

# **Williston Basin Advanced Core Analysis and Well Log Consortium**

**North Dakota Oil and Gas Research Council Review  
Meeting  
August 20, 2013  
Bismarck, ND**

# Petroleum Engineering

- Vision – World class petroleum geoscience and engineering education and research program that provides graduates and technical solutions/technologies to ensure the continued growth of the petroleum industry in North Dakota
- Building blocks
  - People – hired faculty and research staff (14)
  - Equipment – state-of-the-art (being installed)
  - Facilities – planning stages for new building
  - Research programs – aimed at industry and government needs

# UND Petroleum Engineering Department

- Approximately 200 students (fall 2013)
- Initiated a PhD program and MS in progress
- Utilizes staff research scientists and engineers in addition to faculty and undergraduate/graduate students to execute and complete research projects and programs
- 45% of faculty time is devoted to research (UND is a research university)
  - Essential for faculty development
  - Knowledge transfer to the classroom and labs
  - Benefit to industry
- Developing research program
  - Equivalent to the best petroleum engineering programs in the world

# Program Goals

- Collect a uniform set of petrophysical data on the Bakken, Pronghorn Member, and Three Forks Formation
  - Improved geologic understanding of the formations
  - Improved hydraulic fracturing design
  - Assist in future exploration
  - Geographical differences in Williston Basin
  - Student involvement
  - Dataset to compliment existing data (USGS, etc.)

# Project Task Structure

- Task 1. Project Management and Coordination
- Task 2. Strategic Core and Cuttings Selection
- Task 3. Core and Cuttings Characterization
- Task 4. Data Integration and Distribution
- Task 5. Student Projects - Industry Directed

# Project Description

- 15-30 cores/well cuttings
- Core/cuttings selected by project sponsors
- Core and cuttings characterization
- Data compilation/analysis
- Industry directed student projects (Task 5)
  - Small “spin-off” projects identified as the project progresses
  - Ideas generated at biannual meetings

# Project Description

- State of the art lab
  - Equipment for current and future research
  - Equivalent to other petroleum engineering programs
  - Train next generation geologists and petroleum engineers

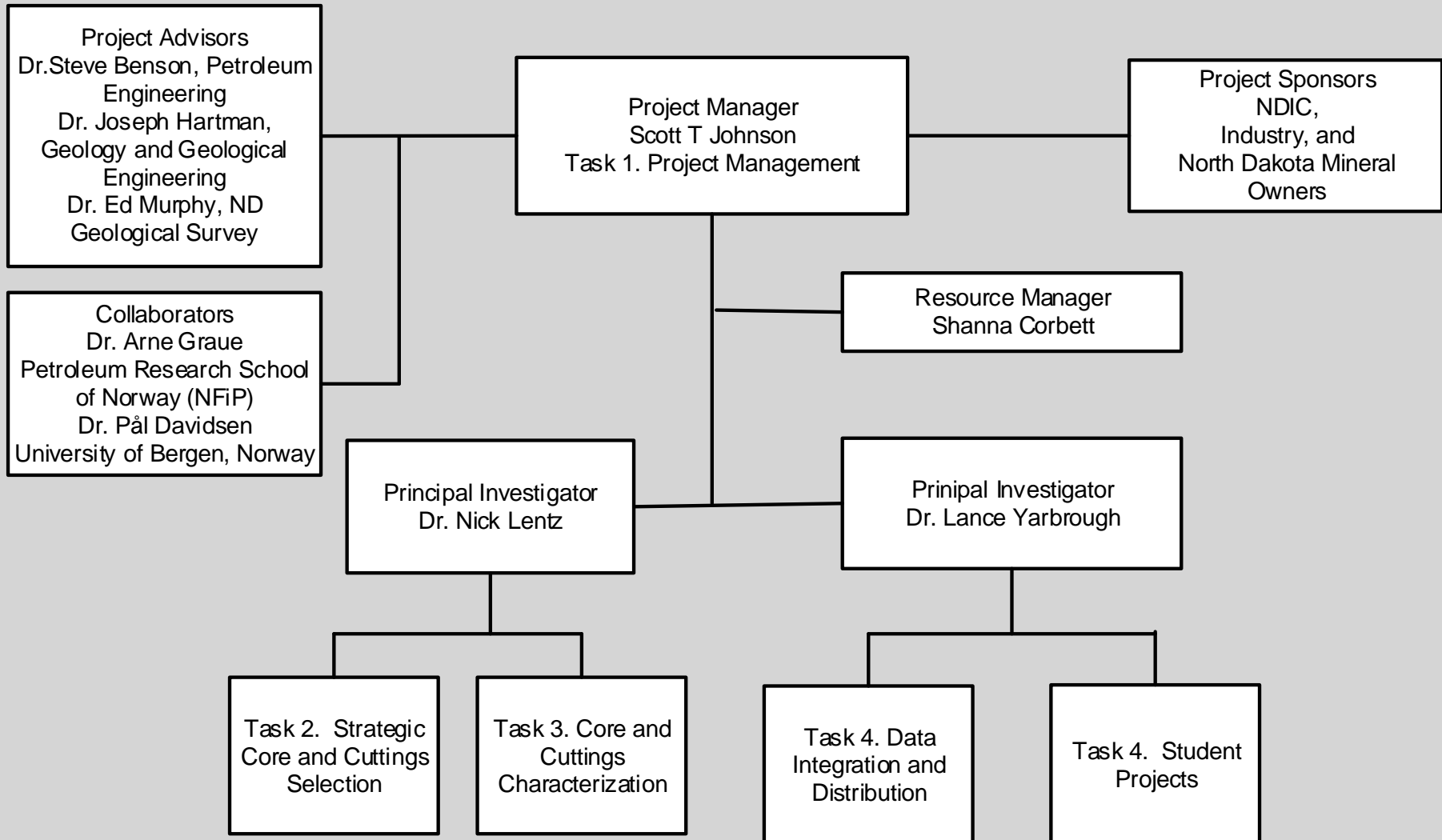
Analysis Technique	Petrophysical Properties Determined
X-Ray Fluorescence (XRF)	Major, minor, and trace elements
Nuclear Magnetic Resonance (NMR)	Pore size distributions, effective porosity, capillary pressure, free fluid index (FFI), bulk volume irreducible (BVI), clay bound water (CBW), hydrogen index permeability, 2-D data mapping (fluid typing)
Core Gamma Ray Logger	Total and spectral gamma
Vitrinite Reflectance	Kerogen age and maturity
X-Ray Diffraction (XRD)	Bulk mineralogy
Scanning Electron Microscopy (SEM)	Porosity and permeability
Triaxial Apparatus	Advanced sonic (Sonic Scanner) logs
Computed Tomography (CT) Scanner	Bulk density, porosity, lithology, and fractures mapping

# Alignment with OGRC Goals

- Education
  - Develop the next generation of ND geologists and petroleum engineers
- Development of baseline information
- Positively effect ultimate recovery
  - Improved geologic understanding of the formations
  - Improved hydraulic fracturing design
  - Assist in future exploration and hydrocarbon recovery



# Management Structure



# Budget

Project Associated Expense	NDIC's Share	Applicant's Share (Cash)	Applicant's Share (In-Kind)	Other Project Sponsor's Share
Personnel	874,170			211,689
Operating	31,626			694,109
Total Direct	905,796			905,798
F&A	344,202			344,203
Total Cost	\$1,249,998			\$1,250,001

- \$250K per year from ND OGRC
- \$250K per year from Industry Sponsors

# Industry Sponsors

- 50% cost share is secured (\$250K per year total)
- Murex
- Hunt Oil
- Statoil
- Whiting
- Hess
- Continental Resources
- ND Mineral owner via UND Alumni Foundation

# Schedule

	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Task 1				D1				D2				D3				D4				M13
Task 2	M1																			
Task 3						M3	M4	M5		M6	M7		M8		M9		M10			
Task 4																		M11	M12	
Task 5			M2																	

Milestone	Planned Completion Date
M1: Finalize core and cuttings selection	12/31/2013
M2: Identify first student project	5/31/2014
M3: Complete gamma ray data collection	3/31/2014
M4: Complete XRF data collection	6/30/2015
M5: Complete XRD data collection	9/30/2015
M6: Complete vitrinite reflectance data collection	3/31/2016
M7: Complete NMR data collection	6/30/2016
M8: Complete SEM data collection	12/31/2016
M9: Complete seismic data collection	6/30/2017
M10: Complete high resolution imaging	12/31/2017
M11: Develop draft database	3/31/2018
M12: Final database and integration with NDGS website	6/30/2018
M13: Issue final report	9/30/2018

# Deliverables

- Semiannual Meetings
  - Research reports and presentations
  - Collaboration and interaction opportunities between industry and UND Petroleum Engineering staff and students
- Topical and Final reports
  - Reports on selected projects
  - Continuation application – summary of research findings
  - Final Report
- Database
  - Large petrophysical dataset along with the high resolution images

# Technological and Economic Impacts

- New original data set collected through the current formations of interest on recent core and cutting samples
  - Compliment and build upon previous data
- Build strong research foundation at UND
  - Compete with other universities to attract quality students exposed to ND and the Williston Basin
  - Establish research lab with innovative equipment for future industry related research
- Cost savings through improved formation characterization and hydraulic fracturing design
- Framework for identifying IOR and EOR options

# Contact Information

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Questions