



NDSU



Proposal to Perform

Analysis of Oil Industry Practices, Production, Impacts and Tax Policy

October 2013



October 4, 2013

Senator Rich Wardner
Energy Development and Transmission Committee Chairman
ND State Capitol
600 East Boulevard Avenue
Bismarck, ND 58505-0360

Re: North Dakota Legislative Management Study

Dear Senator Wardner,

In anticipation of the 2015 Legislative Session, elected officials need accurate data to derive long-term tax policies that balance the needs of constituents and the oil and gas industry. Forecasting changes in enhanced oil production, maturation of oil development and technological advances in the Williston Basin requires a comprehensive understanding of the oil and gas industry, using indicators that are both quantitative as well as qualitative. KLJ has worked for more than 70 years in the Williston Basin for our communities and the industry. Our knowledge and understanding of the region comes from on-the-ground field intelligence, which provides invaluable insight to the study.

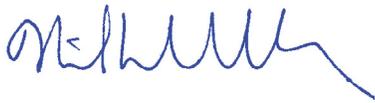
KLJ has assembled a team with strong knowledge of the oil and gas industry and comprehensive understanding of the physical infrastructure needs along with the regulatory, economic, political, environmental and social factors associated with oil and gas development. KLJ's expertise will be supplemented by a team of leading scientists and researchers from the University of North Dakota Energy & Environmental Research Center and North Dakota State University Department of Agribusiness and Applied Economics, which have all worked together on past projects. Our team's practical and theoretical expertise in industry, state government, engineering, social sciences and economics, complemented by our recent and relevant expertise in multiple North Dakota State initiated impact studies, makes the partnership a strong choice.

KLJ is uniquely positioned to offer unbiased factual field data resulting in a more comprehensive forecast. We are confident the study will provide a foundation for elected officials to have clear understanding of multiple variables to consider and analyze when creating future tax policies. Our baseline model will define a five-year window, which provides North Dakota Legislative Management with a view into the foreseeable future of oil and gas activity in the state while still maintaining reasonable forecast accuracy.

We are excited about the opportunity the study will have for the state of North Dakota, and look forward to working with your Committee. Please call 701 355 8400 with any questions.

Sincerely,

KLJ

A handwritten signature in blue ink, appearing to read 'Niles Hushka', written in a cursive style.

Niles Hushka, PE
CEO

A handwritten signature in blue ink, appearing to read 'Mike Wamboldt', written in a cursive style.

Mike Wamboldt, PE
Project Manager



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PROJECT UNDERSTANDING AND APPROACH



The North Dakota Legislative Assembly faces increasing pressure to distribute tax proceeds generated from the production of oil and gas to an ever-growing circle of constituents. Yet the demands to address infrastructure needs in the oil patch have not lessened, and in some ways have become even more extreme as local governments are simply unable to meet the growth demands on their own. At the same time, pressure builds on state legislators to distribute the state's largesse to other areas of the state also needing infrastructure funding. In addition, many other constituents, including the oil and gas industry, say that oil and gas related taxes in North Dakota should be cut in half. Ultimately, the issue needs to be addressed through a rational approach balancing future impacts to production and future funding needs of state and local governments.

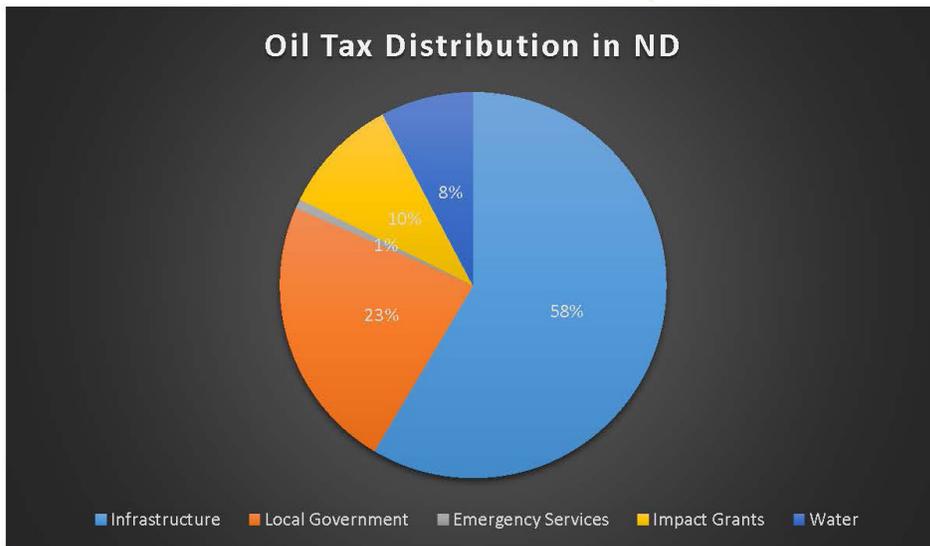
Currently oil and gas taxes revenues are expected to provide \$5 billion in revenue to the state during the 2013-2015 biennium. During the 2013 Legislative session, elected officials had to allocate 40 percent of the oil and gas tax to the legacy fund. Other areas receiving pools of funding include disaster relief, property tax relief, county and city governments and schools.

KLJ is partnering with University of North Dakota Energy & Environmental Research Center (UND EERC) and North Dakota State University (NDSU) Department of Agribusiness and

Applied Economics to examine a broad range of factors pertaining to the future oil and gas development in the Williston Basin to complete the study. The team has completed multiple studies focusing on enhanced oil recovery, socio-economic, infrastructure and power needs across the state. In addition to the team's in-depth experience analyzing numerous variables that impact North Dakota's revenues and expenditures, our industry and agency contacts will provide insight and validate assumptions that will be used to provide the North Dakota Legislative Assembly with the facts required to balance the needs of constituents and industry.

Our approach to the study is grounded on the realization that multiple studies are currently underway, or have recently been completed by private and industry entities as well as governmental agencies, to assess impacts related to the oil industry development occurring in North Dakota. Within the last two years, a tremendous amount of research has been completed, specifically related to oil development, to better understand the needs and impacts that require local and state government involvement. Studies that assess population growth, housing demand, power requirements and transportation infrastructure needs, for example, all contain common and similar data points related to the ultimate recovery of our resources, rates of recovery, and effects of global economics on development. The information is valid and should be addressed. Therefore, a portion of our study will analyze and summarize recent and relevant studies.

However, we cannot completely rely on existing information. The oil and gas industry is constantly and rapidly changing. Technological innovation, changes in reservoir characteristics, political and environmental pressures and market volatility create an ever-changing and dynamic set of data points, short-term trends and scenarios. The team's oil and gas industry experience and industry relationships developed while working with communities and oil producers in North Dakota for several decades, insight into the industries' plans and processes and development of several recent and relevant North Dakota oil industry impact studies gives us the ability to provide North Dakota Legislative Management (NDLM) with the most up-to-date trend analysis of the most variable data points.

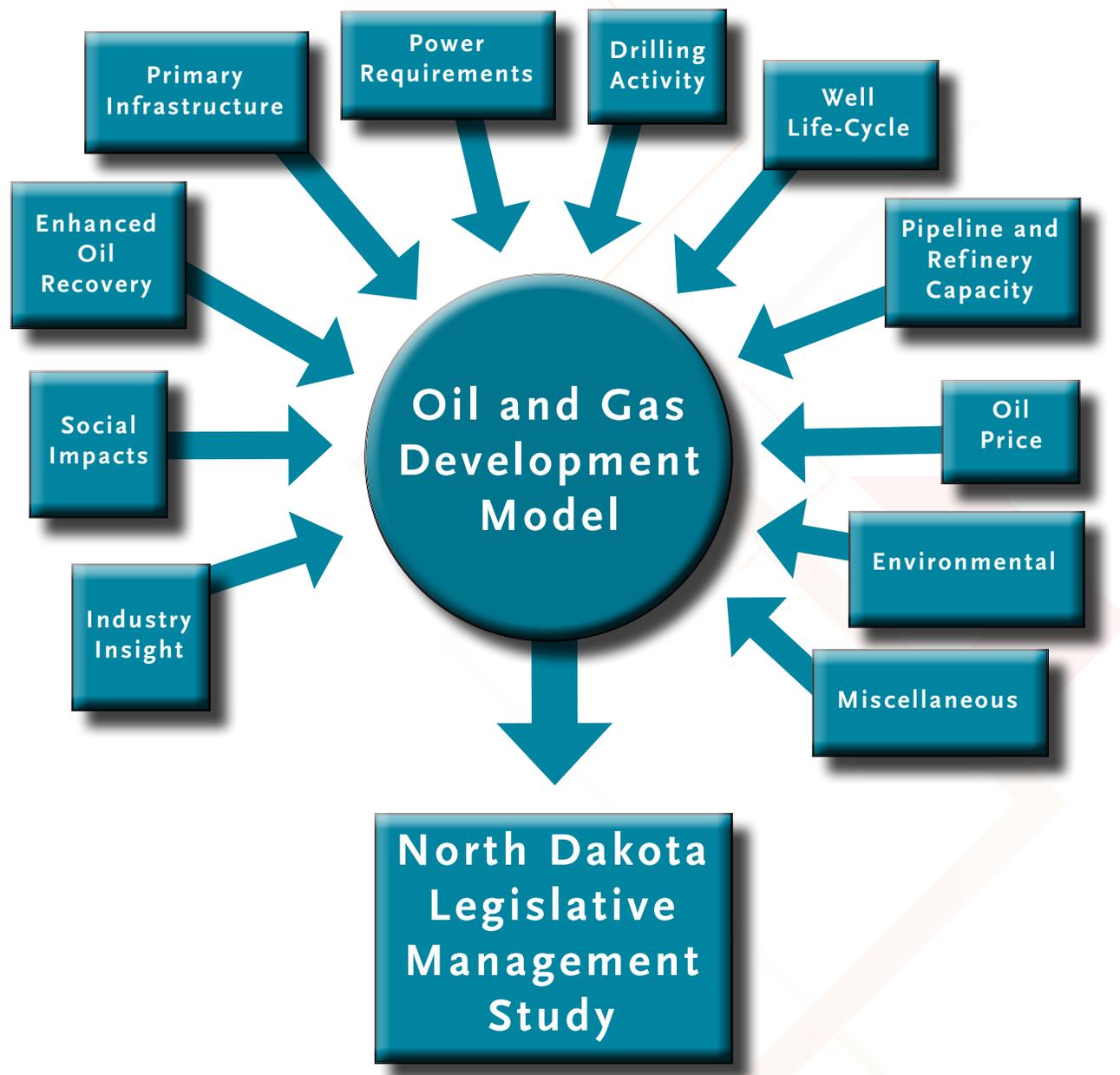


Graph percentages from Dickinson Press editorial published July 25, 2013.



Identifying the primary indicators impacting North Dakota's revenue and expenditures in the near future will be the premises for establishing baseline data for the study. Historic data of primary indicators will be gathered and used to showcase trends for the study period (2014-2019). The primary indicators will have specific secondary and potential tertiary indicators that will illustrate the overall impacts North Dakota is likely to experience.

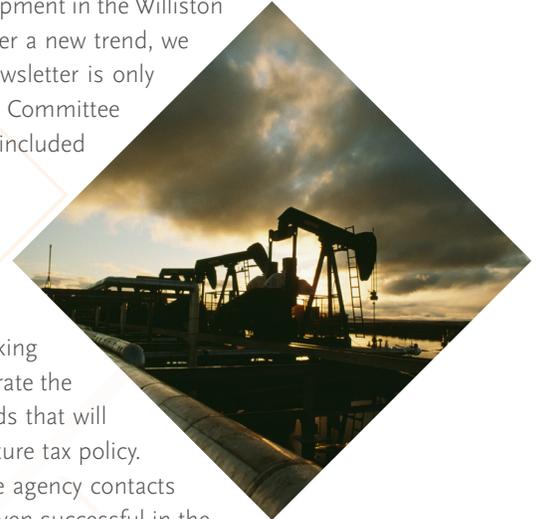
Examples indicators are depicted below.





KLJ's study model, recently utilized in development of the [Williston Basin Oil and Gas Related Electrical Load Growth Forecast \(PF 12\)](#) will be leveraged to develop the study. Several data points have been identified and are continually tracked by KLJ to keep our model and industry insight current. The team does not need to start from scratch to provide NDLM with the information needed to structure future tax policy.

KLJ tracks various credible sources and state agencies to analyze oil and gas development in the Williston Basin and across the nation and compiles the data into a newsletter. If we discover a new trend, we are able to validate our assumptions with key industry contacts. Currently, the newsletter is only published internally to KLJ, however, we will share the information with the NDLM Committee and the Energy Development and Transmission Committee. A sample newsletter is included in this document.



PRIMARY ROLES

KLJ

KLJ will serve as lead for the study. KLJ has full-time research analysts actively tracking oil and gas trends in North Dakota, across the nation and globally. We will incorporate the data into the study to identify baseline assumptions and analyze oil and gas trends that will be important for North Dakota Legislators to know and understand to develop future tax policy. In addition to expanding internal research, KLJ will leverage key industry and state agency contacts to identify and validate the baselines and trending data. This same model was proven successful in the recently completed PF 12, completed by KLJ for the North Dakota Transmission Authority.

KLJ partnered with NDSU to complete the PF 12 study last year and together have advanced the modeling forecasting capability and accuracy based on oil development in the Williston Basin.

Key KLJ staff have an extensive history working with the North Dakota Legislature and understand the dynamics at our capitol. Our understanding on tax policy combined with industry knowledge allows us to weigh indicators most valuable to the study. The KLJ team includes:

- Niles Hushka, PE – Industry Expert
- Sandi Tabor – Government Relations
- Mike Wamboldt, PE – Project Manager
- Kayla Ver Helst – Lead Writer/Research Analyst
- Mark Luther – Research Analyst/Geologist
- Tim Moore – Tax Policy Analysis

In addition to KLJ's oil and gas industry expertise, we have leading researchers and scientists from EERC and NDSU to provide expertise specifically related to CO₂-based enhanced oil recovery (EOR) and socio-economic impacts.

EERC

EERC will conduct and evaluate the near term potential for future oil production from CO₂-based EOR operations in North Dakota. Specifically, EERC will examine the potential for CO₂-based EOR in the next five years (2014-2019) and provide the basis for an estimate of incremental oil production. While the Bakken Formation is by far the largest source of oil in North Dakota and comprises a vast majority of the state's production, there is currently no proven strategy for CO₂-based EOR from the horizontal wells drilled in the Bakken shale. While research suggests the prospects for future CO₂ EOR operations in the Bakken are encouraging, near-term CO₂ EOR operations in the Bakken will likely be focused on pilot-scale field tests. Because of these circumstances the baseline EERC study will only focus on an examination of conventional oil fields and evaluation of likely and potential near-term CO₂ sources.





Screening of predetermined oil fields with the greatest EOR potential combined with the knowledge developed regarding the proximal and likely CO₂ sources should allow identification of which fields are the most likely candidates to come online as tertiary producers within the study time window and beyond. An estimate of the most likely incremental production over the five-year time frame will be delivered by comparison with analogous fields or other means and serve as direct input indicators. EERC staff include:

- John Harju, Associate Director for Research
- John Hamling, Senior Research Manager
- Shaughn Burnison, Research Scientist
- James Sorensen, Senior Research Manager
- Michael J. Holmes, Deputy Associate Director of Research
- Wesley D. Peck, Research Manager

NDSU

NDSU will identify and examine potential socio-economic impacts based on the current understanding of various near-term socio-economic effects and the potential long-term economic effects associated with not addressing socio-economic implications of shale oil development. Examples of key socio-economic effects that have already been observed include increased demand for public services (e.g., ambulance, law enforcement), permanent and temporary population increases, reversal of long-term decline in student enrollments and continued high demand for affordable housing throughout the region. Socio-economic effects to be examined include, but are not limited to, changes in employment, housing and population, and how those changes translate into the demand for public goods and services, infrastructure and other development to meet needs associated with substantial growth.

The potential long-term effects of not addressing the socio-economic implications will also be examined. Examples of potential long-term effects include the Gillette Syndrome and crowding out effects associated with dominant basic-sector industries and whether current data suggest these economic conditions could prevail in North Dakota. The presentation of those socio-economic effects will draw heavily on existing research into those topics, and will include perspectives associated with recent projections of employment, housing and population. NDSU staff include:

- Nancy Hodur, PhD, Research Assistant Professor
- Dean Bangsund, Research Scientist

BASE PROPOSAL

The team will identify likely changes to oil industry practices, production and infrastructure and environmental impacts for the study period 2014-2019. Utilization of existing studies and data will allow us to eliminate redundant work and minimize costs to NDLM. The team's in-depth insight into the industry and relationships with North Dakota State government will provide NDLM with the most current and relevant trends related to oil development in North Dakota. Leveraging multiple existing study models means much of the information NDLM is looking for is already available and we need to draw upon it and deliver in a manner that most effectively helps create your vision. And finally, our engineers, research analysts and scientists have the knowledge and expertise to communicate to NDLM what to expect for the future of North Dakota. The baseline study will result in a concise summary of what can be expected in terms of future infrastructure needs, taking into consideration potential technological and environmental policy changes, and gives NDLM the needed factual information during development of State and local tax policy.

The baseline proposal will be completed for \$125,000 and is divided into four phases.

Phase 1: Initial Data Review

Phase 1 will be a data-gathering phase. KLJ will identify available information, establish how much of the information is relevant and determine what information will be utilized in the study. The core team of KLJ, NDSU and EERC will collaborate on analyzing research conducted by each entity in addition to private and agency studies that are pertinent to the NDLM study. Phase 1 will likely require input from the NDLM related to existing studies available for this research. Establishing a baseline condition is the ultimate goal of Phase 1.



Phase 1 includes:

- Identify key data points directly correlated to oil and gas tax policy considerations
 - ◇ Review recent and relevant studies, identify and summarize correlations
 - Existing relevant documents may include, but are not limited to:
 - ◇ North Dakota Transmission Authority – Williston Basin Oil and Gas Related Electrical Load Growth Forecast (PF 12) (2012)
 - ◇ North Dakota Pipeline Authority/North Dakota Industrial Commission – Natural Gas Production Growth Study (2012)
 - ◇ Upper Great Plains Transportation Institute – Assessment of County and Local Road Infrastructure Needs in ND (2012)
 - ◇ North Dakota Statewide Housing Needs Assessment (2012)
 - ◇ Upper Great Plains Transportation Institute – Needs Study of North Dakota Roads and Bridges (2013)
 - ◇ US Department of Housing and Urban Development Regional Substantiality Planning Grant and the ND Energy Development Infrastructure and Impact Grant Fund — Vision West (2013)
 - ◇ EERC publications:
 - Deep-basin-centered gas (Williston Basin)
 - CO₂ EOR (Williston, Denver–Julesburg and Alberta Basins)
 - Unconventional resource assessment (Williston and Alberta Basins)
 - Utilization of flared gas and distributed generation
 - ◇ Review and summarize current global and national trends in oil and gas development
 - ◇ Utilization of KLJ's relationships with regulatory agency and key policy makers to assess the trends related to future environmental policy. Key policy decisions and regulatory changes within the next five years will most likely be related to air quality, water quality and hydraulic fracturing.
 - ◇ Summarize the baseline condition
 - Report findings to NDLM Committee

Phase 2: Validation of Baseline Condition and Identify Variables

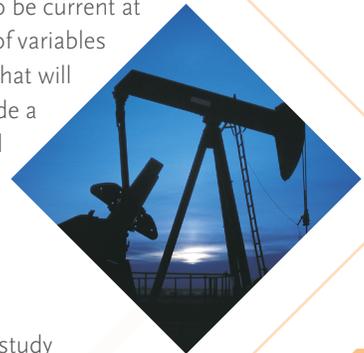
Phase 2 takes the information compiled in Phase 1 and identifies the specific data points and considerations that will be utilized for further analysis. The information will be documented as a set of basic assumptions. Prior to moving forward with analysis, these basic assumptions will be shared and validated by our industry contacts as well as our state and local government contacts. Phase 2 includes:

- Validation of key data points and trends relevant to the study's purpose that will be further analyzed to produce the forecast
- Identification of variable and less-variable data that will be tracked differently
- Seek industry and governmental validation
 - ◇ Compile baseline conditions and communicate with industry and government for their review and validation—modify as required
 - ◇ Key entities from which we would seek validation from include:
 - North Dakota Department of Transportation, North Dakota Department of Health, North Dakota Department of Mineral Resources, North Dakota Pipeline Authority, North Dakota Transmission Authority and North Dakota Petroleum Council
- Summarize variables and any changes to baseline condition
 - ◇ Report findings to NDLM Committee



Phase 3: Modeling and Analysis

Phase 3 will take the key and relevant information determined from Phases 1 and 2, model and analyze information necessary to develop facts for the NDLM to create future tax policy decisions. It is important to recognize over the course of the study (proposed eight months), there will be notable changes in the trends being monitored. We will strive to be current at the completion of the study, and we anticipate a portion of our analysis being based on a set of variables that can be reasonably fixed early in the project schedule, and another portion of our study that will likely evolve over time throughout the duration of the study. For this proposal, KLJ will provide a five-year analysis, looking at infrastructure needs, technological changes and environmental considerations between August 2014 and August 2019.



Phase 3 includes:

- Model and project future trends based on information summarized in Phase 1 and 2
- Track highly variable data points that will be modeled and projected near the end of the study window
- Draw correlation between oil and gas trends and future infrastructure requirements based on key indicators
 - ◇ High level analysis of impacts based on socio-economic implications, CO₂ EOR, and oil and gas production
- Summarize modeling and analysis outputs
 - ◇ Report findings to NDLM Committee

Phase 4: Reporting and Presentation

The final study phase will be to develop the final report and presentation for the NDLM. The report is anticipated to be approximately 20 pages in length and provide a concise summary of findings as well as relevant infographs. KLJ will schedule a formal presentation with the NDLM on August 29, 2014 or on a date preferred by the committee. KLJ will provide 20 hard copies of the report and an electronic version.



Phase 4 includes:

- Report writing and internal review
- Graph and image generation
- External review
- Final data updates
- Deliver hard and electronic copies
- Formal presentation



Reporting

After the completion of each phase, KLJ will report updates and findings to the NDLM. A one- to two-page hard copy report will be provided to each committee member. Upon project award, KLJ and the committee will determine if a face-to-face report would be more beneficial.



ADDITIONAL ANALYSIS

KLJ's core team (including researchers from NDSU and EERC) has developed a phased approach with specific deliverables to meet the requirements of the study within the August 29, 2014 deadline. The following list details additional analysis that can be completed to complement the study and incorporated into the final report and presentation. Detailed scopes will be provided if further studies are requested.

- Examine changes in selected state tax revenues and related economic measures associated with oil and gas development in the Williston Basin — \$25,700
- Assessment of Bakken Formation EOR building off of EERC original baseline data — \$50,000
- Implications of EOR practices on future employment, housing and population in the Williston Basin — \$25,700
- 2014-2019 quantitative analysis, focused on transportation, power, oil and gas, and environmental primary infrastructure requirements related to oilfield development — \$50,000
- 2014-2019 quantitative municipal infrastructure needs assessment outside of the baseline proposal (including but not limited to drinking water, wastewater, airports, schools, etc. in western North Dakota) — \$50,000
- Public input outreach campaign — \$50,000
- Detailed Environmental Considerations Study of oil and gas North Dakota impacted region — \$50,000

The NDLM Committee may choose all or none of the items listed above for additional analysis. The Committee may also provide additional requests for information prior to the study scope being finalized to ensure the team has the resources to complete any additional request.

	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	July 2014	Aug 2014
North Dakota Legislative Management Proposed Study Timeline										
Phase 1: Initial Data Review	Start Nov 1									
NDLM Report Update				Feb 28						
Phase 2: Validation of Baseline Condition and Identify Variables										
NDLM Report Update						April 4				
Phase 3: Modeling and Analysis										
NDLM Report Update								June 27		
Phase 4: Reporting and Presentation										
Final Report										Aug 29
Final Presentation (TBD)										TBD



KLJ Provides Electric Cooperatives 20-Year Planning Tool

Unprecedented oil and gas related growth in North Dakota, South Dakota and Montana is affecting electric cooperatives' ability to plan for future electrical demand within these states.

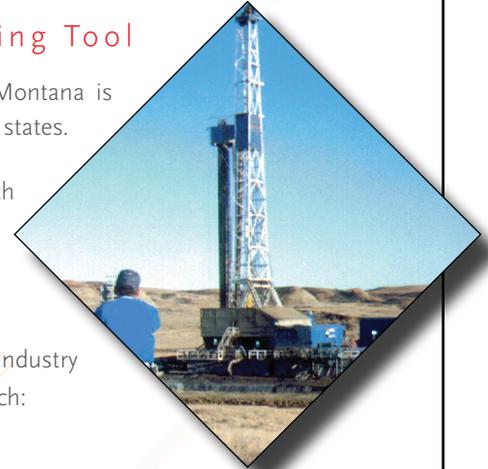
In 2012, KLJ developed the Williston Basin Oil and Gas Related Electrical Load Growth Forecast (PF 12), an extensive study intended to assist in electrical infrastructure assessment and planning, specifically for future industry development and related population and housing projections over a 20-year period.

Research was led by KLJ's Power Group, who gathered input from oil and gas industry representatives and utilized the following experts within KLJ to conduct project research:

- Government Relations
- Ecological and Environmental Services
- Oil and Gas
- Pipeline Services

Additionally, KLJ employed the assistance of UND and NDSU to provide reservoir and population analysis, respectively. Development information and electrical demand calculations were entered into KLJ's GIS-based computer modeling system, facilitating geospatial planning for electric load demand.

Study results indicated by 2032, electricity demand in the study area will nearly triple the 2012 demand and provided electric cooperatives a planning tool which will be utilized in the study region over the next 20 years.



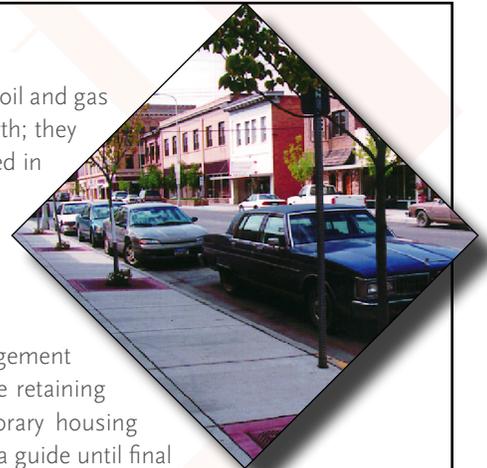
KLJ Alleviates Growth Pressures in Dickinson

The City of Dickinson is experiencing unprecedented growth due to the high levels of oil and gas activity in western North Dakota. Dickinson's citizens are concerned about the growth; they want to know what the future holds for their community and would like to be involved in the decision-making process.

KLJ collaborated with the public on a vision statement for the city and developed goals, objectives and strategies to meet the needs of city residents.

Dickinson's comprehensive plan involved future land use planning, a growth management program, housing strategies to encourage development of affordable housing while retaining the local community character and sense of place, and policies regarding temporary housing accommodations. KLJ also prepared an interim land use map and policies to use as a guide until final plan adoption. Additionally, team members worked with local economic development representatives to create incentive-based housing strategies to entice private developers to build affordable housing units. Other strategies also included creating an adequate public facilities ordinance to assist city staff to evaluate projects that would create an unnecessary hardship on the city's infrastructure capacity.

Dickinson's Comprehensive and Transportation Plan update was completed with a strong level of public involvement. A community-based public visioning process was a key project component that was accomplished through an all-day planning workshop, online community surveys, one-on-one stakeholder interviews and a series of five public input meetings. The city now has a plan for future housing, industrial, commercial and public space compatibility. KLJ also addressed implementation of the updated Comprehensive and Transportation Plans, including many interim policies that could be implemented while the plans were still under development.





KLJ Addresses Safety and Efficiency for NDDOT's Largest Project

Traffic along US Highway 85 between Watford City and Williston has increased in recent years due to oil and gas production in western North Dakota. As a result, traffic has become congested which prompted safety concerns. This section of US Highway 85 is the primary means of transporting thousands of barrels of oil and related equipment, materials and workers from the Williston Basin each day in addition to agriculture industries and recreation vehicles.

KLJ plans to reconstruct the two-lane highway to a four-lane undivided highway from the west edge of Watford City to the junction of US 85 and US 2 east of Williston. Additionally, building either a new four-lane bridge across the Missouri River or building an additional two-lane bridge is included in the plan.

The project is led by KLJ's Transportation Group and will utilize KLJ experts in the following areas:

- Ecological and Environmental Services
- Survey/GIS
- Right-of-Way
- Structural Engineering
- Government Relations

KLJ is partnering with Apex Engineering, Figg Bridge Engineers, Fugro Earthdata, Inc., Dakota Appraisals, MFRA and Braun Intertec to complete the project.

Project completion is anticipated in 2014.



Community Relations To Build Positive Relationships

TransCanada is presently developing the Keystone XL Pipeline, a crude oil pipeline originating in Alberta, Canada and extending south to serve markets on the US Gulf Coast in Texas. In doing so, it is committed to being a good neighbor and to building and maintaining positive relationships with the people who reside near its pipeline right-of-way and facilities. The Tribal relations strategy developed for the Keystone XL Pipeline Project aims to i) recognize the unique status and rights of the Native communities with whom we do business; ii) establish early relationships with the Native communities in proximity and strategic to the project; and iii) find mutually beneficial solutions to concerns raised.

KLJ is working with TransCanada to facilitate Tribal participation and coordination for the project during the cultural survey process. KLJ is leading the coordination of all the logistics involved with Tribal engagement meetings and all necessary follow-up meetings under the direction of TransCanada, assisting with developing project strategy that addresses the specific protocols, needs and interests of each Tribe, and facilitating a process that provides for safety training and a discussion of cultural awareness and terms of engagement for Tribal monitors. All services are being performed in a manner consistent with the imperatives of the project's regulatory process as well as the strong principles underlying the company's Aboriginal Policy.





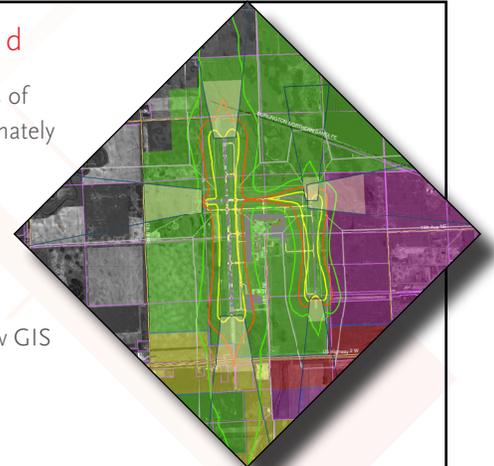
KLJ Studies Proposed Pipeline

In 2012, Sunoco commissioned a Front-End Engineering and Design Study. As one of the main tasks, KLJ reviewed the information within the Sunoco Request for Proposal and performed a hydraulic analysis of the preliminary design of a potential crude oil pipeline approximately 400 miles in length. A +/- 50 percent cost estimate for various stages of the project were contained in the report along with a completed Critical Issues Analysis.



Western North Dakota Pipeline Surveys Completed

The project consisted of high order GPS surveys of 83 miles of pipeline in the oilfields of western North Dakota as part of KLJ's annual pipeline surveys amounting to approximately 250 miles per year. The surveys consisted of as-built GPS ties to the pipelines themselves, and appurtenances that included valves, blowoffs and other fittings as well as ownership changes, road profiles, etc. GPS work was completed utilizing both State Plane Coordinate values and latitude and longitude. GPS methods included both fast static and RTK methodologies. Equipment utilized was Trimble SSi and SSe receivers. Data was then imported into AutoCAD deliverables and/or ArcView GIS products.





Spiritwood Energy Park Truck Impact Study

North Dakota is currently experiencing a tremendous boom in its economy due to the emergence of agri-product as an energy resource. Because of North Dakota's strong agricultural base, numerous agri-processing plants are currently being developed and constructed within the state. The Spiritwood Energy Park near Spiritwood, ND is an agriculturally driven industrial park with the use of grains as its centerpiece. The energy park currently processes 20 million bushels of malt per year and is in the process of expanding its operations. Planned expansions include:

- Increase malt processing from 20 to 28 million bushels per year
- A 40 megawatt coal fired power plant
- A 100 million gallon per year ethanol plant – corn based
- A 30 million gallon per year biodiesel plant – soybean based

The development and growth of agri-business is vital to the local communities within which it exists and the state of North Dakota as a whole. Such development will facilitate the sustainability of a robust economy. However, one issue is an increase and redirection of truck traffic which inevitably accompanies industrial type developments. The purpose of the study is to estimate impacts that may occur to the state and local road networks due to an estimated increase in truck traffic based on the current Spiritwood Energy Park expansions.

The state of North Dakota and potentially impacted counties have expressed concern over the expansions, in particular the associated truck traffic increase and the agency's ability to maintain serviceability of their roadways. The primary purpose of the study is to:

- Estimate which county roadways have the potential to be adversely impacted
- Estimate the additional costs to maintain those roadways due to the estimated increase in traffic loading
- Estimate which state roadways have the potential to be adversely impacted

The study was initiated by NDDOT in partnership with Stutsman County and the Jamestown-Stutsman Development Corporation to estimate what the impacts to the roadways may be and what the long-term implications of those impacts could mean to the affected state and county roadways and budgets.



KLJ Reroutes Traffic to Increase Safety and Efficiency

Traffic along US Highway 85 from Williston, ND to the South Dakota border increased more than 194 percent between 2006 and 2011 and is expected to continue rising. The highway is heavily utilized by oil and gas trucking, which presents public safety concerns in the small towns it traverses. The US Highway 85 Bypass Project will reroute traffic around the City of Alexander to maintain efficient traffic flow while addressing safety issues.

KLJ collaborated with NDDOT and residents of Alexander to develop three alternative routes, including two east of the town and one to the west. KLJ conducted the alternatives analysis for the project and presented its findings to residents and stakeholders during public input meetings.

KLJ's Environmental Group completed an Environmental Assessment (EA) for the project to examine potential environmental, social and economic impacts of constructing a bypass on US Highway 85 and around the City of Alexander.



Project Manager



REGISTRATION

Professional Engineer –
MT, WY

EDUCATION

BS Civil Engineering –
North Dakota State
University

BA Mathematics –
Concordia College

CONTINUING EDUCATION

FHA: Practical Highway
Hydrology

Schinnerer's Risk
Management
Seminar

PSMJ: Project
Management
Workshop

APWA: Quick Course
to Construction
Inspection

XL Design
Professional: Risk
Drivers Seminar



mike WAMBOLDT, PE

Mike is director of KLJ's Power Group. He has a broad background in project management, planning and client relations. Mike oversees all energy-related project activities, develops strategy, is responsible for the QA/QC process and resource allocation, including bringing in any necessary specialists to support our project teams. During his 17 years with KLJ, Mike has developed a very diverse background, working within multiple industries, as a manager of projects, divisions and an office. Mike started our office in Billings, MT and led that effort for 12 years prior to returning to our Bismarck office. Through his past management of our Environmental Division and his current position, Mike has significant experience working within the oil and gas industry in the Williston Basin region, the Powder River Basin and central Montana.

Project Manager

Williston Basin Oil and Gas Electrical Load Growth Forecast (PF 12) – North Dakota Transmission Authority

In 2012, the North Dakota Transmission Authority enlisted the assistance of KLJ to develop the Williston Basin Oil and Gas Related Electrical Load Growth Forecast (PF 12). The study intended to assist in electrical infrastructure assessment and planning, specifically for future industry development and related population and housing projections over a 20-year period. The study results indicated by 2032, electricity demand in the study area will nearly triple the 2012 demand and provided electric cooperatives a planning tool which will be utilized in the study region over the next 20 years.

Project Manager

Tribal Relations for the Bison Pipeline, AECOM – North Dakota, Montana and Wyoming

KLJ was responsible for assisting in the development of practical work plans with Tribes that have expressed an interest in participating in field visits or in providing Tribal monitoring services during construction of the Bison Pipeline Project. KLJ provided AECOM and its client coordination, logistics and efficient implementation of a Tribal monitoring program as well as Tribal liaison services as necessary.

Project Manager

TransCanada, Keystone Pipeline Tribal Relations – Alberta, Canada to TX

KLJ is currently working with TransCanada to facilitate Tribal participation and coordination for the project during the cultural survey process. KLJ is assisting with developing a project strategy that addresses specific protocols, needs and interests of each Tribe and facilitating a process that provides safety training and a discussion of cultural awareness and terms of engagement for Tribal Monitors. All services are being performed in a manner consistent with the imperatives of the project's regulatory process, as well as strong principles underlying the company's Aboriginal Policy.

**Lead Writer
and Research
Analyst**



EDUCATION

BA Mass
Communications
– University of
Washington

**CONTINUING
EDUCATION**

KLJ Leadership
Development
Program

Bismarck-Mandan
Chamber of
Commerce
Leadership
Development
Graduate

Certified FAST
Facilitation Leader

FEMA Hazard
Mitigation Planning
Certificate of
Completion

FEMA Benefit-Cost
Analysis: Entry-Level
Training Certificate of
Completion



kaylaVER HELST

Kayla has eight years of experience in government affairs, business development, public affairs, journalism, campaign work and advertising. She acts as a client liaison with local, state and federal governments to create outline strategies and create initiatives for projects and economic development. Her journalism background and experience working in the engineering industry helps her assist clients in conveying technical information in a concise manner that is comprehensible to numerous audiences. Kayla works with communities and private companies across the upper Midwest to research and explore various market and economic development opportunities.

Oglala Sioux Tribal Department of Transportation TIGER V Grant

KLJ's Government Relations and Transportation Group assisted in the application process to secure \$8,777,960 from the US Department of Transportation's TIGER program. The funds will be utilized to enrich the quality of life for the residents on the Pine Ridge Indian Reservation through improved safety along the road and access for first responders, efficiency of travel, increased Tribal Transit services, access to educational institutions, business and healthcare facilities and develop tourism adjacent to the South Unit of the Badlands National Park which will drive economic development and promote long-term job opportunities. Specifically, the project will upgrade 17.6 miles of loose gravel road to a paved surface that will provide a critical arterial route in the Pine Ridge Indian Reservation. The project will improve safety and reduce fatalities and injuries on this stretch of highway.

Government Affairs Specialist

Kayla works with clients across the upper Midwest to research and compile documents highlighting funding opportunities at the local, state and federal levels. She acts as a client liaison with local, state and federal governments to create outline strategies and create initiatives for projects and economic development. Kayla helps create marketing pieces and proposals highlighting Government Affairs Services, and researches multiple media outlets on current events for internal and external use. Kayla helps author and publish a weekly blog that provides internal and external clients information about pertinent grant opportunities and the latest happenings on Capitol Hill. In 2010, she completed three federal applications for the Telecommunications Group which totaled \$102 million in grant and loan combination through the American Recover and Revitalization Act.

Business Development Coordinator

Kayla's experience includes working with a diverse internal team to explore and analyze business opportunities to expand KLJ into new geographic markets and service sectors, and also assisting with developing internal training programs to enhance client management and sales training for technical staff. She establishes procedures and implementation of client resource management (CRM) for the Business Development Group to track client data to effectively follow through with client requests and to build client intelligence for additional client/work opportunities.

Writer and Research Analyst



EDUCATION

MA Geology –
University of North
Dakota, thesis and
several published
works dealt with a
geologic study of
a Williston Basin
oilfield (the Wiley
Field)

BS Geology and
Archaeology – Idaho
State University

CONTINUING EDUCATION

OSHA – 30 Hours
Construction
Industry



markLUTHER

Mark holds a BS degree in geology from Idaho State University as well as a Master's degree in geology from the University of North Dakota. Mark's thesis and several published works focused on the deposition and diagenesis of reservoir rocks from the Wiley oil field in Bottineau County, ND. Following graduation, Mark worked for nearly a decade as a Geologist II and III for the North Dakota Geological Survey – working and presenting on various surficial and subsurface geological investigations, and implementing the GIS laboratory and map production center at the Survey. Since 1996, Mark has worked for KLJ currently serving in the role of energy analyst.

Mark has served as the North Dakota representative on the Federal Map Requirements Committee, Chairman of the North Dakota GPS Steering Committee and Executive Committee Member on the North Dakota GIS Technical Committee. He has been a member of the American Association of Petroleum Geologists since 1981, a member of the American Oil Chemists Society, a member of the Montana Geological Society, and a member of the North Dakota Geological Society in which he has served two terms as president.

Mark has worked with a variety of field mapping programs (many GIS-based) for ownership parcels, soils, land use and geology. Over a professional career spanning nearly three decades, Mark has presented at numerous conferences and authored or co-authored numerous published works, feasibility studies, business plans, due diligence reports and maps. Mark has also served as project manager for more than 100 projects.

Project Manager

Great Falls Regional Defense Diversification Project, Energy Section – Sweetgrass Region, Northwestern Montana

KLJ personnel were tasked with reviewing energy resource literature for the region, assessment of energy resources with a focus on competitive advantages, assisting local leaders in forming working groups, facilitating discussion of energy related development opportunities and the development of energy related opportunities based on the best fit with local resources and market opportunities.

Major Author

Williston Basin Oil and Gas Related Electrical Load Growth Forecast (PF 12)

PF 12 was a report prepared for the North Dakota Transmission Authority. Mark provided extensive input into spatial modeling components of the study, and authored sections related to geologic background and oil development by region.

Selected Publications:

Davisson, L. and Luther, M., 2013, Environmental Responsibility Drives Siting of Saltwater Disposal Wells: in The Bakken Magazine, July 2013, p. 28-29.

Lee, D. and Luther, M., 2011, New Technology Produces New Opportunities and Pipeline Challenges: Pipeline & Gas Journal, Vol. 238, No.5, p. 60-68.

Luther, M. R., and Miiller, K., 2002, Creating Accurate Addressing Using GIS Technology: Public Safety Communications/APCO Bulletin, v. 68, no. 1, p. 8-22.

Luther, M. R., 1995, The Wiley Field: A Mission Canyon depositional model with no topographic barrier, in L. D. Vern Hunter and Robert A. Schalla, eds., 7th International Williston Basin Symposium, 1995 Guidebook, p. 450-451.

Environmental Considerations and Strategy



EDUCATION

Juris Doctor –
University of North
Dakota

BS Education –
University of North
Dakota

ACTIVITIES

EmPower ND
Commission,
Commissioner –
2007-present

ND CO₂ Storage
Workgroup, Chair –
2008-present

Bismarck City
Commission,
Commissioner –
1996-2008

Bismarck/Mandan
Development
Association

State Bar Association
of ND, President –
2010-2011



Sandi has more than 30 years of local, state and federal public policy experience. Over the course of her career she has overseen development and implementation of community, state agency and private organization budgets and operations. Her work on local economic development issues has provided great insight into the challenges facing communities and with real world ideas regarding new ways to look at economic development opportunities at the local level. She has worked closely with numerous industries, trade associations and government entities to design and implement strategic plans. As a member of the EmPower ND Commission, Sandi served as a key advisor in design and implementation of energy policy and strategies for the state of North Dakota. Her service as the first director of the North Dakota Transmission Authority enhanced her comprehensive understanding of energy policy not only for North Dakota, but for the upper Great Plains. In particular, in her role as director, Sandi directed a major study analyzing the impact of North Dakota's oil and gas expansion on the electric load growth in western North Dakota known as the PF 12 study. Throughout her career, Sandi has worked on a wide range of issues with the North Dakota Legislative Assembly, more recently expanding that experience to include designing federal energy policy in coordination with congressional delegations.

Vice President Government Affairs/General Counsel Lignite Energy Council – Bismarck, ND

Sandi planned and implemented federal and state government action program, provided counsel on public relations program and served as general counsel for the Lignite Energy Council.

Director North Dakota Transmission Authority – Bismarck, ND

Sandi planned and facilitated the expansion of electric transmission grid at a state, regional and federal level as the director of the state Transmission Authority.

Chief Deputy Attorney General Office of Attorney General – Bismarck, ND

Sandi directed day-to-day operations of the Office of Attorney General for the State of North Dakota, including development and implementation of the \$36 million budget.

City Commissioner City of Bismarck – Bismarck, ND

As an elected city commissioner, Sandi directed development and implementation of the \$156 million budget in addition to leading economic development activities for the City of Bismarck during the course of her 12 years on the commission.

Corporate Counsel/Assistant Secretary Knife River Coal Mining Company – Bismarck, ND

Sandi served as corporate attorney for Knife River Coal Mining Company and was responsible for federal coal mining leasing program, compliance with federal and state surface mining regulations, labor relations, administrative hearings, negotiation and administration of a variety of contracts and general corporate matters.

JAG Officer North Dakota Army National Guard – Bismarck, ND

Sandi provided defense counsel and environmental counsel services as member of the Judge Advocate General Corps (JAGC) in the North Dakota Army National Guard.

Tax Policy Analysis



EDUCATION

MBA – University of North Dakota

MS Accounting – University of North Dakota

BS Business Administration – University of Mary

CERTIFICATIONS

Certified Public Accountant – ND

Licensed Business Broker – ND, MN, MT

Licensed Money Broker – ND



tim MOORE

Tim serves as KLJ's Corporate Finance Manager and has more than 30 years of experience in banking, finance, accounting and consulting. He has represented a wide array of clients in both the public and private sectors and assisted in arranging, structuring and packaging both debt and equity financing. He holds licenses as a business and real estate broker and worked extensively in mergers and acquisition.

Director of Economic Development Former US Senator Kent Conrad – Bismarck, ND

Tim served as senior staff advisor for former North Dakota Senator Kent Conrad in the areas of business, finance and economic development. Tim provided policy guidance and assistance on project development and interaction with local, state and federal governmental agencies, community leaders, local economic development personnel and private companies to enhance North Dakota's economic base.

Director of Corporate Finance Eide Bally, LLC – Bismarck, ND

Tim served as Director of the Corporate Finance Division for this Top 25 accounting firm and provided financial and consulting services to their 13 offices. The division specialized in financial services for corporate clients, including financial packaging for expansions, acquisitions, refinancing and venture capital funding. The division also developed an extensive business brokerage practice to assist clients in buying and selling businesses.

The division assisted clients who had special problems or were unable to locate financing through traditional sources. Alternative financing sources included variable rate demand bonds, leveraged leases, special placement tax exempt bonds and various venture capital structures.

The Management Group – Bismarck, ND

The Management Group was a financial consulting business providing business consulting, corporate finance services, and business development for small and medium-size businesses. The Group developed clientele in three states and provided services to manufacturing, processing and retail businesses. The Group specialized in business plan development, loan assistance, project analysis and development and general management consulting. The Management Group was acquired by Eide Bailly in 1997.

Vice President of Planning and Development Bank of North Dakota – Bismarck, ND

Tim directed development activities, legislative lobbying, economic development, special projects and served as public information officer in this senior management position. Tim assisted state agencies, local communities and private ventures in building viable funding options for both public and private projects.

Strategy and Government Affairs



REGISTRATION

Professional Engineer –
ND, SD, MT, MI

EDUCATION

BS Civil Engineering –
North Dakota State
University

niles HUSHKA, PE

Niles is president and chief executive officer (CEO), of KLJ Solutions Co., parent company of KLJ. He has more than 32 years of leadership experience and earned a bachelor of science in civil engineering from North Dakota State University. He is a registered professional engineer in Michigan, Montana, North Dakota and South Dakota. His career began with KLJ as an entry level engineer in 1978. In 1983, Niles created KLJ's aviation division and was promoted to Bismarck office manager. He was promoted again in 1986 to marketing director and director of airports.

He became a member of KLJ's board in 1985 and served as both secretary and treasurer in 1990. From 1996-1997, he served as vice president of the board and became president a year later. In 2003, Niles became KLJ's CEO and in 2009 became president of the company.

As a leader in his profession and the community, Niles is actively involved in the communities, counties and states KLJ serves. He has been a member of the American Consulting Engineers Council for 20 years, the National Society of Professional Engineers for 25 years, former chair of the Bismarck-Mandan Development Association, and served on the Steering Committee for former Senator Kent Conrad's Entrepreneurs Task Force and Former Senator Dorgan's Energy Corridor. He is treasurer of Northern Plains Investments a Regional Angel Investor Network Fund and co-founder of the I.D.E.A. Center in Bismarck, ND.

Leading Innovation

Innovative thinking and leadership is integral to KLJ's success. Niles has been at the forefront of KLJ's expansion over the past few years, resulting in our company more than doubling in size. While other portions of the industry reduced staff and relegated growth due to economic recession, Niles pushed KLJ to strategically invest in new technologies and expand our regional presence. His understanding of the economic potential of the Bakken Shale Formation and the need for expansive infrastructure development throughout Montana, North Dakota and Wyoming demonstrates the level of foresight needed to lead a company focused on the future of our region.

Empowering employees to be leaders and decision makers is a hallmark of Niles' management strategy. Strong focus on mentorship, rewarding performance and providing new leadership opportunities are central to the corporate culture he has developed. Niles keeps KLJ focused on building lasting relationships as our core business strategy, and encourages each employee to recognize established and future relationships as the critical factor to our success.

Select Areas of Expertise

- Corporate Management Strategy
- Energy Infrastructure and Industry Analysis
- Quality Assurance/Quality Control Management
- State and Federal Funding Initiatives
- Business Development



Dean A. Bangsund

Business Address: Department of Agribusiness and Applied Economics
P.O. Box 6050, Dept 7610
North Dakota State University
Fargo, ND, 58105
701-231-7471
E-mail: d.bangsund@ndsu.edu

Current Position:

Research Scientist: July 1996 - present, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo

Economic Research Experience (1987 to 2013):

Grant and Contract Academic Research

Professional activities at North Dakota State University have been an integral part of over 72 grant/contract funded research projects involving nearly \$5 million.

Economic Consulting

Professional activities include direct working relationships with numerous government entities, trade groups, and associations in the northern Great Plains.

Subject Matter

- ◆ socio-economic assessments of community development, population change, and local infrastructure.
- ◆ economic and fiscal impact assessment of agriculture, energy, public service, and tourism-based industries.
- ◆ economic performance of regional business ventures, government programs, and land management/use alternatives.
- ◆ natural resource issues in areas of soil and water conservation, noxious weed management, flood impacts, and wildlife-related recreational activities.

Honors/Awards:

2008 Leslie Hewes Award for Best Social Science Article published in *Great Plains Research* "Producer Responses to Carbon Sequestration Incentives in the Northern Great Plains"

Professional Staff Award for Excellence nominee, North Dakota Agricultural Experiment Station, North Dakota State University, 2002, 2001, 1996, 1995, 1994, 1993

Publications (synopsis):

Principal author and co-author of 18 Referred Journal Articles, 1 Book Chapter, 10 Published Abstracts, 12 Published Papers of Professional Meetings, 5 North Dakota Farm Research Articles, 92 Departmental Research Reports, 23 Miscellaneous Research Reports, 3 Software Analysis Tools, and 5 Newsletters.

Presentations/News Releases (synopsis):

Professional presentations have been made at numerous State, National, and International Symposiums and numerous extension and outreach presentations have been made in support of grant and contract research to regional clientele groups and the general public.

Nancy M. Hodur, PhD

VITA

Relevant Experience:

Assistant Research Professor, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo (March 2001-present).

Community and Resource Development Agent, University of Wisconsin Cooperative Extension Service, Manitowoc, Wisconsin

Legislative Assistant for Agriculture and Natural Resources, U.S. Senator Byron L. Dorgan; Representative Collin C. Peterson, Washington, D.C.

Government Affairs Representative, New York Mercantile Exchange, Washington, D.C.

Education:

PhD, Natural Resources Management: North Dakota State University, Fargo, 2010

MS, Natural Resource Management: North Dakota State University, Fargo, 1991

BA, Business Administration: Jamestown College, Jamestown, ND, 1983

Research:

Conduct research activities on a wide variety of subjects related to economic development, economic impacts, natural resources, and biomaterials. Research findings have been published in refereed academic journals, presented at national professional meetings and conferences, and delivered to numerous constituent groups in North Dakota. Special expertise in primary data collection, both quantitative and qualitative, survey design and data analysis (both quantitative and qualitative). Develop unique methods to address research questions. Recent efforts have focused on data collection efforts to address issues related to rapid expansion in the oil and gas industry in western North Dakota

Selected Recent Publications:

Bangsund, Dean A. and **Nancy M. Hodur**. 2012. *Modeling Direct and Secondary Employment in the Petroleum Sector in North Dakota*. Agribusiness and Applied Economics Report No. 694. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

Bangsund, Dean A. and **Nancy M. Hodur**. 2012. *The Economic Contribution of the Petroleum Industry to the State of North Dakota*. Department of Agribusiness and Applied Economics Report pending publication. North Dakota State University, Fargo.

Bangsund, Dean A. and **Nancy M. Hodur**. 2013. *Williston Basin 2012: Projections of Future Employment and Population in North Dakota*. Agribusiness and Applied Economics Report 704. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

Hodur, Nancy M. and Dean A. Bangsund. 2013. *Population Estimates for the City of Williston*. Agribusiness and Applied Economics Report No.707. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

Hodur, Nancy M., Dean A. Bangsund, Richard Rathge and Karen Olson. 2013. *Estimates of Enrollment Projections: Ray, Stanley, Watford City, Williston and Dickinson*. Agricultural Economics Report No. 708. North Dakota State University, Department of Agribusiness and Applied Economic, Fargo.

Bandsund, Dean A., **Nancy M. Hodur**, Richard Rathge and Karen Olson. 2012. *Modeling Employment, Housing and Population in Western North Dakota: The Case of Dickinson*. Pending Publication Fargo: NDSU, Department of Agribusiness and Applied Economics.



SHAUGHN BURNISON

Research Scientist

Energy & Environmental Research Center (EERC), University of North Dakota (UND)

15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA

Phone: (701) 777-5366, Fax: (701) 777-5181, E-Mail: sburnison@undeerc.org

Principal Areas of Expertise

Mr. Burnison's principal areas of interest and expertise include the application of well-logging principles and geophysics to the efficient development of unconventional petroleum reservoirs, and the application of geophysical methods for monitoring, verification and accounting in CO₂ storage and enhanced oil recovery operations.

Qualifications

Postgraduate coursework, Commerce, University of New South Wales, 1998

M.S., Exploration Geophysics, Stanford University, 1989

B.S., Geological Engineering, University of Minnesota, 1981

Professional Experience:

June 2012–Present: Research Scientist, EERC, UND, Grand Forks, North Dakota. Mr. Burnison's responsibilities include geophysical modeling of the subsurface using regional geological characterizations, petrophysical analyses of geophysical well log data, preparation of technical reports, assessing project uncertainties in oil and gas development and geologic CO₂ storage.

2010–2011: Project Controls/Earned Value Consultant, SLAC National Accelerator Laboratory. Mr. Burnison's responsibilities included preparing schedule and cost estimate for the "Linac Coherent Light Source – II" project, a \$400M addition to the world's brightest hard x-ray laser, directly leading to successful CD-1 approval, scheduling development in Primavera P6, and costing in Deltek COBRA.

2007–2010: Senior Scientist – Program Management, NSTec. Mr. Burnison was responsible for maintaining and improving the Nevada Test Site Environmental Management program's Risk Management Plan, identifying risks and computed impacts using Oracle Primavera Risk Analysis software, scheduling in Primavera P6, and costing in COBRA.

2005–2007: Field Lead – Environmental Restoration, NSTec. Mr. Burnison planned, coordinated, and directed field activities. He was an OSHA supervisor under federal regulations 40 CFR 1910 and 830 and has 40-hr Hazwoper credential.

2003–2005: Task Manager – Environmental Restoration, Bechtel, Nevada. Mr. Burnison managed projects, tracked earned value, and managed compliance at the Nevada Test Site for the Environmental Restoration Project.

2002–2003: Contract Auditor – Logistics Analyst, Innovative Logistics, Inc., McLean, VA. Mr. Burnison performed complicated reconciliations and financial analyses at the direction of the CFO employing Excel, Access, Deltek GCS, and Cognos Impromptu tools working independently in support of a large government contract closeout; created reports for in-house clientele using Business Intelligence tools to enhance analysis; worked night and day shifts as part of a cohesive team on a 24/7 operation to produce a crucial daily deliverable report and management tool.

1994–2001: Investment Manager, Bali, Indonesia/Alexandria, VA. Mr. Burnison was a self-employed investment manager actively managing personal portfolios of stock investments, and controlled costs, taxes, and market actions with financial management software.

1996: Consulting Geophysicist, Robertson Research International, Islamabad, Pakistan. Mr. Burnison initiated client relationships in Pakistan for an embryonic technical joint venture between British and Pakistani geophysical processing companies and trained local technical staff in digital processing theory, designed and implemented production procedures for start-up seismic data processing center.

1992–1994: Geophysicist – Data Processing and Special Projects, Halliburton Geophysical Services, Jakarta, Indonesia. Mr. Burnison’s responsibilities included geophysical guru for local office staffed with expatriate and Indonesian professionals serving national and major oil company clientele, performed wavelet analysis, designed filters, established parameters for key projects, performed exotic processing – seismic inversions and prestack depth migrations, and designed land and marine 3-D seismic surveys to meet bid specifications.

1989–1992: Geophysicist – Data Processing and Data Collection, Halliburton Geophysical Services, Beijing and Ningxia Province, PRC. Mr. Burnison was a geophysicist for local office staffed with expatriate and Chinese professionals, while ensuring quality of geophysical data processing and data collection for a remote joint venture computing center and Gobi desert based data collection crew, established data collection parameters based on modeling and field testing, and designed data processing procedures, and trained Chinese technical staff.

1981–1987: General Field Engineer – Open-Hole Well-Logging and Borehole Seismic Specialist, Schlumberger Well Services, Sacramento and Bakersfield, CA. Mr. Burnison performed open-hole wire-line logging on over 200 oil and gas wells in California and other states. He was directly responsible for the safety and performance of a three man crew and a million-dollar mobile wire-line unit and ensured regulatory compliance handling and transporting explosive and radioactive materials. He specialized in borehole seismic methods, including vertical seismic profiles on land and sea.

Publications and Presentations

Has coauthored several publications.



JAMES A. SORENSEN
Senior Research Manager

Energy & Environmental Research Center (EERC), University of North Dakota (UND)
15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA
Phone: (701) 777-5287, Fax: (701) 777-5181, E-Mail: jsorensen@undeerc.org

Principal Areas of Expertise

Mr. Sorensen's principal areas of interest and expertise include geologic storage of carbon dioxide, petroleum geology, subsurface transport and fate of organic and inorganic contaminants associated with the natural gas industry, research program management, technical report writing, and presentations.

Education

B.S., Geology, University of North Dakota, 1991.

Postgraduate course work in Hydrogeology, Advanced Geomorphology, Groundwater Monitoring and Remediation, Geochemistry, and Contaminant Hydrogeology, 1993–1995.

Professional Experience

1999–Present: Senior Research Manager, EERC, UND. Mr. Sorensen currently serves as manager and coprincipal investigator for several research programs, including the Plains CO₂ Reduction (PCOR) Partnership, a multiyear, multimillion-dollar program focused on developing strategies for reducing carbon dioxide emissions in nine states and four Canadian provinces. Responsibilities include supervision of research personnel, preparing and executing work plans, budget preparation and management, writing technical reports and papers, presentation of work plans and results at conferences and client meetings, interacting with clients and industrial contacts, and proposal writing and presentation.

1997–1999: Program Manager, EERC, UND. Mr. Sorensen managed projects on topics that included treatment of produced water, environmental fate of mercury and natural gas-processing chemicals, coalbed methane, and gas methane hydrates.

1993–1997: Geologist, EERC, UND. Mr. Sorensen conducted a variety of field-based hydrogeologic investigations throughout the United States and Canada. Activities were primarily focused on evaluating the subsurface transport and fate of mercury and natural gas-processing chemicals associated with natural gas production sites.

1991–1993: Research Specialist, EERC, UND. Mr. Sorensen assembled and maintained comprehensive databases related to oil and gas drilling, production, and waste management.

Professional Memberships

Society of Petroleum Engineers

Publications and Presentations

Has coauthored numerous publications.



JOHN A. HARJU

Associate Director for Research

Energy & Environmental Research Center (EERC), University of North Dakota (UND)

15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA

Phone: (701) 777-5157, Fax: (701) 777-5181, E-Mail: jharju@undeerc.org

Principal Areas of Expertise

Mr. Harju's principal areas of interest and expertise include carbon sequestration, enhanced oil recovery, waste management, geochemistry, technology development, hydrology, and analytical chemistry, especially as applied to the upstream oil and gas industry.

Qualifications

B.S., Geology, University of North Dakota, 1986.

Postgraduate course work in Management, Economics, Marketing, Education, Climatology, Weathering and Soils, Geochemistry, Geochemical Modeling, Hydrogeochemistry, Hydrogeology, Contaminant Hydrogeology, Advanced Physical Hydrogeology, and Geostatistics.

Professional Experience

2002–Present: EERC, UND, Grand Forks, North Dakota.

2011–Present: Associate Director for Research. Mr. Harju oversees the activities of a team of scientists and engineers focused on research, development, demonstration, and commercialization of energy and environmental technologies. Strategic energy and environmental issues include zero-emission coal utilization; CO₂ capture and sequestration; energy and water sustainability; hydrogen and fuel cells; advanced air emission control technologies, emphasizing SO_x, NO_x, air toxics, fine particulate, and mercury control; renewable energy; wind energy; water management; flood prevention; global climate change; waste utilization; energy efficiency; and contaminant cleanup.

2003–2011: Associate Director for Research. Mr. Harju's responsibilities included developing and administering programs involving petroleum technology, natural resource evaluations, water management and contamination cleanup and building industry–government–academic teams to carry out research, development, demonstration, and commercialization of energy and environmental products and technologies.

2002–2003: Senior Research Advisor. Mr. Harju's responsibilities included development, marketing, management, and dissemination of market-oriented research; development of programs focused on the environmental and health effects of power and natural resource production, contaminant cleanup, water management, and analytical techniques; publication and presentation of results; client interactions; and advisor to internal staff.

1999–2002: Vice President, Crystal Solutions, LLC, Laramie, Wyoming. Mr. Harju's firm was involved in commercial E&P produced water management, regulatory permitting and compliance, and environmental impact monitoring and analysis.

1997–2002: Gas Research Institute (GRI) (now Gas Technology Institute [GTI]), Chicago, Illinois.

2000–2002: Principal Scientist, Produced Water Management. Mr. Harju's responsibilities included development and deployment of produced water management technologies and methodologies for cost-effective and environmentally responsible management of oil and gas produced water.

1998–2000: Program Team Leader, Soil, Water, and Waste. Mr. Harju’s responsibilities included project and program management related to the development of environmental technologies and informational products related to the North American oil and gas industry; formulation of RFPs, proposal review, and contract formulation; technology transfer activities; and staff and contractor supervision. Mr. Harju served as Manager of the Environmentally Acceptable Endpoints project, a multiyear, \$8MM effort focused on a rigorous determination of appropriate cleanup levels for hydrocarbons and other energy-derived contaminants in soils. He also led GRI/GTI involvement with numerous industry environmental consortia and organizations, including PERF, SPE, AGA, IPEC, and API.

1997–1998: Principal Technology Manager, Soil and Water Quality.

1997: Associate Technology Manager, Soil and Water Quality.

1988–1996: EERC, UND, Grand Forks, North Dakota.

1994–1996: Senior Research Manager, Oil and Gas Group. Mr. Harju’s responsibilities included the following:

- Program Manager for program to assess the environmental transport and fate of oil- and gas-derived contaminants, focused on mercury and sweetening and dehydration processes.
- Project Manager for field demonstration of innovative produced water treatment technology using freeze crystallization and evaporation at oil and gas industry site.
- Program Manager for environmental transport and fate assessment of MEA and its degradation compounds at Canadian sour gas-processing site.
- Program Manager for demonstration of unique design for oil and gas surface impoundments.
- Director, National Mine Land Reclamation Center for Western Region.
- Co-Principal Investigator on project exploring feasibility of underground coal gasification in southern Thailand.
- Consultant to International Atomic Energy Agency for program entitled “Solid Wastes and Disposal Methods Associated with Electricity Generation Fuel Chains.”

1994: Research Manager.

1990–1994: Hydrogeologist.

1989–1990: Research Specialist.

1988–1989: Laboratory Technician.

Professional Memberships

National Petroleum Council

Interstate Oil & Gas Compact Commission, Chairman, Energy Resources, Research and Technology Committee

U.S. Department of Energy Unconventional Resources Technology Advisory Committee

Rocky Mountain Association of Geologists

Publications and Presentations

Has authored and coauthored numerous publications.



MICHAEL J. HOLMES

Deputy Associate Director for Research

Energy & Environmental Research Center (EERC), University of North Dakota (UND)

15 North 23rd Street, Stop 9018, Grand Forks, North Dakota 58202-9018 USA

Phone: (701) 777-5276, Fax: (701) 777-5181, E-Mail: mholmes@undeerc.org

Principal Areas of Expertise

Mr. Holmes's principal areas of interest and expertise include CO₂ capture; fuel processing; gasification systems for coproduction of hydrogen, fuels, and chemicals with electricity; process development and economics for advanced energy systems; and emission control (air toxics, SO₂, NO_x, H₂S, and particulate technologies). He has managed numerous large-scale projects in these areas. Mr. Holmes is the program manager of the National Center for Hydrogen Technology[®] at the EERC and is working under agreement with the U.S. Department of Energy National Energy Technology Laboratory and over 85 partners to develop a broad range of technologies required to advance the opportunity for a hydrogen economy. In addition, he currently oversees Fossil Energy areas of research at the EERC in his role as Deputy Associate Director for Research.

Qualifications

M.S., Chemical Engineering, University of North Dakota, 1986.

B.S., Chemistry and Mathematics, Mayville State University, 1984.

Professional Experience

2005–Present: Deputy Associate Director for Research, EERC, UND. Mr. Holmes currently oversees fossil energy research areas at the EERC, including coproduction of hydrogen, fuels, and chemicals with electricity in gasification systems; advanced energy systems; emission control technology projects involving mercury, SO₂, NO_x, H₂S, and particulate; and CO₂ capture technology projects.

2001–2004: Senior Research Advisor, EERC, UND. Mr. Holmes was involved in research in a range of areas, including emission control, fuel utilization, process development, and process economic evaluations. Specific duties included marketing and managing research projects and programs, providing group management and leadership, preparing proposals, interacting with industry and government organizations, designing and overseeing effective experiments as a principal investigator, researching the literature, interpreting data, writing reports and papers, presenting project results to clients, and presenting papers at conferences.

1986–2001: Process Development Engineer (Principal Research Engineer), McDermott Technology, Inc., Alliance, Ohio. Mr. Holmes's responsibilities included project management and process research and development for projects involving advanced energy systems, environmental processing, combustion systems, fuel processing, and development of new process measurement techniques. He also served as Project Manager and Process Engineer for projects involving evaluation of air toxic emissions from coal-fired power plants; development of low-cost solutions for air toxic control focused on mercury emissions; development of wet and dry scrubber technologies; demonstration of low-level radioactive liquid waste remediation; in-duct spray drying development; development of improved oil lighter burners; limestone injection multistaged burning; the ESO_x process; the SO_x-NO_x-Rox Box[™] process; and the limestone injection dry-scrubbing process.

Professional Memberships

Fuel Cell and Hydrogen Energy Association

- Board of Directors, 2011–present
- Executive Member, 2011–present
- Technical Chair for the 2011 Fuel Cell and Hydrogen Energy Association Conference

National Hydrogen Association

- Board Member, 2004–2011
- Executive Committee Member, 2009–2010
- Cochair of Hydrogen from Coal Group, 2008–2010

Subbituminous Energy Coalition

- Board Member, 2003–2008

Mountain States Hydrogen Business Council

- Board Member, 2009–2010

Tau Beta Pi

Patents

Collings, M.; Aulich, T.R.; Timpe, R.C.; Holmes, M.J. System and Process for Producing High-Pressure Hydrogen. U.S. Patent 8,182,787, May 22, 2012.

Holmes, M.J.; Ohrn, T.R.; Chen, C.M.-P. Ion Transport Membrane Module and Vessel System with Directed Internal Gas Flow. U.S. Patent 7,658,788, Feb 9, 2010.

Holmes, M.J.; Pavlish, J.H.; Olson, E.S.; Zhuang, Y. High Energy Dissociation for Mercury Control Systems. U.S. Patent 7,615,101 B2, 2009.

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Holmes, M.J. Three-Fluid Atomizer. U.S. Patent 5,484,107, May 13, 1994.

Bailey, R.T.; Holmes, M.J. Low-Pressure Loss/Reduced Deposition Atomizer. U.S. Patent 5,129,583, March 21, 1991.

Awards

Accepted the 2010 Robert M. Zweig Public Education Award for Hydrogen on behalf of the EERC.

Lignite Energy Council Distinguished Service Award, Government Action Program (Regulatory), 2005.

Lignite Energy Council Distinguished Service Award, Research and Development, 2003.

Member of the Tau Beta Pi – Engineering Honor Society.

Publications and Presentations

Has authored or coauthored more than 120 publications and presentations.



WESLEY D. PECK

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Principal Areas of Expertise

Mr. Peck's principal areas of interest and expertise include geographic information systems (GIS), cartography, information graphics, geology, and digital asset management. Mr. Peck currently oversees GIS activities for the Plains CO₂ Reduction (PCOR) Partnership. He is also the task leader for two regional characterization efforts within the PCOR Partnership.

Qualifications

M.S., Geology, University of North Dakota, 1992. Thesis: The Stratigraphy and Sedimentology of the Sentinel Butte Formation (Paleocene) in South-Central Williams County, North Dakota.
B.S., Earth Science, North Dakota State University, 1987.

Professional Experience

2011–Present: Research Manager, EERC, UND. Mr. Peck's responsibilities include overseeing a staff of geologists and GIS specialists involved with oil and gas research activities in the Williston Basin as well as regional geologic characterization activities associated with the PCOR Partnership.

1991–2011: Research Scientist, EERC, UND. Mr. Peck's responsibilities included overseeing major GIS activities at the EERC, serving as task leader for the regional characterization component of the PCOR Partnership, as well as report and proposal writing.

1989–1991: Graduate Research Assistant, EERC, UND. Mr. Peck's responsibilities included acquisition and management of geologic data related to Cretaceous and Tertiary geology of the Williston Basin. Mr. Peck also assisted in the collection of Cretaceous and Tertiary fossils and stratigraphic information in western North Dakota and eastern Montana.

Publications and Presentations

Has authored and coauthored several professional publications.



JOHN A. HAMLING
Senior Research Manager

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Principal Areas of Expertise

Mr. Hamling's principal areas of expertise include development, implementation, and oversight of surface, near-surface, deep subsurface, and reservoir characterization and monitoring programs for CO₂ storage and enhanced oil recovery operations. His expertise also includes reservoir measurement and well-logging principles and applications and the development, design, and implementation of new approaches that benefit the exploration, development, and production of oil and gas in unconventional reservoirs.

Qualifications

B.S., Mechanical Engineering, University of North Dakota, 2007.
Associate of Science, Associate of Arts, Williston State College, 2004.
Certified Engineer in Training (EIT)

Professional Experience

2012–present: Senior Research Manager, EERC, UND. Mr. Hamling currently serves as task manager and principal investigator with the Plains CO₂ Reduction (PCOR) Partnership at the EERC, where he leads a multidisciplinary team of scientists and engineers working to develop and implement monitoring, verification, and accounting concepts for large-scale (>1 million tons per year) CO₂ storage and enhanced oil recovery operations. He also works as part of a diverse team in the development, design, and implementation of new approaches that benefit the economic exploration, development, and production of oil and gas.

2011–2012: Research Manager, EERC, UND. Mr. Hamling's responsibilities included managing characterization and monitoring research activities and operations for large scale (>1 million tons per year) combined enhanced oil recovery and CO₂ storage projects for the PCOR Partnership. Mr. Hamling was also involved with various research activities related to oil and gas production, infrastructure, and development from unconventional reservoirs.

2009–2011: Research Engineer, EERC, UND. Mr. Hamling's focus was on the design and implementation of new approaches that benefit the exploration, development, and production of oil and gas, and with the PCOR Partnership, where he evaluated the potential for carbon dioxide storage in geologic formations. Specific responsibilities included field operations design, deployment, and interpretation relating to oil field technologies applicable to the CO₂ capture and storage (CCS) industry; laboratory functions relating to the Applied Geology Laboratory (AGL); data analysis; regulatory compliance; and communication of operations between service providers, management teams, industry partners, and governmental organizations. Additional responsibilities included investigation and/or demonstration of techniques and/or technologies that can enhance oil and gas production or economically benefit the oil and gas industry while reducing the environmental footprint of drilling and production operations.

2007–2009: Reservoir Evaluation Engineer; HSE (Health, Safety, and Environmental) Representative; and Loss Prevention Team Leader, Reservoir Evaluation segment, Schlumberger Limited. Mr. Hamling was responsible for providing tailored geophysical solutions for specific and unique oil field applications.; executing basic and advanced reservoir evaluations utilizing real-time wellbore measurement technologies, reservoir pressure and fluid sampling, interpretation of reservoir measurement data;

2004–2007: Student Research Scientist/Engineer, EERC, UND. Mr. Hamling was responsible for conducting research related to the development of new methods to join high-temperature creep-resistant alloys and advanced processing and manufacture techniques for silicon carbide ceramic composites; materials testing in accordance with ASME International, ASTM, and ISO (International Organization for Standardization) standards; analyzing scanning electron microscopy micrographs; designing and fabricating composite micrometeorite shielding; and literature and patent review.

Publications and Presentations

Has authored and coauthored numerous technical publications.

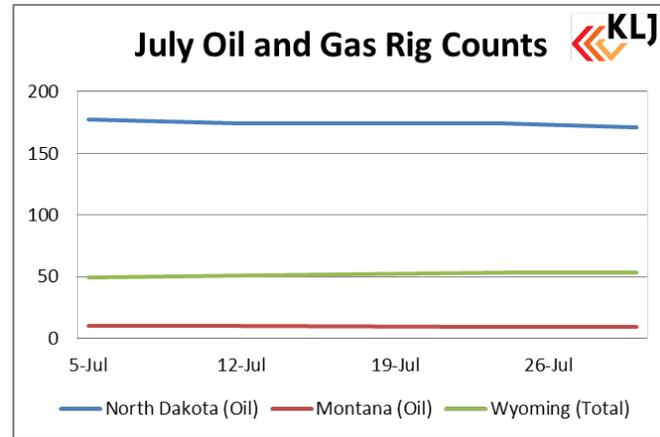
July Statistics

New Drilling Permits:

- North Dakota = 179
- Montana = 18
- Wyoming = 152

Oil & Gas Drilling Rig Average:

- North Dakota = 174
- Montana = 9.5
- Wyoming = 51.5



Average D/I Ratio in North Dakota for July: 16.7/83.3



> REPORTS

7/12 The NDIC has just reported several new all-time high production figures for North Dakota (May figures), including: 810,129 barrels of oil per day, 899,977 mcf of gas per day, and 8,915 producing wells. In addition, they are reporting that the average length of time to drill a well from spud to total depth/length is just under 22 days! Conversely, the average time to complete a well is up to 92 days, and there are now about 500 wells awaiting completion, so these numbers would appear to be steadily increasing.

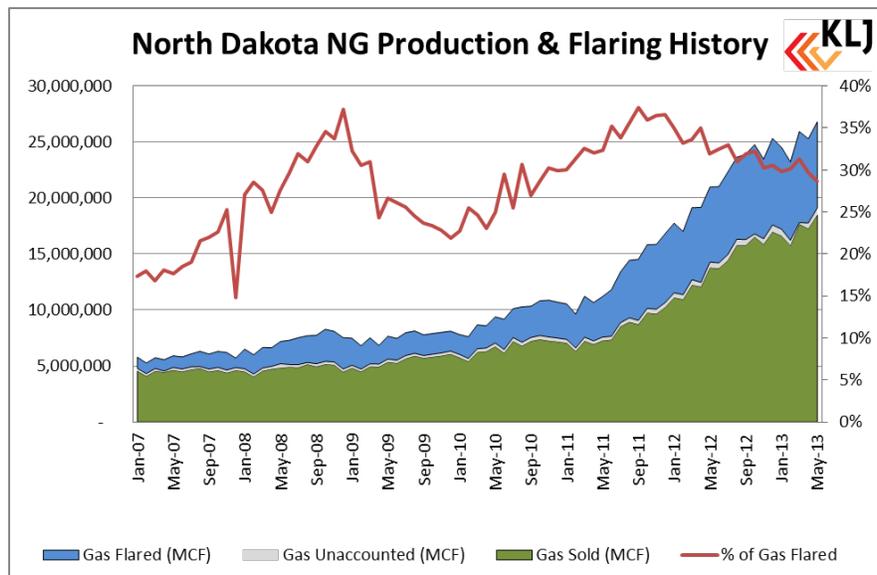
7/19 There are currently 6 seismic projects permitted in North Dakota – the 3 largest of which are being done by: CGG Veritas (646 square miles in Burke and Mountrail counties), Dawson Geophysical (250 square miles in McKenzie County) and WesternGeco (14 square miles in Dunn County)

7/19 Harding County, South Dakota is seeing a sudden increase in Landman activity in their courthouse, and the USDI-BLM recently auctioned off over 14,000 acres of leases in SD

7/19 Williston Basin Sweet = \$98.19 (+\$1.75), Williston Basin sour to sweet discount = \$7.11 (stable), Williston Basin Sweet to WTI discount = \$6.48 (stable), WTI to Brent discount = \$0.02 (NONEXISTANT) – this nonexistent differential appears to be having a negative impact on the shipping of Bakken crude via rail

7/5 The NDIC saw a four-fold increase in June (compared to May) in the number of operators requesting approval to flare gas. Most of the requests are for wells in Williams and McKenzie counties, but also include requests in Dunn, Mountrail, Divide, and Burke counties.

7/26 Reuters is reporting on a recent publication by [Ceres](#) that calculated more than \$100 million worth of natural gas is being flared every month in North Dakota, and over \$1 Billion worth flared during 2012. However, the percent-mix of NGL's that Ceres used for calculations were based on generic assumptions that are not reflective of the liquids-rich Bakken NGL mix, and excluded ethane from their calculations. It is therefore assumed that the true lost value of flaring would be modestly higher than the Ceres projections.

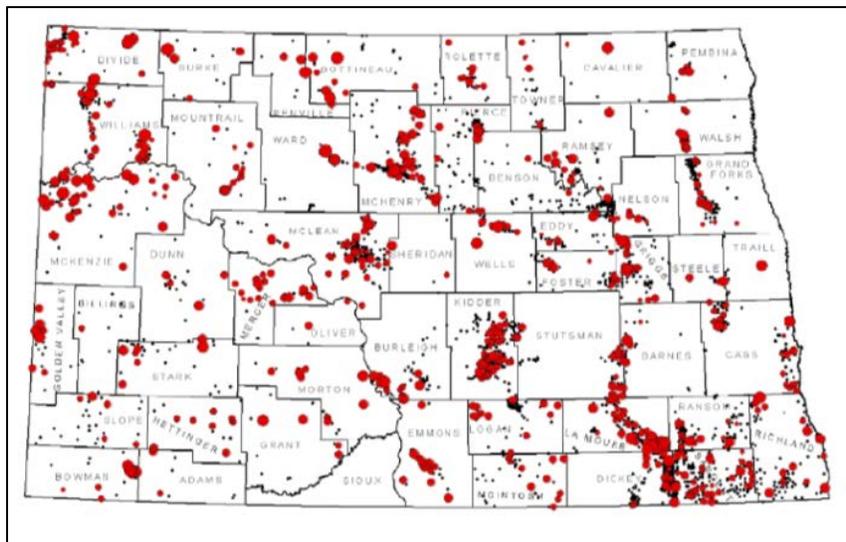


7/5 Whiting Oil & Gas Corp has just reported a nearly 300 bopd well producing from the Deadwood Formation – this is the deepest and oldest (Cambrian) sedimentary rock formation in the Williston Basin, and sits unconformably on the Pre-Cambrian basement. The location of the well is in Golden Valley County, ND. The Deadwood has produced a small amount of oil and gas in the past, but is virtually never an exploration target. Whiting is definitely discovering some interesting new plays in this county!

7/19 Statoil just set a new North Dakota IP record with a well in McKenzie County. The Beaux 18-19 #6H well had an initial 24-hour production of 5,070 barrels of crude

7/26 The NDIC-DMR recently made a presentation in which they are projecting there will be 2,500 Tyler Formation wells in South-west North Dakota (likely Stark, Slope counties), and 2,500 Spearfish Formation wells (Bottineau County) drilled in the future

7/26 The ND Geological Survey did a “background” natural gas study over the course of several years, in which they took samples of shallow groundwater from State Water Commission monitoring wells and examined the samples for the presence of methane. The study – which covered 52 of North Dakota’s 53 counties - found methane in shallow groundwater in every single county, even those that are hundreds of miles from any known oil or gas producing wells. This baseline study showing naturally occurring methane in groundwater is critical in defending fracking and other drilling practices being conducted in North Dakota



Red dots signify the concentration of methane found in monitoring wells, by quantity. Black dots indicate no methane found in the monitoring well.

Source: [NDIC](#)



> TRENDING

7/5 Refineries in northwestern Washington state operated by BP, Phillips 66, and Shell Oil have all announced plans to expand rail infrastructure to take delivery of Bakken sourced crude

7/5 A unit train carrying Bakken crude to a refinery in New Brunswick, Canada derailed in the town of Lac-Megantic, Quebec early Saturday morning (7/6). 72 tank cars were involved in the derailment and subsequent fire and explosion in which 13 people are confirmed dead, and 40 are listed as missing. (Update: On 8/2 The U.S. Department of Transportation’s Federal Railroad Administration issued an [Emergency Order](#) and [Safety Advisory](#) to help prevent trains operating on mainline tracks or sidings from moving unintentionally.)

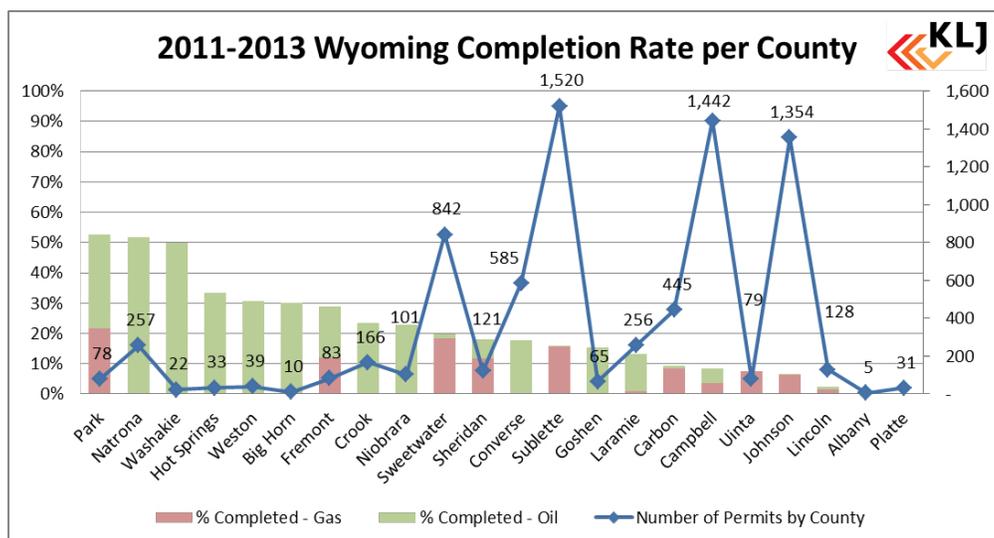
7/12 The ND Pipeline Authority's latest figures indicate a significant reversal in the percentage of oil transported by rail versus by pipeline. The latest figures indicate that 69% of oil production is now shipped via rail (previously 75%), versus 23% now being shipped by pipeline. This indicates much more pipeline capacity coming on line and/or a weakening in the economics of shipping crude via rail (which seems likely given the narrowing of the WTI/Brent differential).

7/19 Partially in response to the delays experienced by the Keystone XL project, Canadian producers are moving ahead quickly to fill the heavy crude (bitumen) transportation problem using rail. They are in the process of building 100's of heated tank cars capable of hauling the thick crude and unloading it without the use of diluents (light NGLs) that are required if transported via pipeline. This could have a significant negative impact on the value of some Williston Basin NGL fractions, as historically NGLs are used to dilute the thick tar-sand oil.



> OUTLIERS

7/26 Initial analysis of the number of wells permitted versus those actually being drilled over the last two years in Wyoming shows some interesting results. In two of the counties with the highest numbers of permits (Campbell and Johnson), less than 8% of those wells permitted have been completed. This may indicate a huge backlog of ready to drill locations waiting for an improvement in natural gas prices, as almost 70% of the total permits issued over the last two years are for gas wells. If Natural Gas prices significantly improve there should be a flurry of work in the area!





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