

# ***Bakken Production Optimization Program***

**OGRC Briefing  
Bismarck, North Dakota  
May 26, 2015**

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Continental Resources, Inc.

# The Brave New World – Unconventional Reservoirs



## UNCONVENTIONAL LEADERSHIP FOR AN UNCONVENTIONAL RESOURCE



### Bakken Production Optimization Program

- Resource characterization
- Site logistics
- Waste management
- Hydrocarbon utilization
- Water management
- Process optimization and systems analysis



### Bakken CO<sub>2</sub> Enhanced Oil Recovery and Storage Project

- Resource maximization
- Innovative reservoir characterization
- Fracture characterization and modeling





# Program Description

- *Pilot hole logs, core data, other data gathering from multiple wells to create a 3-D picture of what happens during and after the hydraulic fracture treatments in a multistage horizontal well. Continental will analyze this data set to:*
    - *Assess total resource available in the second and third benches of the Three Forks Formation (separate and unique?).*
    - *Confirm whether these benches are distinct and independent of the existing Middle Bakken.*
    - *Predict areas of future sweet spots.*
  - *Site logistics, waste management, on-site hydrocarbon utilization, water management, process optimization, and systems failure analysis with an eye on decreased environmental impact.*
- Phase I – Drilling 11 New Wells
  - Phase II – Completions
  - Phase III – Reservoir Engineering
  - Phase IV – Expansion Applications via 3-D Seismic
  - Phase V – Optimization of Wellsite Operations

# Phase V – Optimization of Wellsite Operations

- Consortium-based phase to help industry partners optimize oil and gas activities and improve the efficiency of operation.
- Project scope directed by consortium, not limited to the following topic areas:
  1. Hydrocarbon utilization...*production of oil, gas, or NGLs at wellsites*
  2. Waste management...*handling drilling and production wastes*
  3. Water management...*limit freshwater demand, decrease wastewater production, reduce water/wastewater trucking*
  4. Site logistics...*equipment siting and workflow at multi-operation / multi-well locations*
  5. Process optimization and systems analysis...*analysis of wellsite failures that affect production efficiency*
  6. Waste minimization...*especially drill cuttings recycling*
  7. Spill Remediation...*improved spill cleanup speed/economics/efficacy*
  8. Land Reclamation...*improved return of land to productive use after spills or disturbance*

# This Work Addresses ND Priorities

- Reduce flaring
  - By surveying available technologies, assessing their application to ungathered locations, and demonstrating functional scaled technologies.
- Reduce environmental impacts
  - By exploring surface operations that minimize truck traffic (resulting in decreased diesel emissions, decreased road damage, decreased maintenance costs, decreased road dust, and decreased incidence of spills).
  - By investigating technologies to recycle wastewater and decrease freshwater demand.
  - By minimizing land use impacts (wellpad footprints).
  - By addressing the NORM waste issue with science and outreach/education.
- Define Bakken system resources
  - By gathering new data with advanced tools to characterize the Middle Bakken and multiple benches of the Three Forks.
- Maximize Bakken system recovery
  - By using new data to define two new, undeveloped zones, and by using new data to feed models that will help predict optimum well spacing to maximize resource extraction.
  - By reducing OPEX via focus on systems assessment toward holistic reservoir and operations management.
- Public Education & Outreach

# Bakken Production Optimization Program Membership



# Program Budget

Sponsors	Y1	Y2	Y3	Total
NDIC Share – Cash	\$3,134,512	\$3,204,944	\$2,215,044	\$8,554,500
Industry Share – Cash	\$750,000	\$750,000	\$750,000	\$2,250,000
CLR Share – In-Kind	\$40,989,233	\$40,989,233	\$24,051,534	\$106,030,000
<b>Total</b>	<b>\$44,873,745</b>	<b>\$44,944,177</b>	<b>\$27,016,578</b>	<b>\$116,834,500</b>

**\$6.26M CLR subcontract;  
\$4.54M EERC**



# Program Highlights

- Hawkinson Project Results
- Task 1 – Hydrocarbon Utilization
  - Flaring Task Force Technical Support, Flaring Solutions Database
  - Crude Oil Characterization (w/ DOE & Sandia)
- Task 2 – Waste Management
  - NORM Task Force Technical Support, TENORM Primer
- Task 3 – Water Management
  - Water Use Assessment Update
- Tasks 7 & 8 – Spills Remediation and Land Reclamation
  - Saltwater Spills Task Force Technical Support
  - Spills Primer and Best Practices Guide
- BakkenSMART Fact Sheet Series for Public Education
- Flare Lights Mythbuster Fact Sheet
- 2014 IOGCC Chairman’s Stewardship Award for “Best Environmental Partnership”

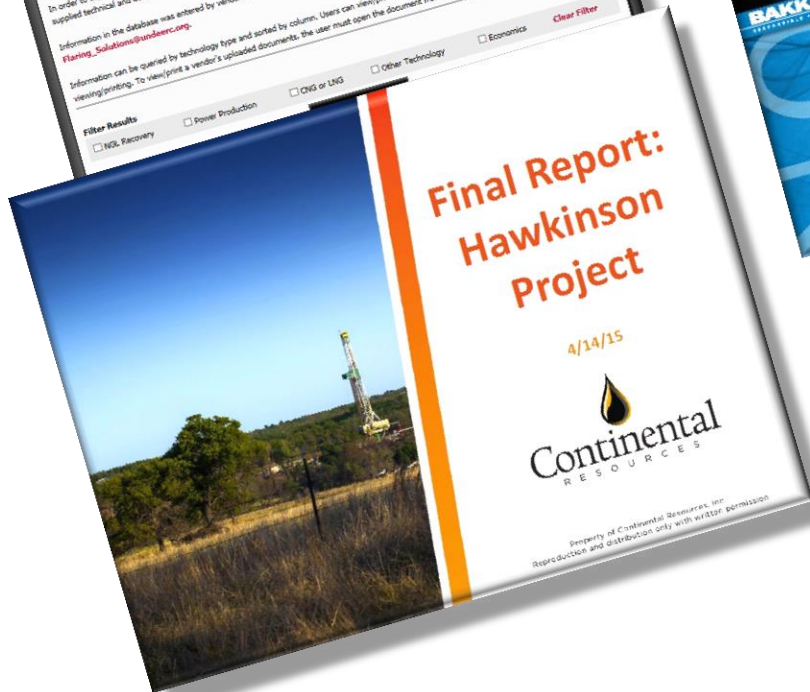
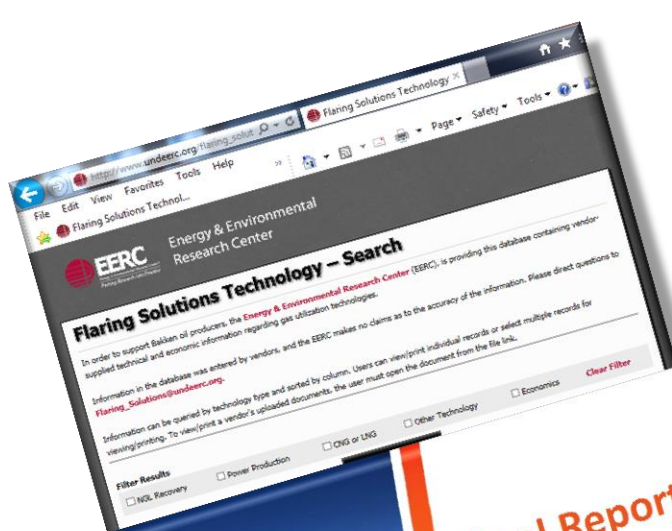


# Continental Resources' Hawkinson Project Completed

## Hawkinson Unit Summary Conclusions

- Results demonstrate that unique reserves exist between the Bakken and Three Forks, even in an area with a high degree of natural tectonic fracturing
- Supports drilling on a denser spacing than 1320' within the same formation
- 200' heel/toe setbacks result in un-captured resources
- Significant un-drained resources remain along section lines
- Fracture asymmetry observed due to pressure depletion and induced stresses
- Stimulations were well contained within the Bakken Petroleum System
- Maximum Positive Curvature is the seismic attribute best suited to predict well performance

# EERC's Major Program Products





# BakkenSMART Fact Sheet Series





# Possible Activities For Coming Year

- Drill Cuttings Recycling Options
- Wellsite Waste Survey
- Well Failure Analysis
- Crude Oil Conditioning Modeling
- Crude Oil Characterization
- UAS-Based Monitoring Demonstrations
- Water Recycling/Reuse Demonstrations
- Spills Remediation / Land Reclamation Demonstrations
- Advanced Reservoir Characterization

# Contact Information

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