THE JOURNAL OF THE INTERSTATE OIL & GAS COMPACT COMMISSION

groundwork

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INSIDE:

ORPHANED & ABANDONED WELLS: INNOVATIVE SOLUTIONS

Mature wells becoming viable.
Increasing production.
Restoring the land.

INTERSTATE Oil & Gas COMPACT COMMISSION

Collectively Representing the States.

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About the IOGCC

The Interstate Oil and Gas Compact Commission is a multi-state government agency that promotes the conservation and efficient recovery of our nation's oil and natural gas resources while protecting health, safety and the environment. The IOGCC consists of the governors of 38 states (30 members and eight associate states) that produce most of the oil and natural gas in the United States. Chartered by Congress in 1935, the organization is the oldest and largest interstate compact in the nation. The IOGCC assists states in balancing interests though sound regulatory practices. These interests include: maximizing domestic oil and natural gas production, minimizing the waste of irreplaceable natural resources, and protecting human and environmental health. The IOGCC provides an effective forum for government, industry, environmentalists and others to share information and viewpoints, to allow members to take a proactive approach to emerging technologies and environmental issues. For more information visit ***www.iogcc.org*** or call ***405-525-3556.***

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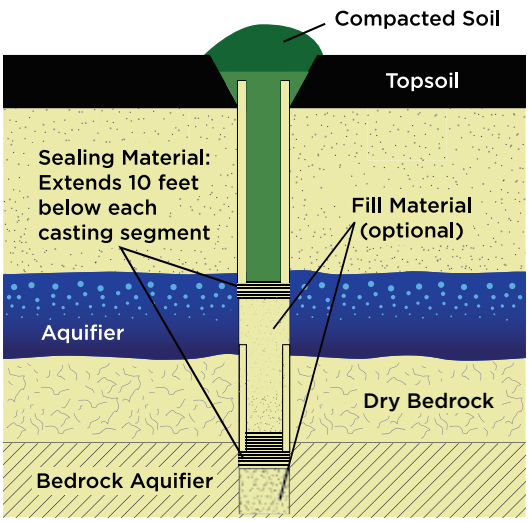
INSIDE**this**ISSUE:

"This is a tremendous opportunity to protect the environment in this beautiful state park, and potentially throughout northwestern Pennsylvania, where thousands of these abandoned, orphaned wells exist."

– Kathleen A. McGinty,
Pennsylvania Secretary of Environmental Protection

INTRODUCTION

The final, **critical step** oil and gas operators must take to prevent surface and groundwater contamination when a well reaches the end of its productive life is plugging the well so that it may be safely abandoned. A properly cased and cemented well prevents fluids from migrating between formations or to the surface.



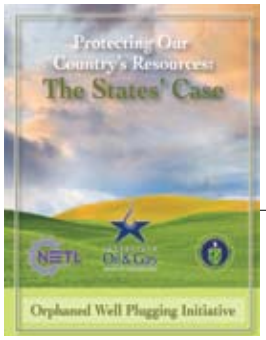
Recommended placement of plugging materials in shallow, large-diameter (Class I) wells. Commonly used plugging materials include sand, cement, and bentonite chips.

The vast majority of wells drilled in the United States have been correctly plugged under rigorous state regulations and enforcement efforts that continue to this day. These wells pose no threat to the environment. Unfortunately, many states have a small percentage of wells that are unplugged or improperly plugged. In many of these wells, there is no known or financially solvent owner. These wells are typically known as orphaned wells. The majority of these wells are shallow and pre-date regulatory programs. Others are the legacy of numerous boom and bust cycles and

sometimes ignorance on the part of oil and gas producers. Some orphaned wells date back to the 19th Century, when drillers plugged wells with tree stumps, mud, or whatever else was available – if they bothered to plug the well at all. More recent orphaned wells are the result of a bust in the 1980s that left many oil and gas producers bankrupt.

In recent years, states have taken measures to ensure that insolvent operators don't leave taxpayers holding the bag when they go bust. Higher bonding requirements, stiffer penalties, and sending field inspectors to witness the actual plugging procedure all help to ensure that abandoned wells are properly sealed.

The Interstate Oil and Gas Compact Commission (IOGCC) has been involved in a number of studies and has issued numerous reports over the last two decades regarding orphaned, abandoned, and idle wells. Because states use different formulas and definitions for their calculations, and because previously unknown wells are located while others are plugged, the number of orphaned and abandoned wells is an estimate that changes from year to year. The IOGCC defines orphaned wells as those that have no known or solvent owner. The term *plugged and abandoned well* refers to those that are properly plugged. Either of these types of wells may or may not be capable of further production. A 2008 survey put the number of orphaned wells awaiting plugging or restoration at approximately 50,000 nationwide.[1] To support the conservation of natural resources and to protect the environment, IOGCC and state oil and gas regulators want orphaned wells returned to production where possible, properly shut-in to allow production at a later time if necessary, or properly plugged and the site reclaimed.



1 The most recent IOGCC report, Protecting Our Country's Resources: The States' Case, reflected orphan and idle statistics for calendar year 2006.

Orphaned Well

Orphaned wells have no known or solvent owner and may or may not be capable of further production.

Plugged and Abandoned Wells

The definition of an abandoned well varies from state to state, but usually refers to a well that has been plugged properly and may or may not be capable of further production.

Idle Well

An idle well is one that is not producing and has not been plugged for any number of reasons.

Orphaned wells that predate regulation often go unnoticed because their locations were never recorded. **Early wells,** which may be 100 or more years old, were shallow, by modern standards, and are almost never a major risk.

An unplugged well creates a conduit allowing hydrocarbons, salts, and ground water to mingle. This mixture can seep to the surface and accelerate the risk and ferocity of wild fires.

According to a 1992 IOGCC study, "very few health, safety, or environmental problems associated with these (pre-regulatory) wells are reported in any given year."[2] States bear the burden of plugging and site restoration that in many cases predates the scientific knowledge required to avoid the hazards posed by orphaned wells.

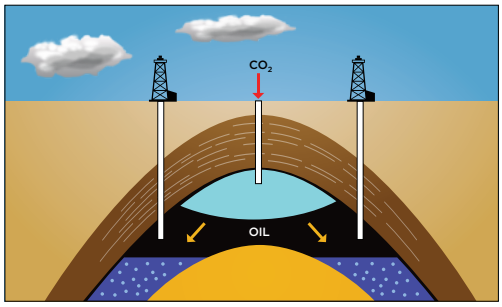
Post-regulatory orphaned wells present different issues. Newer, deeper wells can pose both physical and environmental hazards, because hydrocarbons, salts, and ground water migrate. An unplugged well creates a conduit allowing these materials to mingle, either contaminating below ground aquifers and water wells or seeping to the surface to contaminate fields, waterways, or ponds. Beyond the contamination, surface seeps can accelerate the risk and ferocity of wild fires. As unplugged wells deteriorate over time, they can cave in on themselves or give way to unsuspecting animals and humans. Unplugged wells also might allow water and salt migration to contaminate petroleum reserves. Casing and sealing hydrocarbon-producing formations, brine formations, and freshwater formations prior to installing a

Casing and sealing hydrocarbon-producing formations, brine formations, and freshwater formations prior to installing a cement plug ensures that fluids do not migrate between formations or travel up the wellbore to contaminate soil and water on the surface.

2 A Study of Idle Oil and Gas Wells in the United States. IOGCC and DOE, 1992.

cement plug ensures that fluids do not migrate between formations or travel up the wellbore to contaminate soil and water on the surface.

Also at issue with post-regulatory wells is the potential for further production or use as injection wells in enhanced recovery projects. New exploration and production (E&P) technologies sometimes can be used to make wells that were abandoned as dry holes in the past into solid producers today. Using technology to increase production of marginally producing wells and to bring orphaned wells into production when possible is an important tool that state oil and gas regulators value in their efforts to conserve the nation's energy resources. Primary recovery from wells typically yields only about 10% of the oil in place; secondary recovery methods such as waterflooding boost recovery to 20-40% of a reserve; and enhanced recovery techniques allow production of more than 60% in some cases.[3]



CO_2 Enhanced Oil Recovery

The states long have recognized their duty to locate and plug orphaned wells or return them to production and to work diligently to ensure the mechanical integrity of idle wells – both to protect the environment and to minimize the state's liability due to an operator's financial insolvency. The cost to plug an orphaned well varies widely from state to state and according to fluctuations in material and labor costs and other factors including a well's depth and condition. Recent estimates range from a low of about $2,000 to a high of around $40,000, with most falling between $6,000-$12,000.[4]

Section 349 of the Energy Policy Act of 2005 (EPACT) provides for the establishment of a program to provide technical and financial assistance to oil and gas producing states to facilitate remediation of environmental problems caused by orphaned or abandoned oil and gas exploration or production well sites on state or private land. The Act endorses the Secretary of Energy to work with the states, through the IOGCC, to develop a program that quantifies and mitigates environmental risks associated with onshore production. The program must include a mechanism to facilitate (a) identification of persons currently providing a bond or other form of financial assurance for an oil or gas well that is orphaned or abandoned, (b) criteria for ranking orphaned or abandoned well sites, (c) information and training on best practices for remediation of different types of sites, and (d) funding of state mitigation efforts on a cost-shared basis. The act authorizes that $25 million per year for fiscal years 2006 through 2010 be appropriated to carry out these activities and the Federal Reimbursement for Orphaned Well Reclamation Pilot Program.

To date, however, no funds have been appropriated to assist the states, but plugging activities continue, albeit at a much slower pace than envisioned with the anticipated EPACT funding. The IOGCC has developed a model framework for disbursement of federal funding, which could be applied should plugging funds be appropriated in the future. The IOGCC also worked with member states to develop a model prioritization schedule, published in 2008, that states can use to rank orphaned wells for plugging according to various risk factors.

The average cost to plug an orphaned well varies widely from state to state.
Recent estimates range from $6,000 to $12,000.

Additionally, an online orphaned well prioritization "widget" that uses the model schedule is under development. This tool, which sends a report via e-mail, will be available to regulators, industry members, environmental groups, and private citizens – all of whom have a stake in seeing orphaned wells located and plugged properly.

3 www.fossil.energy.gov/programs/oilgas/eor/index.html accessed on 4/17/2009
4 Protecting Our Country's Resources: The States' Case. IOGCC/NETL 2008.

Most oil and gas producing states have established plugging funds derived from a variety of sources-including levies, assessments, bonds, or taxes-that in nearly every case are tied inextricably to the oil and gas industry. When market prices are high, these funds tend to expand (depending on a state's budget allocations), but invariably drop when market prices fall. Plugging funds are adequate in some states, like Arizona, that report no orphaned wells because oil and gas E&P is relatively small and occurred in a post-regulatory environment. States with a longer history of oil and gas development generally find the funds they have available to plug wells stretched to the limit. Texas, for example, has plugged almost 35,000 wells since 1984 at a cost of more than $163 million, yet the waiting list for plugging as of October 2009 is 8,846 orphaned wells. Kentucky estimated its number of orphaned wells at 12,660, and Pennsylvania, considered the birthplace of the U.S. oil industry, had 8,846 wells on its waiting list that year. New York had 4,717 wells on its plugging list. On the other side of the ledger are states with significant production, such as North Dakota, that have only five wells wait listed and Alaska, with nine that are tributes to effective and efficient processes employed by states.

NUMBER OF WELLS THAT NEED PLUGGING (by state)

Alabama	3
Alaska	9
Kentucky	12,660
New Mexico	190
Pennsylvania	8,827
Texas	8,846

*Based upon a 2008 calendar year survey conducted by the IOGCC

The number of orphan wells needing to be plugged varies greatly from state to state.

Many states use a creative combination of penalties and incentives to reduce the number of orphaned wells. Some states encourage oil and gas operators to test wells in the hope that some might be brought back into production. As noted earlier, enhanced recovery techniques allow production from wells that once were considered dry holes. Actually, "dry hole" is a misnomer for a well that does not produce sufficient volumes of oil or gas to be economically feasible. Higher prices and technologies that raise production are the economic cure.

California has a program that encourages operators to adopt its orphaned wells. Called a "three-way agreement" because the operator must gain consent of the mineral owner(s) and the state Oil and Gas Supervisor, the program allows an operator to test an orphaned well for 90 days with no bonding requirement or liability, provided no mechanical changes are made to the well. After the 90-day "test drive," an operator must legally acquire the well and post bond coverage, or walk away without incurring plugging costs. To date, there have been 23 agreements, some covering multiple wells, and about 50 wells have been returned to production. The program played an important role in reducing California's inventory of orphaned wells from more than 900 to about 300, significantly reducing overall liability for the state.

Kentucky and some other states offer reduced severance taxes on orphaned wells that are returned to production. The Bluegrass State also has a program that allows test permits for orphaned wells. To date, Kentucky has received 694 testing permit applications and approved 550 of them, successfully returning 41% (223) of these orphaned wells to production and saving approximately $669,000 in plugging costs.

A partnership between the Pennsylvania Department of Environmental Protection (DEP) and two seniors groups identifies orphaned wells for plugging. The Pennsylvania Senior Environment Corps (PaSEC) is a statewide network of seniors who monitor Pennsylvania's water resources. The Environmental Alliance for Senior Involvement (EASI) is a nonprofit coalition

ORPHAN WELL TESTING PROGRAMS

California

- Under California's "adopt a well" program, prospective operators can enter into a three-way agreement (the owner of the mineral rights, the operator and the state) to test an orphan well for up to 90 days without incurring any liability for plugging the well.
- If the test is successful, the prospective operator can adopt the well by posting a bond and becoming its permanent operator.
- If the test is unsuccessful, the prospective operator can walk away from the agreement with no liability incurred.

Kentucky

- An operator interested in testing a well files a simple permit application and a small fee.
- Once the testing permit is approved, the operator has 60 days to complete the test, under the strict obligation that the operator may not drill deeper or open new production zones during the test.
- Should the test not indicate sufficient production potential, the operator can walk away with no liability.
- If the test is successful and the operator wants to assume the well, the operator requests the well be transferred to his name and he posts a bond.

of environmental, aging, and volunteer organizations. EASI typically partners with national, state, and local public and private organizations to provide opportunities for seniors to play an active, visible role in improving the environment in their communities.

The Environmental Alliance for Senior Involvement (EASI) is a nonprofit coalition of environmental, aging, and volunteer organizations.

The partners have developed a pilot program that trains and equips senior volunteers to locate and mark orphaned wells in Oil Creek State Park. "This is a tremendous opportunity to protect the environment in this beautiful state park, and potentially throughout northwestern Pennsylvania, where thousands of these abandoned, orphaned wells exist," said Pennsylvania Secretary of Environmental Protection Kathleen A. McGinty. "Sinkholes can develop around these old wells, presenting a danger to hikers, hunters, and all visitors to Oil Creek State Park."

In Pennsylvania, thousands of oil and natural gas wells were dug in rural northwestern parts of the state from the latter part of the 19th Century on. Prior to state environmental laws, these wells often were abandoned once they ceased to be financially viable for their owners. These wells now pose physical and environmental danger, yet most are located in wilderness areas amid rugged terrain and are difficult to find, which is where these senior volunteers come in.

Senior volunteers are provided with many tools, including walkie-talkies to communicate to park personnel when they find abandoned well sites.

EASI trains PaSEC volunteers to find wells and mark their location using handheld GPS units. The volunteers are provided with topographical maps, poles, flags to mark the well sites, orange vests, heavy pants to protect them from injury from the wilderness, and hiking boots. They also are given portable radios and walkie-talkies to communicate with park personnel. The Pennsylvania Department of Conservation and Natural Resources provides technical assistance and computer software for uploading information gathered from the GPS units in the field. Once a well is located and marked, environmental officials inspect the site and assess what action, if any, needs to be taken to protect the environment.

"This program is a wonderful chance for me and the rest of our group to spend time in the beautiful outdoors, while making a meaningful contribution to the community," said John Kolojejchick, one of the senior volunteers.

By June 2007, the volunteers had found and marked more than 317 orphaned wells in Oil Creek State Park. With the pilot program proving so successful, the project alliance moved forward to launch a second phase, with an additional $20,000 in funding and the desire of the seniors to increase the area of interest and to build participation in the program. Four areas were added to the project to include some game lands and forestry preserves. The groups have logged hundreds of volunteer hours and spent a mere $60,000. More than 225 of these wells

By June 2007, volunteers had found and marked more than 317 orphaned wells in Oil Creek State Park.

have been plugged, and now a third phase is in the works.

In 1993, leaders representing Oklahoma's oil producers and royalty owners, working with the Oklahoma Legislature, formed the Oklahoma Energy Resources Board (OERB). Oklahoma's natural gas producers joined soon after. At the heart of OERB's mission is the ongoing commitment to restoring Oklahoma's orphaned and abandoned well sites left by operators who have since disappeared. Site restoration includes (1) the removal of equipment, concrete, trash, and debris; (2) soil erosion and scarring repair; (3) the removal of hydrocarbons; (4) closing of pits; and (5) the removal of lease roads and location pads (OERB 2008). Funded through a voluntary assessment paid by producers and royalty owners on the sale of oil and natural gas in Oklahoma, OERB's environmental restorations cost landowners and taxpayers nothing. Since 1994, Oklahoma's oil and natural gas producers and royalty owners have voluntarily contributed $70 million. OERB has restored more than 7,800 abandoned sites.

Michigan established its Orphan Well Fund in 1994 with revenue from a severance tax on the oil and gas industry. Two percent of the tax revenue, but not less than $1 million, is credited to the fund annually. The money goes toward plugging, response activity, or site restoration at abandoned or improperly closed oil and gas wells. For Fiscal Year 2007-2008, the total cost for plugging, response activity, and site restoration for all projects was $1,488,058. However, $183,819 was returned to the fund as a result of sales from well tubing, casing, and equipment, and $112,000 from the collection of well bonds. Fiscal Year 2007-2008 represented the 13th year that funds were expended from the fund. Sixteen wells were plugged and fifteen oil storage tanks were remediated. Michigan also deposits funds from salvaged equipment from plugged well sites into the fund. In 2009, the value of salvage totaled $31,464. The Office of Geological Survey posts a list of orphaned wells on its Website. Operators are allowed to take over orphaned wells if they get leases for the minerals under the original drilling unit.

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OERB's mission is the ongoing commitment to restoring Oklahoma's orphaned and abandoned well sites left by operators who have since disappeared.

Site restoration includes:

1. Removal of equipment, concrete, trash, and debris
2. Soil erosion and scarring repair
3. Removal of hydrocarbons
4. Closing of pits
5. Removal of lease roads and location pads

STATES HAVE BEEN CREATIVE in finding ways to reduce the potential for adverse environmental impact by plugging thousands of orphaned wells. They also have conserved resources by encouraging the return of orphaned wells to production. Despite making headway, much more work is required before the danger posed by orphaned wells is history. To ensure that the problem of orphaned wells remains a legacy from the past and not an ongoing problem, states have a variety of regulatory tools at their disposal to prevent premature abandonment of current and future wells. States work on a daily basis to ensure that wells are correctly plugged and abandoned and to identify orphan wells that may present a danger to the environment. Agencies quickly act to address any immediate threat that presents itself – regardless of ownership and liability issues. The process of identifying and remediating past problems will take time, but states are dedicating significant human and financial resources to ensure the protection of generations to come.

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