

May 15, 2015

Ms. Karlene Fine
Executive Director
North Dakota Industrial Commission
State Capitol, 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

Dear Karlene:

Please find enclosed a suggested scope of work, time line, and budget for the EERC's *Produced Fluids Gathering Pipeline Study* ("The Pipeline Study") as commissioned by the 64th Legislative Assembly in HB 1358, and as signed into law by North Dakota Governor Jack Dalrymple on April 20, 2015.

As discussed, I will be attending the OGRC meeting on May 26 in Bismarck and will be prepared to provide a short overview presentation regarding this scope of work and to answer any questions and entertain any comments that you, members of the committee, or any Legislators may have.

Please let me know if you have any questions or comments in advance of the May 26 meeting that I can help clarify or answer. I look forward to seeing you soon.

Sincerely,



John Harju
Associate Director for Research

JAH/bjr

Enclosures

c/enc: Lynn Helms, NDIC
Ron Ness, NDPC
Brent Brannan, OGRC
Tom Erickson, EERC
Lucia Romuld, EERC
Jay Almlie, EERC
EERC Contracts

PRODUCED FLUIDS GATHERING PIPELINE STUDY

Commissioned by

The 64th North Dakota Legislative Assembly

INTRODUCTION

On April 20, 2015, North Dakota Governor Jack Dalrymple signed into law House Bill (HB) 1358, legislation regarding the state's regulatory oversight of gathering pipelines for produced water and crude oil. The bill includes enhancements for the prevention and detection of pipeline leaks and expands the state's remediation and restoration program for land and water resources impacted by oil and gas development.

HB 1358 also authorizes the North Dakota Industrial Commission (NDIC) to develop new rules involving the construction and operation of gathering pipelines. The bill includes \$1.5 million to complete a study by University of North Dakota's Energy and Environmental Research Center (EERC) regarding construction standards and monitoring systems for gathering lines, which will guide the NDIC's consideration of new administrative rules.

SCOPE OF WORK

The scope of work for this project directly reflects the language of HB 1358. According to HB 1358, this project will conduct an analysis of crude oil and produced water pipelines including the following:

- Construction standards
- Depths
- Pressures
- Monitoring systems
- Maintenance
- Types of materials used in the pipeline backfill
- Analysis of the ratio of spills and leaks occurring in this state in comparison to other large oil and gas-producing states with substantial volumes of produced water

HB 1358 further states that the EERC will analyze the existing regulations on construction and monitoring of crude oil and produced water pipelines, determine the feasibility and cost-

effectiveness of requiring leak detection and monitoring technology on new and existing pipeline systems, and provide a report with recommendations to NDIC and the North Dakota Legislature's Energy Development and Transmission Committee (EDTC) by December 1, 2015.

To address these requirements, the EERC has developed a two-phase scope of work. The first phase of work will compile information on gathering pipeline infrastructure in North Dakota, existing relevant gathering pipeline regulations, causes of historical leaks and economic and technical feasibility of pipeline monitoring solutions. These efforts will result in a report and recommendations to NDIC and EDTC. The recommendations will deliver critical information to state legislators and regulators that will provide a basis for the State's evolving regulation of construction, inspection, and monitoring practices of liquids-gathering pipelines.

Critical to the success of Phase I will be recruitment of industrial stakeholders to inform the project on current practices and technologies – both successful and unsuccessful. Positive and negative lessons from the field will guide the investigation. Stakeholders will be invited on several occasions to provide intelligence to the project in open forums hosted by the EERC and via one-on-one conversations with EERC staff.

The second phase of work will apply knowledge gained during the first project phase toward the goal of demonstrating best practices in a pilot gathering pipeline project. This pilot project will evaluate and demonstrate best construction practices and the most promising pipeline-monitoring practices and technologies identified in Phase I on a working pipeline, thereby promoting advanced gathering pipeline management statewide. This phase of work will require technical engagement and support from one or more industrial stakeholders in the state. The EERC will do the following:

- Plan the design of the pilot site(s)
- Coordinate installation of the pilot site(s)
- Monitor performance of the installed pilot systems
- Analyze the performance of the installed pilot systems after a test period is completed
- Report on the results of the pilot tests at their completion

This second project phase will validate pipeline-monitoring concepts for use in North Dakota, identify operational challenges inherent in their use, and demonstrate their employment in a relevant environment. The state funds budgeted for this work will not be used for purchase of monitoring systems or pipeline installation. No equipment will be purchased in accomplishment of the first phase of work, but limited equipment to facilitate data collection, transfer, and interpretation may be purchased to best accomplish the pilot demonstration.

It is anticipated that industrial partners with vested interest in the success of these systems will purchase the necessary hardware and own the systems after this publicly funded validation effort is complete. This public–industry collaboration will maximize the value to taxpayers and industry entities alike. It will also ensure adequate financial resources are applied to execute a robust demonstration of technologies applicable to the various extremes that are encountered in the North Dakota environment.

A detailed outline of the project scope of work is offered here as follows:

1. Project Management

This management task will assure timely completion of deliverables, appropriate engagement of stakeholders, and optimal quality assurance and quality control. This task will also provide administrative, technical and budgetary oversight on the technical tasks embodied within this effort. Specific interactions with any interim legislative committees, to include EDTC, and for other interactions with the 65th Legislative Assembly, will also be provided under this management task.

2. Phase I – Pipeline Construction and Monitoring Study

- a. Research North Dakota pipeline regulations
 - i. Research regulations in other oil-producing states
 - ii. Summarize regulations in internal minireport
- b. Understanding infrastructure
- c. Process description
 - i. Construction standards
 - ii. Pipeline materials
 - iii. Monitoring systems
 - iv. Maintenance
 - v. Reclamation
 - vi. Abandonment
- d. Analyze options for liquids storage on network
 - i. Research issues/risks
 - ii. Compile information on opportunities
 - iii. Summarize regulations
 - iv. Investigate secondary containment options and other mitigation
 - v. Cost sensitivity analysis on volumes vs. storage costs
- e. Leak/spill statistical analysis
 - i. Survey of spills/leaks history
 - ii. Federal Emergency Management Agency review
 - iii. Comparison of North Dakota to other states
- f. Technoeconomic analysis of leak detection and monitoring
 - i. Monitoring system vendor discussions
 - ii. Obtain pricing and design criteria from vendors
 - iii. Construct cost models
 - iv. Conduct sensitivity analyses
- g. Make recommendations
 - i. Construction considerations
 - ii. Inspection considerations
 - iii. Monitoring considerations
 - iv. Material selection considerations
 - v. Summary of situational peculiarities

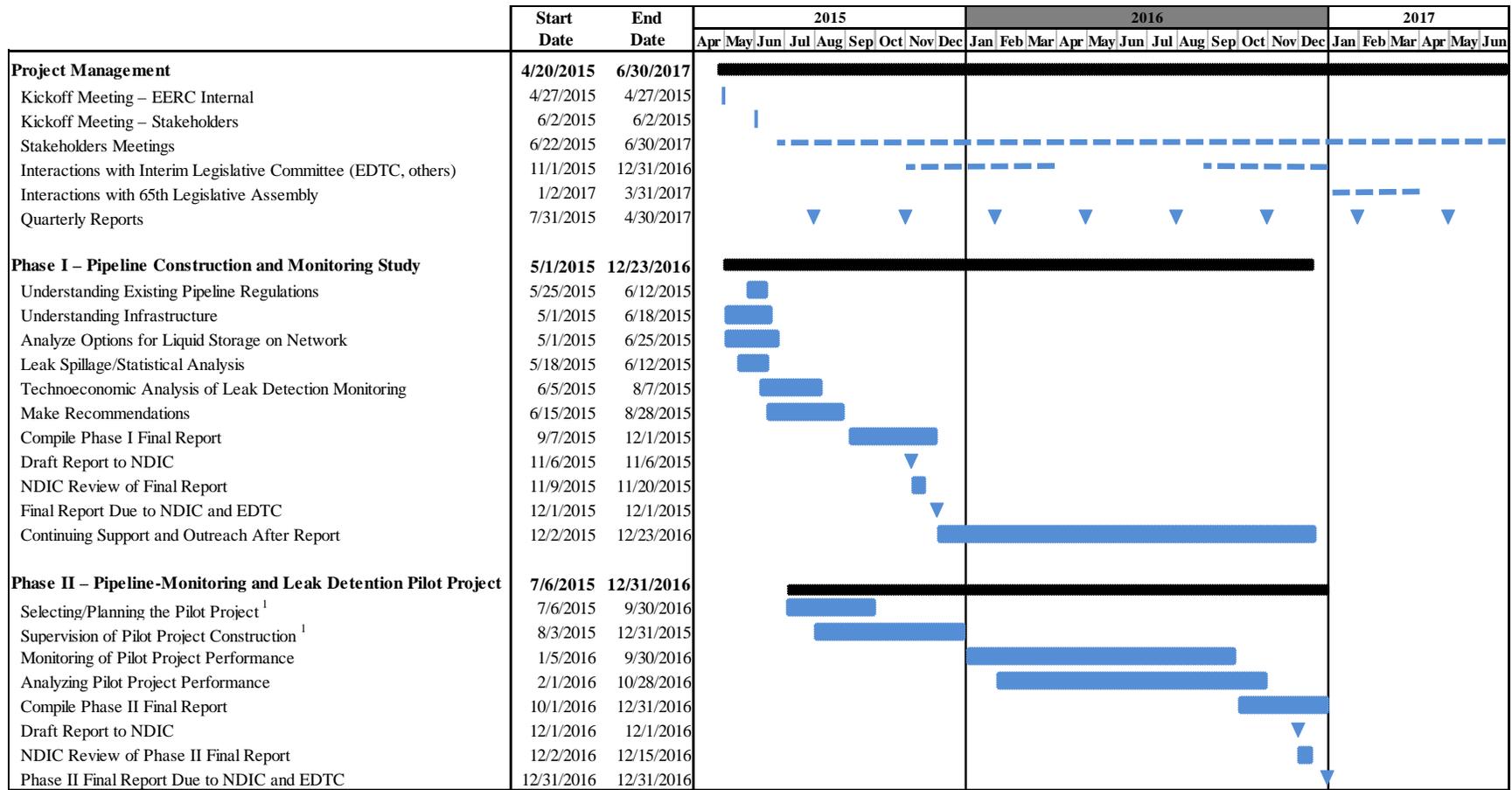
- h. Compile final report
 - i. Draft report
 - ii. Vet draft with key partners
 - iii. Incorporate pertinent suggestions
 - iv. Draft report to NDIC
 - v. NDIC review of draft
 - vi. Incorporate NDIC suggestions to complete report
 - vii. Final report to NDIC and EDTC w/recommendations
- i. Continuing support and outreach after report
 - i. Continuing testimony to EDTC
 - ii. Landowner education

3. Phase II – Pipeline -Monitoring and Leak Detection Pilot Project

- a. Planning the pilot project
 - i. Industrial partner(s) recruitment (producers, midstreams, pipeline operators, monitoring system vendors)
 - ii. Site(s) selection
 - iii. Design of site-specific pilot system(s)
 - iv. Coordination with industry partner(s) for procurement activities
- b. Supervision of pilot project construction
 - i. Coordination with industry partner(s) for construction activities
 - ii. Monitoring of pilot project performance
- c. Data monitoring
 - i. Ongoing instrument condition assessment
 - ii. Instrument calibration verification
 - iii. Sharing project data with industrial partner(s)
- d. Analyzing pilot project performance
 - i. Posttest data analysis
 - ii. Sensitivity analyses with temperature, sunlight, moisture, and snowcover as factors
 - iii. Measurement error analysis
- e. Report on pilot project

PROJECT TIME LINE

The period of performance for this project is April 20, 2015, to June 30, 2017. A detailed time line is presented in Figure 1.



Summary Task [Summary Task Bar] Activity Bar [Activity Bar] Activity to be Performed as Needed [Activity to be Performed as Needed] Deliverable [Deliverable]

¹ Overlap of selecting/planning the pilot project and supervision of pilot project construction reflecting potential early start of the activity during summer 2015 and attendant uncertainty.

Figure 1. Project time line.

DELIVERABLES

Products that will be delivered to the state include the following:

- Quarterly reports to NDIC, summarizing progress made during each quarter and highlighting expected accomplishments during the next quarter – due 30 days after the end of each calendar quarter.
- Phase I final report with recommendations to guide state efforts to deduce effective and economically viable approaches to regulation of gathering pipeline construction, monitoring, and inspection – due December 1, 2015.
- Phase II final report summarizing the pilot demonstration design, the data collected during the pilot demonstration, analysis of that data, and recommended practices resulting from the pilot demonstration – due December 31, 2016.

KEY PERSONNEL

Jay Almlie will serve as project manager. Mr. Almlie has managed numerous large projects during his tenure at the EERC and prior to that during his tenure at National Aeronautics and Space Administration – Johnson Space Center. Mr. Almlie has served a central role in the related Bakken Production Optimization Program, also funded by NDIC.

John Harju will serve as a project advisor. Mr. Harju will provide valuable insight regarding industry conventional wisdom and pertinent relationships within the industry and between the industry and the state.

Tom Doll will also serve as project advisor, offering insights into the regulator's perspective of the issues being studied. Mr. Doll formerly served as the principal oil and gas regulator in Wyoming.

Dr. John Hurley, an EERC materials scientist, will investigate pipeline materials and all related aspects.

Dr. Bruce Folkedahl, an EERC materials engineer, will also investigate pipeline materials, their compatibility with the North Dakota environment, and known failure modes and effects.

Michael Collings, an EERC process engineer and data systems expert, will investigate pipeline-monitoring systems and their compatibility with pipeline construction practices and materials. Mr. Collings will lead the technoeconomic analysis of pipeline-monitoring systems.

Dr. Steven Schlasner, an EERC process engineer with pipeline and refinery experience, will also investigate pipeline-monitoring systems, focusing on advanced monitoring technologies.

Brad Stevens, PE, an EERC civil engineer with experience in remediation and reclamation activities will investigate construction practices and reclamation practices as they relate to the goal of the project and the resulting recommendations.

BUDGET

A detailed budget for all phases of the project is included in Table 1. Budget notes are included in Appendix A.

Table 1. Budget

BUDGET			
	Phase I Pipeline Construction and Monitoring Study	Phase II Pipeline Monitoring and Leak Detection Pilot Project	Total
Category			
Labor	\$ 822,747	\$ 450,898	\$ 1,273,645
Travel	\$ 44,957	\$ 16,632	\$ 61,589
Equipment > \$5000	\$ -	\$ 70,000	\$ 70,000
Supplies	\$ 6,020	\$ 53,978	\$ 59,998
Other*	\$ 12,040	\$ 2,394	\$ 14,434
Laboratory Fees & Services			
Graphics Service	\$ 13,513	\$ 6,821	\$ 20,334
Total Project Costs – U.S. Dollars	\$ 899,277	\$ 600,723	\$ 1,500,000

*May include costs such as food, printing, communications, or other miscellaneous expenses.

Labor Categories	Phase I Labor Hours	Phase II Labor Hours	Total Hours
Research Scientists/Engineers	4,798	2,683	7,481
Research Technicians	460	217	677
Senior Management	140	84	224
Under Graduate Research Students	1,200	-	1,200
Technical Support Services	194	99	293
Total	6,792	3,083	9,875

Note: Phase I and II include project management activities



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APPENDIX A
BUDGET NOTES

BUDGET NOTES

ENERGY & ENVIRONMENTAL RESEARCH CENTER (EERC)

BACKGROUND

The EERC is an independently organized multidisciplinary research center within the University of North Dakota (UND). The EERC receives no appropriated funding from the state of North Dakota and is funded through federal and nonfederal grants, contracts, and other agreements. Although the EERC is not affiliated with any one academic department, university faculty may participate in a project, depending on the scope of work and expertise required to perform the project.

INTELLECTUAL PROPERTY

If federal funding is proposed as part of this project, the applicable federal intellectual property (IP) regulations may govern any resulting research agreement. In addition, in the event that IP with the potential to generate revenue to which the EERC is entitled is developed under this agreement, such IP, including rights, title, interest, and obligations, may be transferred to the EERC Foundation, a separate legal entity.

BUDGET INFORMATION

The proposed work will be done on a cost-reimbursable basis. The distribution of costs between budget categories (labor, travel, supplies, equipment, etc.) is for planning purposes only. The project manager may, as dictated by the needs of the work, incur costs in accordance with Office of Management and Budget (OMB) Circular A-21 found at www.whitehouse.gov/omb/circulars. If the Scope of Work (by task, if applicable) encompasses research activities which may be funded by one or more sponsors, then allowable project costs may be allocated at the Scope of Work or task level, as appropriate, to any or all of the funding sources. Financial reporting will be at the total-agreement level.

Escalation of labor and EERC recharge center rates is incorporated into the budget when a project's duration extends beyond the current fiscal year. Escalation is calculated by prorating an average annual increase over the anticipated life of the project.

The cost of this project is based on a specific start date indicated at the top of the EERC budget. Any delay in the start of this project may result in a budget increase. Budget category descriptions presented below are for informational purposes; some categories may not appear in the budget.

Salaries: The EERC employs administrative staff to provide required services for various direct and indirect support functions. Salary estimates are based on the scope of work and prior experience on projects of similar scope. The labor rate used for specifically identified personnel is the current hourly rate for that individual. The labor category rate is the current average rate of a personnel group with a similar job description. Salary costs incurred are based on direct hourly effort on the project. Faculty who work on this project will be paid an amount over their normal base salary, creating an overload which is subject to limitation in accordance with university policy. Costs for general support services such as contracts and intellectual property, accounting, human resources, purchasing, shipping/receiving, and clerical support of these functions are included in the EERC facilities and administrative cost rate.

Fringe Benefits: Fringe benefits consist of two components which are budgeted as a percentage of direct labor. The first component is a fixed percentage approved annually by the UND cognizant audit agency, the Department of Health and Human Services. This portion of the rate covers vacation, holiday, and sick leave (VSL) and is applied to direct labor for permanent staff eligible for VSL benefits. Only the actual approved rate will be charged to the project. The second component is estimated on the basis of historical data and is charged as actual expenses for items such as health, life, and unemployment insurance; social security; worker's compensation; and UND retirement contributions.

Travel: Travel is estimated on the basis of UND travel policies which can be found at www.und.edu/dept/accounts/policiesandprocedures.html. Estimates include General Services Administration (GSA) daily meal rates. Travel may include site visits, field work, meetings, and conference participation as indicated by the scope of work and/or budget.

Equipment: If equipment (value of \$5000 or more) is budgeted, it is discussed in the text of the proposal and/or identified more specifically in the accompanying budget detail.

Supplies – Professional, Information Technology, and Miscellaneous: Supply and material estimates are based on prior experience and may include chemicals, gases, glassware, nuts, bolts, and piping. Computer supplies may include data storage, paper, memory, software, and toner cartridges. Maps, sample containers, minor equipment (value less than \$5000), signage, and safety supplies may be necessary as well as other organizational materials such as subscriptions, books, and reference materials. General purpose office supplies (pencils, pens, paper clips, staples, Post-it notes, etc.) are included in the facilities and administrative cost.

Subcontracts/Subrecipients: Not applicable.

Professional Fees/Services (consultants): Not applicable.

Other Direct Costs

Communications and Postage: Telephone, cell phone, and fax line charges are generally included in the facilities and administrative cost. Direct project costs may include line charges at remote locations, long-distance telephone, postage, and other data or document transportation costs.

Printing and Duplicating: Photocopy estimates are based on prior experience with similar projects. Page rates for various photocopiers are established annually by the university's duplicating center.

Food: Food expenditures for project meetings, workshops, and conferences where the primary purpose is dissemination of technical information may include costs of food, some of which may exceed the institutional limit.

Professional Development: Fees are for memberships in technical areas directly related to work on this project. Technical journals and newsletters received as a result of a membership are used throughout development and execution of the project by the research team.

Fees and Services – EERC Recharge Centers, Outside Labs, Freight: EERC recharge center rates for laboratory, analytical, graphics, and shop/operation fees are established and approved at the beginning of the university's fiscal year.

Laboratory and analytical fees are charged on a per sample, hourly, or daily rate, depending on the analytical services performed. Additionally, laboratory analyses may be performed outside the university when necessary.

Graphics fees are based on an established per hour rate for production of such items as report figures, posters, and/or PowerPoint images for presentations, maps, schematics, Web site design, professional brochures, and photographs.

Shop and operation fees are for expenses directly associated with the operation of the pilot plant facility. These fees cover such items as training, personal safety (protective eyeglasses, boots, gloves), and physicals for pilot plant and shop personnel.

Freight expenditures generally occur for outgoing items and field sample shipments.

Facilities and Administrative Cost: Facilities and administrative (F&A) cost is calculated on modified total direct costs (MTDC). MTDC is defined as total direct costs less individual capital expenditures, such as equipment or software costing \$5000 or more with a useful life of greater than one year, as well as subawards in excess of the first \$25,000 for each award. The F&A rate for nonfederal sponsors is 60%. This rate is based on costs that are not included in the federally approved rate, such as administrative costs that exceed the 26% federal cap and depreciation/use allowance on buildings and equipment purchased with federal dollars.