

THE UNIVERSITY of
TENNESSEE 

MUNICIPAL TECHNICAL
ADVISORY SERVICE

ETOWAH, TENNESSEE

ISO Review



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Qualification Statement

Reviewing the ISO Fire Suppression Rating Schedule (FSRS) and applying the requirements to an individual community is a subjective process affected by the judgment and application of the person completing the review. The calculations and recommendations listed in this report are interpretative and may not be the same calculations and determinations made by an ISO field representative, but the reviewer used his best judgment and good faith in applying the FSRS requirements to the City of Etowah. Community fire protection is a local policy decision. This report should be used as a reference, guide, and planning tool for local fire protection. The City of Etowah, and in particular the Etowah Fire Department, should monitor continuously the community's risk to fire and other disasters and plan accordingly. MTAS has used due diligence in gather information and applying the Fire Suppression Rating Schedule (FSRS) to the community based on the information available. MTAS does not represent or speak for the Insurance Services Office, and MTAS does not warrant that an ISO field representative would come to the same conclusions or recommendations described in this report.

This study was first started in 2012, and the ISO Fire Suppression Rating Schedule in effect at that time was used for this study. Delays in getting some data resulted in this study taking longer than expected. The water flow data used in this study is the same flow data used in 1993 as current flow data obtained using AWWA testing procedures was not available.

On July 1, 2013, a revised Fire Suppression Rating Schedule took effect, and some of the requirements for evaluating community fire protection changed, especially in communications and distribution. Nationwide, the revisions in the fire suppression rating schedule result in no change in the ISO rating for 71% of communities, an improvement in the rating in about 15% of communities, and a worsening of the rating in about 14% of communities. This study shows that Etowah has made improvements in the fire department and the water supply since 1993, so obtaining a better ISO rating of Class 4 is certainly possible. Therefore, Etowah should use this study as a guide to improving community fire protection features that meet local needs.

Background

The last ISO evaluation of Etowah's fire protection capability occurred in January 1993. In May 2011, the Etowah City Council assigned a committee to review the present conditions of the Etowah, Tennessee Fire Department and research the possibility of achieving a better ISO classification. The department presently is an ISO Class 5 fire department.

To achieve this mission, the team members listed below each collected sectional data and information that has been used to compile a study of the fire department's potential to improve the ISO rating. A "Plan of Services" and an "ISO Improvement Impact Analysis" were included as part of the assessment.

2011 Team Members:

- City Manager Matthew Gravley
- Fire Chief Dale Ammons
- MTAS Fire Contractor David Hodges

The team collected, compiled and assembled the data into a report that included the three following sections.

- Section 1 – Plan of Services
- Section 2 – ISO Improvement Impact Analysis
- Section 3 – Improvement Recommendations

The report was completed and delivered to the city in August 2011. The results of the study showed a decrease in the score for the water system. In early 2012, Etowah requested additional information on this change in the score for the water supply, but MTAS was not able to provide the information because MTAS did not retain the research material used to produce the study. Fire Chief Mike Moore asked MTAS to revisit the study to see if MTAS could make recommendations for improvement. Since more than a year had elapsed since the first MTAS study, and since ISO looks at the preceding twelve months when evaluating a community, MTAS decided to conduct a new study and to focus on the ISO grading schedule component as the original recommendations for improvement in the report delivered to Etowah in August 2011 remain valid.

This report will cover the review of communication, the fire department, and the water system following the recommendations of ISO's Fire Suppression Rating Schedule (FSRS).

Executive Summary

The last ISO evaluation of Etowah's fire protection capability occurred in January 1993. In May of 2011, MTAS began an Insurance Service Office (ISO) Study for the City of Etowah. This study explored the three key categories to fire response and evaluated some additional fire department services. The results of the study showed a decrease in the score for the water system. Etowah requested additional information on this change in the score for the water supply, but MTAS was not able to provide the information because the research material used to produce the study was lost. In 2012, Fire Chief Mike Moore asked MTAS to revisit the study to see if MTAS could make recommendations for improvement. Since more than a year had elapsed since the first MTAS study, and since ISO looks at the preceding twelve months when evaluating a community, the decision was made to conduct a new study and to focus on the ISO grading schedule.

ISO evaluates the fire protection in a community using the Fire Suppression Rating Schedule (FSRS) and awards a Public Protection Classification (PPC) based on total points earned on a scale of zero to one hundred. It is common practice to refer to the PPC as the ISO rating. It is also common practice to refer to the PPC as the *fire department's* ISO rating, but this is not correct. The PPC is composed of a score awarded by the evaluation of three components that make up a community's fire defense program:

- Communications,
- The fire department, and
- The water supply.

Each component carries a percentage that will equate to the ISO rating. ISO rates communications (the dispatch center) on receiving and handling fire alarms and accounts for ten-percent of the rating, the fire department accounts for fifty-percent of the rating, and the water supply accounts for the remaining forty-percent. As in any city, each category had strengths and weaknesses. This study hopes to build on the weaknesses and as a result improve the ISO rating for the City of Etowah.

**ISO Public Protection Classification
City of Etowah**

FSRS Item	Maximum Points Available	Last ISO Survey Date	MTAS Study Date	MTAS Study Date
Receiving and Handling Fire Alarms		01-1993	08-2011	05-2013
Telephone Service	2.00	1.80	1.80	1.30
Credit for Operators	3.00	1.50	2.25	2.00
Credit for Dispatch Circuits	5.00	2.50	5.00	2.50
Total – Alarms	10.00	5.80	8.63	5.80
Relative Classification		5	2	5

Fire Department				
Engine Companies	10.00	8.31	5.80	8.65
Reserve Pumpers	1.00	.80	0.00	0.00
Pump Capacity	5.00	5.00	3.20	5.00
Ladder Service	5.00	3.60	0.00	2.05
Reserve Ladder Service	1.00	.80	0.00	0.14
Credit for Distribution	4.00	2.80	2.9	2.26
Credit for Company Personnel	15.00+	2.26	8.6	3.20
Credit for Training	9.00	1.26	0.00	5.80
Total for Fire Department	50.00+	24.11	20.50	27.10
Relative Classification		4	4	4

Water Supply				
Credit for Water System	35.00	31.70	19.6	31.70
Credit for Hydrants	2.00	1.50	1.80	1.61
Credit for Inspection & Condition of Hydrants	3.00	1.64	2.60	2.73
Total for Water Supply	40.00	35.02	25.00	36.04
Relative Classification		2	4	2

Summary of Credit				
Receiving and Handling Fire Alarms	10.00	5.80	8.63	5.80
Fire Department	50.00	24.11	20.50	27.10
Water Supply	40.00	35.02	25.00	36.04
Divergence	0	-7.87	-4.91	-7.18
Total Credit	100.00	57.06	49.22	61.76
Public Protection Classification (PPC)		5	6	4

Table 1 – Evaluation Analysis Summary

Receiving and Handling Fire Alarms

This item reviews the telephone facilities provided for the public to report fires, the telecommunicators on duty at the communication center, and the equipment used to dispatch emergency response units to the fire.

Etowah scores 5.8 out of 10 points, as determined by a review of the individual components of the ISO requirements for receiving and handling fire alarms.

COMMUNICATIONS		
400. GENERAL: This item reviews the telephone facilities provided for to report fires, the telecommunicators on duty at the communication center, and the equipment used to dispatch emergency response units to the fire.		
410. TELEPHONE SERVICE (TS): Telephone service should comply with NFPA Standard 1221-Installation Emergency Services Communications Systems Maintenance and Use Of. The number of telephone lines reserved for receiving fire calls and business calls, at any one communication center, is indicated below:		
Population Served by Communications Center: 52,508	NUMBER OF RESERVED LINES	
POPULATION SERVED	Fire	Business
Up to 40,000	1	1
40,001 - 125,000	2	2
125,001 - 300,000	3	3
Over 300,000	4	3
A. Other Emergency Calls: Are other emergency calls answered on the 911/fire lines? When emergency calls for other than fire are received over the fire number, double the number of needed reserved fire lines indicated above.		Yes
B. Automatic Equipment: Does the community have known automatic dialing equipment calling to report fires? Automatic telephone dialing equipment used to report alarms from private fire detection systems should have an emergency line separate from the normal fire and business numbers.		No
C. Business Number: Are both the emergency phone number and a business telephone number listed in the telephone directory? When only one telephone number is listed in the telephone directory, no credit shall be given for a reserved fire line.		Yes

D. Progression: Do calls progress from the emergency lines to the business lines? When the number of reserved fire lines equals or exceeds the number of needed fire and business lines, and there is progression in the fire lines, credit shall be given for progression from the fire lines to the business lines even if there is no progression.			No
411. REVIEW OF TELEPHONE LINES (TL):	Needed	Provided	Points Awarded
A. Number of needed fire lines provided, up to 25 points	4	2	12.5
B. Number of needed fire, business and private alarm lines provided, up to 25 points	2	1	12.5
C. Progression of emergency calls to business lines, 10 points			0
D. If detailed information of a fire is received and transmitted through more than one communication center, DEDUCT 20 points			0
TELEPHONE LINES (TL) TOTAL POINTS			25
		Points Available	Points Awarded
412. REVIEW OF TELEPHONE DIRECTORY (TD):			
A. Fire emergency telephone number printed on the inside front cover or front page of the white pages directory. Note: Blank lines for the convenience of customers, even with headings of FIRE or EMERGENCY, are not eligible for credit.		10	10
B. Both the number to report a fire and the fire department business number are listed under "Fire Department" in the white pages		5	5
C. Both the number to report a fire and the fire department business number are listed under the name of the city in the white pages		5	5
D. If the numbers for individual fire stations are listed, DEDUCT		-10	0
TELEPHONE DIRECTORY (TD) TOTAL POINTS			20
413. REVIEW OF RECORDING DEVICE (RD): With arrangement for immediate playback		20	20

414. CREDIT FOR TELEPHONE SERVICE (CTS): TS = TL + TD + RD CTS = TS/100 x 2		2	1.3
420. NUMBER OF NEEDED OPERATORS (NO): The number of operators on duty to handle fire calls should be in accordance with NFPA Standard 1221. No credit is given when the telephone line for reporting fires extends to a number of locations, such as residences, places of business or fire stations, and no definite schedule of attendance at the telephone is provided.			
421. REVIEW OF OPERATORS (PO):			
Total number of alarms the communications center/PSAP processes annually. Includes all police, fire, EMS, 911, and other emergency alarms processed by the communications center/PSAP. The FSRs actually uses the number of <u>total emergency alarms</u> of all types, not the number of telephone calls received or processed.		65,000	
Number of Needed Operators		6	
	Number of Operators on Duty	Points Available	Points Awarded
A. Number of Operators on Duty (OD): (OD)(80)/NO (up to 80 points)	4	80	53.33
B. Number of Operators Awake at All Times (OA): (OA)(20)/NO (up to 20 points) PO = A + B	4	20	13.33
422. CREDIT FOR OPERATORS (CTO): CTO = PO/100 x 3		3	2.0
430. DISPATCH CIRCUITS (DC): Dispatch circuit facilities used to transmit alarms to fire department members should be provided in accordance with the general criteria of NFPA Standard 1221. If all responding fire fighters are in the same building as the communication center, and are alerted, no dispatch circuit is needed. No credit is given for equipment installed but not used.			
Does the communications center/PSAP dispatch more than 729 alarms annually? If yes, ISO requires a primary and a secondary dispatch circuit.		Yes	
A. Dispatch Circuit(s) Provided: Apply <u>only one</u> of the following for each needed dispatch circuit. Maximum credit for this subitem is 40 points.			
	NUMBER OF NEEDED CIRCUITS		
	1	2	

		Primary	Secondary
1. Circuit to fire station where personnel are on duty:			
a. The circuit consists of radio, voice-amplification, facsimile, or teletype facilities.	40	20	20
Points Awarded		20	
b. The circuit indicates only the box number or street intersection.	30	15	15
Points Awarded			
When the circuit indicated above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	10	5	5
Points Awarded			
c. The circuit consists only of a telephone circuit.	10	5	5
Points Awarded			
2. Radio Receivers Carried By Members:			
The circuit consists of a radio transmitter at the communication center and receivers <u>carried</u> by members.			
a. Voice receivers.	40	20	20
Points Awarded			20
b. Coded tone receivers.	30	15	15
Points Awarded			
c. Non-coded tone receivers.	20	10	10
When the circuit indicated in "b" or "c" above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	5	3	3
Points Awarded			
3. Circuit To Outside Coded Sounding Device:			
The circuit is to an outside coded sounding device to notify members.	30	15	15

Points Awarded			
When the circuit indicated above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	5	3	3
Points Awarded			
4. Circuit To Outside Non-coded Sounding Device: The circuit is to an outside non-coded sounding device to notify members.	20	10	10
Points Awarded			
When the circuit indicated above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	5	3	3
Points Awarded			
5. Radio To Members' Homes and Businesses: The circuit consists of a radio transmitter at the communication center and voice receivers in the homes and businesses of members.	20	10	10
Points Awarded			
6. Group Alerting Telephone Circuit: The circuit consists of a group alerting telephone circuit to telephones in the homes and business of members.	20	10	10
Points Awarded			
7. No Circuit Provided:	0	0	0
Points Awarded			
B. Monitoring for Integrity of Circuit:	30	30	---
Points Awarded			
C. Dispatch Recording Facilities at Communication Center:	10	5	5
Points Awarded		5	5

D. Emergency Power Supply:			
Apply only one of the following for each needed dispatch circuit. When a dispatch circuit is dependent upon power at both transmitting and receiving facilities, credit the emergency power arrangement with the least points. Maximum credit for this sub-item is 20 points.			
1. Batteries and manually-started generator:	20	10	10
Points Awarded			
2. Automatically-started generator:	20	10	10
Points Awarded			
3. Manually-started generator:	15	8	8
Points Awarded			
4. Batteries only: When strength and duration of batteries meet Standard, add	10	5	5
Points Awarded			
5. No emergency power provided:	0	0	0
Points Awarded			
E. When no circuit is needed:	100	---	---
Points Awarded			
Note: If some companies and members are notified by one method and others by another method, prorate the points by the number of on-duty, or equivalent call or volunteer, members alerted by each method.			
Dispatch Circuit Summary		Primary	Secondary
Total points awarded for all dispatch circuits		25	25
432. CREDIT FOR DISPATCH CIRCUITS (CDC):		Points Available	Points Awarded
CDC = PC/100 x 5		5	2.5
440. CREDIT FOR RECEIVING AND HANDLING FIRE ALARMS (CFA): CFA = CTS + CTO + CDC		Points Available	Points Awarded
Credit for Telephone Service (CTS)		2	1.3
Credit for Operators (CTO)		3	2.0
Credit for Dispatch Circuits (CDC)		5	2.5
CREDIT FOR RECEIVING AND HANDLING FIRE ALARMS (CFA)		10	5.8

Credit for Receiving and Handling Fire Alarms

CFA = 5.80 out of 10 points, or a relative ISO Class 5.

Fire Department

Engine Companies

Factors such as the community's basic fire flow, the distribution of companies, and operations determine the number of needed engine companies. For Etowah, the determining factor is the community's basic fire flow. From the Needed Fire Flows (NFF), determined in Item 340, the 5th highest is considered to be the Basic Fire Flow. The NFF for buildings in the city rated and coded sprinklered are not considered in determining the basic fire flow. The maximum Basic Fire Flow is 3,500 gpm. As shown in Table 2, Etowah's fifth highest fire flow is the Buckner Funeral Home at 3,000 gpm. Therefore, the community's basic fire flow is 3,000 gpm.

Risk Property	Needed Fire Flow
Advance Spa Design	6,000
301 Tennessee (multi-tenant)	5,000
United Wholesale Discount Store	4,000
Sleep Inn	3,500
Buckner Funeral Home	3,000
Table 2 – Etowah Basic Fire Flow Calculation	

The basic fire flow of 3,000 gpm means Etowah needs three engine companies.

BASIC FIRE FLOW, GPM	NUMBER OF NEEDED ENGINE COMPANIES
500 – 1000	1
1,250 – 2,500	2
3,000 – 3,500	3
Table 3 – Number of Needed Engine Companies by Basic Fire Flow	

Etowah has three engine companies (two engines and a quint). MTAS determined that the credit for engine companies is 8.65 out of 10 points.

Reserve Pumpers

Etowah needs a reserve pumper. Etowah has three pumpers total, including first out and reserve apparatus. Since Etowah needs three pumpers (engines), Etowah has no reserve pumper, so the credit for a reserve pumper is zero.

Pump Capacity

Etowah needs to place 3,000 gpm of pump capacity on the scene of a structure fire.

Engine 13	1,250 gpm
Engine 131	1,250 gpm
Ladder 13 (Quint)	1,500 gpm
Table 4 – Pump Capacity of Etowah Engines	

Etowah's three engines have a combined pump capacity of 4,000 gpm, so Etowah's credit for pump capacity is 5 out of 5 points.

Ladder Service

Etowah needs one ladder truck and Etowah has one ladder truck in the quint. However, since the quint is also needed as an engine company, ISO credit the quint first as an engine and second as a truck, which means Etowah will receive full credit for the engine and half-credit for the ladder truck. Ladder 13 scores 4.11 points out of 5 points, but this score is reduced by 50% because Ladder 13 is receiving full credit as one of three needed engines, so the awarded score is 2.05 out of 5 points.

Reserve Ladder Service

Etowah needs a reserve ladder. Etowah has one first out ladder truck and no reserve ladder truck. However, Etowah does have Service 13, which carries a limited amount of equipment that is also carried on a ladder truck. Under the current FSRs, ISO will credit this equipment. MTAS determined that Etowah earned 0.14 out of 1 point for credit for a reserve ladder.

Credit for Distribution

Distribution evaluates the built-upon area of the city within 1.5 miles of an engine and 2.5 miles of a ladder truck. Approximately 66% of Etowah is within 1.5 miles of an engine company, and 100% of Etowah is within 2.5 miles of a ladder truck. Distribution includes the equipment carried on the apparatus as well. Etowah earned 2.26 out of 4 points for distribution.

Credit for Company Personnel

The fire department maintains two (2) personnel on-duty and averaged 5.7 off-duty paid firefighters responding on structure fires. MTAS calculates the credit for company personnel at 3.2 out of 15 points.

Credit for Training

580. TRAINING (T)			
A. Facilities, Aids and Use (Ti1):			
	Points Available	Available/ Credit	Points Earned
1. Facilities and Aids (FA)			
Drill Tower	8	0	0
Fire Building (including smoke room)	8	0	0
Combustible Liquid Pit	5	1	5
Library and Training Manuals	2	1	2
Slide and Movie Projectors and pump and hydrant cutaways	2	1	2
Training area (this may include streets or open areas when no other training facilities are provided)	10	0	0
TOTALS	35		9
2. Use (FU) Commentary available for this item			
Multiply the points credit for facilities and aids by the following factors for use of the facilities and aids by all company members:			
	Maximum	Number	Score
a. Half-day (3 hours) drills, 8 per year (0.05 each)	0.40	8	0.40
b. Half-day (3 hours), multiple-company drills, 4 per year (0.10 each)	0.40	4	0.40
c. Night drills (3 hours), 2 per year (0.10 each)	0.20	2	0.20
TOTALS	1.00		1.00
Facilities and Aids Score Ti1 = (FA) (FU)	9	1.00	9.00
Note: A single company drill may receive credit under a and c; a multiple company drill may receive credit under a, b, and c.			
	Points		
B. Company Training (Ti2): Company training at fire stations, 20 hours per member per month, up to	25	Reported 220 hours per FF	25.0
C. Classes for Officers (Ti3): 6 hours per year for all officers, up to	15	Reported 15 hours per officer	15.0
D. Driver and Operator Training (Ti4): 12 hours per year for all drivers, up to	2	Reported 4 hours per driver	0.7

E. New Driver and Operator Training (Ti5): Classes for new drivers and operators, 40 hours, up to	2	Reported 4 hours per new driver	0.2
F. Training on Radioactivity (Ti6): 3 hours per member per year	1	Reported 4 hours per FF	1.0
G. Recruit Training (Ti7): 240 hours per recruit, up to	5	240	5.0
H. Pre-Fire Planning Inspections (Ti8): Pre-fire planning inspections of each commercial, industrial, institutional and other similar type building should be made twice a year. Records of the inspections should include complete and up-to-date notes and sketches. Use the point credit for frequency of inspections from Item 630 times 15/100.	15	60.81%	9.1
I. The sum of points credited in Item 580.A through 580.H shall be reduced by up to 20 points for incomplete records (Ti9)	Note: This report did not include a detailed review of individual training records. No deduction taken.		
Items B through H	65		56.0
Item A (Facilities and Use)	35		9.0
TOTAL	100		65.0
ITEM 581. CREDIT FOR TRAINING (CT):			5.8

Credit for Fire Department (CFD):

Item 590 summarizes the credit for the fire department.

The following score is predicted based on the information provided, on the assumption that everything is in order, that all records are complete and available, and:

1. All required equipment is on all apparatus,
2. All incident responses are maintained as currently setup,
3. Training and records continue as they have in the past,
4. Additional manpower is added as recommended, and
5. Minimum staffing guidelines are followed.

$$\text{CFD} = \text{CEC} + \text{CRP} + \text{CPC} + \text{CLS} + \text{CRLS} + \text{CD} + \text{CCP} + \text{CT}$$

$$\text{CFD} = 8.65 + 0 + 5.00 + 2.05 + 0.14 + 2.26 + 3.20 + 5.80$$

CFD = 27.10 out of a possible 50.00+ points, or a relative ISO Class 5.

Water Supply

Item 600 reviews the water supply system that is available for fire suppression in the city. The credit for the water supply includes an evaluation of:

- the maximum daily consumption rate
- the minimum pressure in the water system
- the ability of the water system to deliver an adequate fire flow for a given duration, which is 3 hours for Etowah based on the community's basic fire flow of 3,000 gpm
- the minimum water storage available
- the pumping capacity
- the filter capacity
- the water source
- emergency water supplies (if any),
- the fire department supply (if any),
- the capacity of the distribution system, and
- the distribution of fire hydrants.

Etowah has a good water department and the water supply works is capable of meeting the fire flow demands of the city. The limiting factors are the distribution of fire hydrants and the size of some of the water mains. Appendix XX contains additional details on the water system.

600. GENERAL:
This item reviews the water supply system that is available for fire suppression in the city.
601. PART OF CITY UNPROTECTED:
If any built-on area of the city is not within 1,000 feet of a recognized water system, the unprotected area may receive Class 9 (See Items 801 and 802).

<p>602. MAXIMUM DAILY CONSUMPTION RATE (MDC): The maximum daily consumption rate is the average rate of consumption on the maximum day. The maximum day is the 24-hour period during which the highest consumption total is recorded in the latest 3-year period. High consumption that will not occur again due to changes in the system, or that was caused by unusual operations, will not be considered.</p> <p>When no actual figure for maximum daily consumption is available, it will be estimated on the basis of consumption in other cities of similar character and climate. Such estimates will be at least 50 percent greater than the average daily consumption. When a system is in 2 or more service levels, consider the total maximum daily consumption that must pass through the service level being reviewed.</p>	<p>3.87 MGD on 06/29/2012</p> <p>Average daily consumption over the last 12 months 2.96 MGD</p> <p>Maximum daily consumption is 2,688 GPM</p>
<p>603. MINIMUM PRESSURE: A water system is reviewed at a residual water pressure of 20 psi.</p>	<p>The fire department complies with the 20 psi residual pressure requirement</p>
<p>604. FIRE FLOW AND DURATION: The fire flow duration should be 2 hours for Needed Fire Flows (NFFi) up to 2,500 gpm, and 3 hours for Needed Fire Flows of 3,000 and 3,500 gpm.</p>	<p>Needed fire flow is 3,500 gpm for 3 hours (630,000 gallons)</p>
<p>605. SERVICE LEVEL: A service level is a part of the city distribution system that is served by one or more sources of supply but that is separated from the remaining distribution system by closed valves, check valves or pressure regulating equipment, or is not connected.</p> <p>When a system is supplied from 2 or more sources or supply works, the credit shall be based upon the combined protection provided from all sources or supply works.</p>	<p>The system was reviewed as one service level</p>
<p>610. REVIEW OF SUPPLY SYSTEM: The ability of the water supply system to deliver the Needed Fire Flow (NFFi) at representative locations throughout the city is reviewed in Items 611 through 616. For each representative location, the supply works, mains, and hydrant distribution are reviewed separately.</p>	

<p>611. SUPPLY WORKS: The absolute minimum supply available from water sources under extreme dry weather conditions should not be taken as the measure of the normal ability of the source of supply. The normal sustained flow of supplies should be used as the normal capacity of the source. If the supply is regularly reduced for a period exceeding one month per year, prorate the available supply by the time available.</p>	
<p>A. Minimum Storage (MS_i): The average daily minimum water storage maintained is the maximum amount that can be credited. For storage floating on the distribution system, only the portion of average daily minimum storage that can be delivered at the required residual pressure, and for the fire duration at the point of use, shall be credited. (MS) is the sum of all these storages ($MS = \sum MS_i$) available at the test location for the fire duration, expressed in gpm.</p> <p>For ground or below-ground storage, where the average daily minimum storage must be repumped, the storage is credited, or is limited by pumps under PUi according to the capacity of the pumping facility for the fire duration.</p> <p>When a city experiences large seasonal fluctuations of population and therefore wide variations in consumption, the average daily minimum storage will be considered at the time when consumption is average for the maximum population.</p>	<p>Clearwell: Average daily minimum water storage: 895,000 gallons.</p> <p>Floating on the system: Average daily minimum water storage: 8,675,000 gallons.</p> <p>For a BFF of 3,500 gpm, MS credit is 48,194 gpm</p>
<p>B. Pumps (P_{Ui}): Pumps should be credited at their effective capacities when delivering at normal operating pressures. The effective capacity may be limited by filters, softeners, or other devices in suction or discharge lines, and, when pumping stored water their effective capacity may be limited by the average minimum daily storage. The total pumping capacity (PU) shall be the sum of all pump facilities ($PU = \sum P_{Ui}$) available at the test location, expressed in gpm.</p> <p>When there are 2 or more pump lifts in series, the effective pump capacity is the capacity of the lift with the lowest total capacity.</p> <p>When the same pumps can operate in 2 or more lifts, they shall be credited in each lift to determine the lift with the lowest total capacity.</p>	<p>Actual high-lift (HSP) pump capacity is 8,542 gpm</p> <p>For a 4-hour fire flow, pump capacity is limited by the clearwell supply and filter capacity.</p>

<p>C. Filters (FLi): Filters may be considered as capable of operating at a reasonable overload capacity based on records. When filters limit the capacity of subsequent pumping stages, consider them as a pump capacity limit (PU_i). When filters deliver water directly into the distribution system, without pumping, the total filter capacity (FL) shall be the sum of all filter capacities (FL = $\sum FL_i$) available at the test location, expressed in gpm. Filter capacity is generally the water treatment plant capacity.</p>	<p>Combined filter capacity is 3,840 gpm</p>
<p>D. Emergency Supply (EMi): The ability to utilize emergency supplies through connections from other systems or from separate sources, storage, or equipment not normally used shall be considered in reviewing the system. Credit shall be given for emergency supplies that come in automatically.</p> <p>Credit will also be given for other emergency supplies when sufficient supply is available on the system being reviewed to maintain the total rate credited during the period that would elapse before delivery is possible from the emergency supplies. The total emergency supply capacity (EM) shall be the sum of all emergency supplies (EM = $\sum EM_i$) available at the test location, expressed in gpm.</p>	<p>There is no emergency supply</p>
<p>E. Suction Supply (SSi): Where bays, rivers, canals, streams, ponds, wells, cisterns, or other similar sources are available as suction supply for fire department pumpers, the suction supply shall be considered with respect to its ability, including accessibility, availability during freezing weather, floods, droughts, or other adverse conditions to satisfy the Needed Fire Flow (NFFi) at test locations. The total suction supply (SS) credited shall be the sum of suction supplies (SS = $\sum SS_i$) at the test location for the fire duration, or the capacity of the fire department pumping equipment, whichever is less, expressed in gpm.</p>	<p>There are no suction supply locations</p>

<p>F. Fire Department Supply (FDS): Supply delivered by fire department vehicles carrying or relaying at least 250 gpm to the fire shall be credited. This application rate shall be obtained within 5 minutes of arrival at the fire site, and shall continue for the fire duration of the Needed Fire Flow (NFF_i). If the rate of flow can be increased within 15 minutes of arrival at the fire site, and can be continued for the fire duration of the Needed Fire Flow, the higher rate will be credited.</p> <p>The travel time of apparatus shall be calculated from the formula: $T = 0.65 + 1.7D$, where T = minutes and D = miles.</p> <p>Slower speeds will be used for underpowered apparatus, or apparatus laying hose lines.</p> <p>The fire department supply (FDS) shall be the capacity of the supply for the fire duration, the capacity of the source pumping equipment, the capacity of the delivery equipment, or the capacity of the final delivery pumping equipment, whichever is least, at the test location, expressed in gpm.</p>	<p>There is no fire department supply (tanker) credit</p>
<p>612. SUPPLY WORKS CAPACITY (SWC_i):</p> <p>Calculate the supply works capacity, considering the fire flow duration, for each representative test location. Express the result in gpm.</p> <p>$SWC_{ik} = [(MS = PU + FL + EM) - MDC] + SS + FDS$ for one supply</p> $SWC_i = \sum_{k=1}^n SWC_{ik}$ <p>Where 2 or more supplies are available at a test location, where n = number of supplies.</p>	
Item 611.A Minimum Storage (MS ₁)	48,194
Item 611.B Pumps (PU ₁)	8,542
Item 611.C Filters (FL ₁)	0
Item 611.D Emergency Supply (EM ₁)	0
Item 602 Maximum Daily Consumption	2,688
Item 611.E Suction Supply (SS ₁)	0
Item 611.F Fire Department Supply (FDS)	0
Item 612 Supply Works Capacity	54,048

613. MAIN CAPACITY (MCi):

The normal ability of the distribution system to deliver Needed Fire Flows (NFFi) at those test locations considered in Item 612 shall be reviewed. The results of a flow test at a representative test location will indicate the ability of mains to carry water to that location.

If tests are made on 2 or more systems or service levels at the same location, credit will be given for the sum of the test results on each system, or service, up to the limit of supply, for the fire flow duration at that location.

MCi = Tested gpm at 20-psi residual pressure.

614. HYDRANT DISTRIBUTION (HDi):

This item reviews each hydrant within 1,000 feet of a representative test location, measured as hose can be laid by apparatus, to satisfy the Needed Fire Flow (NFFi). Credit up to 1,000 gpm from each hydrant within 300 feet of the location, 670 gpm from hydrants within 301 to 600 feet of the location and 250 gpm from hydrants within 601 to 1,000 feet of the location. The normal distribution of hydrants in the vicinity of those test locations considered in Items 612 and 613 shall be evaluated.

When there are 2 or more systems or services distributing water at the same location, credit shall be given on the basis of the joint protection provided by all systems and services available.

A. Sub-standard type hydrants, with at least one fire department outlet, will be considered if capable of delivering at least 250 gpm.

B. A cistern or other suction point shall be capable of supplying 250 gpm for at least 2 hours to be recognized.

C. The maximum credit for a hydrant may be limited by A or B above and shall be limited by the number and size of outlets as follows:

Outlets	Maximum Credit
At least one pumper outlet	1,000 gpm
Two or more hose outlets, no pumper outlet	750 gpm
One hose outlet only	500 gpm

HD_{ik} is the creditable capacity for each hydrant within 1,000 feet of the test location, expressed in gpm, where n = the number of hydrants within 1,000 feet of the test location.

$$HD_i = \sum_{i=1}^n HD_{ik}$$

615. CAPABILITY OF WATER SYSTEM AT TEST LOCATION (TLCi):			
The creditable rate of flow at each test location is the lowest of NFF _i , SWC _i , MC _i or HD _i .			
This item measures the results of individual flow tests at key locations and compares the needed fire flow (NFF) against the available fire flow. Credit is given based on the <u>lowest</u> of either needed fire flow, supply works capacity, main capacity, or hydrant distribution.			
616. CREDIT FOR SUPPLY SYSTEM (CSS):			
CSS = (TLC/NFF) x 35			
TLC = Capability of the water system at the test location			
NFF = Needed fire flow at the test location			
TLC			20,150
NFF			22,250
		Points Available	Earned Credit
616. CREDIT FOR SUPPLY SYSTEM (CSS):		35	31.70
ITEM 620 - HYDRANTS - SIZES, TYPE AND INSTALLATION (CH)			
Description of hydrant	No. of hydrants	Points Available	Earned Credit
A. 6-inch or larger branch and a pumper outlet, with or without 2.5" outlets	55	100	22.36
B. 6-inch or larger branch, no pumper outlet, but with two or more 2.5" outlets, or with small foot valve, or with small barrel (<5 inches)	191	75	58.23
C. With only one 2.5" outlet	0	25	0.00
D. With less than a 6-inch branch	0	25	0.00
E. Flush type	0	25	0.00
F. Cistern or suction point	0	25	0.00
TOTAL	246		80.59
621. CREDIT FOR HYDRANTS (CH):			
Credit for hydrants (CH) [Maximum out of 2 points] CH = (PH/100)*2			1.61
Note 1: Deduct 2 points for each 10 percent of the hydrants not opening in the direction of the majority, or with operating nuts different from the majority.			0
Note 2: Deduct 10 points if more than one thread is used for pumper or hose outlets.			0
Note 3: Maximum points under this item are 100.			

630. INSPECTION AND CONDITION OF HYDRANTS:

Inspection and condition of hydrants should be in accordance with American Water Works Association Manual M-17 - Installation, Maintenance, and Field Testing of Fire Hydrants.

A. Inspection (HI):

The frequency of inspection is the average time interval between the 3 most recent inspections.

Frequency of Inspections	Points	Indicate the frequency of inspection
1/2 year	100	X
1 year	80	
2 years	65	
3 years	55	
4 years	45	
5 years or more	40	

Note 1: The points for inspection frequency shall be reduced by 10 points if the inspections are incomplete. An additional reduction of 10 points shall be made if hydrants are not subjected to full system pressure during inspections. If the inspection of cisterns or suction points does not include actual drafting with a pumper, deduct 40 points.

Note 2: If there are no records of claimed inspections, deduct an additional 20 points.

The percentage of the hydrants that are flushed as part of the inspection.	100%
The percentage of the hydrants that are tested for leaks (static pressure test) as part of the inspection.	100%
Average number of hydrants annually referred for maintenance	6
Percent of hydrants annually referred for maintenance	2.44%
Enter number of points for inspection frequency (HI)	100

B. Condition (HF):

Prorate a factor (HF) from the following list of conditions according to the actual condition of hydrants examined compared with the total number examined during the survey:

Condition	Factor
Standard (no leaks, opens easily, conspicuous, well located for use by pumper)	1.0
Usable	0.5
Not Usable	0.0

ITEM 630 B Condition (HF)

Number of Hydrants Tested	22	Percent	Points	Credit
Number rated Standard	18	81.82%	1.0	0.82
Number rated Usable	4	18.18%	0.5	0.09
Number rated Unusable		0.00%	0.0	0.00
Total Credit				0.91
Points available				3

Credit for condition (HF) [Maximum out of 3 points]				2.73
ITEM 631 Credit for Hydrant Condition (CIC)				
630 A. - Inspection (HI)	100			
630 B. - Condition (HF)	2.73			
Credit for Inspection and Condition (CIC) CIC = (HI)(HF)/100*3	2.73			
640. CREDIT FOR WATER SUPPLY (CWS): CWS = CSS + CH + CIC				
Credit for Supply System (CSS)				31.70
Credit for hydrants (CH)				1.61
Credit for inspection and condition (CIC)				2.73
Credit for water supply (CWS)				36.04

Credit for Water Supply (CWS):

CWS = 36.04 out of 40 points, or a relative ISO Class 2.

Fire Suppression Rating Schedule — Total Credit and Classification

Item 700 develops the Public Protection Classification number by summarizing the credits developed in Items 400 through 640, and by adjusting for the difference in credit between Items 590 and 640.

701. PUBLIC PROTECTION CLASSIFICATION (PPC):

$$\frac{100 - \{(5.80 + 27.10 + 36.04) - 0.5[|(36.04) - 0.8(27.10)|]\}}{10}$$

$$\frac{100 - \{(68.94) - 0.5[36.04 - 21.68]\}}{10}$$

$$\frac{100 - \{(68.94) - 0.5[14.36]\}}{10}$$

$$\frac{100 - \{68.94 - 7.18\}}{10}$$

PPC = 61.76, or Class 4

Appendix A – Water Supply Details

Maximum Daily Consumption

Source: Hiwasee River	MGD	GPM	DATE
Maximum Daily Consumption (MDC) for past 3 years:	3.87	2,688	June 2012
Average Daily Consumption for past 12 months:	2.96	2,056	

MDC Calculation method	
Population	3,490
Average gallons water used per person per day (AWWA)	143
Average Daily Consumption (ADC) in gallons	499,070
ADC Rate (Average Daily Consumption (ADC) in GPM)	347
Estimated MDC rate (ADC x 150%) in GPM	520

Water Storage – Below Ground

Location	Service level	Tank size (gal)	Avg. Daily Min. Water Storage	Pump type	Storage type
WTP	High service	800,000	720,000	Transfer	Clear well
WTP	High service	200,000	175,000	Transfer	Clear well
TOTALS		1,000,000	895,000		

Water Storage – Floating on the System

Location	Service level	Tank size (gallons)	Avg. Daily Min. Water Storage (gallons)	Storage type
Linsdale water tank	Main service	200,000	175,000	Standpipe
Parkstown	Main service	4,000,000	3,750,000	Ground level tank
Eastview	Main service	3,000,000	2,750,000	Ground level tank
Manville	Main service	2,250,000	2,000,000	Ground level tank
TOTALS		9,450,000	8,675,000	
Elevated			175,000	
Ground level			8,500,000	

Pump Capacity

Location	Pump ID	Rated Capacity			Actual Capacity			Water Source	Delivered to
		MGD	GPM	@ psi	MGD	GPM	@ psi		
WTP	HS#1	2.80	1,950	100	2.70	1,852	100	Clearwell	Dist. Sys.
WTP	HS#2	2.80	1,950	100	2.70	1,852	100	Clearwell	Dist. Sys.
WTP	HS#3	2.04	1,420	90	1.94	1,350	90	Clearwell	Dist. Sys.
WTP	HS#4	2.04	1,420	90	1.94	1,350	90	Clearwell	Dist. Sys.
WTP	HS#5	3.24	2,250	100	3.08	2,138	100	Clearwell	Dist. Sys.
TOTALS		12.92	8,990		12.36	8,542			

Simultaneous operating capacity

5th Booster	Pump 1	1.44	1,000	70	1.37	950	70	Low side pressure system	High side pressure system
5th Booster	Pump 2	1.44	1,000	70	1.37	950	70	Low side pressure system	High side pressure system
5th Booster	Pump 3	1.80	1,250	70	1.70	1,188	70	Low side pressure system	High side pressure system
5th Booster	Pump 4	1.80	1,250	70	1.70	1,188	70	Low side pressure system	High side pressure system
TOTALS		6.48	4,500		6.14	4,276			

Only two booster pumps can operate at a time and combined output is 1,650 gpm

Filter capacity

WTP raw water intake	Pump 1	3.46	2,400	50	3.28	2,280	50	River	Entry point of treatment process
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WTP raw water intake	Pump 2	3.46	2,400	50	3.28	2,280	50	River	Entry point of treatment process
WTP raw water intake	Pump 3	1.44	1,000	50	1.37	950	50	River	Entry point of treatment process
TOTALS		8.36	5,800		7.93	5,510			

Simultaneous operating capacity	gpm
Low-lift pumps with consideration of any limitations	0
High-lift pumps with consideration of any limitations	4,560
Transfer pumps with consideration of any limitations	3,704
Booster pumps with consideration of any limitations	1,650

Combined filter capacity for each treatment plant	3,840
If overload permitted, what is the percentage?	0%
Are there any restrictions?	No

Appendix B – Water Supply Details

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Etowah

County McMinn

State Tennessee

Witnessed by: Insurance Services Office, Inc.

Date: January 21, 1993

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW-GPM $Q=(29.83(C(d^2)p^{0.5}))$			PRESSURE PSI		FLOW-AT 20 PSI		REMARKS***	
				INDIVIDUAL HYDRANTS		TOTAL	STATIC	RESID.	NEEDED **	AVAIL.		
1	Comm	Tenn. Ave & Carden St	McMinn County Water Dpt., Main	1640	0	0	1640	92	58	2,250	2,500	
2	Comm	Tenn. Ave & 7th St	McMinn County Water Dpt., Main	900	0	0	900	72	50	3,000	1,400	
3	Comm	8th St. & IHnois Ave	McMinn County Water Dpt., Main	1090	0	0	1090	50	43	2,500	2,400	
4	Comm	W Grady Rd&Hwy 411	McMinn County Water Dpt., Main	1780	0	0	1780	85	52	2,500	2,600	
5	Comm	6th St & Indiana Ave	McMinn County Water Dpt., Main	1260	0	0	1260	58	43	2,500	2,100	
6	Comm	2nd St & Pennsylvania Ave	McMinn County Water Dpt., Main	1420	0	0	1420	65	50	2,250	2,600	
7	Comm	9th St & Ohio Ave	McMinn County Water Dpt., Main	1750	0	0	1750	65	45	2,250	2,700	
8	Res	Vermont Ave & Bryant St	McMinn County Water Dpt., Main	820	0	0	820	35	25	1,000	1,000	
9	Res	Greenway Ln & Brentwood	McMinn County Water Dpt., Main	1060	0	0	1060	60	40	1,000	1,500	
10	Res	15th St & Pennsylvania	McMinn County Water Dpt., Main	1340	0	0	1340	73	63	1,000	3,300	
11	Comm	Athens Pk & Lawrence St	McMinn County Water Dpt., Main	1580	0	0	1580	57	50	2,000	3,900	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE NOT INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

"Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.