# LOCATING, STAFFING AND DISPATCHING QUINT APPARATUS: INTEGRATING QUINTS INTO THE ARLINGTON FIRE DEPARTMENT

EXECUTIVE DEVELOPMENT

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# ABSTRACT

By using a descriptive and historical research methodology, this applied research project was conducted to determine the best location, staffing and dispatching procedures to be used when the three quint type fire apparatus arrive in Arlington for service in late 1998. These quints will replace three ladder trucks currently in service. The problem was that Arlington has no experience with quints and no formal plan exists to incorporate their use into the operations of the Arlington Fire Department. No additional staffing will be available to staff the quints.

The research questions to be answered are:

1). Of the five taskforce stations with aerial apparatus, which geographic areas would best integrate the multi-purpose role of the quint apparatus?

2). What would be the best utilization of current available staffing for the quint apparatus?

3). How will the current dispatching department integrate the necessary changes to dispatching procedures? Keeping in mind that whenever the quints are out of service the replacement apparatus will be an aerial apparatus without water supply capabilities.

A literature review was conducted using the Learning Resource Center of the National Emergency Training Center in Emmitsburg, Maryland and by conducting a Texas Inter-library loan search. Interviews were conducted in person and by telephone with fire department officials and with individuals in other related fields.

Quints are successfully used in a mix of traditional and Total Quint Concept methods. Staffing varies almost as much as the specifications for the apparatus themselves. No authors mentioned any significant issues concerning dispatching quint apparatus other than considerations for reserve apparatus when quints are out of service for repairs.

Based on the findings of this research paper, the ideal locations for quints are in response areas containing numerous apartment and garden home locations. Quints are also well suited to more rural areas or areas where longer response times for additional equipment exist. Fire departments which respond each of their quints to fewer than 2,000 incidents per year have less major maintenance problems and are quite happy with their decision to purchase them.

Quints integrate quite well into the fire service emergency response, but as with most innovations or changes those who investigate, plan, evaluate risk, and carefully implement, are those who are satisfied with the results.

# TABLE OF CONTENTS


| | PAGE |
|---|---|
| Abstract..... | 2 |
| Table of Contents..... | 4 |
| Introduction..... | 5 |
| Background and Significance..... | 7 |
| Literature Review..... | 10 |
| Procedures..... | 20 |
| Results..... | 22 |
| Discussion..... | 30 |
| Recommendations..... | 34 |
| References..... | 37 |
| Appendix A- Quint Survey ..... | 40 |
| Appendix B-Table- Traditional System VS. Total Quint Concept ..... | 45 |
| Appendix C- Arlington Structure Fire Experience……..... | 47 |

# INTRODUCTION

In 1997 the Arlington Fire Department had 1.8 million dollars to spend on new fire apparatus. Some of the funds came from Fleet Services. One requirement of this program was that a minimum of two aerial apparatus be purchased as replacements for two ladder trucks. The remainder of the funds could be divided among new aerials, engines or brush trucks. The Arlington Fire Department chose to use the moneys to fund three quint apparatus, three engines and one brush truck.

Arlington currently utilizes triple combination pumpers for fire suppression and ladder trucks for aerial operations, ventilation and rescues. A pumper according to NFPA 1901, is an automotive fire apparatus with a permanently mounted fire pump, water tank, and hose body, hence the name "triple-combination pumper". The unit must be designed to sustain pumping operations during structural firefighting and be capable of supporting associated fire department operations. The vehicle also may be equipped with an optional water tower to provide an elevated master stream for fire suppression (Peters 1995). Arlington's five ladder trucks have rear mounted ladders which extend from 75' to 110'.

Arlington operates under the taskforce concept consisting of one engine with a four member crew responding and a ladder truck with a three member crew. On a single alarm assignment an additional two engines and a Battalion Chief and Incident Technician are dispatched. (Taskforce crew assignments were recently changed from a three member engine crew and four member truck crew when trucks

were removed from the first responder program due to excessive wear on the apparatus.)

What is a quint fire truck? It is an apparatus that carries hose, has a water tank, a pump, carries ground ladders and has a power operated aerial ladder (Coleman 1988). Why does it merit attention? Reduced staffing and new technology have placed the quint squarely in all discussions concerning the efficient use of staffing and equipment. With fire departments clearly now answering the call for universal life saving not just firefighting (Grover 1996), multi-purpose vehicles of many types are being utilized by the fire service. The need for multi-purpose, multi-use vehicles is reaching an all time high. With technology advancing all types of rescue equipment, more is being done with less manpower (human power) than ever before.

The purpose of this project is to look at how the Arlington Fire Department should locate, staff and dispatch these quint style apparatus as they arrive for service in approximately eight months.

With the recent opening of the fifteenth fire station and the anticipated opening of the sixteenth station within the next eight months, district coverage areas and responses of equipment is being reformatted to provide the best available coverage for the citizens of Arlington.

This project was written using historical and descriptive methodologies. The research questions to be addressed are:

1. Of the five existing taskforce stations with aerial apparatus, which geographic areas would best integrate the multi-purpose role of the quint apparatus?

2. What would the best utilization of current available staffing for the quint apparatus?

3. How will the civilian dispatching department integrate the necessary changes to dispatching procedures? Keeping in mind that whenever the quints are out of service the replacement apparatus will be an aerial apparatus without water supply capabilities.

## BACKGROUND AND SIGNIFICANCE

The City of Arlington was a small but growing community midway between Fort Worth and Dallas in the mid 1950's when General Motors decided to build an automobile assembly plant on the outskirts of Arlington. Arlington is now a large metropolitan city located in the middle of the Dallas-Fort Worth Metroplex. With a population approaching 300,000 in an area of 100 square miles, Arlington is governed by a City Council/ City Manager form of government. City leaders typically have been progressive and enjoy the image of being leaders in innovative community service.

Besides General Motors, Arlington is home to National Semi-Conductor, The Texas Rangers American League Baseball Team , The Ballpark in Arlington , Six Flags Over Texas Amusement Park , Hurricane Harbor Water Park, Great Southwest Industrial District and one of the largest concentrations of retail stores

per square mile found anywhere.

The Arlington Fire Department consists of 287 members assigned to three divisions: Operations, Prevention, and Administration. Operations is the largest divisions with 249 members, divided among three 24-hour shifts, assigned to 15 engine companies and 5 truck companies housed in 15 fire stations. A Hazardous Materials Response Team, Medium Duty Rescue Team, High Angle Rescue Team and a Dive Rescue Team are operated as needed using personnel assigned to the engine and truck companies.

Since 1984 the fire department has operated a First Responder Emergency Medical System providing Basic Life Support utilizing engine and truck companies. All members of Battalion Chief rank and below are certified Emergency Medial Technician-Basic level.

In 1989 The City of Arlington formed Dispatch Services. A separate department to provide radio and Mobile Display Terminal communications for all city departments. This department currently consists of 98 personnel. There are 30 police dispatchers, 13 fire dispatchers, 14 supervisors, 34 call takers and 7 other support personnel. The City of Arlington received the Technology Achievement Award at the National League of Cities Congress of Cities in Houston in 1990. This award was for the innovation of returning sworn fire and police personnel to their respective departments and creating a civilian dispatch service department. Arlington Dispatch Services has received several Silent Hero Awards from the State of Texas 911 System.

The decision was made in 1997 to replace three first line trucks with

quints. The decision to invest in quints was made in order to provide the best utilization of staffing and equipment (Ast. Chief John Murphy, personal discussion, All Chiefs meeting, January 8, 1997). The Arlington Fire Department has had no experience with quints. Therefore, personnel from the Apparatus Committee started at ground zero to determine the exact specifications for the new quints. Information gathered was based on the general parameters used previously to determine that quints were preferred over aerial apparatus. No studies were conducted to determine the exact station assignments (The particular trucks to be replaced were known due to age and use). No study was conducted to determine any staffing reallocations for optimal performance. It was known that no additional staff would be hired to enhance the capabilities of the quints.

Significantly, since the determination was made to purchase the quints, Arlington has hired a new Fire Chief (to replace a retirement), replaced the Assistant Chief over Operations (due to a terminal illness), replaced the Assistant Chief over Administration (due to an acceptance of a Chief's position with another department), and is currently assessing candidates to replace the two battalion chief positions due to promotions. The fire departments organizational chart provides for three Assistant Chiefs, six Operations Battalion Chiefs, one Training Battalion Chief, one Special Operations Battalion Chief, and one Medical Operations Battalion Chief. The integration of quint style apparatus within the Arlington Fire Department is but one of many changes taking place currently or appearing on the horizon.

The Fire Chief and the two Assistant Chiefs who decided to purchase the three quints as replacements for the three aging ladder trucks will not be responsible

for their integration into the Arlington Fire Department.

This research was related to the Organizational Change and Development modules of the Executive Fire Officer course entitled Executive Development.

## LITERATURE REVIEW

The mid 1930's saw the cities of Louisville and Minneapolis take the first steps in the creation and introduction of the quint apparatus (Adelman 1986). Since that time the widespread use of diesel power has provided the needed power to develop the quint into a truly multi-purpose vehicle. When the specifications are written properly, a quint can function as an independent engine company or as an independent ladder company on the emergency scene. It can be designed to carry any and all of the equipment necessary for the fire service to carry out its modern mission of universal life saving including emergency medical response (Grover 1995). Sometimes coincidences make our decisions appear prophetic or disastrous. On the first fire in the first hour it was in service Quint 17 in St. Louis rescued a man from a third floor window with their aerial while other members of the crew attacked the fire using the pre-connected attack line (Schaper 1991).

Use of any multi-purpose vehicle always carries with it the reality that operating efficiency and capability tends to decrease if too many functions are to be performed by one piece of apparatus. And if one feature of the apparatus requires

repair, the entire apparatus must be taken out of service (Cote & Linville, 1992, p.9-85).

Most quints are custom designed and built units. NFPA has developed standards that address both aerial ladder apparatus (NFPA Standard 1904, 1991) and pumper apparatus (NFPA Standard 1901, 1991). The design and specification provisions for performance are generally left up to the individual fire department based on their perceived need. This flexibility is reflected in the general number of feet of ground ladders carried on quints dropping over the last two decades. This can be attributed to a reduction of the total number of feet of ground ladders required in NFPA 1904, titled Aerial Ladder and Elevating Platform Fire Apparatus, and a desire for more compartment space. Dawson (1990) recommends that departments use the National Fire Academy Publication, Fire Risk Analysis: A Systems Approach, to develop and define their critical needs.

The fire problem in the United States is overwhelmingly a residential dwelling scenario (Grover 1995). This holds true for the City of Arlington. With Arlington growing from a small rural type community in the 1950's to a large 300,000 city in the 1990's, most industrial and commercial occupancies are fully sprinkled buildings and of relatively new construction. High-rise office and residential buildings also have fire sprinklers. In the late 80's further fire sprinkler ordinances were passed for most apartment buildings. The majority of fires and multi-alarm fires in Arlington involve either residential apartments or large (4000+ square feet) private residences.

As stated in Managing Fire Services " in one typical East Coast City

95% of the fire calls in 1985 were either false calls or handled by the first suppression vehicle to arrive on the scene. Multiple alarms occur much less than one in one hundred alarms. However this statement does not negate the fact that some alarms do require multiple crews and sustained efforts." Water supply requirements must also be considered for multi-purpose vehicles and the number of members needed to utilize that supply effectively. NFPA Manual #1410 Training Standard of Initial Fire Attack states "that the water supply should be adequate to provide a minimum of 400 gallons per minute. This flow will be capable of providing 2 handlines, a minimum of 100 gpm each and will also provide a required flow of 200 gpm for a supply line." This supply will effectively require 4 members to operate (Stevens, 1984).

Therefore, "in evaluating the suppression capability of any initial arriving unit, the primary goal is to determine how quickly adequate firefightiing forces can arrive at the scene, and determine the manpower necessary to perform rescue operations, plus conduct initial fire attack" (MFS, p.120).

A manpower fire tasks analysis published in Managing Fire Services states that 5 member suppression companies are 100 percent effective in their task performance, four member companies are 65 percent effective, three member companies are 38 percent effective and six member companies are judged 20 percent faster than a four member crew.

Most departments are forced to make staffing decisions based not on efficiency studies, but based on available funding. During the mid-80's and early 90's financial restrictions forced many large departments to purchase quints. Substantial

numbers of these departments used the quints as reason to combine ladder and engine companies into one unit and reduce manpower (Calderone). In looking at the varied manner in which fire departments utilize quints, it does not always have to replace two units. The IAFF report says that "awkward tactical situations may arise, unless the department uses several such combination pieces"(IAAF).

Quint usage can be seen from one extreme "The Total Quint Concept" (TQC) in cities such as St. Louis and Richmond to the use of a single quint in smaller departments such as Encinitas, CA and Pantego, TX. A sometimes surprising mix of ideas exist in between.

St. Louis converted to the TQC due to major budget cuts. In 1987 these cuts made its traditional engine/truck system incapable of delivering adequate fire and rescue services to the public. In his article TQC Quints Are Here to Stay, Schaper includes a chart showing the extra benefits in increased capabilities. A copy of this chart is included in Appendix B. Schaper applauds the rapid deployment typically available with their system. On a typical fire, they can have three aerials and five handlines in operation on the first alarm in less than 15 minutes (Scharper 96).

Another distinct advantage for St. Louis is the immediately available rescue equipment. In areas where large numbers of residents have bars on their windows, firefighters no longer have to wait for a truck company to arrive to start forcible entry (Hines 88). The change in equipment becomes radically clear when observing that St. Louis went from 56 engine companies and 23 hook and ladder companies to 34 Quints in two years. To convert a fire department to total quint

operation takes planning, research, creative engineering, daring and risk (Scharper 91). Sometimes the risk factor is too great, but is placed on current personnel by previous administrations. As one chief replied, " If I was to say what I feel and it was found out, I would be committing political suicide" (Loeb 92). This comment came from a chief who has a large rural area with poor water supply. The engines in his department have 1,000 gallon water tanks. It is unreasonable to even consider building a quint with this type of water capacity. The sheer volume of other equipment needed would make an apparatus with a gross vehicle weight exceeding legal restrictions in most jurisdictions. Compartment space on all quints is at a premium even with minimal ground ladders, hose and water tank capacity.

Richmond, VA Fire Department faced a similar circumstance. The chief was hired in 1995 to develop a nontraditional way to lead the department. The mandate was to increase efficiency and reduce cost. If he didn't the city manager would find someone who would. There would be a substantial loss of personnel (50) and yet all 20 stations needed to be kept operating. This was accomplished by reducing companies from 26 to 23 (McElfish 97). The cost savings were estimated at $13 million over a 15 year period. This figure also took into account an estimated $18 million in additional maintenance costs for the quints over normal maintenance for the engine and ladder trucks being replaced.

McElfish's article contained a short observation article by Larry Stevens on ISO ratings on quints. In most communities rated by ISO the combination of two quints on first alarms receives a credit of three apparatus. They can count as two ladder

or service companies and an engine. Obviously, this is a big boost to small communities wanting to make the most of their dollars.

Another perspective came from Rochester, NY combining the traditional with the non-traditional. Rochester protects the heavy industrial, institutional and high value commercial districts with the traditional engine and ladder companies. The other areas are protected with a Quint/Midi-pumper combination. The Midi-pumper is about 3/4 the size of a regular pumper and has a crew of two (Loeb 84). It handles all minor calls such as vehicle, brush and rubbish fires. The Quint has a crew of four. When run on other calls in combination with the Quint, the Midi lays two supply lines and assists the Quint crew. Structure fires receive additional engines and squads as well as battalion chiefs as needed.

In 1989 Donald Loeb conducted a survey which he included in his three part series "Quint Fever," for Fire Chief magazine. With more than 50% of the total quints built during the 80's (Loeb 1-89), chief's and firefighters were anxious to share their comments and findings.

Div. Chief Terry Weckerly of Mesa, AZ stated that quints work especially well at defensive fires. Attack lines and overhaul lines can be in place while elevated streams and hand lines to protect exposures are also being utilized (Loeb 3-89). With the critical need for exposure protection in garden apartment type structures, quints have become especially appreciated in those cities having large numbers of these occupancies. Fort Worth, TX fits into this type scenario and has eight quints with more variety in how they run their quints than any other department surveyed (Loeb 3-89).

As with any exposure protection, ladders and speed of laddering a building become a critical factor. Here quints have an advantage as they are built with a wide variety of capabilities both in the length of the powered aerial device and in the amount of ground ladders carried for use. This can be attributed to two factors. In 1970 NFPA standard 1901 called for slightly more than 200' of ground ladders. By 1991 NFPA standards had been relaxed and allowed local jurisdictions more latitude in designing their equipment to meet local needs (Loeb 2-89). Most departments reduce footage of ladders for more compartment space and for the capacity to carry more rescue and ventilation equipment. Significantly, many quints don't carry the necessary hose to meet the standards of an engine company. Loeb prefers to call these apparatus Multi-Purpose Firefighting Units or MPFFU's.

In 1992 Loeb received comments regarding his 1989 survey from departments which had placed quints in service since 1989. The most significant observation was that small departments seem to have greater appreciation for the versatility of the quint (Loeb 1-92). Small departments can also be versatile in problem solving. Sometimes their problems and their solutions to these problems can have widespread application. Weirton Heights VFD developed an inexpensive solution to loading and laying large diameter hose with their quint (Stankiewicz 91). Their chute with rubber flap and roller has made a significant difference in their ability to lay LDH without damage to their unit or the couplings. Several pictures and illustrations in Stankiewicz's article clearly demonstrate their method.

Other small cities have shown how satisfaction with your equipment

is indeed related to the amount of time invested investigating and defining exactly what your departments needs are prior to ordering equipment and specifically quints. Encinitas, CA conducted an extensive study of their city. With no structures over 50' in height, but with setback considerations, they determined they needed an aerial of over 75'. Ease of maneuverability was a primary need. As a result, they purchased a 100' tiller quint resulting in a turning radius that was the same as their engines and are very happy with their decision (Mello 97).

San Diego, CA had almost a completely opposite experience with quints. In 1969 they purchased four quints. By 1973 they were all parked and collecting dust. What had started out as a wonderful multi-purpose concept became a disaster. The units were too heavy and too big for the drive train and amount of use they were receiving. The San Diego mechanics saw the weakness first. Even when driven with care, peculiar accidents were happening. In one incident the quint's bucket, which extends five feet beyond the tailboard, knocked out several windows of a parked city bus. For a smaller city with fewer responses and less use they might be a good fit (Benson 83).

In specifying where quints are most ideally suited Hatch defines the ideal location as at a station that makes less than 2,000 incidents per year, an outlying station or one that serves a large population of apartment complexes (Hatch 96).

Consideration of the coverage area that a quint will be stationed in appears in almost every noted situation. After all, we are providing essentially the same services to our customers, just in different geographic and topographic areas. Staffing

ideals can generally be agreed upon for quints. A minimum of six can essentially do all three of our primary goals: rescue, fire attack and ventilation (Mittendorf 96). But budget considerations normally will dictate staffing due to staffing being the largest single cost in any fire department budget.

Most any shortcomings or special application requirements for a quint can be overcome with advanced planning. Large amounts of equipment can quickly exceed the gross vehicle weight capacity of a chassis. For a modest cost of $5,000-$7,000 a tandem axle can be added yielding much greater capacity, twice the breaking power and little if any turning radius difference. Advancing to a tiller type apparatus can provide a turning radius rivaling that of most engines and still provide a 100' aerial apparatus (Mittendorf 96).

Quints have been shown to be a very versatile piece of equipment. Few departments buy quints with the idea of a simultaneous dual purpose use (Loeb 1-97). Rather they utilize them as either a ladder truck or an engine, or perhaps to supply their own ladder pipe at a defensive fire. This is usually related to staffing. After all a crew of four cannot be expected to do the work of a crew of eight. And when simultaneous dual use is preferred two apparatus operators are needed. One to operate the aerial and one to operate the pump (Loeb 1-97).

The quints also move to the forefront when considering the NFPA concept of full suppression capability. Perhaps the greatest application is the move by most departments to a universal life saving response. When in trouble everyone calls the fire department first. We now see almost any type rescue being handled by fire

department rescue teams. A list of them all could run pages. The calls for varied rescue service are seen everyday on local newscasts. A large number of departments find that structure fires account for less than 5% of their fire responses and less than 2% of the total responses (Loeb 2-97).

Sometimes the extra comfort of providing the best possible service at the best price comes in very simple terms. As San Jose, CA reports: our First Responder program with a paramedic on each engine has resulted in longer time periods on EMS calls. Their out-of-service time is often lengthy and they have to be missing fire calls as they fulfill their dual roles. Having a quint rather than a ladder truck available gives an option not present previously (Loeb 1-97).

What the quint can do is provide a well-equipped basic unit for quick and fast attack under limited conditions. The idea of using the concept to overcome budget shortfalls or as a political maneuver to close companies is very dangerous, if not deadly, according to Chief William Taylor of Newton Abbott Fire Company, Hamburg, NY (Loeb 2-97).

## PROCEDURES

This applied research project was started after the Arlington Fire Department had already decided to purchase three quints to replace three aging ladder trucks. A descriptive and historical research procedure was utilized to establish what the current fire service literature reveals concerning the use of quints and their staffing. A

literature review was conducted by contacting the Learning Resource Center at the National Emergency Training Center Emmitsburg, MD. An additional search was conducted through the Texas Inter-Library Loan system.

Six major manufacturers of quint style apparatus were contacted and asked to provide up to 30 names of departments that utilized quints whether they used their brand of equipment or not. Additional departments were identified from the literature review. These departments were the target audience for the survey conducted.

Since the questions posed by this research paper were dealing with the location, staffing and dispatching of quints, it followed logically that only departments with some experience with quints were needed to respond. Limitations may include: that these departments may or may not be similar in size or makeup, these communities may have different type building construction features and that response areas may be vastly different in makeup.

Surveys were sent out to 128 departments. A total of 27 were returned (21%). A sample copy of the survey is included in Appendix A. From the information gathered, it was found that several departments use an eight-member cab quint. As staffing is one of the critical issues all departments face this was an interesting development. Most departments with eight member cabs are volunteer or combination volunteer and paid departments.

The Arlington Fire Department had already committed to the purchase of three quint type apparatus. The questions that needed to be answered should be

answered by other departments that are very satisfied with their quints. That is, what is it about their quints that makes them happy? Arlington needs answers to the questions about how to staff, locate and dispatch the new quints. How are we going to provide efficient cost effective service with these new apparatus within the confines of no additional staffing and no new locations? How can we be successful in implementing this new program without repeating other fire department's mistakes?

Interviews were also conducted with members of the Arlington Fire Department's, Apparatus Committee, Dispatch Communications Taskforce, Training Division staff and Assistant Chief of Operations (at the time of Quint purchase approval). These interviews were conducted to determine what type of research, analysis or information was used to determine the purchase of the quints, where they were to be located and to what extent dispatching changes were needed to satisfy our mission.

The interviews were conducted with broad open ended questions so that the members could express their opinions as to what decisions had been made on the quints and also express on what information these decisions were based. As Arlington is a relatively new department (since 1948), we face change as a challenge to innovate, rather than an affront to tradition. We have little tradition to impede our progress.

Interviews were also conducted with individuals in the City of Arlington Dispatch Services, Code Enforcement and Geoprocessing Departments.

# RESULTS

The research and literature review indicated some common threads among the departments that were highly satisfied with their quints. Most had done extensive research prior to the purchase of their quints. This included careful analysis of the type of area the quint was to serve. Is the aerial long enough to reach the type buildings that are in the service area of the quint? Do road conditions dictate maneuverability to be a major factor? The departments that took a long hard look at their service area developed not only the desirable features for their quints, but they also could take the next step in determining the staffing for the quint to best serve that areas needs.

The results of the survey followed relatively closely to the findings of others. In fact some of the other authors had conducted surveys on quints and that was the total focus of their article. Some surveys had been at random and others had tried to pinpoint departments who matched in some ways their own department. With a return of only 21%, I was hesitant to reach any conclusions that were vastly different from those found in the literature review. The intent of the survey was to gather information to corroborate ideas presented by various authors in the literature review. The low return rate may be related to the fact that many of the departments were the same ones surveyed over the past ten years by other authors.

Since my effort was to focus on what usage of quints resulted in satisfaction with the quints, I looked at the points of satisfaction in regards to my original

three questions.

1) Of the five existing taskforce stations with aerial apparatus, which geographic areas would best integrate the multi-purpose role of the quint apparatus? One statement which occurs time and time again is that quints are most effective in areas with concentrations of apartments or garden homes. This allows the quick use of water and aerial capability as needed for rescue. The quint also provides for a rapid application of an elevated stream to quickly "blackout" a fire and allow hand lines to deploy rapidly and finish extinguishment. In areas of large apartment concentrations, exposure protection becomes a major factor in life safety. Again, the quint provides rapid implementation of options with staffing either restricting or enhancing operational options.

In more rural areas, quints provide all the firefighting equipment parked right in front of the building. Later arriving companies can utilize the quint to its fullest capabilities by providing successive actions to bring the emergency to a conclusion. Where access is limited or long time responses exist for second and third companies, having an apparatus that can perform total fire suppression with proper staffing is an ideal situation. Life safety and rescue abilities are also enhanced by no delays in waiting for rescue equipment or aerial equipment to arrive after the first unit.

Although I focused on the positive aspects, one must also consider that with any multi-purpose vehicle greater repair frequency is likely. This situation can rapidly deteriorate if one piece of equipment is depended on solely to provide the service of two. When it breaks what will be in reserve to replace it? Can your

response of other equipment change at a moment's notice to provide similar service at a slightly changed timeframe? If you replace a quint with an engine, how long of an extension of time will occur for the first aerial apparatus to arrive? Will staffing and reserve equipment availability allow you to replace a quint with both an engine and ladder? Will the station size allow such changes?

San Diego found maintenance to be excessive with their quints and parked them after four years. Even with dual rear axles, drive train problems were epidemic. Their excessive weight (over 25 tons) and frequent use were the factors blamed for their excessive repair record. The decision to pull them from service was based solely on these factors. They attributed their problem mainly to the high number of incidents that their quints were called upon for service. Officials in San Diego concluded that a quint would be ideally suited to a department that responded a quint to fewer incidents than they experienced (Benson 83). Tim Hatch of Fort Worth says that a quint is ideally suited to a department that responds each quint to less than 2,000 incidents per year (Hatch 96).

The second question to be addressed by this project focuses on staffing. 2) What would be the best utilization of current available staffing for the quint apparatus?

Current staffing at Arlington's five taskforce stations consists of seven members. Engine companies at the taskforce stations are staffed with four members. Ladder companies are staffed with three members. The purchase of three quints requires some differences between taskforce stations as two of the taskforce stations

will be unchanged.

Dawson makes the statistical argument for five as a minimum staff on a quint due to its multi-purpose role. Some authors argue that fewer crew members are acceptable depending on the balance of the response. The use of the midi-pumper/ quint combination response works well for Rochester NY (Loeb 84). Fort Worth makes use of the engine company /quint combination quite successfully. Other options such as the Total Quint Concept are certainly viable in some situations.

The staffing issue revolves around the central premise that the apparatus cannot do the job of eight crew members if only four crew members are available. Arlington Fire Department standard operating procedures call for the first arriving truck captain to assume incident command. Within current staffing, the captain then has two members, a firefighter and an apparatus operator, to accomplish any and all truck functions until the next arriving (or available) engine company can be assigned to assist the truck crew with truck functions. All Arlington Fire Department members are cross trained to function as engine or truck companies.

The quints ordered for Arlington have all controls at one location so that one apparatus operator should be able to perform pumping and aerial operations. Again, dual, simultaneous use may be questionable.

According to Coleman, a staffing of four is 65% efficient. Dawson states that three is in direct conflict with the operational intent of a quint. Dawson's values are based on analysis of community life safety as well as NFPA standards for fire suppression. Arlington has the relatively easy position of choosing either, without

disrupting current staffing assignments or eliminating equipment from service.

The number of members on a truck company more often than not falls to three. Both Dallas and Phoenix have not been able to justify more than three even with extensive studies (Lt. Don Gibson, personal interview, January 27,1998). Arlington is replacing trucks with the quints. Staffing quints differently than trucks may be a viable for the future. If the three primary goals of rescue, fire attack and ventilation are to be accomplished quickly a crew of six minimum is required (Mittendorf 96).

The third factor for this research project to consider is one of dispatching changes. With a separate city department providing this service, any change must be carefully weighed due to the time and bureaucratic delays it may take to train personnel involved in any change.

Question 3). How will the current dispatching department implement the necessary changes to dispatching procedures? Keeping in mind that whenever the quints are out of service, the replacement apparatus will be an aerial apparatus without water supply capabilities.

Jamie Cole, Dispatch Services Assistant Director, in an interview for this research paper stated that any of the changes recommended by the Communication Taskforce “could be implemented almost immediately following the writing of the Standard Operating Procedures”. Training and implementation should be a short time item since only a few terminology changes are expected. Any changes in equipment dispatch can be implemented immediately with SOP changes. Supervisors will have to keep extra vigilant in the first few weeks to insure that the dispatchers are following all

new procedures (Jamie Cole, personal interview, January 12,1998).

While no written procedure or document has been written, the fire department members of the Communication Taskforce have discussed procedural changes. The fire department members indicate the need to add a ladder truck to the initial one alarm assignment whenever the initial truck company apparatus will be one of the new quints. The quints radio call identification will be "Quint" followed by the station number where it is located. The initial quints will be "Quint One", "Quint Six" and "Quint Seven". The truck companies will be "Truck Eight" and "Truck Nine". This will allow the dispatchers to immediately know if the aerial at a station can be sent on a call where water capabilities are needed (LT. Brian Cudaback, personal interview, January 27, 1998).

The fire department apparatus committee members feel strongly about adding a ladder truck to the initial alarm on structure fires due to the quints having a 75' aerial. The current trucks have 110' aerial ladder capabilities. The trucks will also carry a greater quantity of all rescue equipment due to greater available compartment space. The members feel that at any large fire the quints while versatile may not be able to adequately perform all the required truck work as effectively as our current trucks and therefore would like a greater comfort zone.

The added cost of sending an additional truck will be small as Arlington's fire experience shows that structure fires account for only 3% of fire department incidents. Other than the designation change and the addition of a truck on initial structure alarms, the only other anticipated change for dispatch services is a need

to send the tone alarm to the station where the quint is stationed on all alarms. This will allow the quint officer the initiative to respond to any call where the quint might have a quicker response time than the engine assigned to that station when the engine is out in district.

The "Quint" radio designation should also alleviate any confusion as to the capabilities of the equipment in service when reserves are used. Whenever a quint is out of service the equipment replacing it will either be "Engine #" or "Truck #".

Two factors found while researching this project need mentioning. Further investigation and analysis may provide information that will allow more effective location of equipment in anticipation of emergency needs. One is the City of Arlington's Geoprocessing Information System. The other is the Code Enforcement Departments data base in regards to apartment fire code and safety code violations.

As this report was reaching final stages, the City of Arlington's Geoprocessing Department was developing the information system for the fire department that will allow a much more exact mapping of incidents (Janice Williams, personal interview, January 30, 1998). Currently incidents can be located by grid (see Appendix C). With the new system, incidents can be called up by address and will be shown on a map. The user can then "zoom out" to see a larger area along with incidents pinpointed by street location for the surrounding area. If desired the most recent aerial photographs of the area can also be used as one of the possible overlays. This system should allow visual confirmation of where truck or quint locations would be best suited based on previous incidents.

The Code Enforcement Division inspects and enforces fire and other city codes in multi-family residences as well as other commercial occupancies. As shown in the Arlington Fire Department's Structural Fire Experience Report, east and northeast Arlington have the highest rate of structure fires in the city. This trend has changed little in the past ten years. In recent months Code Enforcement has taken an aggressive role in east Arlington in cooperation with citizen groups to revitalize the east Arlington area. Their statistics in showing where the greatest number of violations occur could be of interest, especially if it correlates with the number of calls for service to the fire department.

## DISCUSSION

As the Arlington Fire Department determines how it will locate, staff and dispatch the quint apparatus, it must look at the experiences of others in order to effectively implement this major organizational change with as few mistakes as possible.

How does the Arlington Fire Department fulfill its desire to make the most effective use of resources (Murphy 97) when it adds the three quints to its response fleet?

The current Fire Chief Robin Paulsgrove has instructed the Apparatus Committee members that the quints are not to be pampered and kept underutilized, but that they are to be used and used well. The truck company with the most yearly incidents even under our First Responder program responded to less than 1500

incidents. This is well below the favored numbers indicated as ideal by officials in Fort Worth (Hatch 96).

Fort Worth's experiences are of special interest to Arlington for several reasons. Fort Worth is Arlington's neighbor with several miles of shared city limit border. Mutual aid calls are frequent and mutual aid agreements call for one alarm assignments to be exchanged whenever three-alarm or greater incidents occur. Fort Worth also has years of experience with the widest variety of quints of any fire department ( Loeb 3-89).

We could re-instate the quints as a part of the First Responder program with little difficulty. Service to the citizens would be enhanced at little increased cost.

Based on the number of incidents, the quints could be placed at any current taskforce station. Arlington's fire vehicles have never been permanently assigned to any station. The apparatus rotate to different locations for various reasons. The apparatus may remain at a location for a number of years, but there are no set conditions. In fact, each apparatus has its identifying numbers facing the front, sides and rear fastened to the apparatus in holders with removable numbers.

Another major factor that indicates an ideal location for a quint, is one where there is a concentration of apartment complexes and garden homes in the primary response area (Hatch 96). The Apparatus Committee selected locations based on their own experiences as firefighters and what they perceived as the areas where quints could be best utilized. Stations 1 and 6 are the truck locations that respond to the areas that

have the largest concentrations of structure fires in Arlington. Both also respond to the areas that have the oldest apartment structures in Arlington. (See Appendix C).

The other location chosen by the Apparatus Committee may allow experimentation to the extent that Station 7 has the fewest incidents of any taskforce station consistently year after year. The response area however, consists of primarily single family homes. A large portion of these homes are 4,000+ square feet in size. This area is also bordered almost entirely on the western side by Lake Arlington. This results in additional responding units on multiple alarms having limited access and "following the leader" to the scene. The need to have "Total Suppression Capability" as noted by NFPA is indeed a factor in this area.

These locations all fit within different ideal locations expressed by varied authors. This varied demographic response area should indeed give the Arlington Fire Department enough insight as to the effectiveness of the quint style apparatus given time. One opinion expressed by Lt. Gibson (Personal interview, January 27, 1998) was that perhaps our truck work effectiveness would best be served by building Station 14 (to replace the current station 14 operating out of our training facility) as quickly as possible and changing our truck and quint assignments. Gibson felt that to more centrally locate our quints to stations 2 and 14 and our 110' ladder trucks to stations 8 and 9 (see Appendix C) would result in better citywide coverage. This would also result in providing us with a reserve quint and remove one truck company from service. These crew members could then be utilized in other areas. As Gibson stated "We have so few incidents where we actually use the aerial ladder that they are not the most cost

effective apparatus. We have them for insurance ratings purposes, but telesquirts are more effective for the types of fires we experience in Arlington." Perhaps Gibson's observations would be determined to be very accurate with a careful study of the information from GIS and Code Enforcement and compared to actual fire data. Arlington currently responds to an annual average of 18,000 incidents. Approximately 3% are structure fires.

Location may be an ongoing study in Arlington. Station 7 does fit into one set of criteria. Station 8 on the other hand has the largest concentration of apartments within the city in its response area. These apartments on the north side of Arlington (see Appendix C) were built largely in the late 70's. As time goes by this area may show a larger percentage of the structure fires in Arlington. Again, a close study of the statistics available from Code Enforcement and GIS may show a change in trends early enough for the fire department to change locations with equipment and staffing to more effectively handle the emergency calls for service.

## RECOMMENDATIONS

This report was begun before any decisions were concluded concerning the location of the quints. As noted many changes in administrative personnel have taken place in the past few months. Decisions were recently made to locate the new quints at Stations 1, 6 and 7, based on recommendations made by the Apparatus Committee. Their determinations were based on their perceptions and experiences as

firefighters.

Two locations chosen, Station 1 and Station 6, are locations where the present truck companies respond to the areas of most structure fires in Arlington. I would recommend that Station 7's responses be carefully studied as the quint is used over the short term. Station 8 may be a more logical placement due to the large number of apartments in its immediate response area. (The site for Station 8 was donated by the apartment developers back in the mid 70's.) Another consideration may be for one quint to be stationed at Station 2. Station 2 is in the heart of East Arlington and Engine 2 responds to more emergencies than any other company in Arlington. This station is large enough to be reconfigured as a taskforce station at a moment's notice. All that is needed is to move the equipment and staff (from Station 1 or 6).

Staffing is always the variable with the greatest cost. No new staff will to be hired to staff the quints in Arlington. Time and further study may prove that much greater customer service can be accomplished with the addition of more crew members assigned to the quints. The greater cost verses efficiency may never overcome the almost universal desire to reduce firefighting staff. While one can point to studies (Managing Fire Services, 1988) that show five member crews are 100% efficient, most managers are content with less efficient crews that save money.

I believe that the changes in dispatching procedures can be confined to a few minor changes. By designating the quints as "Quint One" and so on by station number, the dispatchers should be able to determine what equipment is available. When in a reserve engine or truck, it should be apparent what capabilities each

company possesses.

The change to alerting the station which houses a quint when the engine is out in district I believe is a necessary one in order to provide the best possible service to the citizens of Arlington. The training involved in implementing these two changes should be minimal.

I cannot recommend the dispatching of an extra truck company with each structure alarm. The risk to the public with an additional emergency vehicle responding on our already overcrowded street system is not prudent. As some members stated (Gibson 98), "We only have 400 actual structure fires each year. We only set up our aerials at 5% of those. Sometimes we can use more rescue or ventilation equipment, but we really don't need another truck on the scene." We do exceptional work at really large fires with our truck companies. We just don't have that many multiple alarm fires.

Quints are obviously an important and versatile part of the fire service equation. As we face advances in technology and the reality of fiscal restraints, we must utilize all our resources efficiently. We must study new or different concepts with the idea of incorporating the best into our service programs. The citizen down the street working at General Motors wants to know why taxes need to be raised to provide a staffing level change. Fire departments with four or more crew members on apparatus are a dying breed (Grover 96).

We must provide the best possible service to our customers and be able to justify our fiscal requirements to provide that service. Proper planning,

evaluation, careful implementation while minimizing risk will provide efficient service for our customers.

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# APPENDIX A

**Fire Department Quint Questionnaire**

Department _____

Name and title of person completing form_____

Telephone & FAX numbers _____

Type of department: Volunteer _____ Paid _____ Combination _____

Number of Uniformed Members _____

Number of Stations _____

City population (approximate) _____

City size (approximate square miles) _____

Number of available Quints _____ Number of reserve Quints _____

Number of other aerial apparatus _____ Number of reserve aerial apparatus_____

Number of available engines _____ Number of reserve engines _____

Do you operate your Quint(s) as a ladder or an engine? _____

Do you operate your Quint(s) as both? _____

Do you operate it as both simultaneously?_____

How do you staff your Quint(s)? minimum_____ maximum_____

other _____

_____

What have you found to be the most effective staffing for your Quint(s)? And Why do you feel it most effective?

_____

_____

What is the demographic makeup of the immediate 4 minute response area of your Quint(s)?

a) single family

b) Multi-family (apartments/garden homes)

c) Light commercial

d) Industrial

e) combination Which categories? _____

Is the 6 minute response area the same? _____ If not Please list type(s)_____

What is the street makeup of the primary response area of your Quint(s)?

a) boulevard & highway

b) multi-lane streets

c) dual lane streets with ditches

d) dual lane curbed streets

e) dual lane or two-lane one-way with multi-story buildings

f) combination (Please list major types.)_____

Why did your department purchase a Quint(s)? _____

_____

How many incidents does each of your Quints respond to each year?_____

What have you found to be the best feature of your Quint?_____

_____

What is the single most outstanding use of a Quint by your department?_____

_____

_____

_____

Have you ever found a Quint to be a hindrance? _____

_____

_____

Did the acquisition of your Quint(s) result in a staffing change overall in your department? Please explain.

_____

_____

Did the acquisition of your Quint(s) result in altered staffing on other equipment in your department? Please explain.

_____

_____

On a one alarm assignment what other equipment and staffing responds with the Quint?

_____

_____

What dispatching changes are necessary in your department when a Quint is out of service?

_____

_____

Does your department have Standard Operating Procedures for your Quint(s)?

_____

Would you buy more Quints? Why? Why not?_____

_____

_____

I would appreciate any other information concerning your Quint(s) you would like to include. Negative and positive comments are appreciated.

# APPENDIX B

**TRADITIONAL SYSTEM VS. TOTAL QUINT CONCEPT**

A comparison of the capabilities of the engine/ hook-and-ladder system in 1986 and the Total Quint Concept (TQC) in 1995.

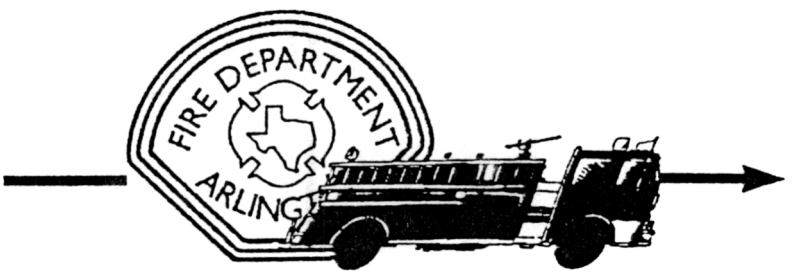
| | **1986** | **1995** | |
|---|---|---|---|
| Pumping capacity | 37,500 gpm | 65,000 gpm | +73% |
| Number of aerial ladders | 10 | 34 | +240% |
| First-alarm staffing | 14-17 | 28 | +64% |
| Aerials on first alarm | 1 | 5 | +400/0 |
| Companies capable of engine work | 30 | 34 | +13% |
| Companies capable of truck work | 12 | 36 | +200% |
| Companies capable of rescue squad operations | 10 | 36 | +260% |
| Companies capable of first-responder medical operations | 0 | 36 | Total benefit |
| Extrication tools | 10 | 38 | +280% |
| Ventilation fans | 14 | 42 | +200% |
| Rescue saws | 12 | 38 | +216% |
| Firefighters on department | 752 | 631 | -16% |

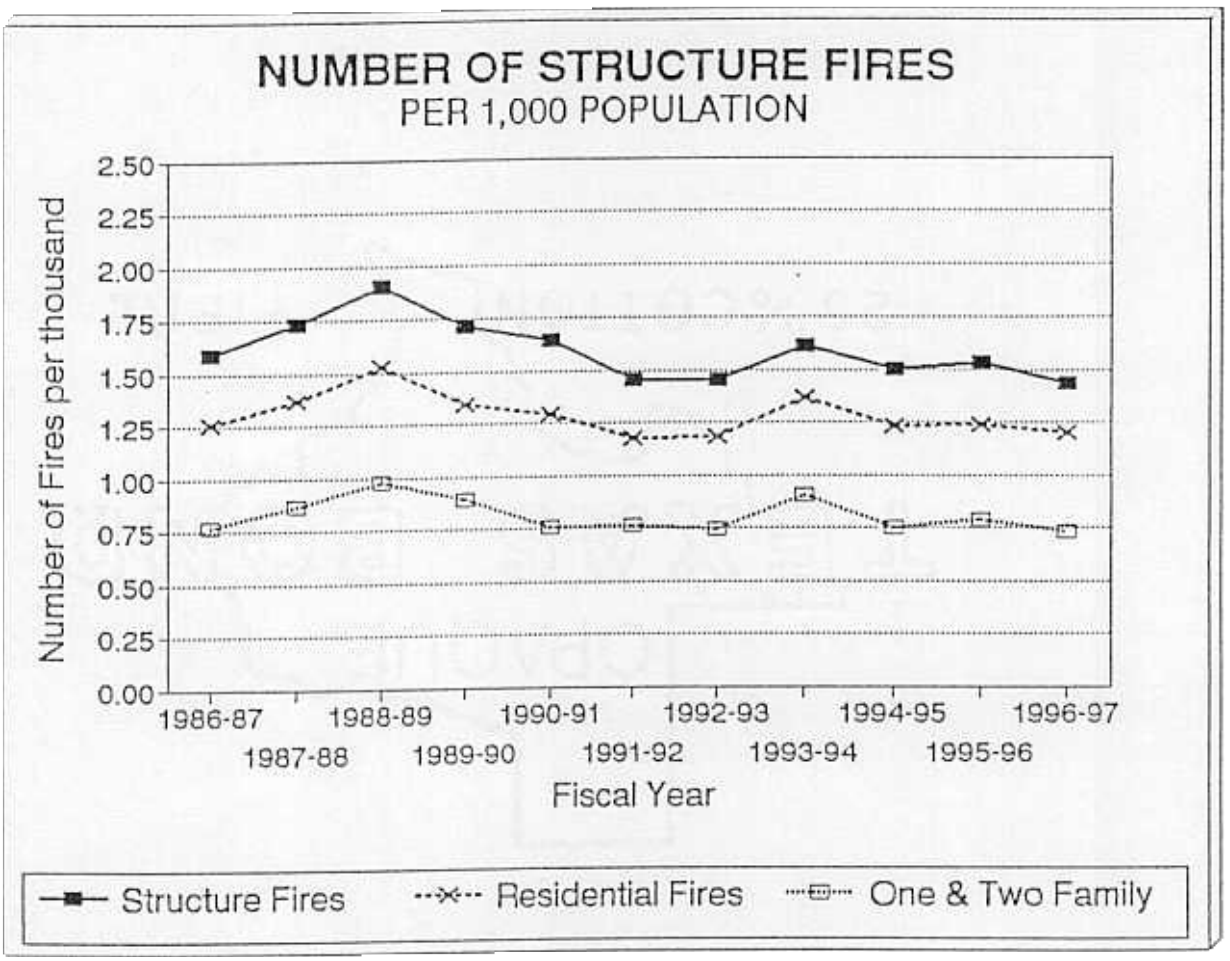
*Source: St. Louis Quint Concepts, L.L.C.*

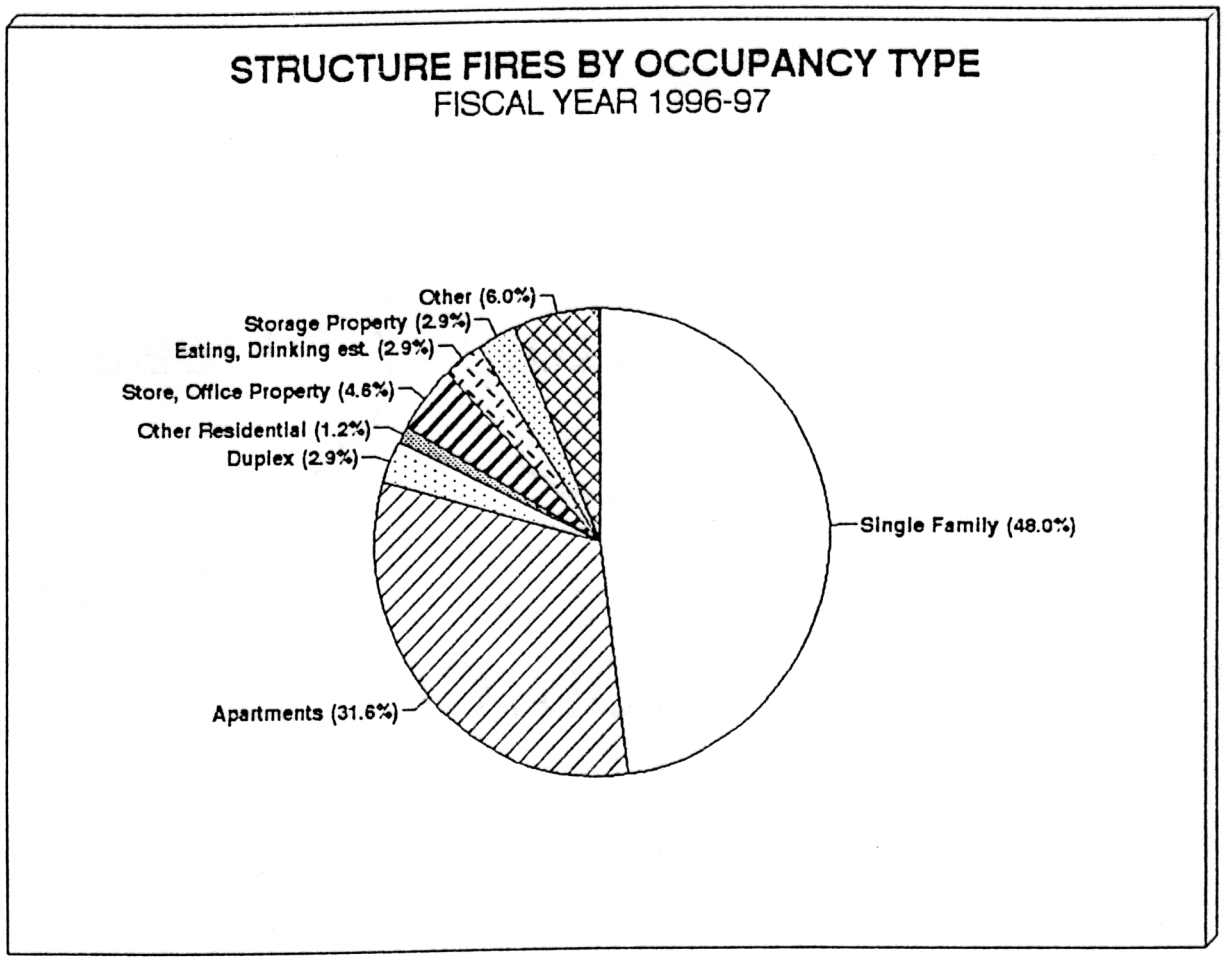
# APPENDIX C

# Arlington Structure Fire Experience

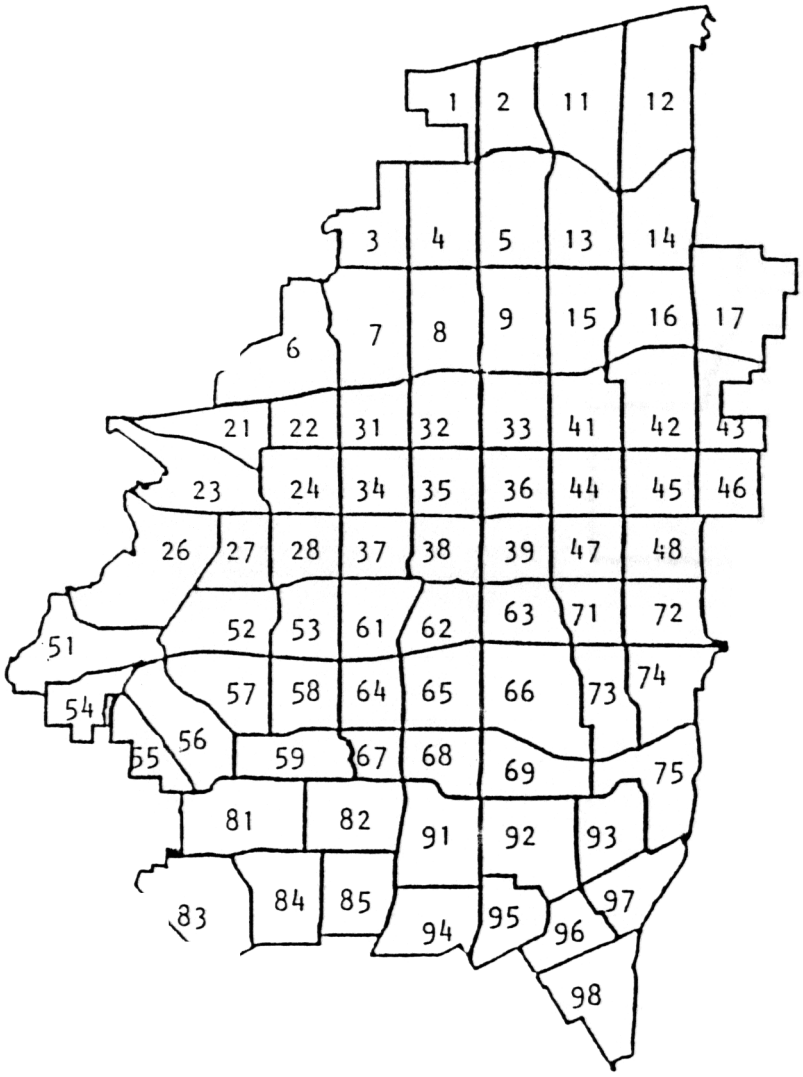
# Fiscal Year 1996-97



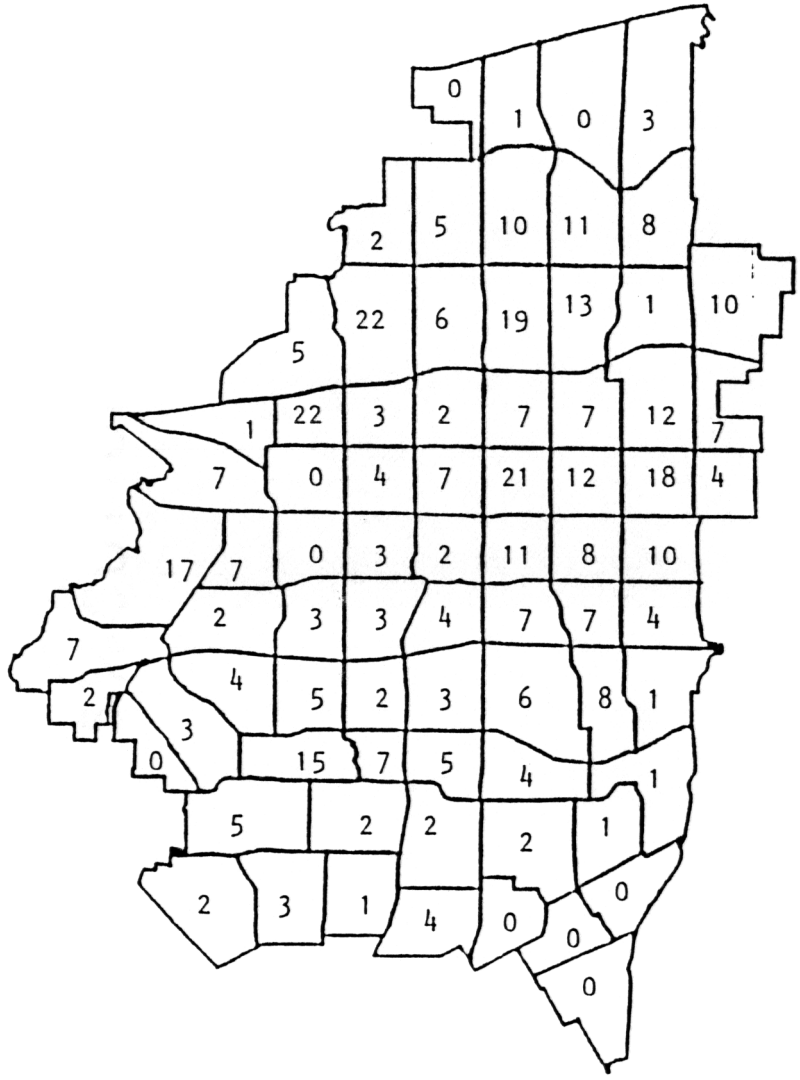

NUMBER OF STRUCTURE FIRES
PER 1,000 POPULATION
Number of Fires per thousand
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
1986-87
1987-88
1988-89
1989-90
1990-91
1991-92
1992-93
1993-94
1994-95
1995-96
1996-97
Fiscal Year
Structure Fires
Residential Fires
One & Two Family


STRUCTURE FIRES BY OCCUPANCY TYPE
FISCAL YEAR 1996-97
Other (6.0%)
Storage Property (2.9%)
Eating, Drinking est. (2.9%)
Store, Office Property (4.6%)
Other Residential (1.2%)
Duplex (2.9%)
Single Family (48.0%)
Apartments (31.6%)

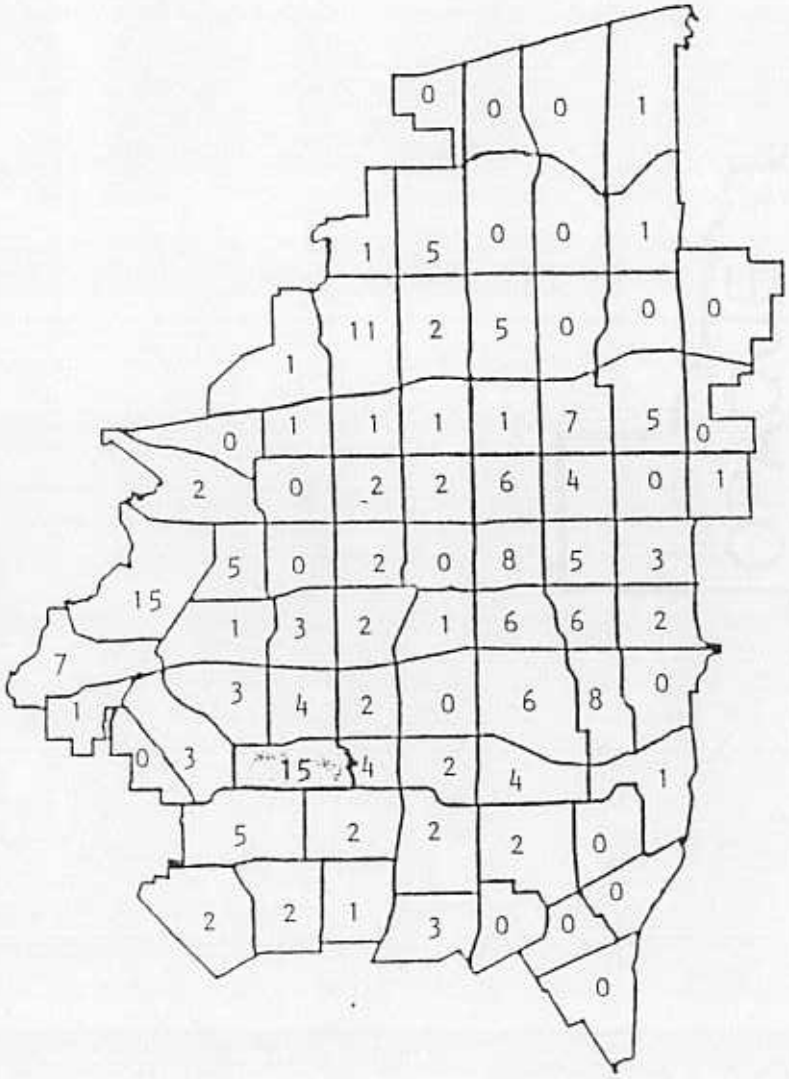
## C TY O ARLINGTON
## RID Y TEM



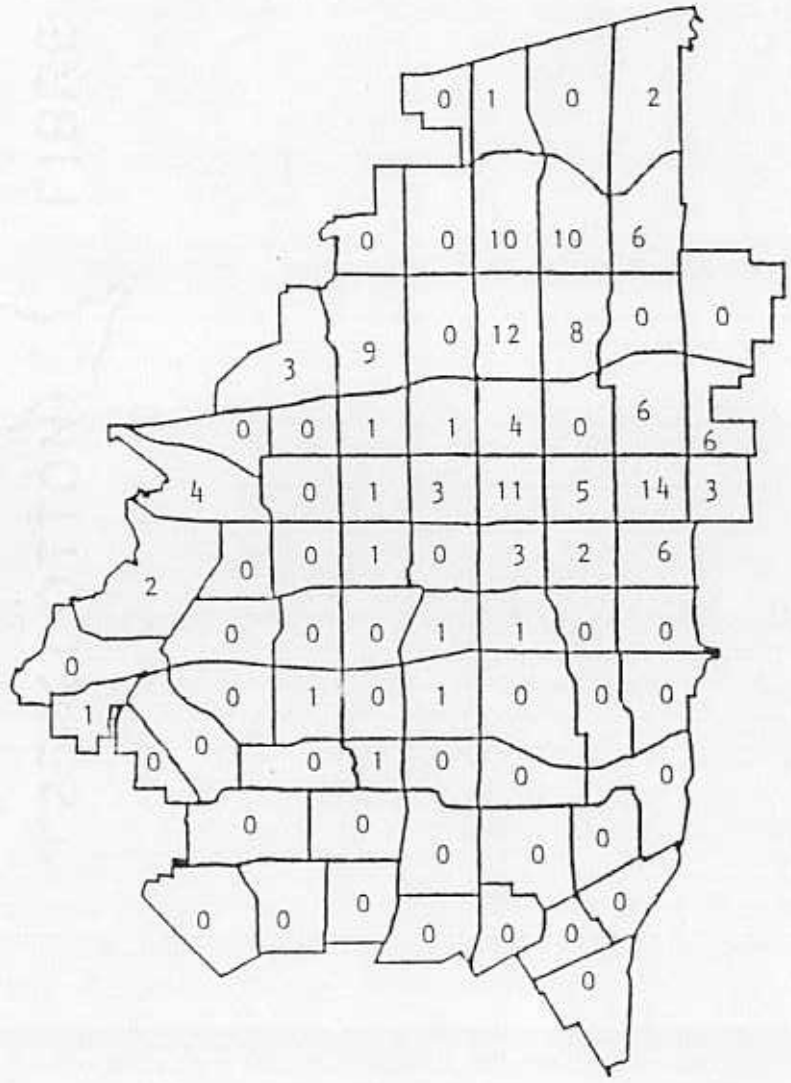

## TOTAL TRUCTURE FIR
## BY GR D 1996-97



## SINGLE-FAMLY HOME FIRES BY GRID 1996-97

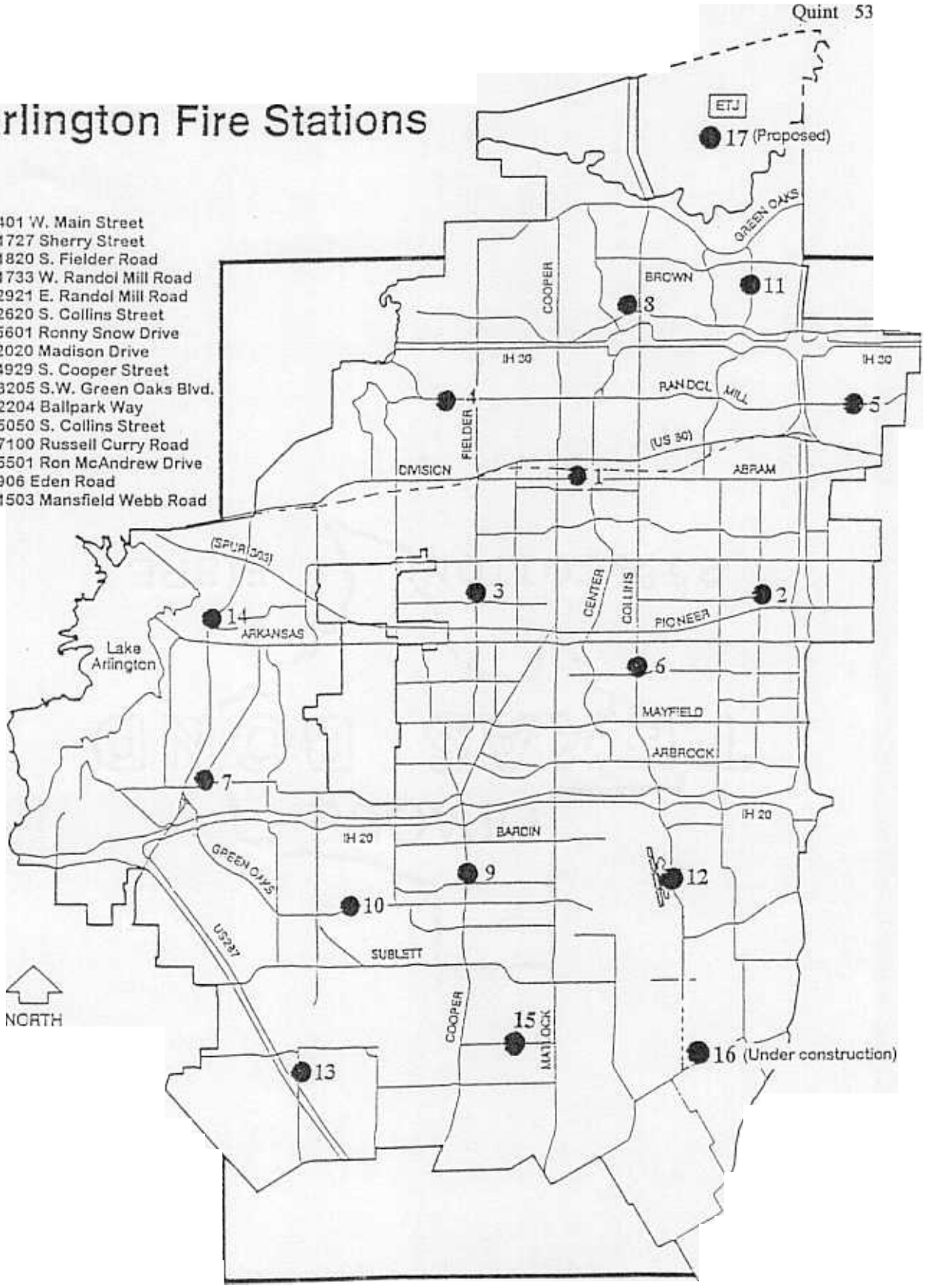



## MULTI-FAMILY HOME FIRES BY GRID 1996-97



# Arlington Fire Stations

# 1 401 W. Main Street
# 2 1727 Sherry Street
# 3 1820 S. Fielder Road
# 4 1733 W. Randol Mill Road
# 5 2921 E. Randol Mill Road
# 6 2620 S. Collins Street
# 7 5601 Ronny Snow Drive
# 8 2020 Madison Drive
# 9 4929 S. Cooper Street
#10 3205 S.W. Green Oaks Blvd.
#11 2204 Ballpark Way
#12 5050 S. Collins Street
#13 7100 Russell Curry Road
#14 5501 Ron McAndrew Drive
#15 906 Eden Road
#16 1503 Mansfield Webb Road




City of Arlington

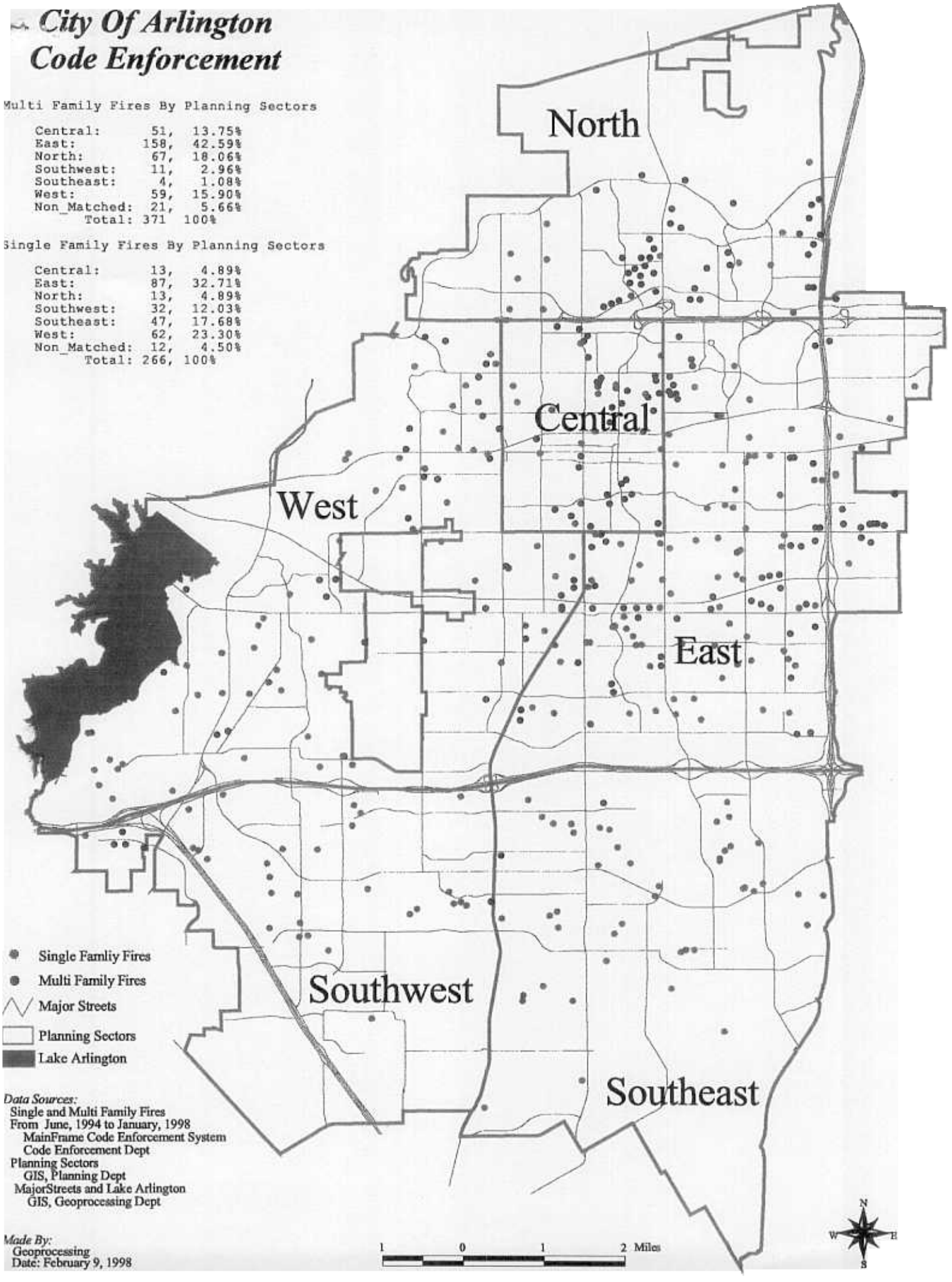
# City Of Arlington
# Code Enforcement

Multi Family Fires By Planning Sectors

| | | |
|---|---|---|
| Central: | 51, | 13.75% |
| East: | 158, | 42.59% |
| North: | 67, | 18.06% |
| Southwest: | 11, | 2.96% |
| Southeast: | 4, | 1.08% |
| West: | 59, | 15.90% |
| Non_Matched: | 21, | 5.66% |
| Total: | 371 | 100% |

Single Family Fires By Planning Sectors

| | | |
|---|---|---|
| Central: | 13, | 4.89% |
| East: | 87, | 32.71% |
| North: | 13, | 4.89% |
| Southwest: | 32, | 12.03% |
| Southeast: | 47, | 17.68% |
| West: | 62, | 23.30% |
| Non_Matched: | 12, | 4.50% |
| Total: | 266, | 100% |




*Data Sources:*
Single and Multi Family Fires
From June, 1994 to January, 1998
MainFrame Code Enforcement System
Code Enforcement Dept
Planning Sectors
GIS, Planning Dept
MajorStreets and Lake Arlington
GIS, Geoprocessing Dept

*Made By:*
Geoprocessing
Date: February 9, 1998