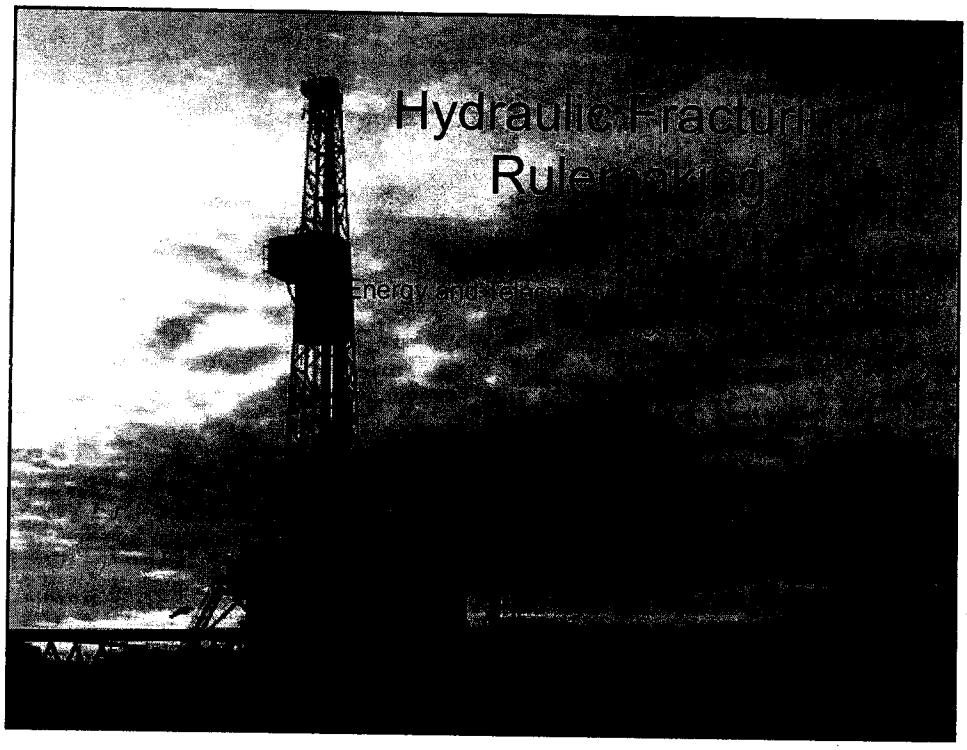
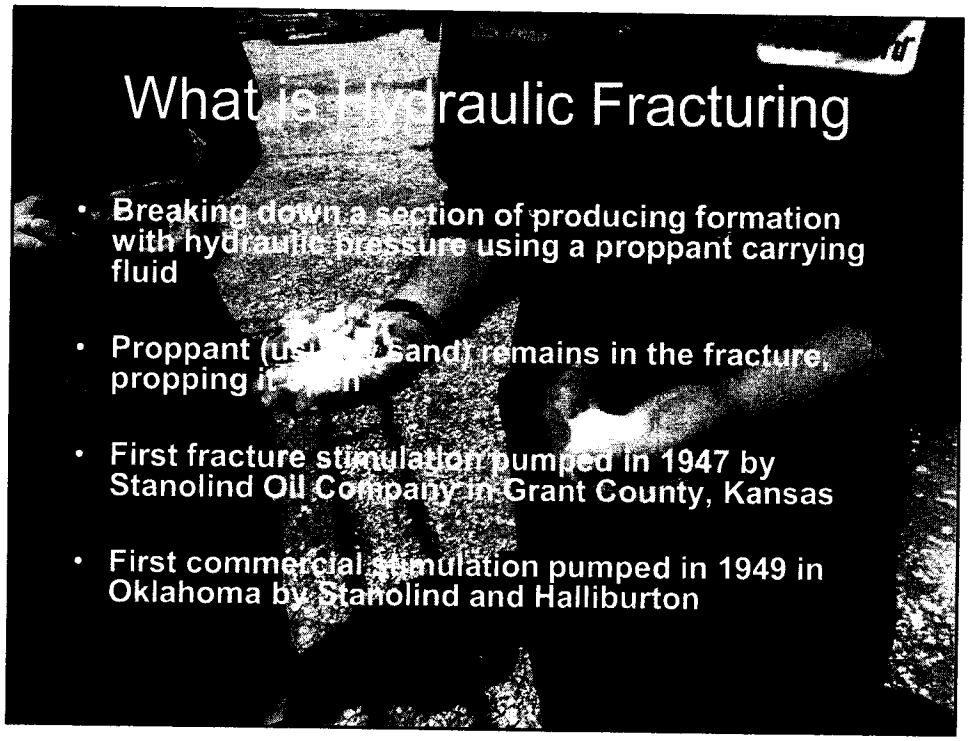
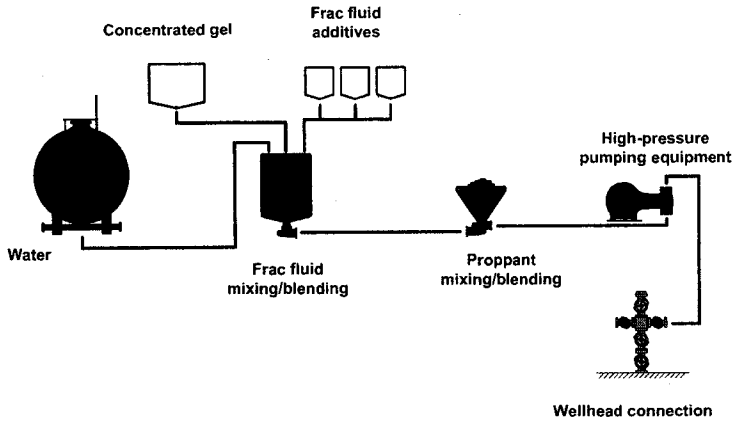




Energy & Telecommunications Committee Mtg.
September 16, 2011

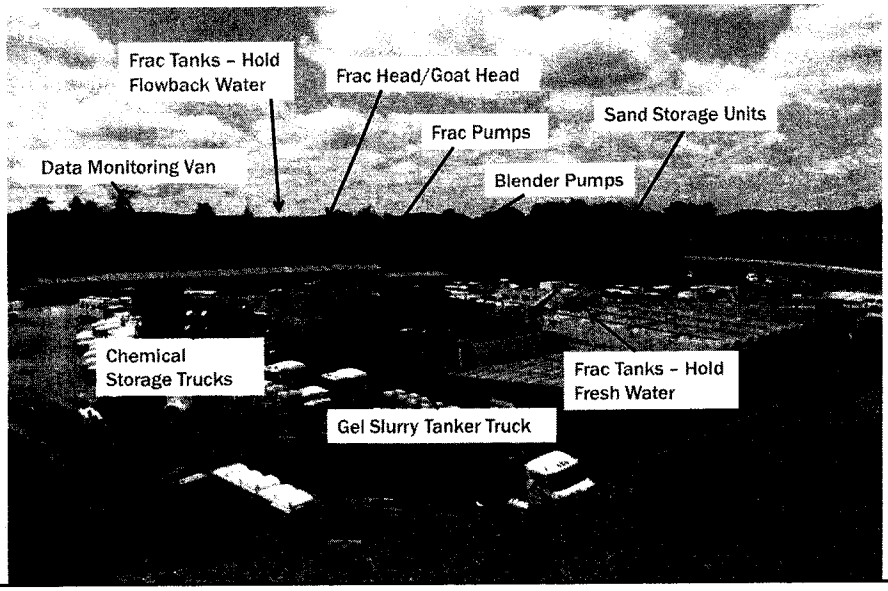
Exhibit 7

Fracturing Process



Source: Schlumberger

Fracing requires lots of stuff



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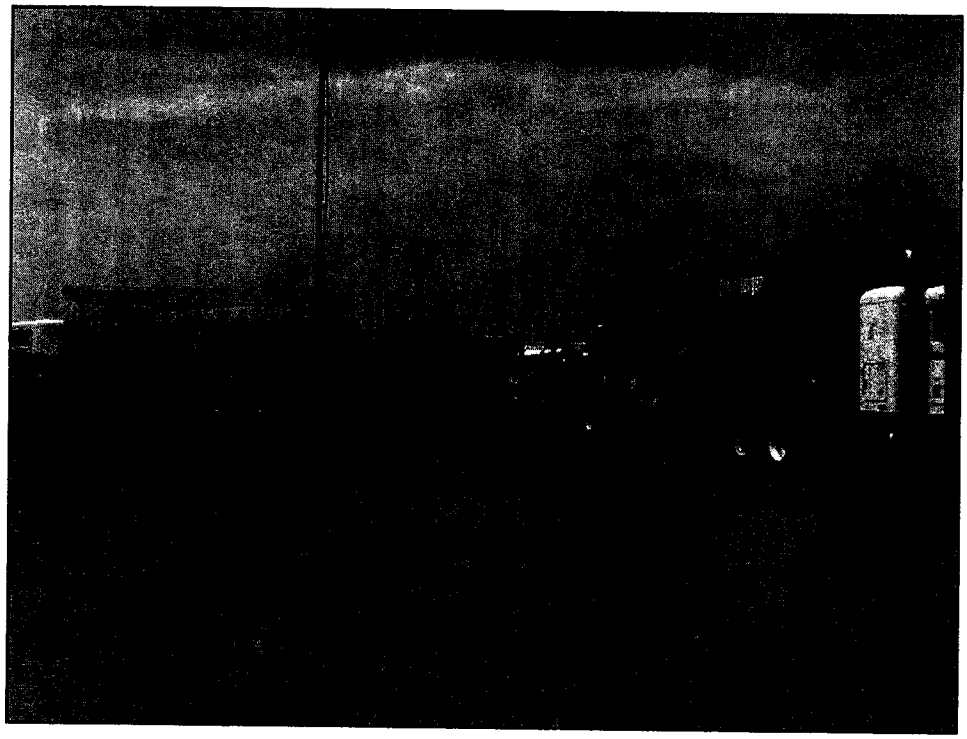
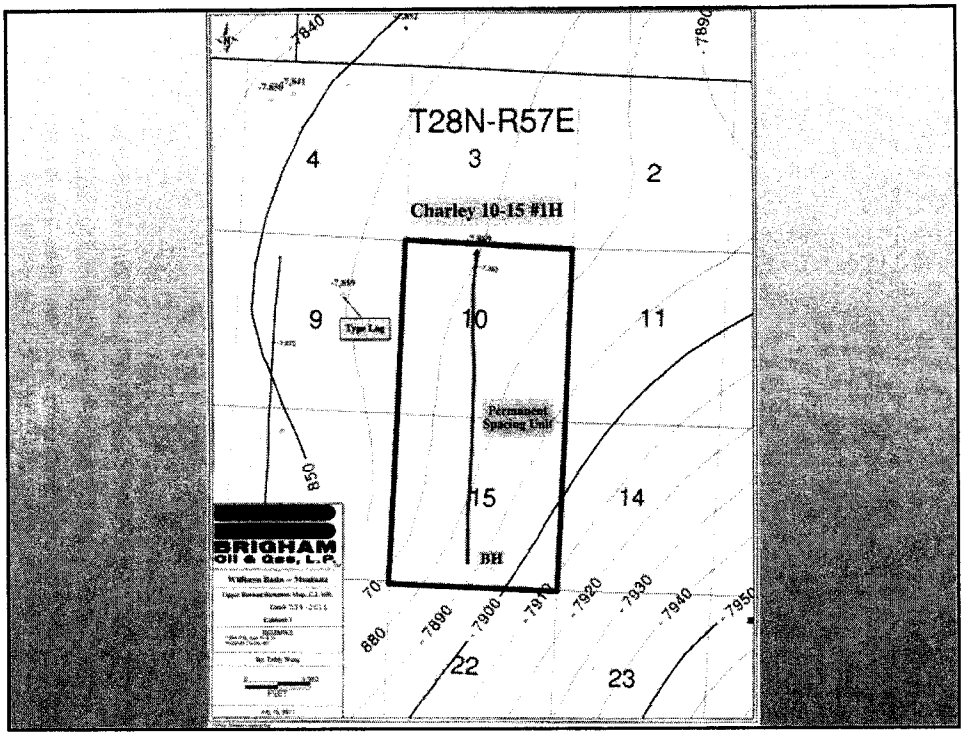
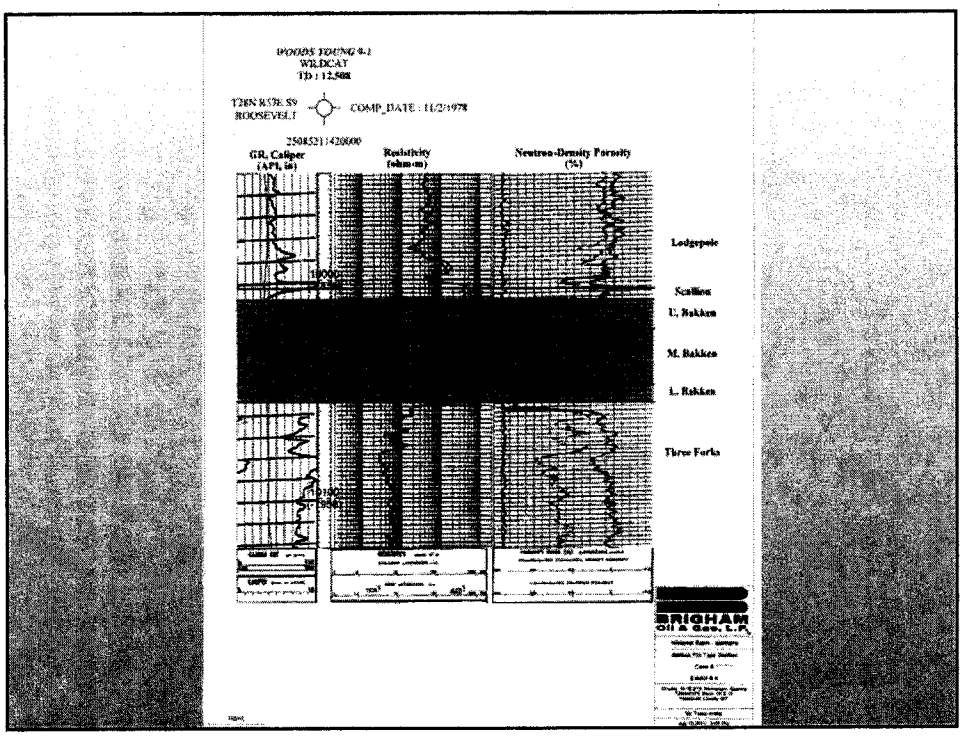
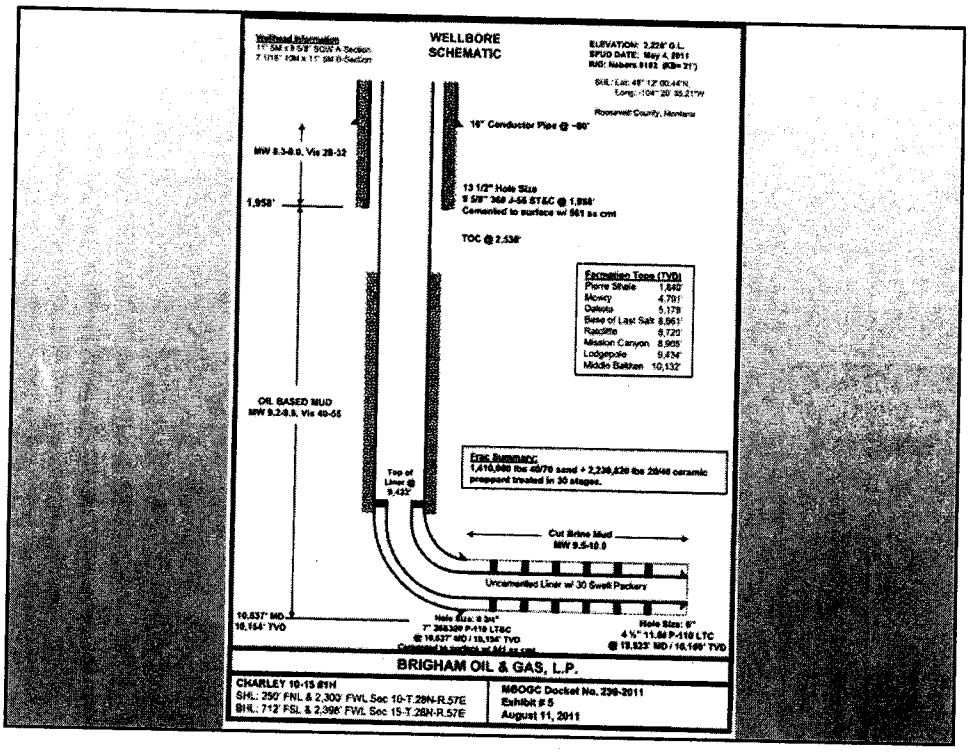



T28N-R57E
Charley 10-15 #1H
Type Log
Permanent Spacing Unit
BH
BRIGHAM
Oil & Gas, L.P.
Williston Basin – Montana
4
3
2
9
10
11
15
14
22
23
7840
7890
7900
7910
7920
7930
7940
7950
850
880


WILDCAT
T28N R57E S9
ROOSEVELT
COMP. DATE : 11/2/1978
GR, Caliper
(API, in)
Resistivity
(ohm-m)
Neutron-Density Porosity
(%)
Lodgepole
Scallion
U. Bakken
M. Bakken
L. Bakken
Three Forks
BRIGHAM
Oil & Gas, L.P.



Fracturing is controlled by reservoir and rock parameters

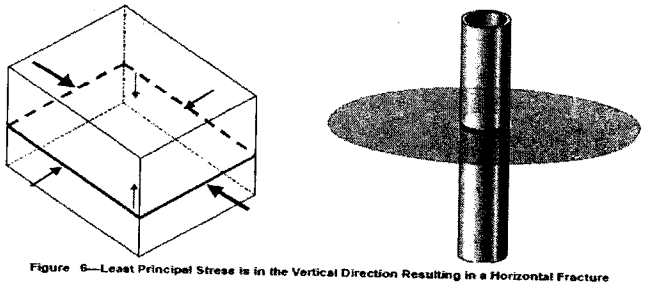


Figure 6—Least Principal Stress is in the Vertical Direction Resulting in a Horizontal Fracture

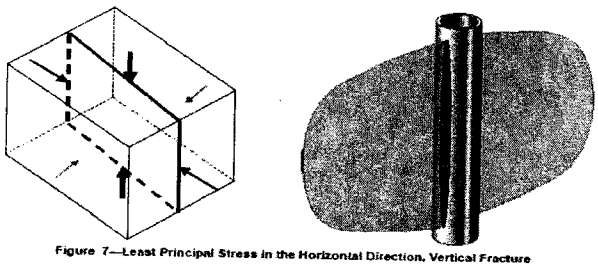
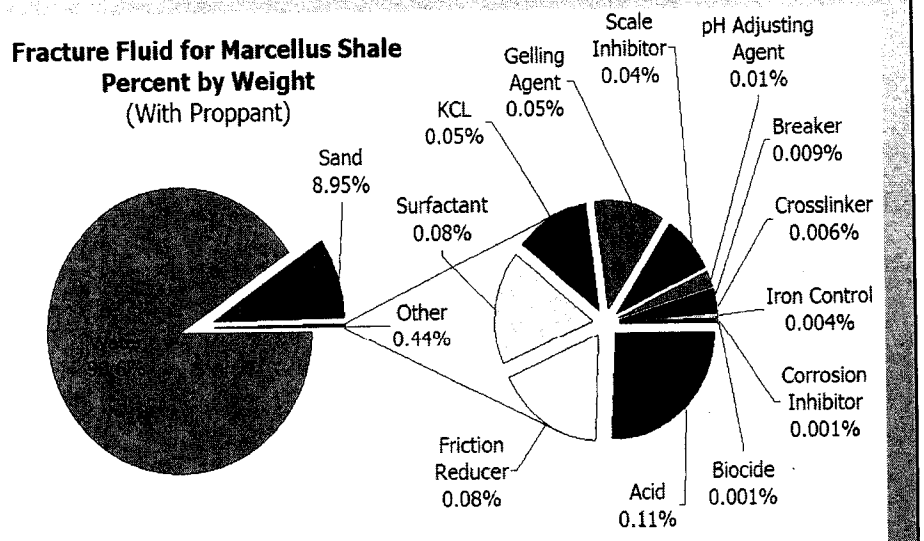
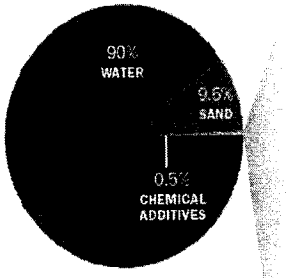


Figure 7—Least Principal Stress in the Horizontal Direction, Vertical Fracture

Fracture Fluid Composition



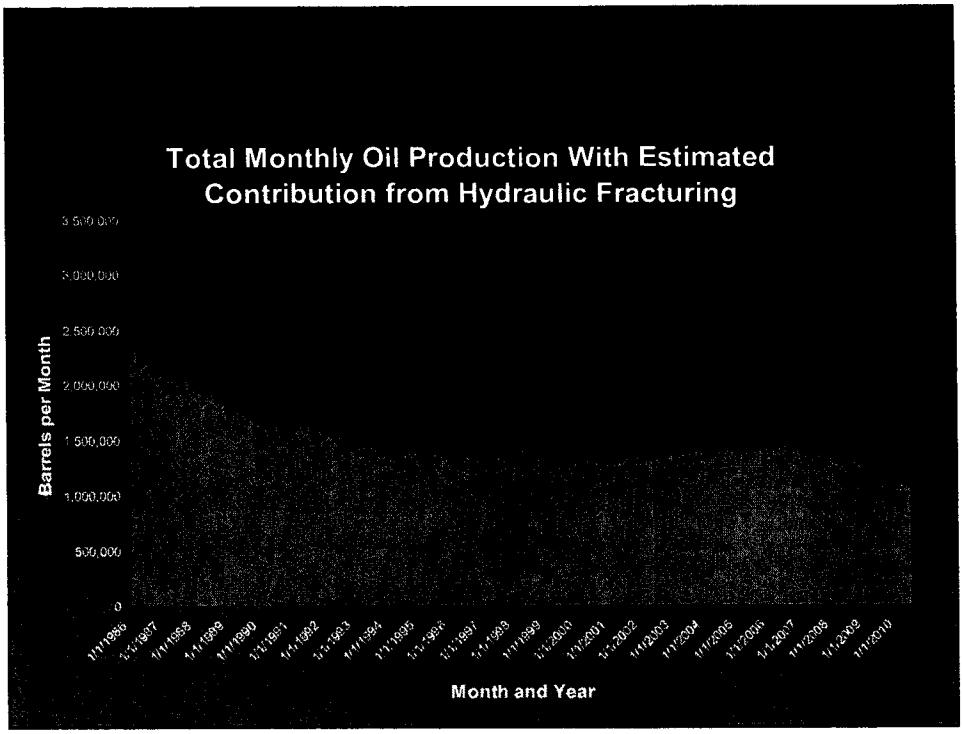


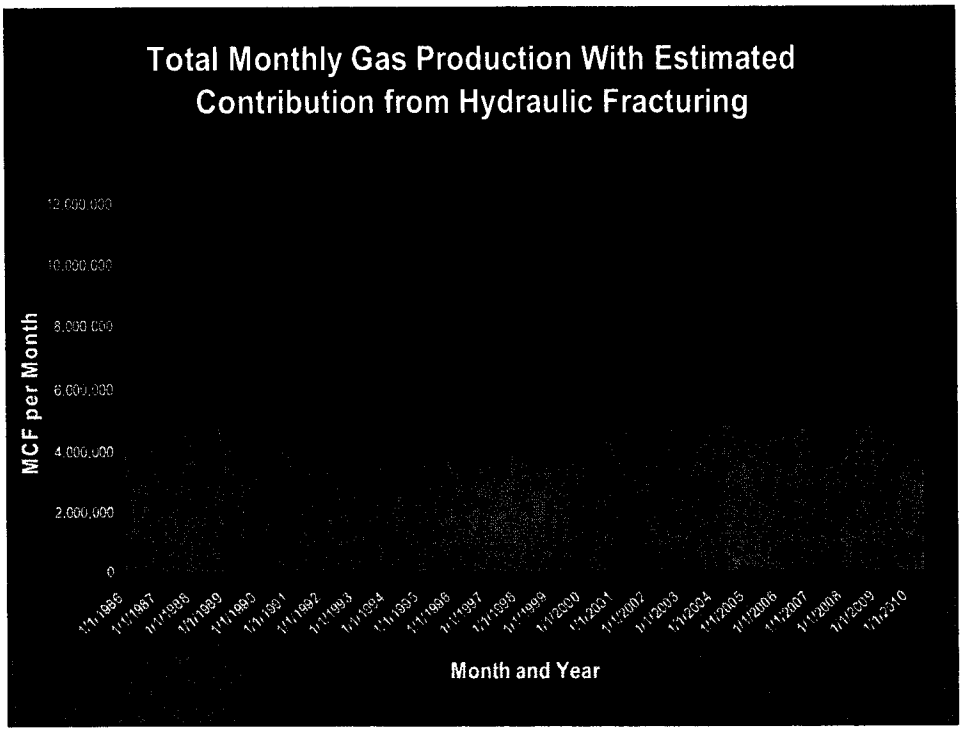
Typical Shale Fracturing Mixture Makeup

Typical Chemical Additives Used in Frac Water

Compound	Purpose	Common application
Acids	Helps dissolve minerals and initiate fissure in rock (pre-fracture)	Swimming pool cleaner
Sodium Chloride	Allows a delayed breakdown of the gel polymer chains	Table salt
Polyacrylamide	Minimizes the friction between fluid and pipe	Water treatment, soil conditioner
Ethylene Glycol	Prevents scale deposits in the pipe	Automotive anti-freeze, deicing agent, household cleaners
Borate Salts	Maintains fluid viscosity as temperature increases	Laundry detergent, hand soap, cosmetics
Sodium/Potassium Carbonate	Maintains effectiveness of other components, such as crosslinkers	Washing soda, detergent, soap, water softener, glass, ceramics
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant, sterilization of medical and dental equipment
Guar Gum	Thickens the water to suspend the sand	Thickener in cosmetics, baked goods, ice cream, toothpaste, sauces
Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice
Isopropanol	Used to increase the viscosity of the fracture fluid	Glass cleaner, antiperspirant, hair coloring

Source: DOE, GWPC Modern Gas Shale Development in the United States: A Primer (2009).


Total Monthly Oil Production With Estimated Contribution from Hydraulic Fracturing
Barrels per Month
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Month and Year


Total Monthly Gas Production With Estimated Contribution from Hydraulic Fracturing
MCF per Month
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
Month and Year

Rulemaking Timeline

•APRIL 28, 2011	BOARD AUTHORIZES DRAFTING OF NEW RULES
•MAY 16, 2011	PROPOSED RULES PUBLISHED IN M.A.R
•JUNE 15, 2011	PUBLIC HEARING AT HELD AT SIDNEY
•JUNE 23, 2011	PUBLIC COMMENT PERIOD ENDS
•AUGUST 10, 2011	BOARD VOTES TO ADOPT AMENDED RULES
•AUGUST 25, 2011	FINAL RULES PUBLISHED
•AUGUST 26, 2011	RULES IN EFFECT

Hydraulic Fracturing Rules

New Rule I

- Clarify Drilling Permit includes well completion activity
- Provides for written modification of the drilling permit with 48 hours notice
- Requires pre-frac disclosure of proposed fluids using estimated quantities and generic or trade names of components
- Allows pre-filing of designs; use of generic designs by geologic province and formation

New Rule II

- Requires disclosure of chemicals, CAS number and rate or concentration of frac fluids actually used
- Requires disclosure of non-hazardous chemicals
- Operator may file job logs, contractors reports or other reports
- Board may waive direct report if operator submits info to FracFocus.org

Hydraulic Fracturing Rules

New Rule III

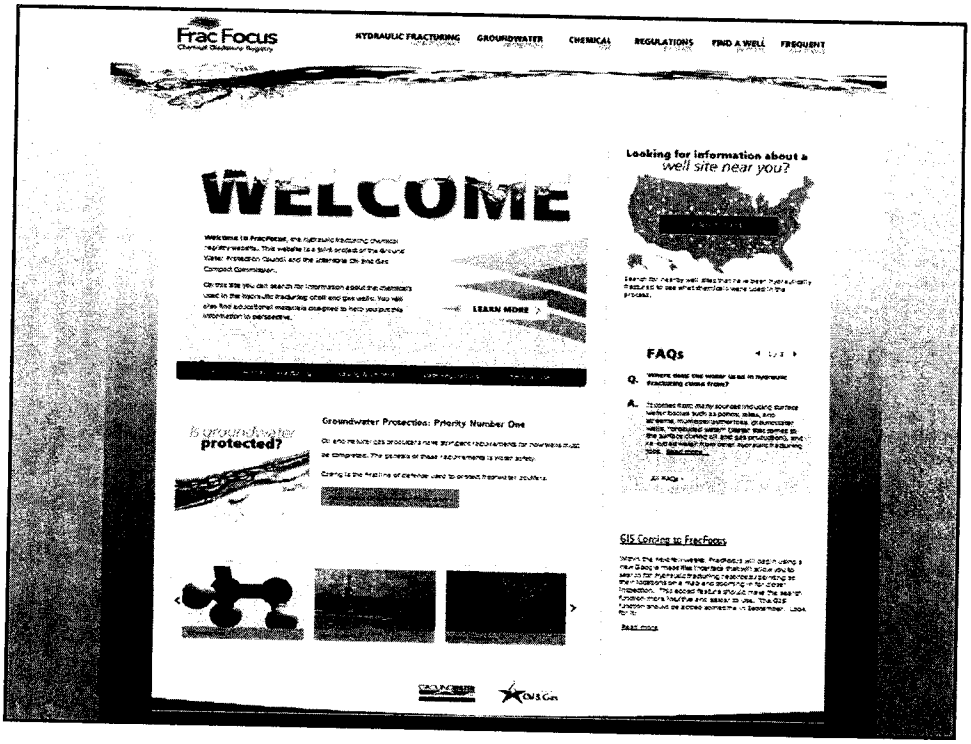
- Cites the MT Uniform Trade Secrets Act
- Does not require proprietary information disclosure except:
  - To respond to spills or similar incidents
  - Medical emergency
- Requires non-disclosure agreement for parties receiving confidential info

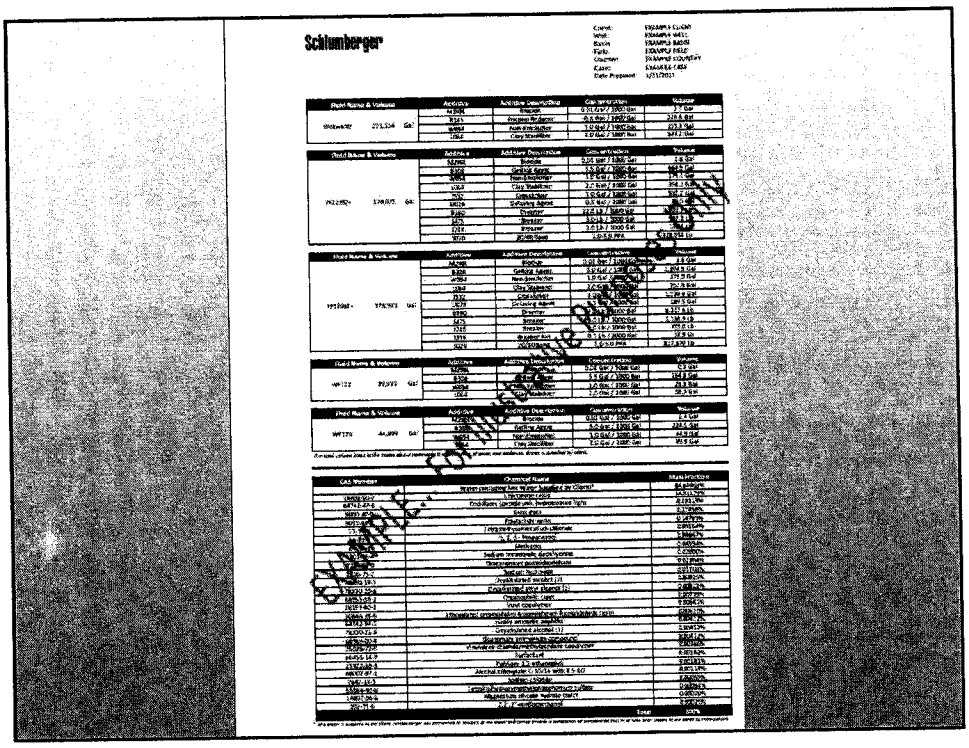
New Rule IV

- Establishes casing evaluation requirement and pressure testing requirement
- Requires surface safety devices

New Rule V

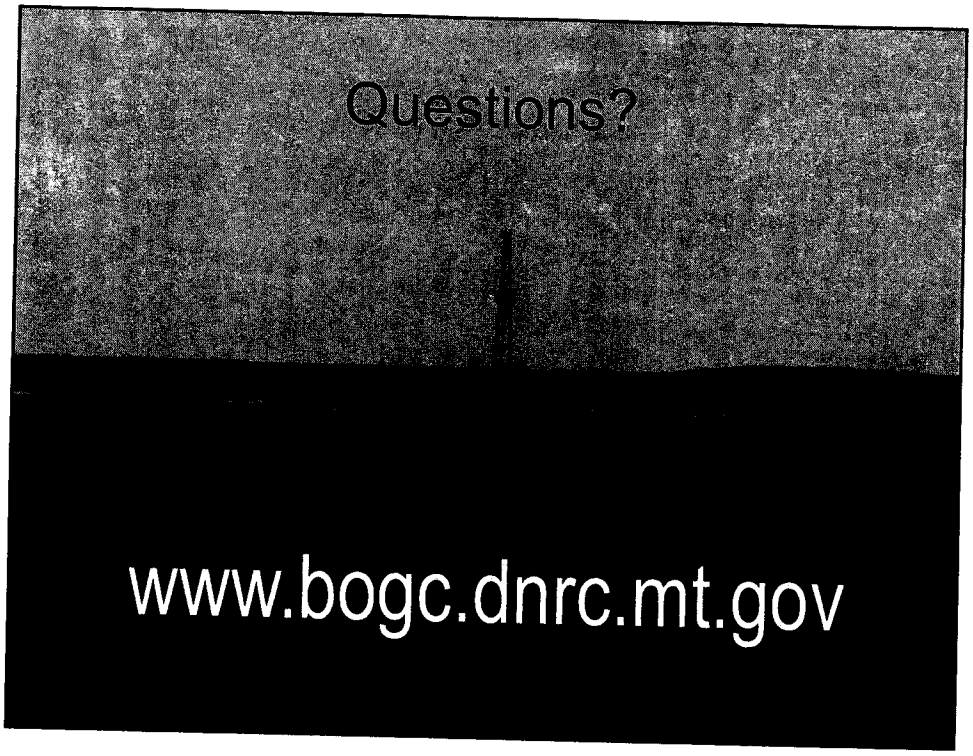
- Clarifies permit requirements for work over of existing wells
- Exempts mechanical repairs and certain well treatments from permitting
- Requires only a subsequent report for certain well treatments





Schlumberger

Hydraulic Fracturing Fluid Product Component Information Disclosure


Questions?
www.bogc.dnrc.mt.gov