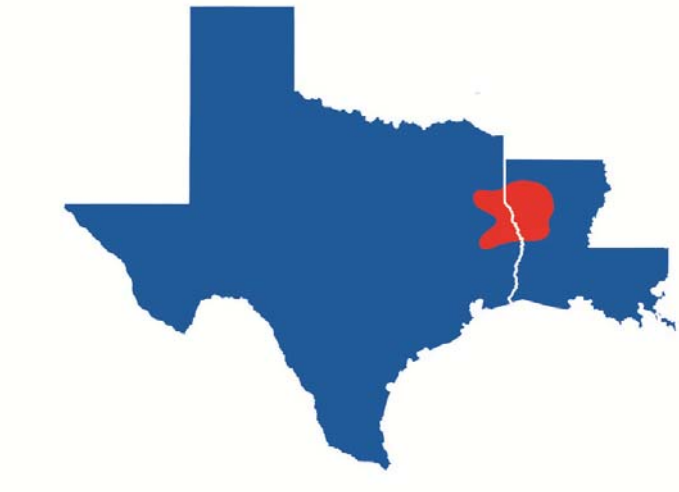
HAYNESVILLE SHALE HYDRAULIC FRACTURING

FACT SHEET JANUARY 2012

Hydraulic fracturing, commonly referred to as fracing, is a proven technological advancement that allows producers to safely recover natural gas and oil from deep shale formations. This discovery has the potential to not only dramatically reduce our reliance on foreign fuel imports, but also to do so in an economically and environmentally responsible manner. Simply put, deep shale natural gas and oil development is critical to America's energy needs and its economic renewal.

Experts have known for years that natural gas and oil deposits existed in deep shale formations, but until recently the vast quantities of natural gas and oil in these formations were not thought to be recoverable. Today, through the use of hydraulic fracturing and sophisticated horizontal drilling techniques, extraordinary amounts of natural gas and oil are being safely produced from deep shale formations across the country.

Hydraulic fracturing has been used by the industry since the 1940s and has become a key element of natural gas and oil development worldwide. In fact, this process is used in nearly all natural gas wells drilled in the United States today. Properly conducted modern fracing is a highly engineered, controlled, sophisticated and safe procedure.



Chesapeake's Haynesville Shale Operations

KEY POINTS

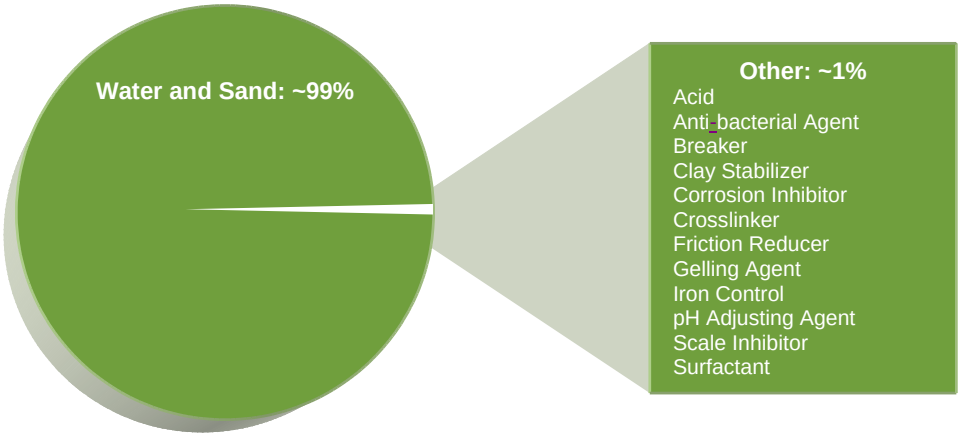
- Hydraulic fracturing is essential for the production of natural gas and oil from shale formations.
- Haynesville fracing fluids are comprised of approximately 99% water and sand and are handled in self-contained systems.
- Freshwater aquifers are protected by multiple layers of protective steel casing surrounded by cement. This is administered and enforced under state regulations.
- Deep shale natural gas and oil formations exist many thousands of feet underground.

Hydraulic Fracturing Process

Hydraulic fracturing is the process of creating fissures, or fractures, in underground formations to allow natural gas and oil to flow. In the Haynesville Shale, Chesapeake Energy Corporation pumps water, sand and other additives under high pressure into the formation to create fractures. The fluid is approximately 99% water and sand, along with a small amount of special-purpose additives. The newly created fractures are "propped" open by the sand, which allows the natural gas to flow into the wellbore and be collected at the surface. Normally a hydraulic fracturing operation is only performed once during the life of a well. Variables such as surrounding rock formations and thickness of the targeted shale formation are studied by scientists before hydraulic fracturing is conducted. The result is a highly sophisticated process that optimizes the network of fractures and keeps them safely contained within the boundaries of the deep shale gas formation.

Fracing Fluid Makeup

In addition to water and sand, other additives are used to allow hydraulic fracturing to be performed in a safe and effective manner. Additives used in fracing fluids include a number of compounds found in common consumer products.



Example of Typical Haynesville Shale Fracing Fluid Makeup

A representation showing the percent by volume of typical Haynesville Shale fracing fluid components (see graphic) reveals that approximately 99% of hydraulic fracturing fluid is comprised of freshwater and sand. Visit fracfocus.org for the additive quantities used to hydraulically fracture Chesapeake and other industry wells. This fluid is injected into the deep shale gas formation and is typically confined by many thousands of feet of rock layers.

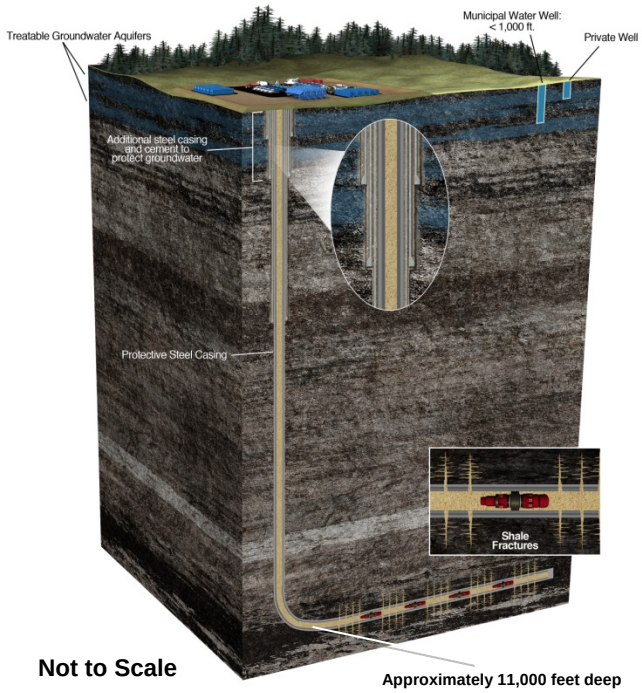
Product	Purpose	Downhole Result	Other Common Uses*
Water and Sand: ~ 99%			
Water	Expands the fracture and delivers sand	Some stays in the formation, while the remainder returns to the surface with natural formation water as "produced water" (actual amounts returned vary from well to well)	Landscaping and manufacturing
Sand (Proppant)	Allows the fractures to remain open so that the natural gas can escape	Stays in the formation, embedded in the fractures (used to "prop" fractures open)	Drinking water filtration, play sand, concrete and brick mortar
Other Additives: ~ 1%			
Acid	Helps dissolve minerals and initiate cracks in the rock	Reacts with the minerals present in the formation to create salts, water and carbon dioxide (neutralized)	Swimming pool chemicals and cleaners
Anti-bacterial Agent	Eliminates bacteria in the water that produces corrosive by-products	Reacts with micro-organisms that may be present in the treatment fluid and formation; these micro-organisms break down the product with a small amount returning to the surface in the produced water	Disinfectant; sterilizer for medical and dental equipment
Breaker	Allows a delayed breakdown of the gel	Reacts with the crosslinker and gel in the formation, making it easier for the fluid to flow to the borehole; this reaction produces ammonia and sulfate salts, which are returned to the surface in the produced water	Hair colorings, as a disinfectant and in the manufacture of common household plastics
Clay Stabilizer	Prevents formation clays from swelling	Reacts with clays in the formation through a sodium-potassium ion exchange; this reaction results in sodium chloride (table salt) which is returned in the produced water	Low-sodium table salt substitutes, medicines and IV fluids
Corrosion Inhibitor	Prevents corrosion of the pipe	Bonds to the metal surfaces, such as pipe, downhole; any remaining product that is not bonded is broken down by micro-organisms and consumed or returned to the surface in the produced water	Pharmaceuticals, acrylic fibers and plastics
Crosslinker	Maintains fluid viscosity as temperature increases	Combines with the breaker in the formation to create salts that are returned to the surface in the produced water	Laundry detergents, hand soaps and cosmetics
Friction Reducer	"Slicks" the water to minimize friction	Remains in the formation where temperature and exposure to the breaker allows it to be broken down and consumed by naturally occurring micro-organisms; a small amount returns to the surface with the produced water	Cosmetics including hair, make-up, nail and skin products
Gelling Agent	Thickens the water to suspend the sand	Combines with the breaker in the formation, making it easier for the fluid to flow to the borehole and return to the surface in the produced water	Cosmetics, baked goods, ice cream, toothpastes, sauces and salad dressings
Iron Control	Prevents precipitation of metal in the pipe	Reacts with the minerals in the formation to create simple salts, carbon dioxide and water, all of which are returned to the surface in the produced water	Food additives; food and beverages; lemon juice
pH Adjusting Agent	Maintains the effectiveness of other components, such as crosslinkers	Reacts with acidic agents in the treatment fluid to maintain a neutral (non-acidic, non-alkaline) pH; this reaction results in mineral salts, water and carbon dioxide – a portion of each is returned to the surface in the produced water	Laundry detergents, soap, water softeners and dish washer detergents
Scale Inhibitor	Prevents scale deposits downhole and in surface equipment	Attaches to the formation downhole; the majority of the product returns to the surface in produced water, while the remaining amount reacts with micro-organisms that break down and consume it	Household cleansers, de-icers, paints and caulks
Surfactant	Increases the viscosity of the fracture fluid	Returns to the surface in the produced water, but in some formations it may enter the gas stream and return in the produced natural gas	Glass cleaners, multi-surface cleansers, antiperspirant, deodorants and hair colors

*Other common uses of the product may not be in the same quantity or concentration.

Hydraulic Fracturing and Groundwater Protection

Unlike shallow natural gas and oil projects, such as shallow coalbed methane (CBM), the producible portions of deep shale natural gas and oil formations exist many thousands of feet below the surface. The Haynesville Shale formation is found at depths ranging from 10,500 to 13,500 feet underground. The average depth of a Chesapeake natural gas well in the Haynesville Shale formation is more than 11,000 feet. Chesapeake does not conduct any production or hydraulic fracturing activities in fresh groundwater aquifers. In fact, across Chesapeake's Haynesville Shale operations, groundwater aquifers are separated from producing natural gas and oil formations by thousands of feet and the immense weight of tons of protective rock barriers.

State natural gas and oil regulatory programs also place a great emphasis on protecting groundwater. Current well construction requirements consist of installing multiple layers of protective steel casing surrounded by cement that is specifically designed and installed to protect freshwater aquifers.



How deep is 11,000 feet?

- Almost **16 One Shell Square** buildings (New Orleans, Louisiana) stacked end to end
- More than **twice as deep** as the deepest part of the **Grand Canyon**
- More than **36 football fields** laid out goal line to goal line

The measures required by state regulatory agencies in the exploration and production of deep shale natural gas and oil formations have been very effective in protecting drinking water aquifers from contamination attributable to hydraulic fracturing operations. Based on reviews of state natural gas and oil agencies, there has not been a documented case of drinking water aquifer contamination related to hydraulic fracturing of a deep shale natural gas and oil well.

Furthermore, the Groundwater Protection Council issued a report in April 2009 stating that the potential for hydraulic fracturing in deep shale natural gas and oil wells to impact groundwater is extremely remote, as low as one in 200 million.

Information Sources

- Dr. Michael Economides
- Ground Water Protection Council
- United States Department of Energy

About Chesapeake

Chesapeake Energy Corporation is the second-largest producer of natural gas, a Top 15 producer of oil and natural gas liquids and the most active driller of new wells in the U.S. Headquartered in Oklahoma City, the company's operations are focused on discovering and developing unconventional natural gas and oil fields onshore in the U.S. Chesapeake owns leading positions in the Barnett, Haynesville, Bossier, Marcellus and Pearsall natural gas shale plays and in the Granite Wash, Cleveland, Tonkawa, Mississippi Lime, Bone Spring, Avalon, Wolfcamp, Wolfberry, Eagle Ford, Niobrara, Three Forks/Bakken and Utica unconventional liquids plays. The company has also vertically integrated its operations and owns substantial midstream, compression, drilling, trucking, pressure pumping and other oilfield service assets. For more information on Chesapeake environment initiatives, visit the environment section of CHK.com, HydraulicFracturing.com, NaturalGasAirEmssions.com, NaturalGasWaterUsage.com, AskChesapeake.com or fracfocus.org.