



NORTH DAKOTA OIL AND GAS IMPACT STUDY 2014-2019

PHASE III UPDATE

JULY 8, 2014



The items contained in this document pertain to Phase III of the North Dakota Oil and Gas Impact Study 2014-2019.

- Phase III Scope of Work
- July 8, 2014 Presentation

PHASE II SCOPE OF WORK

Phase 3 Modeling and Analysis

Phase 3 will be the process of taking the key and relevant information determined from Phases 1 and 2, and then modeling it and analyzing it, to develop the facts necessary for the North Dakota Legislative Management to create future tax policy decisions. It is important to recognize that over the course of the study (proposed 8-months), there will be notable changes in the trends being monitored. KLJ will be flexible to change during the course of the study so that information is current at the study's completion. A portion of the analysis will be based on a set of variables that can be reasonably fixed early in the project schedule, and another portion of the study that will likely evolve over time throughout the duration of the study. KLJ will provide a five year analysis, looking at infrastructure needs, technological changes and environmental considerations between August 2014 and August 2019.

Phase 3 will include:

- Model and project future trends based on information summarized in Phases 1 and 2
 - KLJ analysis of validated baseline data
 - EERC analysis of potential CO2 based EOR
 - NDSU analysis of potential socio-economic impacts
- 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
- Summarize modeling and analysis outputs
 - Provide a 1-2 page report of findings and report out to North Dakota Legislative Management Committee



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The modeling and analysis will be incorporated into the final North Dakota Oil and Gas Impact Study 2014-2019.

The modeling and analysis results presented are subject to change before publication of the study.

North Dakota Oil and Gas Impacts Study 2014-2019

Phase III Update



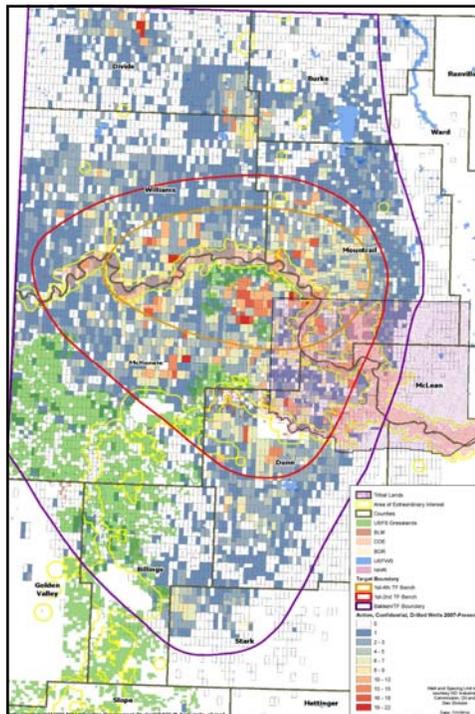
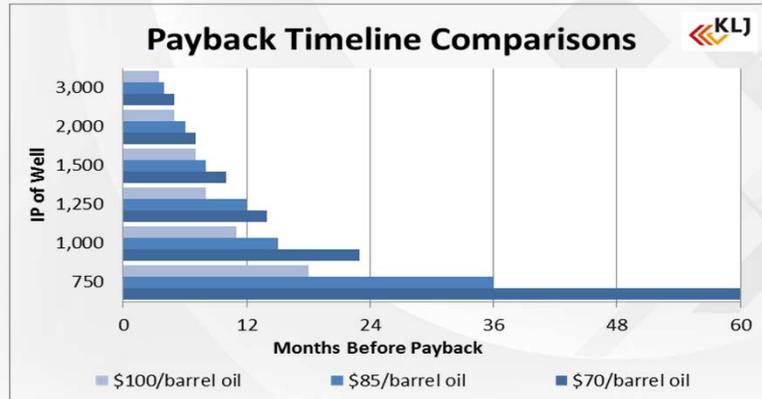
Scope Review

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graph TD; PhaseI((Phase I)) --> Forecast((Oil and Gas Forecast 2014-2019)); PhaseII((Phase II)) --> Forecast; PhaseIII((Phase III)) --> Forecast; PhaseVI((Phase VI)) --> Forecast;
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- ◇ Phase III Scope
 - ◇ Model and project future trends
 - ◇ KLJ, EERC and NDSU
 - ◇ Draw correlation between trends and future infrastructure requirements
 - ◇ Summarize modeling and analysis



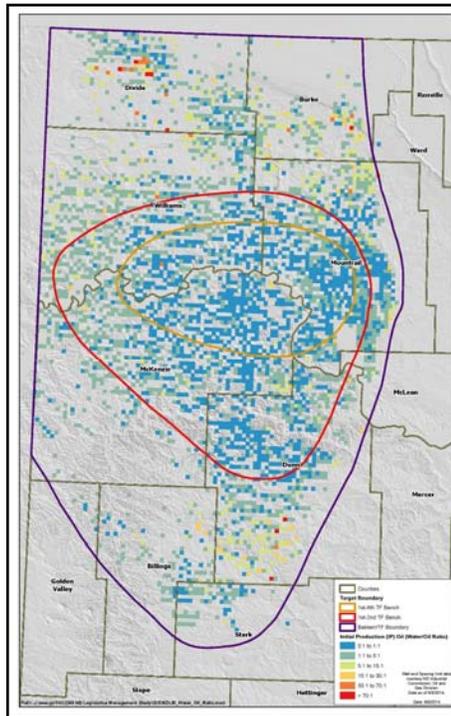
Bakken Production Payback



Federal and Protected Lands

- ◇ Federal grasslands and protected lands (see legend) cover a substantial area of the Bakken in North Dakota.
- ◇ If Federal permitting regulations were changed it is anticipated that drilling and production would occur in these areas within the five year study time frame. Impacts to the environment, infrastructure, workforce and housing would occur in the new drilling areas.





Water to Oil Ratio

- ◇ The water to oil ratio indicates greater infrastructure needs and impacts for increased trucking or pipeline construction traffic.
- ◇ Areas in yellow, orange and red have the greatest potential of future environmental impacts
- ◇ Producers have higher operation costs where the ratio of water to oil is higher

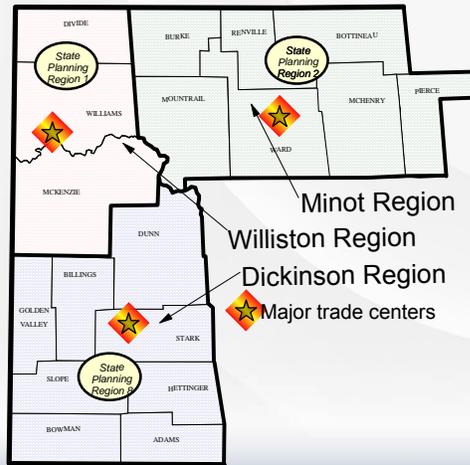


CO₂ EOR Potential Williston Basin 2014-2019



- Estimated incremental recovery in the top 10 units is **82.7 to 186.2 million barrels of oil**.
- This recovery would require **13.9 to 83.6 million tons of CO₂**.
- Uncertainty of CO₂ availability within 5 years:
 - DGC pipeline contract may or may not be renewed.
 - Greencore pipeline extension from Montana has been delayed.
 - Current operator focus is the Bakken system rather than conventional oil fields.

Forecasted Change in Economy-Wide Employment
Williston Basin (Williston, Dickinson, Minot)
2014-2019



Regions established for NDSU research area

Minot Region
Williston Region
Dickinson Region
Major trade centers



Forecasted Change in Economy-Wide Employment
Williston Basin (Williston, Dickinson, Minot)
2014-2019

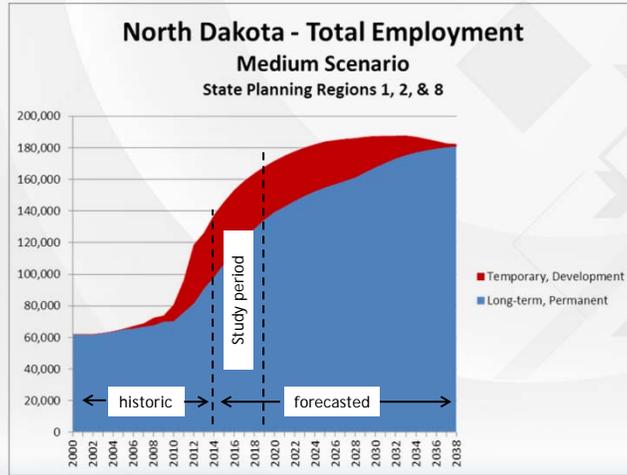


2014 Status Growth Scenario Potential ~ Not Actual Projections

	Williston Region	Minot Region	Dickinson Region	Combined
2014 (estimated)	52,559	51,795	33,132	137,485
2019	67,990	57,506	42,494	167,991
Total Jobs	15,432	5,710	9,363	30,505
% Growth	29.4	11.0	28.3	22.2

• NDSU Employment Characteristics Study will provide more insight on the percent of workers seeking permanent residency. Estimated completion December 2014.

Forecasted Change in Economy-Wide Employment
 Williston Basin (Williston, Dickinson, Minot)
 2014-2019



Forecasted Population
 Williston Basin (Williston, Dickinson, Minot)
 2014-2019



2014 Status Growth Scenario Potential ~ Not Actual Projections			
	Williston Region	Minot Region	Dickinson Region
2014	96,806	123,502	59,970
2019	131,325	136,914	77,483
Total Change	34,519	13,412	17,513
% Growth	35.7	10.9	29.2

• Forecasts of permanent population predicated on ability to supply permanent housing. Represents population potential.

Forecasted Demand for Housing (Total Units)
Williston Basin (Williston, Dickinson, Minot)
2014-2019



2014 Status Growth Scenario Potential ~ Not Actual
Projections

	Williston Region	Minot Region	Dickinson Region
2014	42,353	55,312	25,931
2019	58,037	61,741	35,419
Total Units	15,684	6,430	9,539
% Growth	37.0	11.6	36.8

Potential Wildcards

- ◇ Global tensions increases price of oil
- ◇ New regulations increasing operation and production costs
- ◇ US shale play development and competition
- ◇ Access to Federal lands will spur new production
- ◇ Development on Tribal lands



Phase IV Deliverable

- ◇ Final North Dakota Oil and Gas Forecast 2014-2016 (September)



Phase III Update

Questions?





MODELING AND ANALYSIS

The modeling and analysis results are influenced by variables such as: number of drilling rigs, producing wells in a specific region, technological advances in drilling and completion, development of oil, gas and water transportation infrastructure, environmental regulations, global markets and economics.

The information generated during the modeling and analysis process developed trends of future oil and gas development in the study area for years 2014-2019.

Global and Local Economic Trends

- » Drilling and Drilling Rigs
- » Drilling and Rig Efficiency
- » Total Well Counts/Extent of Development
- » Well Completion
- » Oil and Gas Pricing
- » Bakken Crude Differential
- » Natural Gas
- » Global Market

Infrastructure

- » Surface Transportation
- » Pipeline
- » Rail
- » Power
- » Right-of-Way

Environmental

- » Water Resources
- » Protection of Land and Natural Resources
- » Oilfield Waste
- » Air Quality-Natural Gas
- » Hydraulic Fracturing
- » Endangered Species

Technology

- » Drilling and Hydraulic Fracturing Advancements
- » Monitoring and Automation Implementation
- » CO₂ Enhanced Oil Recovery in Conventional Oil Fields

Socio-economic

- » Labor
- » Population
- » Housing
- » Community Attributes
- » Public Safety



VARIABLES

The following is a list of variables tracked for modeling and analysis:

Fairly Consistent:

- US Refining Capacity
- ND county regulations
- ND state regulations
- Federal regulations
- Number of unitized fields (non Bakken)
- Number of wells operating in unitized fields (non Bakken)
- Oil production from the unitized fields (non Bakken)
- Drilling activity on the unitized fields (non Bakken)
- Estimated DGC CO₂ pipeline capacity
- North Dakota gas rig counts

Variable:

- US crude oil importation
- ND Pipeline export capacity
- ND Gas processing plant numbers/capacities
- ND Crude-By-Rail (CBR) export capacity
- Bakken crude market destinations
- Oil rig counts on Federal surface ownership
- ND oil counties electric power supply
- ND Bakken/Three Forks “hotspots”
- ND Bakken/Three Forks “multi-pay regions”
- ND landowner issues

Highly Variable:

- ND oil production
- ND number of producing oil wells
- ND oil wells awaiting completion
- ND gas production
- Gas hub prices
- Williston Basin sweet crude price
- Brent crude versus West Texas Intermediate (WTI) price differential
- Williston Basin sweet crude versus WTI price differential
- Competing shale basin rig counts
- North Dakota Energy Related rig counts
- North Dakota oil rig counts
- North Dakota horizontal rig counts
- North Dakota non-Bakken/Three Forks rig counts
- ND weekly oil/gas permits
- ND weekly oil/gas well spuds
- ND ratio of leasehold/wildcat versus infill oil wells (statewide and by county and reservation)
- ND Bakken/Three Forks well costs
- Competing shale basin well costs
- ND gas flaring percentages/amounts