

NOT JUST



# *BLOWING* SMOKE

An Army slogan says, “We train the way we fight,  
and we fight the way we train.” Burns & McDonnell

is helping the Army Chemical School and Army

Military Police School at Fort Leonard Wood,

Missouri, live up to that motto — while rigorously

protecting the environment.

## Environmental Worries

Fort Leonard Wood borders the Mark Twain National Forest, in an area of the Missouri Ozarks that's a hunter's paradise, full of deer and wild turkey. When the Army considered moving the Chemical School there in 1993, some feared the school's obscurant training could damage the environment. In 1995, when the decision was finally made to relocate the school to Fort Leonard Wood, the Missouri Department of Natural Resources placed stringent limits on the fort's air permit regulating obscurant training and other activities.

"We want to make sure every soldier is trained as realistically as possible, and that means hands-on experience," says Emily Brown, chief of environmental compliance at Fort Leonard Wood. "The permit restrictions made planning and scheduling training extremely challenging."

## Raising the Bar

Obscurant training teaches troops to produce a "smokescreen" that reduces their visibility to an enemy. This "smokescreen" isn't really made up of smoke, but of fog oil vapor, produced by heating a highly refined mineral oil — something like baby oil without skin softeners or perfume. The process causes tiny droplets to become airborne in the form of a heavy vapor. Training exercises may also call for smoke pots and smoke grenades.

The air permit required Fort Leonard Wood to limit total particulate emissions — including vapor droplets and dust raised by vehicles — and stipulated that air quality monitors be placed at the fort's immediate boundaries.

"We worked with the Army Corps of Engineers to find a company knowledgeable in air compliance matters," says Brown. "The corps selected Burns & McDonnell, as it had the needed expertise."

## Team Building

Burns & McDonnell had worked with Army Corps of Engineers project manager Alan Gehrt and Fort Leonard Wood during the Chemical School and Military Police School relocation. Now, Gehrt and Brown teamed with Burns & McDonnell scientists, engineers and technical specialists to help Fort Leonard Wood fulfill its training mission. Together, over the next six years, the team planned, developed and built an air quality monitoring system that made it easier for the schools to conduct training — while meeting air quality standards.

## Measuring Compliance

First, the team installed the air monitors. Continuously operating tapered element oscillating microbalance air monitors (TEOMs) were placed at critical points along the fort's boundary. The TEOMs are simple in appearance. But inside the housing, dime-sized fabric filters vibrate rapidly on tiny spindles to collect and weigh particulate.

"The TEOMs clearly demonstrate that the school complies with particulate limits," says Burns & McDonnell project manager Greg Knauer. "They also collect information that helps Fort Leonard Wood better schedule training."

Fort Leonard Wood makes use of the TEOMs' data through special software developed by Burns & McDonnell.

## Scheduling Difficulties

To stay within permit stipulations, the concentration of fog oil vapor has to be reduced through natural dispersal, by mixing with air before it drifts off-site. But, calm winds and atmospheric stability — the conditions best for laying down a low, thick smokescreen — are least conducive to dispersal.



The Army tried limiting training to six specific sets of conditions, including wind speed and direction, under which smoke training could take place.

“We had very little training flexibility,” Brown says. “The permit restrictions limited training realism.”

### A Thorny Dilemma

Burns & McDonnell meteorologists began building a database of the types and amounts of obscurants needed for training. Plugging the combinations into a dispersion model under various weather conditions yielded more “OK to train” scenarios, but training within permit guidelines remained challenging.

“We could schedule training,” Brown says. “But with no idea of whether or not it could actually take place. Sometimes, training even had to be stopped in the middle of an exercise.”

Part of the problem was that weather and fog oil output weren’t the only factors the school had to consider. For

example, traffic on gravel roads or wind-blown dust from neighboring landowners plowing fields could add to particulate loads. The permit required that for training to occur, particulate had to stay within limits — regardless of the source.

### Online Solution

Fort Leonard Wood was committed to protecting the environment — and determined to fulfill its mission. The team brain-stormed solutions. They hit on pulling in data from the TEOMs and meteorological stations to use in real-time calculations. Burns & McDonnell’s information management

specialists developed software to analyze the data and let users in the field access the results via a browser-based tool that’s easy for non-technical personnel to use.

“As we worked with Burns & McDonnell on the project, we got the feeling they were truly concerned about making it work,” Brown says. “It was very satisfying to work as a team, exchanging ideas, feeding off that exchange to develop solutions, helping each other modify plans when needed.”

**Event Search Criteria**

Event ID: 2060  
 Start Date: 28 August 2002  
 Start Time: 08:00  
 Unit: COBC  
 Training Type: Fog Oil  
 Facility: BAILEY  
 Quantity (gal.): 120  
 Lot #: D2719  
 SPO #: 450-98D-4153002Z

End Date: 28 August 2002  
 End Time: 17:00

**Duration**

Add	Start Time	End Time	Duration
Update			
Delete			

**Event Detail Information**

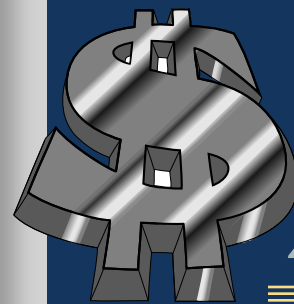
Event Date: 28 August 2002

**Training Event Close Out**

Event Unit	Event ID	Training Type	Facility	Quantity (gal.)	End Date	End Time
2059 COBC	2059	Fog Oil	TA-401		28 August 2002	9:27:00 AM
2060 COBC	2060	Fog Oil	TA-401	120		

**Meteorological**

Time	Event	Quantity (gal.)	Duration	Start Time	End Time	Duration
09:19	2060					
09:19	2059					
09:19	2059					
09:20	2058					
09:20	0071					
09:21	2059					
09:21	2060	2	71.4	041	34.89	Favorable Monitoring
09:24	2059	2	59.18	041	34.89	Favorable Monitoring
09:24	2060	2	59.18	041	34.89	Favorable Monitoring



# MORE FOR THE *Money*

## Perfect Record

Since the monitoring system was put in place in 1995, Fort Leonard Wood can show it hasn't exceeded particulate limits even once. Burns & McDonnell scientists are now working with the Corps of Engineers to install TEOMs to follow new boundaries created when the fort exchanged land with the Mark Twain National Forest.

"This was the most phenomenal team of folks you could imagine," says Gehrt. "They joined with other contractors to form a seamless team with total customer commitment. There's still a lot of work to be done, and Burns & McDonnell will be an integral part of it. But the project has been a success, for the Kansas City district and the corps."

## The Commander's Award

Burns & McDonnell was recognized for its work on the project in a Commander's Award received for public service. The award citation, signed by Garrison Commander Colonel Joel G. Himsl, reads in part:

"This team's efforts through the years have greatly improved the quality and the training opportunities for our soldiers while protecting the environment. Their professionalism and dedication are a credit to themselves and Burns & McDonnell."

There was never any question whether Fort Leonard Wood would continue to train soldiers the way they'll fight — Burns & McDonnell just made it a little easier. ☰



Pulling in data from remote sensors for real-time calculations may sound simple — but in this case, it wasn't. Burns & McDonnell's wide range of in-house expertise helped the project team make its idea work.

Several of the TEOMs that measure particulate at Fort Leonard Wood's boundaries are in rough terrain, powered by on-site generators. Installing pole-and-wire data transfer connections wasn't feasible.

The project team called on Jim Cupp of Burns & McDonnell's telecommunications department for advice.

"Some of the stations were way out in the sticks," says Cupp. "The terrain presented a lot of barriers to cellular transmission, and telephone land lines were not available in the more remote locations. The best communication option was a spread-spectrum wireless system."

Cupp, working with Fort Leonard Wood information management personnel, helped the team choose the best location for the radio-based system — a range control tower with an existing Ethernet connection. His assistance helped the team complete the project on a timely basis, allowing training to proceed.