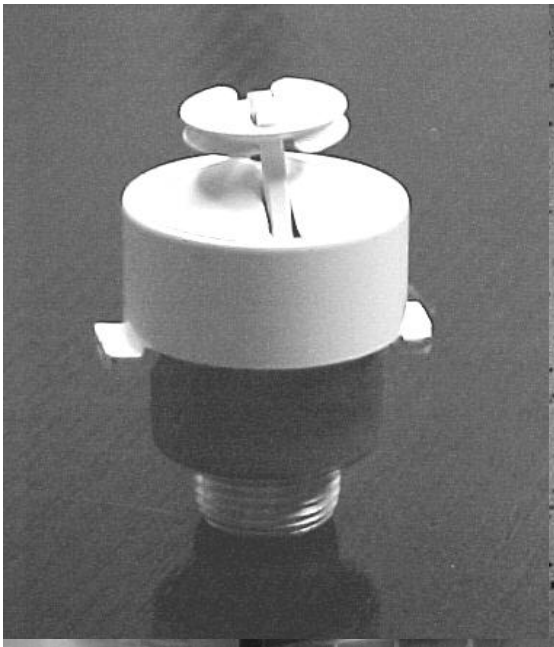
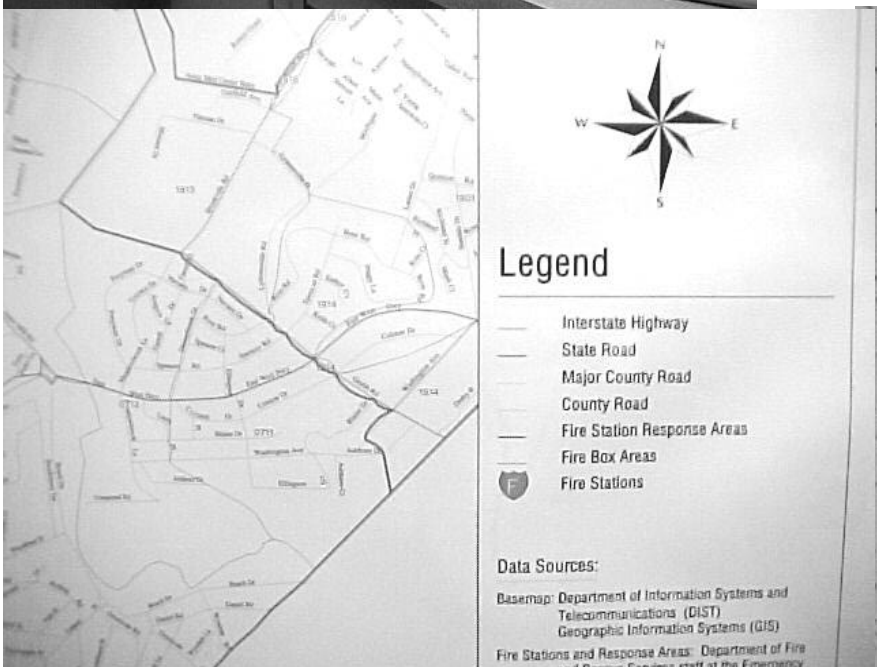



FIRES NT

The Future


N
W
E
S
Legend
Interstate Highway
State Road
Major County Road
County Road
Fire Station Response Areas
Fire Box Areas
Fire Stations
Data Sources:
Basemap: Department of Information Systems and Telecommunications (DIST) Geographic Information Systems (GIS)
Fire Stations and Response Areas: Department of Fire

Automatic Sprinkler Protection

Automatic sprinklers are temperature sensitive devices that open at a predetermined design temperature when exposed to heat. A heat sensitive element, either a fusible link, or glass bulb on each sprinkler head, senses heat from fires. After opening, the activated sprinkler releases water on the fire in quantities designed to extinguish or confine the fire until the fire department arrives. The ability of sprinklers to react early to a developing fire is critical to their well-documented success as a fire protection strategy.

Water is supplied to the heads by a system of pipes and valves, and in the case of homes supplied by wells, a water tank separate from the domestic water supply. Pipes are located overhead, or in side walls near the ceiling, while valves and tanks are located near the point where the domestic water line enters the home, typically in the basement.

Sprinklers were originally introduced in the late 1880's. They were used primarily in highly protected risks, (HPRs) such as warehouses, factories, and industrial plants. As improvements have developed, sprinklers have been increasingly mandated in other occupancies such as schools, nursing homes, prisons, places of assembly, and high rises of all types.

In recent years, quick response sprinklers with special low flow discharge characteristics and spray patterns known as residential sprinklers have been used to suppress fires in residential dwellings. They are proven to be very successful in fighting residential fires. Even though other interventions such as smoke detectors and public education have reduced U.S. fire losses considerably, residential sprinklers represent new and improved technology. Sprinklers add fire suppression capability to the early warning of smoke detectors.

Since their introduction in the 1970's, smoke detectors have significantly contributed to the reduction in fire deaths and property loss due to fire[1]. Properly installed and maintained smoke detectors provide early warning of a fire to the occupants who may take actions to escape, notify the fire department, and otherwise react to the event. While smoke detectors are effective, they must be properly installed and maintained.

From September of 1995 through June of 1999, Montgomery County fire fighters have approached 101, 893 homes as part of the *Safety In Our Neighborhood Program*. Of the 42,146 homes entered, batteries needed to be installed in 4,857 smoke detectors (11.5%), and entire smoke detectors needed to be replaced in another 5,446 homes (12.9%). Using these statistics as a reference, nearly 25% of all homes entered had a non-working smoke detector.

[1] Montgomery County's residential smoke detector law became effective in 1978.

Another consideration concerning smoke detectors involves the requirements for smoke detector coverage. Smoke detectors are required to be installed outside of all sleeping areas, and/or on each level of the home depending upon the specific application. Traditionally there was no mandate to install detectors in every room based upon listed coverage of the individual smoke detector. However, smoke detectors are now required in every sleeping room and on every floor of one and two family dwellings in the latest CABO (Council of American Building Officials) One and Two Family Dwelling Code in use in Montgomery County. The NFPA Life Safety Code has additional requirements for smoke detectors in several occupancies. These requirements can be waived by the authority having jurisdiction when the building is fully sprinklered. The purpose of this requirement is to provide early warning for sleeping occupants whom must then react properly and escape, with or without the assistance of the fire department.

Residential sprinklers offer opportunities for improvement in the delivery of suppression services that are far broader than smoke detectors and other interventions.

First, sprinklers protect the lives of the building's occupants. Residential sprinklers are specifically designed to intervene before life-threatening conditions develop below the five-foot level in a room, (the height of the average adult's airway, when standing). Second, property is conserved. The structure and furnishings have increased probability at being preserved. Finally, sprinklers reduce the severity of a fire, reducing the danger to fire fighters. The National Fire Protection Association estimates that sprinklers can extinguish a typical residential fire in less than one minute. Further, they improve the chance of surviving a fire by ninety percent.

More importantly, residential sprinklers do not rely upon changed human behavior to prevent fires and subsequent losses. The majority of residential fires are attributed to behavioral causes such as careless smoking, unattended cooking, or children playing with fire. Sprinklers help to control the results of the inappropriate behavior, and they are on-duty at all times. Sprinklers will generally protect the occupants of a building even when the batteries in the smoke detector have run out, or if the occupants are physically unable to escape. These impediments to fire survival have existed in residential occupancies for many years. At particular risk are the elderly and the very young, the two largest groups of victims who succumb to fire.

Residential sprinklers offer increased efficiency from a water delivery standpoint, as well. In residential applications, systems are designed to provide either an 18 GPM, or a 26 GPM, required fire flow for a period of ten minutes. From a practical viewpoint, this means that homes not connected to public water need only store 260 gallons of fire fighting water, a tank about the size of a typical fuel oil tank. State of the art residential sprinkler heads have demand flows

as low as 6 GPM per head. This lowers the stored water requirement to 180 gallons. In some cases, small pumps would be required to maintain adequate pressures to deliver the design flow. Presently, combination tanks and pumps are available to meet this requirement.

The WSWG turned to the experience gained in other jurisdictions to formulate conclusions regarding residential sprinklers. Collectively, these jurisdictions are able to share a large base of experience with residential sprinklers. Some of the more important benchmarks are listed here:

- In 1978, San Clemente, California was the first jurisdiction in the United States to require residential sprinklers in all new occupancies.
- "Operation San Francisco" served as a national pilot project for the application and testing of residential sprinklers.
- Scottsdale, Arizona passed the nation's most comprehensive sprinkler ordinance in 1985, requiring automatic sprinklers in every room of every new building in the city.
- Neighboring Prince George's County, Maryland has required sprinklers in all new residential construction, including single family homes, since 1987.
- Cobb County, Georgia has tested voluntary incentives for sprinkler installations resulting in reduced construction costs for builders.
- Port Angeles, Washington has tied their sprinkler requirements to the distance a given home is located from a fire station.
- International Association of Fire Chiefs "Operation Life Safety"[2] promotes the use of quick-response sprinklers.

In addition to this collective experience, the WSWG would like to note the increasing focus of the U.S. Congress that appears to support installation of residential sprinklers.

The Hotel and Motel Fire Safety Act of 1990, requires Federal employees on travel to stay in facilities equipped with smoke detectors and sprinklers that meet NFPA standards. In addition, the Federal Fire Safety Act of 1992 mandates sprinklers in all newly-constructed government-owned high rise buildings, in all newly leased Federal facilities, and in all multi-family assisted housing greater than four stories in height.

[2] Operation Life safety is a partnership of the International Association of Fire Chiefs, U.S. Fire Administration, and the private sector whose goal is to reduce residential fire deaths, injuries and property damage through promotion of fast response sprinkler systems, early warning detection and alarm, and public educational programs.

Major conclusions from the experience gained by these jurisdictions and others have determined that **residential sprinklers save lives, reduce property loss, and have the ability to reduce the insurance costs of property owners sufficiently to receive a return on their initial investment over time.** As technology is advanced, public awareness of the benefits of sprinklers is increased, and additional experience is gained, there is evidence that the costs associated with residential sprinkler installation can be reduced and offset.

In comparing the results of other jurisdictions to anticipated local needs, the WSWG identified two problems that may require additional study.

The marginal water supply requirements mandated for a typical single family dwelling may not directly transfer to the unusually large homes located in many areas of Montgomery County. Water supply design requirements mandated within the national standards are limited because it is expected that not more than two heads will activate simultaneously.

In 1987, Montgomery County adopted an Executive Regulation that requires a three-head design flow to deal with this problem in certain multi-family residential occupancies. It is believed that this regulation will adequately address the needs in single family homes within the prescribed limits of NFPA 13-D (single family detached) systems.

Secondly, fires that originate outside of the home, or in unprotected void spaces such as attics are likely to spread without the response of a residential sprinkler. In these cases, significant fire losses could occur. This loss potential is accepted in the code for single family dwellings. Clearly, the intent is life safety and survival, rather than suppression and extinguishment. However, a fire that extends into the home for any reason should activate sprinkler(s), delivering water to the extending fire and alerting the occupants if the system is equipped with an audible water flow alarm.

The WSWG recommends the MCFRS initiate actions necessary to introduce legislation to mandate the installation of quick-response, residential sprinklers in all new single family dwellings.

High-rise buildings present a unique fire safety challenge. The height of the building creates obstacles for the occupants and fire fighters. In an emergency situation, occupants have to utilize stairs to evacuate the building. For the elderly and physically challenged, this may be an impossible task. Many times, smoke cannot be removed from the building, creating untenable conditions in corridors and stairs, rendering the preferred exits unusable and trapping occupants. Therefore, occupants may have to remain in their apartment on the same floor as the fire.

High-rise fires are also difficult for the firefighter. The fire fighter must carry heavy tools and equipment up numerous flights of stairs to access the fire. Often this is accomplished while occupants are trying to evacuate through the same stairs. Even though additional resources are deployed at high rise fires, the time required to assemble these resources is considerable.

Montgomery County and the State of Maryland utilize the National Fire Protection Association's *Life Safety Code,* to govern fire safety features in buildings. The *Life Safety Code* is rewritten and updated every three years by the NFPA. Within the code, there are specific requirements for different uses of buildings. Requirements for new and existing construction are separate and distinct.

In the chapter addressing existing apartment buildings, the code requires existing high-rise apartments to be equipped with automatic sprinkler protection. Under State law, State officials do not enforce the "existing" chapters of the *Code*. Montgomery County, through local authority, can enforce more stringent requirements than the State and does enforce the "existing" chapters of the *Code*. Since the standard is rewritten every three years, both the State and County have to go through their legislative process to amend and adopt the newest edition. Each entity makes changes to the *Code* as they see fit.

In 1994 during the adoptive process, staff from the executive branch learned about the requirement for sprinklers in existing high-rise apartments. At the request of the County Executive, that particular requirement was deleted from the *Code*. During the 1998 adoption process, the Fire Marshal attempted to retain the sprinkler requirement for high rise apartments. Several groups representing apartment building owners expressed opposition to the requirement. Again, the proposal failed to pass. However, the Fire Marshal was directed by the County Council to prepare a response to questions raised at the hearing and be prepared to initiate the change at a separate hearing.

The Fire Code Enforcement Office has surveyed the existing high-rise apartment buildings in the County and determined that eighty of these buildings would require automatic sprinkler protection under the *Life Safety Code*. Of these eighty buildings, four are in the City of Rockville. All of these buildings are presently equipped with standpipes, which would lessen the financial impact of installing sprinkler protection.

The WSWG recommends that the MCFRS initiate actions necessary to retrofit existing high rise apartment buildings with automatic sprinkler protection as required by the Life Safety Code. This will significantly reduce the potential for the loss of life, injuries and property damage from fire in these occupancies. Sprinklers will also reduce the physical demands on fire service personnel by limiting the size of, or extinguishing, fires before the fire department arrives.

Tanker Deployment

After careful review of the tanker testing data, recommendations forwarded by the various LFRD's, and a time-distance analysis of tanker coverage, ***the WSWG recommends that four additional tankers be placed in service as soon as possible. Specifically, a tanker should be deployed at FS-31, FS-4, FS-30, and a reserve tanker added to the fleet[3].*** (See maps in Appendix M).

The FS-31 area has the worse exposure of non-hydranted area next to Upper Montgomery FS-14. By placing a tanker at FS-31, we will be able to protect a large area of the county that is currently without water, and supplement the very large FS-14 area. FS-31 is the next closest station to most of the FS-14 area, clearly the largest exposure. Tanker 31 could also meet the established response goals for most of the rural portions of the Germantown FS-29 area.

The addition of a tanker at Sandy Spring FS-4 will fill a significant gap in existing coverage for a large portion of the county where large single family homes exist. This tanker would also serve the area of Montgomery County east of New Hampshire Avenue that is presently served by Howard County Tanker 5 which is too far away to contribute initially[4].

The addition of a tanker at Cabin John FS-30 will help to fill a gap in coverage for large, non-hydranted portions of Cabin John FS-30, Rockville FS-33, and Cabin John FS-10. Initial tanker coverage for these areas are presently served by Upper Montgomery Tanker 14, and Fairfax County Tanker 12 from Great Falls, VA, some 12 miles away. Neither of these tankers are able to fulfill initial response goals for any portion of these response areas. A tanker at FS-30 will also provide timely response to Interstates 495 and 270. Placement of a tanker at FS-31 will reduce the travel time for the first arriving tanker into FS 30, 33, and 10's areas, but will not provide adequate coverage to meet the 5,000 gallon goal in 10 minutes.

These areas are unique in that large portions of the areas are serviced by municipal water and adequate hydrants are available. However, there are also unacceptably large gaps in hydrant coverage that create a severe challenge to the departments providing fire suppression service to these areas. When needed, tanker coverage is simply too far away at present. Station and apparatus allocation is such that establishment of a rapid water relay from existing hydrants is not guaranteed.

[3] Presently, Sandy Spring FS-4 and Cabin John FS-30 cannot accommodate a tanker due to facility limitations. Current CIP projections recommend FS-4 replacement, and FS-30 renovation or replacement. When these projects are completed, these stations should be able to accommodate tankers.

[4] Howard County Tanker 5 is five miles from the Montgomery County line, therefore it does not meet the minimum service expectations recommended by the WSWG.

The homes within these service areas are the epitome of large, unprotected, combustible structures, with limited access. The Cabin John Park, and Rockville departments have long recognized the special hazards presented by these unusually large homes. For a number of years, the house fire assignments had been altered to the full box alarm assignment[5] for inside structure fires in this portion of the county.

Currently, there is no replacement vehicle for any tanker in the fleet that goes out of service for any reason. This is unacceptable by any reasonable measure. Should the county purchase a reserve tanker, the Upper Montgomery VFD has expressed interest to the WSWG concerning housing and maintaining a reserve tanker. A proposed addition and expansion of an existing building adjacent to FS-14 could accommodate the unit. More importantly, FS-14 is in a unique situation in that there first due area is extremely large, (88.7 square miles) as compared to any other single station response area. Even if a tanker is added to the resources at FS-31, portions of the FS-14 area are unreachable from any other current station in a timely manner. A reserve tanker housed at FS-14 could be deployed as a second tanker in the FS-14 area when staffing is available. The proposed Germantown-West station is another possible site to house the reserve tanker.

The Hyattstown VFD currently operates the only combination engine-tanker in Montgomery County. This unit carries 1500 gallons of water and is dispatched as a tanker. Although the unit is equipped with a rear 10” gravity dump, Tanker 9 cannot dump from the sides, and is not equipped with a direct tank fill. As a result, Tanker 9 must be filled through the pump, and must take time to back into position when dumping. This significantly slows the continuous flow capability of the unit as compared to the larger elliptical tankers deployed elsewhere. More importantly, any combination of Tanker 9 and an engine will not meet the recommended goal of 5000 gallons of water on the fire ground within ten minutes. Therefore, when existing FS-9 units are replaced , the engine-tanker currently deployed at FS-9 should be replaced with an elliptical design tanker of similar capacity to the units deployed throughout the county. If station location recommendations are adopted, then locating the elliptical tanker at the proposed Clarksburg station would provide improved deployment of available resources. The existing Tanker 9 could then be moved to front line engine service at FS-9, providing enhanced suppression capabilities from that location.

Considerable discussion took place regarding the placement of a tanker at Bethesda FS-26 for interstate highway coverage in the down county corridor. The WSWG acknowledges that a tanker located at FS-26 is the best location for coverage of the limited-access highways that include I-495, I-270, and the I-270 spur. However, the WSWG believes that the greater need is served by placing tankers in areas where coverage for structure fires does not currently exist.

[5] As of May 1, 1999, all house fires in the county receive a full box alarm assignment.

Therefore, the WSWG cannot support a tanker at FS-26 at this time. A reasonable alternative may be to place a tanker at Cabin John FS-10. This station has ready access to the interstates, but would provide less than optimum coverage for the gap in the Cabin John FS-30, and Rockville FS-33 areas. As stated above, FS-30 is the best location to provide tanker coverage to both the interstates and areas of Potomac lacking hydrants.

If the additional tankers recommended in this study are deployed, ***the WSWG recommends that the specifications for future tankers closely parallel the existing elliptical tankers in service at FS-14, and FS-17.*** Both of these units tested well and were the greatest contributors in a water shuttle. Future enhancements to the tanker fleet should include electric side discharge chutes, and removable rear discharge chutes so that precise positioning is not as critical when dumping. All units (tankers and or engine tankers) should be equipped with large capacity, direct-fill lines to expedite the filling process. To the extent possible, existing units should be modified to meet the minimum expectations outlined throughout this report.

Mapping

Presently, mapping efforts within the MCFRS exist at the discretion of the Local Fire Rescue Departments. In some stations, mapping is a top priority driven by new development. In other areas, streets and complexes seldom change.

Since fire department mapping has evolved over time, some stations manually draw maps, while others have incorporated the use of basic and sophisticated computer programs to produce dashboard maps for use on apparatus. It has been said that more time and resources have been expended on mapping projects than any other single project in the Montgomery County Fire Rescue Service.

The WSWG recommends that all hydrants, alternate water supply points, and other water supply enhancements, be plotted on the GIS system as the basis for future mapping strategies. Standardized hydrant maps, made available through the GIS, will allow unit officers to access accurate hydrant maps from the cab of their units, either in hard copy form in binders or, ideally, directly from mobile data terminals. The GIS maps will provide the unit officer the exact location of each hydrant. Accurate, uniform, high quality maps are the best way for firefighters to locate and utilize water supply points. This need is immediate and ongoing. Production of new maps should receive the highest priority available.

Essential components for the water supply points vary by location. The following components should be considered:

- Accurate hydrant location with a unique hydrant shaped symbol
- Address numbers for all hydrants
- Locations of all fire department connections with an identifier that graphically indicates Standpipe, Sprinkler, or both
- All drafting points
- Standard labeling of water supply points that include:
  - Address of the drafting or connection point
  - Source of water (lake, pond, stream, tank, cistern, etc.
  - Size and calculated capacity of the source
  - Type and size of the connection, if applicable

Standard Water Supply Procedures

Careful planning for standard evolutions can all but eliminate water supply problems on the fire ground. Reasonable limitations must be established for hose lays based upon known friction loss characteristics for the various diameter hoses. The goal should be to move the maximum amount of water through a prescribed hose layout while limiting net pump pressures to 150 PSI. This will assure that the rated capacity of the pump can safely be delivered provided that hoses of adequate number and diameter are in place. For a standard 1250 GPM pumper, this would require three 3-inch lines, two 4-inch lines or one 5-inch line.

The following fundamental rule is often overlooked when planning and implementing water supply evolutions: The maximum rated capacity of a pumper decreases as the net pump pressure increases. A standard pumper is rated to supply 100% of its rated capacity at a net pump pressure of 150 PSI, 70% of its rated capacity at 200 PSI, and 50% of its rated capacity at 250 PSI. Therefore, we should equip our pumpers and design evolutions to take full advantage of the pumper's design limitations.

Operations in urban areas where fire hydrants are available have become standardized over time by inertia. For the most part, apparatus and equipment is sufficiently standardized to permit uniform operating procedures for establishing water supply. However, criteria for multiple supply lines, alternate coverage, and expansion of existing water supply remains fragmented and non-standard. Some departments struggle with appliance and hose diameter compatibility problems, as well.

All local Fire-Rescue Departments operating routinely in rural areas of the county were asked to submit Standard Operating Procedures for rural fire fighting

operations. Only one department (Laytonsville) had committed their rural operations to an operational Standard Operating Procedure. Subsequent follow up visits to Upper Montgomery, Rockville, Cabin John, Sandy Spring, and Hyattstown determined that most of the pre-plans and standard operating procedures were in the heads of the various chief officers operating in those departments. Although some similarities exist, collectively, the strategies, tactics, and resource deployment is fragmented and non-standard. Clear expectations for rural operations have not been delegated to the end users. This is particularly true with the transient DFRS career work force. Most DFRS employees have little or no practical experience in rural fire fighting operations. The WSWG believes that this situation is unacceptable.

Since rural operations generally involve more than one engine and tanker from more than one department, Montgomery County units need Standard Operating Procedures to work together effectively. These Standard Operating Procedures will require detailed planning, outlining the roles and responsibilities for all personnel, including mutual aid departments from neighboring counties. Incident commanders must receive this training so that tactical strategies are selected from this standard menu. More importantly, regular training and drills in the various areas should be conducted to assure competency and readiness.

The WSWG recommends that all operational personnel receive new training on fire department water supply. This training is essential for a number of reasons.

First and foremost, water supply is so fundamental to successful operations on the fire ground that every member of the service should be closely familiar with the needs and expectations throughout the county. Secondly, our present pump operator and incident command training falls short of the mark to assure that our personnel understand the tactical requirements of our fire ground strategies. Additionally, like it or not, our work force is transient. The employee working at FS-1 today can be the wagon driver at FS-14 tomorrow. Our expectations are for this employee to perform flawlessly at either work site. Finally, incident commanders are permitted under the IECS to function anywhere in Montgomery County. The MCFRS owes it to these people to provide them with sound, fact-based procedures as a platform from which to conduct operations.

Developing a rigid, single method for rural water supply delivery is controversial and counter productive. Instead, ***the WSWG recommends a FRC operations policy entitled "Fire Department Water Supply" that would encompass standard operating procedures for all areas of the county.*** This policy would establish parameters for operating in areas with fire hydrants and areas without fire hydrants. A separate policy should be devoted to Water Supply Command. Apparatus should be uniformly equipped, and personnel properly trained to perform any of the following fire ground functions:

Standard Water Supply Evolutions in Areas with Fire Hydrants:

1. Direct Lay-Single Line
2. Direct Lay-Dual Lines
3. Split Lay-Single Line
4. Split Lay-Dual Lines
5. Reverse Lay-Single Line
6. Reverse Lay-Dual Lines
7. Initiate Relay Operations
8. Operations on Limited-Access Highways

Standard Water Supply Evolutions in Areas without Fire Hydrants:

1. Direct Water Supply From a Tanker
2. Supply From a Static Source Pumper
3. Supply From a Nurse Tanker
4. Supply From a Single Portable Tank and a Draft Pumper
5. Supply From Three Portable Tanks and a Draft Pumper
6. Continuous Water Supply From a Tanker Shuttle
7. Tanker Fill Site Operations
8. Operations on Limited-Access Highways

Utilization of one or more of these SOPs will enable incident commanders to take advantage of as many of the available water supply points as possible. Personnel can operate from known standards using consistent terminology and expectations. Publication of a well-designed water supply delivery system will provide the opportunity to increase our effectiveness on the fire ground. These procedures will also establish primary contingency plans for loss of any municipal water supply.

Dispatch Procedures

On May 1, 1999, the Operations Committee of the Fire-Rescue Commission initiated a standard structure fire response to include 4 engines, 2 trucks, 1 rescue squad, an ambulance and 2 command officers. This dispatch assignment replaces the urban and rural dispatches that were non-standard. In areas that are pre-determined to be rural by the local fire rescue departments, two tankers are automatically dispatched, as well. Prior to this change, some departments requested only one tanker initially.

In addition to the two initial tankers, ***the WSWG recommends that a separate dispatch assignment be established called a "Water Supply Task Force" that comprises 2-tankers for water shuttle, a front-mount pumper to pump from a static or hydranted fill site, and an additional command officer to be dedicated to the water supply function.*** Similar to the existing "Safety Dispatch", and "Task Force" assignments, this new assignment would enhance the water supply delivery system by placing two tankers on the road initially, and at the command officer's request, place two additional tankers enroute to expand the water supply. The command officer would be dedicated to the water supply function as a sector officer who would report to the incident commander.

Justification for this increase in tanker usage lies in the test results for continuous fire flow as documented in the WSWG findings dated January 20, 1999. Utilizing any combination of Montgomery County Tankers, a 500 GPM continuous flow can be expected at 1.6 miles, and a 250 GPM continuous flow can be expected for the 4.8 mile shuttle. If longer shuttles and or, higher fire flows are required, additional tankers may be dispatched as required. The Water Supply Task Force is simply a more efficient way to have the CAD system recognize and recommend additional resources.

In spite of these recommended enhancements, the WSWG has identified a significant problem that will take the combined efforts of all elements of the MCFRS to correct. Presently, geographical box areas are established by the various LFRDs that pre-determine whether or not tankers are assigned to a given structure fire dispatch. This system needs improvement because pockets of areas without hydrants contained within an urban box area have resulted in the failure to dispatch tankers initially on a structure fire assignment. These areas have been identified as part of this report through a system-wide Standardized Training Project (STP) conducted in November 1998.

A house fire in the Sandy Spring FS-40 area in August of 1997 serves as a representative example of this problem. Norbrook Drive is located within an urban box area even though no hydrants are available on the street. The urban house fire assignment was dispatched, and units responded to a working fire. In the direction of travel, the closest hydrant was located a mile away. Tankers were then requested. Other attempts to secure water using alternate supply points were unsuccessful. Tankers were too far away and delayed due to another incident. Attempts to establish water from the hydrant one mile away was simply too time consuming to be effective. Units were eventually able to establish a water supply using a hydrant that was located through a wooded area in an adjacent neighborhood that did not appear on the reference map on board fire-rescue units.

Other potential examples exist throughout the county. For instance, Box Area 8-5 is classified in CAD as an urban box area by the LFRD. An area lacking hydrants known as Prathertown is located within that box area. The CAD

software recommends a structure fire response without the addition of tankers in this entire box area.

Extending this example, River Road begins in Glen Echo, FS-11's area and terminates in the Upper Montgomery, FS-14 area after passing through FS-10, FS-30, and FS-31's areas. River Road passes through a total of 20 box areas. Many portions of River Road are without hydrants, or hydrant spacing is such that tankers should be recommended at dispatch.

The WSWG met with representatives of the Emergency Communications Center to discuss this problem. As a result, two potential solutions were recommended.

The WSWG recommends that separate box areas be established for areas where entire streets without hydrants can be identified. By doing so, affected streets can be isolated within CAD assuring tankers will be assigned to the incident immediately. Using the examples above, Norbrook Drive and Prathertown Road would be assigned a unique box number.

In areas where the non-hydranted portions of a roadway change along the length of the road, (i.e.- River Road), then the "Block Face Node" feature of CAD should be employed. Specific and unique address ranges without hydrant coverage must be identified. Using the River Road example, each break in hydrant coverage throughout the twenty different box areas must be uniquely identified by address range using a separate block face node in CAD.

The WSWG recommends that separate block face nodes be established for areas where an entire street without hydrant coverage can be isolated using separate geographical box areas.

Individual streets without hydrant coverage were identified in the November 1998 STP project however, specific address ranges were not part of that project. Therefore the first step in correcting this problem will be to create a database that will identify separate address ranges for non-hydranted streets. This process will be time consuming and labor intensive. Accurate data must be gathered at the first-due response level, and then this data must be entered into the CAD system. ***The WSWG recommends that a project be initiated to identify all non-hydranted areas that will include specific and unique address ranges.***

Plans for a new 800 MHz Public Safety Radio and Mobile Data System are in place at this writing. The MCFRS should assure that the information gathered in this process will be transferred to the new radio system components and the software that drives the system. Creation of smaller *Fire Demand Zones*[6]

[6] Fire Demand Zones are proposed to be six square block areas, much smaller than existing geographical box areas.

will allow many more specific response assignments to smaller areas, optimizing the assignment of available resources to a given incident.

Hydrant Identification

To increase the visibility of fire hydrants to aid firefighters en route to incidents, many fire departments in the United States employ various marking systems or signs. While their use has been limited in Montgomery County to date[7], the WSWG was asked to address whether markers/signs would have a practical application in the county, possibly on a widespread basis[8].

The WSWG believes that quick identification of fire hydrants can be accomplished through two means – standardized hydrant maps using GIS and mobile data technology, and use of markings and signs to the greatest extent possible.

Related to this issue, the WSWG has identified the need to identify all municipal fire hydrants with a separate and unique identifier, possibly a five-digit number. This is necessary to utilize an existing hydrant file database within the CAD system so that the MCFRS can be properly notified when hydrants are taken out of service for any reason. Using this file will assure that the end users, (stations, and station personnel) will be able to identify alternate water sources when needed. This process should occur electronically and transfer to any planned GIS enhancements in the proposed radio/mobile data system. ***The WSWG recommends that a unique identifier be established for all fire hydrants in Montgomery County, including private hydrants.*** An integrated database available to the end users is an essential future consideration.

Hydrant Markers

Markers consist of reflective devices or material that are placed either on or next to hydrants, or in the roadway adjacent to hydrants. As apparatus approach marker-equipped hydrants in darkness, their headlights are reflected, thus aiding firefighters in finding them. Markers may be as simple as strips of Scotchlite™ attached to the hydrant, or distinctive reflectors embedded within the road surface. The latter device typically employs a distinctive blue lens that sets it apart from the standard amber lens found in highway lane markers. The blue reflectors can be seen up to 1000 feet away, according to manufacturer's sales literature. One model is designed to allow snow plows to pass across the device

[7] The hydrants along Oak Drive in Damascus, for example, have reflective green tape on their bonnets.

[8] While not part of the WSWG's original charge, the Fire Administrator added this task.

without causing damage. The WSWG obtained a sample of a *Fire-Lite Hydrant Spotter*™, but did not conduct a comprehensive field test to assess its effectiveness other than to set it on top of (vs. embedded within) the road surface during a night-time trial run to witness its reflectiveness.

Another type of marker that is employed by some fire departments outside Montgomery County is a reflective stake either attached directly on, or immediately next to, a hydrant. The primary purpose of these stakes is to mark a hydrant's location when snow has covered the hydrant, although the stakes are also useful in locating hydrants in darkness. The WSWG obtained a sample device of this type (known as *FlexStake FH*™; see Appendix N), composed of an orange-colored polycarbonate material with a reflective decal on top. The device is 4 feet high and can be attached to the hydrant bonnet or to the ground. According to the sales literature, the FlexStake is very flexible yet difficult to break and stands up to any weather conditions. The WSWG did not conduct a field test to assess the effectiveness of the FlexStake but believes that a device of this type may have limited application within hydranted semi-rural sections of the county.

The WSWG has learned that District Chief Tom Carr, in 1997, had begun researching the in-road reflective markers and had spoken to the Department of Public Works and Transportation about the possibility of installing hydrant markers as part of their on-going lane marking project. While the concept of hydrant markers was not supported, at that time, by senior Fire-Rescue Service management, ***the WSWG recommends that reflective hydrant markers be explored as a pilot test in both a rural and urban area.***

Hydrant Signs

A reflective sign posted near a fire hydrant is another means to quickly identify the locations of hydrants. In Howard County, Maryland, for example, reflective signs are in place to identify the locations of dry hydrants. The District 5 - Clarksburg Volunteer Fire Department has installed signs of this type near the 20 dry hydrants in its district. In addition to signs immediately adjacent to the dry hydrants, signs indicating the distance to each hydrant are posted at intersections along main roads to further assist fire department water supply apparatus. The signs were custom made by a local sign company in Sykesville. ***The WSWG recommends that similar signs be purchased and posted near all existing and future underground water tanks/cisterns and dry hydrants in Montgomery County.***

The addition of standardized reflective signs for all fire department connections is another enhancement that could significantly benefit apparatus operators and officers charged with locating FD connections to complete water

supply evolutions. Similar initiatives have been instituted in other jurisdictions. Locally, the University of Maryland, College Park campus uses high profile reflective signage to identify FD connections. The symbols used are those recommended by the NFPA.

Service Testing of Pumpers

Every front line attack pumper should be capable of delivering rated capacity safely and efficiently. Pumpers should undergo annual service tests that demonstrate that the pump-engine combination is capable of meeting the performance requirements of the original certification[9]. At the present time, this is not being done in Montgomery County. An underground tank and discharge port exist at the PSTA that is not fully utilized for this function. Performing this test annually, and after major repairs, is essential to providing reliable equipment that will meet the expectations of the end users.

In addition to pump capacity, the annual service test assures that:

- the pressure control device can control the discharge within prescribed limits
- all gages and flow meters are accurate
- the engine is capable of reaching its no load governed speed at rated capacity.

The WSWG recommends that the MCFRS develop a plan for the service testing of all fire department pumpers. NFPA 1911, "The Standard for Service Testing of Pumps on Fire Department Apparatus" calls for annual testing. ***The WSWG recommends a tri-annual test for fire department pumpers less than 5 years old, a bi-annual test for pumpers less than 10 years old, and an annual test for pumpers greater than ten years old.*** This will meet our local needs, while recognizing the need to conserve expenditures and still guarantee that the apparatus with the greatest need will be tested more frequently to assure the reliable operation of the pumper over the entire service life of the pumper. If this recommendation is adopted, a given pumper will be tested at manufacture, year 3, year 6, year 8, and year 10. Pumpers older than 10 years will be tested annually.

Future Insurance Ratings

As explained on pages 14-16 of this report, the ISO has moved away from the Fire Suppression Rating Schedule in cities and municipalities serving 250,000 people or more. Montgomery County has a current population of approximately

[9] NFPA standard 1911-1997 edition: "Standard for Service Testing of Pumps on Fire Department Apparatus" outlines the requirements and procedures for the annual service testing of fire department pumpers.

855,000 people and therefore is affected by this change. Application of the full Fire Suppression Rating Schedule is very labor intensive. Because of the detailed site visit and inspection requirements, the ISO has achieved favorable results with a computerized statistical rating based solely on fire loss statistics provided by the various insurance underwriters. Therefore, insurance ratings are now primarily determined by past annual fire loss history for a given area rather than a detailed evaluation of local capabilities every ten years.

The net results of an inadequate water supply, poor hydrant maintenance, or non-certified rural static sources cannot be ignored. The MCFRS should respond to this changing dynamic by assuming a leadership role in developing an on-going, working relationship with the WSSC, City of Rockville, and the Town of Poolesville to assure that fire protection needs are met. Sufficient attention can be directed to existing problems and future problems can be prevented. More importantly, a working relationship can be developed that could provide enhanced input in determining hydrant locations, hydrant inspection, defect reporting, and other issues that determine water supply reliability. ***The WSWG recommends that an ongoing relationship be developed with the various municipal water authorities to take full advantage of all opportunities to improve planning and technology changes.***

Seizing this opportunity to improve rural ratings, ***the WSWG recommends that resources be allocated and deployed to identify and certify all rural water supply points.*** This information should then be transferred in a standardized format that can be utilized in current and future mapping efforts. Alternate water supply resources could be strategically located in rural areas to: 1) reduce tanker shuttle time, and 2) provide initial fire attack water for groups of structures in various communities to improve future insurance ratings.

Class A Foam

Unlike Class B foam discussed earlier in this report, Class A foam is designed for use on wood and other Class A materials. Developed originally for forestry use, the technology has been improved to the point where more and more departments are exploring the use of Class A foam for inside structural fire fighting.

Specifically, pumper enhancements that produce a special type of Class A foam known as compressed air foam systems (CAFS) is reported to increase the effectiveness and efficiency of plain water for fire suppression. The driving force in many departments is to utilize CAFS as a method to reduce staffing on suppression units, or to reduce the number of suppression units necessary by decreasing the workload of busy units by increasing their efficiency.

CAFS technology was introduced to the structural fire fighting force nationwide around 1990. After nearly a decade, the technology has failed to gain wide spread acceptance. This is most likely due to the associated costs of the equipment necessary to produce compressed air foam. Current estimates suggest that the system will add approximately thirty-five thousand dollars to the cost of a pumper, plus the costs associated with maintenance of the system and foam replenishment.

The focus of this evaluation is strictly limited to the ability of CAFS to enhance plain water to suppress fires, and therefore conserve limited water resources.

Empirical trials and tests conducted by a variety of municipal fire departments across the nation and cited in the U.S. Fire Administration's Report 083 (1996) by Jeff Stern and J. Gordon Routley listed the advantages of CAFS for structural fire fighting as follows:

- CAFS foams allow faster fire suppression than plain water
- CAFS foam increases efficiency and conserves water
- CAFS foam can be produced at a relatively low cost
- CAFS attack lines are lighter than plain water attack lines
- CAFS attack streams can reach twice as far as normal attack streams

It is further estimated that CAFS will extinguish a given fire in one-quarter of the time using only 30 percent of the water needed when plain water alone is applied. This makes it very difficult to ignore the potential of compressed air foam systems.

Any technology that extends the useful life of fire fighting water by seventy percent should be explored further. The potential for this technology to benefit the MCFRS, particularly in rural areas where water is limited, is obvious.

The DFRS apparatus specifications committee has considered a pilot test with CAFS on a single unit in the past. The concept was rejected because of up front costs associated with unproven technology. ***The WSWG recommends that a future pumper be purchased and equipped with a Compressed Air Foam System to pilot test the technology.*** This unit should be deployed in an area that provides a mix of urban, suburban, and rural hazards with a busy suppression workload. Stations 28, 29, or 31 may be appropriate.