Inc., Journal of Petroleum Technology, July 1986, at 718; Hearing on 12/12/2017 Applicant Ex. 24.

⁶⁷ McCain, William, D., The Properties of Petroleum Fluids, Second Edition, PennWell Corporation, 1990, at 149; McCain, William, D., The Properties of Petroleum Fluids, PennWell Corporation, 2017, at 122-123.

Typically, heptanes plus (C7+) data is correlated to a GOR_i / GLR_i for the Field. McCain's research indicates that a heptanes plus (C7+) at 12.9 mole percent correlates to a GLR_i of 3,200 cf/bbl, which is McCain's predicted point of oil transitioning to retrograde gas. Although established by McCain as a certainty, Mr. Moses, another leading expert cited in the hearings and the 2006 Commission Memo, indicates less certainty about the heptanes plus (C7+) correlation at 12.9 mole percent being a definite transition point when a reservoir transitions from an oil reservoir to a gas reservoir.⁶⁸ Based on numerous reservoir observations, the boundary of oil and gas is a constant (at 3,200 cf/bbl GOR_i) and does not change based on reservoir conditions. However the fluid types contained in the reservoir change from field to field and have a unique mixture of hydrocarbon composition at GLR_i .

The Field's compositional data consisted of samples from three of the five formations within the correlative interval, as established for the Field. The compositional data focused on 12 samples with heptane plus (C7+) values, API gravity values; and hydrocarbon color.

Regarding Field-specific data, heptanes plus (C7+) values are mostly less than four mole percent and entirely less than seven mole percent, which correlate to a GLR_i that is near the top-end of the gas retrograde range, approximately a GOR_i of 10,000-15,000 cf/bbl.⁶⁹ It is noted that nine of the 12 samples of heptane plus (C7+) from the Field show laboratory GLR_i values that are higher than 15,000 cf/bbl, which correlates to a fluid type very different than a rich retrograde gas with a GLR_i at 3,000 to 3,200 cf/bbl, which is typically observed in the Nearby Fields and Eagle Ford Fields. These lean fluid types are most likely representative of wet gas or dry gas which corroborates the testimony by Dr. Ibrahim and Mr. Richter.

McCain states in his 2011 textbook:

A heptanes plus composition of the initial reservoir fluid of four mole percent or less indicates a gas condensate that can be treated as if it were a wet gas and a reservoir gas with 0.5 mole percent heptanes plus or less can be treated as if were a dry gas.⁷⁰

Therefore, it is assumed based on the heptanes plus (C7+) data set that the reservoir is a gas reservoir, most likely a lean retrograde or retrograde gas. Also, the API gravity was consistent with values attributed to a lean retrograde gas or wet gas, with gravity consistently exceeding 50 degrees in most producing wells in the Field which often

⁶⁸ Phillip L. Moses, Engineering Applications of Phase Behavior of Crude Oil and Condensate Systems, Core Laboratories Inc., Journal of Petroleum Technology, July 1986 at 717; Hearing on 12/12/2017 Applicant Ex. 24: Moses states: "Oils have been observed with heptanes and heavier concentrations as low as 10% and condensate as high as 15.5%. These cases are rare, however."

⁷⁰ McCain, William, D., The Properties of Petroleum Fluids, PennWell Corporation, 2017, at 122-123.

represents gas values. In addition, the color of the stock tank liquid is consistently clear, which may also be indicative of lean retrograde gas.

Regarding the requests by Apache for a 3,000 cf/bbl GOR_i, a fluid at the lower GLR_i threshold is expected to be a liquid-rich retrograde fluid with heptanes plus (C7+) values that cluster around 12.9 mole percent. It is noted that a liquid-rich fluid may equate to oil by Commission definitions. No heptane plus (C7+) data was presented for the Field, with a GLR_i below the 10,065 cf/bbl. Attachment G to this PFD, which is Exhibit 54, shows a graph illustrating the GLR_i for the Field wells demonstrating the wells have a GLR_i exceeding 10,000 cf/bbl at initial conditions.

Divergence from the GOR_i of 3,000 cf/bbl

Apache requested a 3,000 cf/bbl GOR_i based on precedent established for the Eagle Ford shale formations of South Texas. Apache's evidence identified numerous PFDs that documented the initial reservoir reclassifications starting in May 2011 with the Briscoe Ranch (Eagleford) Field to August 2017 with a PFD for the Phantom (Wolfcamp) Field.

The Briscoe Ranch (Eagleford) Field established an GOR_i of 3,000 cf/bbl demarcation based on 34 samples from wells with a 12.5 mole percent heptanes plus (C7+). Once the Briscoe Ranch (Eagleford) Field was assigned a GOR_i of 3,000 cf/bbl, numerous South Texas fields followed the trend as outlined in the hearings. It is noted that at least four shale fields, with lower thermal maturity, are near the Alpine High (Cons) Field and also have been issued a GOR_i of 3,000 cf/bbl.

The Examiners reviewed the Briscoe Ranch (Eagleford) Field and the Nearby Field's PFDs submitted into the hearing record and have concluded the following:

- It appears that the GOR_i was established using the procedures in the 2006 Commission Memo.
- The low thermal maturity of the Eagle Ford shale formations of South Texas established a GOR_i of 3,000 cf/bbl, based on the Briscoe Ranch (Eagleford) Field data which demonstrated fluids with over 12.5 mole percent heptanes plus (C7+) exhibited bubble points while fluids with less than 12.5 mole percent heptanes plus (C7+) exhibited dew points.
- The Eagle Ford shale appears to be a liquid-rich and transitional reservoir between gas and oil.

In contrast, the thermally mature Alpine High (Cons) Field is a lean retrograde gas or wet gas reservoir based on evidence. The Examiners utilized the same basic guidance, engineering principles and research as with other fields to establish the GOR_i / GLR_i for the reservoir. The Examiners arrived at a different GOR_i value using the compositional analyses data submitted as evidence for the case. The Field is not a liquid-

rich transitional environment based on the evidence, thus does not warrant a 3,000 cf/bbl GORi. There is no policy based on 3,000 cf/bbl, as the standard for a field rule.

Lateral and Vertical Extent of Field

Testimony indicates the Field's dimensions are roughly 65 miles long by 30 miles wide, or 1,950 square miles or about 1.2 million total acres.⁷¹ Testimony in the hearings indicates the stratigraphy is laterally continuous across the 65-mile long spans and represents a transgressive source interval which is conducive to development of wet gas or retrograde gas in the reservoir.⁷²

Testimony also indicates that the Field is represented by a correlative interval that is 1,820 feet thick, which includes five different stratigraphic formations.⁷³ Well data establish that 111 wells have been completed in three producing zones within the correlative interval, which consists of the Pennsylvanian Formation, Barnett Formation and the Woodford Formation. Although the Mississippi Lime Formation and the Devonian Formation were not part of the well data presented at the hearings, the testimony indicates the depth of the reservoir across the Field is between 10,000 to 13,000 feet deep.⁷⁴ Apache indicates the correlative interval formations are conducive to a quality petroleum reservoir.⁷⁵

The Examiners were persuaded that it is reasonably anticipated that hydrocarbons in the Field's correlative interval is predominately gas.

Nearby Fields

Evidence indicates that four Nearby Fields associated with the Delaware Basin have a 3,000 cf/bbl GOR field rule. Testimony established that the Derby (Bone Spring) Field; the Ford West (Wolfcamp) Field; the Phantom (Wolfcamp) Field; and, the Sandbar (Bone Spring) Field, all have the 3,000 cf/bbl GOR language in their field rules. Testimony indicates common factors between the Nearby Fields are a depth of 12,000 feet; a retrograde gas reservoir; and, the fields have an API liquid gravity typically ranging from 40 to 60 degrees.

The evidence indicates the Alpine High(Cons) Field is a perched ancestral shelf with no other geologically equivalent identified in the vicinity.⁷⁶ Apache entered each Nearby Fields' PFD and Final Order into evidence to support their argument that the Alpine High (Cons) Field should be classified as a gas reservoir based on proximity to the Nearby Fields with a gas classification field rule. The four (4) fields are proximal to the

⁷¹ Hearing on 12/12/2017 Applicant Ex. 26.

⁷² Hearing on 12/12/2017 Applicant Exs. 26 and 30.

⁷³ Hearing on 12/12/2017 Applicant Ex. 32; Hearing on 10/17/2018 Applicant Ex. 18R.

⁷⁴ Hearing on 12/12/2017 Applicant Ex. 22 and Hearing on 12/12/2017 Audio:45 min. 58 sec. to 48 min. 25 sec.

⁷⁵ Hearing on 12/12/2017 Applicant Ex. 27.

⁷⁶ Hearing on 12/12/2017 Applicant Ex. 29 and Hearing on 12/12/2017 Audio:1 hr, 10:45 min. to 1 hr, 13:05 min.

Alpine High (Cons) Field, but evidence indicates the Nearby Fields composition (mineral and organic content) and post-depositional activities such as down-thrusted faults resulted in the Delaware Basin being subjected to subsidence relative to the Alpine High's stable shelf. Therefore, the differences in post-depositional and tectonic activities (e.g., faulting) may have resulted in significantly different gas forming conditions when comparing the Nearby Fields to the Alpine High (Cons) Field. The Examiners were not persuaded by the Nearby Field data to support a GOR_i of 3,000 cf/bbl in the Alpine High (Cons) Field since the different geologic conditions may result in different regulatory requirements.

Examiners' Recommendation

The Examiners were not persuaded to use the lowest threshold of the academic research classification (3,200 cf/bbl) to replace field-specific data in establishing a GOR_i in the requested amended field rule. The Examiners conclude that it is reasonably anticipated that wells with a GOR_i of 10,065 cf/bbl or greater meet the gas well criteria established by the Commission. Therefore, the Examiners propose that the Alpine High (Cons) Field have the following field rule language:

"For any well in the Alpine High (Cons) Field completed with a gas-oil ratio (GOR) of 10,065 cubic feet per barrel and above, the operator may elect to have such well permanently classified as a gas well without the need of further administrative review effective the date of initial completion, provided the GOR was determined by stabilized well test conducted within 180 days of well completion and in accordance with the GOR determination requirements of Commission procedures as indicated on Forms G-1, G-5 or W-2 as appropriate."

FINDINGS OF FACT

1. Apache (Operator No. 027200) seeks to amend the current oil and gas field rules in effect for the Alpine High (Cons) Field ("Field") in Reeves, Culberson and Pecos Counties, Texas.
2. The Field was discovered on June 7, 2016, at a depth of 12,100 feet in Reeves County, Texas. The Field (No. 01942500) and temporary field rules were formed through Final Order 08-0302080, adopted on February 14, 2017. These temporary field rules were reviewed and made permanent by Final Order. 08-0312263, dated October 16, 2018.
3. The correlative interval for the Field is from 10,425 feet to 12,245 feet, a thickness of 1,820 feet, established using Mont Blanc Well No. 1H (API 42-389-35184).
4. Apache requested a hearing in a letter sent to the Commission dated September 19, 2017. Notice of the hearing ("Notice") was sent to all operators in the Field and

to those entitled to notice more than 10 days before the December 12, 2017 hearing.

5. The Application was not protested.
6. A hearing was held on December 12, 2017, a post-hearing conference was held on June 28, 2018, and the record was reopened to enter additional evidence at a hearing held on October 17, 2018.
7. Apache's Application requested to add the following rule language to the existing field rules to establish permanent gas well classification:

All wells completed with a gas-oil ratio of 3,000 standard cubic feet per barrel and above in the Alpine High (Cons.) Field, Reeves and Culberson Counties, Texas, are permanently classified as gas wells without the need of further administrative review, effective the date of initial completion.

8. Apache amended their request in the October 17, 2017 hearing. Apache indicated in the hearing that the following would not be considered adverse by Apache:

All wells completed with a gas-oil ratio of 3,200 standard cubic feet per barrel and above in the Alpine High (Cons.) Field, Reeves and Culberson Counties, Texas, are permanently classified as gas wells without the need of further administrative review, effective the date of initial completion.

9. Apache indicated that 111 wells were completed in the Field, with 99 of the wells producing at the time of the October 17, 2018 hearing.
10. A cross-section oriented from northwest to southeast across several counties depicts the geology of the Field, which is about 65 miles long and 20 to 30 miles wide and is estimated to be about 2,000 square miles within a four-county area: Reeves, Culberson, Pecos and Jeff Davis Counties, Texas.
11. Apache developed a structure map of the Field, and assessed the reservoir using well log data and gamma ray signatures, induction or resistivity log signatures, API liquid gravity data, etc.
12. Current Commission guidelines for well classification is based on the August 3, 2006, Commission's memorandum ("2006 Commission Memo") from Richard A. Varela, Director of Oil and Gas, to the Commissioners' Offices. Guidance indicates a well may be administratively classified as a gas well if:
 - The GOR is 100,000 cf/bbl or more as defined by Statewide Rule 79 (11);

- It is determined that a well satisfies certain criteria on an American Society for Testing and Materials (ASTM) Test submitted on Form G-5;
 - A pressure, volume, temperature (PVT) test (a.k.a. Visual Cell PVT test) for a reservoir shows that the GOR exceeds 100,000 cf/bbl, or it is above dew point at reservoir conditions;
 - The heptanes plus (C7+) mole percent of a compositional analyses is less than 11% [mole percent].
13. Production graphs for the 99 wells in this Field with a production history indicate that some wells have no liquid production and produce as wet gas wells from first production.
14. Compositional analyses data for 12 wells was entered into the hearing record. These compositional analyses were processed by Core Lab, an independent testing company. The compositional analyses results showed consistently low heptanes plus (C7+) results, all much lower than the Commission's 11% administrative cutoff for gas well classification in the 2006 Commission Memo. The heptanes plus (C7+) values are mostly less than four mole percent and entirely less than seven mole percent, which correlate to a gas-oil ratio ("GOR_i") that is near the top-end of the gas retrograde range, approximately a GOR_i of 10,000-15,000 cf/bbl.
15. The data presented at the hearings is not definitive in establishing the Field as a lean retrograde or wet gas reservoir, but the evidence indicates the reservoir is under high pressure and high temperature and will meet permanent gas well classification criteria throughout the Field with a GOR_i of 10,065 cf/bbl, or greater.
16. Apache did not provide PVT test data (a.k.a., Visual Cell PVT test) to generate bubble or dew point information to confirm the testimony of Apache's experts and support its GLR_i request in its Application.
17. The lack of a dew point pressure precludes a finding of initial reservoir conditions.
18. Adherence to the Commission's definition for oil and gas and the basic principles established by Moses and McCain for gas classification are consistent with the 2006 Commission Memo.
19. Apache's Field-specific evidence established the lowest proven GOR_i for the reservoir to be 10,065 cf/bbl.
20. Apache's evidence does not support the 3,000 and 3,200 cf/bbl GOR_i.
21. Apache's evidence supports a GOR_i for the reservoir at 10,065 cf/bbl or greater.

22. The Examiners recommend an amended field rule with a GOR_i of 10,065 cf/bbl, or greater. The amended field rule for the Alpine High (Cons) Field is proposed as follows:

- For any well in the Alpine High (Cons) Field completed with a gas-oil ratio (GOR) of 10,065 cubic feet per barrel and above, the operator may elect to have such well permanently classified as a gas well without the need of further administrative review effective the date of initial completion, provided the GOR was determined by stabilized well test conducted within 180 days of well completion and in accordance with the GOR determination requirements of Commission procedures as indicated on Forms G-1, G-5 or W-2 as appropriate.

CONCLUSIONS OF LAW

1. Resolution of the subject application is a matter committed to the jurisdiction of the Railroad Commission of Texas. Tex. Nat. Res. Code § 81.051.
2. All notice requirements have been satisfied. 16 Tex. Admin. Code § 1.42.
3. Apache has not demonstrated that, at initial conditions, the hydrocarbon fluids in the reservoir exist as a retrograde gas phase at a GOR of 3,000 or 3,200 cf/bbl, as requested in the hearing.
4. Substantial evidence supports amending the field rule to allow for permanent gas well classification based on a criteria of a GOR of 10,065 cf/bbl.

EXAMINER'S RECOMMENDATION

Based on the above findings of facts and conclusions of law, the Examiners recommend denial of Apache's Application to add a gas classification provision based on a GOR_i at 3,000 cf/bbl or 3,200 cf/bbl for the Alpine High (Cons) Field. Based on the evidence, the Examiners recommend approval of a field rule amendment to allow for permanent gas well classification from the date of first production based on a GOR_i of 10,065 cf/bbl or greater.

Respectfully submitted,



Robert Musick, P.G.
Technical Examiner



Kristi M. Reeve
Administrative Law Judge



Austin Gaskamp
Technical Examiner