

Contract No. G-018-039
“Determination of the Uniqueness of Reserves and Productivity
from the Middle Bakken and the Three Forks Sanish Zones”

Submitted by **Continental Resources, Inc.**

Principal Investigator: Gene Carlson

PARTICIPANTS

Sponsor	Cost Share
Continental Resources, Inc.	\$6,795,000
North Dakota Industrial Commission	<u>\$ 600,000</u>
Total Project Cost	\$7,395,000

Project Schedule – 10 months
Contract Date – January 15, 2010
Start Date – April 15, 2009

Project Deliverables:
Status Report: December 8, 2009 v
Draft Final Report (without Mathistad 2
geo-chemical data): January 20, 2010 v
Deadline for OGRC & staff review of
Draft Final Report: February 1, 2010 v
Final Report with Mathistad 2 geo-
chemical data: February 20, 2010 v

Completion Date – February 20, 2010

OBJECTIVE/STATEMENT OF WORK:

The objective of this project is to determine if the Middle Bakken and Three Forks production are separate and distinct reservoirs. If the two intervals are actually separate and distinct, producible reserves per spacing unit would greatly increase with proper development. The success of this project will be measured by the development of a dataset and performance of reservoir modeling that leads to the establishment of evidence regarding relationship, or lack thereof, between the Three Forks-Sanish and Middle Bakken oil producing zones. Understanding the degree of communication is key in determining the number of wells and where they should be drilled to optimize recovery from each zone. This work tested whether wells should be drilled directly over or beneath an existing producer in the Bakken or Three Forks-Sanish zones or whether one well would be able to adequately drain both zones.

STATUS

Contract executed. A condition of the contract was that the original geo-chemical data on the wells be provided to the Commission. That geo-chemical data was provided as part of the December 8, 2009 status report. Subsequent geo-chemical data is now being analyzed. Gene Carlson is scheduled to present the Draft Final Report at the January 20, 2010 Oil and Gas Research Council meeting.

January 20, 2010. Gene Carlson presented the draft final report to a meeting of the Oil and Gas Research Council on January 20, 2010. A copy of the draft final report is posted on the Industrial Commission/Oil and Gas Research Council website. The draft final report states the following under Results:

The results showed that the #2 fraced into the #1 wellbore in all frac stages but, even with the well to well communication, the #2 is estimated to recover an additional 400 MBO over the base case of only drilling and producing the #1. Pressures measured in the #1 showed communication from at

least 13 of the 14 stages and fluid tracers recovered in the #1 production showed frac fluid from all 14 of the #2 frac stages.

April 26, 2010. The final report has been received and a copy is posted on the Industrial Commission/Oil and Gas Research Council website. The final report states the following under Results and Application:

The test consisted of drilling the Mathistad #2 in the middle member of the Bakken above the Mathistad #1, an existing Three Forks Sanish (TFS) producer. Pressure data, frac fluid tracers and oil samples were gathered as part of the project. The analysis shows a TFS well alone would not recover a significant portion of the Middle Bakken reserves. Results show that the #2 fractured into the #1 wellbore in all frac stages but, even with the well to well communication, the #2 is estimated to recover an additional 400 MBO over the base case of only drilling and producing the Mathistad #1. Pressures measured in the #1 showed communication from at least 12 of the 14 stages and fluid tracers recovered in the #1 production showed frac fluid from all 14 of the #2 frac stages.

Analysis of the oil samples showed no major differences in the oils sampled. Oil compositions from multiple Bakken and TFS wells showed more areal variation in the same zone than the variation in samples from separate zones in the same location.

History matching the pressure and production data in the reservoir simulator allows it to be used to forecast different operating scenarios. The different scenarios investigated showed the Mathistad #2 will recover additional oil but the optimum recovery is obtained by staggering wellbores 660' apart in the Bakken and TFS zones. This means wellbores in the same zone will be 1320' apart for optimum recovery and economics.

A key parameter in the history matching is the vertical permeability between zones. History matching shows that prior to fracture treating the Mathistad #2, the vertical permeability between the Middle Bakken and TFS is only .01 microDarcies. This allows some pressure communication but not enough to adequately drain the other zone with only one well. The modeling showed it takes at least 5-6 months of production to begin to fully recognize the effect of vertical permeability.

Hydraulic fracture modeling showed the fracture treatments would be contained in zone at initial reservoir pressures. However, with pressure depletion the fracture model showed the fractures would grow from the Bakken to the TFS. The pressure data and fluid tracer data support this model result.

The Conclusions portion of the Final Report states:

Conclusions from the analysis of the data gathered as part of this project are as follows:

1. There is very limited communication between the Bakken and TFS reservoirs at the Mathistad location prior to fracturing in a pressure depleted area.
2. Enough additional reserves will be produced from a second well completed directly above or below the first to be economic, even with high permeability fractures communicating between the wells.

3. Fracture communication may exist in a limited area due to natural or hydraulic fractures, but significant additional reserves can still be developed for up to 7 wells per spacing unit.
4. Pressure depletion can create significant hydraulic fracture growth between zones over a short distance. It might be possible to produce the incremental reserves of the second well from the first well after the second well is stimulated.
5. No distinguishable differences exist between the Bakken and TFS oil to separate the zones.

This project is now complete.

04/26/10