Middlesex Fire Department
Middlesex, New York

Rural Water Supply Operations Seminar & Drill

Tanker Shuttle Drill & Relay
October 25, 2009
Summary Report

Overview

- In October 2009, the Middlesex (New York) sponsored a rural water supply operations seminar.
- The seminar, which was delivered by GBW Associates, LLC of Westminster, MD was a joint effort between several fire departments in Yates County to practice and improve water supply operations.
- This presentation is a summary of the tanker shuttle and relay pumping drill that was part of the seminar.

The Purpose

- The purpose of the rural water supply seminar was two-fold. First, the folks at the Middlesex FD wanted to practice tanker shuttle operations.
- Second, the they also wanted an opportunity to perform a relay pumping operation.

The Seminar

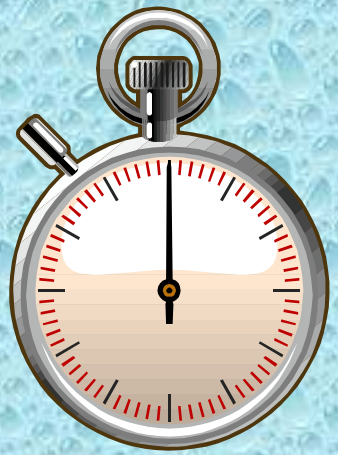
- In order to prepare for the tanker shuttle drill, participants attended a 6-hour refresher seminar on October 24th to review the basics of rural water supply operations.
- The seminar was held at the Middlesex Fire Department.
- Seminar topics included the history of rural water supply, types of water hauling vehicles, dump site operations, fill-site operations, tanker shuttle operations, and drafting.

The Drill

- The tanker shuttle drill was held on October 25, 2009, in Middlesex FD's first-due area.
- 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 in recent times, ISO has come under some scrutiny for its rating schedule, the ISO 2-hour test is still a reasonable standard by which fire departments can compare their water supply operations.

The ISO Test

- There are three critical time segments of the ISO 2-hour Water Supply Delivery Test:
  - 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 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!

Drill Participants

The drill participants were from 7 different fire departments and the apparatus that was used was representative of the type of water supply support that would respond to a fire in Middlesex.

Drill Participants

- Middlesex E16
  - 1,000 gpm pump w/300 gal tank & 1,000-ft of 5-inch LDH

- Middlesex PT17
  - 1,000 gpm pump w/1,500 gal tank & 600-ft of 5-inch LDH

Drill Participants

- Middlesex PT46
  - 1,000 gpm pump w/1,500 gal tank & 1,200 ft of 5-inch LDH

- Rushville E2311
  - 1,250 gpm pump w/1,000 gal tank & 1,000 ft of 5-inch LDH

Drill Participants

- Branchport/Keuka Park PT12
  - 1,250 gpm pump w/2,500 gal tank & 1,000 ft of 5-inch LDH

- Potter PT35
  - 1,250 gpm pump w/1,500 gal tank & 1,200 ft of 5-inch LDH

Drill Participants

- Dundee PT6
  - 1,500 gpm pump w/1,500 gal tank & 2,000 ft of 5-inch LDH

The Target Hazard

Located about a 1-1/2-mile outside of the Middlesex hamlet, is the Rochester Folk Art Guild – an artisan village comprised of various workshops and residences. The complex has been the site of several fires over recent years and was chosen as part of a pre-planning effort by the Middlesex FD.

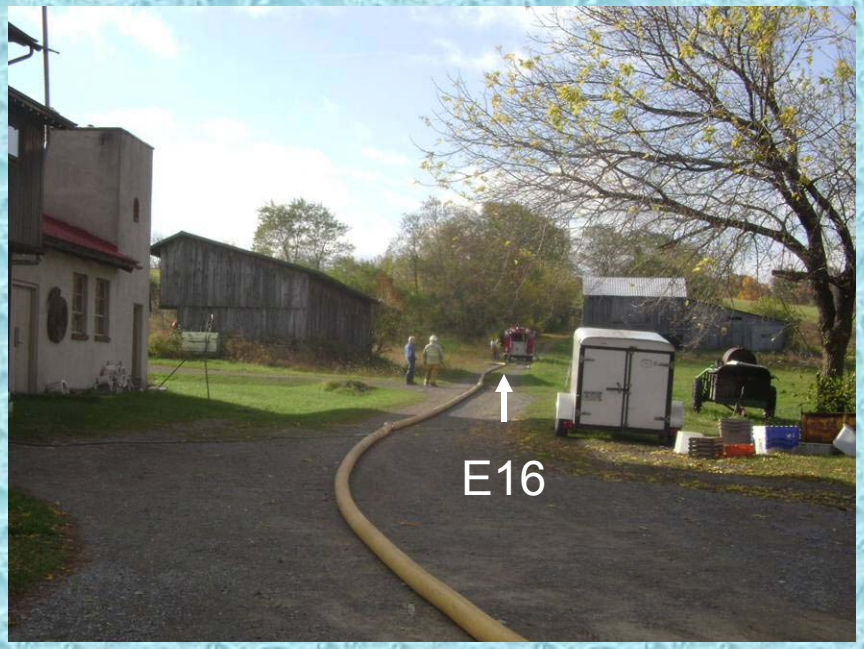
The Drill Begins

With the crews staged at the Middlesex fire station, the drill begins. The two photos above show Middlesex E16 arriving on the scene and dropping a 5-inch supply line at the entrance to the complex.

Help Arrives

Middlesex PT17 arrives shortly behind E16 and positions to set-up a dump site operation.

1,000 feet of 5-inch LDH



E16 lays 1,000 feet of 5-inch supply line through the complex. The ability to get this smaller engine into position in this type of complex and then supply it with LDH allows a crew to mount a large caliber fire attack without the need for multiple supply lines.

Engine 16 Sets Up and Flow Begins

Having dumped its supply bed of 5-inch hose, Engine 16 sets up to flow water. The blue hose line in the photo is used for the initial flow of 300 gpm that was started at the 5:05 minute mark.

Flow Measurement

This flow diffuser - with a built-in pitot tube/gauge - was used to provide an accurate flow measurement.

Supply Line is Charged

PT17 charges the 1,000 ft, 5-inch supply line feeding E16 and water supply operations begin.

Incident Command

Captain David Harrington of the Middlesex FD established command and assumed the role of Incident Commander for the duration of the drill.

Dump Site Operations

The crew of PT17 works to set up the dump site operation so that a tanker shuttle operation can begin.

Dump Site Operations

At the 10:10-minute mark, two dump tanks are set-up and water transfer operations are in place.

Dump Site Operations

Dundee's PT6 offloads its 1,500 gallons of water via one of its side dumps.

Dump Site Operations

With a 300 gpm flow, the dump site is challenged to keep the water flowing.

Jet Siphon Use

A jet siphon is used to transfer water to the primary drafting tank. One point to note is that while this type of jet siphon can really move some water, it cannot draw down the tank as low as one of the low-level siphons. Plus, this type of jet siphon often creates a vortex much sooner than a low-level type.

Suction Hose Problem

At about the 12:00-minute mark, a leak developed in PT17's suction hose. Duct tape was used as a temporary fix but since water flow was lost, the decision was made to replace the defective section.

Regrouping

With the flow stopped, crews regrouped and fixed a couple of issues that were affecting their effectiveness and the drill was restarted. Middlesex PT46 is shown here backing in to dump its 1,500 gallons of water.

Dump Site Operations

With the operation back up and running, PT12 is back at the 28:13-minute mark to dump its second load of water.

Dump Site Operations

The dump site now seems to be working effectively in managing the two tank operation. However, the flow could not be increased and sustained because of the limited number of tankers in the shuttle.

Dump Tank Pointers

Although not always avoidable, crews should avoid tankers offloading their water directly on top of the suction strainer – it can often result in issues maintaining a prime. The playground ball it used to reduce the vortex.

Shuttle is Sustained

Two tankers are shown arriving at the dump site. With the shuttle now up and running, keeping tankers moving was a priority.

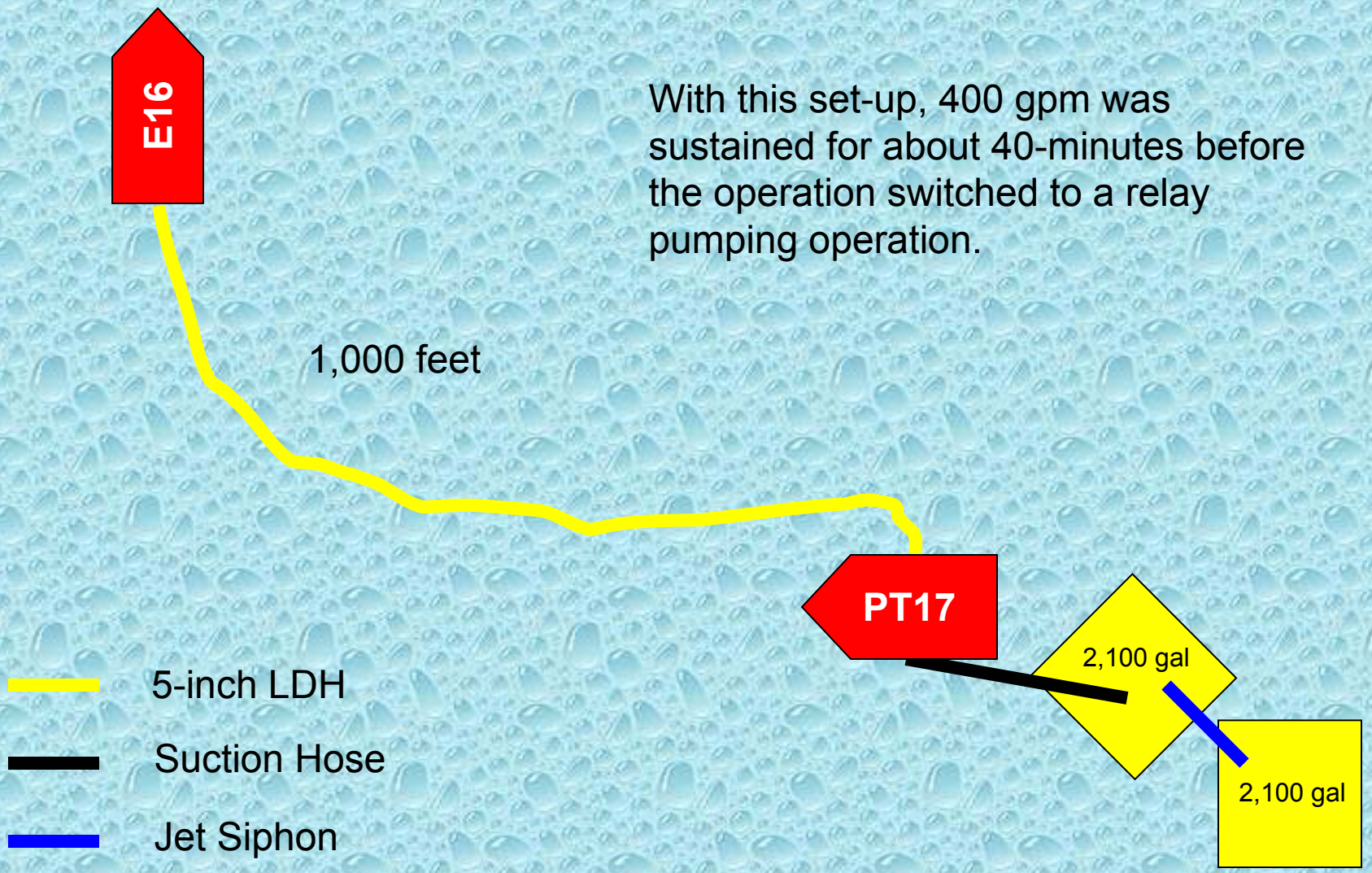
Flow is Stabilized

A good example of dumping and transferring water. The level in the drafting tank shows that this operation might be approaching its maximum capability.

Tankers Offload

Dundee's rig quickly dumps its water into the primary drafting tank in order to sustain the operation

Dump Tank Layout

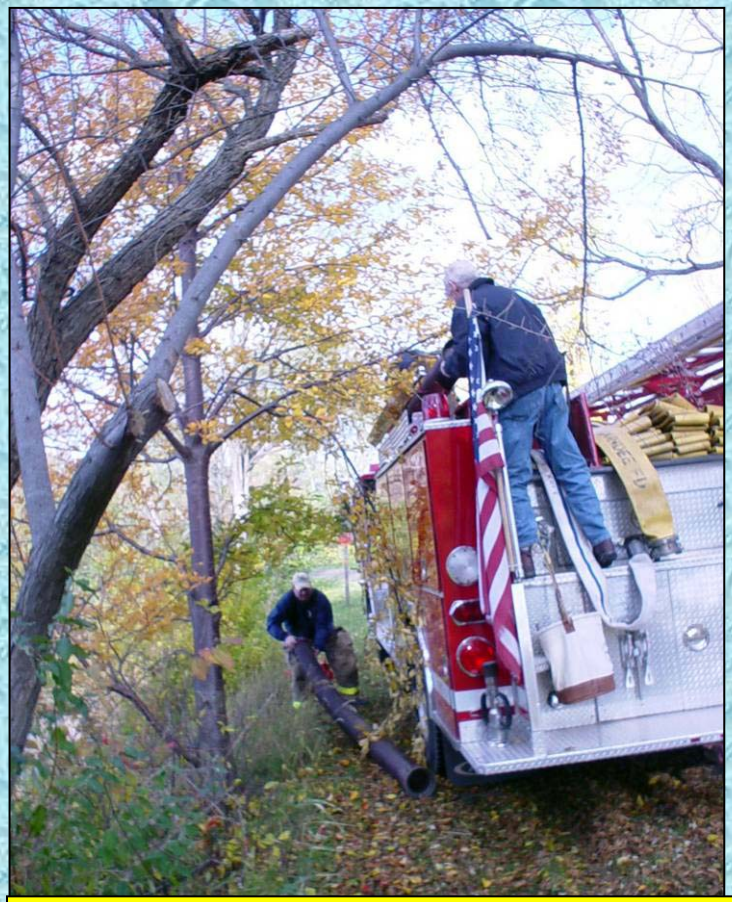


With this set-up, 400 gpm was sustained for about 40-minutes before the operation switched to a relay pumping operation.

The Fill Sites

- One fill site was used for this drill – a lake about 1,700 feet away from the dump site.
- The intent was to start the drill with a tanker shuttle and then transition to a relay pumping operation – thus only one fill site.
- The fill site engine was Rushville Engine 2311, a 1,250 gpm pumper. This fill site provided just under a 1.0-mile round trip for rigs hauling water.

Fill Site Setup



A 3-person crew works to get Engine 2311 set up to draft at the lake. The crew had the site up and running in a relatively short period of time.

Fill Site Setup

Initially, 20-ft of 6-inch suction hose was used to reach the water. This was changed when the relay operation began due to concerns over vegetation possibly clogging the strainer.

Fill Site Setup

The crew worked hard to have the site ready by the time the first tanker arrived – this required teamwork and of course – people.

Fill Site Setup

Because the pumper did not have a high-flow discharge, two, 3-inch lines were used to feed a single 5-inch line.

Fill Site Setup

Water was sent out to the hard road via the 5-inch hose where an LDH manifold was used to control tanker fill lines.

Fill Site Setup

The LDH manifold makes managing the fill site much easier and takes the stress off of the pump operator.

Fill Site Operations

The fill site used 3-inch lines and a 5-inch line to fill tankers depending on which tanker could take which line.

Fill Site Operations

As Dundee's tanker approaches the fill site, two fill lines are laid out in preparation for filling operations.

Fill Site Operations

A traffic cone was used to help the driver know where to stop in order to be in the best position for the fill site crew to connect the fill lines.

Fill Site Operations

The use of Storz-style “quick-connect” fittings on the 3-inch fill lines reduced the time needed to make and break the connections.

Fill Site Operations

Branchport's PT12 was the biggest water hauling rig in the drill. Its 2,500 gallons of water helped to sustain the operation.

Fill Site Operations

The Branchport rig was also capable of being filled through a 5-inch fill line which made filling operations go very quickly.

Fill Site Operations

Even though two tankers were in-place and ready for filling, the fill site crews followed the best practice of only filling one at a time, thus allowing the fill site pumper to commit all of its pumping capacity to one unit.

Relay Pumping Operations

After about an hour of tanker shuttle operations, the decision was made to move to a relay pumping operation. A 5-inch supply line was laid from the tanker fill site to the dump site and the flow was increased to 700 gpm at the attack engine. *(Flow was measured using a handheld pitot tube.)*

Relay Pumping Operations

Middlesex PT17 (1,000 gpm) switched from drafting from the dump tanks to relay pumping to the attack engine, E16 (1,000 gpm). The lack of a high-flow discharge limited the amount of water that this pumper could discharge into a single, 5-inch line.

Relay Pumping Operations

1,700 feet of 5-inch hose was laid between the fill site manifold and the dump site engine – PT17. Two tests were done – one with no relay pumper between the sites and one with a relay pumper between the sites. In each test, the goal was to maximize the flow.

Relay Pumping Operations

A LDH manifold was placed at about the 1,100 ft point in the line so that a relay pumper could be added later.

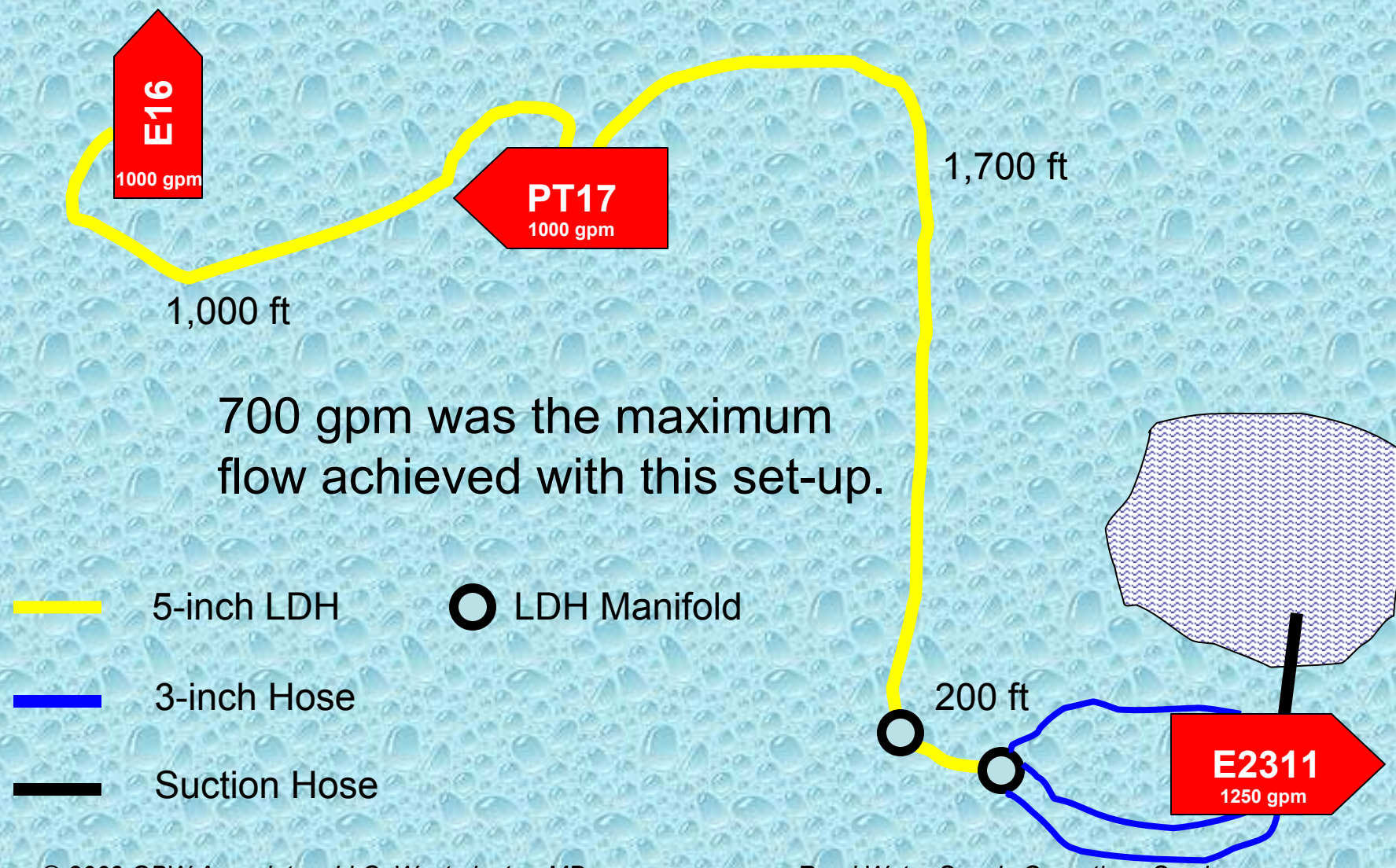
Relay Pumping Operations

In order to improve flow at the draft site, E2311 added a third section of 6-inch suction hose and also used a 2-1/2-inch suction line.

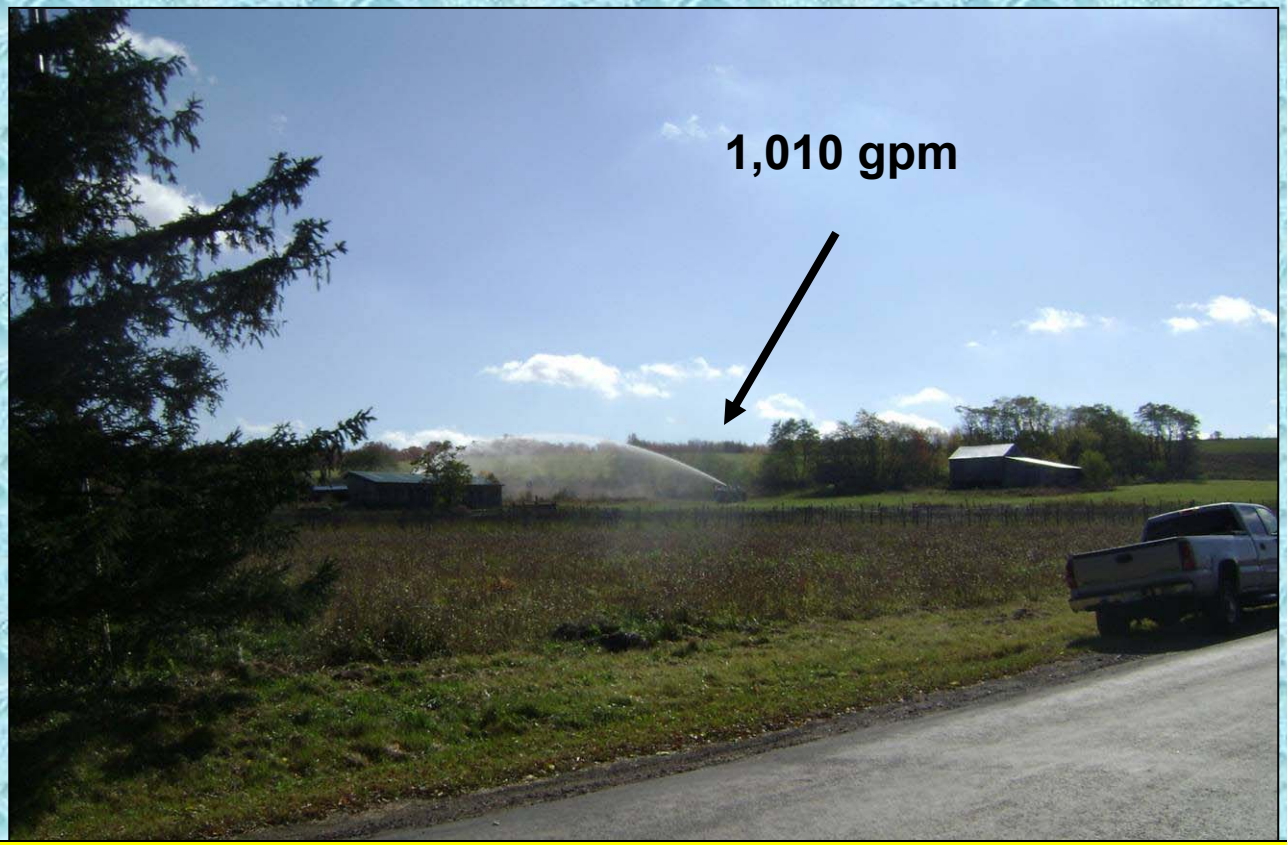
Relay Pumping Operations

E2311 also added a third, 3-inch supply line so that the flow could be increased knowing that the goal was eventually 1,000 gpm.

Initial Relay Pumping Layout



Improving the Relay



To improve the flow capability of the relay, Potter's PT35 (1,250 gpm) was put in as a relay pumper at around the 1,100 ft point. With the addition of this pumper, the flow was maximized at about 1,000 gpm.

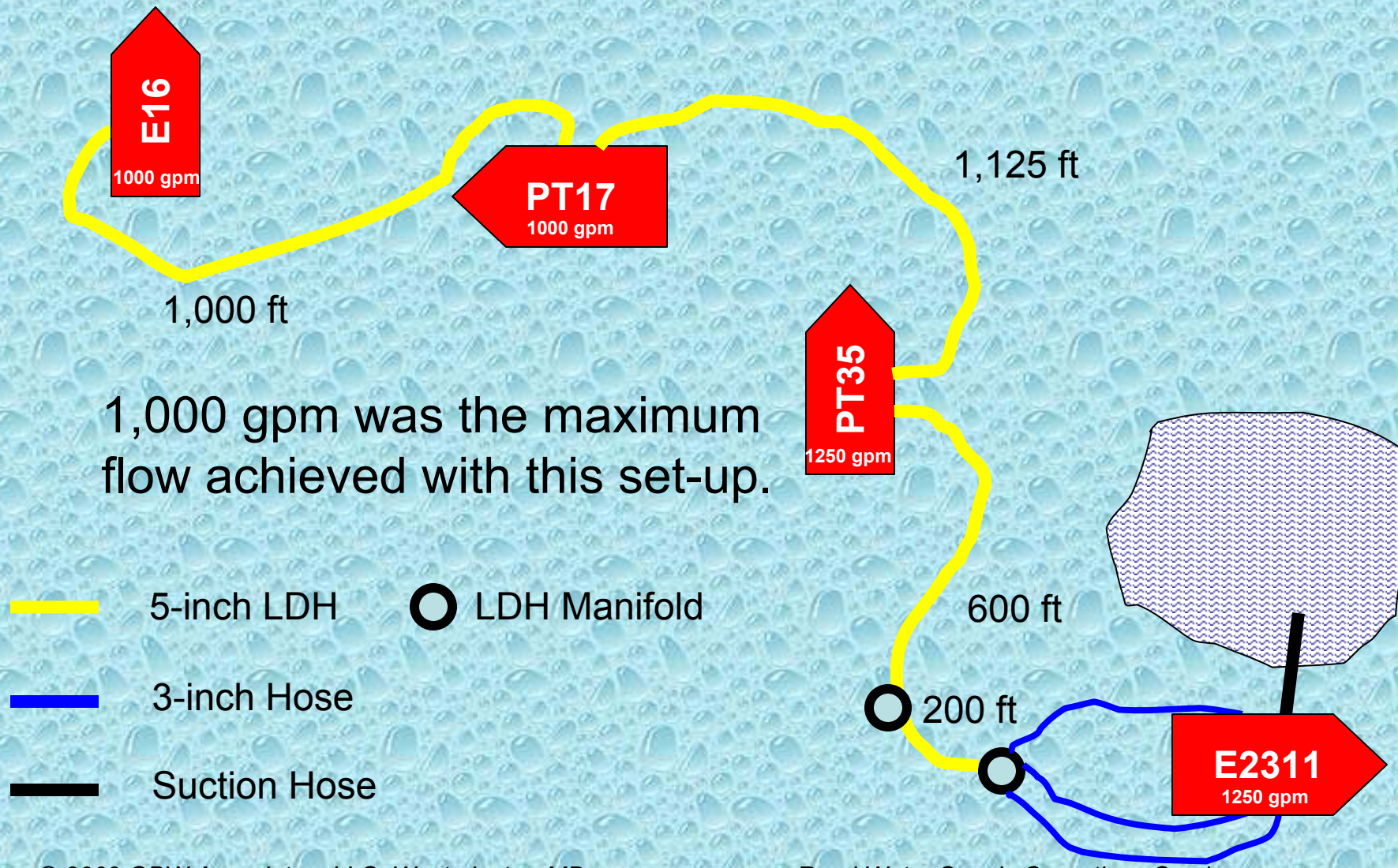
Improving the Relay

By adding this 1,250 gpm pumper, the draft pumper did not have to work as hard to move the water, thus more water could be moved.

Improving the Relay

Like PT17 at the dump site, the absence of a high-flow discharge will restrict the total flow available. Perhaps a couple of 3-inch lines feeding the 5-inch line would have produced a better flow.

Final Relay Pumping Layout



The Results

- Although water flow was interrupted a number of times, the drill was still a success because it forced the participants to troubleshoot and correct “real life” problems.
- The transition from a tanker shuttle to a relay pumping operation was an interesting approach for this target hazard and it showed the amount of resources that would be needed to make such an operation a success.

The Results

- In terms of the tanker shuttle operation, the crews were successful in supporting a 400 gpm flow for about 40-minutes – however, that was not without interruption.
- In terms of the relay pumping operation. It took about 10-minutes to get the relay up and running and then the flows were sustained.

The Results

- With only three pumpers in place in the relay, a flow of 700 gpm was obtained. *(All pumpers were "maxed out" in their discharge abilities.)*
- Adding the fourth pumper allowed the flow to be moved to 1,000 gpm.
- Even though the tanker shuttle was not as smooth as everyone would have liked, the drill was still a success because <u>everyone</u> learned something.

Lessons Learned

- The use of 5-inch LDH in the rural setting really makes a difference in the ability to move water over great distances.
- This drill allowed an attack engine to be supplied with 1,000 gpm of water, 1,000 feet from the supply engine. This type of set-up provides an excellent water supply strategy for those areas of a community where fire truck access is limited.

Lessons Learned

- Suction hose is a vital part of any rural water supply operation and it should be tested on a regular basis to ensure that it does not leak.
- When setting up multiple dump tanks – take into consideration the layout and the need to accommodate both rear and side offloading tankers.

Lessons Learned

- Side dumps in addition to rear dumps provide greater flexibility in tanker offloading operations.
- The use of jet siphons improves the transfer of water between dump tanks and dedicating one person to operate the jet siphons generally makes the process function better.

Lessons Learned

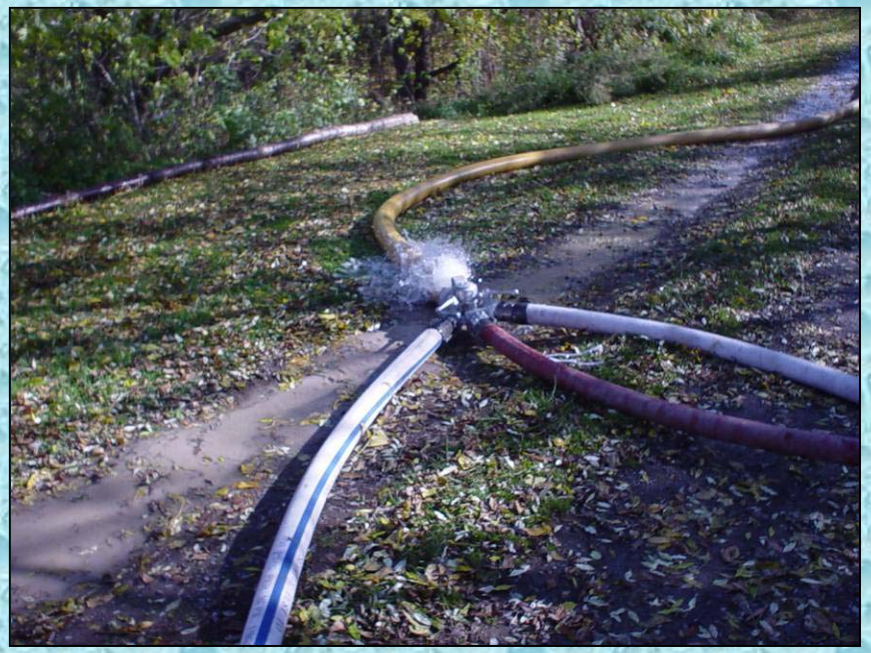
- Jet siphons consume pump capacity; consider using a separate pumper to run jet siphons when attempting flows approaching 1000 gpm.
- All size tankers can contribute to the overall delivery rate – some will just be more efficient in the process than others.

Lessons Learned

- Small fill lines slow down tanker fill operations. Even if a tanker has a 2-1/2-inch direct fill connection – use an adaptor and connect LDH to that connection.
- Threaded connections slow down fill site operations – consider using cam-lock or Storz-style fittings.
- Adaptors are critical – every tanker should carry multiple adaptors so that they can support all types of fill scenarios.

Lessons Learned

- When relay pumping using LDH, be sure that the relief valves on LDH appliances are set at the service test pressure of the hose, otherwise, the maximum capability of the hose will not be realized.



Lessons Learned

- When relay pumping with pumpers that do not have high-flow discharges, it may be best to discharge two smaller lines into the larger supply line because the 2-1/2-inch discharges will be limited in flow at some point.

Lessons Learned

- When possible, place the largest capacity pumper at the water source in a relay pumping operation – especially if that pumper has to draft.

Summary

- The drill was a success. It showed the value of equipment interoperability and identified a couple of areas where improvement can be made.
- It also showed how to transition from dump site operation to a relay pumping operation.
- Many thanks to the Middlesex Fire Department for sponsoring the program and to all of the fire departments who provided support to the seminar.

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