Chesapeake Energy

Shale Operations Overview

Chesapeake Energy Overview

- Founded in 1989
- Headquartered in Oklahoma City, OK
  - Office regionally located in Canton, OH, Uniontown, OH, Charleston, WV, Jane Lew, WV, Mt. Morris, PA, Canonsburg, PA
- Exclusive U.S. onshore focus
- Second-largest producer of U.S. natural gas and a Top 15 producer of U.S. liquids
  - 3Q'11 gas production of ~2.8 bcf/d
  - Liquids production of ~94 mbbls/d
  - 8.3% of daily U.S. natural gas production is from Chesapeake
- Nation's most active horizontal driller 1993-2010
  - #1 in the world in horizontal shale drilling over past 10 years; > 4,100 wells
- Exceptional drilling success rate – 99%

Chesapeake Energy Overview

- Most active driller in U.S. 1993-2011
  - 171 operated rigs currently
    - 9 rigs currently drilling in the Utica Shale area
    - ~27 rigs currently drilling in the Marcellus Shale area
- Consistent production growth
  - 21st consecutive year of sequential production growth
- Unparalleled inventory of U.S. onshore leasehold and 3-D seismic
  - 29 million acres of 3D seismic data
  - Lower risk of suboptimal return on capital
  - Higher production rates

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- ~ 15 mm net acres of U.S. onshore leasehold
  - 1.35 million acres acquired in Ohio
- Acreage position in gas shale plays:

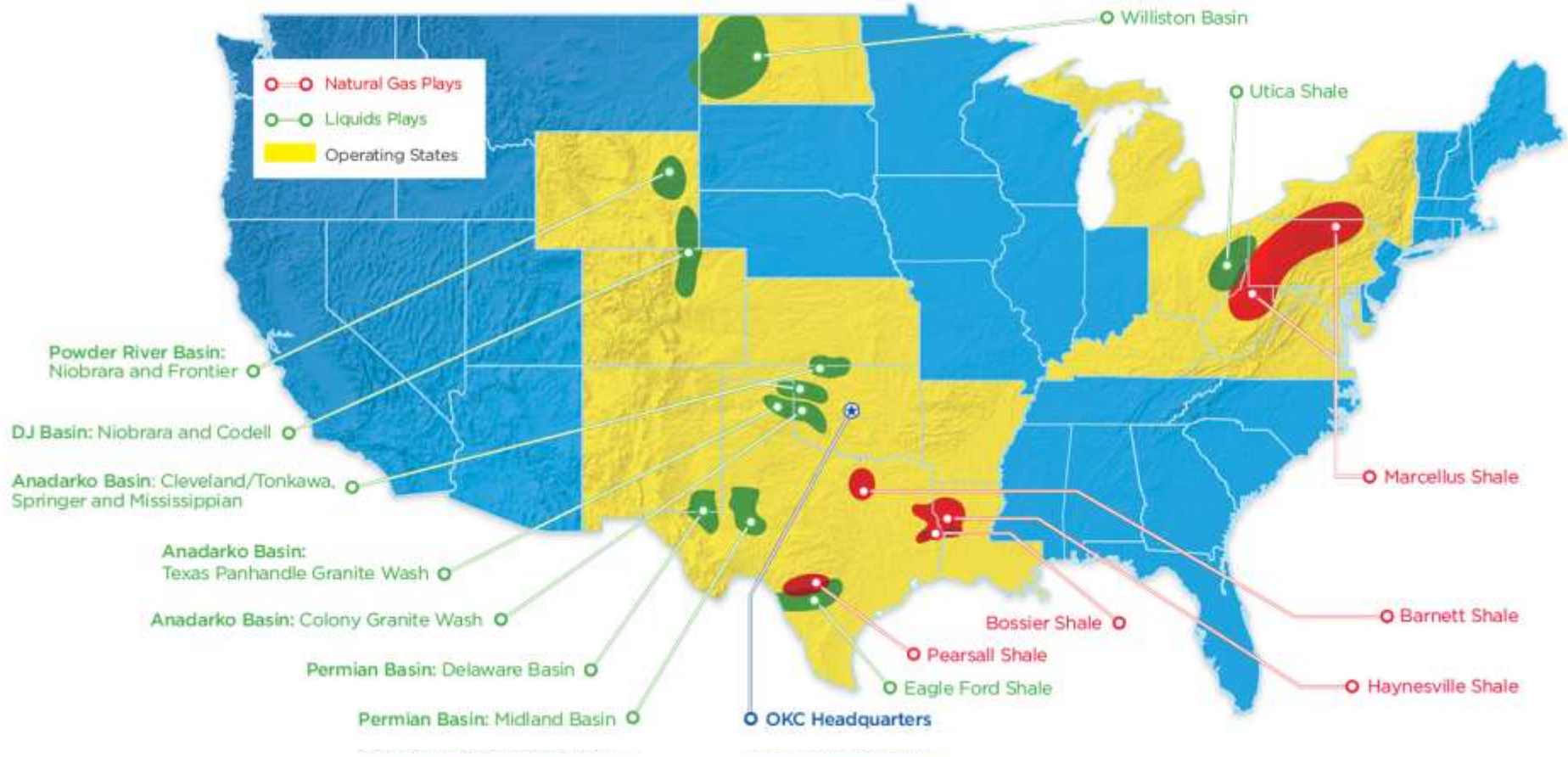
Barnett Shale	220,000
Haynesville Shale	460,000
Marcellus Shale	1,780,000

- Acreage position in unconventional oil plays

Anadarko Basin	2,385,000
Eagle Ford Shale	460,000
Permian Basin	835,000
Powder River and DJ Basin	595,000

- Advantageous joint venture arrangements and partnerships
  - StatoilHydro, Total, Plains Exploration and Production Company, CNOOC
  - Utica JV partner to be announced soon….

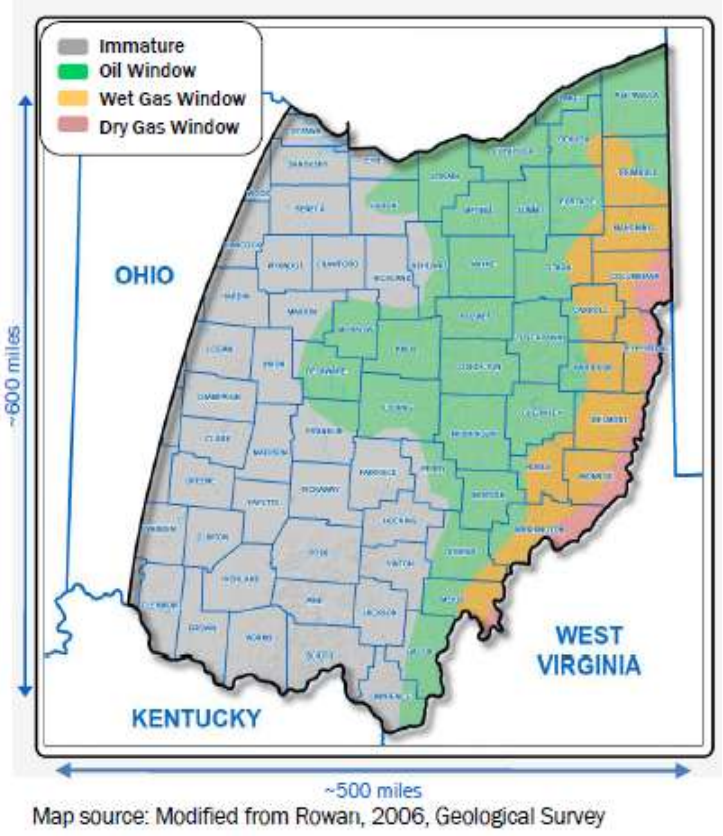
Chesapeake's Key Operating Areas



Characteristics of Shale Formations

- Found in organic-rich sedimentary rocks (shales) that were originally deposited as muds within tidal flats and deep water basins
  - Shale formations can be found 1 mile or more underground
- Dense rock with low permeability
- Typically requires a combination of horizontal drilling and hydraulic fracturing for the natural resources to be recovered in economic quantities

Major Liquids Discovery- CHK's Ohio Utica Shale



Map source: Modified from Rowan, 2006, Geological Survey

» Began leasing in Ohio for Utica in mid-2010 now have:

- 1.36 mm net acres of leasehold, by far the largest position in the industry (~50% of the potentially drillable acres)
- Extensive well log and petrophysical data as well as 4,000

  feet of proprietary core samples
- Spudded 19 horizontal wells to date, 8 being completed
- Strong initial drilling results from 7 horizontal wells
  - All from the dry and wet phase of the play
  - Early in the process of evaluating the oil phase

» CHK is currently operating 9 drilling rigs in the play

» Plan to increase operated rigs in the play up to 8 by YE'11, up to 20 by YE'12 and up to 30 by YE'14

» Believe the play is likely most analogous, but economically superior, to the Eagle Ford in South Texas

The Production Process

Five Steps

- Site selection and well pad preparation
- Drilling the well
- Completing the well
- Marketing the resources
- Reclaiming the site

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Site Selection

» A number of factors are considered in selecting a drilling site:

- Favorable geology
- Topography
- Access Roads
- Routes for pipelines and utilities
- Proximity to schools or residential areas
- Environmental factors such as wetlands and sensitive wildlife habitat
- Available water source(s)

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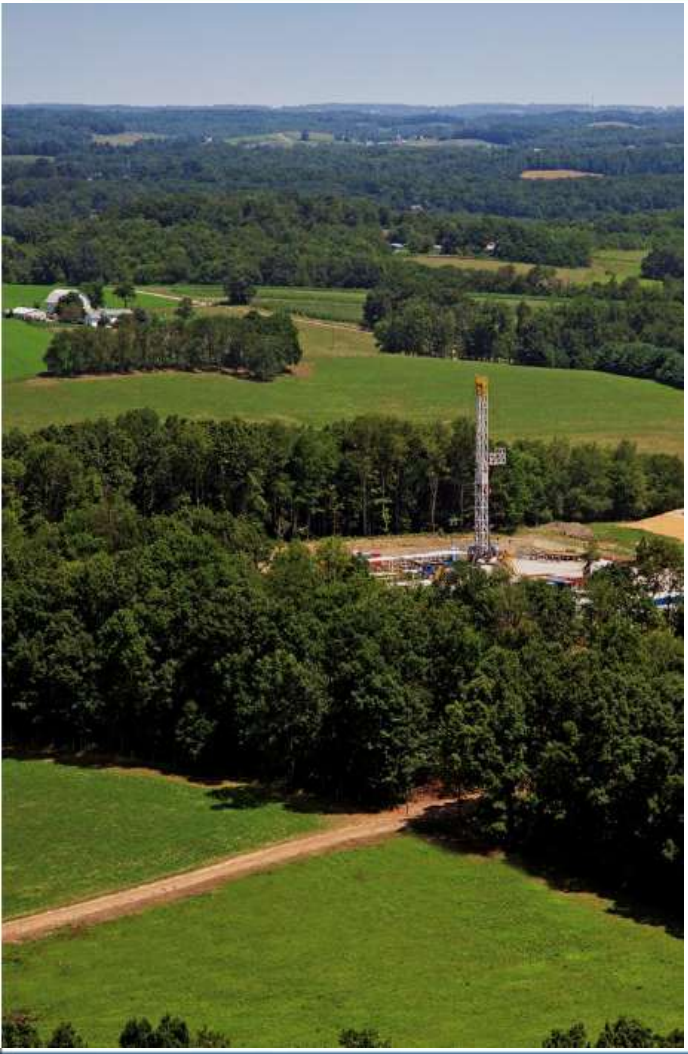
Use of Roads



- Chesapeake Energy prefers to use a Road Use Maintenance Agreement (RUMA) for dealing with potential effects on public roads
  - Has been used extensively for Chesapeake's operations are in PA
- Currently utilizing 50+ miles of county/township roadways in Ohio as haul routes
- To date in 2011, Chesapeake has spent ~$25 million in county/township roadway upgrades or repair projects
- Currently employing 2 primary roadway engineering and construction firms to facilitate route planning, design and construction

Haul Route Planning

- Prior to any construction activities
  - Field visit to determine preliminary haul route
  - Construct preliminary inspection report
    - Pavement condition, bridge structures, culverts, turning radius, etc.
  - Authorize and coordinate engineering investigation work
    - Geotech, bridge, culvert, etc.
  - Coordinate survey work (ROW, topo, loco, etc.)
  - Meeting with roadway authorities
    - Discuss road agreements, upgrades needed, construction schedule
  - Coordinate RUMA approval process

Haul Route Design/Construction

- Design
  - Site survey to identify drainage issues, drive locations, base repair areas
  - Base map creation
  - Preliminary plan design
  - Circulate to Chesapeake, roadway authority and utility companies for review
  - Final Plan design
  - Coordinate roadway authority plan approval
  - Prepare engineer's construction cost estimate
  - Prepare out-to-bid package
- Construction
  - Solicit bids and award projects
  - Coordinate construction inspection, testing and survey work
  - Manage contractors
  - Project close-out (punch list, roadway authority approval)

Pre-drill Testing

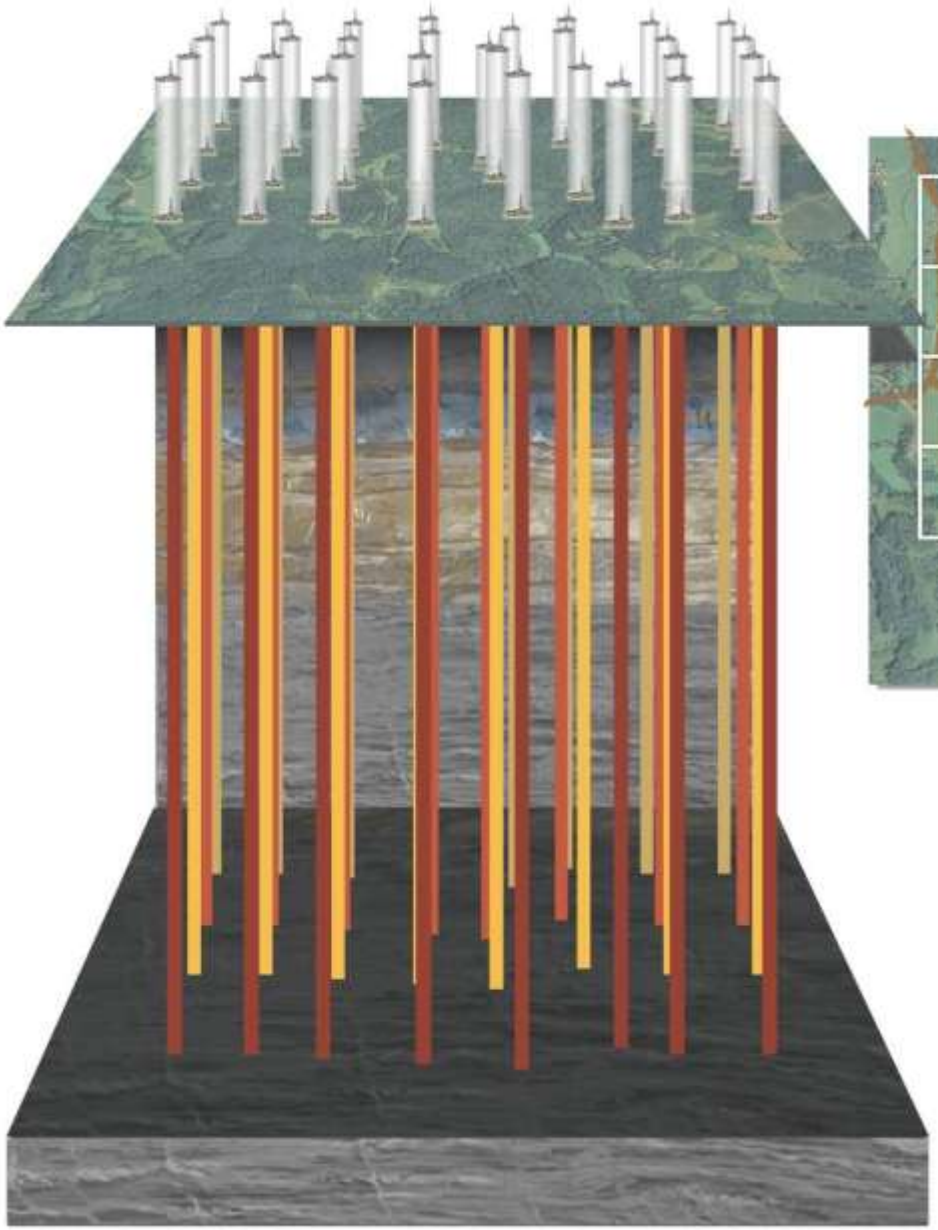
- Chesapeake Energy conducts pre-drill testing on water sources prior to conducting drilling operations in an area
  - Testing is done on water sources within 3,000 feet from the vertical portion of the well
    - Includes springs, wells, streams and ponds
  - The testing establishes a baseline of water quality conditions for both Chesapeake and the property owner
  - The testing is free for the property owner

- A representative from Chesapeake will collect a water sample
  - It is preferred that the property owner be present during the collection
  - Analysis is conducted by a state-certified analytical laboratory
  - The property owner receives a copy of the laboratory's analysis

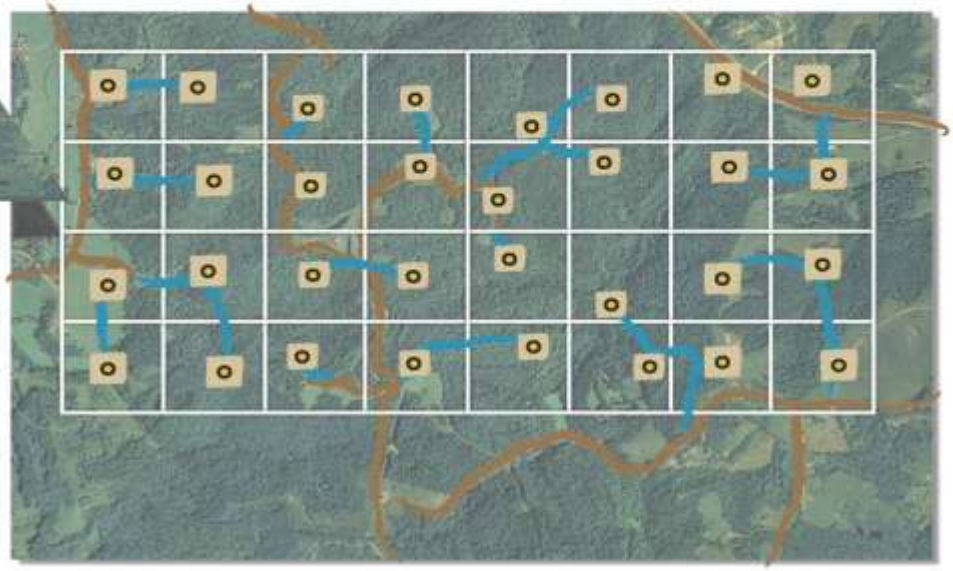
Well Pad Preparation

- Well pads can be located in rural or urban areas
  - Pad preparation requires approximately 4-6 weeks
  - Typical horizontal well pad requires 3-5 acres to construct
    - Approximately 5,000 tons of aggregate is used for construction
  - Appropriate erosion and sediment controls are installed

Area shown is 1,280 acres



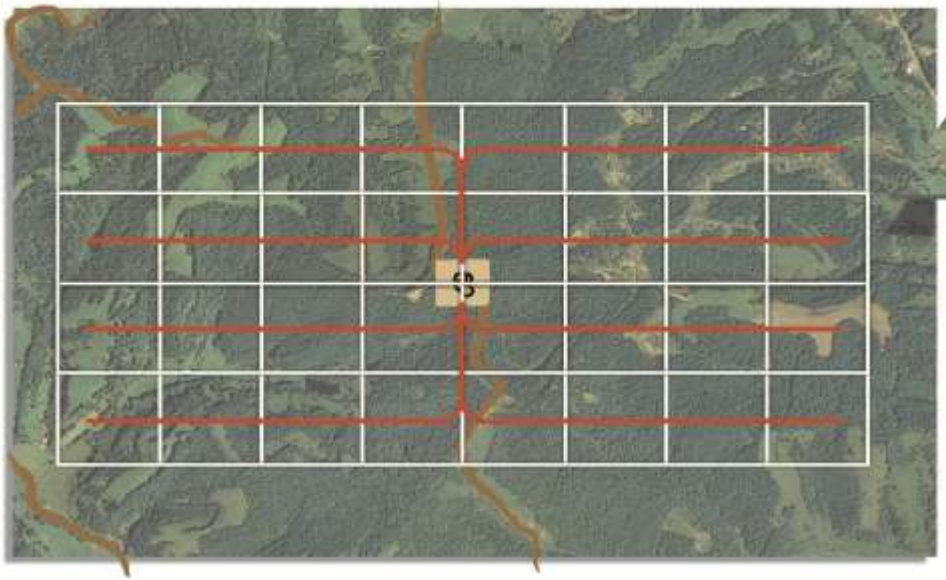
Idealized Vertical Well Spacing



Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.

Area shown is 1,280 acres

Idealized Horizontal Well Spacing



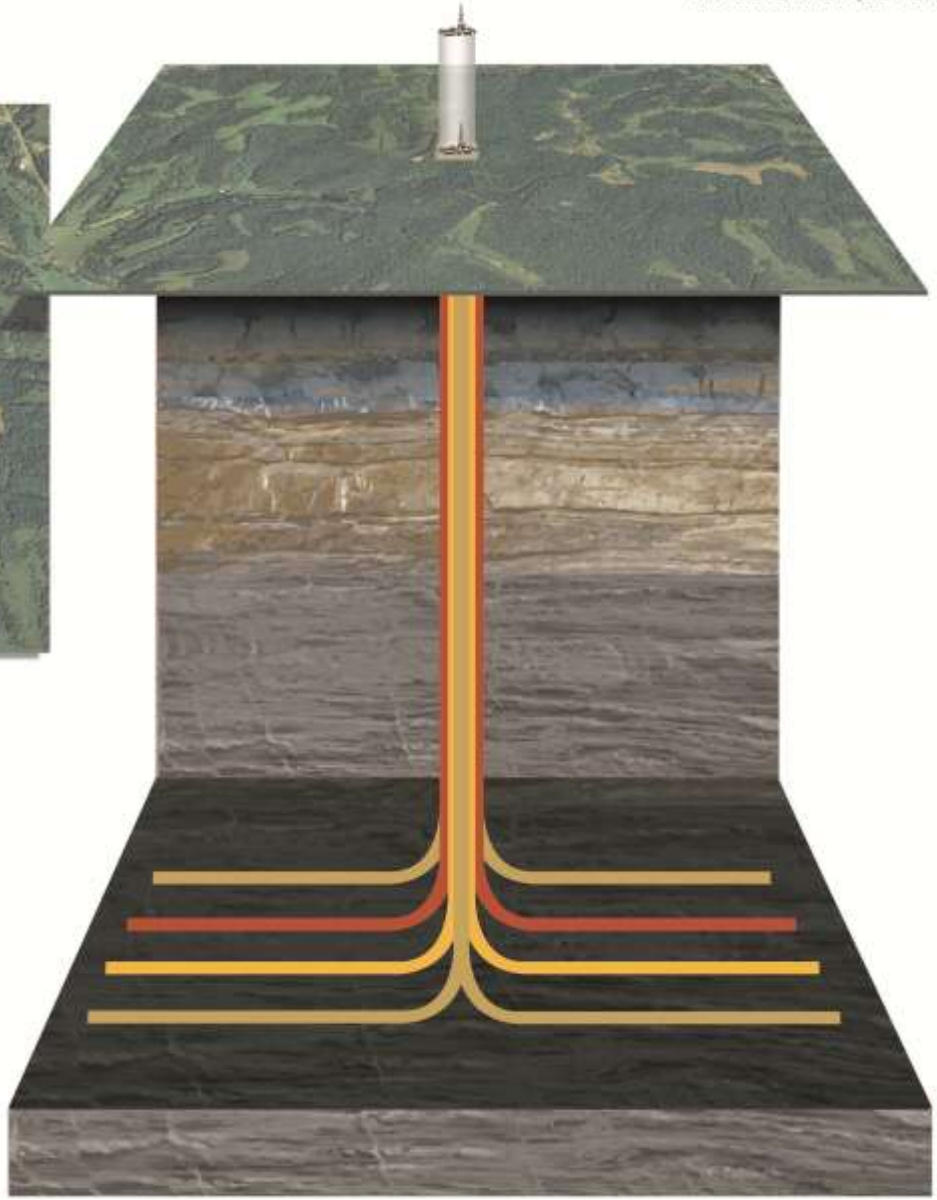
Existing Road

40 Acre Grid

Padsite

Gas Wells

Wellbore



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Drilling the Well Using Today's New Technology

- Wells are drilled and constructed to recover the natural resources while protecting the environment and providing for the safety of workers and area residents
- Drilling is a 24/7 operation
  - Reduces rig time on location
- The drilling phase is a temporary operation, typically lasting 4 weeks per wellbore
  - Multiple wells may be drilled in succession
- Chesapeake Energy utilizes a "closed-loop" drilling system
  - All drilling materials are contained
  - No materials collected in earthen pits

Drilling the Well Using Today's New Technology

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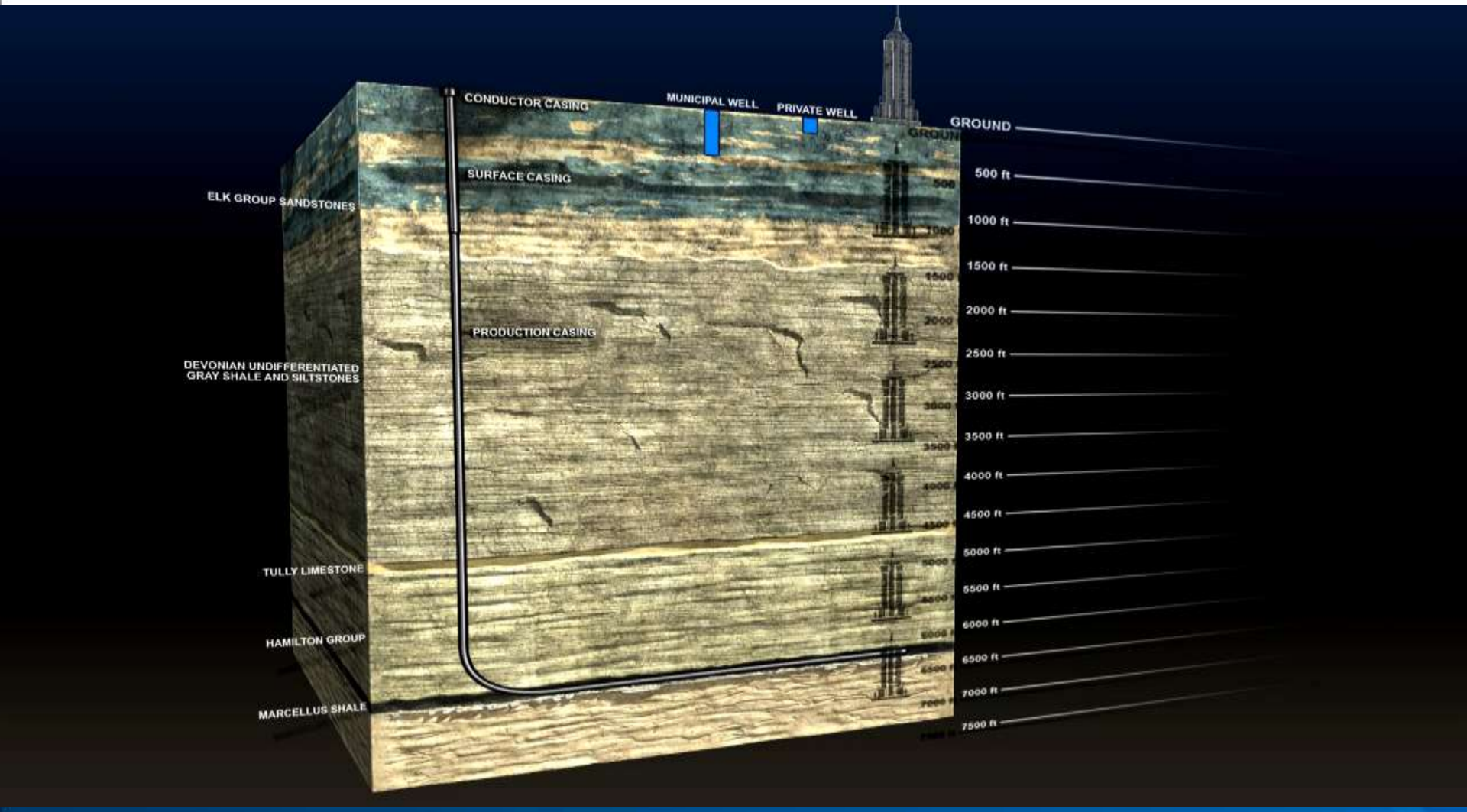
Drilling Best Management Practices

- Pre-job meetings
  - Review safety, operational and environmental concerns
- Equipment staging
  - Staged to allow for visual inspection of potential leak points
  - Staged to take advantage of site construction measures
- Closed-loop drilling system
  - Solids/cuttings will be separated from the drilling fluid and maintained in steel tanks
  - Tanks hauled off and disposed of consistent with OEPA regulations
  - Fluids diverted back to mud tanks for reuse
- Use of air drilling through freshwater aquifers

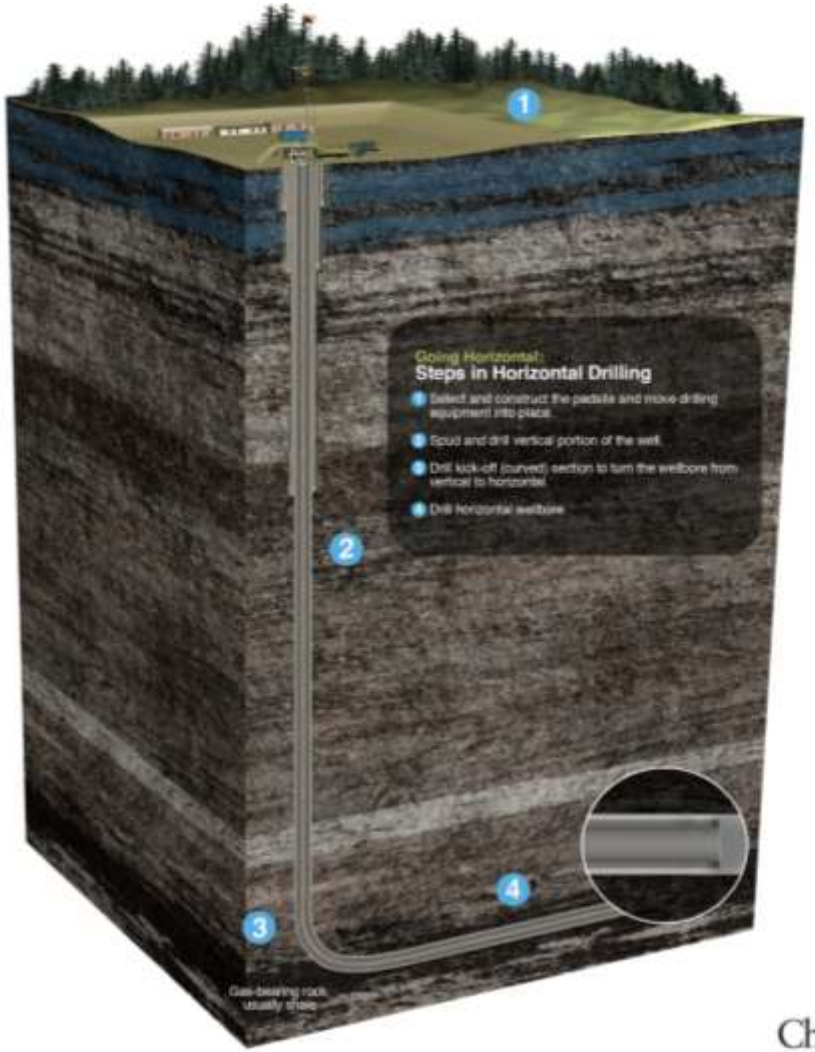
Drilling Best Management Practices

- Chemical containers, tanks and process vessels
  - Containers greater than 55-gallons placed inside lined secondary containment
    - Secondary containment may include temporary earthen berms with polyethylene underlining the entire contained area
    - Or, a portable containment area constructed of steel, PVC or other suitable material
- Hoses and fittings
  - Where practical, hoses will be run within secondary containment
  - Drip-pots or troughs placed under all hose connections in concentrated chemical transfer service outside of secondary containments

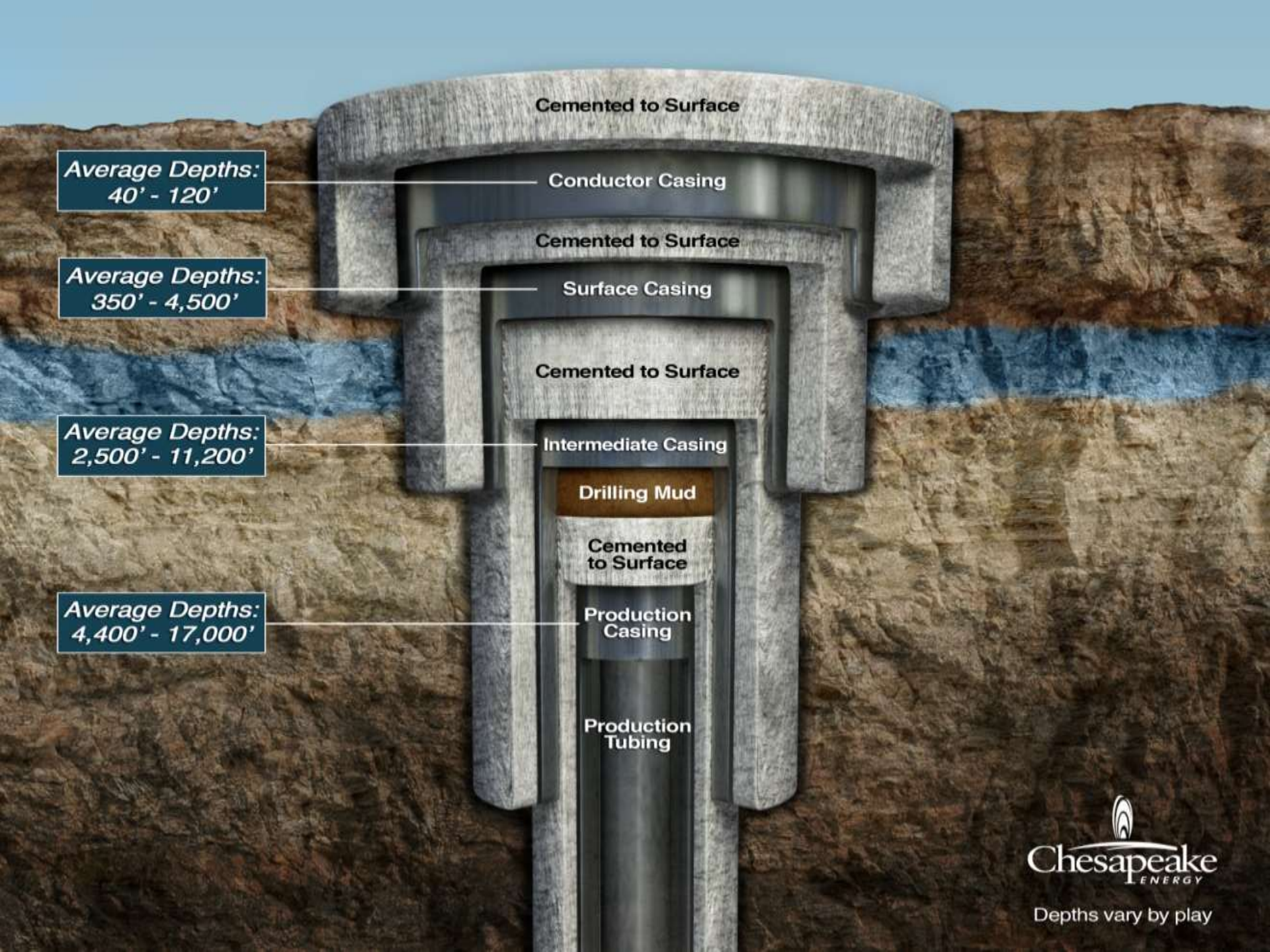
How Deep?


CONDUCTOR CASING
MUNICIPAL WELL
PRIVATE WELL
GROUND
SURFACE CASING
ELK GROUP SANDSTONES
PRODUCTION CASING
DEVONIAN UNDIFFERENTIATED GRAY SHALE AND SILTSTONES
TULLY LIMESTONE
HAMILTON GROUP
MARCELLUS SHALE
500 ft
1000 ft
1500 ft
2000 ft
2500 ft
3000 ft
3500 ft
4000 ft
4500 ft
5000 ft
5500 ft
6000 ft
6500 ft
7000 ft
7500 ft

Drilling the Well- Groundwater Protection



- 4 or more layers of protection are installed in the well to isolate the well from the surrounding strata and protect groundwater supplies and the environment
  - Multiple layers of steel casing and cement are utilized
  - Casing set in place below freshwater aquifer zone
  - FIT test performed and cement logs recorded to ensure proper seal
- ODNR must be notified prior to the installation and cementing of all casing strings


Cemented to Surface
Average Depths:
40' - 120'
Conductor Casing
Cemented to Surface
Average Depths:
350' - 4,500'
Surface Casing
Cemented to Surface
Average Depths:
2,500' - 11,200'
Intermediate Casing
Drilling Mud
Cemented to Surface
Average Depths:
4,400' - 17,000'
Production Casing
Production Tubing
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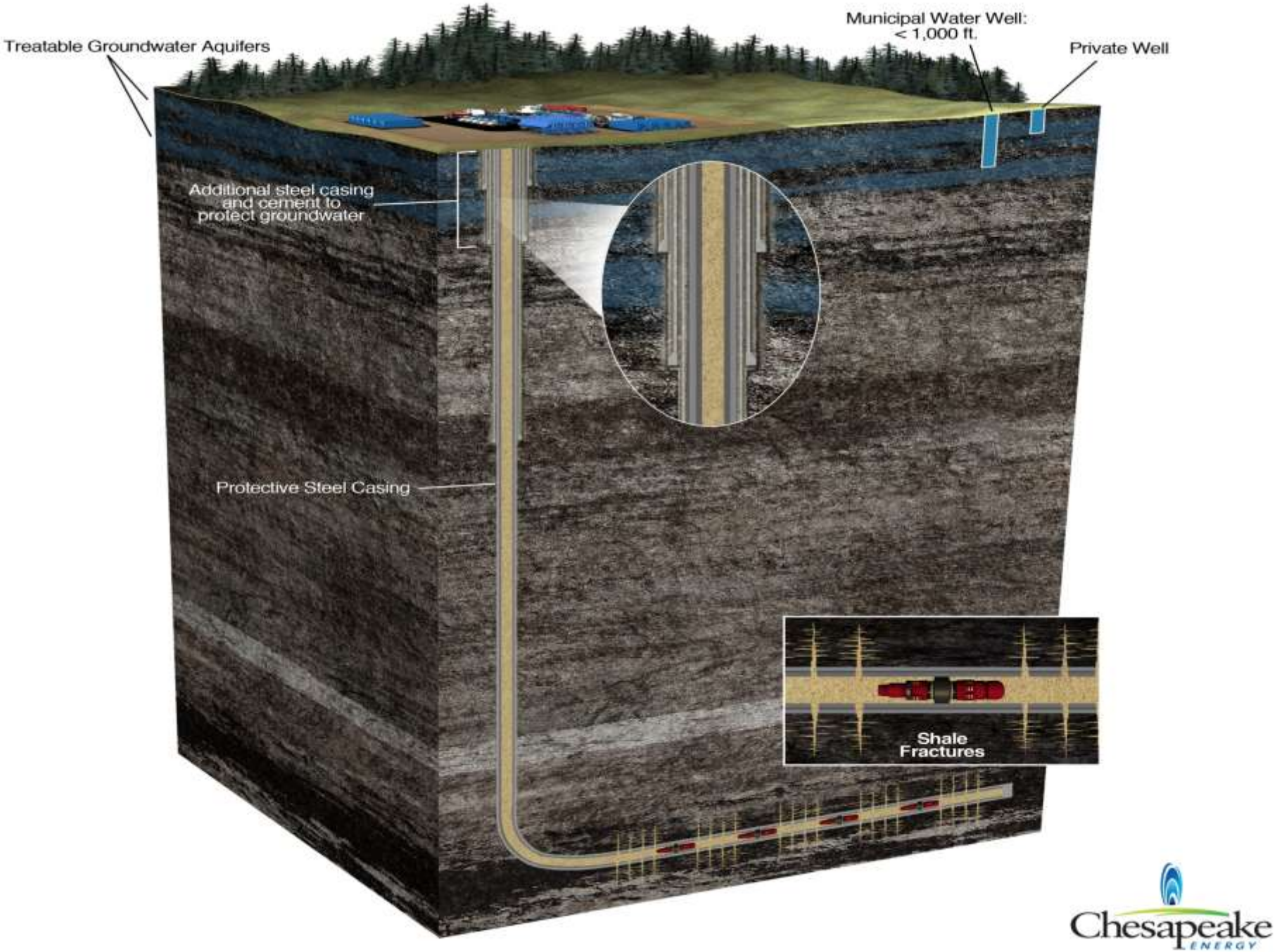
Depths vary by play

Well Completion-Hydraulic Fracturing

- After the drilling rig is removed, hydraulic fracturing ("fracing") begins
  - Not new technology; has been in use since after World War II
  - ODNR estimates over 80,000 wells have been hydraulically fractured in Ohio
- Water is mixed with proppant (such as sand) and pumped into the shale reservoir under pressure
  - 99.5% of fracturing fluid is made up of water and sand
    - ~6 million gallons of water needed per well
- Generally takes 7-10 days per wellbore

For more information on hydraulic fracturing, please visit AskChesapeake.com


Treatable Groundwater Aquifers
Municipal Water Well:
< 1,000 ft.
Private Well
Additional steel casing
and cement to
protect groundwater
Protective Steel Casing
Shale
Fractures
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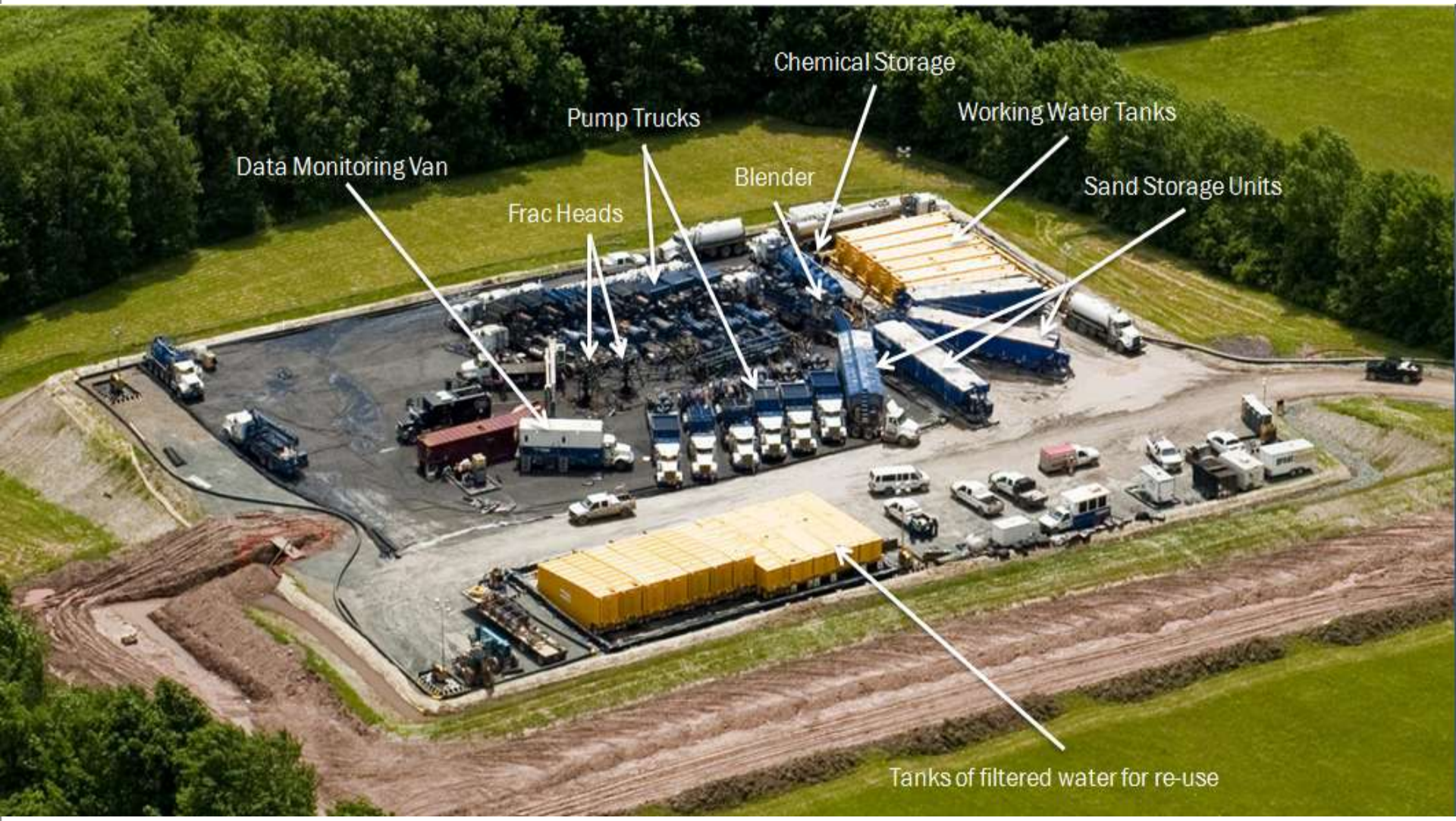
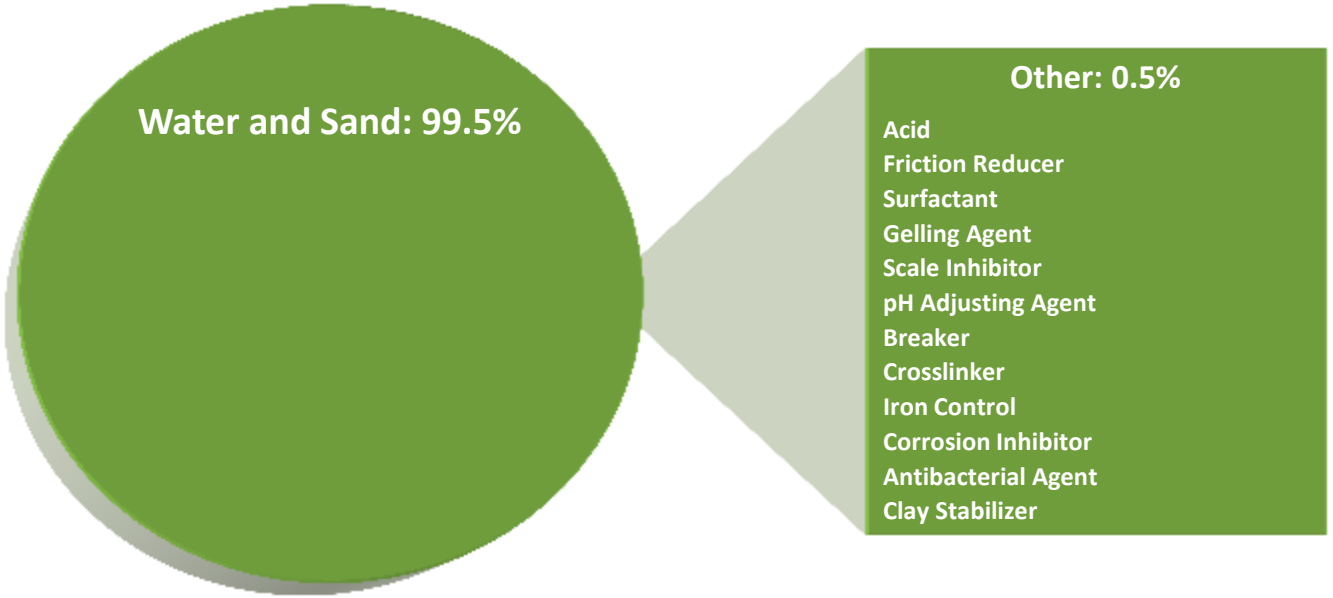
Hydraulic Fracturing Site Layout



Well Completion Best Management Practices

- Containment
  - Chemical trailers, containers and raw chemical transfer equipment will be placed in secondary containment
  - Troughs and/or drip pots will be placed underneath hose connections in concentrated chemical service not located within secondary containment
- Use of freshwater impoundments only
- Aqua Renew Program

Typical Deep Shale Gas Fracturing Mixture



Fracturing Fluid Additives

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Product	Purpose	Downhole Result	Other Common Uses*
Water and Sand: ~ 98%			
Water	Expand fracture and deliver sand	Some stays in formation while remainder returns with natural formation water as "produced water" (actual amounts returned vary from well to well)	Landscaping, manufacturing
Sand (Proppant)	Allows the fractures to remain open so the gas can escape	Stays in formation, embedded in fractures (used to "prop" fractures open)	Drinking water filtration, play sand, concrete and brick mortar
Other Additives: ~ 2%			
Acid	Helps dissolve minerals and initiate cracks in the rock	Reacts with minerals present in the formation to create salts, water, and carbon dioxide (neutralized)	Swimming pool chemical and cleaner
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 of the product returning in produced water.	Disinfectant; sterilizer for medical and dental equipment
Breaker	Allows a delayed breakdown of the gel	Reacts with the "crosslinker" and "gel" once in the formation making it easier for the fluid to flow to the borehole. Reaction produces ammonia and sulfate salts, which are returned in produced water.	Used in hair coloring, 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. Reaction results in sodium chloride (table salt), which is returned in produced water.	Used in low-sodium table salt substitute, medicines, and IV fluids
Corrosion Inhibitor	Prevents corrosion of the pipe	Bonds to metal surfaces (pipe) downhole. Any remaining product not bonded is broken down by micro-organisms and consumed or returned in produced water.	Used in 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 in produced water	Used in 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 with produced water.	Used in cosmetics including hair, make-up, nail and skin products
Gelling Agent	Thickens the water in order to suspend the sand	Combines with the "breaker" in the formation thus making it much easier for the fluid to flow to the borehole and return in produced water	Cosmetics, baked goods, ice cream, toothpaste, sauces, and salad dressings
Iron Control	Prevents precipitation of metal (in pipe)	Reacts with minerals in the formation to create simple salts, carbon dioxide and water all of which are returned in produced water	Food additive; 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. Reaction results in mineral salts, water and carbon dioxide; a portion of each is returned in produced water.	Used in laundry detergents, soap, water softener and dish washer detergents
Scale Inhibitor	Prevents scale deposits downhole and in surface equipment	Product attaches to the formation downhole. The majority of product returns with produced water while remaining reacts with micro-organisms that break down and consume the product.	Used in household cleansers, de-icer, paints, and caulk
Surfactant	Used to increase the viscosity of the fracture fluid	Generally returned with produced water, but in some formations may enter the gas stream and return in the produced natural gas	Used in glass cleaner, multi-surface cleansers, antiperspirant, deodorants and hair-color

Process

- Currently recycling / reusing nearly 100% of produced water
- Produced water is collected and stored in holding tanks onsite
  - Then pumped from the tanks through 20–micron filter
  - Then pumped into a clean storage tank
  - Prior to reuse, the water is tested for chlorides and then blended accordingly with freshwater during the next fracturing job

Benefits

- Reduces or eliminates need for water to be sent offsite for disposal
- Reduces impact on local supplies
- Reduces truck traffic, lower impact on roads, noise and air
- Reduces the cost of operations

Marketing / Reclaiming the Site

- Production equipment is installed
- Pipeline carries natural gas to market
  - Depending upon production level, liquid production may be trucked or transported via pipelin
- Produced water is retained on location in tanks until removed via truck
- Site is reclaimed and landscaped
  - Site is reduced to approximately 1 acre
  - Small access road will be retained
- Company returns regularly
  - Maintain equipment / monitor production rate

Who Shares In The Revenue

- Mineral Owners
  - Bonuses and royalties
- Local workers
  - Wages and benefits
- Local Business
  - Subcontractors and service companies
- Counties, Cities, School Districts
  - Ad valorem and other taxes
- Other Stakeholders
  - Charitable organizations
  - Chesapeake shareholders

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Questions?

For more information:

AskChesapeake.com

Information provided is subject to change based on multiple factors