THE WATER NEEDS OF SMALL TENNESSEE FIRE DEPARTMENTS

Ron Darden, Municipal Management Consultant
Gary West, Fire Management Consultant

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THE UNIVERSITY of TENNESSEE
MUNICIPAL TECHNICAL ADVISORY SERVICE

In cooperation with the Tennessee Municipal League



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By sharing information, responding to client requests, and anticipating the ever-changing municipal government environment, MTAS promotes better local government and helps cities develop and sustain effective management and leadership.

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INTRODUCTION

Many small and mid-sized Tennessee cities operate either volunteer, combination volunteer/career, or all career fire departments or contribute to volunteer fire departments that provide fire services to their community. According to the Tennessee State Fire Marshal's Office and data collected from the Tennessee Fire Chief's Association, there are 723 recognized fire departments in Tennessee. This consists of approximately 578 volunteer fire departments, 110 combination fire departments, and 44 career fire departments.

Tennessee fire departments are organized, equipped, staffed, and trained to minimize injuries, deaths, and loss of property from fires. Although some fires require chemicals for extinguishment, water is the universal agent for extinguishing fires. Many small communities in Tennessee do not have sufficient quantities of water for effective fire service, and they lack adequate resources to obtain a needed supply. Small city fire departments often spend much of their time locating an available source of water for fire extinguishment. "When assessing the water needs of a community, the water needs of the fire department are often not considered even though fire protection is the only municipal delivery service where improved capability can result in savings to taxpayers through reduced property insurance premiums."[1]

This report discusses the fire department's need for water, fire insurance ratings, hydrant marking regulations, problems confronting local government's ability to provide water for fire service, the value of residential sprinkler systems, and potential savings from improved fire service. It also covers the need for innovative financing for small city fire departments.

PROBLEMS CONFRONTING LOCAL GOVERNMENT'S ABILITY TO PROVIDE WATER FOR FIRE SERVICE

1. **There is a lack of resources to fund improvements to the water system, including fire hydrants.**
   Cities often are reluctant to increase the property tax rate to fund needed improvements in fire service, even though it can lead to savings in homeowners' insurance premiums. However, many elected officials recognize that the savings in insurance premiums can be used to pay for minimizing property loss and to reduce loss of life due to fires. They stand up for their community and vote to raise revenues required for improved fire service. The savings in homeowner insurance premiums usually offset the costs for fire service improvements.

2. **Many water utility districts, both public and private, provide only potable water for consumption and do not provide water for fire service.**
   Although municipal governments in Tennessee are responsible for providing fire service, utility districts that struggle to provide water for consumption often think they are not responsible for fire service. Many utility districts are faced with the same lack of funds to

finance improvements to the water storage and distribution system that would be beneficial to city fire service.

The typical response from many water utility managers is, "We are not in the fire protection business." They fail to recognize that 40 percent of a community's local property insurance rates are based on the water utility system. Many water utility boards of directors are unaware what affect they can have on a community by providing good fire protection. The Insurance Service Organization (ISO) rating for a community is based half on the fire department and almost half on the water service. If a water manager is doing the right things, he also must be concerned with fire protection. The water utility is not in the full-time fire protection business, but it is half responsible.

3. **The water utility district is not materially linked to local planning.**
   A water utility district operating within a city or the city's urban growth area is not required to comply with the city's growth plans or the city's subdivision regulations. A city cannot enforce its subdivision regulations within its urban growth area without permission from the county. Cities in Oregon and Washington, states with growth regulations similar to those in Tennessee, are authorized to require that utilities comply with local government planning regulations. Tennessee law does not require that utilities comply with a city's local planning regulations or the 20-year growth plan required by Public Chapter 1101.

   Many small-town mayors pose questions such as, "How can I require a public or private water utility district operating within my city and urban growth boundary to comply with the city's subdivision regulations? How can my city provide water to the fire department to prevent the loss of property and life due to fires?" Invariably the answer is, regardless of any city police powers, subdivision regulations, county growth plans, or city land use plans, cities clearly lack the authority to direct a utility district to comply with its development regulations. Cities cannot require water utilities to install needed fire hydrants or replace substandard water mains, even if a developer or a city agrees to pay the cost.

   Cities need to investigate innovative ways of providing fire service and innovative ways for funding those services, many of which are outlined in this report.

4. **Local governments generally lack the authority to take over and upgrade water utilities operating within their political jurisdictions.**
   Although state law allows a city to take over a utility operating within its jurisdiction, federal law prevents such action if the utility has outstanding bond obligations for utility infrastructure within the area. Cities have been unsuccessful in getting needed federal law amendments that would allow them to take over the utility upon paying off the bond debt.

THE IMPORTANCE OF WATER

The fire department is one of every city's greatest assets. Even though cities may allocate significant resources for fire equipment and facilities, they are confronted with the need for an adequate water supply and delivery system. The water supply and delivery system counts for 40 percent of the Insurance Service Organization grading system that determines, to a large extent, private property fire insurance premiums.

"Water is our most precious resource. This is especially true when considering firefighting applications. When it comes down to it, water

is the fire department's ammunition. Despite all the equipment, training, and efficiency of the firefighting personnel, an adequate water supply for firefighting plays the most important role in our ability to protect life and property from fire."[2]

Not having an adequate and readily available supply of water for fire service can result in the following:

- High fire insurance premiums;
- Inefficient and ineffective fire service;
- A detriment to business and economic development; and
- High property loss and greater potential for loss of life.

WATER SYSTEM REGULATIONS THAT AFFECT FIRE SERVICE

Minimum requirements for fire service are 500 gallons of water per minute (gpm) and water flows at 20 pounds per square inch (psi) residual pressure. This requires a minimum six-inch water main (see TDEC Regulation 1200-5-1-17 paragraph 18) for lower residential requirements. A professional engineer licensed in the state of Tennessee should determine the community's water system storage capacity. Water is stored in standpipes, elevated water tanks, reservoirs, and clear wells at treatment plants. Many small-city fire departments take water from nearby streams, portable storage tanks, distant hydrants, swimming pools, and large tanker fire trucks. Tennessee fire departments are required to track the water usage from fire hydrants.

Tennessee public water system regulations require that all community water systems planning to or having installed fire hydrants must protect the distribution system from contamination. New installations of fire hydrants shall not be installed on water mains less than six inches in diameter or on water mains that cannot produce 500 gallons per minute at 20 psi residual pressure unless the tops are painted red. Out-of-service hydrants shall have tops painted black or covered with a black shroud or tape. Existing Class C hydrants (hydrants unable to deliver a flow of 500 gallons per minute at a residual pressure of 20 psi) shall have their tops painted red by January 1, 2008.

Beginning January 1, 2008, the water system must have provided notification by certified mail at least once every five years to each fire department, that may have reason to use its hydrants, that fire hydrants with tops painted red (Class C hydrants) cannot be connected directly to a pumper fire truck. Fire departments may be allowed to fill the booster tanks on any fire apparatus from an available hydrant by using only the water system's available pressure. (Fire pumps shall not be engaged during refill operations from a Class C hydrant.) While these regulations protect the water distribution system from contamination, they also speak to the need for an improved water source for Tennessee's rural fire departments.

FIRE SERVICE PLANNING FOR WATER

Most municipal subdivision regulations require six-inch water mains capable of delivering 500 gpm at a residual pressure of 20 psi, and they require that hydrants be installed 1,000 feet apart or 500 feet from residential structures. With the use of GPS equipment, insurance companies now can more accurately determine the exact distance of a structure from a fire hydrant and charge the correct rate. Public and private water utility districts operating within a city and its urban growth area are not required to comply with municipal subdivision regulations that require the installation of fire hydrants. There often is a serious disconnect between municipal planning and the provision of water by utility districts and private utility companies. It is somewhat ironic that only the largest utility, usually the electric system or the telephone company, was required to participate in the development of the 20-year urban growth plan required by Public Chapter 1101, and utilities are not required to comply with the city's growth plan.

According to Kevin J. Lauer, UT County Technical Assistance Service fire consultant, water systems typically can be designed and installed for fire protection with an increase in total project cost of only 4 to 10 percent over a potable system only. This is another area that will pay huge dividends over the next 10 to 15 years. He goes on to say that water systems and community development planning is a complex subject that local governments cannot afford to ignore. It is vital, not only for safety and property conservation, but also for the continued economic growth of a region.

Many communities in Tennessee want a water supply with six-inch mains and community-wide fire hydrants. They want improved fire service to save lives and property; however, they complain about the affordability of such improvements. The Environmental Protection Agency (EPA) bases its affordability determinations on the criterion that a household with the median (50th percentile) income should be able to pay 2.5 percent of its pre-tax income for water. The 2003 median income for a family of four in Tennessee was $55,401. At 2.5 percent this affordability measure indicates that customers should be able to pay up to $115.42 per month for water. The average monthly water bill in calendar year 2000 for Tennessee cities with populations of less than 5,000 was $17.46. Most households in Tennessee are paying approximately one-sixth of the EPA affordability index amount. While the author is not advocating a six-fold increase in water rates, many families are paying considerably more for cable television service than for water service.

THE VALUE OF RESIDENTIAL SPRINKLER SYSTEMS IN REDUCING COSTS

Studies by the Federal Emergency Management Agency's United States Fire Administration indicate that installing residential fire sprinkler systems could have saved thousands of lives, prevented a large portion of injuries, and eliminated hundreds of millions of dollars in property losses.

"Automatic sprinkler systems were the first and still are the foremost forms of automatic fire suppression system used throughout the world. With over 100 years of operating history and a 95 percent plus success record, these systems represent one of the most readily available means for effective fire suppression for a wide range of different occupancies. The success story for automatic sprinkler system is confining, controlling, and extinguishing developing fires in structures has been a phenomenon."[3]

Using quick response sprinklers and approved piping, homes can be built or even retrofitted to include low-cost automatic sprinkler systems connected to the domestic water supply, lowering insurance rates by 5 to 15 percent. At present, the cost of a home sprinkler system is approximately $1 to $1.50 per square foot in new construction amounting to about 1 percent of total building cost. More than 270 communities[4] now have residential sprinkler laws. The use of residential sprinkler systems and smoke detectors remains the key to reducing the overall fire death toll, which amounts to 83 percent[5] of all fire deaths.

"A study based on 15 years of data from Scottsdale, Arizona, categorized fire damage in two types of homes — those with and those without sprinkler systems. Property loss due to a fire in a residential home with a sprinkler system was $2,166 compared to $45,019 in the home without a sprinkler system. A 12-year study of Prince George's County, Maryland, reported fire damage in the home with sprinkler system amounted to $3,429 and, without, $326,752."[6]

FIRE INSURANCE RATINGS

The ISO uses a grading system from 1 to 10 with 1 being the best and 10 representing a community without an effective fire service. Within this grading structure, a split class means that all properties within 1,000 feet of a water supply (usually a fire hydrant) are eligible for the first class (1-8).

Properties that are 1,000 feet from a water supply but within five road miles of a fire station are eligible for a Class 9. All properties more than five road miles from a fire station are Class 10. An example would be a 3/9 classification where most of the properties are within 1,000 feet of a water supply and meet other fire standards, and some of the community is more than 1,000 feet from a water supply but within five road miles of the fire station with the grade 9. The following charts demonstrate that there are significant savings from fire insurance classification improvements and that a large number of communities provide only minimum fire service. The challenge to local government is to improve the fire service using the savings from an improved insurance rate classification.

The ISO rates community fire service in Tennessee. *According to the Tennessee County Fire Handbook*, "For areas without a public water supply system, the following flow rates must be achievable for a minimum of two hours:

ISO Rating	GPM
9	100
8	250
7	350
6	450

The flow, measured in gallons per minute (gpm), must be established within 15 minutes from the alarm time."[7]

THE IMPORTANCE OF INSURANCE RATINGS

"In the following example, if a homeowner pays $1 per year for fire insurance in a Class 10 rating, then:

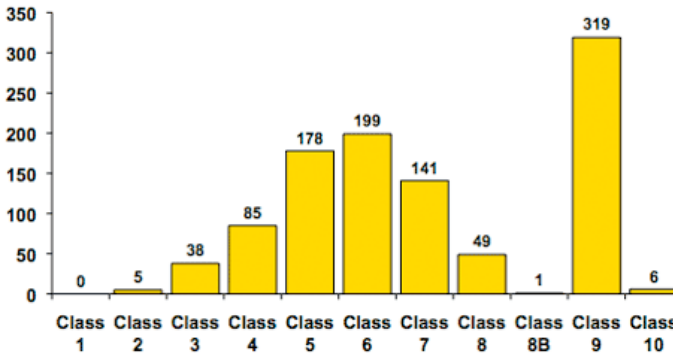
- Class 9 pays 93 cents, a savings of 7 percent over a Class 10.
- Class 8 pays 72 cents, a savings of 28 percent over a Class 10.
- Class 7 pays 68 cents, a savings of 32 percent over a Class 10.
- Class 6 pays 65 cents, a savings of 35 percent over a Class 10
- Class 5 pays 63 cents, a savings of 37 percent over a Class 10.
- Class 4 pays 60 cents, a savings of 40 percent over a Class 10.
- Class 3 pays 58 cents, a savings of 42 percent over a Class 10.
- Class 2 pays 55 cents, a savings of 45 percent over a Class 10.
- Class 1 pays 53 cents, a savings of 47 percent over a Class 10."[8]

ISO Mitigation Online reports the following:

Grade	Number of Fire Districts
1	0
2	5
3	37
4	83
5	180
6	193
7	137
8	52
8B	1
9	321
10	6
TOTAL	**1015**

ISO RATINGS — TENNESSEE FIRE DEPARTMENTS

Tennessee Fire Department Classifications as of January 26, 2011



Of the 1,015 ISO-classified communities in Tennessee, 321, or 31.6 percent, are grade 9, and they meet only minimum standards.

The Tennessee ISO ratings are consistent with national ratings in that "more than one-third of the fire districts in the United States have a Class 9 rating, which indicates the minimum recognized standard of fire protection. And more than 63 percent of the fire districts have gradings of Class 7 to 10. The value of homes in areas graded Class 7 to 10 is rising faster than in areas with better classifications. From 1994 to 1998, the average amount of insurance purchased by homeowners in communities graded Class 7 to 10 grew nearly 14 times faster than in communities graded Class 1 to 6, where the rate of growth was only 0.3 percent."[9]

While many Tennessee cities and utility districts with water systems have unaccounted-for water losses from 10 percent to as much as 50 percent, amounting to hundreds of thousands of gallons annually, the typical residential fire requires approximately 4,500 gallons for extinguishment, cleanup, and refilling tanks. Fire department usage is a mere drop in the bucket in comparison to water loss from leakage. A new Tennessee statute requires that cities report their unaccounted-for water losses annually. "The State of Arkansas addressed this problem in statutes indicating that nothing in this subchapter shall be construed to prevent county, municipal, or local water utilities or associations from contributing water free of charge for fire fighting and training activities to volunteer fire departments and districts."[10] The statute encourages a commitment to better fire service with the supply of water.

FIRE SERVICE RATING EFFECT ON COMMERCIAL AND ECONOMIC DEVELOPMENT

Every small town and rural community in Tennessee is interested in promoting growth and commercial and economic development. They budget for economic development, participate in area development efforts, become Three-Star certified, subsidize new development and support it in other ways. They want business and industry to locate in their communities for jobs and economic opportunities. A community that does not have adequate water for fire service is at a tremendous disadvantage over a community that does. The difference in commercial fire insurance premiums between a community with adequate water for fire service and a community that does not have adequate water is significant and in many instances may prevent industry from locating in the community.

EXAMPLES OF SAVINGS FROM IMPROVED FIRE SERVICE

A recent MTAS fire study for an East Tennessee city with a population of just over 4,000 with an ISO rating of Class 9 indicated that for a $100,000 home structure paying an annual fire insurance premium of $806, the annual savings per household where the ISO class was improved to Class 5 was $298. When multiplied by the estimated 1,477 homes inside the

city, the annual savings to city dwellers amounted to $440,146. The cost of improving the water system was $695,470, 57 percent of the total $1,220,123 cost of improving fire service, including the water distribution system and installing hydrants. By using long-term debt and paying approximately $100 annually per household for fire service improvements, each household received savings of approximately $298 annually.

If a fire department improves its ISO rating, homeowners and businesses in the community often save money on their insurance premiums. If the savings are spent in the community, the extra cash can help the local economy. The U.S. Chamber of Commerce states that every dollar that stays in a community will turn over more than six or seven times. Using the above example, the $440,146 annual savings in insurance premiums minus the annual cost of $147,700 will generate an additional $292,446. When this turns over six times during the year it generates an additional $1,754,676 ($293,846 x 6) for the local economy. At the rate of 2.75 percent local sales tax, this savings generates $48,254 in additional tax revenue to the local government, not to mention the sales tax revenue to the state, which returns approximately $73 per capita to the local government. The local tax generated from the savings pays nearly 50 percent of the entire cost of improving the fire service and the water system. Much of this money currently is going to insurance companies outside the community. In this example, it clearly was in the local government's interest to make the improvements with the projected savings. Cities in need of revenues for improving fire service may want to do a similar analysis.

"In 2000, the Rural Fire Protection Work Group, a committee appointed by Arkansas Governor Mike Huckabee, quantified the economic benefits of improved fire protection for that state. In its final report the work group estimated the statewide cost of projects to be about $150 million or $15 million a year for 10 years. Next, the work group projected the reduction in property insurance premiums when each of 839 rural fire departments has improved its Public Protection Classification (PPC) to Class 7. According to that analysis, the statewide savings would total more than $100 million per year. More than 425,000 homeowners would share the benefits, with an average savings of $235 per household. The Arkansas work group projected increased economic activity at more than $2 billion over a period of 13 years. According to the work group's analysis, that economic activity would generate additional state and local sales tax revenue more than offsetting the cost of the improvements."[11] These savings from approximately 700 fire departments in the state of Arkansas are consistent with the savings of the East Tennessee city cited previously. Perhaps a similar approach would work in Tennessee.

FIRE RESOURCE CONSERVATION AND DEVELOPMENT

Councils (RC&Ds) in East Texas have begun a pilot project that will turn over to the state of Texas a model to improve rural volunteer fire department (VFD) fire suppression and to provide VFDs with training in homeland protection. The key, long-term measure of success will be that insurance ratings for many volunteer fire departments will be lowered, and, as a result, substantial savings will be returned to rural homeowners. The impact of a successful project in just 10 years could potentially be millions of dollars saved in reduced insurance premiums, which will boost local economies. In the short term, during the pilot project, 50 counties and their volunteer fire departments will:

- Prepare county master plans for improved fire protection;
- Train local volunteers in ways to lower their ISO rating; and
- Provide training in key areas of homeland security and emergency management.

The pilot project is modeled after a very successful statewide project in Arkansas. In just six years, that project improved the fire suppression capability of hundreds of volunteer fire departments and realized $25 million dollars in annual savings for rural counties when homeowner insurance rates dropped because of the improved ISO ratings.

The above examples demonstrate that there are substantial insurance cost savings from improving a community's fire service. Often the problem is that the government agency, the fire department, has the expense, and the homeowners receive the insurance savings from their insurance premiums. Many homeowners are not willing to return any savings realized from a reduction in insurance premiums to pay for needed fire service improvements. They do not want their property taxes increased to pay for the savings. Another funding mechanism is needed to capture these savings for the benefit of the fire service as well as the homeowner.

Could insurance companies enter into agreements with local governments to provide upfront the costs of needed fire service improvements, with the insurance company, the fire department, and the homeowner sharing in the savings? Could a government fund be established to contract with local governments for improving fire service with the fund and the fire department sharing in the savings? With a 3-to-1 return on investment from improved fire service, there are many potential ways to recover the insurance savings for the benefit of the fire department, the homeowner, and the finance organization. Tennessee cities have not sought optional and innovative ways to capture the insurance rate savings for the benefit of the fire departments and the homeowner.

SUMMARY

Small municipal fire departments using volunteers are important to Tennessee cities. There are 723 recognized fire departments in Tennessee. Most of them are small fire departments struggling with water supply issues. Many small-city fire departments lack an adequate supply of water and the necessary funding to provide for needed supplies, equipment, and facilities. Improving a city's fire service rating can lead to homeowner insurance savings, and it can provide a mechanism to fund needed improvements in the fire service. Residential sprinkler systems can reduce the loss of life and property. Growth issues affecting a city's ability to provide an adequate level of fire service to its community need to be adequately addressed.

MTAS recommends that cities look for innovative methods to improve the water supply required for fire service such as:

- Develop and participate in model programs that pay for fire service improvements from reduced fire insurance rates, similar to the Texas model program outlined herein;
- Seek changes in federal laws that prevent a city from taking over a utility inside the city where the utility has outstanding bond obligations. Cities should be allowed to pay off the bonds and acquire the utility;
- Support changes in the state's growth laws requiring utility districts operating within a city, or its urban growth area, to comply with the city's subdivision regulations. This would give cities the ability to provide needed water for fire service; and
- Include utilities in the county/city 20-year growth plan.

END NOTES

1. Public Technology, Inc. (PIT) Washington, D.C. Model for Fire Station Location. *Fire Suppression Posting Schedule Handbook*.
2. *Water Supplies for Commercial and Residential Fire Protection,* Colorado Springs Fire Department.
3. *Water Supply Systems and Evaluation Methods*, Dr. Harry E. Hickey.
4. Residential Fire Safety Institute.
5. Ibid.
6. Economic Analysis of Residential Fire Sprinkler Systems by Hayden Brown.
7. *Tennessee County Fire Handbook,* Kevin J. Lauer, County Technical Assistance Service.
8. www.isomitigation.com.
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10. *Arkansas Code Annotated* 14-284-408. Contribution; funds; water.
11. www.iso.com.



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