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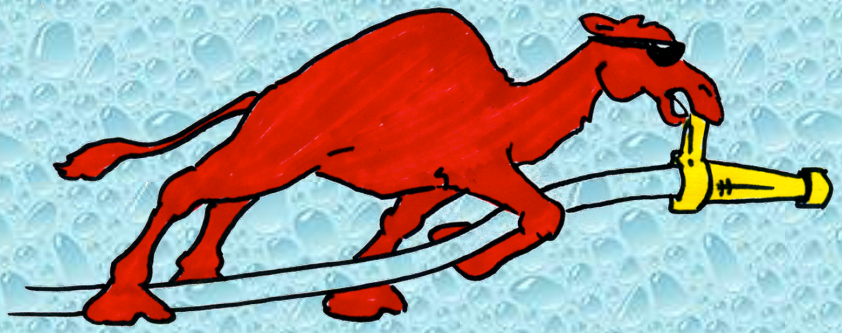


Morrisvale Volunteer Fire Department
Morrisvale, West Virginia

Rural Water Supply Operations Seminar
2-hr Water Supply Drill – October 23, 2011
Summary Report

The Purpose

- The purpose of the seminar and drill was to review the basics of rural water supply operations and to practice water supply operations in a non-hydranted setting.
- The drill also allowed mutual aid companies to work together in a real-life training situation.

The Seminar

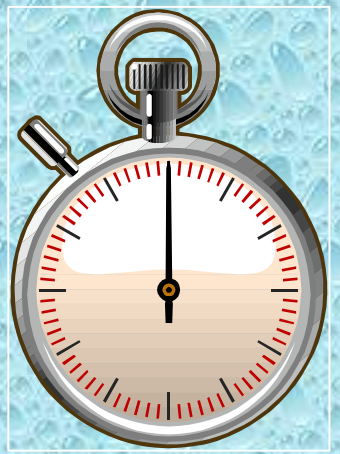
- The seminar started with a 6-hour classroom session to review the basics of rural water supply operations.
- The review session was held at the Morrisvale VFD located in southwestern West Virginia.
- Seminar topics included the history of rural water supply, tanker design, dump site operations, fill-site operations, tanker shuttle operations, and drafting.
- Seminar participants were from Lincoln and Boone Counties, West Virginia and a couple of locations in Ohio.

The 2-hour Water Supply Drill

- The tanker shuttle drill was held on October 23, 2011, near a coal mine outside of Morrisvale.
- The drill attempted to replicate the 2-hour Water Supply Delivery Test used by ISO in their evaluation of fire department water supply capabilities.
- While everyone in the fire service may not agree on ISO's evaluation of fire department capabilities, the ISO 2-hour test is still a reasonable standard by which fire departments can compare their water supply operations.

The ISO Test

- The ISO 2-hour Water Supply Delivery Test has three critical time segments:
  - 0:00 to 5:00 minutes
  - 5:01 to 15:00 minutes
  - 15:01 to 120:00 minutes



ISO Test *0:00 to 5:00 Minutes*

- A drill location is selected and the units due to respond on the first-alarm assignment are dispatched.
- Time starts when the first engine arrives on the scene and comes to a complete stop.
- There is no requirement to flow water during the first 5 minutes, but the crew must be prepared to flow water once the 5-minute mark is reached.

ISO Test *5:01 to 15:00 minutes*

- At the 5-minute mark, a flow of at least 250 gpm must be started - and it must be sustained.
- During the next 10-minutes, crews can work to further develop their water supply and increase their flow, however…
- At the 15-minute mark (5+10), whatever amount of water is flowing at that time must be maintained for the remainder of the 2-hour test.

ISO Test *15:01 to 120:00 minutes*

- Once the 15-minute mark has been reached, the remainder of the 2-hour test is really just about ***sustaining*** the flow.
- The ISO test includes the simulation of automatic mutual aid response and allows additional water supply units to arrive and assist in the delivery process as would happen on a real incident.
- The real advantage of the ISO test is that it gives a fire department the chance to see where improvements can be made in their water supply delivery process.

It is one thing to say that your fire department can deliver 500 gpm for two hours – it is another thing to prove it in a real-life drill scenario!

Water Supply Drill Participants

- *The participants for the drill were from seven different fire departments in the Boone and Lincoln Counties area and the water hauling apparatus was representative of the type of water supply support that would respond to a structure fire in the Morrisvale area.*

Drill Participants

- Morrisvale Tanker 361
  - 2,000 gal vacuum tanker

- Morrisvale Tanker 363
  - 2,000 gal vacuum tanker

Drill Participants

- Morrisvale Engine 353
  - 1,000 gpm pump w/1,250 gal tank

- Morrisvale Engine 352
  - 1,250 gpm pump w/1,000 gal tank

Drill Participants

- Morrisvale Engine 355
  - 1,250 gpm pump w/1,000 gal tank
- Guyan River Tanker 663
  - 2,000 gal vacuum tanker

Drill Participants

- Mud River Tanker 162
  - 2,000 gal vacuum tanker

- Wharton-Barrett Pumper/Tanker 764
  - 1,000 gpm pump w/3,000 gal vacuum tank

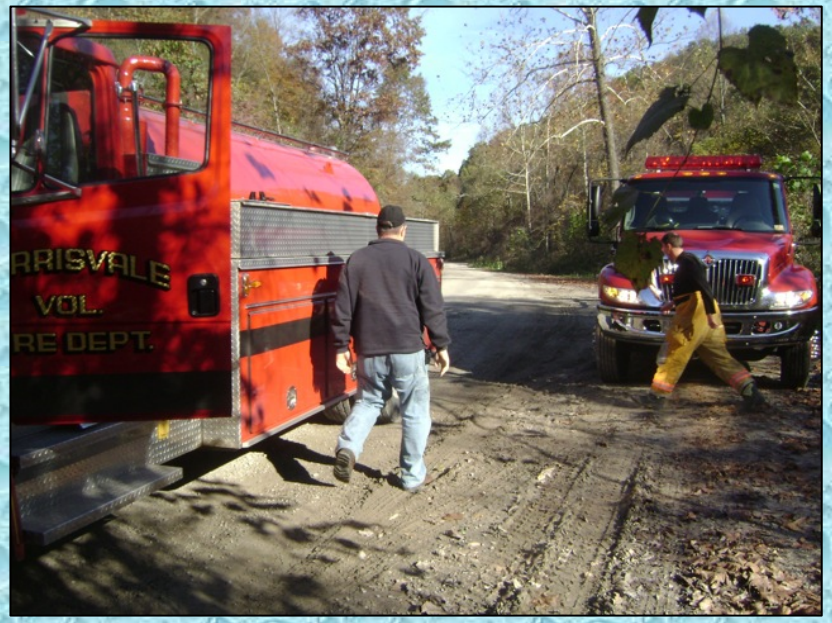
Drill Participants

- Morrisvale Tanker 362
  - 3,000 gal tanker

Preparation

Units began the day at the Morrisvale VFD substation where a briefing was held. Crews then proceeded to the Hobet mine where units were staged in preparation for response.

The Drill Begins



With everyone ready, the drill was started. Engine 352 was first to arrive with Tanker 361 immediately behind it. When Engine 352's driver's brought the rig to a stop, the timer was started.

The Drill Begins

Each rig had a crew of two personnel and they hustled to set-up a dump site so that a nurse tanker operation would not be needed.

Getting Ready to Flow Water

While three personnel work to get a dump tank set-up, the fourth person stretches 100-ft of 5-inch LDH to a flow monitoring device in preparation for starting water flow operations.

Wow!

In just 3:55 minutes, the two crews have the dump site set up and the first tanker off loads its 2,000 gallons of water – pretty impressive!

Water Flow Begins

At the 5-minute mark, water flow was started at 690 gpm; this was a bit high, since the goal was 250 gpm for the first 10-minutes. The flow was adjusted down to the 250 gpm mark. A Hose Monster flow diffuser was used to measure flow. Its built-in pitot tube allows for accurate measurements.

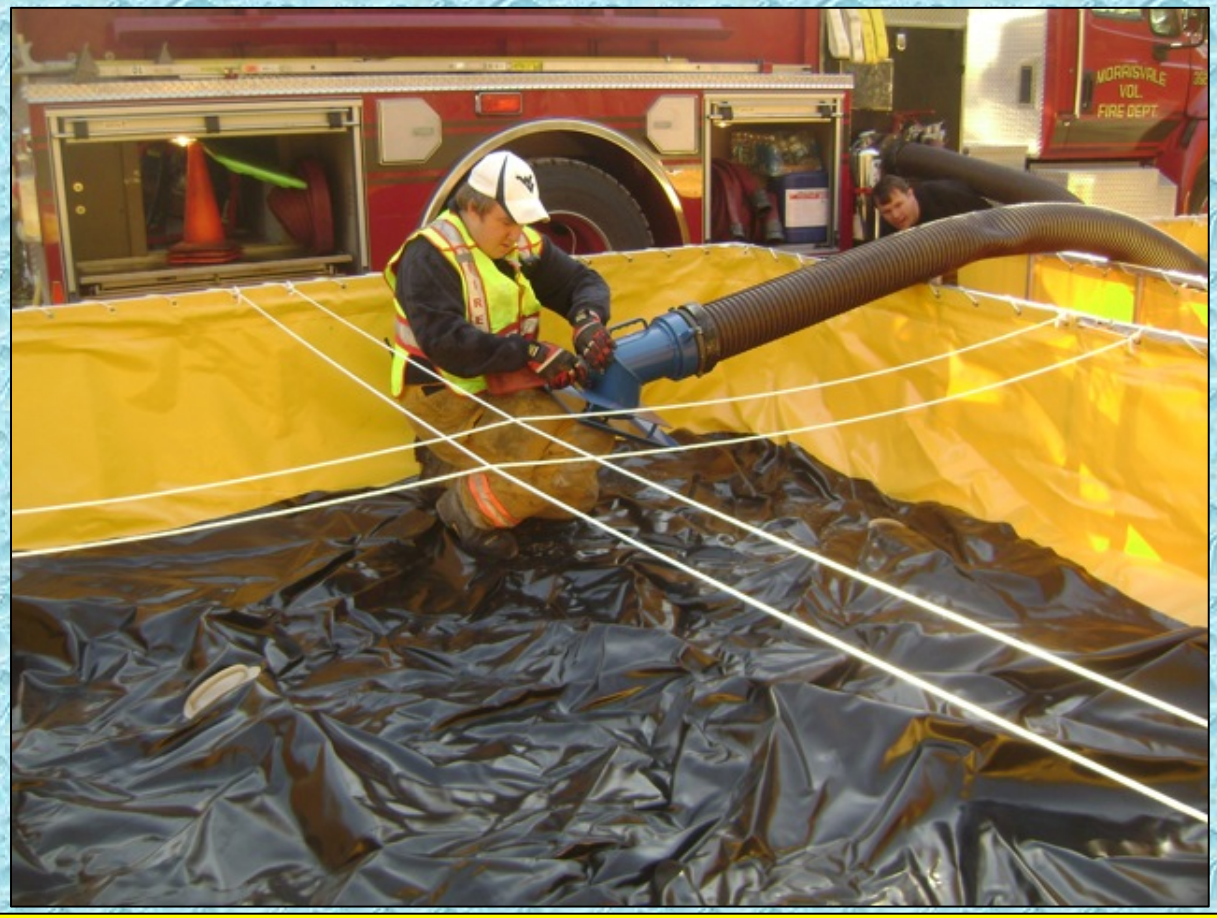
Second Tanker Arrives

At the 8:44 minute mark, Tanker 363 arrives and offloads its 2,000 gallons.

Dump Site Set-up

A second dump tank is deployed around the 9:27-minute mark and crews work to set a water transfer device.

Dump Site Set-up



A jet siphon is set-up to transfer water from the second tank into the primary dump tank.

More Tankers Arrive

At the 15:38 minute mark, more tankers arrive and flow is moved to 500 gpm.

Tanker 764 Offloads

Wharton-Barrett Tanker 764 dumps is 3,000 gallons of water around the 17:30-minute mark.

Tanker 663 Offloads

Guyan River Tanker 663 dumps is 2,000 gallons of water while crews work to expand the dump site.

Dump Site Expansion

With more tankers arriving, crews prepare to set-up a third dump tank in hopes of moving to a 1,000 gpm flow.

Dump Site Set-up

Crews change the location of the 3rd dump tank prior to it being filled with water. The decision was based on using a 3-tank arrangement and drafting out of the center tank as opposed to drafting out of the end tank. It is important to make these changes early because once a tank is filled with water, it normally does not get moved.

Water Transfer

With two dump tanks in operation, water transfer becomes important. This 6-inch jet siphon is moving water very effectively.

Dump Site Set-Up

Around the 24:00 minute mark, the third dump tank is in position.

Dump Site Operations

With the third dump tank now in position, two tankers can offload at the same time – a feature that will be needed in order to increase the flow.

Flow Increased

At the 50:00 minute mark, flow is moved to 800 gpm.

More Tankers Arrive

As additional tankers arrive, they have to be positioned so that they don't impede the operation of other tankers.

Dump Site Operations

With three tanks in operation, plans are put into action to move to a fourth tank.

Tankers Offload

Because of the limited road width, some of the tankers were directed to the end tanks where they could back up and dump and still allow tankers to pass them.

Tankers Offload

Wharton-Barrett Tanker 764 dumps its second, 3,000-gallon load of water.

Fourth Dump Tank

Around the 60:00-minute mark, a fourth, 2,500-gallon dump tank is placed into operation.

Water Transfer Operations

With the fourth tank in operation, a problem arose – the the dump site pumper was nearing its maximum capacity and could not run another jet siphon or support a higher flow. So a 250 gpm portable pump was located to help transfer water.

Water Transfer Operations

Because the portable pump cannot develop enough pressure to run a jet siphon, it is set up to float in the fourth tank and pump water to the primary drafting tank using a short length of hose.

Water Transfer Operations

The floating portable pump discharges water into the primary drafting tank using the attachment shown above.

Flow Increased

At the 87:00 minute mark, with four dump tanks in operation, the flow was moved to 1,000 gpm where it was sustained for the remainder of the drill.

Dump Site Operations

In an effort to improve jet siphon operations, a second pumper was put into operation at the dump site to run jet siphons. The pumper had been hauling water in the shuttle, so the decision to remove it as a water hauler had to be made carefully.

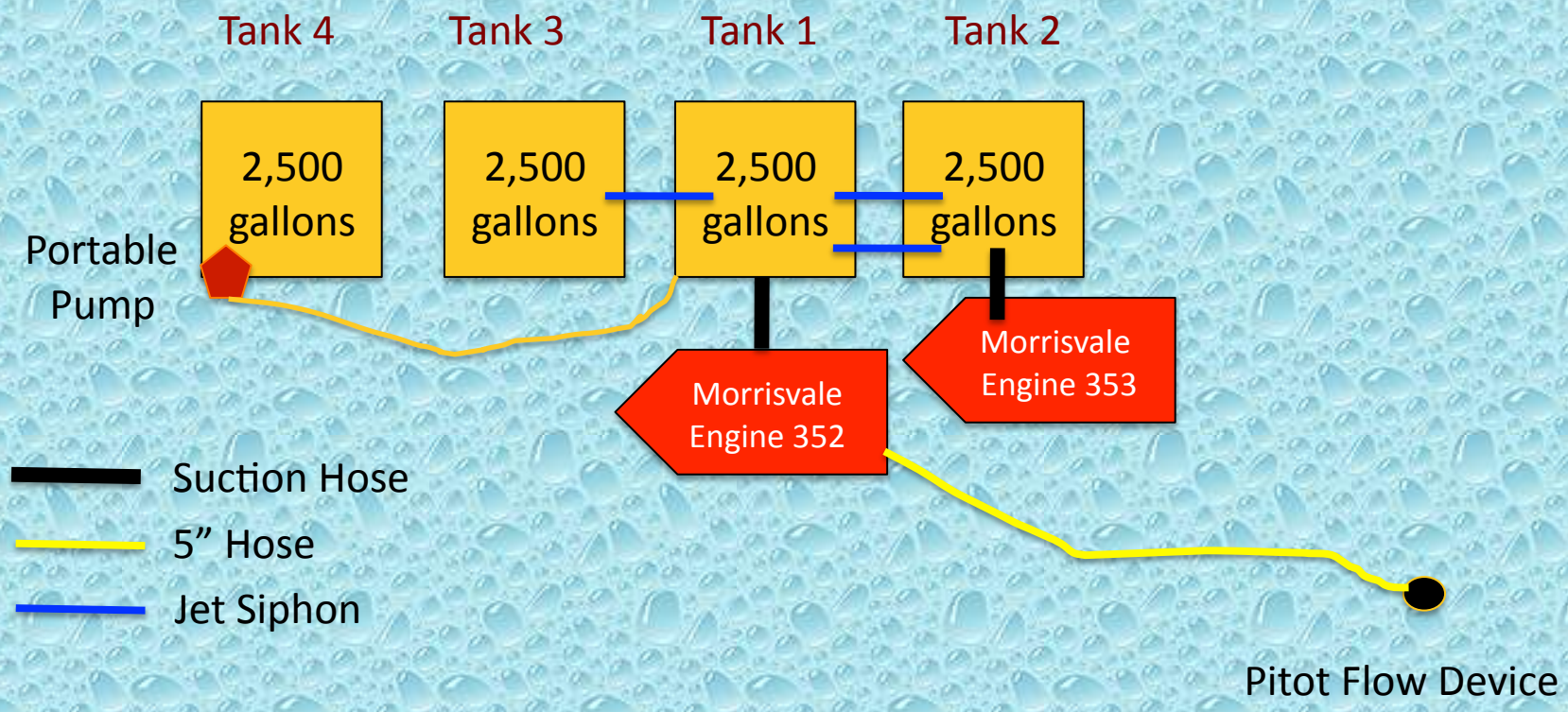
Dump Site Operations

An important note, when setting up dump tanks in the “parallel” arrangement, be sure to keep them aligned as best as possible – otherwise, tanker drivers will have some difficulty positioning their units for offloading water.

Flow Limitation

The 1,250 gpm draft pumper could not support a flow much above 1,000 gpm for a couple of reasons. Perhaps the main reason was the flow capability of the rear discharge. Had two discharges been used to feed the 5-inch LDH line to the Hose Monster, then the pumper most likely could have discharged a higher volume.

Dump Site Layout



The Fill Sites

- For this drill – two fill sites were used.
- Both sites used the same stream and each provided about a 2-mile roundtrip.
- The stream provided ample flow to support the drill and water access was no problem.
- The interesting note is that because so many vacuum tankers were used, only one fill site needed a pumper, and that site was only used to fill the conventional tankers.

Fill Site Operations

Morrisvale Tanker 361 arrives at a location where they can access the stream. The crew assembles the suction hose in short order.

Fill Site Operations

A strainer, specially designed for vacuum tanker use, is attached to the suction hose.

Fill Site Operations

Two lengths of suction hose are needed to reach the stream.

Fill Site Operations

The suction hose is deployed into the stream and will remain in place for the duration of the drill.

Fill Site Operations

Positioning the strainer is important.

Fill Site Operations

With the strainer in position, the final connection is made.

Fill Site Operations

With everything connected, loading commences at over 1,000 gpm without the need for a fill site pumper.

Fill Site Operations

The specially designed strainer has high-flow capability and can operate in shallow as well as deep water.

Fill Site Operations

At the second fill site, a similar set-up is used. The first arriving vacuum tanker sets up the suction hose and strainer arrangement and leaves it in place for return trips and for other vacuum tankers to use.

Fill Site Operations

Cam lock style fittings make suction hose fittings easy to connect and disconnect on a vacuum tanker.

Fill Site Operations

This 2,000-gallon vacuum tanker loads very quickly and will soon be on its way back to the dump site.

Fill Site Operations

Because there were two conventional style tankers hauling water in the drill, a traditional fill site was needed – thus, a pumper was needed to draft and fill those tankers.

The Results

- The drill was stopped after two hours.
- Water flow was only interrupted once at the 9:30-minute mark and was restored in about 60 seconds.
- The water flow interruption occurred because of the initial flow that was over 500 gpm – there simply was not enough water on site yet to restore capacity.

The Results

- An estimated 85,187 gallons of water were flowed through the attack engine during the drill - producing an average flow rate of 751 gpm.
- However, it is important to note that a flow of 1,012 gpm was sustained during the final 33 minutes of the drill using five vacuum tankers and one conventional tanker.

The Lessons Learned

- An interesting way to examine the results of this drill is to look at the number of people needed to sustain the total water flow.
- In others words, what was the "gpm per person."
- The gpm per person concept becomes important when dealing with minimum staffing issues. If a department is only averaging 20 members on a structure fire incident and it takes 15 people to develop and sustain a water supply, then we come back to that age old question of, "Who fights the fire?"

The Lessons Learned

- At the Morrisvale drill, there were only about 14 people actively involved in the water supply delivery process.
- The following is a breakdown of personnel and assignment:

Unit	# of People	Assignment
Engine 353	1	Driver/pump operator for drafting and jet siphons
Engine 352	3	Driver/pump operator, 2 FF's to assist with dump site ops
Tanker 361	2	Driver and FF to manage fill site (hook up hose so driver stays in)
Tanker 362	1	Driver only
Engine 355	2	Driver/pump operator and FF to fill conventional tanker and assist with vacuum tanker hook up
Tanker 363	1	Driver only
Tanker 162	1	Driver only
Tanker 764	1	Driver only
Tanker 663	1	Driver only
IC	1	Incident Commander

The Lessons Learned

- Using the gpm per person concept, 14 persons supported an average flow of 751 gpm over the duration of the drill. Therefore, the gpm per person result was 53.6 gpm per person.
- During the time period where the drill produced a 1,000 gpm sustained flow rate, each of the 14 persons contributed 71.4 gpm.
- In both cases, the results show that the higher the gpm per person rate, the more efficient the water supply operation.
- This is the first GBW Associates event where the gpm per person concept has been applied – but we certainly believe that it has merit and we hope to use it as a quantifying tool in future drills when possible.

The Lessons Learned

- One of the most important features of a vacuum tanker is the ability to self-load without the need for a pumper. This feature frees up staffing that can be used to fight the fire.
- Four dump tanks were used at the drill, but they all were smaller in size (<2,500 gal) – when the 1,000 gpm mark was reached, water transfer operations became an issue. Larger dump tanks would have reduced the demand for water transfer.

The Lessons Learned

- Portable pumps have value. At this drill, the 250 gpm floating pump made a significant impact in implementing the fourth dump tank.
- When using LDH without a high-flow discharge, take the time to combine (or manifold) multiple small lines into the LDH as opposed to connecting the LDH to a 2-1/2-inch outlet. At low flow rates, the small outlet will work, but as flows reach pump capacity, flow restriction will occur and changing hose layouts may not be able to be done without shutting down pumping operations – so plan ahead!

The Lessons Learned

- The "bundling" of water hauling mutual aid resources has proven successful in many drills. The tanker task force concept is an effective process for requesting and using additional rural water supply resources.
- Tankers should be marked on all four sides with their unit numbers. When operating at large, mutual aid incidents, group supervisors and command staff may not recognize a tanker – so identification markings are important.

Summary

- The drill was a success. For the new folks, they got to see how dump tank operations work.
- For the older, experienced folks, it was a chance to practice their "craft."
- The success of the drill showed the importance of mutual aid response practices and procedures – and the importance of mutual aid interoperability.
- Many thanks to the Morrisvale VFD for sponsoring and hosting this seminar.

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This program was developed by
GBW Associates, LLC

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