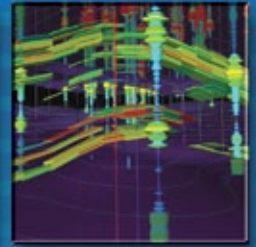
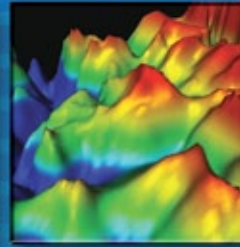
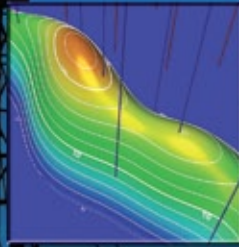
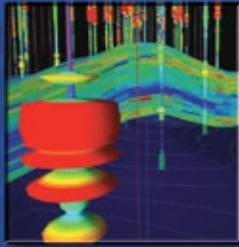
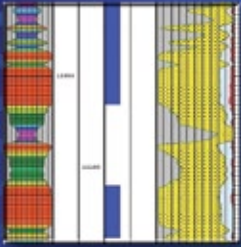




WILLIAM M. COBB & ASSOCIATES, INC.

Worldwide Petroleum Consultants



*Industry Leader in Reservoir Engineering,  
Formation Evaluation, and Geological Services  
for the Oil & Gas Industry.*

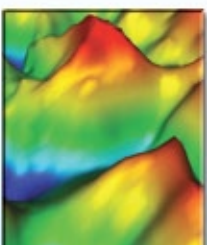
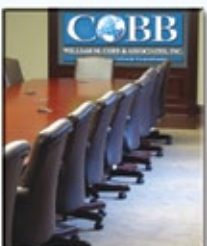
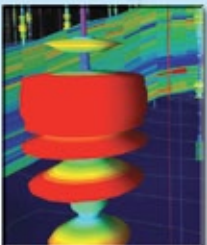
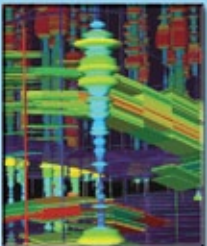
# Important Reasons to Consider Cobb & Associates

## **Technical Competence:**

**We are recognized for our ability to identify and solve complex problems.**

## **Experienced:**

**We possess the breadth of experience and expertise to provide objective and practical solutions and real answers, not "hunches."**



## **Cobb & Associates Services Provided to Assist With:**

- **Reservoir Management**
  - Reservoir analysis
  - Waterflood Field studies
  - Reservoir simulation
  - Gas field studies
  - Unitization studies
  - Pressure transient test analysis
  - Enhanced oil recovery
  - Project management
  - Reservoir surveillance programs
  - Worse Case Discharge (WCD) Modeling
  - Waterflood Feasibility Workshops
  - Gas Storage field planning and, evaluation
  - CO<sub>2</sub> Sequestration Candidate evaluation
- **Financial Decisions**
  - Property evaluations
  - Property acquisitions
  - Property sales
  - Reserve estimates
  - Investment analysis and economic evaluation
  - Due diligence
- **Geological Evaluation and Reservoir Characterization**
  - Field development studies
  - Petrophysical analysis
  - Core interpretation; SCAL program design and oversight
  - Formation evaluation programs
  - Exploration and evaluation programs
  - Basin studies
- **Training**
  - Waterflooding: Performance Predictions and Surveillance
- **Technical Representation**
  - Engineering and management committees
  - Expert witness testimony
  - Mediation

**Responsive:**

**We are good listeners; we help define the problem and respond accordingly.**

**Provide Value:**

**We are able to identify the important factors which drive the outcome, thereby allowing us to quickly focus on the major issues and develop solutions in a timely and cost-efficient manner.**

**Added Value:**

**In many instances, we are able to recognize and identify undeveloped potential outside the scope of the original study.**



## **Waterflooding: Performance Predictions and Surveillance**

This five-day course covers the reservoir engineering aspects of waterflooding. The seminar combines geology, rock and fluid properties, and immiscible displacement theory to develop waterflooding prediction techniques and to aid in the evaluation of actual waterflood performance behavior. Detailed predictions of oil and water producing rates, water injection rates, and recovery efficiency (areal, vertical, and displacement), and an analysis of other variables which control recovery efficiency are included. Also discussed are waterflood surveillance techniques such as production plots, WOR analysis, floodable pore volume versus primary depletion pore volume, injection profile testing, pressure transient testing, step-rate testing, Hall plots, pattern balancing, bubble maps, volumetric sweep evaluation, and injection efficiency determination. These surveillance techniques provide the

engineer with data required for the efficient management of both new and mature waterfloods. Several waterflood case studies are reviewed.

The course is ideally suited for engineers and geologists with several years of waterflood experience; however, the course is presented in a manner so that both beginning and experienced personnel will find the material very useful. The course content and example problems have been selected to teach and illustrate important concepts.

This course is available to the public several times a year; check our schedule at [www.wmcobb.com](http://www.wmcobb.com) for the next upcoming course. Upon special request this course can be taught in house, please contact us for more information.

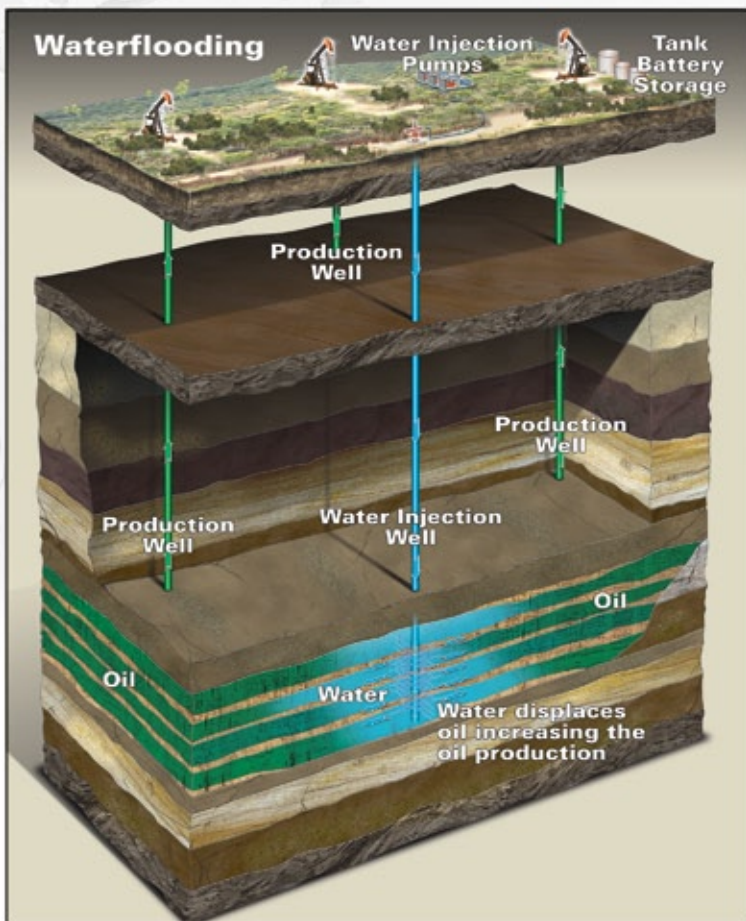


Illustration: Designs by Mote, Inc.

### **Instructors**



William M. Cobb, Ph.D., P.E.



Michael L. Wiggins, Ph.D., P.E.

### **Course Outline**

- Factors Controlling Waterflood Recovery
- Review of Rock Properties and Fluid Flow
- Determination of Oil in Place
- Mechanism of Immiscible Fluid Displacement (displacement sweep)
- Flood Patterns and Areal Sweep Efficiency
- Reservoir Heterogeneity
- Injection Rates and Pressures
- Waterflood Performance Prediction
- Waterflood Surveillance
- Planning a Waterflood



## Areas Worked



### United States

Alabama (including Coalbed Methane)	Kentucky	Oklahoma
Alaska (Cook Inlet; North Slope; Prudhoe Bay)	Louisiana (including Gulf of Mexico)	Oregon
Arkansas	Michigan	Pennsylvania
Arizona	Mississippi (including Deep Sour Gas)	South Dakota
California (Coalbed Methane; Offshore; Onshore)	Montana	Texas (including Gulf of Mexico)
Colorado (including Coalbed Methane)	Nebraska	Utah
Florida	New Mexico (including Coalbed Methane)	Virginia
Illinois	New York	West Virginia
Indiana	North Dakota	Wyoming
Kansas	Ohio	

### International

Angola	Equatorial Guinea	Qatar
Argentina	Egypt	Russia
Australia	France	South Africa (Offshore)
Azerbaijan	Guatemala	Syria
Bangladesh	Honduras	Thailand
Barbados	Indonesia	Trinidad
Belize	Irish Sea Malaysia	Tunisia
Bolivia	Mexico	U. K. (Onshore)
Brazil	New Zealand	United Arab Emirates
Canada (including oil shale)	Nigeria	Venezuela
Colombia	North Sea	Western Siberia
Congo	Oman	Viet Nam
Dubai	Peru	Yemen



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## ***Technical Team***



## **Dr. Michael L. Wiggins**

**Dr. Michael L. Wiggins** currently serves as President of William M. Cobb & Associates, Inc. (Cobb & Associates). He has over 30 years of professional experience in academia and the upstream oil and gas industry including drilling, production, and reservoir engineering. His industry experience includes employment with major and independent E&P companies and he has been offering petroleum engineering consulting services to the industry for over 20 years. His technical interests include reservoir management and engineering, production operations, well performance, and production optimization.

Before joining Cobb & Associates in 2006, Mike was a professor of petroleum and geological engineering at the University of Oklahoma, serving on the faculty for 15 years. In this role, he taught courses and conducted research related to reservoir engineering, production operations, and petroleum project evaluation. He has co-authored numerous papers in his areas of expertise and received research funding from various governmental agencies, international oil companies, and national oil companies. In addition, he has conducted numerous short courses in the areas of reservoir management, reservoir engineering, waterflood design and evaluation, well completions, production operations, and petroleum project evaluation.

Mike is a Distinguished Member of the Society of Petroleum Engineers (SPE) and has served on the SPE Board of Directors. He has been the Executive Editor for SPE Production and Facilities and has served as a technical editor for SPE since 1991. He has served on numerous program committees for SPE technical meetings and served as the General Chairman for the 2003 SPE Production and Operations Symposium.

Mike is a registered professional engineer in the states of Texas and Oklahoma. His activities at Cobb & Associates include reservoir studies, oil and gas reserve evaluations and audits, improved recovery design, educational courses, and litigation support including expert witness services.

### **EDUCATION**

Ph.D. Petroleum Engineering  
Texas A&M University, May 1991

M.Eng. Petroleum Engineering  
Texas A&M University, August 1988

B.S. Petroleum Engineering  
Texas A&M University, May 1979



## **Dr. William M. "Bill" Cobb**

**Dr. William M. "Bill" Cobb** is President Emeritus of William M. Cobb & Associates, Inc. (Cobb & Associates). Bill has over 40 years of experience as a petroleum engineering consultant specializing in waterflooding, pressure transient analysis, and property management. He has conducted numerous one-week short courses on the subjects of waterflooding, pressure transient analysis, and petroleum economics. His industry experience includes employment with major and independent oil companies.

In 1983, he formed William M. Cobb & Associates, Inc. and served as President until his retirement in December, 2010. During this period he oversaw the growth of the firm from startup to an internationally recognized petroleum engineering and geological consulting firm.

Bill served on the petroleum engineering staff at Mississippi State, where he taught reservoir engineering courses. He has served on numerous committees for the SPE, including the Reservoir Engineering Program Committee, Publications Review Committee, Distinguished Author Series Committee, and Chairman of the Formation Evaluation Committee. Dr. Cobb was the 2008 SPE President and a member of the Board of Directors. Previously he served as Vice-President of Finance for SPEI. He also served as a Distinguished Lecturer for SPE member in 1995. In 1999, he was presented with the SPE Reservoir Engineer Award. He is currently an adjunct professor of Petroleum Engineering at Texas A&M University.

Bill received B.S. and M.S. degrees from Mississippi State University and a Ph.D. from Stanford University, all in Petroleum Engineering.

### **EDUCATION**

Ph.D., Petroleum Engineering  
Stanford University, January 1971

M.S., Petroleum Engineering  
Mississippi State University, August 1967

B.S., Petroleum Engineering  
Mississippi State University, January 1966



## **Frank J. "Deacon" Marek**

**Frank J. "Deacon" Marek** is a Senior Vice President of William M. Cobb & Associates, Inc. (Cobb & Associates). He has over 30 years of industry experience with a focus on reservoir engineering and field studies. Deacon has worked as an employee or as a consultant for independent oil companies, major oil companies, and national oil companies on domestic and international projects. He has been a consulting reservoir engineer since joining William M. Cobb & Associates, Inc. in 1985.

At Cobb & Associates, Deacon has performed oil and gas reserve studies and field studies for independent, major, and national oil companies. Various types of studies include year-end reserve studies, acquisition/divestiture analysis, litigation and regulatory support, and enhanced recovery studies. Waterflood feasibility and optimization studies have become a specialty of Deacon's. He has conducted more than 50 waterflood workshops in recent years, assisting clients in quickly identifying and quantifying the waterflood potential of their oil properties. Deacon has also conducted numerous field-wide waterflood studies for domestic and international projects.

Deacon also has considerable experience with producing oil and gas properties in the Gulf of Mexico, on the shelf and in deep water. He has recently been instrumental in assisting clients with new well permitting issues, specifically with new worst case discharge (WCD) calculations required by the Bureau of Ocean Energy Management.

Deacon is a member of the Society of Petroleum Engineers (SPE) and the Society of Petroleum Evaluation Engineers (SPEE). He has served as Chairman of the Dallas section of both organizations, and he was General Chairman of the SPE's Hydrocarbon Economics and Evaluation Symposium in 1999. Deacon has received SPE's Section and Regional Service Awards, and he was the SPE Dallas Section Outstanding Engineer in 2005.

Deacon is a registered professional engineer in the state of Texas.

### **EDUCATION**

B.S., Petroleum Engineering  
Texas A&M University, May 1977



## **M. Fred Duewall**

**M. Fred Duewall** is a Senior Vice President of William M. Cobb & Associates Inc. (Cobb & Associates). He is a registered professional engineer with over 38 years of experience in the oil and gas industry. Fred's primary responsibility is to prepare reserve reports for companies that need to quantify recoverable oil and gas reserves, project future cash flows, and assess value attributable to petroleum assets. He specializes in auditing petroleum assets for lending institutions and determining the value of properties for potential acquisition or sale.

Fred has performed evaluations to estimate recoverable reserves and future production from reservoirs with primary, secondary, and tertiary recovery operations. He has prepared reserve studies and reports for properties throughout the continental United States, Gulf of Mexico, and in many international locations.

Prior to joining Cobb & Associates in 1991, Fred held increasing levels of responsibility with both major and independent E&P companies, and another consulting firm. His industry experience includes the optimization, design, and installation of oil and gas production facilities, pipelines, gas processing plants, and treating facilities. He has provided technical assistance to marketing groups and understands hedge and derivative contracts. He has conducted reservoir engineering studies to maximize production and optimize oil and gas recovery from many different types of reservoirs, both conventional and unconventional, his entire career.

Fred is a member of the Society of Petroleum Engineers (SPE) and the Society of Petroleum Evaluation Engineers (SPEE), and has served on the SPEE Board of Directors. He is a registered professional engineer in the state of Texas.

### **EDUCATION**

B.S., Mechanical Engineering, with honors  
Texas A&M University, May 1983



## **Randal M. "Randy" Brush**

**Randal M. "Randy" Brush**, a Senior Vice President of William M. Cobb & Associates, Inc. (Cobb & Associates), has over 30 years of petroleum industry experience, both as a reservoir engineering consultant with Cobb & Associates since 1995 and as an engineer and manager at Atlantic Richfield Company from 1980 to 1995. He uses engineering analysis, mathematical modeling, and appropriate data collection and analysis techniques to evaluate the injection of gas and water into underground geologic formation and the production of oil, gas, and water from those formations.

Randy specializes in reservoir evaluation, management, and simulation studies to estimate oil and gas reserves, and provides ultimate recovery estimates by predicting reservoir performance under alternate development plans and various reservoir drive mechanisms. These evaluations typically relate to water injection projects, enhanced oil recovery projects (such as those using CO<sub>2</sub>, hydrocarbon gas, polymer, and steam injection), gas storage projects, field redevelopment, and CO<sub>2</sub> sequestration. Recent projects include several simulation-based redevelopment evaluations of both sandstone and carbonate reservoirs; gas storage evaluations in Kansas, Texas, Colorado, and Wyoming; domestic and international reserves certifications using both deterministic and probabilistic techniques; CO<sub>2</sub> miscible and immiscible flood evaluations of both domestic and international properties; reviewing oil and gas reservoirs for CO<sub>2</sub> sequestration; analytical screening studies of waterflood candidates; and the successful unitization proceedings for several Texas waterflood projects.

Randy has served as an expert witness on a number of domestic and international projects, and has testified before several state and Federal courts, regulatory agencies, and legislative bodies. He is a member of the Society of Petroleum Engineers (SPE), where he has been a technical review committee member and Session Chairman of the Annual Technical Conference and Exhibition since 1999, and the Society of Petroleum Evaluation Engineers. Randy has several SPE technical papers and publications, and is a registered professional engineer in Texas.

### **EDUCATION**

M.S., Petroleum Engineering  
Stanford University, January 1981

B.S., Chemical Engineering, with honors  
Rice University, May 1978



## **Donald L. Bailey**

**Donald L. Bailey** is currently the Senior Vice President of Geosciences for William M. Cobb & Associates, Inc. (Cobb & Associates). Don has over 30 years of continuous professional experience in the upstream petroleum industry, including exploration and production in various basins worldwide. He has been a geosciences consultant for over 14 years.

Before joining Cobb & Associates in 1996, Don was employed by Chevron in California, Houston, and Saudi Arabia. During his tenure with Chevron, he was responsible for exploration evaluation and lease management for offshore California, reservoir development for onshore California and Texas, and reservoir description and waterflood maintenance for the eastern onshore reservoirs of Saudi Arabia. Don has experience in a wide range of carbonate, siliciclastic, and unconventional reservoirs.

Don specializes in reservoir characterization through integrated interpretation of log and core analysis data, subsurface and seismic mapping, and cross section studies. His geoscience expertise includes: reservoir characterization, geostatistics, and 3D earth modeling using Petrel software; siliciclastic, carbonate, and shaly sand formation evaluation/log analysis; 2D and 3D seismic interpretation; structural mapping in a variety of regimes; regional stratigraphic studies and sequence stratigraphy applications; fractured reservoir analysis; siliceous shale oil recovery; waterflood and enhanced recovery evaluation and management; gas storage evaluation and management; and exploration economic evaluation and decision analysis.

Don also has extensive legal support experience in equity disputes, arbitration, and litigation, including expert witness testimony. He is a registered professional geologist in the state of Texas. Don is a member of the American Association of Petroleum Geologists (AAPG) and the Society of Petroleum Engineers (SPE).

### **EDUCATION**

M.B.A.

California State University, Bakersfield, June 1996

Completed M.S. Coursework, Geology

University of Southwestern Louisiana May 1980

B.S., Geology

Millsaps College, May 1978



## **Robert E. Williams, Jr.**

**Robert E. Williams, Jr.** is currently a Senior Geologist for William M. Cobb & Associates, Inc. (Cobb & Associates). Robert has over 14 years of experience as a consultant geologist in exploration and production in a variety of basins throughout the world.

Before joining Cobb & Associates in 2001, Robert was employed by Gaffney-Cline & Associates (GCA) in Dallas. During his time at GCA, he was responsible for digitizing or creating structure and net pay maps for reservoir volumetric calculations. While with GCA, Robert acquired significant Russian well log experience. Robert worked closely with the engineers to determine reservoir characteristics. He also was an assistant system administrator helping with daily operations (email server, data server), as well as technical support for approximately 25 employees on various software.

Robert specializes in generating maps using various software packages, Geographix, Petra, and SMT. He is responsible for reservoir characterization through integration of core, well log, and seismic data. He has experience organizing and maintaining digital databases and data rooms for acquisitions, divestitures and legal support. His geoscience expertise includes: structural, isopach and reservoir parameter mapping; 2D and 3D seismic interpretation; well log interpretation; cross section interpretation and construction; worse case discharge (WCD) calculations for GOM drilling permits; and technical spreadsheet data evaluation.

Robert is also the system administrator at Cobb & Associates. His daily responsibilities include maintaining our email server, data server, network, printers, website, phone system, and voice mail system. He also provides hardware and software technical support for all users.

Robert has legal support experience in equity disputes, arbitration, and litigation. He is a registered professional geologist in the state of Texas. He is a member of the American Association of Petroleum Geologists (AAPG) and the Society of Petroleum Engineers (SPE).

### **EDUCATION**

B.S. in Geology

Oklahoma State University – Stillwater, Oklahoma Dec. 1991



## **Brian D. Nicoud**

**Brian D. Nicoud** is currently senior geological and petrophysical advisor at William M. Cobb & Associates, Inc. (Cobb & Associates). He has over 25 years of professional experience in the upstream oil and gas industry. His industry experience includes employment with both large and small service companies, consulting firms, and an independent E&P company. His technical interests include all aspects of development geology, petrophysical evaluation of various reservoir types, and clastic and carbonate sedimentology and stratigraphy.

Before joining Cobb & Associates in 2006, Brian was manager of Reservoir Geology for Core Laboratories' US Geology Group. In this capacity, Brian managed the geologic and petrophysical evaluation of reservoir rocks from around the world, including gas shales, tight gas sands, unconsolidated sands and carbonate reservoirs of varying quality. He taught courses and conducted research related to reservoir rocks and their evaluation.

Brian is a registered professional geoscientist in the state of Texas. His activities at Cobb & Associates include reservoir characterization studies, core studies, special core analysis (SCAL) program design and oversight, performing and coordinating petrophysical, geological and geophysical studies, integration of core data in support of petrophysical, geological and engineering evaluations, reservoir development planning, reservoir simulation, reserve and financial evaluation and, litigation support including expert witness services.

Brian is a long-time member of the American Association of Petroleum Geologists (AAPG), the Dallas and Houston Geological Societies, the Society of Petroleum Engineers (SPE) and the Society of Petrophysicists and Well Log Analysts (SPWLA). Mr. Nicoud currently (2010-11) serves as Vice President of the Dallas chapter of the SPWLA.

### **EDUCATION**

Completed M.S. Course work, Geosciences  
University of Texas at Dallas, May 1987

B.S. Geosciences  
University of Texas at Dallas, May 1982



## **Brent W. Hale**

**Brent W. Hale** currently serves as senior engineering advisor at William M. Cobb & Associates, Inc. (Cobb & Associates). He has over 30 years of professional experience in reservoir engineering and has specialized in vertically fractured gas well analysis, horizontal well analysis and coal bed methane well analysis. He has experience with coal bed methane reservoirs in Colorado, New Mexico, Wyoming, Oklahoma, and Kansas. He has studied low permeability and shale gas reservoirs in Colorado, Kansas, Louisiana, New Mexico, North Dakota, Michigan, Oklahoma, Pennsylvania, Texas, and Wyoming. He has managed production operations and environmental, health, and safety operations with significant work with governmental agencies.

Before joining Cobb & Associates, he was a director with the Williams Companies with various responsibilities including production operations, environmental, health, and safety operations, and reservoir engineering and geologic services with a focus on acquisition and development of oil and gas properties.

Brent is a member of the Society of Petroleum Engineers (SPE), the Society of Petroleum Evaluation Engineers (SPEE), and the American Association of Petroleum Geologists (AAPG). He has served as section chairman of the Salt Lake Section of the Society of Petroleum Engineers and has served on the SPE Gas Technology Committee. He has also served on the SPEE Resource Play Evaluation committee. He has authored or co-authored technical papers dealing with low permeability gas reservoirs, shale gas reservoirs, and coal seam gas reservoirs.

Brent is a registered professional engineer in the states of Texas and Utah. His activities at Cobb and Associates include reservoir studies, oil and gas reserve evaluations and audits, environmental sound mitigation studies, and litigation support including expert witness services.

### **EDUCATION**

M. S., Petroleum Engineering  
University of Wyoming, May 1979

B. S., Petroleum Engineering  
University of Wyoming, May 1976



## **Andrea Mielcarek**

**Andrea S. Mielcarek** joined Cobb & Associates in May of 2009 as a staff engineer. In this role she supports projects including SEC reserve reporting, property evaluations for sales and acquisitions, and due diligence reviews for lending institutions. Her experience includes oil and gas reserve estimation and economic evaluation through traditional reservoir engineering methods. Andrea is proficient in the AIRES and PHDWin economic software packages.

Prior to joining Cobb & Associates, Andrea worked as a manufacturing process engineer for 3M where she supported daily manufacturing operations, managed product quality issues and led process optimization projects.

### **EDUCATION**

B.S. Chemical Engineering  
Texas A&M University, May 2005

## **Associates**

### **Engineering:**

- **H. James “Jim” Davitt** – Ph.D. degree in Chemical Engineering from Purdue University. Over forty (40) years of technical and supervisory experience with major oil and gas companies and consulting. Jim has extensive reservoir modeling experience on complex hydrocarbon systems and full-field compositional reservoir simulation using equation-of-state descriptions. Jim is very accomplished at integrating geophysical and geological, petrophysical, and engineering data for optimum reservoir development and management.
- **Doug Hess** – ABD, M.S. and B.S. degrees in Nuclear Engineering/Health Physics from Texas A & M University. Over twenty (20) years of supervisory and technical experience in light/heavy oil and gas operations with experience in reservoir management, acquisitions/divestitures and planning.

### **Geology, Geophysics, and Petrophysics:**

- **J. Frederick “Rick” Sarg** – Ph.D. degree in Geology from the University of Wisconsin. Over thirty (30) years of extensive petroleum exploration and production experience in research, supervisory, and operations assignments. Rick was a member of the exploration research group that developed sequence stratigraphy, where his emphasis was on carbonate sequence concepts. He has authored or co-authored twenty-seven (27) papers on carbonate sedimentology and stratigraphy.
- **Joseph R. “Joe” Davis** – Ph.D. degree in Geology from the University of Texas. Over thirty (30) years of technical and supervisory experience with major oil and gas companies, independent oil and gas companies, and consulting. Joe is an expert geophysical interpreter and has wide-ranging geophysical and geological experience in a variety of basins worldwide. Joe has extensive experience as an expert witness in legal disputes and arbitration.