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To: [fracking inquiry](#)
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Attachments: [multi well pads unique challenges.pdf](#)

To: The fracking Inquiry

During the Q&A following my presentation on 8 March in Katherine, one of the Panel members asked me about the challenges presented by scaling up from a small number of exploration wells to the larger number of a production field. I understood the question to refer to multi-well pads and focussed my attempt at an answer on the interaction between the wells at depth. I have been searching since for any information on interactions between cemented wells in production and adjacent wells on a multi well pad undergoing perforation and fracking. I have had no success. However I recently came across the attached **“Multiwell Pad Drilling, Simultaneous Operations Introduce Unique Risks”** dated December 2014. This article discusses the risks introduced when different processes and associated crews, which in the single well pad work sequentially, work simultaneously on a multi well pad. I commend this article to the Inquiry as describing challenges in management, coordination, emergency response plans and liability arising from scaling up the number of operations conducted on a multiwall pad from one at a time to several simultaneously.

Errol Lawson

Multiwell Pad Drilling, Simultaneous Operations Introduce Unique Risks

By Eric Boquist

HOUSTON—As U.S. oil and gas operators look to increase efficiency and improve profit margins, multiple-well pad drilling has become much more widespread. Multiwell pads made up only about 5 percent of all wells drilled in the Bakken, Barnett, Eagle Ford, Fayetteville, Haynesville, Marcellus, Niobrara, Permian and Woodford unconventional resource plays in 2006, according to Drillinginfo. By the third quarter of 2013, more than 58 percent of all wells drilling in these formations were located on pads with multiple wells.

The ability to drill multiple wells on a single pad provides numerous operational and economic advantages to operators, most notably dramatically improved drilling and completion efficiencies. It also substantially reduces surface footprint. Co-locating wells allows for fewer roads and pipelines to access pad sites and the centralization of production facilities with assets such as compressors, storage tanks, separators, and vapor recovery units. The smaller footprint also reduces traffic for ongoing operations and maintenance activities.

Pad sites make it possible to implement simultaneous operations and batch drilling solutions to minimize the cost and time associated with drilling and completing wells, and then moving them onto production. However, for all the benefits that pad drilling and simultaneous operations can generate for oil and gas companies, they also present unique challenges and risks.



While operators using multiwell pad drilling are seeing cost reductions on the order of 15-30 percent per well, they also are facing additional risks related to both property and people. Operators and contractors alike should be aware of these risks, as well as understand the best practices for managing exposures. While many risks involved with multiwell pad drilling are similar to those on single-well sites, the potential for catastrophic loss can be much greater.

Pad drilling was implemented widely first in the Barnett Shale, and the Barnett and Fayetteville Shale were the most heavily pad-drilled plays in 2013, with 80-90 percent of all wells in those plays drilled from multiwell pads, according to Drilling-info. About 75 percent of all wells drilled in the Bakken and Eagle Ford shale plays were on pad sites last year. That compared with only 10 percent in the Permian Basin, but that number is somewhat deceptive. Pad drilling is growing rapidly in the Permian, but in 2013, pad techniques were only beginning to be extensively adopted as more and more plays that had been drilled with vertical wells were transitioning rapidly to horizontal trajectories.

Drilling and completion operations on a traditional single-well site typically take place in sequential order, beginning with site preparation and moving to drilling, stimulation, completion, and finally, production. Each stage of the operation has its own set of unique hazards.

Simultaneous operations introduce several of these hazards onto the well site at the same time. One part of the pad brings risks associated with drilling or completion, while another brings perils related to well stimulation, flow back, or even production. Simultaneous operations can be complex in the sense that a multiple-well operator must juggle a number of the risks in a well's life cycle all at once.

Pad Spacing And Design

The design of a pad can be just as important as the operations. Greater well spacing can give emergency response crews more room to operate in the event of a fire or a blowout, and installing remote shut-off valves can mitigate the possibility of an incident spreading to neighboring wells. The risk at poorly designed sites is considerably higher because of the "domino effect" that can exist even with well-designed operations. With above-ground drilling and completion equipment

and personnel in close proximity with horizontal wells, managing the domino effect from one well to the others on a pad is essential for mitigating risk in any multiwell incident.

Significant property damage can occur on poorly managed simultaneous operations with improper site design and maintenance. That is because multiwell pads generally have a higher concentration of assets than traditional single-well sites during both drilling and completion operations. The accumulation of equipment such as frac tanks, trucks, pumps and equipment can resemble a crowded city on a pad location and represent tens of millions of dollars. Even a small incident on these sites can spread easily to other assets and quickly escalate to a large-scale event. This makes planning, design and site maintenance top priorities.

The concentration of property and the way equipment is utilized also creates an environment where maintenance and proper management of equipment are absolutely critical. Simultaneous operations can cause greater wear and tear on equipment, since there is less downtime between jobs, potentially increasing the frequency of breakdowns, malfunctions and failures. If equipment is not well-maintained and regularly inspected, operators can lose control easily, causing damage to the multiwell pad and nearby equipment. This means it is even more critical to inspect piping, valves and any other equipment used in the hydraulic fracturing process.

Operators and contractors should institute a sophisticated inspections program with written record keeping to note the frequency of inspections, and comprehensive equipment maintenance programs to help avoid breakdowns and potentially dangerous situations. On-site storage of spare or replacement parts for key machinery also is recommended to limit possible business interruption.

Because a multiwell site requires more equipment and oversight than a single-well pad, it also requires more people—a lot more people, in fact. A single-well site generally will have one crew working at a time, with some overlap between operations. However, with simultaneous operations, multiple crews may be present at any given time. This can lead to additional exposure as site activities such as drilling, logging, fracturing and completion, and production increase.

Emergency Response Plans

Communication among multiple crews

is crucial on any job site, but it is particularly important when dealing with a multiwell pad, where there can be a large number of crews tackling a wide range of jobs. For example, if contractor A is drilling a well and contractor B is performing the completion operations on another well on the same pad and something goes wrong, not only is there exposure to property damage, but people are at serious risk as well.

If the two contractors are not aware of each other's actions, they are less likely to know what dangers may be present. Safety on a multiwell pad requires that all groups working on a job site communicate with one another and know the hazards of work that are occurring next to them or nearby, and coordinate accordingly.

In record keeping, one of the most important safety items is the multiwell pad site's emergency response plan in the event of an accident. This is especially true if numerous smaller contractors are involved. The plan ensures that each contractor does not react independently to an event, which could create additional confusion and increase the danger to themselves and others. Without centralized oversight of contractors, the potential for a communication breakdown is even greater.

The complexity of a multiwell pad site makes an emergency response plan more challenging to develop. It should be far more comprehensive in scope and must address different issues than a typical single-well plan, accounting for both on-site and off-site contingencies, and requiring additional due diligence for all contractors at a multiwell pad site. The operator, or contracting company providing oversight, should proactively engage with local first responders and medical facilities. Among the issues that any emergency response plan should address include:

- Where is the nearest emergency room?
- Does the multiwell pad provide helicopter accessibility for more urgent evacuations?
- Does the site have a contract with any air medical transport companies?

To revisit the "domino effect" analogy, it is comparable to dealing with a house fire versus a commercial building fire. With the latter, additional infrastructure, workers and potentially the general public could be at risk if an incident occurs.

Once an emergency response plan is in place, those on the job site should hold reg-



ular drills to rehearse correct procedures, especially as new owners and operators take over certain operations or new contractors are brought onto an active multiwell location.

Contractor Selection

Contractor selection is a very important safety consideration. It is critical that a contractor has a staff that is experienced on multiwell pads, has a history of safe operating practices, understands proper bonding, and possesses equipment capable of completing the job properly. Identifying and working with consistent, quality partners can protect the entire multiwell site in addition to the people and equipment on it.

Those who have a history of working on multiwell pads understand that this is a standard procedure and a best practice for managing risks. Contractors with specific multiwell pad experience also are more aware of the risks on this type of operation. As new operators and contractors cycle in and out at a multiwell site, reviewing what each party is responsible for during an incident is an important foundational step.

Another critical step when hiring contractors is to ensure that they understand and sign a master services agreement (MSA) prior to commencing any work. If an accident occurs and not all parties have signed the MSA, the operator can be held financially responsible for any num-

ber of expenses, even if the accident is the result of negligence by a contractor.

Just as the process for choosing the right contractor is critical, it is also important to work with a risk management professional that has specific experience and a strong track record of working with multiwell pads and related exposures. Selecting a well-informed, experienced risk manager and involving him in the early stages of planning can help identify potential problems at the outset and provide solutions in the event an incident does occur.

With the industry's shift to the production process and hydraulic fracturing over the past decade—and the increasing value of on-site equipment and other physical assets—operators and contractors should review their exposures for property, liability and contract liabilities against existing insurance coverages and limits to help ensure they have the proper coverages in place.

Experienced people, clear communication and properly maintained equipment are what make a successful multiwell location possible. Managing exposures while drilling, completing, maintaining and operating multiwell pads is a significant undertaking. From coordinating simultaneous operations and getting the design right, to communicating a clear response plan and hiring the right partners, new and different risks exist at every turn. Opera-

tors can be better prepared to manage risks and, in turn, protect the people and property located on site, by understanding the complex risk equation—and how to effectively manage it—at the start. □



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