UNIVERSITY OF NORTH DAKOTA
Research Development and Compliance

Grant Proposal Transmittal Form

TITLE: Shallow Gas in Western North Dakota

FUNDING AGENCY: North Dakota Industrial Commission - Oil and Gas Research Council

PRINCIPAL INVESTIGATOR: Dr. Richard D. LeFever, Assoc. Prof., Geology and Geological Engineering **PHONE:** 701-777-3014
(Name, Title, Department)

PROPOSED PROJECT PERIOD: September 1, 2005 **To:** August 31,2007

FUNDS REQUESTED: **FIRST YEAR:** $36,089.39 **SECOND YEAR:** $22,615.20

THIRD YEAR: _____ **FOURTH YEAR:** _____ **FIFTH YEAR:** _____

TOTAL FUNDS REQUESTED: $58,704.59 **INDIRECT COSTS REQUESTED:** $16,652.59

PROPOSAL DEADLINE DATE: June 1, 2005

Will your project involve the use of any of the following? (Review and approval of a proposal may be required by the appropriate committee.)

Yes		Yes	
☐	Animals (Institutional Animal Care Committee)	☐	Biohazards or Recombinant DNA (Institutional Biosafety Committee)
☐	Human Subjects (Institutional Review Board)	☐	Radioactive Materials (Radiation Safety & Hazardous Materials Committee)

UNIVERSITY COMMITMENTS (Faculty, Support Staff, Space, Funds): Principal Investigator (25% commitment over two years); $3,000 from Engineering and Mines; $3,000 from Geology and Geological Engineering

Has lobbying occurred with respect to this proposal? ___ Yes X No (Required for Federal projects only)

Will the project involve a confidentiality agreement or proprietary information? ___ Yes X No

Have any agreements been entered into related to this project? (e.g. material transfer, confidentiality) ___ Yes X No If yes, attach explanation.

I have filed with the Dean of my college appropriate, up-to-date Financial Interest Disclosure forms that relate to this agency. I understand that these forms indicate that I will cooperate in the development of a Memorandum of Understanding that constitutes a conflict of interest "resolution plan" if a conflict of interest or potential conflict of interest is found to exist that relates to this proposal, and to comply with any conditions or restrictions imposed by the University to manage, reduce or eliminate actual or potential conflicts of interest or forfeit the award.

Richard D. LeFever — Principal Investigator — Date: 5/16/05

Co-Investigator or Key Personnel — Date

APPROVALS:

1. W.D. Gosnold — Department Chairperson — Date: 5-13-05
2. _____ School of Medicine & College of Nursing - Admin. & Finance — Date
3. John Watson by Arnold Johnson — Project Director's Dean — Date: 5/16/05
4. _____ Institutional Animal Care Committee (if required-Kap Lee) — Date
5. _____ Institutional Review Board Committee (if required-ORPD) — Date
6. Budget & Grants Administration — Date: 5-16-05
7. Research Development and Compliance (signs proposal) (JAMES K. PETERS) — Date: 05/12/05

Please submit 2 copies of signed proposal in final form no less than 3 working days prior to proposal deadline to:
RD&C, 105 Twamley Hall, UND

School of Medicine only: Copies of Awards or Denials should be sent to:
Grants & Contracts, Office of the Dean, School of Medicine

Oil and Gas Research Council Proposal

Shallow Gas in Western North Dakota

Principal Investigator:

Dr. Richard D. LeFever
Department of Geology and Geological Engineering
University of North Dakota

Date:

Amount Requested: $58,704.59

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Abstract

The proposed project is intended to enhance our understanding of the Cretaceous rocks which produce gas in North Dakota and adjacent parts of Montana, and to evaluate the gas production potential in other areas in western North Dakota. The ultimate goal of this project is to identify which additional areas in western North Dakota have potential for Cretaceous gas production. This is a collaborative project between the Department of Geology and Geological Engineering of the University of North Dakota, and the North Dakota Geological Survey.

The expected results include: 1) construction of a stratigraphic framework for Cretaceous rocks in western North Dakota and eastern Montana; 2) compilation and interpretation of reservoir data for the Cretaceous gas producers; and 3) interpretation of collected data to evaluate the gas production potential in areas in western North Dakota which do not currently produce.

The duration of the project is expected to be two years. The total project cost will be $118,985; $58,705 is requested as grant support, and $60,280 is promised as cost share.

Project summary

The ultimate goal of this project is to identify which additional areas in western North Dakota have potential for Cretaceous gas production. We will do this first by characterizing the existing gas production in both Montana and North Dakota, and then extending what we have learned into areas with no current gas production.

Project activities will consist of three phases: 1) Delineation of the stratigraphic framework for the Cretaceous in western North Dakota and eastern Montana; 2) Characterization of the Cretaceous gas reservoirs; and 3) Evaluation of the production potential in nonproductive areas in western North Dakota.

Project Description

The proposed project entitled "Shallow Gas in Western North Dakota" is intended to enhance our understanding of the stratigraphy of the Cretaceous rocks in which gas production occurs in western North Dakota and adjacent parts of eastern Montana, and to evaluate the gas production potential in other areas in western North Dakota. This is a collaborative project between the Department of Geology and Geological Engineering of the University of North Dakota, and the North Dakota Geological Survey.

Natural gas production from shallow Cretaceous reservoirs in Montana currently occurs from about 640 wells in 7 fields and 8 pools, with a cumulative reported production to date of about 88.9 BCF. In North Dakota, by contrast, Cretaceous gas producers comprise only 101 wells in 2 fields and 2 pools, with a reported cumulative production of about 10 BCF. The ultimate goal of this project is to identify which additional areas in western North Dakota have potential for Cretaceous gas production. We will do this first by characterizing the existing gas production in both Montana and North Dakota, and then extending what we have learned into areas with no current gas production. The duration of the project is expected to be two years. The project will be conducted in three phases of approximately 8 months each:

Phase 1 - Delineation of the stratigraphic framework for the Cretaceous in western North Dakota and eastern Montana.

Stratigraphic data will be collected from wireline logs in western North Dakota and eastern Montana. Electronic versions of the logs are available online and at the North Dakota Geological Survey offices in Bismarck and at the Wilson Laird Core Library in Grand Forks.

Phase 2 - Characterization of the Cretaceous reservoirs.

As far as possible, we will attempt to determine the significant reservoir characteristics for each producing well and field, including stratigraphic placement of producing interval, porosity, permeability, and production history. Data sources will include wireline log data, well cores, and the relevant materials on file with the North Dakota Oil and Gas Division, and the Montana Board of Oil and Gas Conservation.

Phase 3 - Evaluation of production potential.

Using the data acquired during the first two phases of the project, we will evaluate the production potential of non-productive areas in western North Dakota. Relevant data are expected to include reservoir characteristics, production history, stratigraphy of producing intervals, and geographic extent of productive lithofacies.

Most research activities will take place in the Department of Geology and Geological Engineering at the University of North Dakota, and at the Wilson Laird Core and Sample Library on the University campus. Existing facilities on campus, including the availability of computer hardware and software, and access to electronic databases, are adequate.

Although the Montana Board of Oil and Gas Conservation has made some well and production information available online, much of the well information on file is only available on site at the Billings facility. It will thus be necessary to travel to collect the data. Moreover, Montana has no core repository, and operators send cores to the U.S. Geological Survey core facility in Denver, Colorado. According to USGS records, some Cretaceous cores from eastern Montana are housed in Denver, and travel to their facility will be necessary to examine the cores.

Personnel

Richard D. LeFever - Department of Geology and Geological Engineering, University of North Dakota

Julie A. LeFever - North Dakota Geological Survey

Student - Graduate student in Geology, University of North Dakota

Standards of success

Each phase of the project will produce results for the tasks undertaken in that phase (below). The standards of success for this project are the production of such items by the completion of the corresponding phase. Each of the products should be considered preliminary until the entire project is completed.

Phase 1 - Delineation of the stratigraphic framework for the Cretaceous

Isopach maps of stratigraphic intervals

Cross-sections illustrating stratigraphic relationships

Stratigraphic data base

Phase 2 - Characterization of the Cretaceous reservoirs.

Data base and maps of reservoir characteristics

Production history and decline curves

Estimations of ultimate recovery

Phase 3 - Evaluation of production potential.

Compilation and synthesis of results from phases 1 and 2

Extension of compilation into nonproducing areas and evaluation of western North Dakota counties for gas production potential

Background

Cretaceous Stratigraphy

The applicant has spent about 10% of his time over the past year collecting stratigraphic data on the Cretaceous strata in eastern Montana and western North Dakota, and in beginning to assemble it into a stratigraphic framework. The NDGS staff geologist, as part of her role in the Weyburn CO_2 project, collected some data on the Cretaceous section in eastern Montana and western North Dakota. Considerable work remains to be done.

Many workers have published on the Cretaceous stratigraphy and sedimentology in the area, including NDGS and USGS scientists. The results are usually portrayed as maps; a few publications show cross-sections. The previous works provide little that could be readily incorporated into existing databases, and the results are often difficult to relate from one study to another.

Reservoir characterization of Cretaceous gas pools

Almost nothing exists in the public domain. One article was published on Little Missouri Field in 1981.

Production potential

There appears to have been nothing published on the gas production potential of western North Dakota.

Qualifications

The project work will be performed by the principal investigator, the NDGS staff geologist, and a graduate student under the supervision of the principal investigator.

The principal investigator has over 20 years of experience working in the subsurface of the Williston Basin, including Cretaceous strata, has numerous publications and presentations on the subsurface of the Williston Basin, and has supervised 17 graduate theses on Williston Basin subsurface geology. The NDGS staff geologist has more than 20 years experience working in the subsurface of the Basin, and numerous publications and presentations on the subsurface of the Williston Basin.

Value to North Dakota

It is anticipated that petroleum geologists, and oil and gas operators will make use of the project results. The value to North Dakota lies principally in three areas:

1) The ultimate goal of this project is to identify which additional areas in western North Dakota have potential for Cretaceous gas production. If we are able to show gas production potential in areas which do not presently produce, it might well encourage exploration by companies already operating within the state, and attract new companies.

2) A more detailed understanding of the gas reservoirs and the factors which influence their characteristics should enable more efficient production.

3) The stratigraphic and reservoir data which will be collected, as well as our interpretations, will be available to the public, and may generate ideas for additional projects or approaches.

Management

The graduate student will be under the direct supervision of the principal investigator, who will meet with the student every two weeks to assess progress. The NDGS geologist is under the direct supervision of the Acting State Geologist, and NDGS work schedules and priorities are reviewed weekly. Management and oversight of the project as a whole will be conducted through monthly conferences of all participants and their supervisors.

Timetable

Project Duration: September 1, 2005 - August 31, 2007

Phase 1 - Delineation of the stratigraphic framework for the Cretaceous (September 1, 2005 - April 30, 2006) Interim report - May 31, 2006

Products: Isopach maps of stratigraphic intervals; Cross-sections illustrating stratigraphic relationships; Stratigraphic data base

Phase 2 - Characterization of the Cretaceous reservoirs. (May 1, 2006 - December 31, 2006) Interim report - January 31, 2007

Products: Data base and maps of reservoir characteristics; Production history and decline curves; Estimation of ultimate recovery

Phase 3 - Evaluation of production potential. (January 1, 2007 - August 31, 2007)

Products: Compilation and synthesis of results from phases 1 and 2

Extension of compilation into nonproducing areas and evaluation of western North Dakota counties for gas production potential

Budget

	Year 1	Year 2	Total
Requested Grant Support:			
Personnel			
Salary - Principal Investigator	7,600.00		7,600.00
Graduate Assistantships	15,000.00	15,000.00	30,000.00
Fringe Benefits	3,252.00	1,200.00	4,452.00
Total Personnel	25,852.00	16,200.0	42,052.00
Total Direct Cost	25,852.00	16,200.00	42,052.00
Indirect Cost	10,237.39	6,415.20	16,652.59
Total Requested	36,089.39	22,615.20	**58,704.59**
Cost share:			
Personnel			
Salary - Principal Investigator	17,140.00	17,140.00	34,280.00
Salary - NDGS Geologist	10,000.00	10,000.00	20,000.00
Operating Costs			
Travel	3,000.00	3,000.00	6,000.00
Total Cost Share	30,140.00	30,140.00	**60,280.00**
Total Project Cost	66,074.28	52,658.00	**118,984.59**

Budget (contd)

Explanation of Budget Items

Funds Requested: The principal investigator salary is for one month support during the summer, to conduct project research and to supervise a graduate student working on the project. The graduate assistantship is the support for a half-time graduate research assistant for 12 months. The fringe benefits and indirect costs are calculated at the current rates for the University of North Dakota.

Cost Share: The principal investigator will be spending 25% of his time during two academic years on this project, and the NDGS geologist will be spending 20% of her time during the two years of the project. The travel costs are to support travel to Billings and to Denver for data collection during Phase 2 of the project (please see project description).

If less funding is available than requested, the project's objectives will be delayed.

Matching funds

1) Department of Geology and Geological Engineering, University of North Dakota

- $3,000 for travel over the lifetime of the grant
- The principal investigator will devote 25% of his time during the next two academic years to this project ($34,280)

2) North Dakota Geological Survey

The NDGS geologist will devote 20% of her time during the next two years to this project ($20,000)

3) School of Engineering and Mines, University of North Dakota

- $3,000 for travel over the lifetime of the grant

Tax liability

Not applicable

Confidential information

None of the information in this application is of a confidential nature.

Patents and Rights to Technical Data

There are no patents or rights that the applicant wishes to reserve.

Appendix

North Dakota Geological Survey

INDUSTRIAL COMMISSION
John Hoeven - Governor, Chairman
Wayne Stenehjem - Attorney General
Roger Johnson - Agriculture Commissioner

May 13, 2005

Dr. Richard D. LeFever
Dept of Geology and Geological Engineering
University of North Dakota
Grand Forks, North Dakota 58202-8358

RE: Shallow Gas in Western North Dakota Proposal

Dear Dr. LeFever,

The North Dakota Geological Survey recognizes the widespread potential for shallow gas in the Cretaceous rocks within the North Dakota portion of the Williston Basin and the potential economic boost to both traditional and nontraditional oil and gas producing areas in North Dakota. This project proposal is timely because we recently began an evaluation of the deep gas potential in North Dakota and plan to initiate an evaluation of the shallow gas potential this fall.

The North Dakota Geological Survey supports this project proposal and will commit in-kind cost share of up to $20,000 for the study ie., $10,000 for each year of the project. The Survey commitment will primarily be the time that one of our subsurface geologists contributes to the project.

The North Dakota Geological Survey has a long tradition of working with faculty at the University of North Dakota. We look forward to working with you on this project.

Sincerely,

Edward C. Murphy
Acting State Geologist

600 East Boulevard Avenue v Bismarck, North Dakota 58505-0840 v Phone (701) 328-8000 v Fax (701) 328-8010