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OIL AND NATURAL GAS IN ARKANSAS: AN EDUCATIONAL MESSAGE FROM THE ARKANSAS OIL AND NATURAL GAS COMMUNITY

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OIL AND NATURAL GAS IN ARKANSAS: AN EDUCATIONAL MESSAGE FROM THE ARKANSAS OIL AND NATURAL GAS COMMUNITY



YOUR QUESTIONS ANSWERED

Advances in proven technologies are delivering new opportunities in oil and natural gas exploration and production around Arkansas, which has brought substantial economic benefits for our state. Oil and natural gas development has been around for nearly 100 years in southern and western

Arkansas. As these operations extend into previously untapped regions of the state, area residents and local elected officials are likely to have questions and want to learn more.

As part of ongoing statewide educational efforts, several trade associations have come together to provide objective factual information about the oil and natural gas industry and its operations. This resource is designed to raise awareness about operations among the public, local leaders, and elected officials, and to share information about the extensive precautions taken to maintain safety of workers, local communities, and the environment.

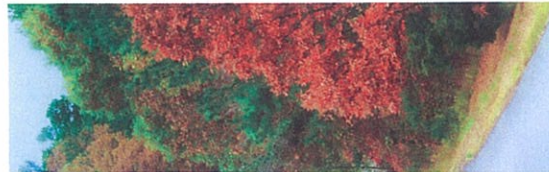
Participating organizations include the Arkansas Independent Producers and Royalty Owners Association, the American Petroleum Institute, the Arkansas Petroleum Council and America's Natural Gas Alliance.

OIL AND NATURAL GAS IN ARKANSAS:





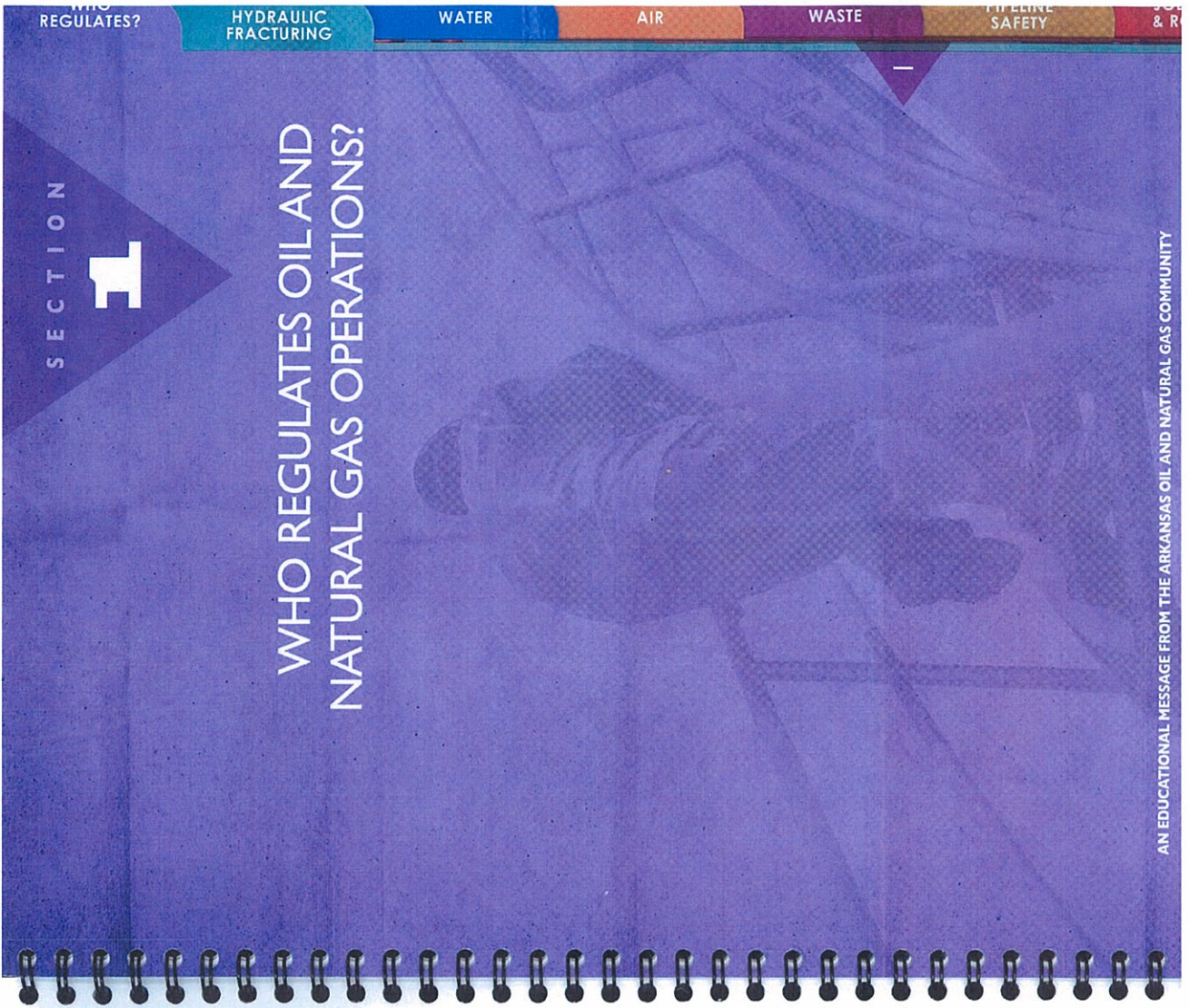
TABLE OF
CONTENTS



AN EDUCATIONAL
MESSAGE FROM
THE ARKANSAS OIL
AND NATURAL GAS
COMMUNITY



1	WHO REGULATES OIL AND NATURAL GAS OPERATIONS?	1
2	HYDRAULIC FRACTURING	3
3	WATER.....	13
4	AIR.....	19
5	WASTE.....	25
6	PIPELINE SAFETY.....	31
7	OIL AND NATURAL GAS BY THE NUMBERS: JOBS, TAXES & ROYALTIES.....	35



SECTION

1

WHO REGULATES OIL AND
NATURAL GAS OPERATIONS?

AN EDUCATIONAL MESSAGE FROM THE ARKANSAS OIL AND NATURAL GAS COMMUNITY

WHO
REGULATES?

HYDRAULIC
FRACTURING

WATER

AIR

WASTE

PIPELINE
SAFETY

& R



Comprehensive laws and regulations govern Arkansas oil and natural gas exploration and production activities. State agencies have been delegated authority to enforce federal programs and Arkansas laws establish additional requirements to protect the environment and public health. State and local laws also address road repair procedures, permit fees, protection of royalty owners, and bonding to guarantee operators' financial responsibility.

The Arkansas Oil & Gas Commission (AOGC) and Arkansas Department of Environmental Quality (ADEQ) are the two state agencies that share most of the responsibility for establishing standards and enforcing regulations for oil and natural gas exploration and production and environmental protection.

The AOGC oversees all aspects of drilling activity including well spacing, well design and integrity, groundwater protection during drilling and completion, surface water protection at the well site, wastewater handling and disposal, and operational and public safety. ADEQ's primary role during oil and natural gas exploration and production relates to control of air emissions, environmental compliance of waste disposal well surface operations, water quality protection, and protecting against adverse effects or threats to the environment away from the drill site. The Arkansas Natural Resources Commission (ANRC) also plays an important role in monitoring and regulating certain water uses, including water transfer permits, and monitoring stream flows.

The Arkansas Oil & Gas Commission, the Arkansas Public Service Commission (APSC) and several federal agencies, principally the U.S. Department of Transportation (USDOT), regulate oil and gas pipelines. The AOGC regulates noise emissions from compressors, and the ADEQ regulates air emissions and storm water runoff associated with pipeline operations. ADEQ, the U.S. Army Corps of Engineers, and the U.S. Environmental Protection Agency regulate pipeline and roadway stream crossings to protect water quality.

HYDRAULIC FRACTURING

WHAT IS HYDRAULIC FRACTURING?

Hydraulic fracturing is a proven technology that has been used for more than 60 years to safely enhance the production potential of oil and natural gas from more than one million wells across the United States. Hydraulic fracturing is but one important step used in the completion stage of preparing a well to "flow" or produce oil or natural gas. Popular media has adopted the nickname "fracking" to refer to this process, but the term is often misused to broadly refer to anything related to oil or natural gas drilling and production.

For years, oil and natural gas deposits in certain rock formations, like Arkansas' Fayetteville Shale formation, were "locked" within the tight, sep rock and could not be produced economically. Advances in drilling and completion technology, like hydraulic fracturing, made it possible for operators to unlock these natural resources. Modern technology now allows operators to drill thousands of feet below ashwater supplies and then turn and drill horizontally through rock formations where hydraulic fracturing releases



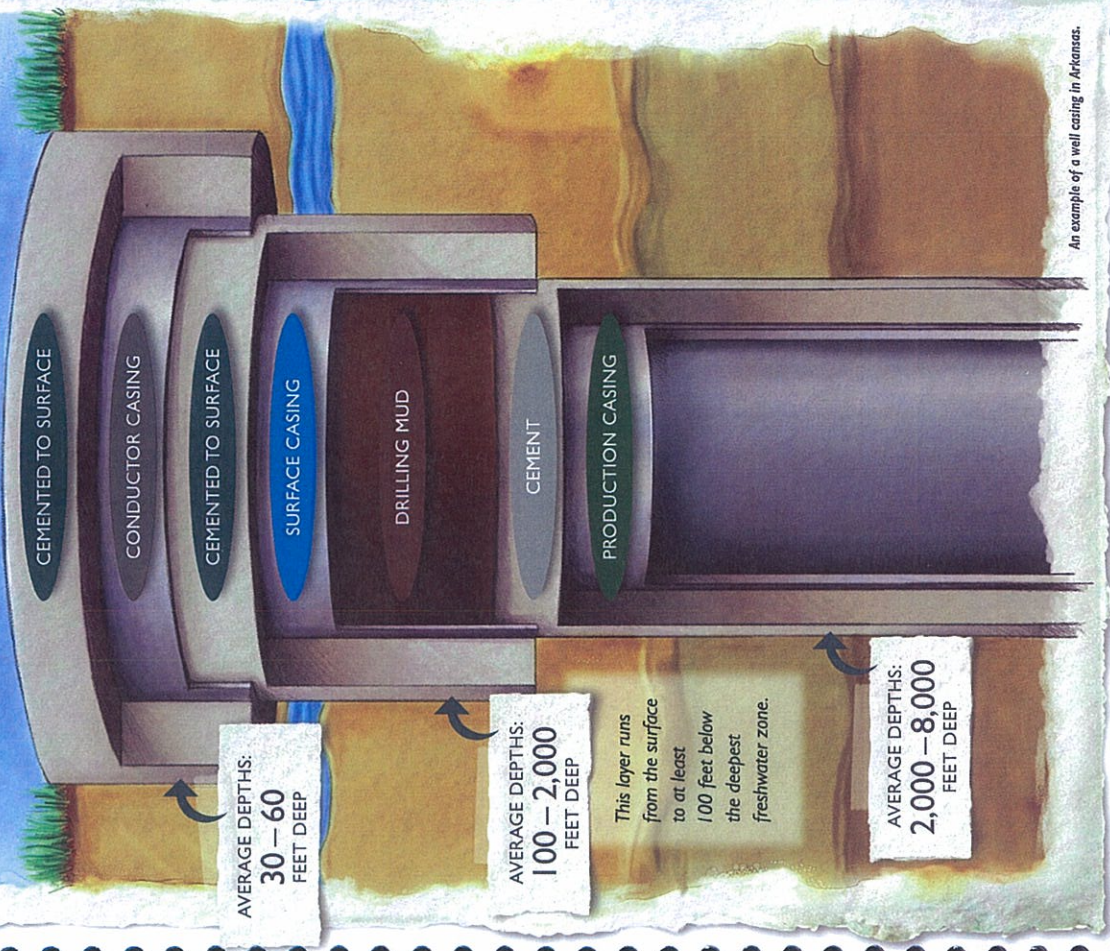
vast oil and natural gas deposits that were once unreachable. While the hydraulic fracturing technique generally has been used for decades, the process has been continuously refined to be even more safe and effective.

How does well construction protect freshwater supplies?



For decades, state regulators have imposed strict, comprehensive requirements for how oil and natural gas wells must be constructed. Each well must be encased in multiple layers of protective industrial-grade steel casing, with each layer being surrounded by cement, to create a multi-level safeguard for underground freshwater supplies. In the oil and natural gas producing areas of Arkansas, fresh groundwater sources are generally located from near the surface to less than 500 feet deep, often shallower than 300 feet. Most oil or natural gas producing zones are thousands of feet – some over a mile – deeper than the nearest freshwater zone. This regulated safety system and thousands of feet of impermeable rock keep oil and natural gas out of the freshwater and freshwater out of the oil and natural gas.

The Arkansas Oil & Gas Commission regulations include stringent quality and integrity requirements for steel casing and cementing to isolate and protect fresh groundwater zones. When a well is no longer productive, regulations further require that the well bore be plugged with hundreds of feet of cement to further ensure continued fresh groundwater protections.



An example of a well casing in Arkansas.

WHAT IS IN FRACTURING FLUID?



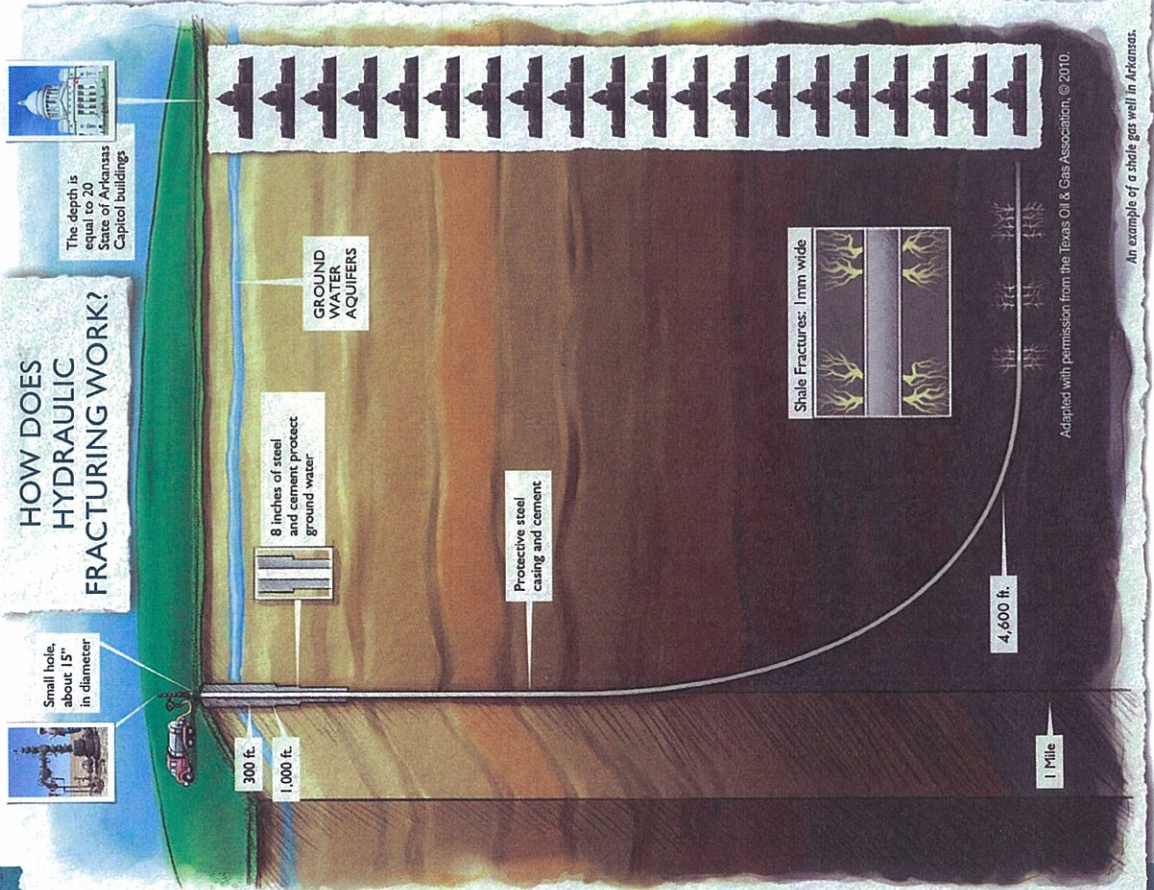
Natural gas operators in the Fayetteville Shale area typically use fracturing fluid that is about 90% water and 9.5% sand, plus about one-half of one percent (0.5%) chemically-based additives. The small amount of additives help make the process work in various ways, like making the fracturing fluid “slick” to reduce friction and preventing growth of bacteria. Most of these additives are the same chemicals contained in everyday household, food, hygiene, and cosmetic products.

Adapted with permission from EnergyfromShale.org.

HYDRAULIC FRACTURING DISCLOSURE

To ensure transparency and inform the public about fracturing fluid, the Arkansas Oil & Gas Commission requires

HOW DOES HYDRAULIC FRACTURING WORK?



Hydraulic fracturing generally occurs at great depths – up to a mile or more underground – below freshwater supplies. With the safety system of six or more layers of steel casing and cement in place, operators drill vertically thousands of feet

IS HYDRAULIC FRACTURING SAFE?



Hydraulic fracturing has a 60-year track record of safe operations. The U.S. Environmental Protection Agency, the Groundwater Protection Council (composed of state water pollution control officials), and the Interstate Oil and Gas Compact Commission all have studied hydraulic fracturing and found that existing regulations address and mitigate potential risks.

DOES HYDRAULIC FRACTURING CAUSE EARTHQUAKES IN ARKANSAS?



Although the media sometimes incorrectly associates "fracking" with earthquakes, drilling and hydraulic fracturing of production wells have not been found to have any correlation or connection with earthquakes in Arkansas.

The Arkansas Geological Survey (AGS) conducted seismic analysis in Faulkner and Cleburne Counties. This area experienced a high frequency of small earthquakes during 2009-2011, many of which were undetectable without sensitive monitoring equipment. The AGS worked with the AOGC to determine whether any correlations existed with natural gas operations in the area.

In March 2011, the Arkansas Oil & Gas Commission formally notified the public that the AOGC and the Arkansas Geological Survey "found no correlation between seismic activity and the drilling, or completion (including fracture stimulation) of production wells."

The analysis did reveal a previously unidentified fault, now called the Guy-Greenbrier Fault. The studies found sufficient correlation between the increased seismic activity and the location of some nearby underground injection wells (a type of well oil and gas operators use to safely dispose of produced water and other waste fluids by injection far below freshwater supplies). Although the data was not conclusive, the AOGC ruled that existing nearby injection wells be shut down permanently, and all of the operators complied. The AOGC has now established a permanent moratorium on injection wells within an 1150-square-mile area around the fault, and has imposed new seismic testing and monitoring for any new applications for injection wells elsewhere. In other areas of Arkansas, injection wells have operated for many decades without any sign of increased seismic activity.

WHAT ARE THE ENVIRONMENTAL BENEFITS OF HORIZONTAL DRILLING AND HYDRAULIC FRACTURING?

Advances in technology significantly reduce the environmental impacts of drilling for oil and natural gas.

1-

LESS SURFACE AREA.

The amount of land surface area required for each horizontal well today is much less than space required for conventional wells.

2-

FEWER WELLS.

Today, operators drill as many as six to eight horizontal wells on a single drilling location to access the same amount of natural gas that once would have required 16 or more wells drilled from separate locations. While conventional vertical wells are still common in other parts of Arkansas, the Fayetteville Shale has been developed almost exclusively with horizontal drilling.

3-

INCREASED WATER EFFICIENCY.

Most of the companies with hydraulic fracturing operations in Arkansas have instituted water recycling programs that can capture 95 to 100 percent of the flowback and produced water returned to the surface after completions for reuse in future operations.

4-

REDUCED AIR EMISSIONS.

Greater equipment and engine efficiency, improved technologies, and consolidation of operations at fewer locations mean less energy consumption per unit of fuel produced, thus lower air

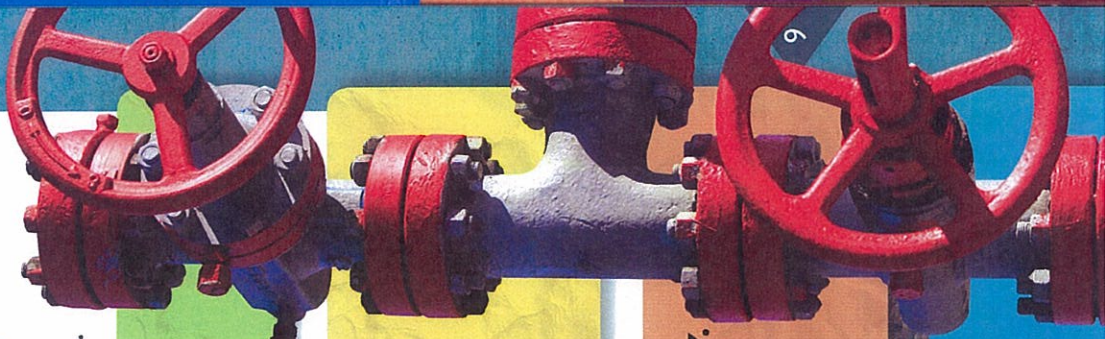
WATER

AIR

WASTE

PIPELINE SAFETY

9



WHAT HAPPENS TO WATER AFTER IT'S USED FOR HYDRAULIC FRACTURING?

A large volume of water is normally recovered during the initial weeks of well production. An ever-increasing amount of this water is being recycled and reused in other completion operations. Fracturing fluids that are no longer reusable, along with saltwater produced by the oil and natural gas formations, are collected and disposed of in approved underground injection wells. Injection wells typically deposit fluids in deep geological formations that already contain natural saltwater. Disposal wells must comply with strict regulatory programs delegated to the Arkansas Oil & Gas Commission and Arkansas Department of Environmental Quality from the U.S. Environmental Protection Agency. (See Waste Chapter for more information.)

HOW MUCH WATER ARE OIL AND NATURAL GAS OPERATORS USING?

In horizontal shale wells, operators typically use about 4.1 million gallons of water to drill and fracture a well. This is a one-time use. **To put this water volume in perspective, the average U.S. golf course uses this amount of water approximately every 29 days,** according to the McMahon Group, a consulting firm for golf clubs. Traditional vertical wells use less water. Oil and natural gas operators work closely with state regulators and water management experts to develop innovative ways to reduce water usage in their operations.

Water used in Fayetteville Shale operations is taken almost exclusively from excess surface water, often from ponds built by the operators. The ANRC has installed stream gauges around the Fayetteville Shale area to monitor stream conditions and to help decide if any restrictions are needed during low-flow periods. Operators must obtain permits from ANRC 10 days in advance to pump from streams to ensure that the needs of in-stream communities are considered.

WHAT HAPPENS IF THERE'S AN INCIDENT LIKE WATER SPILLED ON THE DRILL PAD?

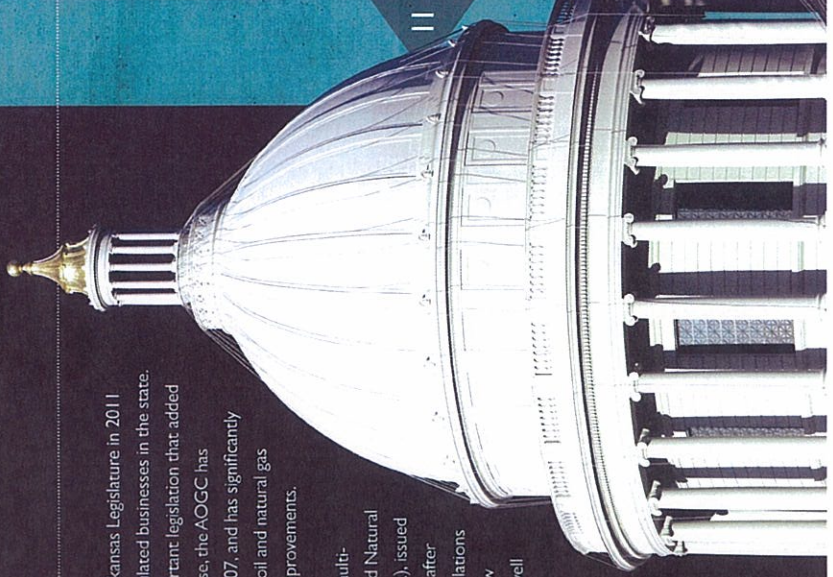
Fortunately, spills on the drill pad are rare in Arkansas. Drill pads have multiple containment systems including synthetic liners under equipment and berms around any tank holding fluids. Oil and natural gas companies constantly monitor operations. In addition to on-site safety measures, operators can remotely monitor the site, control valves and issue warnings. In the event of any incident, each site is required by the AOGC and ADEQ to have an emergency response plan in place. The plan details the proper steps needed to immediately contain and clean the area, minimize any impact on the environment, and notify regulatory authorities.



IS ARKANSAS DOING A GOOD JOB OF REGULATING HYDRAULIC FRACTURING?

In fact, the Director of ADEQ testified to the Arkansas Legislature in 2011 that the industry is one of the most highly-regulated businesses in the state. The agency has worked with legislators on important legislation that added inspectors to meet the growing demand. Likewise, the AOGC has increased its inspectors more than 25% since 2007, and has significantly updated and improved its rules since 2006. The oil and natural gas industry was supportive of these changes and improvements.

In February 2012, the independent, non-profit, multi-stakeholder organization, State Review of Oil and Natural Gas Environmental Regulations, Inc. (STRONGER), issued a report by its Hydraulic Fracturing Workgroup after completing an in-depth review of Arkansas' regulations and regulatory agencies. The STRONGER review team "concluded that the Arkansas program is well managed and professional and generally meets the 2010 Hydraulic Fracturing Guidelines," developed by STRONGER as a model for state regulation of hydraulic fracturing. The report commends Arkansas for regulatory innovation, updated rules, a model water well complaint protocol, and public information resources, among other things.



BASICS OF DRILLING

WHAT HAPPENS BEFORE COMPANIES DRILL A WELL?

Before a company drills a well, geologists and engineers study the size, structure, and thickness of the geological formations to scientifically determine how and where drilling should take place. Operators are required to determine the depth and location of all freshwater zones to ensure that protections for the entire zone of freshwater are in place. Operators must file for all necessary state and local permits, providing detailed information to the AOGC and other state agencies about the planned drilling and completion of any oil or natural gas well.

HOW ARE WELLS CONSTRUCTED TO PROTECT FRESHWATER SUPPLIES?

Each well is encased in multiple layers of protective, industrial-grade steel casing, with each layer surrounded by cement to create a redundant safeguard for underground freshwater supplies. (See page 5 for a detailed diagram.)

HOW LONG DOES IT TAKE TO DRILL A WELL?

It generally takes several weeks to prepare a well site and conduct drilling operations, depending on the size, type, and number of wells planned. This timeframe includes pad site construction, moving equipment on and off site, and completion. The rig and the equipment are temporary and are removed when the well is finished. Once all wells are completed, within 6 months, the drilling site is reduced to the size necessary for the production equipment for the life of the well(s).



QUESTIONS ABOUT HYDRAULIC FRACTURING OR DRILLING? VISIT WWW.AOGC.STATE.AR.US

WHO OVERSEES THE RULES OIL AND NATURAL GAS OPERATORS MUST FOLLOW TO PROTECT THE WATER IN ARKANSAS?

The Arkansas Oil & Gas Commission, Arkansas Department of Environmental Quality, and Arkansas Natural Resources Commission are the state agencies primarily responsible for water protection in the State. These agencies administer wide-ranging state laws and regulations to protect surface and subsurface waters during oil and natural gas drilling, completion, and production operations. Also, the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and the U.S. Fish & Wildlife Service, each have important roles in protecting water quality and wildlife during various drilling, production, and transportation activities.

Any operator with plans to drill or produce oil and natural gas in Arkansas must apply for a drilling permit and file an organization report with the AOGC, which includes detailed well information before a well is drilled. Operators must notify the AOGC prior to starting construction of any pit associated with drilling. AOGA in turn notifies the ADEQ, the Arkansas Department of Health, and the appropriate County Judge. The operator must indicate if the pit is going to be part of a recycling program. The AOGC forwards this notification to the ADEQ for approval of recycling plans prior to each hydraulic fracturing job. The AOGC inspects on-site during hydraulic fracturing jobs and the ADEQ inspects routinely all pit construction and operation. Both agencies are notified of any environmental issues occurring during operations.



EACH WELL MUST BE ENCASED IN MULTIPLE LAYERS OF PROTECTIVE INDUSTRIAL-GRADE STEEL CASING, WITH EACH LAYER SURROUNDED BY CEMENT TO CREATE A REDUNDANT SAFEGUARD FOR UNDERGROUND FRESHWATER SUPPLIES.

How does well construction protect freshwater supplies?

For decades, state regulators have imposed strict, comprehensive requirements for how oil and natural gas wells must be constructed. Each well must be encased in multiple layers of protective industrial-grade steel casing with each layer surrounded by cement to create a redundant safeguard for underground freshwater supplies. When a well is no longer productive, regulations require that the well bore be plugged with hundreds of feet of cement to further ensure continued freshwater protection. (See page 5 for a detailed diagram.)

What are oil and natural gas operators doing to help control erosion from storm water run-off?

Operators have successfully incorporated voluntary storm water management practices into day-to-day operations based on guidance developed by the national Storm Water Technical Workgroup. The group, made up of several national and state trade associations and company representatives, has developed Best Management Practices to control erosion associated with storm water runoff from oil and natural gas development.

THE ARKANSAS OIL & GAS COMMISSION AND ARKANSAS
DEPARTMENT OF ENVIRONMENTAL QUALITY

SHALIERE

THE OVERSIGHT OF RESPONSIBLE WATER HANDLING
RELATED TO OIL AND NATURAL GAS DEVELOPMENT.



DOES ARKANSAS
HAVE SPECIFIC
RULES THAT
PROHIBIT WATER
POLLUTION?



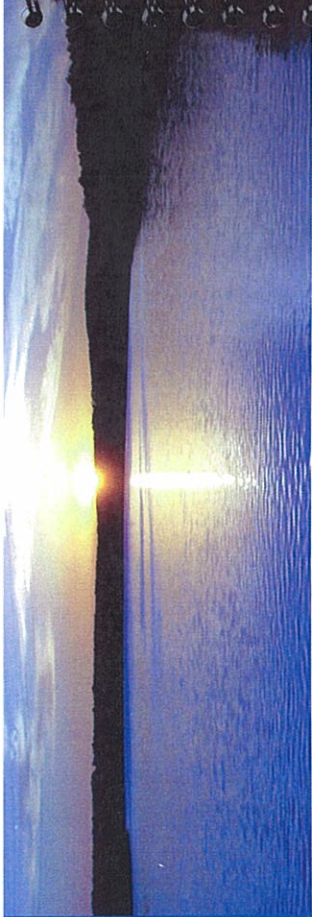
The Arkansas Oil & Gas Commission and Arkansas Department of Environmental Quality share the responsibility for water pollution prevention related to oil and natural gas development. The AOGC administers rules that regulate oil and natural gas well operations, including hydraulic fracturing, to prevent spills or releases. The ADEQ administers water quality regulations and has primary enforcement responsibility for any waste that is removed or released from the drill site. Both agencies respond to citizen complaints or concerns about drinking water wells.

HAS HYDRAULIC
FRACTURING
CONTAMINATED
WELL WATER IN
ARKANSAS?



Both the AOGC and the ADEQ have received and investigated citizen concerns about well water contamination in the Fayetteville Shale development area. The STRONGER review team investigated the agencies' records and concluded: "To date, neither agency has found any evidence of contamination from hydraulic fracturing in any of the water wells tested."

The United States Geological Survey office in Little Rock also recently completed a testing program of 121 residential water wells in Van Buren and Faulkner Counties, counties with active natural gas production and hydraulic fracturing operations. The program found no evidence of contamination from hydraulic fracturing in the water wells tested. The USGS reports that: "All analyses to date are within the range of concentrations listed for historic samples taken previous to 1983," which is about 20 years before any natural gas development of the Fayetteville Shale.



SECTION
4

AIR

**WHAT HAPPENS
TO INACTIVE OR
"ORPHANED"
WELLS?**

When a well is no longer economically viable and is no longer actively used, operators must follow the Arkansas Oil & Gas Commission's specific procedures and requirements to properly plug the well to protect surface water and groundwater. If operators do not properly plug such wells they may face stiff fines and sanctions, including having their authority to operate revoked.

Before a drilling permit is ever issued, AOGC regulations require each operator to provide proof of financial responsibility for proper well plugging and closure, such as a surety bond or letter of credit. If the operator fails to properly plug a well as required, the financial assurance is forfeited and can be used by the AOGC to pay for proper plugging. In addition, the AOGC administers the Abandoned and Orphaned Well Plugging Fund, which receives funds primarily from industry fees and forfeited bonds to pay for plugging abandoned wells and well site restoration.

**WHO CAN
THE PUBLIC
CALL WITH
QUESTIONS
ABOUT WATER
WELLS?**

If you or anyone you know has questions about a drilling operation and your water well, contact the nearest regional office of the AOGC, or the ADEQ office in Little Rock. Contact information is available online at www.aogc.state.ar.us (AOGC), and www.adeq.state.ar.us (ADEQ).

AIR

WASTE

PIPELINE
SAFETY

REGULATION
& RISK

WHO REGULATES AIR QUALITY ASSOCIATED WITH OIL AND NATURAL GAS OPERATIONS?

The Arkansas
Department of
Environmental Quality
(ADEQ) has primary
authority and jurisdiction
to ensure that oil and
natural gas operations
comply with state and
federal air quality rules
and regulations. ADEQ
administers rules and
programs that stem
from Arkansas laws that
predate the Federal Clean
Air Act by about 30 years.

How can the public check on their air quality?

Arkansas state regulators installed an ambient air monitoring network across the state, including sites in the Arkoma Basin, south Arkansas, and Fayetteville Shale areas, which provides air quality data through U.S. Environmental Protection Agency web portal AirData (www.epa.gov/airdata/). Anyone is able to check the air quality data at any time.

In 2010 the EPA Region 6 office awarded the Arkansas Department of Environmental Quality (ADEQ) a grant to estimate emissions associated with natural gas production and perform air quality monitoring at natural gas production sites in the Fayetteville Shale. Ground-based ambient air monitoring was performed from November 2010 – June 2011 at 14 sites, including compressor stations that transport natural gas and new wells that were undergoing drilling or hydraulic fracturing. ADEQ reported that “Studies conducted by the Department of Environmental Quality indicate that most natural gas production activities in northern Arkansas do not significantly impact the state’s air quality.”

Further, the public can check on air emissions from specific permitted facilities and certifications from Title V facilities or major sources to see how well they are complying with the requirements of their permits:

Data from the Arkansas air monitors: www.epa.gov/airdata/

Data from the Arkansas Permitted Facility Emissions and Stack Database: www.adeq.state.ar.us/air/isteps/isteps.asp

Data from the Arkansas Compliance Monitoring & Certification Database: www.adeq.state.ar.us/air/branch_compliance/compliance.htm

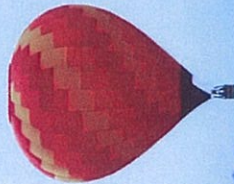


TOOLS TO INSPECT

EQUIPMENT FOR LEAKS INCLUDE INFRARED CAMERAS AND HANDHELD EMISSIONS DETECTION DEVICES.

How does the State keep track of air emissions?

All oil and natural gas facilities in Arkansas with emissions above a minimum threshold must submit an annual air emissions inventory to state regulators. The annual air emissions inventory allows the State to review air quality conditions and trends. The inventory provides a basis for focusing regulations and manpower on high-priority areas. State regulators also use continuous air monitors, handheld air monitoring equipment, mobile laboratory equipment, air sampling canisters, infrared cameras and windshiled surveys to assess air emissions at oil and natural gas operations across the state.



What are oil and natural gas operators doing to protect the air?

All oil and natural gas operators must comply with ADEQ regulations established by the Arkansas Pollution Control & Ecology Commission. Depending on the nature of the operation and the potential to emit, oil and natural gas operators may be subject to specific permitting requirements. Companies also must comply with regulations that cover emissions from engines and generators at well sites.

The pressure in pipelines and other production equipment can be monitored from remote sites using computerized systems. Additional tools to inspect equipment for leaks include infrared cameras and handheld emissions detection devices. Operators have a proven track record for quickly identifying and repairing faulty equipment. They may install additional air quality equipment to reduce the risk of leaks.

Is the air near oil and natural gas facilities safe?



The ADEQ performed air quality monitoring at natural gas production sites in the Fayetteville Shale development area, in 2010, using grant funds awarded by the U.S. Environmental Protection Agency. The ADEQ study concluded that natural gas production activities in the Fayetteville Shale area do not significantly impact the state's air quality.

AIR REGULATIONS ON THE BOOKS

Oil and natural gas operators must ensure that each of their sites complies with all state statutes, rules, and regulations, including federal requirements delegated from EPA to state agencies. Arkansas air regulation is substantial and in some cases, the state's requirements are more stringent than federal requirements.

All oil and natural gas operators must obtain appropriate air authorizations from the Arkansas Department of Environmental Quality unless the activity first has been determined by ADEQ to be an Insignificant Activity.

MAJOR SOURCE PROGRAMS

Title V Permit – Large oil and natural gas production facilities and natural gas processing plants typically have a potential to emit significant air emissions at such a level that a major-source air permit is required for their construction and operation. This permit is known as the federal Clean Air Act Title V permit, a program delegated to ADEQ to administer. Major source facilities undergo a stringent "New Source Review" process to ensure that local and regional ambient air quality is not impaired. Title V permits impose strict pollution control requirements that are validated through regular and frequent emissions testing and reporting to ADEQ. Major source facilities are under the regular and careful scrutiny of ADEQ, which commonly conducts recordkeeping and emissions measurement audits.

MINOR SOURCE PROGRAMS

Insignificant Activities – Activities that emit very minor amounts of air emissions. If an operation or activity meets the requirements of the

Insignificant Activities Rule, then no other state air authorization is required.

Registration – Emissions below certain actual emission levels require the oil and natural gas operator to register with the ADEQ.

General Permit – Certain oil and natural gas sites with higher level emissions than established for the previous types of authorizations may be required to apply for a General Permit (a permit for a specific, well-characterized type of facility).

Site Specific Minor Source Permit – Certain oil and natural gas sites require an individual permit to cover emissions from facilities located at the well site.

WHO OVERSEES WASTE FROM OIL AND NATURAL GAS OPERATIONS?

The Arkansas Oil & Gas Commission and Arkansas Department of Environmental Quality share regulatory oversight of waste from oil and natural gas operation sites such as drilling mud, produced water, salt water, or drill cuttings (the soil and rock that come out of the ground when a well is drilled). AOGC has primary oversight of activities on the well site, and ADEQ takes the lead on enforcing waste transportation, releases, or activities off the well site. Disposal of waste fluids in underground injection wells is also under dual regulation.

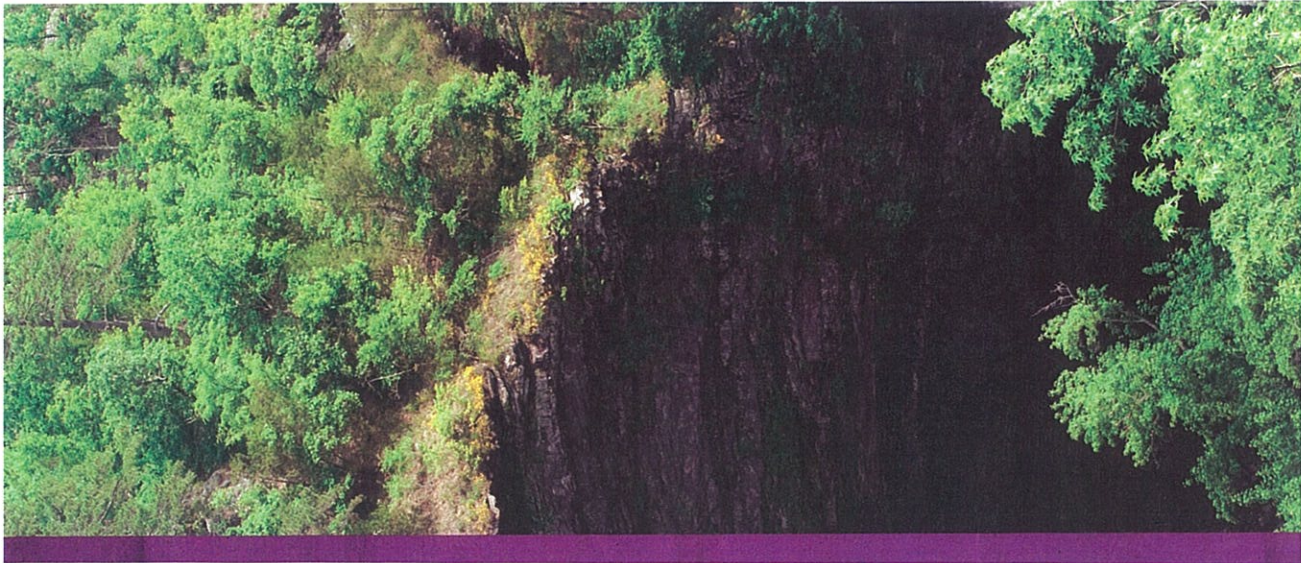
HOW IS ON-SITE WASTE REGULATED?

AOGC Rule B-17 is a joint enforcement between the AOGC and ADEQ which defines water types, regulates on-site pit construction and pit liner requirements, prohibits discharges, contains detailed operations requirements, institutes erosion and storm water controls, and sets standards for any site repairs and restoration. Drill site waste pits typically must be closed within 6 months of rig release. AOGC also regulates the transportation of waste fluids removed from the well location. ADEQ administers its mirror Regulation 34, overseeing activities or impacts that occur off the drill site.

HOW IS OFF-SITE WASTE REGULATED?

The Arkansas Oil & Gas Commission and the Arkansas Department of Environmental Quality have worked together for about 40 years to ensure that oil and natural gas waste is stored, treated, and disposed of at properly permitted off-site waste handling facilities. AOGC requires waste haulers to obtain and renew permits annually, and to maintain records of each transportation tank, the identity of the property from which oil and natural gas waste is hauled, the type and volume of waste transported, and the name and location of the permitted off-site waste storage or disposal facility where the waste is delivered. Each waste storage and disposal facility must have a proper permit and maintain records of its waste-handling operations.





When oil and natural gas is produced using hydraulic fracturing, some of the water and other fluids used in the process return to the surface. When water used for oil and gas production can no longer be recycled, it requires disposal. Like every industry, the oil and natural gas industry has a waste product that must be disposed of in a safe and effective manner.



WHAT IS AN INJECTION WELL?

After much study, the industry and agency regulators determined decades ago that the safest way to dispose of produced water was through the use of "injection wells." AOGC and ADEQ jointly regulate injection wells, in accordance with stringent U.S. Environmental Protection Agency regulations pursuant to the federal Safe Drinking Water Act. Produced water and other waste fluids are safely injected into permitted disposal wells far below freshwater supplies. Most often produced water is returned to naturally-occurring, underground salt water formations.

AOGC has the primary regulatory responsibility over injection well permitting related to the activities below the surface up to the well head. The ADEQ handles permitting of the surface facilities. Permit applicants must provide engineering details and comprehensive plans to protect groundwater including details about adequate separation and impermeable rock formations between the proposed injection zone and shallow freshwater formations. Applicants must also provide information about expected amounts of disposal, chemical make-up of the waste to be injected, and injection pressures to be used during the process. Operators must submit evidence showing that all plugged and unplugged wells within a 1/2 mile radius contain adequate cement and are constructed or plugged in a manner to prevent any intrusion into freshwater zones. Notice of every injection well application must be prominently published in a local newspaper, and anyone can object and require a hearing before the full Commission.



HAVE INJECTION WELLS CAUSED EARTHQUAKES IN ARKANSAS?

An analysis of seismic activity by Arkansas Geological Survey (AGS) "found no correlation between seismic activity and the drilling, or completion (including fracture stimulation) of production wells." However, studies have found a possible correlation between increased seismic activity and certain injection wells in the vicinity of the newly identified Guy-Greenbrier Fault in central Arkansas. In response, the AOGC proposed that the existing nearby injection wells be shut down permanently, and all of the operators complied. The AOGC has now established a permanent moratorium on injection wells within an 1150-square mile area around the fault, and has imposed new seismic testing and monitoring for any new applications for injection wells elsewhere. In other areas of Arkansas, injection wells have operated for decades without any sign of increased seismic activity.

PIPELINE SAFETY

How does injection well construction and monitoring protect freshwater supplies?

The Arkansas Oil & Gas Commission maintains rules and requires permits that specify stringent injection well construction standards that require several layers of steel casing, each surrounded by cement. Injection well operators are required to constantly monitor multiple pressure gauges, record injection pressure and rate, and perform periodic mechanical integrity tests on the disposal well. Operators must maintain and report this monitoring and testing information to the AOGC. (See page 5 for well casing illustration.)

QUESTIONS ABOUT WASTE? VISIT WWW.AOGC.STATE.AR.US AND WWW.ADFO.STATE.AR.US



WHO OVERSEES PIPELINE SAFETY IN ARKANSAS?

The Arkansas Oil & Gas Commission regulates the operation of pipelines associated with the production of natural gas – with jurisdiction over flowlines, production lines, gathering lines, and pipelines from the well location up to the “custodial transfer” point, where the natural gas enters a system owned by a company other than a producer. The AOGC applies and enforces the Federal Pipeline Safety Regulations applicable to production-related processes, found at 49 C.F.R. Part 192 (AOGC Rule D-17).

The Arkansas Public Service Commission’s Pipeline Safety Office (PSO) is responsible for intrastate pipelines other than production-related pipelines handled by the AOGC. The PSO enforces pipeline safety rules in the Arkansas Natural Gas Pipeline Code, which incorporates the Federal Pipeline Safety Regulations. The PSO inspects natural gas distribution utilities, intrastate natural gas operators, and master meter natural gas systems for operating safety, natural gas leakage, and corrosion control. The Federal Office of Pipeline Safety regulates interstate natural gas pipelines in cooperation with the PSO. The PSO consistently receives the highest evaluations in the nation, including a perfect score during the most recent evaluation.

ARE NATURAL GAS PIPELINES SAFE?



Statistics indicate that transporting natural gas through a closed, controlled pipeline system is the safest mode of transportation. Only when natural gas unexpectedly escapes from a pipeline does it have the potential to be a hazard. Thankfully, pipeline accidents are very rare. Most pipeline incidents are caused by unauthorized digging or excavating near the pipeline, in violation of state laws. (See explanation of the One-Call System on page 34.)

OIL AND NATURAL GAS BY THE NUMBERS: JOBS, TAXES & ROYALTIES

Pipelines are constructed or buried at different depths depending on the type and location of the line, with the majority of pipelines being at least three feet deep when initially built. Pipeline operators take extensive steps to protect the integrity of their systems as well as the safety of the communities where they operate. This includes building pipelines to specific construction standards, taking measures to prevent internal and external corrosion, monitoring the pipeline rights-of-way, and conducting public awareness efforts in the communities where they operate.

Additionally, transmission and distribution operators are required to implement integrity management programs to assess the greatest integrity risks of their systems. To inspect for leaks and confirm the integrity of the pipe, pipeline operators routinely walk and fly over the pipeline right-of-way, and conduct other testing on a periodic basis.

Pipeline operators must mark the route of a pipeline with signs or markers that list the name of the operator, the type of product being transported, and an emergency phone number to contact the operator.

WHAT IS THE ONE-CALL SYSTEM?

It is very important for anyone planning an excavation project, large or small, to know the location of pipelines and other underground facilities before digging begins. In Arkansas, anyone digging near a pipeline is required to take specific safety measures before and during excavating.

The first requirement is to call the local One-Call center at least two days before excavation begins. This applies to anyone who will be digging, such as homeowners, commercial contractors, fence builders, and road maintenance crews. One-Call centers serve as a clearinghouse for digging or excavation activities near pipelines or other underground facilities. Underground facilities operators will then mark their facilities using paint, flags or stakes to designate the location of the buried facility. In Arkansas, dial 8-1-1 to reach the local One-Call center. Visit www.arkonecall.com for more information.

- Call 8-1-1 before you dig.
- Wait the required 48 hours to receive the locations of any underground pipelines and other facilities.
- Respect the marks.
- Dig with care.

WHAT CAN YOU DO TO PROMOTE PIPELINE SAFETY?

In Arkansas, dial 8-1-1 before you dig to reach the local One-Call center.

QUESTIONS ABOUT PIPELINES? VISIT: ARKANSAS OIL & GAS COMMISSION: WWW.AOGC.STATE.AR.US
APSC PIPELINE SAFETY OFFICE: WWW.APSCSERVICES.INFO/PSOINDEX.ASP
FEDERAL PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION: WWW.PHMSA.DOT.GOV

OIL AND NATURAL GAS BY THE NUMBERS -

JOBS, TAXES AND ROYALTIES



The oil and natural gas

industry paid almost

\$77 million in Arkansas

severance taxes in 2011.

The industry has also paid

well over \$1 billion in royalty

payments to Arkansans

who own mineral rights.

The taxes paid go toward

funding Arkansas roads, schools, textbooks, Medicaid and children's health insurance programs, child protective services, and first responders such as police and firefighters.

More than 564 new businesses have located in Arkansas to service

the Fayetteville Shale project. And all of these businesses pay

sales, property and employment taxes to the state.



MORE THAN

564

**NEW BUSINESSES HAVE LOCATED
IN ARKANSAS TO SERVICE THE
FAYETTEVILLE SHALE PROJECT.**

BETTER JOBS, BETTER WAGES

Oil and natural gas employers provide more than **22,000 high-quality, high-paying jobs** in Arkansas. The average oil and natural gas industry worker earns about **\$74,555 a year**, which is twice the average pay of all industries in Arkansas.

JOBS CREATING JOBS

Given the large capital outlays and other expenditures that accompany oil and natural gas jobs, each job tends to generate many other jobs in Arkansas, creating a "ripple effect." This ripple effect stems from the purchases that oil and natural gas companies make including machinery, pipe, fuel, raw materials, concrete, steel, engineering services, legal services, well services, electricity, maintenance, construction, and land. The ripple effect also extends to the wages oil and natural gas companies pay to their employees.

OIL & NATURAL GAS INVESTMENT IN CONTEXT –
**\$11 MILLION
 EVERY DAY,
 EVEN ON SUNDAYS**

OIL AND NATURAL
 GAS BY THE
 NUMBERS



AVERAGE OIL AND
 NATURAL GAS WAGE –
\$74,555
 (200% OF THE STATE AVERAGE)

OIL AND NATURAL
 GAS JOBS IN
 ARKANSAS –
22,000

ARKANSAS ROYALTY OWNERS
 – MORE THAN
\$1 BILLION
 SINCE 2004

Every day, the state of Arkansas produces more than \$11 million in oil and natural gas. For the past four years, that is more than the production of rice, cotton and soybeans combined. While historically known for agriculture, Arkansas has quickly emerged as an energy production leader in our country. In fact, Arkansas is now the 7th largest producer of natural gas in the country and the 17th largest producer of oil in the country.

HELPFUL RESOURCES

- Arkansas Public Service Commission – Pipeline Safety Office: www.apservices.info/PSO/index.asp
- Federal Pipeline and Hazardous Materials Safety Administration: www.phmsa.dot.gov
- Independent Petroleum Association of America: www.ipaa.org
- State Review of Oil & Natural Gas Environmental Regulations (STRONGER): www.strongerinc.org
- U.S. Environmental Protection Agency Region 6: www.epa.gov/aboutepa/region6.html
- America's Natural Gas Alliance: www.aingas.us
- American Petroleum Institute: www.api.org
- Arkansas Department of Environmental Quality: www.deq.state.ar.us
- Arkansas Geological Survey: www.geology.ar.gov
- Arkansas Independent Producers & Royalty Owners Association: www.aipro.org
- Arkansas Natural Resources Commission: www.anrc.arkansas.gov
- Arkansas Oil & Gas Commission: www.aogc.state.ar.us
- Arkansas One Call: www.arkonecall.com

