



SIPES QUARTERLY

www.sipes.org

THE SIPES NATIONAL OFFICE HAS MOVED! SEE PAGE 22 FOR MORE INFORMATION.

Society of Independent Professional Earth Scientists

SIPES 2021 Convention

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Deciphering the Cleveland Sandstone Stratigraphy in Pawnee County, Oklahoma Finds Bypassed Production

Part Two of Two
(Part One of this article was published in the November 2020 issue)

by Connor L. Cain
Master Thesis
Oklahoma State University

DISCUSSION

Stratigraphy and Stratigraphic Framework

Detailed cross section work and wireline log correlations indicate that both the Owasso and Kiefer sandstone complexes are incised valley complexes formed by fluvial processes that cut down into the existing strata and formed the linear trends observed across the study area. Paleocurrent indicators from the Collinsville Lake outcrop and image logs ran in Cleveland Field Unit indicate dominate flow direction of west-southwest (Table 1).

The incised valley systems were subsequently filled with sediment as sea level fluctuated with transgressive and regressive cycles over the Cherokee Platform. Downcutting into the underlying Marmaton Group carbonates was achieved by both the Kiefer and Owasso sandstone complexes on the stable shelf. Evidence for fluvial processes was observed in both outcrop and core data. However, the overall Cleveland sandstone interval is heterogeneous and is composed of multiple depositional events and environments as is typical of a backfilling system including rhythmic tidal deposits at

(Continued on Page 15)



President's Column

Dawn S. Bissell, #3095
Corpus Christi, TX



Happy New Year!

With the New Year we have new things at SIPES – a new office location and a redesigned website.

The SIPES National Office has moved. The new address is 1401 N. Central Expressway, Suite 105; Richardson, TX 75080. I'm sure the new address will be repeated several times throughout this newsletter, so make a note in your files. A big thank you to John Stephens, Carol Shiels, and Gregg Alletag for all your help with the move. Of course Katie and Phyllis spent weeks before and after the move organizing, packing, and unpacking in this monumental undertaking.

If you haven't already, check out the SIPES website – www.sipes.org. We have transitioned to a new platform to make it easier to navigate and update. But the website is for you. Let us know if you need other information to be included on the new website, or if you can't find something.

Convention News

The convention will be held June 7-10, in Fredericksburg, Texas. This is an excellent, convenient location with a lot of attractions. Great talks, an interesting and fun post-convention field trip, and several optional day tours have been planned. There are some great musicians in SIPES and our Thursday field trip will end at the dance hall in Luckenbach with some pickin' by these folks.

In September, you should have received a letter and a page outlining sponsorship and advertising opportunities for this convention.

(Continued on Page 5)



The following report was prepared by Vice President of National Energy Christopher H. Reed, #2935. The views and opinions expressed are those of the author. Some of the information is available in the public domain.

"There are strange things done in the midnight sun / By the men who toil for gold;" (Service 1-2).

Harken back to the last *Quarterly* on adaptability. Our current conditions will be requiring extreme adaptability. As we were going to press with the last *Quarterly*, the DOE Fossil Energy Office of Oil and Natural Gas released their report, U.S. Oil and Natural Gas Providing Energy Security and Supporting Our Quality of Life, by a Zoom meeting that members of the SIPES Executive Board were invited to attend. It is an informative and laudatory report on the excellent efforts of the industry. It is a good reference, summarizing industry advances in the resource and nonconventional plays over the past twenty years and encourages a bright future. Figure 1 from the report, shows that 68% of the U.S. energy demand is provided by oil and gas.



Chris Reed

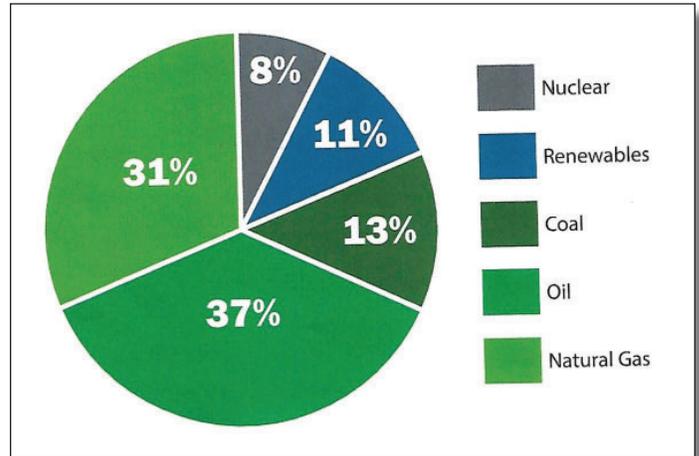


Figure 1. From DOE Report 9/2020 - Percentage of sources of energy consumed in the U.S.

Simultaneously, energy demands plummeted along with a very significant drop in product prices. The rig count suffered drastically as operators postponed or curtailed projects until profits could be stabilized. It appears that this threshold is at \$65 per barrel (WTI). Despite the economy slow down, oil prices have been rising steadily to the point of \$53 per barrel (O: G parity 1/20th) at the close of the third week in January.

We went "from heroes to goats" in less than a full day after the inauguration of the incoming administration on January 20. Executive orders were issued to stop work on the XL Pipeline, a moratorium on the leasing of federal lands, re-embrace environmental policy commitments and encouragement of stricter lending regulations to oil and gas companies. The environmentalists have taken this as full endorsement of the "Green New Deal" with its followers calling for the elimination of fossil fuels in the very near term. Obviously, the replacement of 81% of our current energy demands with nuclear and/or renewables is impossible even within several decades.

Let not your hearts be troubled--an interesting historical dichotomy can be observed from over the past fifty years. The two most progressive administrations that have attempted this replacement of fossil fuel, 2009-2017 and 1977-1981, witnessed the most rapid product price escalations. Help is on the way.

The Northern Lights have seen queer sights,
But the queerest they ever did see
Was that night on the marge of Lake Lebarge
I cremated Sam McGee.

— Robert W. Service, 1907

Chris Reed
Vice President of National Energy

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Administrative Assistant/Editor Katie Ruvalcaba
Member Services Phyllis Davis

2021 BOD Meeting Date
March 4. Virtual

2021 Annual Meeting Dates
June 7-10Fredericksburg, TX

The SIPES Quarterly is published by the
Society of Independent Professional Earth Scientists.
Send your comments, letters, address changes and
advertising inquiries to the SIPES Headquarters
in Richardson, Texas.

SIPES 2021 Convention — Technical Program June 7-10 — Fredericksburg, Texas

TUESDAY, JUNE 8

8:00-8:40 a.m. — **C. Randy Bissell, #3547** —
Headington Energy Partners, LLC, Corpus Christi, TX

*"Wellsite Utilization of Diagnostic Fluorescence
in Oil-Based-Mud Filtrate RFT Samples"*

8:40-9:20 a.m. — **Sam LeRoy** — Earthview
Associates, and **Yury Lyasch** — JYL, LLC, both of
Houston, TX (co-author Evgeny Rizanov)

*"'Side-View' and 'FracSeis Passive' Seismic Imaging
of Fracture Intensity and Hydrocarbon Saturation"*

9:20-10:00 a.m. — **Patrick A. Nye, #3105** —
Nye Exploration & Production, Corpus Christi, TX
"What's a Wind Deal??"

10:15-10:55 a.m. — **Dwayne C. Purvis, #3470** —
Dwayne Purvis, P.E., Fort Worth, TX
"New Dynamics of the Natural Gas Market"

10:55-11:35 a.m. — **Barry J. Rava, #3198** —
Icarus Oil and Gas, Inc., Houston, TX
*"Finding Subtle Structural Prospects in the 21st
Century — Is There Still a Need for Them?"*

WEDNESDAY, JUNE 9

8:30-9:15 a.m. — **Michael P. Smith** —
Advanced Hydrocarbon Stratigraphy, Tulsa, OK
"AHS Rock Volatiles, Cuttings and Core Well Logs"

9:15-10:00 a.m. — **Gary C. Huber, #3134** —
Rangeland E&P, LLC, Centennial, CO
"Developing Mineral Prospects for the Independent"

10:15-11:00 a.m. — **Sam McNeil** —
River Capital Partners, Charlotte, NC
"Is My Project Suitable for Private Capital?"

11:00 a.m.-12:00 p.m. — **John E. Jordan, Jr.** —
Jordan Consulting, Houston, TX
Ethics Course — *"Grey Areas: Interactive Application
of Business Ethics in the Geoscience Profession"*

SPEAKERS AND SCHEDULE
ARE SUBJECT TO CHANGE.
PLEASE SEE WWW.SIPES.ORG
FOR UPDATES.

It's Already Time for the SIPES Foundation 2021 No Hassle Raffle!

First Prize: \$400

Second Prize: \$300

Third Prize: \$200

You do not need to be present to WIN!

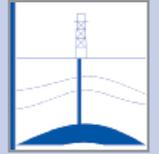
Raffle tickets will be sent to all members soon.
Drawing will be held at the SIPES Convention
Awards Banquet on June 8, 2021

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2020-2021 SIPES CORNERSTONE GROUP

Many thanks to the members listed below for their continuing support of our society.

This is a combined list of 2020 and 2021 supporters.



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Eduardo Gonzales — Carrollton, TX
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Jeffrey A. Smith — Midland, TX

* Deceased

If you supported SIPES for 2020 – THANK YOU! Your contribution will be recognized for 2021 also, at no additional cost. If you choose to provide support again for 2021, you will be specifically recognized in all printed materials. If you have questions about advertising or sponsorships, contact the national office at sipes@sipes.org.

National Dues and SIPES Cornerstone Group

You have received your membership renewal notice for the 2021 year. Please return this form at your earliest convenience. Also note this year there is an additional question regarding your other professional affiliations.

Dues are the main source of revenue for SIPES. Cornerstone contributions are our next largest source of income. Cornerstone was founded in 1994 as a voluntary contribution plan, to provide financial stability to SIPES. Last year brought the crises of the COVID-19 pandemic and the associated drop in oil prices. These two factors affected our other main sources of income – our annual convention and NAPE. Given this loss of revenue, we are concerned that 2021 will be short for our minimum budget projections. However, with your renewed dues and generous support through the Cornerstone Group, we are confident that our budget will be met. Thank you for your contributions to Cornerstone in the past, and thank you for your continued support for 2021.

I am writing this on January 20, inaugural day for our new president. This begins a new administration with new plans and goals, not all that seem friendly to our industry.

On January 5, SIPES submitted the letter below to the Office of Comptroller of the Currency regarding a proposal to prevent large banks from excluding industry sectors -- such as oil and natural gas production -- from access to capital.

These comments are filed on behalf of the Society of Independent Professional Earth Scientists (SIPES). SIPES represents over 800 independent oil and natural gas explorers and producers who will be significantly affected by the changes caused by this regulatory proposal.

SIPES members drill over 2,000 oil and gas wells in 25 states each year. This is a smaller part of another statistic: small American oil and gas companies produce 54% percent of American oil and 85% of American natural gas.

As the *Federal Register* Notice states:

Despite the OCC's statements and guidance over the years about the importance of assessing and managing risk on an individual customer basis, some banks continue to employ category-based risk evaluations to deny customers access to financial services. This happens even when an individual customer would qualify for the financial service if evaluated under an objective, quantifiable risk-based analysis. These banks are often reacting to pressure from advocates from across the political spectrum whose policy objectives are served when banks deny certain categories of customers access to financial services.

Every item Americans consume and touch is directly impacted by oil and gas production. Medical supplies are packed and delivered in plastic containers; petroleum based

synthetic materials are used in food packaging, clothing, footwear, furniture, and building materials. Even items produced from natural products (i.e., cotton and wool), are processed and transported with oil-and-gas-based fuels.

Should small oil and gas producers and explorers lose access to banking facilities by 'red-line' methods, the price of these two fundamental commodities, oil and gas, will necessarily increase; thereby causing costs to rise across the economy. Increases in oil and gas prices disproportionately affect our poorest citizens. Restricting access to U.S. oil and gas reserves will result in dependence on other countries for our energy needs, thereby affecting the U.S.'s ability to defend our nation.

The OCC proposal is a great step in preventing abuse of public forums that would skew banking decisions away from individual determinations toward "red-lining" applied to entire categories of businesses.

SIPES appreciates the opportunity to present these comments.

On Thursday, January 14, the rule was finalized. According to [TheHill.com](https://thehill.com):

The fair access rule is set to take effect April 1, but the Biden Administration likely has several options to prevent that from happening.

Biden is expected to appoint a new acting comptroller on January 20 while his nominee to lead the OCC awaits Senate confirmation. A new acting comptroller can likely delay when the rule takes effect so the OCC can revise it or scrap it altogether.

Biden and Congress can also try to revoke the rule through the Congressional Review Act (CRA), which allows both chambers to pass a bill repealing a new regulation and preventing the agency from releasing a similar rule.

The full article can be found at this link: <https://thehill.com/policy/finance/534197-regulator-finalizes-rule-forcing-banks-to-serve-oil-gun-companies>

If this is an area of interest to you, contact your representative and senators to express your opinions.

On a more pleasant note, below is a picture of the sunset on January 3 from Mile Marker 10 in Padre Island National Seashore.



In this New Year may you –
Live life to the fullest . . .
Cherish every moment . . .
Hold family and friends close . . .

Dawn S. Bissell

SIPES 2021 Convention

Fredericksburg, Texas — June 7-10

Register Early and Save!

Be sure to register for the SIPES 2021 Convention by May 7 before prices increase.
Online registration will open in March.
Check www.sipes.org periodically for updates.



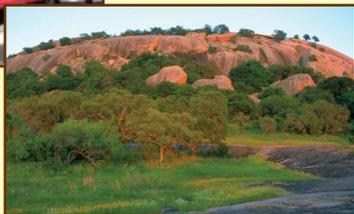
Convention Tour Options*

TUESDAY, JUNE 8

Trolley Historical Tour

Enchanted Rock Tour

Cooking School Demonstration



WEDNESDAY, JUNE 9

Bamberger Ranch Tour

Art Gallery Tour

Wine & Cheese Tasting



* Please note that all of the above tours are only tentatively scheduled and are subject to cancellation due to COVID-19 safety protocols during the time of the convention.

Refunds will be given if a tour is cancelled.



NEW ORLEANS

In November, we held our second Zoom meeting. James D. (Jamie) Robertson, #2826, presented “Climate Change: A Technical Perspective.” Jamie is a partner in Salt Creek Petroleum LLC, an independent oil and gas company active in exploration and production in onshore Texas. Prior to becoming an independent, he worked for Atlantic Richfield Company (ARCO) for 25 years, retiring as exploration vice president of ARCO’s international division when ARCO merged with BP plc in the year 2000. He is a past president (1994-95) and honorary member of the Society of Exploration Geophysicists, a three-time winner of best paper awards in SEG journals and annual meetings, a founding member and past chair of the Fort Worth Chapter of SIPES and a licensed professional geoscientist in the state of Texas. Jamie received a B.S.E. in geological engineering from Princeton University and a Ph.D. in geophysics from the University of Wisconsin.

Jamie provided great insight into the current topic of climate change. Below is an abstract of his presentation.

Climate is constantly changing at many time scales from millions of years

to decades. The drivers range from the long-term impacts of plate tectonics and orbital oscillations to the shorter-term impacts of solar radiation and volcanic activity. Many diverse datasets converge to show that earth’s climate is currently warming; average global surface air temperature on land, for example, is 3o F warmer presently than in the late 1800s. Direct measurements also show that greenhouse gas concentrations in the atmosphere have increased in recent time; carbon dioxide (CO₂) concentration, for example, is more than 35% higher presently than in the late 1800s. There are no significant natural sources of this rise in CO₂. The sources virtually all relate to human activity: electric power plants, transportation, cement plants, residential and commercial heating, agriculture, and landfills. Is this rise in CO₂ the probable cause of the current climate warming? Multiple lines of evidence suggest yes: (1) the greenhouse effect is established science; (2) directly measured heat exchange at various levels in the atmosphere demonstrates increasing net warming over time consistent with an increasing greenhouse effect; (3) the troposphere is heating while the stratosphere is cooling consis-

tent with an increasing greenhouse effect (if solar radiation was the cause, both would be heating); (4) nights are warming faster than days and winters warming faster than summers, also a fingerprint of a greenhouse cause rather than a solar radiation cause; and (5) climate simulation models as they improve are supporting the CO₂ to climate warming link. Hypotheses that climate warming over the past century is all natural (caused by solar radiation changes, volcanic activity, jet stream and ocean current fluctuations and the like) are not supported by scientific data, though these natural drivers do have discernible impacts over short time spans.

We had excellent participation with over 20 members viewing the presentation. The presentation was followed by many questions from the group. You can view the entire presentation at our local SIPES website video page. The link is: <http://sipesneworleans.homestead.com/Videos.html>

Cliff Williams, Vice Chairman
and
Eric Broadbridge, Treasurer

OKLAHOMA CITY

The speaker for our October luncheon was Steve Agee, Dean of the Oklahoma City University Meinders School of Business. He is widely regarded as an expert on the financial fundamentals of the oil and gas industry. His presentation focused on the importance of using good verifiable data for energy policy analysis. He reflected briefly on the departure of U.S. production from M. King Hubbert’s Peak Oil Theory, noting that nearly 70% of U.S. energy consumption is still heavily weighted towards fossil fuels and will be for the foreseeable future, both domestically and globally. We lost 21 million BOPD of oil demand when COVID hit, but have regained 13 million since the low point. It will likely take until the end of 2021 before demand

climbs back to pre-pandemic levels as excess oil supply will depress oil prices.

Charles Smith was our speaker for the November luncheon. After retiring from Haliburton in 2015, Charlie has been a consultant to various industry partners in the area of reservoir evaluation and enhancement of horizontal drilling projects. His presentation was titled, “Horizontal Reservoir Value Increased by Enhanced Geological Knowledge.” He walked us through a Permian Basin drilling project that was struggling due to massive water production and was near failure. After studying down-hole logs, mud logs and mineralogical cuttings analysis, Charlie was able to determine that the primary target was a 60-80-foot horizon encased in the greater rock formation. Once the operator

started laying their laterals down within this horizon, the production of oil increased over 200% and the water production declined dramatically.

In December, we had our annual Christmas Party. In a departure from the past, it was held jointly with SIPES OKC and the Oklahoma City Geological Foundation at the new Camp Trivera Girl Scout Meeting Facility in northeast Oklahoma City. It is a wonderful facility featuring a rock climbing wall donated by the Geological Foundation. It was designed around and includes the geological time scale of Oklahoma.

Cody Griffin
Secretary

FORT WORTH

The Fort Worth Chapter opened the final quarter of 2020 in October, with a sobering program presented by Dwayne Purvis, #3470, entitled “Climate, COVID and Careers: A Look at a Changing Industry.” The program examined how a changing world, changing economics and a global pandemic may create a tipping point in our industry and what that could mean for those of us in it. The key issue of the talk was the tremendous downturn created by the coronavirus and how it affected the use of hydrocarbons when the government instituted sweeping lockdowns and stifling restrictions on non-essential businesses. This caused thousands of people to lose their jobs and reduced the usage of hydrocarbons when most employers had their employees begin working from home. The airline industry virtually came to a standstill because of the fear of transmitting the coronavirus in airports and on flights, thus severely reducing the use of jet fuel as well. This reduction in usage of hydrocarbons caused a huge oversupply of crude oil, and storage was at all-time highs and came extremely near reaching total capacity. This all occurred in conjunction with OPEC attempting to flood the market with crude oil to recapture their market share from shale drillers who had increased the total production for the United States to 12 million barrels of oil per day. This was all happening during a time when renewable energy sources such as wind and solar were becoming more and more popular with environmentalists, therefore causing the oil and gas industry to become more and more involved with renewable energy. These factors have had a devastating effect on the industry as a whole with numerous bankruptcies among many of the shale players, and huge write-downs of both reserves and exploration budgets among the majors. And last, but not least, there is the continuing discussion on climate change and how the measures that will be taken to reduce the effects of climate change will affect the



October speaker Dwayne Purvis.

oil industry. More than half of Americans think that climate change is caused by human society and the use of fossil fuels. Everyone walked away from this meeting with a lot to ponder and hoping that conditions will improve in the not-too-distant future.

Dwayne Purvis, P.E. has spent two and a half decades in reservoir engineering and executive leadership as a consultant and operator. He has led or participated in hundreds of field studies and reserve analyses over dozens of basins in the United States and abroad, and he has participated in the sale or acquisition of projects valued from tens of thousands to billions of dollars. Before starting his own consulting practice in 2015, he served Jetta Operating Company as reservoir engineering manager and reserves manager. Prior roles include founder and executive vice president of consulting firm The Strickland Group, and partner at Cawley, Gillespie & Associates, and he currently serves as an adjunct professor at Texas Christian University. Mr. Purvis has published on issues of shale reservoirs, decline curve analysis, reserves, and risk analysis. He is a registered professional engineer in the state of Texas, member of SPEE, AAPG, SEG, SIPES and a 25-year member of SPE.

The program presented in November was by Jim Gibbs, #314, was insightful and thought provoking. The talk was entitled “What’s Next” and presented Jim’s thoughts on what we can do as

independents to add value to our companies, and what one should be doing to make oneself more successful, profitable, creative, and effective. The oil industry is currently out of favor, and prospective investors are looking elsewhere than oil and gas to invest their money. This is due to the shale players who had investors convinced that there would be no more dry holes and became the darlings of Wall Street. Investors have realized that because production from shale wells declines so quickly, one must continuously add new wells to keep oil production at a steady level. Instead of generating cash flow that could be returned to investors in the form of dividends, these funds were being used to drill additional wells and investors were not getting the return on their investment that they were looking for. This also led investors away from more conventional plays because they were too “risky!” This has hurt the independent oil man because the oil business has become dominated by larger companies that are well-financed and staffed, and the majors. Other factors have made it more difficult for the small independent to be successful including product prices are more volatile, leases are more difficult and expensive to acquire, lease terms and contracts are more complex, environmental and safety requirements are more stringent, oil-field services have become more expensive, plugging, abandonment and remediation expenses have escalated, and market value for salvage is low. On the plus side, drilling and workover rigs are more efficient, data and services are more available and can be obtained quickly, engineering evaluations can be completed in a timelier manner, geophysical surveys are more accurate, and diagnostic and hedging strategies can reduce price risk in acquisitions. Worldwide population and energy needs will continue to increase. It appears that once we can conquer the coronavirus, that demand will return to levels that will reduce the current oversupply of oil

(Continued)

and gas and cause prices to rise. It has also become clear that wind and solar energy are not the answer either because they are both much too inefficient. Jim's "secrets" to becoming a successful oil finder are to equip your mind with a thorough understanding of rock and fluid properties and the principles of how they interact, a large mental inventory of various trap types, and an insatiable quest to know how, when and where oil can occur in a specific reservoir. Jim shared many secrets in his talk, but I thought the best one was "just keep drilling."

Jim Gibbs was born in Wichita Falls, and received his B.S. and M.S. degrees



November speaker Jim Gibbs (right) accepting his speaker gift from Chairman Monte Meers.

in geology from O.U. After a two-year stint in the Navy, he started work for Chevron, (known as The California Company "Calco"), first in New Orleans and later in Lafayette. In 1964, he left Chevron, came to Dallas, and began work as a consultant and an independent oil and gas producer. During the following two decades he served as the exploration manager for various companies, including Cornell Oil, Ross Perot's Petrus, and Dr. Bobby Lyle's Lyco Energy Company. In 1984, he founded Five States Energy Company, whose purpose was to acquire interests in producing oil and gas properties for Jim's family and clients, and to further develop them as warranted. Jim has served as the president of the Dallas Geological Society and the AAPG and is an honorary member of both. He is also a SIPES honorary member. Today, nothing at Five States has really changed from Jim's original model. They still seek to acquire operated and non-operated working interests in producing properties in Texas and adjacent states, the mid-continent, and the Rocky Mountains. They are always looking for opportunities to join with individuals or companies who need dollars to acquire producing properties, or to further develop those they already own. They would be a good partner for you if you had any ideas you would like to run by them!



Adrian Gilfoil,
December guest
speaker.

The program presented in December was entitled "Regional Dataset Analysis" and was given by Adrian Gilfoil from Enverus. Enverus has increased its market research offerings over the last few years with acquisitions of PLS, 1Derrick, and most recently RS Energy. The combinations of knowledge, data, and software are designed to rapidly analyze assets to help customers get ahead of their competition.

Adrian briefly covered Enverus' product offering, but focused mainly on workflows such as a regional analysis of historic transactions, identifying current marketed deals, cash flow analysis to understand PDP (proven developed producing) and PUD (proven undeveloped) potential, and comparison of merger and acquisition trends.

Jim West
Secretary

LAFAYETTE

The Lafayette Chapter remained under the dark cloud of COVID-19 in the fourth quarter of 2020. The chapter was forced to forgo its annual Barbeque in the Park in October due to the continued resurgence of the COVID-19 virus and social distancing guidelines.

The November meeting date fell on Veteran's Day, November 11. We were graced with beautiful weather and held our meeting outdoors, in Girard Park, one of Lafayette's most beautiful parks. We made special social distancing arrangements for seating, cleaning everything that did not move with disinfectant, and using disposable trays and utensils in order to provide the safest possible outdoor event for our members. All members in attendance who are veterans were recognized and thanked for their service. Special recognition went out to Jack P. Martin, #246, 1974 SIPES National Secretary and 1975 SIPES National Vice President, who



November meeting in Girard Park.

passed away on September 4, 2020, just one month short of his 101st birthday.

December's Lafayette Chapter Annual Christmas Party was another victim of COVID-19.

C. Houston Elkins
Secretary/Treasurer

DALLAS

The Dallas Chapter kept things simple for the fall, hosting two virtual meetings. We greatly miss gathering together, so it was particularly painful to miss our usual holiday party in December. Regardless, our online luncheons were both excellent.

In October, Grant Swartzwelder gave a talk on environmentalism in the oilfield. Grant has a varied background in the industry, both on the capital side and as owner of several oilfield businesses. He is currently president of OTA Compression and Kimark Systems. During the talk, Grant laid out the growing issue of environmental liabilities for operators, and how those issues are being pushed by different groups out-

side of the industry. There were several case studies presented detailing not only litigation, but also showing how companies are responding with tighter internal policies.

Our November talk was a real treat as Scott Tinker took time out of his busy schedule to give his talk “The Role of Oil and Gas in a Sustainable Energy Future.” If you have seen his talks or visited his website for the Switch Energy Alliance, you know that Scott brings unparalleled command of a myriad of facts and stats concerning the interrelated issues of energy, economy, and environment. Much of the public dialog is centered on western/OECD countries with flat energy consumption and CO₂ output, yet the narrative is quite differ-

ent in much of the rest of the world, where the focus is on cheap and reliable energy to drive rising economic prosperity. Some of the issues involve tricky topics – hunger, human rights, health-care, education, immigration/migration, and population growth to name a few. Scott made a strong point that policy and education must stay grounded in facts and reality, free from partisan distortions – solutions are not simple, nor will they come quickly. The “radical middle” is where most of the solutions to the tough issues lie, and it turns out that earth scientists are some of the best advocates for sensible conversations.

We wish everyone a happy new year!

Michael Adams
Chairman

SIPES Chapter Meeting Information

CORPUS CHRISTI

Chairman: Rajan Ahuja
V-Chrmn: Marty Thering
Secretary: Brent Winborne
Treasurer: Dan Pedrotti
Meets: Water Street Market
Last Tuesday of month

DALLAS

Chairman: Michael Adams
V-Chrmn: Neil Barman
Secretary: Carole Popa
Treasurer: John Stephens
Meets: Prestonwood Country Club
3rd Tuesday

DENVER

Chairman: Gary Thompson
V-Chrmn: Bill Pearson
Secretary: Jerry Cuzella
Treasurer: Melanie Westergaard
Meets: Wynkoop Brewing Co.
4th Thursday

FORT WORTH

Chairman: Monte Meers
V-Chrmn: Dennis Browning
Secretary: Jim West
Treasurer: Michael O'Donnell
Meets: Fort Worth Petroleum Club
1st Wednesday

HOUSTON

Chairman: Jeff Allen
V-Chrmn: TBA
Secretary: Scott Leaseburge
Treasurer: Luis Carvajal
Meets: Petroleum Club
3rd Thursday

LAFAYETTE

Chairman: King Munson
V-Chrmn: Julia Battle
Secretary/
Treasurer: Houston Elkins
Meets: Petroleum Club
2nd Wednesday

MIDLAND

Chairman: David Cromwell
V-Chrmn: Tom Wilson
Secretary: George Friesen
Treasurer: Jerry Elger
Meets: Midland Country Club
3rd Wednesday

NEW ORLEANS

Chairman: Louis Lemarié
V-Chrmn: Cliff Williams
Secretary: TBA
Treasurer: Eric Broadbridge
Meets: Andrea's Restaurant
3rd Tuesday

OKLAHOMA CITY

Chairman: Greg Riepl
V-Chrmn: Michael Bone
Secretary: Cody Griffin
Treasurer: Terry Hollrah
Meets: The Petroleum Club
Chase Tower, 35th Floor
1st Wednesday

SAN ANTONIO

Chairman: Tom Kirby
Co-V-Chrmn: Lee Billingsley & Bill Layton
Secretary: Doug McGookey
Treasurer: Tim McGovern
Meets: Petroleum Club
3rd Thursday

WICHITA

Chairman: Tom Pronold
V-Chrmn:
Secretary:
Treasurer:
Meets: Time and Location TBD

WICHITA

The Wichita Chapter remains active, but only via remote. The one-year anniversary of our last in-person meeting will occur on March 12, 2021. Since then, we have held one virtual meeting which occurred on December 17, 2020. At that meeting, Mark Mills presented a talk entitled “Is a Wholesale ‘Transition’ to a ‘New Energy Economy’ Happening or Inevitable? What Are the Consequences of Energy ‘Transition’ Policies and Subsidies?” Mark Mills is a senior fellow at the Manhattan Institute, a faculty fellow at Northwestern University’s engineering school, and a

partner in Cottonwood Venture Partners. He writes frequently for the *Wall Street Journal*, *Forbes*, and numerous other outlets. He earlier served as chairman and CTO of ICx Technologies, helping take it public in a 2007 IPO. He is author of *Digital Cathedrals: The Information Infrastructure Era* (Encounter Books, 2020) and *Work in the Age of Robots* (Encounter, 2018), and earlier co-authored the book, *The Bottomless Well*, which rose to number one in Amazon science. He served in the White House Science Office under President Reagan, and began his career as an experimental physicist and engineer in semiconductors and fiber optics.

This excellent talk was sponsored by the Wichita Chapter, but was hosted by SIPES President, Dawn Bissell, and is available on YouTube using the following link:

<https://www.youtube.com/watch?v=L87T7jWvr34>

The total length of the presentation is one hour and thirty-three minutes, with the talk lasting forty-six minutes followed by a lengthy question and answer period.

Tom Pronold
Chairman

HOUSTON

The Houston Chapter had Zoom board of directors meetings in October, November, and December of 2020. There were also Zoom speaker events in October by Gabriel Collins from Baker Botts Institute, and in December by John Snedden, a senior research scientist at the University of Texas at Austin.

Something however, happened at the end of the year that was important to me and to a lot of other geologists in the world, Daniel Lester Smith, #1647, passed away on December 23, 2020. (See Page 13 for his memorial). Active in the Houston area Scottish organizations, Dan was a past chieftain of the Heather & Thistle Society, and a life member and long-time supporter of the Houston Highland Games Association. Myself and my wife, who is from the McNabb Family from Killin, Scotland, once ran into Dan and his wife standing in line to get into the Toyota Center to hear the St. Thomas Episcopal Pipe Band play. Dan was a great geologist and a highly respected member of the SIPES family. Condolences to Dan’s family, friends, and associates.

The October Zoom meeting was given by Gabriel Collins speaking on “China and the Global Energy Market.” Gabriel Collins is the Baker Botts Fellow in Energy & Environmental Regulatory Affairs at Rice University’s Baker

Institute. He was previously an associate attorney at Baker Hostetler, LLP, and is the co-founder of the China SignPost™ analysis portal. Collins has worked in the Department of Defense as a China analyst and as a private sector global commodity researcher, authoring more than 100 commodity analysis reports, both for private clients and for publication.

Collins’ research portfolio is global. His work currently focuses on legal, environmental, and economic issues relating to water, including the food-water-energy nexus, as well as unconventional oil and gas development, and the intersection between global commodity markets and a range of environmental, legal, and national security issues. His analysis draws from a broad swath of geospatial and other data streams, and often incorporates insights from sources in Chinese, Russian and Spanish.

Collins received his B.A. from Princeton University and a J.D. from the University of Michigan Law School. He is licensed to practice law in Texas.

In the luncheon talk, Mr. Collins describes China as the world’s most populous country (1.4 billion people in 2019) with a fast-growing economy that has led it to be the largest energy consumer and producer in the world. Rapidly increasing energy demand has

made China influential in world energy markets. Despite structural changes to China’s economy during the past few years, China’s energy demand is expected to increase, and government policies support cleaner fuel use and energy efficiency measures. Fossil fuel-fired power capacity has historically accounted for the bulk of installed capacity. This event explored how these dynamics will impact global demand for fossil fuel.

John W. Snedden was our Zoom meeting speaker for December. Dr. Snedden is the director of the Gulf Basin Depositional Synthesis research project at the Institute for Geophysics at the University of Texas at Austin. Dr. Snedden received his M.S. in geology from Texas A&M University, and a Ph.D. in geology from Louisiana State University. He is a Certified Petroleum Geologist No. 5279 and has more than 25 years of industry experience in exploration, production, and research. Dr. Snedden is the author of numerous technical papers and is a training course instructor. He is the author of “Gulf of Mexico Sedimentary Basin: Depositional Evolution and Practical Applications” (Cambridge University Press, October 2019). Dr. Snedden’s specialties are sequence and seismic stratigraphy, sedimentology, reservoir characterization,

(Continued on Page 12)

IN MEMORIAM

We regret to note the passing of the following members:



Douglas E. Bacon, #31
of Sugar Land, Texas
who died on
August 3, 2020



**Williard R. Green,
#1676**
of Midland, Texas
who died on
December 23, 2020



**Frank J. Schuh,
#2095**
of Plano, Texas
who died on
December 24, 2020

Herbert F. Boles, #2568
of Midland, Texas
who died on
December 11, 2020



**Sally J. Meader-Roberts,
#2075**
of Midland, Texas
who died on
December 18, 2020



**Daniel L. Smith,
#1647**
of Houston, Texas
who died on
December 23, 2020



**E. Bernard Brauer,
#2978**
of Corpus Christi, Texas
who died on
February 2, 2021

Rex D. Coppedge, #2514
of Dallas, Texas
who died on
November 20, 2020



**Michael A. Pollok,
#2512**
of Tulsa, Oklahoma
who died on
January 21, 2021



**Michael W. Taylor,
#1409**
of Flower Mound, Texas
who died on
January 29, 2021



reservoir connectivity analysis, unconventional resource stratigraphy, and training of technical professionals.

Dr. Snedden says the northern Gulf of Mexico federal offshore area easily qualifies as a super basin, based upon estimated petroleum endowment over 100 BBOE and cumulative production of 60 BBOE. Like other super basins, it has multiple petroleum systems and stacked reservoirs. Examination of four key elements of these petroleum systems (reservoirs, source rocks (and maturation windows), seals, and traps yields important insights to the geologic processes that result in such an exceptional habitat for conventional hydrocarbons. The bulk of hydrocarbon resources in federal offshore waters are in Cenozoic sandstone reservoirs such as the Paleogene Wilcox reservoir of deepwater subsalt

areas. Overall, Cenozoic sandstone reservoirs in both suprasalt and subsalt fields yield the highest flow rates and cumulative production volumes. Notable is the recent addition of the deepwater Jurassic Norphlet sandstone play, the newest and second largest by UTRR. Overall Gulf of Mexico reservoirs are diverse, formed in paleoenvironments ranging from aeolian to deepwater.

Powering this super basin are three primary marine source rocks centered in the Oxfordian, Tithonian, and Cenoturonian stages. These source rock intervals often act as top seals, but other Neogene and Mesozoic shales and even carbonate mudstones are also important trap sealing elements, as proven by analytical work and downhole pressure measurements. The extensive salt distri-

bution and relatively late Cenozoic burial delayed source rock maturation and migration until culmination of trap formation in many areas. High rates of Cenozoic deposition on a mobile salt substrate also generated a myriad of salt tectonic structures ranging from simple diapiric closures and extensional fault traps to complex subsalt configurations such as salt-cored compressional anticlines, salt-cutoff traps, and bucket weld traps. Exploration success in the past twenty years is a direct result of improved seismic imaging around and below salt, as well as advances in drilling, completing, and producing wells and fields.

Steve Smith
2020 Secretary



Douglas Eugene Bacon, #31

1925-2020



Douglas E. Bacon was born in Boone, Iowa on June 11, 1925. He is survived by his wife, Judith (Judy), and his three children. Doug lived a very full life. He enlisted in the Marines during WWII, immediately after graduating from high school. After four years of military service, he attended the University of Arkansas and graduated with honors with a B.S. and M.S. in geology in 1949. After graduation, he borrowed \$100 from his father for bus fare to report to his first job with Atlantic Refining Company in Wichita, Kansas, where he met E.J., his first wife. Through several promotions, he moved the family to Houston in 1957. In 1960, he started his own independent oil and gas company, then in the late '60s joined forces with Norman Bock to form Bock and Bacon, which became a successful oil and gas exploration partnership. Doug met his present wife, Judy, in 1996. They were married in 2004, at which time he also gained a new loving family. Doug loved sports. Early in life he played basketball, tennis, softball, and ice hockey, later taking up his favorite sport, handball. At 50, he won The Seniors Handball Championship of Houston. He played golf into his early 80s. Doug died a peaceful death at home with his family on August 3, 2020. Doug was a founding member of SIPES.

Daniel Lester Smith, #1647

1936-2020

Daniel L. Smith, #1647, passed away on December 23, 2020. He had just finished correlating logs and put his final touches on his latest prospect. Dan passed away at his desk; he was 84 years old. People say they are not sure what happened, but some say that his heart just gave out. Dan was very successful and highly respected, and just loved doing geology. A native Houstonian, Dan was born on August 23, 1936. He graduated from the University of Texas at Austin with a B.S. in geology in 1958. Dan got his first job at Amoco, worked for several other companies and was currently serving as the executive vice president of exploration at Sandalwood Oil & Gas, Inc. when he died. Dan was a widely respected and prominent member of the oil and gas industry in Houston and around the world.



Dan held numerous leadership positions at the highest levels. His SIPES activities included being on the National Board of Directors, and holding the position of secretary. He also served as secretary (1992) and president (1993) on the SIPES Foundation Board of Directors. He received the Outstanding Service Award in 2004, and was made an Honorary Member in 2010.

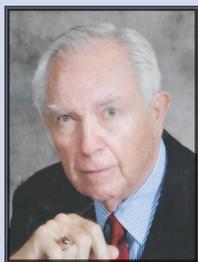
Dan served the AAPG as chairman of the House of Delegates and president. Locally, he had been president of the Houston Geological Society. He also contributed his time and leadership skills to GCAS, AIPG, NOGS, and LGS. In addition to being an AAPG Honorary Member, Dan's extensive list of accolades includes being a Distinguished Member of the AAPG House of Delegates, an AAPG Certificate of Merit, a DPA Best Paper Award, HGS Distinguished Service Award, and the HGS Gerald A. Cooley Award for "Service above and beyond the call of duty over many years." His greatest achievement was receiving the 2011 Halbouty Outstanding Leadership Award, given in recognition of outstanding and exceptional leadership in petroleum geosciences.

Dan was passionate about promoting education in the field of petroleum geology, and mentored numerous young geologists over the years. Those who have worked with Dan found him to be a true example of inspiration for humility, ethics, diplomacy, and above all, getting the job done. He was the epitome of outstanding leadership.

Memorial contributions may be directed to the scholarship programs of the following organizations: SIPES, AAPG, or the University of Texas at Austin Jackson School of Geosciences.

E. Bernard Brauer, #2978

1936-2021



Emil Bernard "Bernie" Brauer, 85, passed away peacefully on February 2, 2021. Bernie was born January 29, 1936 in Houston, Texas. He was preceded in death by his wife, Helen Robinson Brauer, and his daughter, Emily Clement Brauer. Bernie is survived by his daughter and son-in-law, Daphne and Jim O'Sullivan, grandsons, Colin Bernard O'Sullivan and Craig Joseph O'Sullivan, and sister, Ella Baker.

Bernie graduated from W.B. Ray High School in Corpus Christi, Texas in 1954, where he was a pitcher on the baseball team. He attended the University of Texas at Austin and earned a Bachelor of Science and Master of Science in petroleum engineering, graduating in 1961.

Bernie enjoyed a distinguished career in the oil and gas industry beginning at Unocal. After 38 years of service, where he served as president and general manager, responsible for exploration and production, Bernie retired from Unocal Canada, Ltd. in 1998. During his career, he held various positions in engineering, operations, planning and management in Louisiana, Texas, California and Canada. He made many close friends at Unocal and in the oil and gas community that were an important part of his life. Bernie traveled extensively in his career and loved sharing stories of his experiences. He continued his oil and gas experience as a petroleum consultant and board member for Unbridled Energy, and later as a petroleum consultant for Synergy Oil & Gas.

Bernie joined SIPES after retiring from Unocal. It did not take the Corpus Christi Chapter long to recognize that Bernie was gifted, and we put him to work. He was probably one of the best program directors we ever had. The speakers he found were often nationally recognized and always delivered poignant presentations. Bernie also served on the SIPES Board of Directors from 2005-07, first as a national director, then as treasurer and vice president of national energy. We relied upon his intellect and discernment to help guide the society.

Bernie was always gracious, benevolent, and humble; and always conducted himself with class. Bernie believed deeply in giving back. In addition to his SIPES service, he was a past president and member of the executive committee and chairman of the Council of Past Presidents of the Society of Petroleum Evaluation Engineers. He was a life member of the Society of Petroleum Engineers, and a past member of the Engineering Advisory Board of the Cockrell School of Engineering, the University of Texas at Austin. Bernie was devoted to his Episcopal faith, and an active member of All Saints' Episcopal Church in Corpus Christi, Texas, where he served on the vestry.

Bernie loved nothing more than sharing good food and wine with family and friends and could always be counted on to bring the fun and the wine. Bernie cherished his family, the weekly lunches with his daughter, and cheering on his grandsons at their events, never missing a chance to say he was proud. And there was never any doubt that he adored his wife, Helen, with whom he is now reunited.

Well done, good and faithful servant.

- Brian S. Calhoun, #1586, SIPES Corpus Christi Chapter

SIPES FOUNDATION

SIPES Foundation donation request letters will be sent to all members soon. Please consider making a donation to support SIPES Foundation scholarships for earth science students.

THANK YOU FOR YOUR SUPPORT!

Well Name	Surface Type	Depth	Measurement	Remarks
JA JONES #58	distributary front	1637-1677'	N 20 W - S 20 E	tidal reworking
JA JONES #58	channel	1665-1677'	N 8 E - S 8 W	current flow to 199
JA JONES #58	channel	1677-1689'	N 10 E - S 10 W	
JA JONES #58	channel edge	1689-1697'	N 36 E - S 36 W	
JA JONES #58	channel	1706-1718'	N 4 E - S 4 W	
JA JONES #58	channel	1718-1732'	N 37 E - S 37 W	
JA JONES #58	channel	1732-1745'	N 13 E - S 13 W	
JA JONES #58	channel	1754-1774'	N 13 E - S 13 W	
JA JONES #58	channel	1774-1789'	N 35 E - S 35 W	
FRAZEE #22	distributary channel	1702-1705'	N 62 E - S 62 W	current flow is SW
FRAZEE #22	distributary channels	1705-1770'	N 19 E - S 19 W	current flow is SSW
FRAZEE #22	distributary channels	1770-1810'	N 10 E - S 10 W	current flow is S
FRAZEE #22	channel margin	1810-1837'	N 44 E - S 44 W	NE - SW trend

Table 1. Image log interpretation from two wells in the Cleveland Field Unit showing dominate flow direction of the fluvial channels. Interpretation by Mike Grace (2014).

various positions within the cores, multiple episodes of scouring, and an overall lack of correlation between Cleveland intervals in the cores from Cleveland Field Unit.

The Nuyaka Creek Shale is the most important stratigraphic marker bed in the Cleveland sandstone interval, as it is crucial to determining whether sandstone bodies are true Cleveland or Marmaton aged. It is well documented that sandstones across the Cherokee Platform have long been classified “Cleveland” without any indication of whether they are above or below the Nuyaka Creek Shale. In this study, emphasis was placed on correlating the Nuyaka Creek Shale across several counties in order to better understand the distribution of true Cleveland and Marmaton sandstones. One of the primary questions for this study was whether or not the interaction between the Kiefer and Owasso sandstone complexes could explain the discrepancy in oil production from the Cleveland Field Unit. Part of answering this question included deciphering which sandstone complex was younger/older. After detailed correlations, it became evident that the Nuyaka Creek Shale was the key in aging the two sandstone complexes. The Nuyaka Creek Shale is consistently observed directly above the thick

Cleveland sandstone in the Owasso sandstone complex and other Marmaton aged sandstones. This observation is consistent over the entire length of the Owasso sandstone complex. In contrast, the Nuyaka Creek Shale is not present in any wells containing the thick Kiefer sandstone complex. Along the length of the Kiefer sandstone complex, the Nuyaka Creek Shale is observed in wells only on the edges of the trend, however, where the sandstone is thick, the shale marker is missing. Based on these observations, the Owasso sandstone complex is the older sandstone complex and was deposited following the Marmaton Group carbonate deposition, but before the widespread flooding associated with the Nuyaka Creek Shale. The Kiefer sandstone complex, on the other hand, was deposited later after the major transgressive event that resulted in the deposition of the Nuyaka Creek Shale. The Kiefer incised valley cut through the Nuyaka Creek Shale, into the Owasso sandstone in Cleveland Field, and into the Marmaton Group carbonates in parts of the stable shelf.

The Nuyaka Creek Shale is a regionally distributed shale; however, the shale is inconsistently developed over much of the stable shelf including the majority of Noble, Garfield, and northern Logan Counties. Due to the scope of this study,

this area was not studied extensively, and time was not dedicated to determining why the shale is missing in this area. However, absence of the Nuyaka Creek Shale does not appear to be due to incision by fluvial systems. A preferred hypothesis is that the area was experiencing shallower water with higher energy that resulted in less clay availability, less water stratification, and more oxygenation. This resulted in lower concentrations of radioactive minerals due to dilution by sediment and/or oxidation of uranium in oxygenated waters. Schaffer and Heckel (1985) state that core shales in the Midcontinent are commonly missing over paleogeographic highs, adding evidence for the missing Nuyaka Creek Shale over areas on the stable shelf.

The paleogeography of the Marmaton Group carbonates greatly influenced the deposition and geometry of the Owasso sandstone complex and other Marmaton aged sandstone bodies. Interval isopach maps of the Marmaton Group show a linear thicker carbonate section interpreted as a buildup along a shelf boundary that runs approximately south-southwest to north-northeast across the study area and significant carbonate banks on the eastern edge of the study area (Figure 10). The southwest to northeast shelf break not only marks a significant increase in the overall thickness of the Cleveland sandstone interval, but also correlates to the geometry of the Owasso sandstone complex. The Owasso sandstone complex follows the shelf break from the county line between northern Tulsa and Osage counties and continues west along the trend for approximately 40 miles, where the sandstone complex overcomes the shelf and continues west in middle Pawnee County, indicating that the Marmaton Group carbonate shelf was a prominent feature during the deposition of the Owasso sandstone complex and similarly aged Marmaton sandstones.

(Continued)

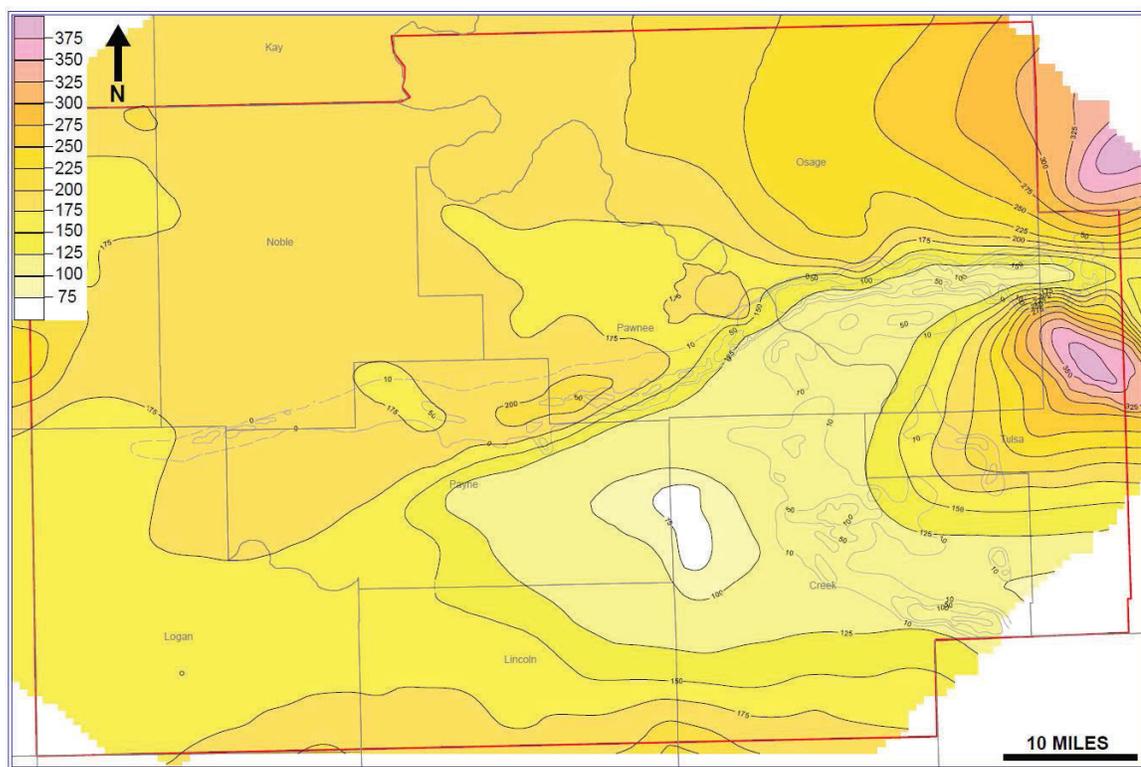


Figure 10. Thickness map of the Marmaton Group carbonates with contoured thickness of the Marmaton aged sandstones including the Owasso sandstone complex and other sandstone bodies in Creek County. Study area outlined in red. Contour interval for Owasso sandstone complex and Marmaton sandstones = 50 ft. Contour interval for Marmaton Group carbonates interval thickness map = 25 ft.

In addition to the Marmaton carbonate shelf, it is also evident that the Marmaton aged sandstones (Owasso sandstone complex and other Marmaton aged sandstones in southern Creek County) are deposited in areas of thin Marmaton Group carbonate. A noticeable thin is present along the trend of the Marmaton carbonate shelf and extends to northern Tulsa County where the Owasso sandstone complex is observed in outcrop. In southeastern Creek County, a major thinning of the Marmaton Group carbonates occurs and the area contains several sandstone trends that are interpreted to be Marmaton aged sandstones that were sourced from a southeastern or southern source (these are stratigraphically below the Nuyaka Creek Shale unlike the Kiefer sandstone complex). In summary, the mapped Marmaton sandstone bodies took advantage of the accommodation allowed by the thinning Marmaton

Group carbonates and in most of the study area are not thought to have incised the Marmaton carbonate intervals. In contrast, the Owasso sandstone complex does however display downcutting into the Marmaton Group carbonates on the edge of the stable shelf in Payne County.

As a result of its deposition long after accommodation was filled with Marmaton sediment, the Kiefer sandstone complex distribution does not appear to be influenced by underlying Marmaton Group carbonates. The Kiefer sandstone complex trends northwest from southern Creek County and intersects the trend of the Marmaton shelf at a high angle before turning slightly west and continuing across Pawnee and Payne counties. The Kiefer sandstone complex trend does not show any change in depositional direction related to the carbonate shelf trend, indicating the Marmaton Group carbon-

ate paleo-features were no longer prominent. Additionally, it does not appear that the presence of the Owasso sandstone complex influenced the deposition of the Kiefer sandstone complex. The overall flow direction of the sandstone complexes is west towards the prominent depocenter, the Anadarko Basin. The westward turn of the Kiefer sandstone complex is attributed to a flat stable shelf that still existed over much of the Cherokee Platform. The Kiefer sandstone complex shows clear incision on the stable shelf (**Figure 11**). On the interval isopach map of the Cleveland sandstone interval, the Kiefer sandstone complex is clearly observable due to differential compaction of the sandstone verses the surrounding shale and the downcutting of the sandstone complex into the Marmaton Group carbonates (**Figure 12**).

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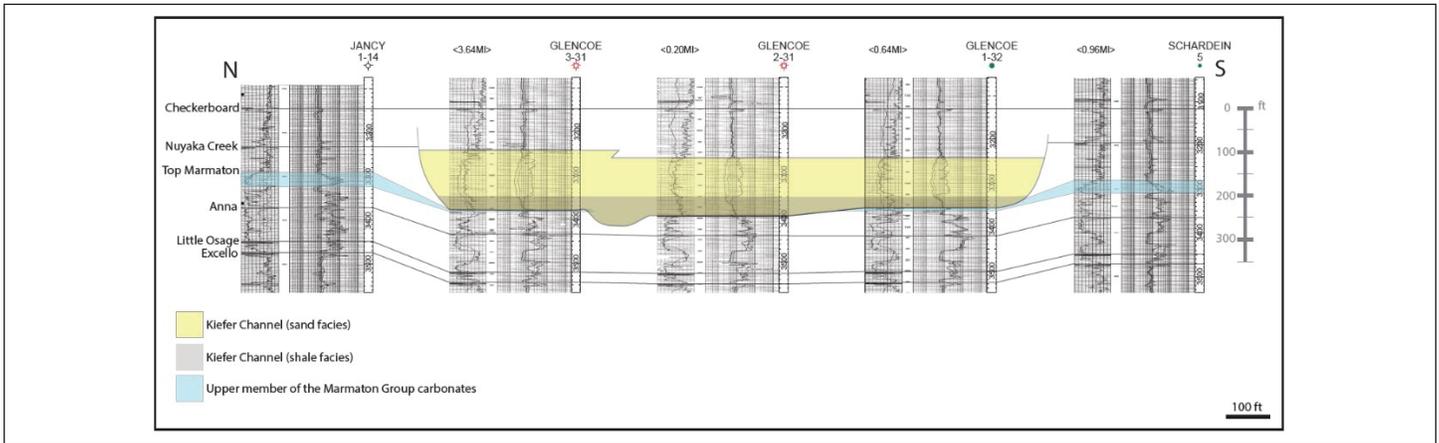


Figure 11. Cross section through the Kiefer sandstone complex showing possible incision into the upper unit of the Marmaton Group carbonates.

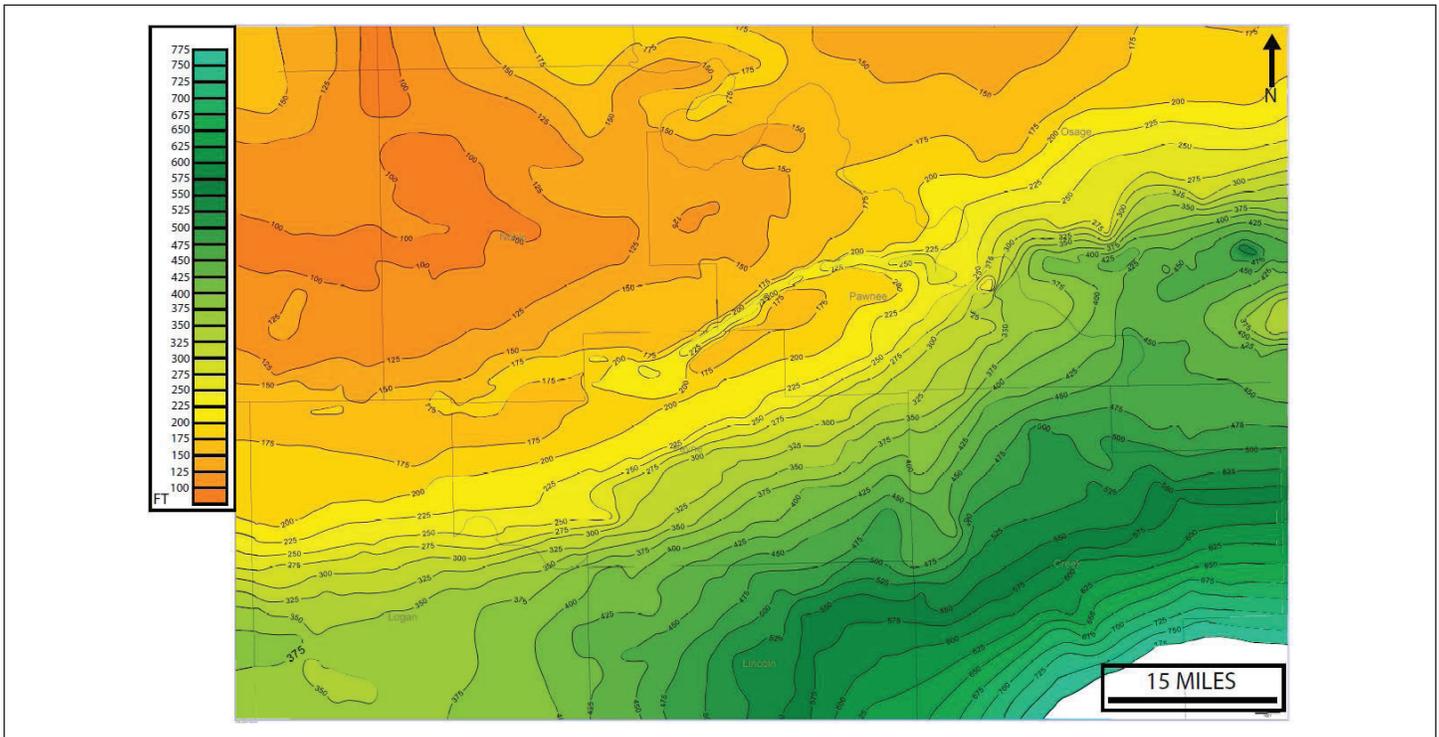


Figure 12. Interval isopach map of the Cleveland sandstone interval. The Marmaton Group carbonate shelf has a SW - NE trend diagonally across the middle of the study area. Additionally, the Kiefer sandstone complex is seen as a thickening trend on the stable shelf (red arrow). Contour interval = 25 ft.

Cleveland Field Unit

The Cleveland sandstone in the Cleveland Field Unit has an average thickness of 150 feet, which is consistent over the majority of the field. The multi-storied sandstone is composed of both the Owasso and Kiefer sandstones complexes, which converge and intersect at or near the Cleveland Field Unit (Figure 13). Considerable time was dedicated to wire-line log correlations, core analysis, and thin section analysis to determine if the Kiefer sandstone complex could be distin-

guished from the Owasso sandstone complex. An expected erosional contact between the two complexes was not identified using the available data. As a result, the sandstone within the Cleveland Field Unit will remain undifferentiated, given the missing Nuyaka Creek Shale and the difficulty in identifying how deeply the Kiefer sandstone complex eroded into the existing Owasso sandstone complex (Figure 14).

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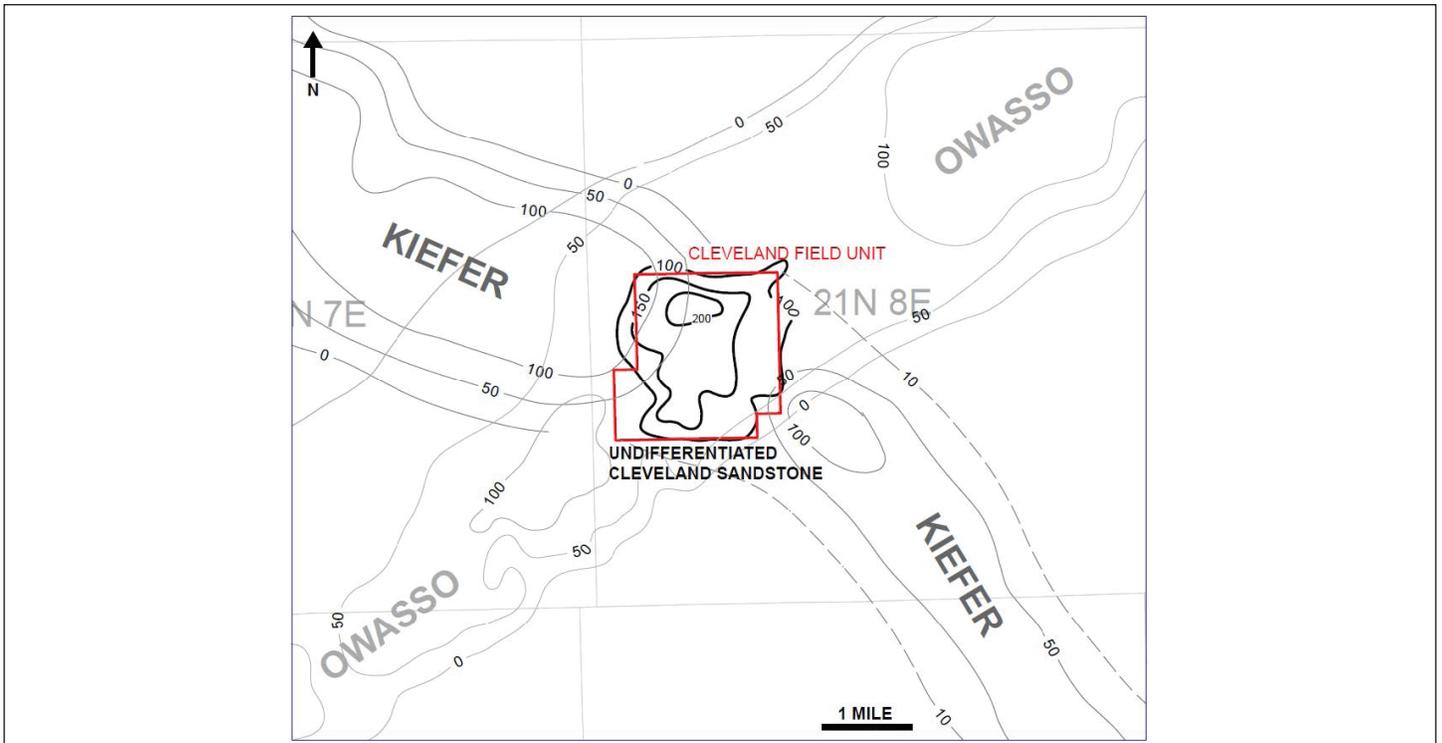


Figure 13. Map of the Kiefer and Owasso sandstone complexes intersecting at the Cleveland Field Unit, including the undifferentiated sandstone thickness within the Cleveland Field Unit. Contour interval = 50 ft.

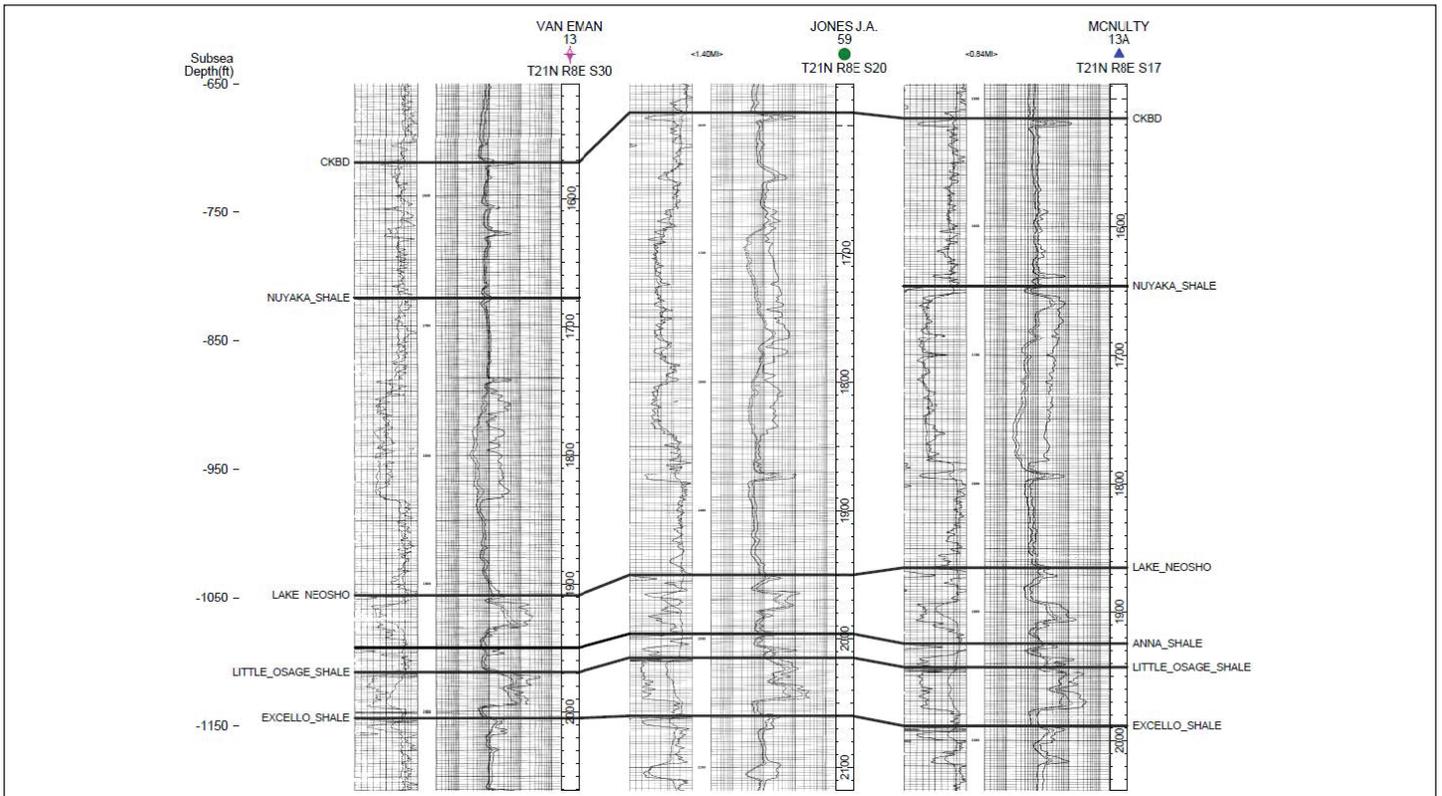


Figure 14. Cross section from the Cleveland Field Unit showing undifferentiated sandstone due to the absence of the Nuyaka Creek Shale marker bed.

(Continued)

The cores examined contained multiple erosional surfaces, representing high energy events at different depths, however, these surfaces cannot be correlated between the different cores from the Cleveland Field Unit, and none could be attributed to the major incision of the Kiefer sandstone complex. Adding to the difficulty of differentiating the two sandstone complexes in Cleveland Field, the mineralogy of the two sandstone complexes is very similar, which was verified by comparing outcrop thin sections first, and then to thin sections from Cleveland Field. Grain size, texture, and constituent grains are all comparable between the two sandstone complexes.

The discrepancy in production from the northern to southern portions of the field cannot be confidently attributed to the interaction of the Kiefer and Owasso sandstone complexes. As mentioned previously, the upper 50 feet of the Cleveland sandstone within the field contains the highest permeability and porosity and was the reservoir that was initially depleted by early development. This is evident through early completion reports and core cut in the 1960s. The Cleveland Field Unit is still producing several hundred barrels of oil per day because of bypassed zones within the sandstone interval that were stratigraphically trapped. As a result of large hydraulic fracture treatments, the less permeable zones produce at acceptable rates. In conjunction, a waterflood was initiated to aid in flushing movable oil through the bypassed intervals. Comparing the north wells to the south wells, it is clear that these bypassed zones are not present in the south due to the missing stratigraphic traps. The southern wells contain a transitional zone from interbedded sandstone and shale to cleaner sandstones near the top of the interval. The lower to middle sandstones are not apparent in the south. Based on core analysis from the Lucinda Martin #13, the upper sandstones are significantly more homogeneous and do not contain the same vertical permeability baffles that would result in trapped

oil. During initial completions in the south, the permeable rock was efficiently depleted. An additional hypothesis is that the structure resulted in buoyancy separation of associated gas, and had an effect on oil production. The highest structural closure is located in the southeast portion of the unit study area, and production and completion data indicate that this structure contained a gas cap of unknown size. Due to early development, this gas cap was not maintained; this allowed for oil migration into the gas cap and water influx into the highest permeability rock.

Based on the core data from older and recent cores, the lower sandstone intervals in the south maintained oil saturation due to lower quality reservoir rock (low permeability); however, the upper zones were swept and depleted and in some cases filled with water from cross-flow or other injection.

Cleveland Field Lithotypes

Based on the stratigraphic correlations, distribution patterns, and identification of lithotypes within the Cleveland sandstone, it is evident that the Owasso and Kiefer sandstone complexes were both incised valley systems that are interpreted to have formed by eroding previously deposited sediments during drops in sea level and filled during subsequent transgression or highstands. As a result, the complexes contain several depositional environments and changes in lithotype. The majority of the lithotype intervals are less than 5 feet thick (many being less than 1-foot-thick) and most changes between lithotype are abrupt. In many cases there are several lithotypes in 1 foot of core. The differentiation of each core into lithotypes is displayed in **Figure 16**. A cross section of the lithotypes was constructed to show the variation in lithotypes of each well (**Figure 15**). Establishing lithotypes in core aided in understanding the depositional environments that contributed to the complex sediment suites that comprise the Cleveland sandstone within these incised valleys.

Lithotype #1 (shale), which is mainly subjacent to the base of the sandstone interval as a marine shale that most likely predates the incision of the sandstone complexes. Based on the observed intervals, this marine shale signifies that the area was inundated by a significant body of water before major progradation and after deposition of the Marmaton Group carbonates. The thin shale intervals present within the sandstone intervals could indicate short-term increases in sea level, temporary abandonment of channels, or other low-energy environments. Without obvious environmental indicators, such as marine fossils, detailed environment of the shale remains unresolved.

Lithotype #2 (interbedded to interlaminated sandstone and shale) is more common at the base of the cored intervals in the southern Cleveland Field wells (Frazee #22 and Lucinda Martin #13) as an intermediate zone from the underlying marine shale to the cleaner fluvial sandstones in the upper interval. It is unclear if the boundary between the marine shale and the interbedded and interlaminated sandstone and shale is a conformable surface or the interbedded to interlaminated intervals are the first preserved strata that filled the valley. The interbedded and interlaminated sandstone and shales are believed to be the result of estuarine and tidal influences that occurred during backfilling of these valleys.

Lithotypes 4-6 (sandstone lithotypes with varying sedimentary features) are the more common lithotypes observed in the Cleveland sandstone cores and outcrops. They are fluvial and were deposited in channels. Varying levels of energy are represented.

Lithotypes 7 and 8 (shale clast and clay pebble conglomerates) are sporadic throughout the cored intervals. There is not a recognizable pattern of erosional surfaces and high energy events that resulted in the conglomerate intervals. These lithotypes indicate high energy events that deposited shale fragments

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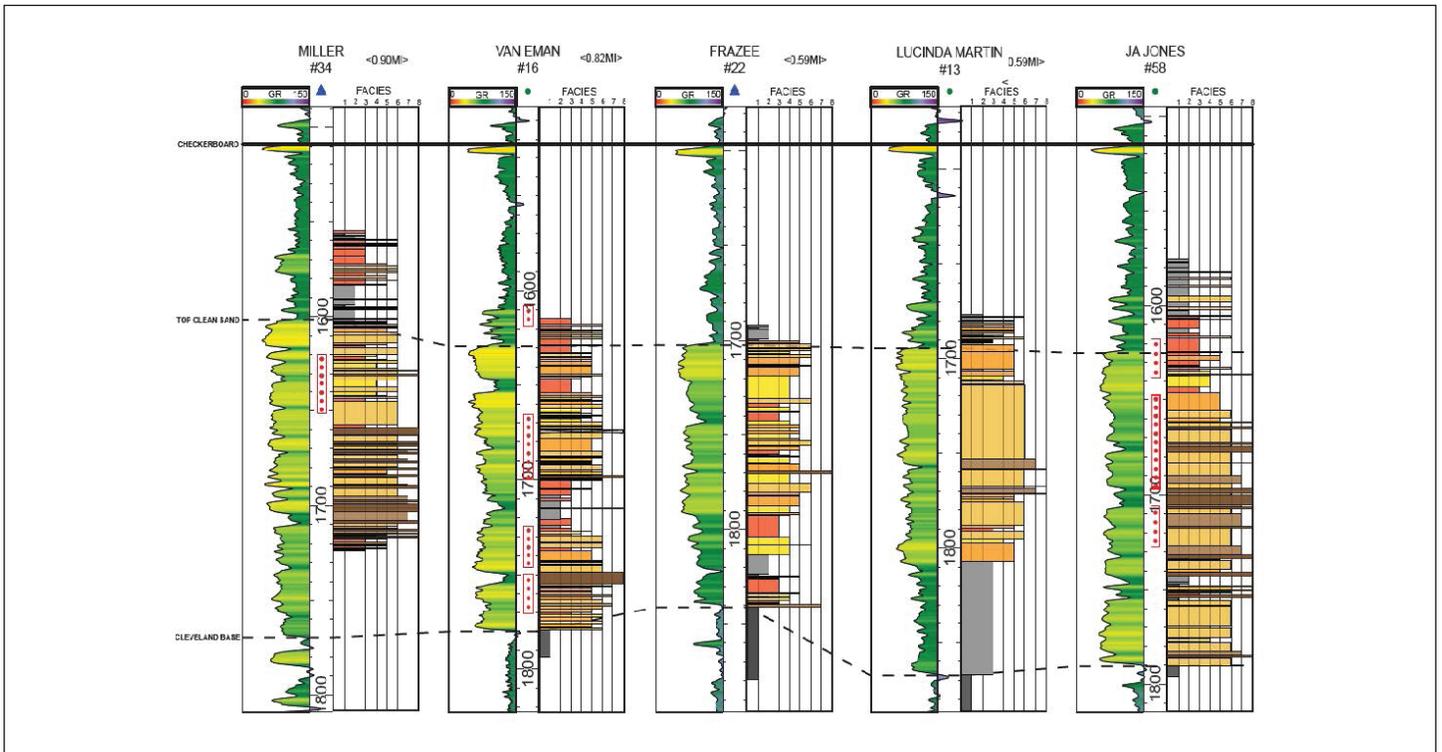


Figure 15. Cross section of the cored wells in Cleveland Field that show the lithotype in each core. Datum for the cross section is the Checkerboard Limestone and shows the significant variability in lithotypes over the cored interval. Perforations are shown in red.

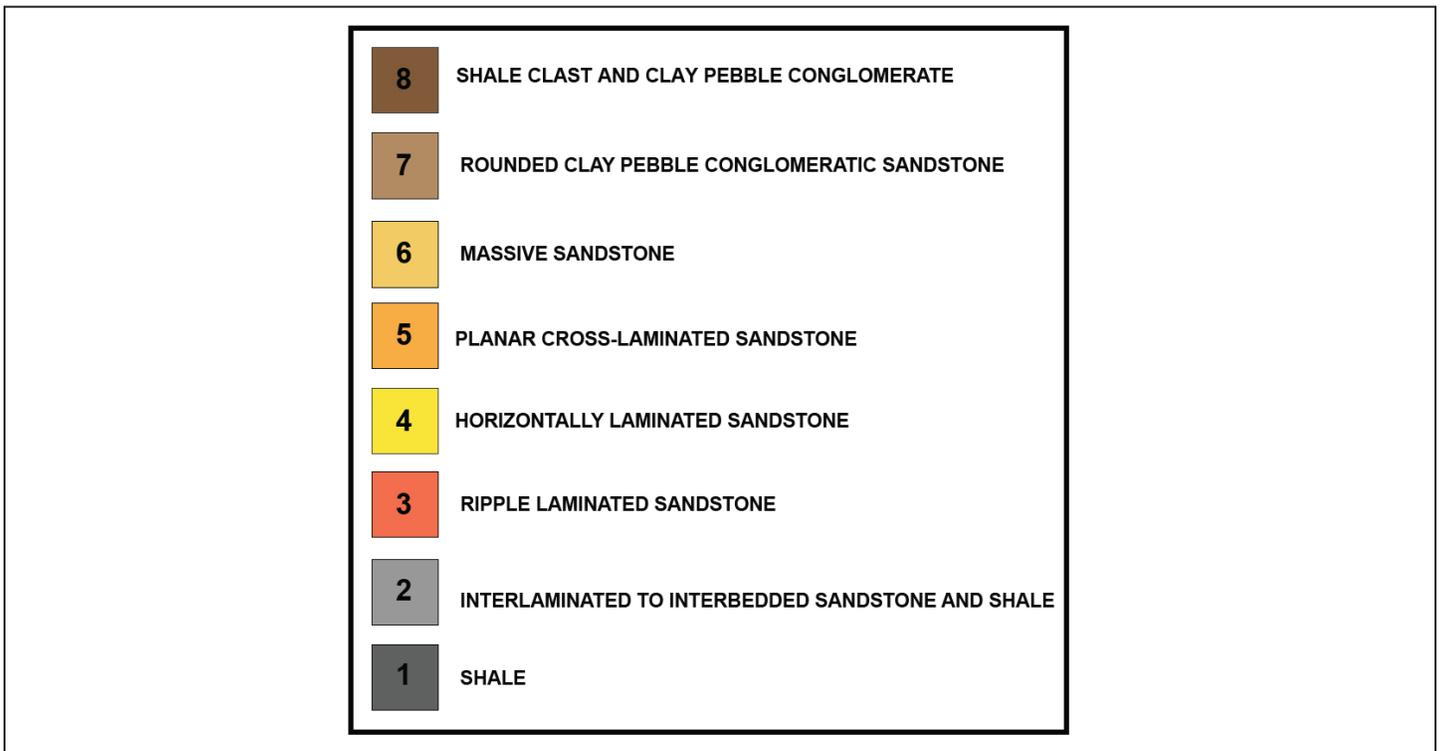


Figure 16. Lithotypes and color guide.

(Continued)

eroded from the channel walls or floor. These intervals were likely deposited following storms or other high energy events, but are generally less than 1 foot thick. Based on the angularity of shale clasts and preserved laminations in shale fragments, clasts were not transported far, suggesting these are the product of short-lived events.

Due to the significant variations in lithotypes across the cored intervals, stacking patterns of lithotypes were difficult to establish and when attempted, did not result in any meaningful interpretation of field wide patterns that could be used to interpret trends in production from the Cleveland Field Unit. Instead, emphasis was placed on identifying lithotypes that are targets for producing the Cleveland sandstone. Out of the five cored wells, only three are perforated and completed in the Cleveland sandstone (JA Jones #58, Van Eman #16, and Miller #34). Out of these, the Miller #34 is an injection well for the Cleveland sandstone waterflood. Therefore, the JA Jones #58 and Van Eman #16 were studied for the primary reservoir lithotypes. In the JA Jones #58, which produces approximately 50 barrels of oil per day, the completion interval primarily covers the massive sandstone, planar cross-laminated sandstone, and shale clasts conglomerate lithotypes. The shale and clay clast conglomerate intervals are commonly found adjacent to the massive sandstone facies, so this relationship is expected. In the Van Eman #16, which produces less than 5 barrels of oil per day, the primary reservoir lithotypes are the massive sandstone, planar cross-laminated sandstone, and thin intervals of ripple-laminated sandstones. The Miller #34 injection well was never produced, but the perforated interval (waterflood target) is composed of massive sandstone, horizontally-laminated sandstone, and thin ripple-laminated sandstone lithotypes.

CONCLUSIONS

This study incorporated multiple forms of subsurface and surface data in order to better understand the Cleveland sandstone interval in terms of stratigraphic framework and deposition. The ultimate goal of this study was to answer key questions about the production in the Cleveland Field Unit and whether certain discrepancies in production could be attributed to the two major sandstone complexes that cross the field. In the process of correlating and mapping the Kiefer and Owasso sandstone complexes, emphasis was placed on determining their respective ages in order to determine how they might interact in Cleveland Field. The key to determining which sandstone complex was older was recognizing the presence of the Nuyaka Creek Shale, which occurs above and is therefore younger than the Owasso sandstone complex. In contrast, the Nuyaka Creek Shale is eroded by the valley filled with the Kiefer sandstone complex, indicating the shale must be older based on cross-cutting relationships. The key findings of this study are:

1. The Kiefer and Owasso sandstone complexes filled incised valleys formed during times of regression and lowstand. The sandstone complexes backfilled with fluctuation in sea-level resulting in stacked sandstone complexes containing a number of depositional events related to fluvial to tidal processes.

2. The Owasso sandstone complex was deposited as part of the Marmaton Group and should not be classified as a Cleveland sandstone.

3. The Kiefer sandstone complex was deposited as part of the Skiatook Group (Missourian Series) and is considered to be true Cleveland sandstone.

4. The Nuyaka Creek Shale is a regionally extensive, stratigraphic marker bed that was crucial in determining that the Owasso sandstone complex is the older complex deposited during Marmaton

time and that Kiefer sandstone complex incised through it.

5. Marmaton Group carbonate paleogeography greatly influenced the deposition of the Marmaton aged sandstones, including the Owasso sandstone complex.

6. The contact of the Kiefer sandstone complex with the Owasso sandstone complex was unidentifiable in the Cleveland Field Unit, even with multiple cored wells and modern wireline logs.

7. The production discrepancies in the Cleveland Field Unit cannot be confidently attributed to the interaction between the Kiefer and Owasso sandstone complexes due to the difficulty in differentiating the two complexes in core data.

8. The primary factor in better production in the north half of the Cleveland Field Unit is the presence of lower interval sandstone bodies that were bypassed by early development and exploitation due to stratigraphic trapping. These sandstone bodies are not present in the same position in the south and southeastern portions of the field.

9. The structural high present in the southeastern portion of the Cleveland Field Unit resulted in a gas cap that was “blown down” (depleted) by early development. This gas cap was then filled with injected water resulting in water-filled high permeability sandstones near the top of the interval.

10. Eight lithotypes were identified within cores from the Cleveland Field Unit wells. The lithotypes range from shales and interlaminated sandstone and shales to massive sandstones. The majority of the lithotypes observed in core were also observed in the Collinsville Lake and Jenks outcrops.

11. The primary reservoir lithotypes for the Cleveland sandstone include the massive sandstone, planar cross-laminated sandstone, horizontally-laminated sandstone, and ripple-laminated sandstone. ■

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In accordance with the SIPES Constitution, By-Laws and Code of Ethics, the following list includes a new member who has been unanimously approved by the SIPES Membership Committee during the last quarter. This member has completed the 30-day waiting period and we welcome him as a new member of the Society.

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