Town of Westwood

Massachusetts

Fire and Ambulance Services Study

June 2013

Emergency Services Consulting International

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Executive Summary

The Town of Westwood, Massachusetts, engaged Emergency Services Consulting International (ESCI) to re-evaluate the operations of the Westwood Fire Department (WFD) and to provide a summary of current conditions specific to staffing and capital assets both from a current perspective and based on the impact of new development occurring within the Town, particularly the University Station project. This report serves as the culmination of that project and begins with a general overview of the department for those that are not familiar with the project of similar scope conducted in 2007 by ESCI.

The Town of Westwood is located east-southeast of metropolitan Boston, Massachusetts, along the I-95/I-93 beltway. The community is served by Westwood Fire Department (WFD), a municipal department that provides services to the entirety of the Town comprised of a population of 14,117 and an area of 11.1 square miles. The department provides services from two fixed facilities (stations) with a complement of two engines, one aerial ladder, two squads, and three ambulances along with several support and ancillary vehicles with an operational staff of 28 divided into four shifts of seven.

ESCI conducted a non-architectural/non-engineering evaluation of current stations to assess suitability for current conditions and viability for future service delivery. Station 1, located in the heart of Westwood, was constructed in 1948 and underwent a significant renovation in 1975. The building is multi-storied with maintenance and storage facilities in the basement, administrative offices and apparatus bays on ground level, and living facilities and dormitories on the second floor above grade. The building is well constructed but offers limited storage space or room for expansion. Station 2, located in the Islington area of the Town was constructed in 1952 and underwent renovations in 1958 and 1960. The station is small and located in an area adjacent to a busy intersection. Recent mold issues are currently being abated but future viability of the station is in question.

In addition to a review of facilities, ESCI also evaluated current apparatus for general condition and serviceability. The department's fleet is in generally good condition and in line with national benchmarks with regard to numbers and types of apparatus.

A review of current staffing was of paramount importance to this project in that policymakers asked ESCI to determine if current staffing levels were adequate for existing conditions and what changes might be necessary given future development within the community. The department currently staffs both stations with career personnel and also employs four administrative and support staff. Station 1 houses the administrative and support positions including the Fire Chief, Deputy Chief, Administrative Assistant, and Mechanic as well as a complement of shift operational personnel, including a Captain and three Firefighter/Paramedic personnel at full staffing. These personnel staff an ambulance as well as a structure response engine but also cross-staff a second ambulance or the ladder truck based on incident dispatches. Station 2 is staffed by a Lieutenant and two Firefighter/Paramedic personnel and staffs a structural engine that responds to all incidents within its primary response area as well as all motor vehicle accidents throughout the entirety of the Town.

The current minimum staffing requirement for the department is six personnel per shift. In most cases (approximately 77 percent of the time) only three personnel are on duty at Station 1, reducing response capability. Given the critical task analysis conducted within this project, ESCI recommends that the minimum staffing be increased to seven per shift (nine at full staffing) to better enable the department to meet its existing demand.

A detailed analysis of service demand and performance was also reviewed as a component of this project. The elements evaluated included service demand, distribution of resources, apparatus concentration capabilities, unit/resource reliability and mutual aid, and overall response performance analyzed by time component.

The analysis revealed that the department's overall service demand is dominated by medical responses and other non-fire responses such as alarms, service calls, and public assists. Temporal analysis revealed that the department is busiest during the daytime hours as would be expected for a department that is actively involved in the delivery of emergency medical services. Service demand was also determined to be heaviest in the heart of Westwood in close proximity to Station 1 with another pocket of relatively high demand in close proximity to Station 2.

Distribution analysis showed that current stations were well-distributed in a manner that allowed the department to affect the quickest response to a majority of service demand and achieve a high ISO score, which translates to lower fire insurance premiums for residents and businesses. Concentration analysis indicates that the area is well-resourced with apparatus but staffing shortages both in Westwood and the surrounding agencies will impact the ability of the region to produce sufficient resources in a timely manner.

Reliability analysis indicates that most of the department's workload occurs singularly with two incidents occurring simultaneously approximately 20 percent of the time. Three simultaneous incidents occurred approximately 2 percent of the time.

Mutual aid was determined to be a potential element in the number of simultaneous incidents since most requests for mutual aid are occurring during the busiest times for the department. While mutual aid to other communities has decreased from 2011 to 2012 and is continuing this trend in 2013, the department should be vigilant in ensuring that resources are not being unnecessarily depleted.

Response performance was evaluated from the perspective of how long it takes units to get en route to an incident (turnout time) and from an overall response time perspective (dispatch to first unit arrival). The department's overall performance is close to national standards as illustrated below.

	Average Turnout	90th Percentile Turnout	Average Response	90th Percentile Response
WFD	0:42	1:55	3:36	6:34
NFPA Benchmark	N/A	0:60 to 1:20	N/A	5:00

The next section of the report considered historical population as well as future development to project a forecast population for the community. From this projection, ESCI used a per capita incident rate to project future service demand. Based on historical usage rates, ESCI predicts that fire incidents will increase approximately 22.2 percent; EMS incidents will increase approximately 30.9 percent; and other incident types will increase approximately 28.6 percent by 2034. Development in the University Station area will produce a slight increase in service demand, particularly EMS demand, and the timing of that increase will be determined by how quickly the residential, assisted living, and memory care units are occupied.

The intent of this project was two-fold: To provide policymakers with information relative to current conditions within the fire department and to address future needs within the fire department relative to planned development, particularly that of University Station. Given the current street network of the Town combined with proposed changes to streets, including the closing of Blue Hills Drive near the University Station development, ESCI evaluated several facility deployment strategies that the project team believes offers the Town the best options for addressing future service delivery demand.

The first option is to simply modify the response performance objective for the department. Adoption of an eight-minute performance objective would allow coverage of 100 percent of historical service demand given the existing street network. However, proposed closures and traffic calming devices may change the outcome of that model. ESCI also presented a model that relocates Station 2 closer to the University Station development. This model retains a five-minute response performance objective and, with additional staffing and a modification of the deployment model, will provide a better overall response to that station's primary service area.

Based on critical tasking, NFPA benchmarks, community risk and hazard assessment, and assembly of an effective response force to handle emergency medical service risks as well as fire suppression (given the additional development at University Station as well as throughout the Town at full build-out), ESCI recommends that fire department staffing be increased such that the minimum on-duty staffing is nine personnel. This would allow Station 1 to be staffed with five daily (a three-person fire suppression company and a two-person ambulance) and would also allow Station 2 to be staffed with four personnel daily, staffing a two-person suppression engine/quint and an additional two-person ambulance.

Assuming a full staffing of 11 personnel per shift and a mutual aid response of an additional four-person engine company from the adjacent municipality, WFD would have an effective response force of 14 to 15 firefighters. This would also double the emergency medical transport capacity for concurrent medical calls anticipated from an increase in the population base and demand from University Station. The following figure summarizes the potential staffing pattern and apparatus deployment scenarios.

	Station 1	**Station 2**	**Minimum Staffing per Shift**	**Full Staffing per Shift**
Scenario 1 – Two-Station Deployment (from current conditions assessment)	Engine – 3 Ambulance – 2 Ladder – Cross	Engine – 2 Ladder – Cross	**7**	**9**
Scenario 2 – Two-Station Deployment (University Station Build-Out)	Engine – 3 Ambulance – 2 Ladder – Cross	Engine/Quint – 2 Ambulance – 2	**9**	**11**

WFD has been providing fire suppression and emergency medical services to the Town of Westwood at a high level for a number of years. There is little expectation that this level of service should be decreased given the development occurring throughout the Town. In order to maintain the current level of service or to improve it based on current benchmarks and industry standards, ESCI believes that certain modifications are necessary in the current facility, apparatus, and staffing protocols.

In today's fire service environment, no fire department can be expected to be completely self-sufficient. WFD has worked diligently with its neighbors to establish automatic and mutual aid agreements that provide additional resources for certain types of incidents or when service demand surpasses the department's ability to respond. Even with these agreements in place, there remains a certain level of uncertainty in the availability of resources. In addition, fire departments must ensure the safety of their own personnel, as well as the safety of the community protected, by adequately staffing the deployed resources. In the case of WFD, it is ESCI's opinion that minimum daily staffing should be increased to seven per shift to accommodate current service demand and industry safety standards. As development continues and University Station becomes occupied, particularly the senior/memory care housing units, an additional ambulance should be deployed at Station 2 and minimum staffing should be increased to nine per shift as previously described.

If the Town decides to retain a performance objective built around a four-minute travel model, then Station 2 should be relocated to the vicinity of Canton Street and Everett Street. In fact, regardless of the decided upon performance objective, this location will reduce overlap with Station 1 and will provide a better response to the University Station development. In regard to apparatus, specific deployment will be based on the deployment model implemented but should be matched with the recommended staffing patterns already discussed.

ESCI began collecting data and information for this project early in 2013 and relied heavily on data provided by the fire department, police department, Town administration, and planning staff. It is the project team's sincere hope that the information contained within this document is found to be useful in future planning for the provision of fire suppression and emergency medical services to the Town of Westwood.

Evaluation of Current Conditions

The Town of Westwood, Massachusetts, engaged Emergency Services Consulting International (ESCI) to re-evaluate the operations of the Westwood Fire Department (WFD) and to provide a summary of current conditions specific to staffing and capital assets both from a current perspective and based on the impact of new development occurring within the Town, particularly the University Station project This report serves as the culmination of that project and begins with a general overview of the department for those that are not familiar with the project of similar scope conducted in 2007 by ESCI.

Organization Overview

The Town of Westwood is located east-southeast of metropolitan Boston, Massachusetts, along the I-95/I-93 beltway. The community is served by Westwood Fire Department (WFD), a municipal department that provides services to the entirety of the Town comprised of a population of 14,117 and an area of 11.1 square miles.[1] The department provides services from two fixed facilities (stations) with a complement of two engines, one aerial ladder, two squads, and three ambulances along with several support and ancillary vehicles with an operational staff complement of 28 divided into four shifts of seven.

Capital Assets

Aside from personnel, capital assets can be a department's most critical expense; and without proper upkeep and replacement planning, facilities and apparatus can fall into disrepair and fail at a critical time. This section evaluates the capital assets of WFD and provides recommendations for replacement as necessary.

Facilities

Facilities are the structures that provide housing not only for apparatus but also for personnel, both career and volunteer. Modern emergency services facilities (fire and EMS stations) have a number of needs that must be met through the design process that allow for adequate space for apparatus, storage, training, living space, personal hygiene requirements, safety, and code compliance. The following figures summarize ESCI's non-engineering/architectural review of each WFD facility.

[1] 2010 U.S. Census Bureau. Estimated current population of 15,274 based on local estimates.

Station 1	
Is this facility solely used for administrative offices	No
Facility used for:	Active response station, Administrative offices (HQ station),Training or drill facility, Maintenance facility
Year Facility Initially Constructed	1948
Number of Major Additions or Renovations	1
Year of Major Addition/Renovation	1975

Construction Features

Building Square Feet	Unknown
Apparatus Bays:	
Back-in, single unit	*0*
Back-in, used with stacked parking	*7*
Drive-through use, single unit	*0*
Drive-through capable, used with stacked parking	*0*
Building Height	Two-story
Construction Type	TYPE I-B--Fire Resistive Non-Combustible
Outside Finish	Brick veneer
Unusual Construction Features	None
Overall Construction Condition	Good condition
Does Structure Appear to be ADA Compliant	No
Building Code Issues Evident	No sprinklers
Roof Type	Peaked- shingle, Flat- membrane
Roof Age	1 to 10 years
Roof Condition	Small, isolated leaks evident or reported
Type of Heating System	Forced air- natural gas, Steam/boiler- natural gas
Heating System Age	1 to 10 years
Air Conditioning	Central air- living and administrative areas only
Any Other Known Maintenance or Disrepair Issues	Yes HVAC difficult to regulate, general age issues, apparatus floor cracking.

Design Features

Overall Size of Facility Adequate for Current Use	No, limited space
Apparatus Exit	Exit to traffic flow safe and unimpeded
Building and Property Blend Well with Neighborhood	Yes
Building and Property Adaptable if Future Expansion Needed	Yes
Adequate Staff and Visitor Parking	Visitor parking is inadequate

Safety Features

Automatic Door Stops on Overhead Doors Operating Properly	No
Adequate Fire Extinguishers (not on apparatus)	No
Cooking Equipment Central Shutdown	No
Automatic Fire Sprinklers Present	None
Alarm Systems Present	Local smoke detection only
Is Commercial Cooking Equipment Present	No
Flammable and Combustible Liquids Stored in Approved Cabinet	Yes
All Pressure Cylinders Stored Properly	Yes
SCBA Compressor System Present	Yes
Air Sample Certification Present and Visible	Certification status current, but not present
Back-Up Generator Present	Yes, with auto transfer switch
Generator Fuel Type and Source	Diesel fuel, local tank

Environmental Features

Apparatus Exhaust Removal	Direct connect vacuum system, connected
Underground Storage Tanks Present	No
Apparatus Floor Drain Oil Separators in Place	Yes

Station Staff Facilities and Features

Adequate Space for Working On or Around Apparatus	Space around apparatus cramped and movement is limited
Apparatus Room Accommodates Working on Small Equipment	Space is small and limited
Personnel Can Move Quickly and Easily to Apparatus for Response	Yes
Adequate Space for Cooking and Eating	Inadequate space
Adequate Space for Local Company Training and Drills	Inadequate space
Are Compromises Necessary for Two-Gender Staffing	Yes
Two-Gender Compromises	No private dressing area
Adequate Space for Personal Hygiene	Inadequate space
Adequate Space for Sleeping	Inadequate space
Adequate Space for Storage	Inadequate space
Facility Features	Separate watch room/station office, Station officer private office, Administrative/support offices, Day room/lounge, Kitchen, Classroom for >10, Training library, Male dormitory, Female dormitory, Separate officers’ dormitory, Shower/locker room(s),Dedicated exercise/workout area, Turnout gear extraction washer, SCBA filling station

Station 2	
Is this facility solely used for administrative offices	No
Facility used for:	Active response station
Year Facility Initially Constructed	1952
Number of Major Additions or Renovations	2
Year of 1st Major Addition/Renovation	1958
Year of 2nd Major Addition/Renovation	1960

Construction Features

Building Square Feet	Unknown
Apparatus Bays:	
Back-in, single unit	*0*
Back-in, used with stacked parking	*2*
Drive-through use, single unit	*0*
Drive-through capable, used with stacked parking	*0*
Building Height	One-story
Construction Type	TYPE V-A--Protected Wood Frame
Outside Finish	Brick veneer, Vinyl siding
Unusual Construction Features	None
Overall Construction Condition	Worn paint or finishes
Does Structure Appear to be ADA Compliant	No
Building Code Issues Evident	Yes, non-rated doors between apparatus bays and living areas
Roof Type	Peaked- shingle
Roof Age	1 to 10 years
Roof Condition	Small, isolated leaks evident or reported
Type of Heating System (all that apply)	Forced air- natural gas
Heating System Age	1 to 10 years
Air Conditioning (all that apply)	Central air- living and administrative areas only
Any Other Known Maintenance or Disrepair Issues	Yes, significant mold issue being abated

Design Features

Overall Size of Facility Adequate for Current Use	No
Apparatus Exit	Exit to traffic flow safe and unimpeded
Building and Property Blend Well with Neighborhood	No
Building and Property Adaptable if Future Expansion Needed	No
Adequate Staff and Visitor Parking	Staff parking is inadequate, Visitor parking is inadequate

Safety Features

Automatic Door Stops on Overhead Doors Operating Properly	No
Adequate Fire Extinguishers (not on apparatus)	No
Cooking Equipment Central Shutdown	No
Automatic Fire Sprinklers Present	None
Alarm Systems Present	Local smoke detection only
Is Commercial Cooking Equipment Present	No
Flammable and Combustible Liquids Stored in Approved Cabinet	Yes
All Pressure Cylinders Stored Properly	Yes
SCBA Compressor System Present	No
Back-Up Generator Present	Yes, with auto transfer switch
Generator Fuel Type and Source	Natural gas, piped in

Environmental Features

Apparatus Exhaust Removal	Direct connect vacuum system, connected
Underground Storage Tanks Present	No
Apparatus Floor Drain Oil Separators in Place	Oil separator in use

Station Staff Facilities and Features

Adequate Space for Working On or Around Apparatus	Space around apparatus cramped and movement is limited, limited space for working at rear of apparatus
Apparatus Room Accommodates Working on Small Equipment	Space is small and limited
Personnel Can Move Quickly and Easily to Apparatus for Response	Yes
Adequate Space for Cooking and Eating	Inadequate space
Adequate Space for Local Company Training and Drills	Inadequate space
Are Compromises Necessary for Two-Gender Staffing	Yes
Two-Gender Compromises	No private dressing area
Adequate Space for Personal Hygiene	Inadequate space
Adequate Space for Sleeping	Inadequate space
Adequate Space for Storage	Inadequate space
Facility Features	Separate watch room/station office, Station officer private office, Day room/lounge, Kitchen, Coed dormitory, Separate officers' dormitory, Shower/locker room(s),Dedicated exercise/workout area

Apparatus

Fire apparatus have undergone an enormous transition over the last couple of decades. The time of a fire department building its own apparatus is history; today's equipment has advanced technology that improves safety for those on board and provides for greater efficiency in fire suppression, extrication, rescue, and specialty response. The following figures detail the existing apparatus inventory.

Engine 5

Unit Status	Active Service
Manufacturer	Emergency One
Year of Manufacture	2003
Mileage	24,053
Hours	30,821
Pumping Capacity	1,500 gpm (gallons per minute)
Tank Capacity	750 gallons
Seating Capacity	5
Number of SCBA	4
Equipment	Large diameter hose, Generator, Articulating flood light, Power rescue tool, BLS medical gear, Automatic external defibrillator, Thermal imaging camera, Class A foam injected, Class A foam/eductor, Class B foam/eductor
Surface Rust Present	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Squad 1

Unit Status	Active Service
Manufacturer	Emergency One
Year of Manufacture	1991
Mileage	26,820
Hours	Unknown
Pumping Capacity	1,000 gpm
Tank Capacity	750 gallons
Seating Capacity	3
Number of SCBA	3
Equipment	Large diameter hose, BLS medical gear, Automatic external defibrillator, Class A foam/eductor
Surface Rust Present	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Ladder 1

Unit Status	Active Service
Manufacturer	Emergency One
Year of Manufacture	2003
Mileage	11,414
Hours	1,324
Pumping Capacity	1,500 gpm
Type of Elevating Aerial Device	Straight Ladder
Elevating Device Style	Mid-Chassis Mount
Height Of Device At Full Elevation	100
Does this unit also respond as a standard engine (quint use)	Responds as aerial/truck company only
Tank Capacity	200 gallons
Seating Capacity	6
Number of SCBA	5
Equipment	Large diameter hose, Generator, Articulating flood light, BLS medical gear, Automatic external defibrillator, Thermal imaging camera
Surface Rust	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Ambulance 2

Unit Status	Active Service
Manufacturer	Horton
Year of Manufacture	2003
Mileage	77,220
Equipped for	ALS
Crew Seating Capacity	2
Number of SCBA	2
Equipment	ALS medical gear
Surface Rust	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Ambulance 3

Unit Status	Active Service
Manufacturer	Life Line Emergency Vehicles
Year of Manufacture	2006
Mileage	Unknown
Equipped for	ALS
Crew Seating Capacity	2
Number of SCBA	2
Equipment	ALS medical gear, Power rescue tool
Surface Rust	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Engine 2

Unit Status	Active Service
Manufacturer	Emergency One
Year of Manufacture	2003
Mileage	86,287
Hours	5,310
Pumping Capacity	1,500 gpm
Tank Capacity	750 gallons
Seating Capacity	5
Number of SCBA	4
Equipment	Large diameter hose, Generator, Articulating flood light, Power rescue tool, BLS medical gear, Automatic external defibrillator, Thermal imaging camera, Class A foam/eductor, Class B foam/eductor
Surface Rust Present	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Squad 2

Unit Status	Active Service
Manufacturer	Emergency One
Year of Manufacture	1990
Mileage	33,640
Hours	Unknown
Pumping Capacity	1,000 gpm
Tank Capacity	750 gallons
Seating Capacity	3
Number of SCBA	3
Equipment	Large diameter hose, BLS medical gear, Class A foam/eductor, Class B foam/eductor
Surface Rust Present	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Good

Brush 2

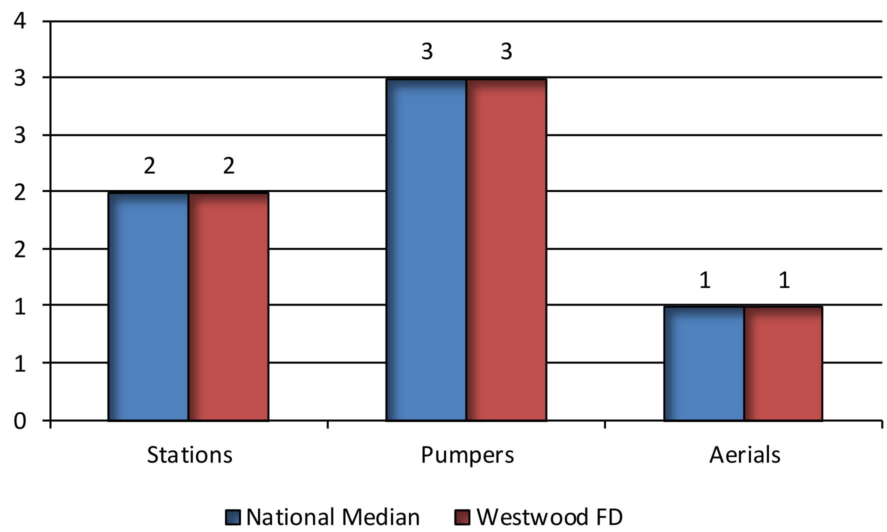
Unit Status	Active Service
Manufacturer	Greenwood
Year of Manufacture	2001
Mileage	2,188
Pumping Capacity	100-250 gpm
Tank Capacity	300 gallons
Seating Capacity	3
Number of SCBA	3
Equipment	BLS medical gear, Automatic external defibrillator, Class A foam
Surface Rust	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Excellent

Engine 1	
Unit Status	Reserve Service
Manufacturer	Emergency One
Year of Manufacture	1991
Mileage	87,000
Hours	Unknown
Pumping Capacity	1,500 gpm
Tank Capacity	750 gallons
Seating Capacity	5
Number of SCBA	5
Equipment	Large diameter hose, BLS medical gear, Automatic external defibrillator, Class B foam eductor.
Surface Rust Present	Significant
Structural Rust and Corrosion	Significant
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Fair

Ambulance 1	
Unit Status	Active Service
Manufacturer	International/Horton
Year of Manufacture	2011
Mileage	Unknown
Equipped for	ALS
Crew Seating Capacity	2
Number of SCBA	2
Equipment	ALS medical gear
Surface Rust	None
Structural Rust and Corrosion	None
Apparent Fluid Leaks	None
Overall Appearance and Condition Rating	Excellent

The following figure compares WFD's physical resources against available national benchmark data provided by the NFPA.

Figure 1: Comparison of Capital Assets to National Median



WFD's resources are equally matched with other departments serving similar populations. It should be noted, however, that these benchmarks do not take into consideration geography or physical barriers to response that may exist (such as the low rail overpass in Westwood) that prevent passage of large apparatus. Any necessary modifications to capital asset deployment will be discussed in the future delivery models section of this report.

Capital Improvement Programs

Most emergency services agencies do not properly plan for the replacement of capital equipment but rather rely on long-term debt to replace equipment. While long-term debt may be necessary for facilities, apparatus replacement planning is relatively simple. If a plan is consistently followed, apparatus can be purchased with cash rather than incurring debt, but annual allocations must be made on a consistent basis for this to work. ESCI developed a capital replacement plan for WFD's primary response apparatus (not including command and small vehicles or specialty trailers or equipment).

Figure 2: Recommended Capital Replacement Plan

Unit	Year	Replacement Cost	Annual Fund Contributions	Current Cash Requirements	Current Age	Life Expectancy	Replacement Year
Engine 2	2003	$500,000	$33,333	$333,333	10	15	2018
Squad 1	1991	$350,000	NA	$350,000	22	15	OVERDUE
Squad 2	1990	$350,000	NA	$350,000	23	15	OVERDUE
Ladder 1	2003	$750,000	$37,500	$375,000	10	20	2023
Brush 2	2001	$140,000	$9,333	$112,000	12	15	2016
Ambulance 2	2003	$155,000	$15,500	$155,000	10	10	OVERDUE
Ambulance 3	2006	$155,000	$15,500	$108,500	7	10	2016
Ambulance 1	2011	$155,000	$15,500	$31,000	2	10	2021
Engine 5	2003	$500,000	$33,333	$333,333	10	15	2018
Engine 1	1991	$500,000	NA	$500,000	22	15	OVERDUE
		TOTALS	**$160,000**	**$2,648,167**			

Based on this plan, four apparatus are already overdue for replacement and a deficit of $2.6 million exists if the plan had been in place since the purchase of the first apparatus currently in service. In addition, to fully fund this plan moving forward, $160,000 must be set aside annually for future apparatus replacement. This figure is intended only as a guide to indicate what a fully funded capital replacement plan would look like for WFD and is not intended to replace internal organizational knowledge about apparatus condition or life expectancy. In addition, an internal decision would be necessary as to useable life of all apparatus and estimated replacement costs.

Staffing

In many cases, emergency services agencies were formed by concerned citizens after a tragic event within the community that prompted dedicated residents to come together to prevent the event's recurrence. These personnel resources serve as the backbone of any emergency service provider. Regardless of the deployment of stations or the availability of vehicles and apparatus, people are the resource that put these other items into action and fulfill the mission of the organization.

Today's emergency services agencies are a mix of career (paid full-time), part-time, paid-on-call, and volunteer personnel. Which of these an agency utilizes (one or more) is dependent upon several factors, including availability of paid-on-call or volunteer personnel, service demand, population density, socioeconomics and demographics of the community, and financial resources. This section of the report evaluates WFD's personnel resources including administrative staffing, operational staffing and performance, and member recruitment and retention efforts.

Station 1 supports fire department administration offices of the chief, deputy chief, and administrative assistant as well as a mechanic position (vacant). This station houses a transport ambulance, a structural engine, and an aerial device. When ideally staffed, this station houses a captain and three firefighter/paramedics. It was reported to ESCI by the Fire Chief that during the last 12 calendar months this level of staffing was present 23 percent of the time. Subsequently, what appears to be predominantly Station 1 staffing level (77.2 percent of the shifts over the last 12 calendar months) was staffing of three: a captain and two firefighter/paramedics. The staff is utilized in a dynamic delivery model—for emergency medical calls two firefighter/paramedics respond in the Town ambulance, followed by the captain in a "chase" vehicle. As required by the collective bargaining agreement, three personnel respond on fire suppression calls—the captain and two firefighters.

Station 2 staffs a minimum of three personnel daily—a Lieutenant and two firefighters. Currently, these personnel staff a structural response engine. The department is working towards equipping and staffing Engine 2 as a paramedic first response engine which would enhance advance life support coverage within the Town and reduce arrival time of paramedics in certain locations.

The Town is a mix of residential, light commercial, and retail. Structural fire response within the Town given full staffing (23 percent of the time) is two engines or an engine and an aerial with a total complement of seven firefighters. More typical is six firefighters and two pieces of structural apparatus. This response is supplemented upon arrival and confirmation of a working fire by the addition of a mutual aid engine from Norwood, if available, staffed with four firefighters and the next closest aerial or ladder company from Dedham with two firefighters. This represents a consistent potential response of six firefighters from within Westwood plus the Norwood engine for a total fire response force rapidly of ten personnel.

The demand of emergency medical service within the Town commits two personnel to any ambulance response at minimum, reducing Town-wide fire protection staffing during those instances to four personnel when staffed at six daily. Critical advanced life support calls such as cardiac arrest, multiple system trauma, and acute respiratory failure may require additional personnel for advanced life support stabilization and transport, further reducing the staffing available for fire suppression response.

A comparable community evaluated was the City of Concord, Massachusetts, which has a population of approximately 17,000 and responds to an average of 3,000 calls for service annually. The fire department utilizes a two-station deployment with a total shift staffing of nine firefighters daily.

Concord's Station 1 staffs four on a structure fire engine and two on a rescue, which also cross-staff to the ladder if necessary; Concord Station 2 staffs three personnel on its second structural engine. Mutual responding aid companies account for the balance of the necessary effective response force to complete critical emergency ground tasks.

National Fire Protection Association (NFPA) guidelines speak to consensus recommendations as to the number of firefighters necessary to safely and effectively extinguish fire, perform rescue, and complete all other necessary fire ground tasks for successful fire ground operations. NFPA recommendations establish 14-15 firefighters assembled rapidly, defined as within 8 minutes from the time of call 90 percent of the time for a 2,000 square foot residential home. We note that many the homes within Westwood were substantially larger than this 2,000 square foot paradigm. Of course, commercial properties present even greater staffing resource needs. These numbers are determined based a variable of several factors inclusive of tasks necessary to be performed and the criticality of time to mitigate the emergency.

Critical Tasking

Westwood Fire Department's service area is a combination of suburban residential, light commercial and retail areas and, as such, contains a variable number, density, and distribution of risk. It is notable that large assisted living facilities, large square footage residential estates, light commercial, schools, manufacturing, and residential in-patient facilities exist as well the proposed University Station mixed use development. WFD should have the resources needed to effectively mitigate the incidents that have the highest potential to negatively impact the community. As the actual or potential risk increases, the need for higher numbers of personnel and apparatus also increases. With each type of incident and corresponding risk, specific critical tasks need to be accomplished and certain numbers and types of apparatus should be dispatched. This section considers the community's identified risks and illustrates the number of personnel that are necessary to accomplish the critical tasks at an emergency.

Tasks that must be performed at a fire can be broken down into two key components: life safety and fire flow. Life safety tasks are based on the number of building occupants and their location, status, and ability to take action for self-preservation. Life safety related tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks and complete some in chronological order rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Backup/rapid intervention

Critical task analysis also applies to non-fire type emergencies, including medical, technical rescue, and hazardous materials emergencies. Numerous simultaneous tasks must be completed to effectively control an emergency. The department's ability to muster needed numbers of trained personnel quickly enough to make a difference is critical to successful incident outcomes.

WFD has developed the following Critical Task Analyses for various incident types. Further it has defined, based on current unit staffing levels, the number and type of apparatus needed to deliver sufficient numbers of personnel to meet the critical tasking identified. Review of the Critical Task Analyses indicates that all are in keeping with industry standards and provide the minimum number of personnel needed for effective incident operations.

Critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents in order to control the situation. The fire department is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner.

- **Fires** – Critical tasking for fire operations is the minimum number of personnel to perform the tasks required to effectively control a fire in the listed risk category. Major fires (beyond first alarm) will require additional personnel and apparatus.
- **Emergency Medical –** Critical tasking for emergency medical incidents is the minimum number of personnel to perform the tasks required to support the identified strategy based on the department's adopted medical protocol.

The figure below identifies WFD's personnel needs (given existing staffing levels) for specific incident types, based on the types of typical occupancies and risks within the community.

Figure 3: Critical Tasking for Low Rise Residential Structure Fire

Task	Initial Assignment Number of Personnel	Working Fire Initial Assignment Number of Personnel
Command	1	1
Pump Operator	1	1
Attack Line	2	4
Search and Rescue	2	2
Ventilation	1	2
RIT	0	2
Other (hydrant)	0	1
Total	**7**	**13**

Figure 4: Critical Tasking for High Rise Residential Structure Fire

Task	Initial Assignment Number of Personnel	Working Fire Initial Assignment Number of Personnel
Command	1	1
Pump Operator	1	2
Attack Line	2	6
Search and Rescue	2	4
Ventilation	1	4
RIT	0	4
Other (hydrant)	0	1
Total	**7**	**22**

Figure 5: Critical Tasking for Moderate Risk Commercial Structure Fire

Task	Initial Assignment Number of Personnel	Working Fire Initial Assignment Number of Personnel
Command	1	1
Pump Operator	1	2
Attack Line	2	6
Search and Rescue	2	4
Ventilation	1	4
RIT	0	4
Other (hydrant)	0	1
Total	**7**	**22**

Figure 6: Critical Tasking for High Risk Commercial Structure Fire

	Initial Assignment	Working Fire Initial Assignment
Task	**Number of Personnel**	**Number of Personnel**
Command	1	2
Pump Operator	1	3
Attack Line	2	6
Search and Rescue	1	4
Ventilation	1	4
RIT	0	6
Other (hydrant)	0	2
Total	**6**	**27**

Figure 7: Critical Tasking for Grass/Brush Fire

Task	Number of Personnel
Command/Safety	1
Pump Operator	1
Attack Line	2
Other (hydrant)	0
Total	**4**

Figure 8: Critical Tasking for Car Fire

Task	Number of Personnel
Command/Safety	1
Pump Operator	1
Attack Line	2
Other (hydrant)	0
Total	**4**

Figure 9: Critical Tasking for Emergency Medical Incident

		Cardiac Arrest
Task	**Number of Personnel**	**Number of Personnel**
Patient Management	1	2
Patient Care	2	3
Documentation	1	1
Total	**4**	**6**

Figure 10: Critical Tasking for Motor Vehicle Accident

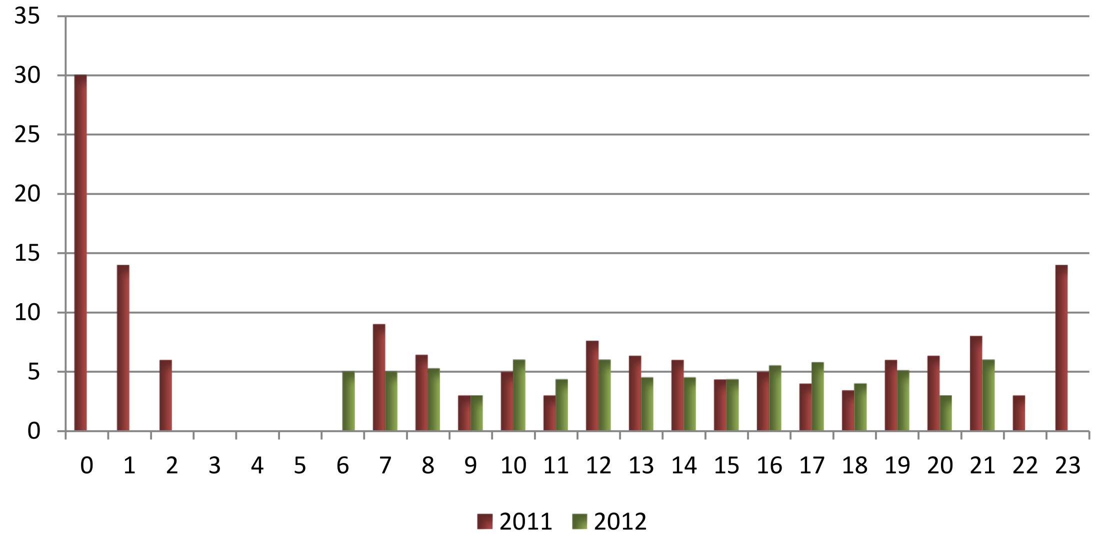
	Surface Street	Freeway	Pin-In/Entrapment
Task	**Number of Personnel**	**Number of Personnel**	**Number of Personnel**
Scene Management/Command	1	1	2
Patient Care	2	2	2
Extrication	2	2	2
Fire Protection	1	1	2
Documentation	0	0	1
Other	1	1	1
Total	**7**	**7**	**10**

Figure 11: Critical Tasking for Hazardous Materials Incident

	Level 1	Level 2
Task	**Number of Personnel**	**Number of Personnel**
Command/Safety	1	2
Entry Team	2	2
Backup Team	2	2
Decontamination	1	4
Research	0	1
Support	0	3
Other	0	2
Total	**6**	**16**

The preceding figures illustrate the number of personnel that WFD has determined are necessary for effective mitigation of particular incidents. As is common in most areas of North America, fire departments staff their resources so that an initial emergency response force can minimize spread or exacerbation of an incident while awaiting additional resources from other areas for high risk or unusual incidents. Although a minimum number of staff is desired for each specific type of incident, that number is not always available either due to simultaneous incidents or staff shortages. ESCI evaluated the department's NFIRS data to determine average staffing for the most critical types of incidents, structure fires. The analysis indicates that the average structure fire staffing over the 2011 and 2012 calendar years equates to 6.6 personnel. This number, however, is variable given the hour of day and the type of structure involved. The figure below provides an analysis of the average number of staffing by hour of day for all structure fires coded 111 through 118 in the NFIRS documentation. This chart represents the average of the actual number of personnel that were recorded in the department's documentation for all structure fires during 2011 and 2012. Those periods without a column represent time periods where no incidents of this type were recorded.

Figure 12: Structure Fire Staffing by Hour of Day



Most structure fires over the data period had an average of five to nine personnel that actually responded, similar to the on-duty staffing for the Town.

Dynamics of Fire in Buildings

Most fires within buildings develop in a predictable fashion, unless influenced by highly flammable material. Ignition, or the beginning of a fire, starts the sequence of events. It may take several minutes or even hours from the time of ignition until a flame is visible. This smoldering stage is very dangerous, especially during times when people are sleeping, since large amounts of highly toxic smoke may be generated during this phase.

Once flames do appear, the sequence continues rapidly. Combustible material adjacent to the flame heat and ignite which in turn heats and ignites other adjacent materials if sufficient oxygen is present. As the objects burn, heated gases accumulate at the ceiling of the room. Some of the gases are flammable and highly toxic.

The spread of the fire from this point continues quickly. Soon the flammable gases at the ceiling as well as other combustible material in the room of origin reach ignition temperature. At that point, an event termed "flashover" occurs; the gases and other material ignite, which in turn ignites everything in the room. Once flashover occurs, damage caused by the fire is significant and the environment within the room can no longer support human life.

Flashover usually occurs about five to eight minutes from the appearance of flame in typically furnished and ventilated buildings. Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to apply water to a fire before flashover occurs.

Although modern codes tend to make fires in newer structures more infrequent, today's energy-efficient construction (designed to hold heat during the winter) also tends to confine the heat of a hostile fire. In addition, research has shown that modern furnishings generally burn hotter (due to synthetics).

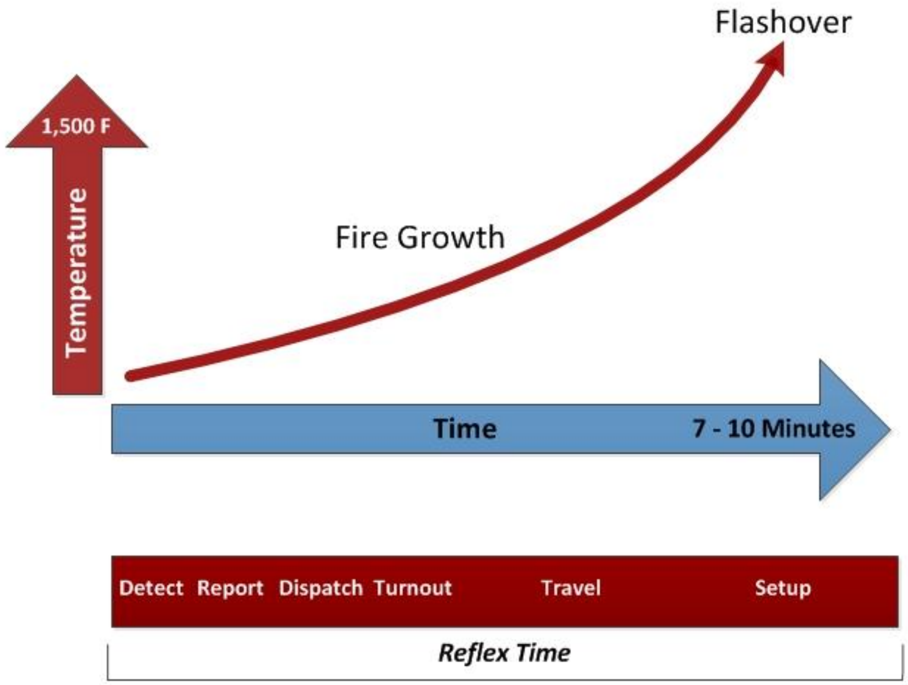
In the 1970s, scientists at the National Institute of Standards and Technology found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by heat and smoke. Today, that estimate is as short as three minutes.[2] The necessity of effective early warning (smoke alarms), early suppression (fire sprinklers), and firefighters arriving on the scene of a fire in the shortest span of time is more critical now than ever.

Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. "Light weight" roof trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a dangerous environment for firefighters.

In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a fire. All of these factors make the need for early application of water essential to a successful fire outcome. A number of events must take place quickly to make it possible to achieve fire suppression prior to flashover. The following figure illustrates the sequence of events.

[2] National Institute of Standards and Technology, *Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings,* Bukowski, Richard, et al.

Figure 13: Fire Growth vs. Reflex Time



As is apparent by this description of the sequence of events, application of water in time to prevent flashover is a serious challenge for any fire department. It is critical, though, as studies of historical fire losses demonstrate.

The National Fire Protection Association found that fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). As evidenced in the following table, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

Figure 14: Fire Extension in Residential Structures

Consequence of Fire Extension In Residential Structures, 2003 - 2007			
	Rates per 1,000 Fires		
Extension	Civilian Deaths	Civilian Injuries	Average Dollar Loss Per Fire
Confined to room of origin or smaller	2.44	25.67	$5,317
Confined to floor of origin	16.18	72.79	$34,852
Confined to building of origin or larger	27.54	54.26	$60,064

Source: National Fire Protection Association "Home Structure Fires", March 2010

Emergency Medical Event Sequence

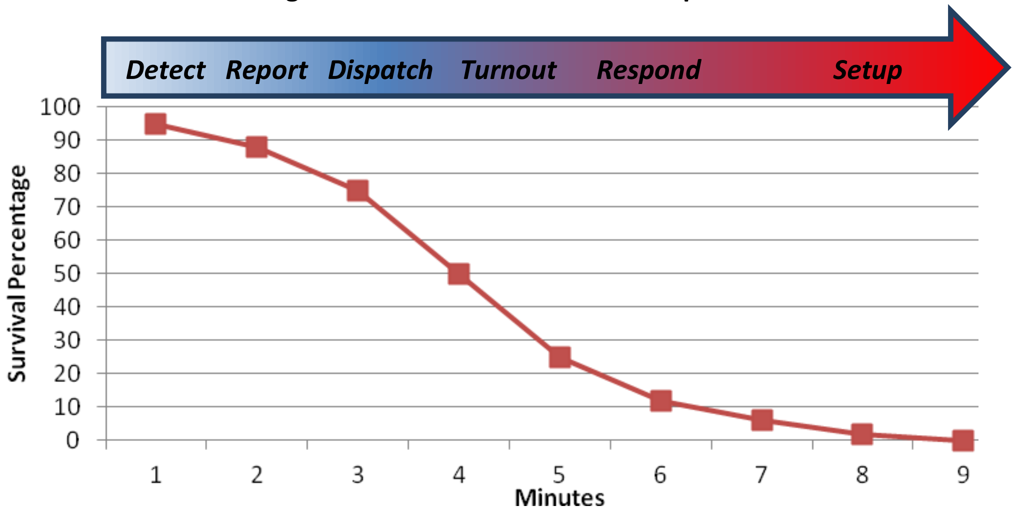
Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation.

The American Heart Association (AHA) issued a set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims and to increase the likelihood of survival. The AHA guidelines include goals for the application of cardiac defibrillation to cardiac arrest victims.

Cardiac arrest survival chances fall by seven to 10 percent for every minute between collapse and defibrillation. Consequently, the AHA recommends cardiac defibrillation within five minutes of cardiac arrest.

The following table illustrating cardiac arrest survivability was published in a 1998 study by the Emergency Medical Directors Association of California and illustrates the value of early CPR and cardiac defibrillation.

Figure 15: Cardiac Arrest Event Sequence



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for a fire response. Recent research stresses the importance of rapid cardiac defibrillation and administration of certain medications as a means of improving the opportunity for successful resuscitation and survival.

Recommendation – Establish Full Daily Staffing of Nine (Minimum Daily Staffing of Seven)

The addition of two firefighters daily, assigning one to each of the current stations would allow Station 1 to maintain three-person staffing of the structural engine company at all times and staff the paramedic rescue ambulance with two personnel. This complement would also allow four personnel to be assigned to the fire suppression unit at Station 2 and effectively engage in the two-in/two-out OSHA requirements for interior structural firefighting.

In addition, a second ambulance unit could be placed at Station 2 to allow that station to provide responses to second medical incidents or to serve as the primary for medical incidents occurring in that area.

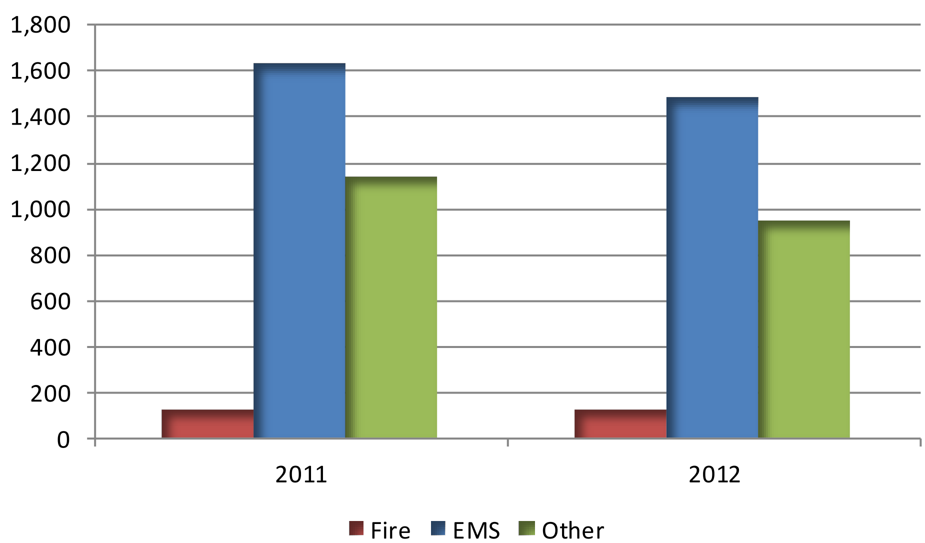
Service Delivery and Performance

While the previous sections of this document provide the reader with an overview of how the department is organized and managed, the primary responsibility of all emergency services organization is to provide emergency response services to their respective communities. This report section evaluates the service delivery and performance of WFD from the perspective of service demand, distribution of resources, concentration capabilities, reliability of resources, response performance, and mutual and automatic aid systems.

Demand

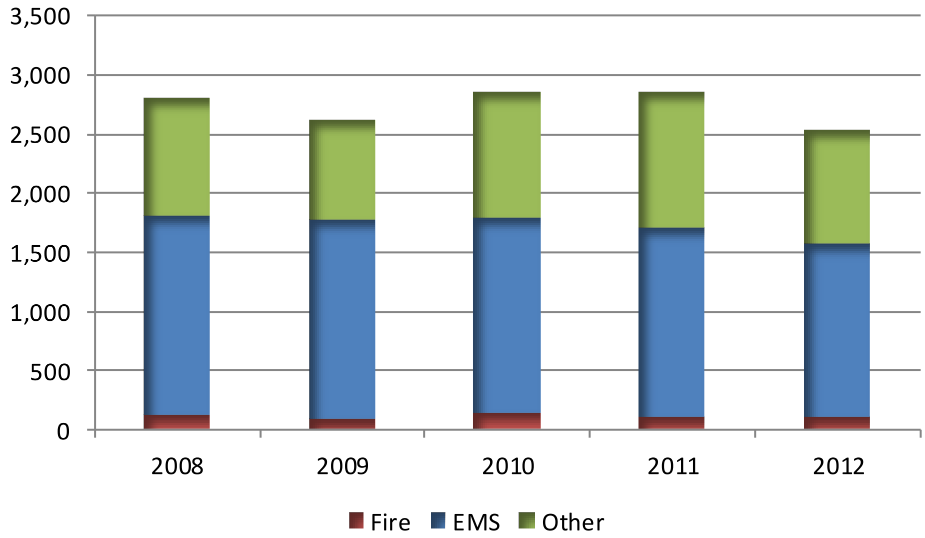
Service demand can be defined in a number of ways depending on the types of services provided by the organization. For the purposes of this report, service demand is defined as any and all incidents where emergency resources are utilized to resolve the situation. These may include non-emergency incidents where resources are simply provided in a support role as well, but the primary goal is to show how busy the department is over a given period of time. This analysis begins with a general overview of WFD's total service demand. ESCI was provided with computer aided dispatch (CAD) data for calendar year 2012 from Westwood Police Department as well as National Fire Incident Reporting System (NFIRS) data for calendar years 2011 and 2012 from WFD. Each dataset was used where appropriate and is noted as such in each analysis. Demand analysis begins with an overview of total workload by category as presented in the following figure.

Figure 16: Service Demand by Type of Incident



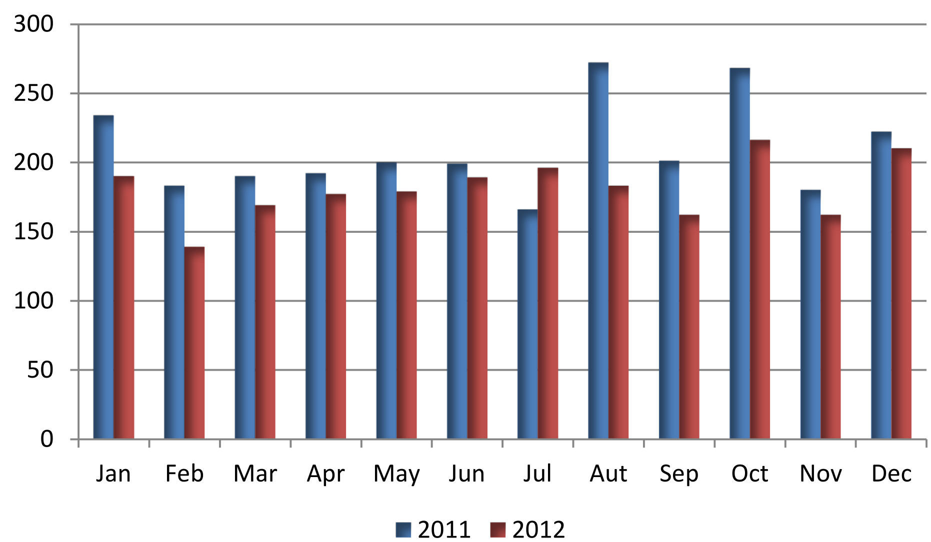
As expected, emergency medical services (EMS) incidents comprise a majority of the department's workload followed by incidents not involving any type of fire ('Other') such as alarms, service calls, and public assists. While the figure above only shows two years' worth of data, the following figure provides a more historical view of overall service demand.

Figure 17: Historical Service Demand



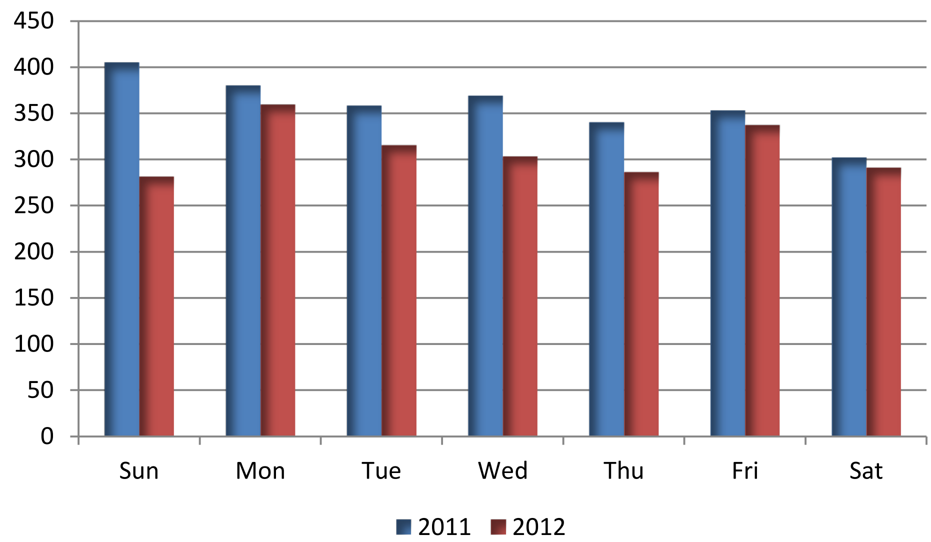
Over the five-year period illustrated above, overall service demand for the department has decreased 9.3 percent. Although viewing aggregate workload is useful in determining how busy any give department is in general, reviewing that workload temporally allows management to deploy units based on variations in service demand over given periods of time. This temporal analysis begins with a review of WFD's service demand by month.

Figure 18: Service Demand by Month



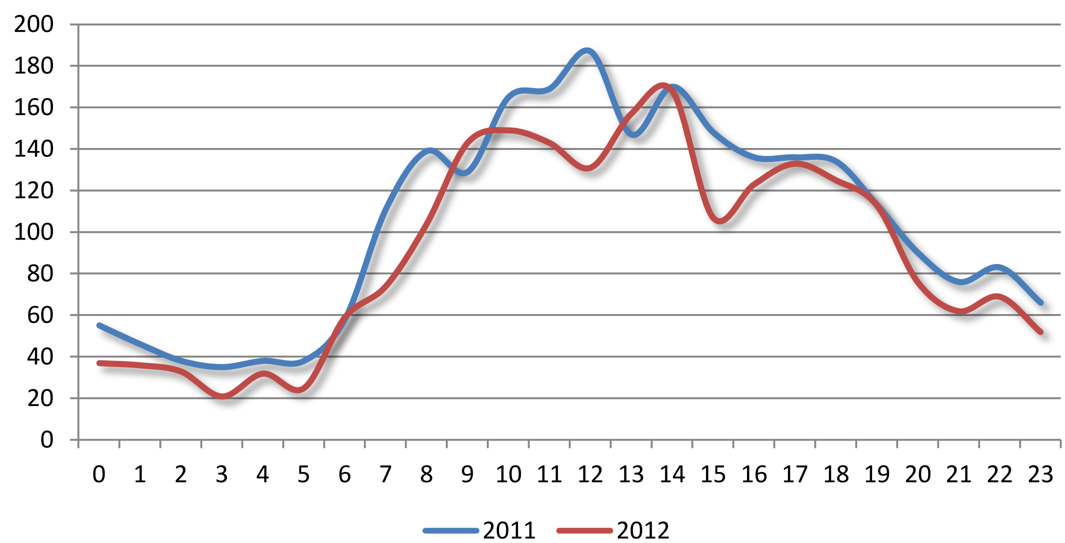
While service demand varies by month, there is no discernible pattern. The next analysis reviews service demand by day of week.

Figure 19: Service Demand by Day of Week



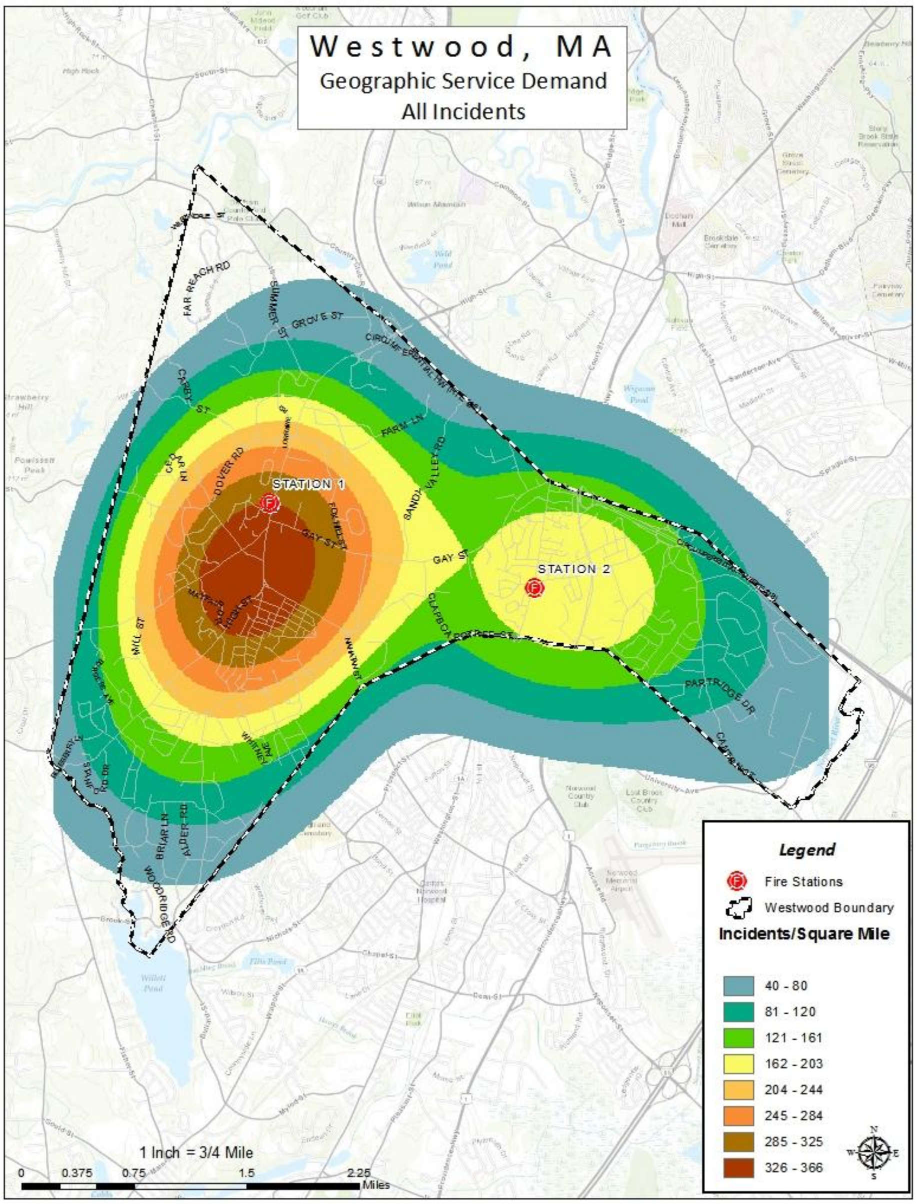
As with monthly service demand, no pattern is visible across the two-year data period analyzed. The final temporal analysis reviews service demand by hour of day.

Figure 20: Service Demand by Hour of Day



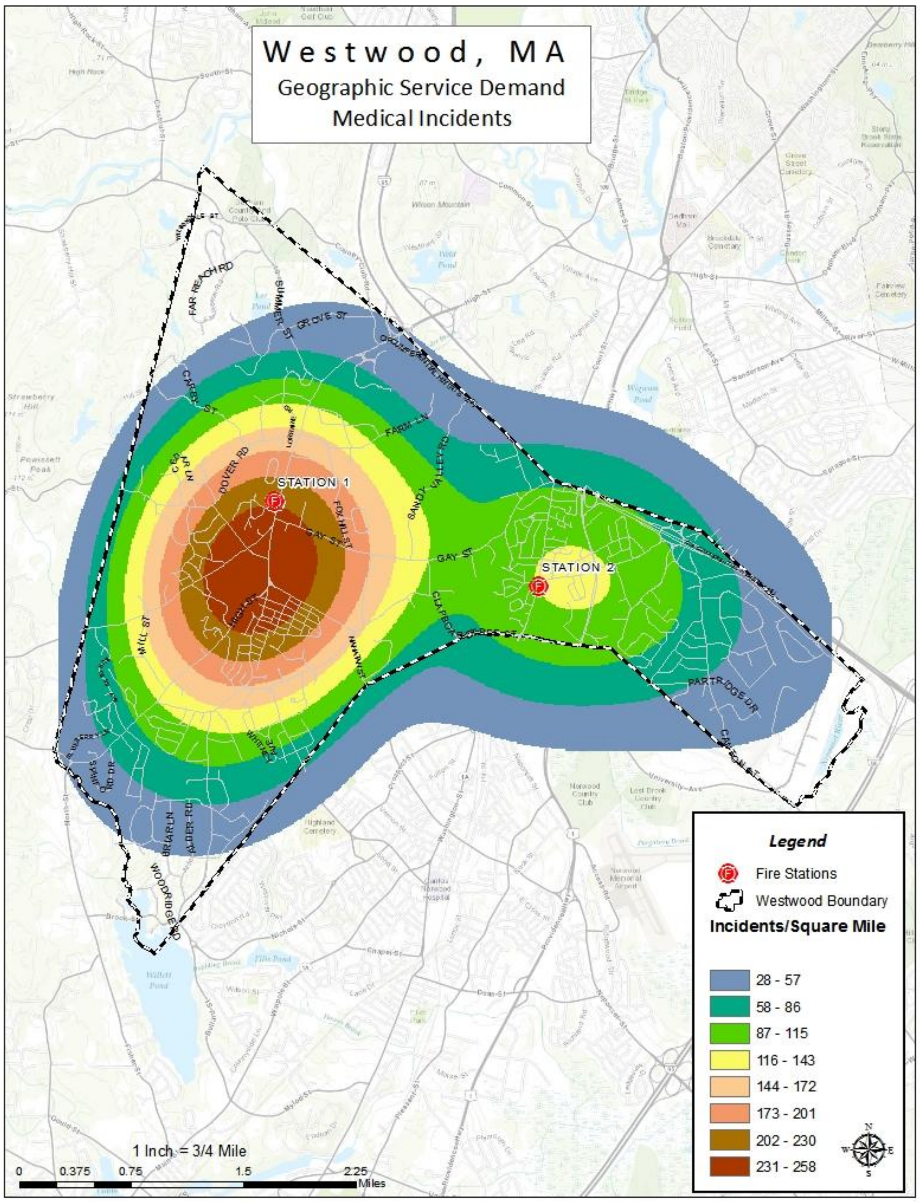
The bell curve pattern visible in the preceding figure is typical of emergency services agencies that actively participate in EMS activities since these types of incidents are driven by human activity. As expected, activity begins to increase between 0500 and 0600 (when the population becomes more active) and declines from 1700 to 1800 into the evening as commuters reach their destinations and settle in for the evening. The final analysis of service demand evaluates where demand is occurring throughout the community as represented in the following figures based on 2011 and 2012 incidents.

Figure 21: Geographic Service Demand - All Incidents



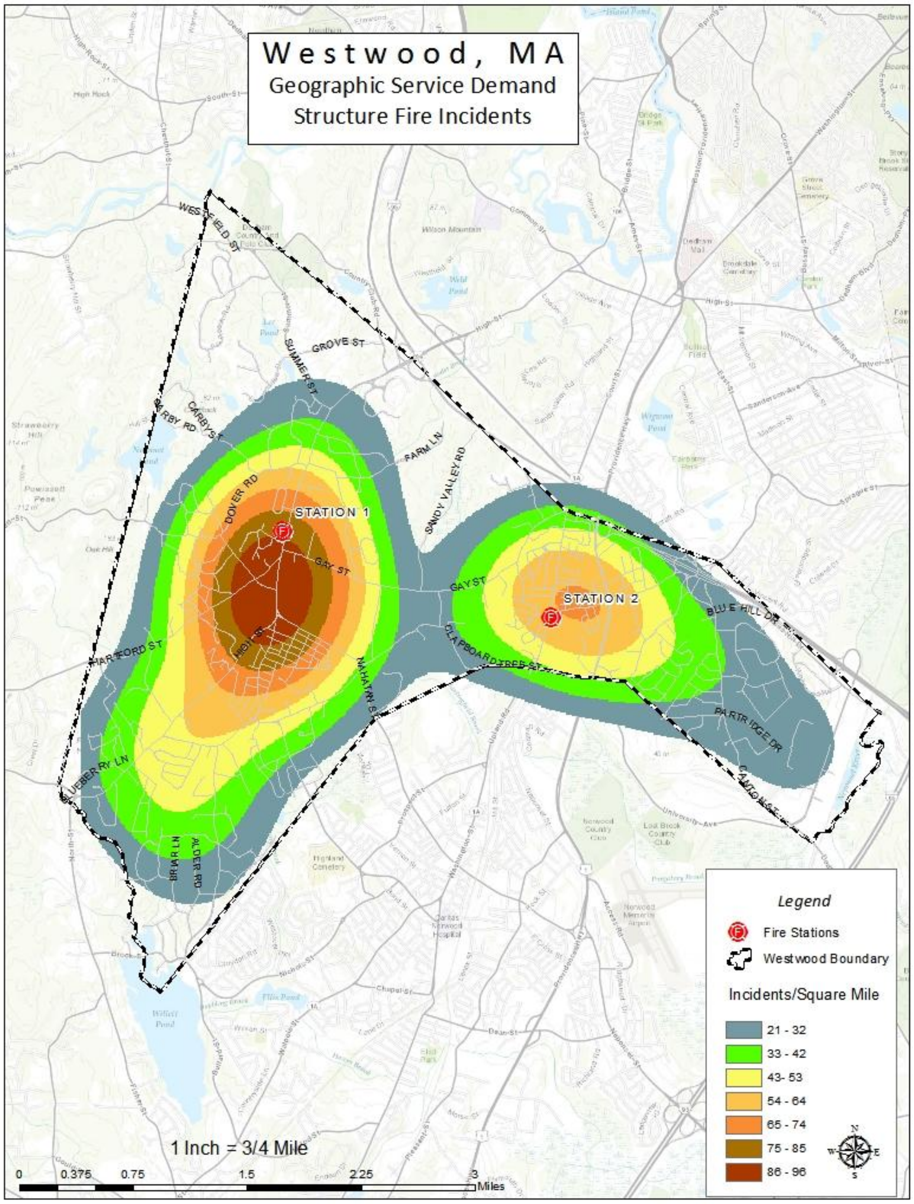
Plotting service demand geographically indicates that the most dense volume of service demand is occurring just south of WFD Station 1 with another moderate cluster close to Station 2. This represents total service demand. To show how service demand varies by call type, ESCI broke out EMS incidents from all other service demand. EMS incidents are plotted in the figure below.

Figure 22: Geographic Service Demand - Medical Incidents



Not surprisingly, a majority of EMS incidents occur on the west side of the community. The same is true for fire incidents, as illustrated in the next map.

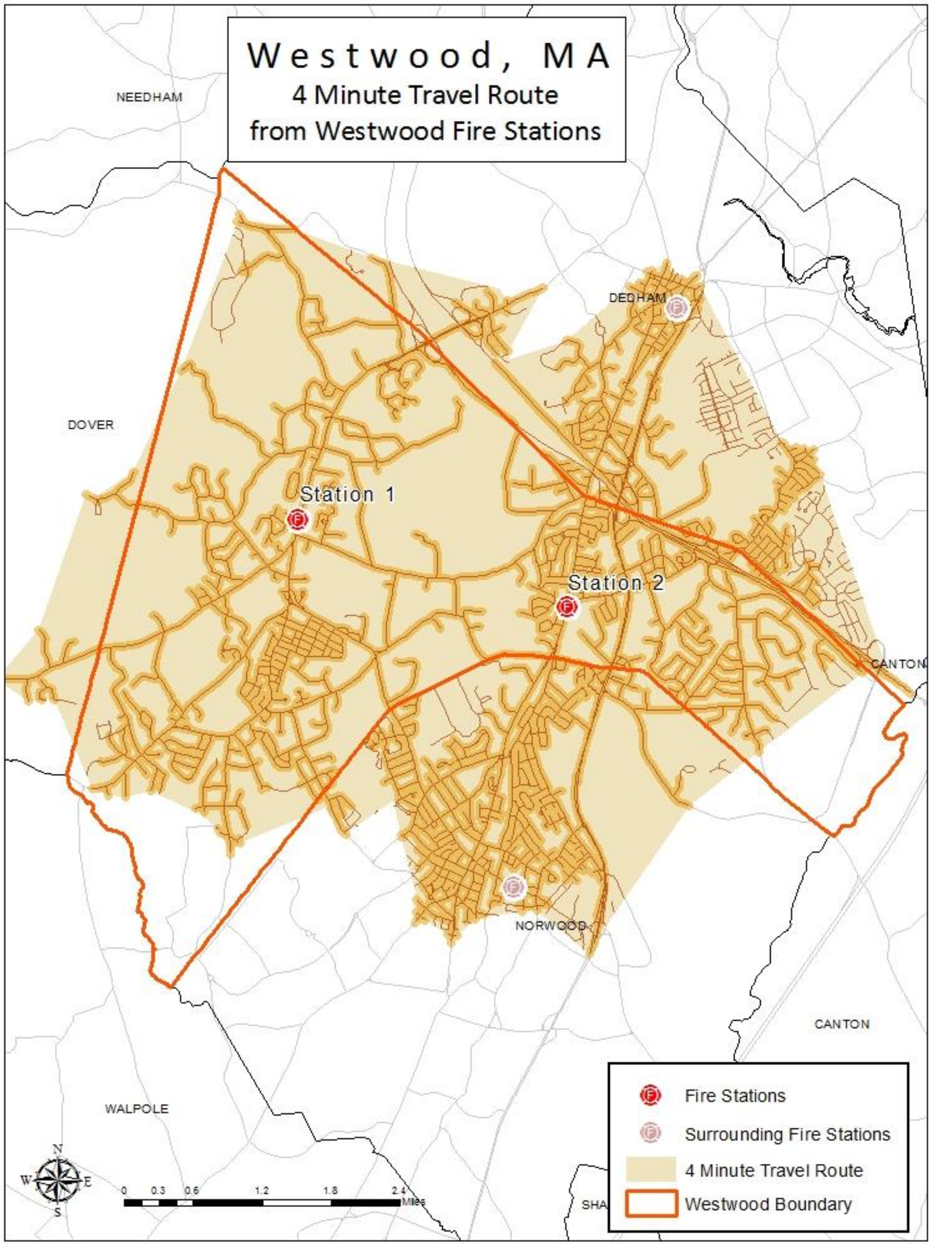
Figure 23: Geographic Service Demand - Fire Incidents



Distribution

Distribution analysis is an evaluation of how well physical resources (facilities) are deployed across a specific geographic area. For medical incidents there is little in the way of guidance on how well resources should be distributed because these incidents are primarily driven by human activity. For fire protection, however, there are several industry standards that specify how fire stations should be distributed. NFPA recommends that fire departments serving urban areas with career personnel be able to respond to 90 percent of emergency incidents within five minutes of total response time or four minutes of travel. The following figure illustrates a four-minute travel model from existing stations and does not take into account station staffing. This is the standard methodology for distribution analysis.

Figure 24: Current Facility Distribution and Travel Time Model – Four-Minute Travel



A vast majority of the Town is within four minutes of travel from an existing station. Coupled with a one-minute turnout time, the department should enjoy an exceptional overall response time.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Public Protection Classification™ (PPC) rating system from which insurance rates are often based. The rating system evaluates three primary areas: the emergency communication and dispatch system, the fire department, and the community's pressurized hydrant or tanker-based water supply. The overall rating is then expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. It is also important to note that, according to the Insurance Services Office website information on the PPC™ minimum criteria, "the ISO generally assigns Class 10 to properties beyond five road miles" from a fire station.[3]

A community's PPC™ can affect decisions insurers make regarding the availability and price of property insurance. Many insurance companies make at least some use of the classification to price their policies, determine which coverages to offer, or to determine deductibles for individual homes and businesses. Regardless of the community's classification, individual insurance companies establish their premiums, not the Insurance Services Office. The particular system that any given company uses when calculating premiums for property insurance may be affected by that company's fire-loss experience, underwriting guidelines, and marketing strategy. This makes it extremely difficult to generalize how any improvement or decline in the PPC™ rating will affect specific insurance policies or premiums.

The following figure shows how insurance premiums might vary for two typical structures under a couple of insurance companies' current rating schedules. While these figures are reasonable examples of the impact the PPC™ can make on insurance premiums, the value of the premium credits for the different PPC™ ratings will vary among insurance companies. This example chart was obtained from a report published by the League of Minnesota Cities entitled "The ISO Fire Protection Rating System".

Figure 25: Representative Insurance Premiums by Fire Protection Class

PPC Classification	$150,000 Residence	$1,000,000 Commercial Space
1	$670	$2,950
2	$670	$2,980
3	$670	$3,020
4	$670	$3,040
5	$670	$3,060
6	$670	$3,120
7	$670	$3,230
8	$777	$3,330
9	$972	$3,440
10	$1,072	$3,710

[3] Information obtained from the Insurance Services Office website, www.isomitigation.com.

According to the report, there are some points to note regarding the chart:

- "In this schedule, no additional credit is given on residential property for a fire class better than 7. The reason has largely to do with the role that water supply plays in the ratings. Having a better water supply helps in fighting fires in larger commercial structures, and therefore is reflected in a better rating. But for most residential fires a lesser water supply is actually needed, and having more than that available really doesn't help the fire department fight that particular residential fire any better. There's some variation among insurance companies (e.g., some might allow additional credit for class 6, others might lump classes 7 and 8 together for rating purposes, etc.) but this general pattern is fairly typical for residential premium structures.
- Not all insurance companies use the ISO classifications. This is especially true for residential coverage. Some companies have their own rating systems based on their own historical loss data for the area rather than on an evaluation of the fire protection in the area. Other insurance companies use their own systems for rating the fire protection for a particular property; a company might classify properties based on the individual property's distance from a fire station and water supply, for example".[4]

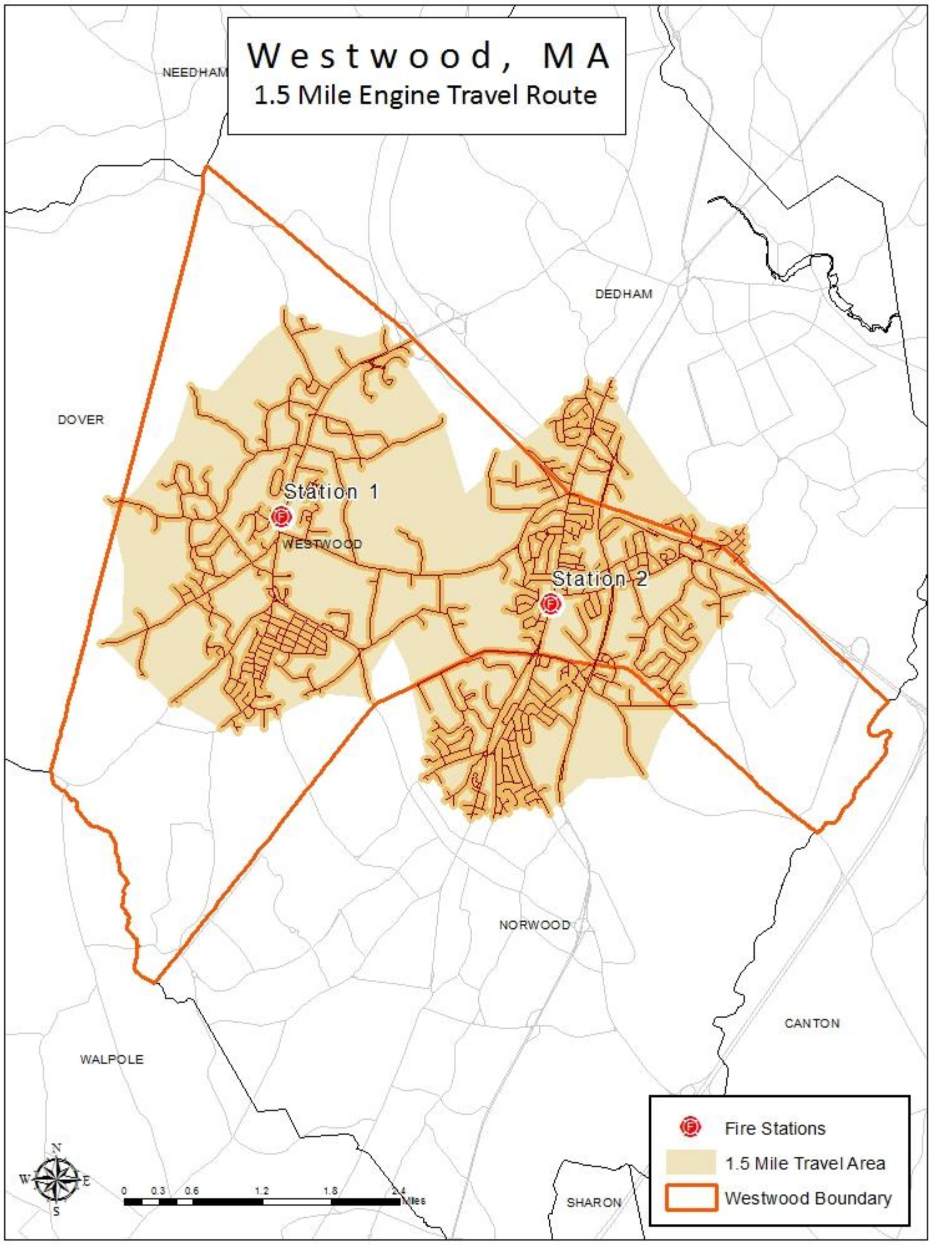
As of the latest rating, ISO gave the Town of Westwood a rating of Class 3. The ISO classification details indicate that the fire department received a credit of 32.57 out of a possible 50 points, while the community's water system received 33.11 out of a possible 40 points. The rating was conducted in April 1999.

While distribution credits in the PPC™ may not be the most important factor in the decision to add facilities, it is acknowledged that this issue does affect the community's rating classification and should be considered. The next few paragraphs of the report examine the travel coverage based upon the PPC™ credentialing criteria by the Insurance Services Office.

To receive maximum credit in this section, all "built-upon" portions of a community would need to be within 1.5 road miles of an engine company and 2.5 road miles of a ladder or service company. In order to determine the distribution of engine companies across "built upon" areas, ISO reviews the response area of each existing engine and identifies the number of fire hydrants within those response areas. ISO analyzes whether there are additional geographic areas of the district outside of the existing engine company response where at least 50 percent of the number of hydrants served by the largest existing response area could be served by a new engine. For ISO purposes, the response area is measured at 1.5 miles of travel distance from each engine company on existing roadways.

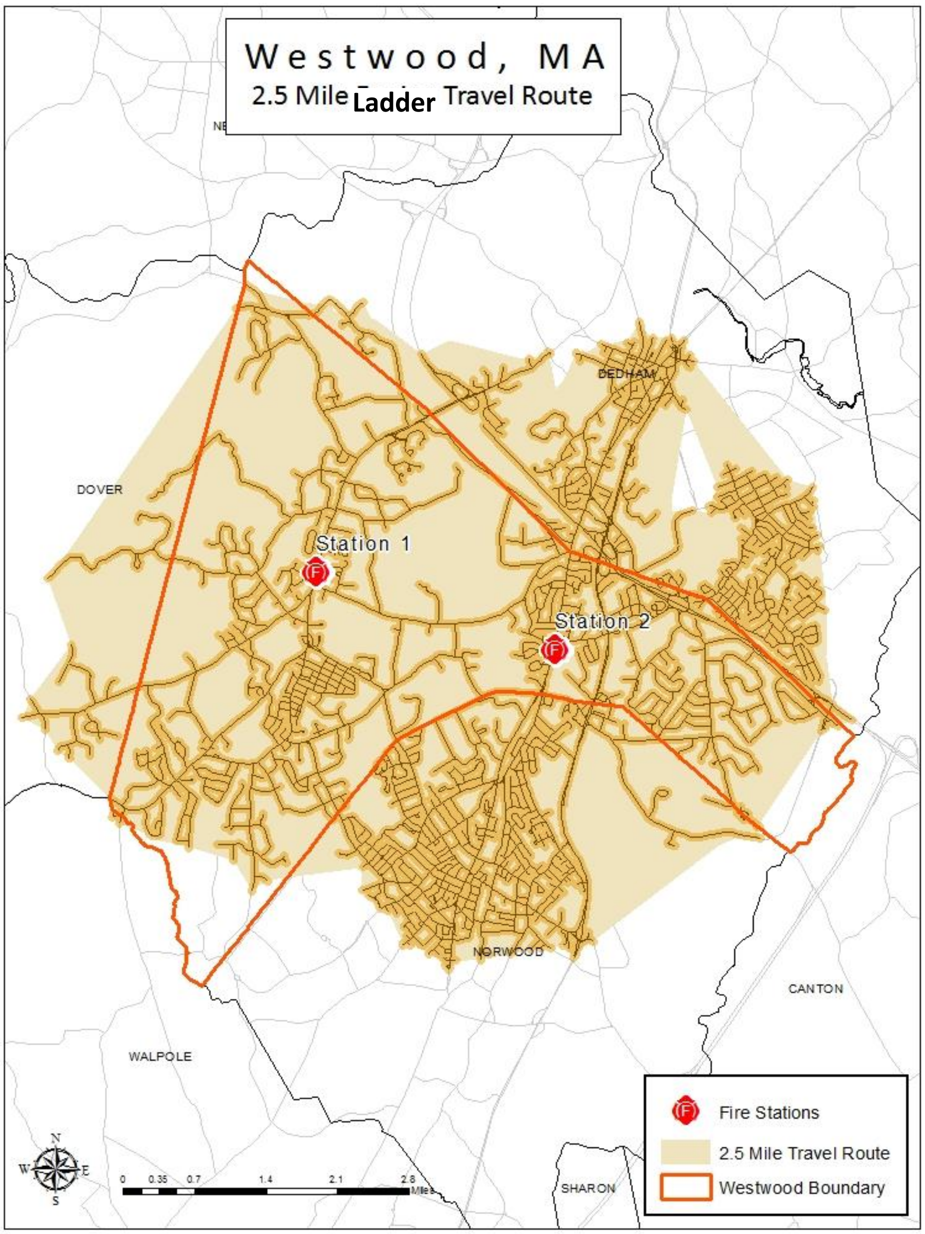
[4] League of Minnesota Cities. *The ISO Fire Protection Rating System*. www.lmnc.org.

Figure 26: 1.5-Mile Engine Travel Model



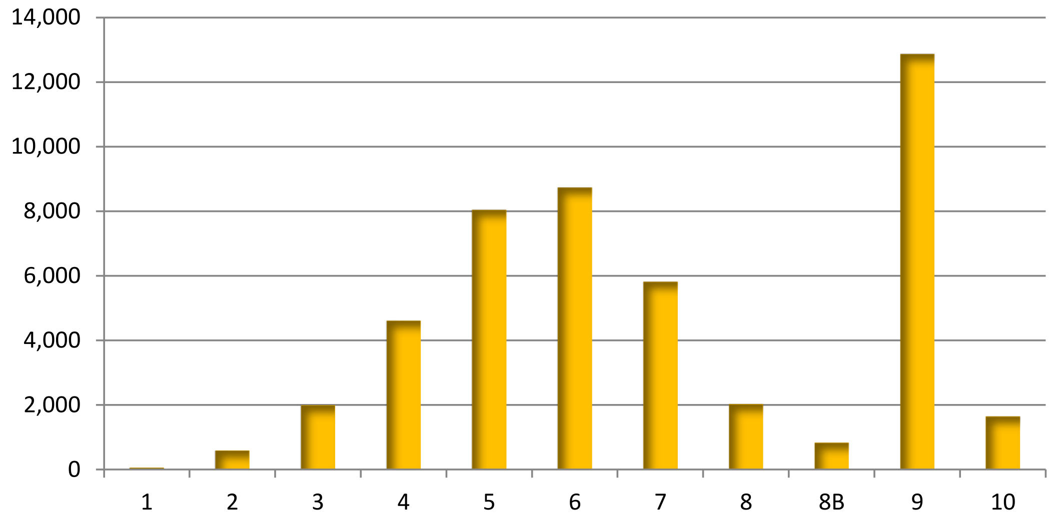
A large portion of the Town lies within 1.5 miles of an engine. In similar fashion, to achieve optimum credit for the number of truck companies, ISO reviews the response area of each existing ladder company and identifies the number of fire hydrants within those response areas. ISO analyzes whether there are additional geographic areas of the jurisdiction outside of the existing ladder response areas where at least 50 percent of the number of hydrants served by the largest existing response area could be served by a new truck, were one to be added. For ISO purposes, the response area is measured at 2.5 miles of travel distance from each ladder company on existing roadways. A ladder company is not required to have an elevating ladder or aerial device unless there are a sufficient number of buildings that would meet the three-story height and square footage limits. Other areas can receive similar credit for a service company without the requirement of an elevated device and can even receive partial credit for a service company if other apparatus, such as an engine, carries a complement of service company equipment.

Figure 27: 2.5-Mile Aerial Travel Model



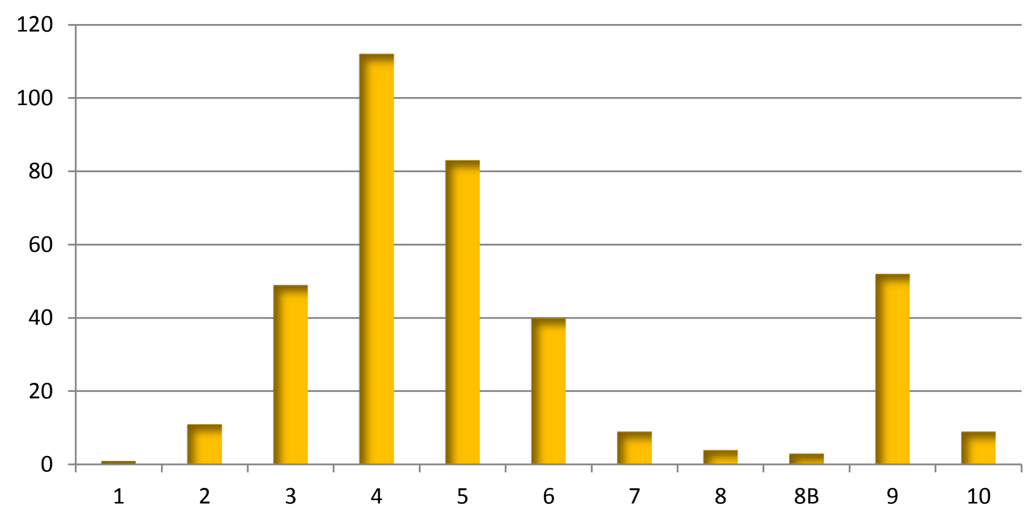
While the preceding figure indicates travel time for aerial ladder apparatus from both stations, only Station 1 currently houses an aerial apparatus. The model is provided to indicate the benefits of an aerial apparatus stationed at WFD Station 2 to set the stage for future service delivery models related to development. The following figure shows how the ISO score is distributed across individual departments nationwide.

Figure 28: Comparison of National ISO Classifications



WFD is in the top tier of departments regarding ISO score when compared to departments across the nation. The figure below provides a comparison against departments in Massachusetts; only 13.1 percent of fire departments in Massachusetts have obtained an ISO rating of 3.

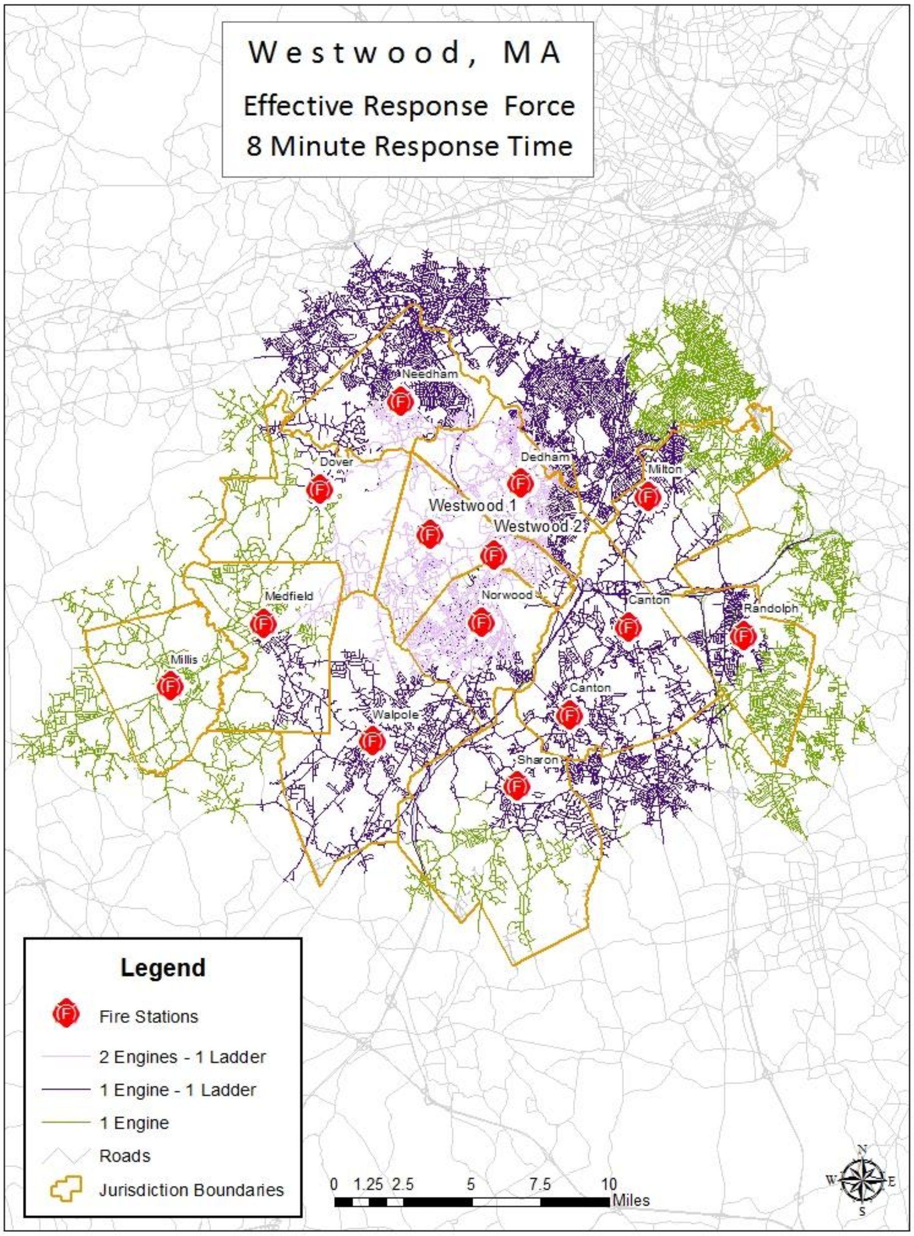
Figure 29: Comparison of Massachusetts ISO Classifications



Concentration

Concentration analysis evaluates an organization's or region's ability to assemble a sufficient number of apparatus and/or personnel to effectively mitigate a certain level of risk. This is also known as an effective response force (ERF) and can be measured a number of ways. For the purposes of this study, ESCI ignored response boundaries, included mutual aid units where available, and assumed a normal apparatus staffing of three personnel on each engine and aerial apparatus. The following figure illustrates how well the study region can assemble an effective response force of two engines and one aerial ladder within the given response time parameters.

Figure 30: Effective Response Force - Eight-Minute Travel Model



The core of Westwood is well protected while areas to the west can assemble fewer apparatus within the eight-minute travel model. This will come into play more when the University Station development is evaluated for impact on the fire department.

Reliability

The workload on emergency response units can also be a factor in response time performance. The busier a given unit, the less available it is for the next emergency. If a response unit is unavailable, then a unit from a more distant station must respond, increasing overall response time. A cushion of surplus response capacity above average values must be maintained due to less frequent but very critical times when atypical demand patterns appear in the system. Multiple medical calls, simultaneous fires, multi-casualty events, or multiple alarm fires are all examples.

One way to look at resource workload is to examine the amount of time multiple calls occur within the same time frame on the same day. ESCI examined incident records for 2012 to find the frequency that the department is handling multiple calls within any given time frame. This is important because the more calls occurring at one time; the more stretched available resources become leading to extended response times from distant available apparatus.

Figure 31: Call Concurrency Rates, 2012

Number Of Concurrent Incidents In Progress							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
79.06	19.11	1.78	0.05	0.00	0.00	0.00	0.00

As indicated in the figure above, most of WFD's incidents occur singularly but almost 20 percent are occurring at a rate of two at a time. In other words, at minimum staffing levels, two incidents that occupy two ambulances reduce available staff at Station 1 to zero, leaving Station 2 to cover the entire Town. To add to this, most medical incidents are responded to by both an ambulance from Station 1 and the engine from Station 2 for personnel resources or first response reasons. Two simultaneous incidents effectively eliminate the ability for WFD to respond to another incident or effectively respond to a fire incident that typically requires four personnel.

For most departments, the majority of calls occur one or two at a time. However, as communities grow the propensity for concurrent calls increases. When the concurrency reaches a level to which it stretches resources to near capacity, response times begin to extend. Although multiple medical calls will cause drawdown, especially as concurrency increases, they usually occupy only one unit at a time. Concurrent fire calls, however, are of more concern as they may require multiple unit responses for each call depending upon the dispatch criteria.

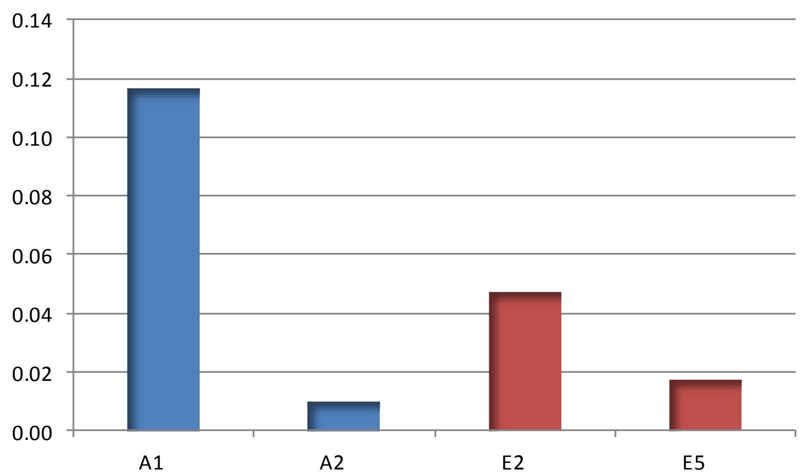
It is important to note that an area with the highest workload will typically have the highest rate of concurrent calls and resource drawdown. This requires response units from other stations, to respond into this area. The impact on station area reliability can be affected by several factors such as:

- Out of service for mechanical reasons
- Out of service for training exercises
- Out of area on move-up deployment
- Lack of staffing
- Concurrent calls

When these factors impact the reliability of a station to respond within its prescribed territory, response time performance measures for the back-up station/apparatus can be negatively affected.

For ambulance units in fire-based EMS systems, a unit hour utilization (UHU) rate of 30 percent is considered maximum before paramedic burnout becomes a serious factor. The figure below illustrates the UHU for each primary response unit in the WFD fleet except for Ladder 1.

Figure 32: Unit Hour Utilization



None of the WFD rescue units has exceeded this level. Based on the analysis in this section of the report, reliability of all stations in their primary response area should be high and significant resource drawdown is rare.

Performance

When discussing emergency services organizations, the primary issue of question is response performance. Response performance analysis evaluates how quickly an organization responds to an incident and is more commonly known as response time. The response time continuum, the time between when the caller dials 9-1-1 and when assistance arrives, is comprised of several different components as described below:

- Processing Time – The amount of time between when a dispatcher answers the 9-1-1 call and resources are dispatched.
- Turnout Time – The amount of time between when units are notified of the incident and when they are en route.
- Travel Time – The amount of time the responding unit actually spends on the road to the incident.
- Response Time – A combination of turnout time and travel time and generally accepted as the most measurable element.

Other performance measurements are also valuable but not utilized in this analysis of staffing and deployment, such as:

- Patient Contact Time – The actual time personnel arrived at the patient and began treatment.
- Scene Time – The total amount of time resources have spent on the emergency scene prior to transport or clearing the incident.
- Transport Time – The total amount of travel time spent transporting the patient to a definitive care facility.
- Hospital Time – The total amount of time the transporting unit spent at the receiving facility before returning to service.
- Total Commit Time – The total amount of time between dispatch and clearing the incident.

For this particular study, ESCI focused on the first list of performance measures but the department should be actively engaged in tracking all of the aforementioned times in an effort to continually improve services to the community. Before presenting performance analysis, it is important to have a general understanding of the difference between average and percentile measures.

The 'average' measure is a commonly used descriptive statistic also called the mean of a data set. It is a measure which is a way to describe the central tendency, or the center of a data set. The average is the sum of all the points of data in a set divided by the total number of data points. In this measurement, each data point is counted and the value of each data point has an impact on the overall performance. Averages should be viewed with a certain amount of caution because the average measure can be skewed if an unusual data point, known as an outlier, is present within the data set. Depending on the sample size of the data set, this skewing can be either very large or very small.

As an example, assume that a particular station with a response time objective of six minutes or less had five calls on a particular day. If four of the calls had a response time of eight minutes while the other call was across the street and only a few seconds away, the average would indicate the station was achieving its performance goal. However, four of the five calls, or 80 percent, were beyond the stated response time performance objective.

The reason for computing the average is because of its common use and ease of understanding. The most important reason for not using averages for performance standards is that it does not accurately reflect the performance for the entire data set.

With the average measure, it is recognized that some data points are below the average and some are above the average. The same is true for a median measure which simply arranges the data set in order and finds the value in which 50 percent of the data points are below the median and the other half are above the median value. This is also called the 50th percentile.

When dealing with percentiles, the actual value of the individual data does not have the same impact as it did in the average. The reason for this is that the percentile is nothing more than the ranking of the data set. The 90th percentile means that 10 percent of the data is greater than the value stated and all other data is at or below this level.

Higher percentile measurements are normally used for performance objectives and performance measurement because they show that the large majority of the data set has achieved a particular level of performance. This can then be compared to the desired performance objective to determine the degree of success in achieving the goal.

For this analysis, ESCI was most interested in the ability to respond the appropriate resources to the highest percentage of incidents. For this reason, ESCI analyzed computer aided dispatch (CAD) data provided by Westwood Police Department for 2012. This analysis begins with an evaluation of call processing time.

Figure 33: Call Processing Performance, 2012

Measurement	Minutes:Seconds
Average	02:26
90th Percentile	04:02

NFPA 1221 recommends that all emergency incidents are dispatched within 90 seconds when measured at the 95th percentile. As is evident from the figure above, Westwood PD dispatch's call processing times are well above the recommendation.

The second component of the response time continuum is that of turnout, or the time between when resources are dispatched and when they are en route to the incident. Turnout times can vary based on staffing patterns and will typically be longer for volunteer or paid-on-call departments. *NFPA 1710*, the standard that applies to career organizations, recommends a turnout time performance of 60 seconds for medical incidents and 1:20 (1 minute 20 seconds) for fire incidents, when measured at the 90th percentile. *NFPA 1720*, the standard that applies to volunteer and combination departments, does not outline a specific turnout time performance recommendation.

Figure 34: Turnout Time Performance, 2012

Measurement	Minutes:Seconds
Average	00:42
90th Percentile	01:55

Regardless of what the call processing or turnout times are for a particular organization or a region as whole, the most important aspect of response is actually getting the appropriate resources on the scene of the emergency. The figure below illustrates the total response performance for WFD from time of dispatch to arrival at the incident for 2012.

Figure 35: Response Time Performance, 2012

Measurement	Minutes:Seconds
Average	03:36
90th Percentile	06:34

NFPA recommends that career fire departments respond to incidents within five minutes of total response time when measured at the 90th percentile. This is considered by many to be a very aggressive response performance objective and is difficult for most agencies to meet. The current performance of WFD is well within acceptable levels but, in the interest of continual improvement, the department should work with operational staff to evaluate response methodologies to ensure that the quickest response possible is being achieved.

Mutual and Automatic Aid Systems

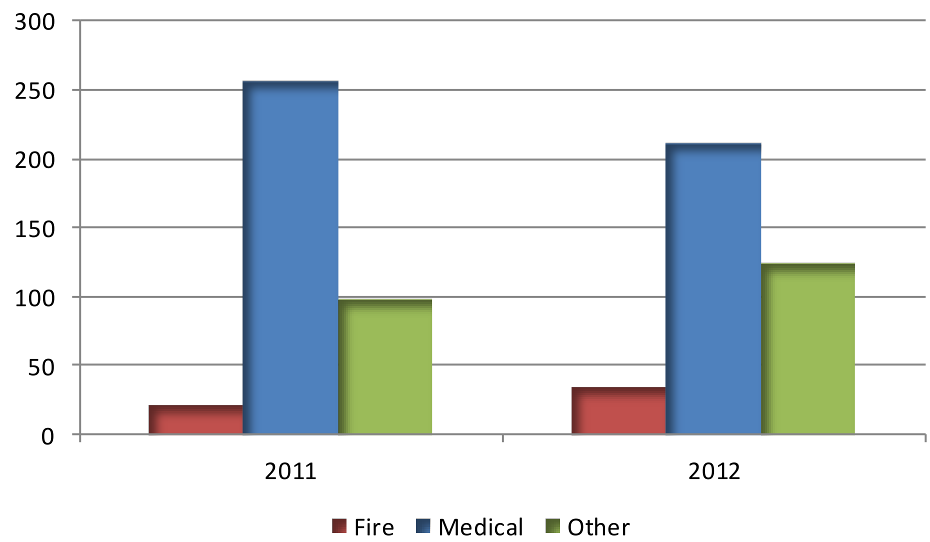
In today's society and economic climate, no fire department can stand on its own. Instead, fire departments must rely on their neighbors to provide additional apparatus and personnel resources for all but the most routine of incidents. Establishing formal agreements with adjacent departments where resources are summoned based on a case-by-case basis is known as mutual aid. Under this type of arrangement, apparatus and personnel resources can be sent back and forth across departmental boundaries at the simple request of incident commanders once the need is determined. An even more formalized agreement for these types of resources is known as automatic aid. Automatic aid is mutual aid agreed to prior to an incident occurring and the automatic dispatch of resources based on a given call type or incident location.

WFD enjoys both mutual and automatic aid with adjacent departments and frequently utilizes (and supplies) resources to other agencies, particularly along the municipal lines known as line boxes. The figure below illustrates how often WFD both responds to and receives mutual/automatic aid from/with its neighbors. Based on the data provided, WFD provides mutual and automatic aid almost twice as much as it receives aid from adjacent departments.

Figure 36: Mutual and Automatic Aid Received/Given

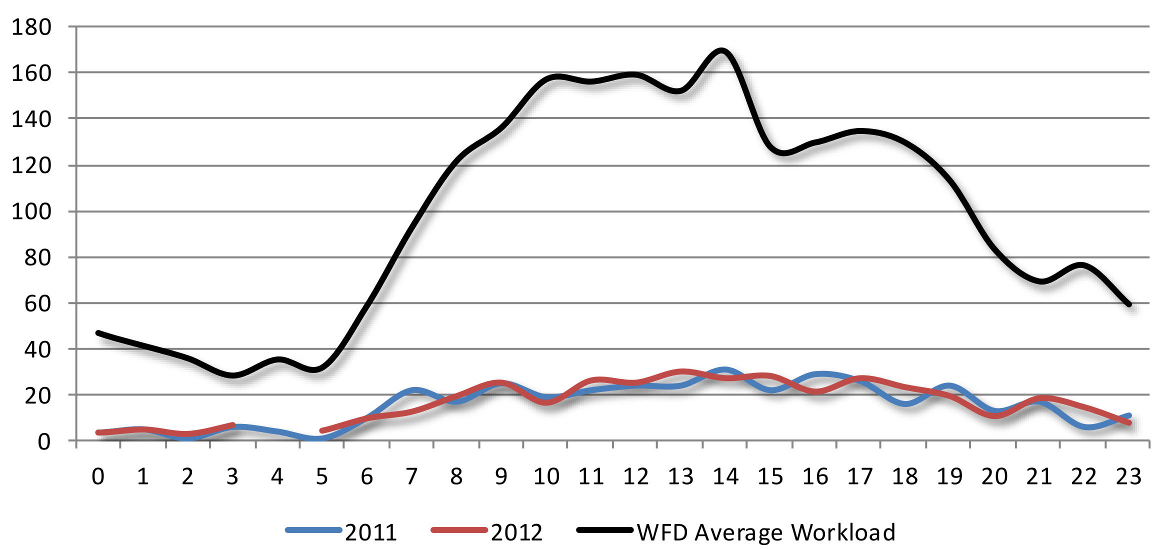
Simply viewing mutual aid given versus mutual aid received does not really tell the story of how resources are being shared between regional departments. WFD provides Advanced Life Support transport ambulance to its citizens and that service is often called to surrounding communities as is seen in the following figure.

Figure 37: Mutual Aid Given by Type of Service



As seen in the figure above, although medical mutual aid declined between 2011 and 2012, it still comprises a majority of the mutual aid responses to other communities. In addition, mutual aid requests are occurring at times when WFD is the busiest as illustrated below.

Figure 38: Mutual Aid Given versus Average Internal Service Demand



It stands to reason that communities of similar geography and demographics would have similar service demand to that of WFD. Thus, call volumes tend to be similar between departments. However, as resources get busier, the availability of those resources is diminished as was discussed previously in regards to concurrency. Mutual aid plays a part in the overall concurrency and reliability of WFD units but ESCI was unable to determine where that service demand is occurring with the greatest frequency. WFD should make a point to track which departments are receiving and giving mutual aid in the future in order to evaluate the efficacy of continued mutual aid agreements.

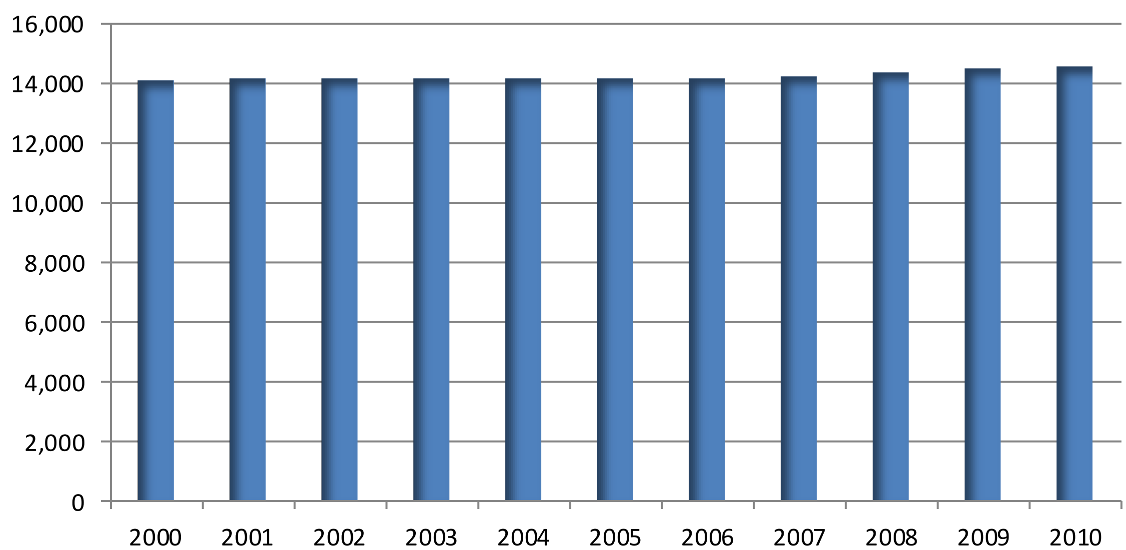
Future System Demand Projections

While the preceding sections of this report provide an overview of current conditions, this section is intended to evaluate what the future emergency services delivery system should be prepared for given development and population trends. In order to project what future service demand might be, ESCI looks at population history, demographics, community risk and planned development. Each of these elements is discussed separately in the paragraphs that follow.

Population History

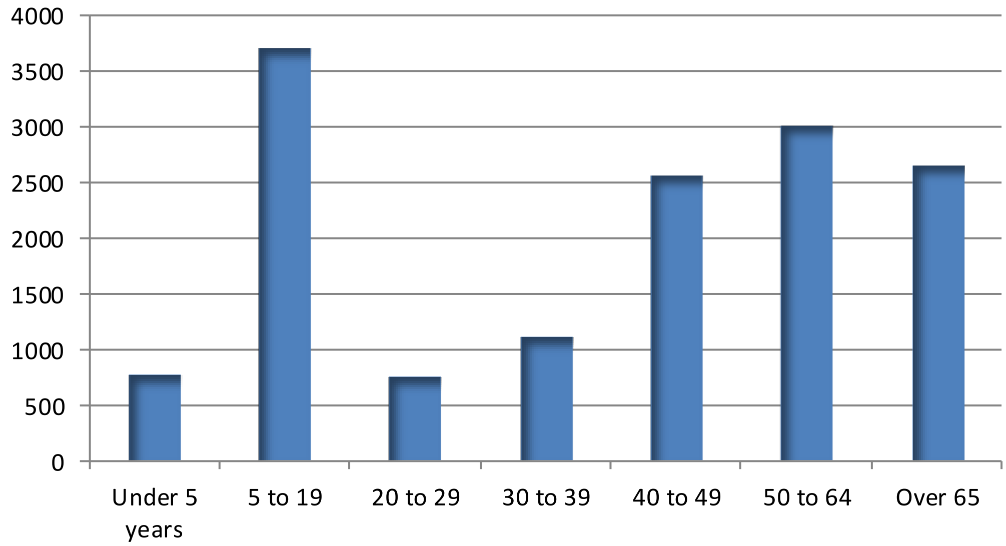
The process of forecasting growth within any given community begins with an overview of historical growth and demographic changes. The figure below illustrates the population history for the Town of Westwood over the last decade.

Figure 39: Population History



According to the 2010 Census, the population of Westwood was 14,618, which represents a 3.5 percent increase since the 2000 Census when a population of 14,118 was recorded. While the population of the Town has grown only slightly, the general population is aging. The median age as of the 2000 Census was 41, which increased to 43.9 in 2010. This is compared to a median age of 37.2 nationally. Given this fact, it is important to identify the target age groups within the community. The following figure illustrates how the resident population is distributed across various age groups.

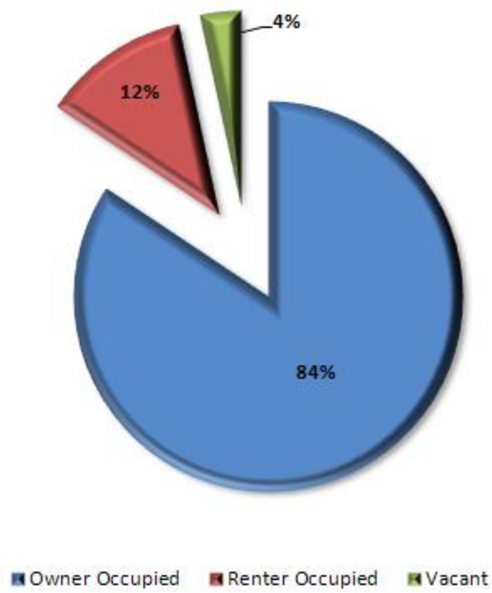
Figure 40: Population by Age Group - 2010



Based on 2010 Census data, 5.3 percent of the population is under five years of age while 18.2 percent is over the age of 65. These two age groups, 23.5 percent combined, represent the two primary target age groups that are most often injured in fire incidents or utilize emergency services at a higher rate than others. The national medians for these age groups are 6.5 and 13.0 percent, respectively, for a total of 19.6 percent.

Numerous rentals and vacancies can signal economic conditions that correlate with higher rates of emergency incidents. The following figure illustrates the distribution of housing units by tenure within the Town.

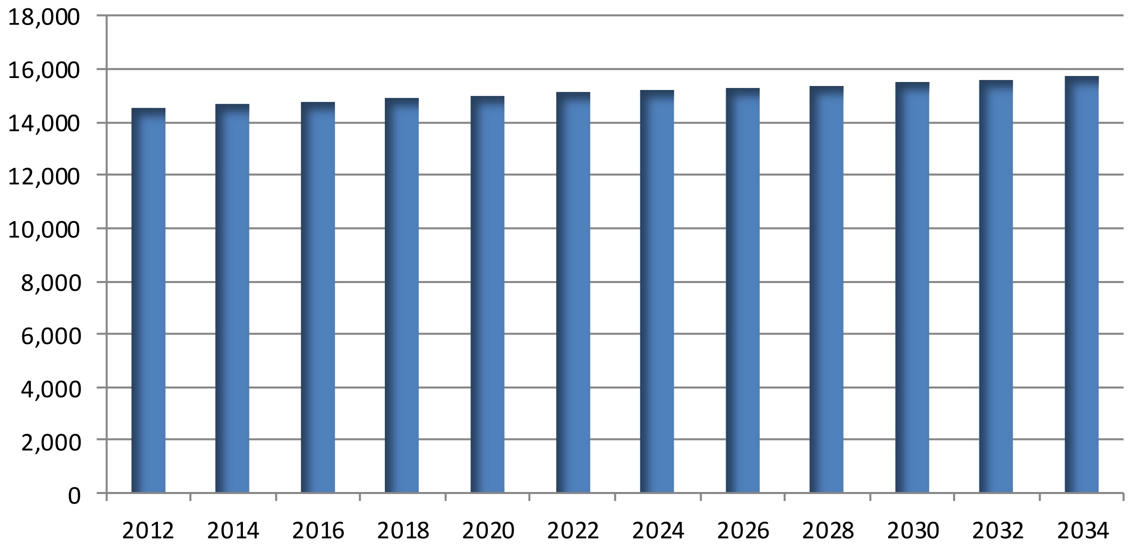
Figure 41: Housing Occupancy - 2010



High rates of vacant properties tend to suggest depressed economic conditions, which could lead to higher demand for emergency services. The high level of owner-occupied housing indicates a stable economic environment that would tend to decrease overall demand for emergency services. The national rates for owner-occupied, renter occupied, and vacant are 57.7 percent, 30.9 percent, and 11.4 percent, respectively, indicating that the Town is well positioned in regard to socioeconomic risk.

While the population of Westwood has grown slightly over the last decade, there is nothing aside from future development to indicate that future population trends will differ substantially from historical rates. The figure below projects the resident population over the next 20 years, which will be used to project future service demand (combined with development projections) later in this section.

Figure 42: Population Projection Through 2034

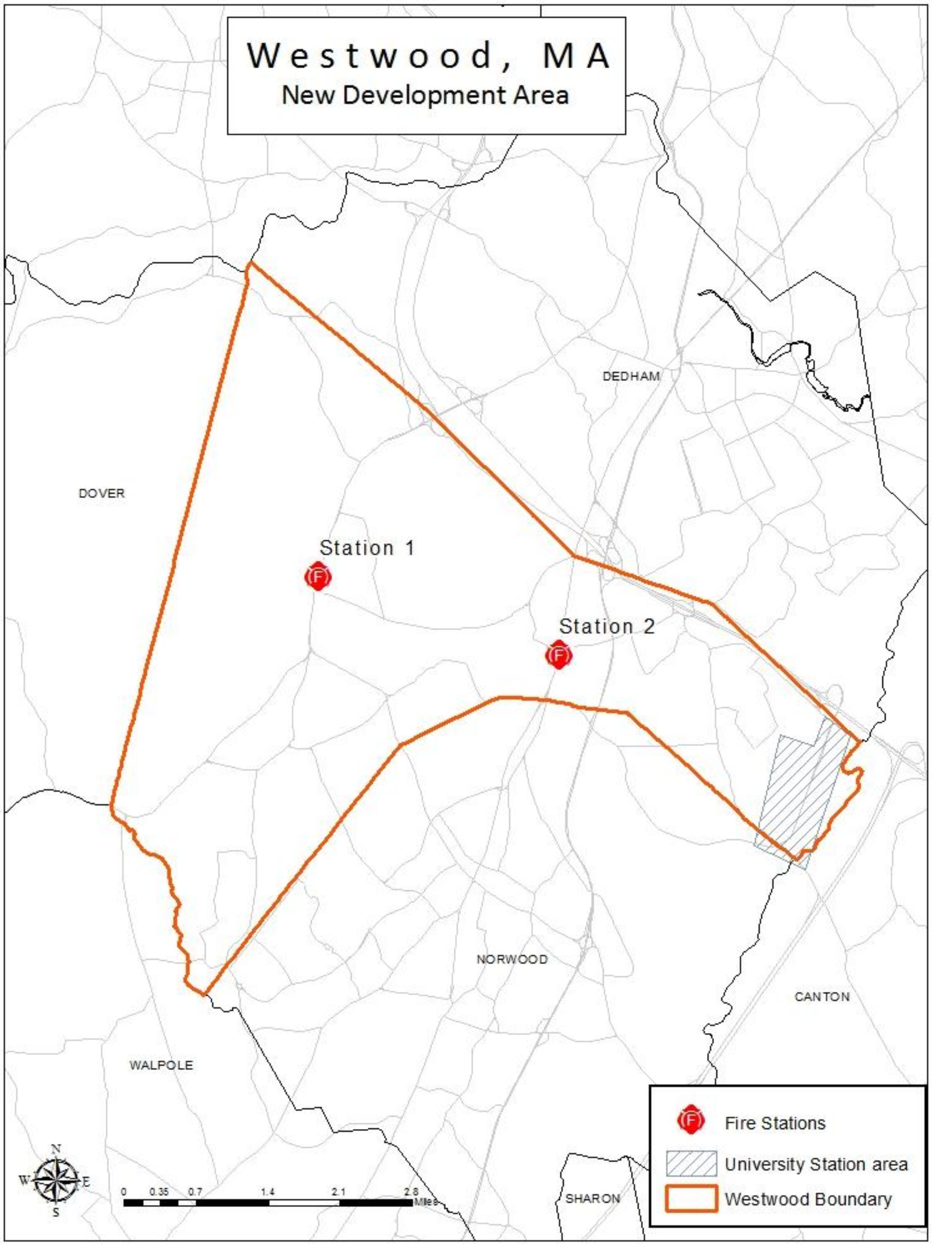


It is not the intent of this study to be a definitive authority for the projection of future population in the service area, but rather to base recommendations for future fire protection and emergency services needs on a reasonable association with projected service demand. Since it is known that the service demand for emergency agencies is based almost entirely on human activity, it is important to have a population-based projection of the future size of the community.

Planning Development

Although the previous section of this report evaluates historical and potential population within consideration of future major development, one aspect of the project that is critical to future service delivery models is the University Station development at the far eastern side of the Town as shown in the following map.

Figure 43: University Station Location



The University Station development sits at the edge of the Town, bordering Dedham, Canton, and Norwood. While these departments work closely with WFD to provide mutual and automatic aid to areas in close proximity to each municipal border, the expected development will tax the response capabilities of everyone involved. The following map shows a more close-up view of the proposed development area.

Figure 44: University Station Inset

The following figure displays the proposed site plan and some of the intended purposes of the structures within the project.

Figure 45: Proposed University Station Site Plan

The proposed development will contain a variety of occupancies including 'big box' retail stores, mixed-use residential, a hotel, senior housing/memory care, and a retail 'village.' Each of these occupancies will produce varying degrees of service demand based on their use type. In addition, the periods during which the area is used will impact temporal service demand.

The risk associated with this type of project is a combination of fire and medical risk, particularly structures that contain senior housing. As with the original proposed development several years ago, the larger retail spaces present special hazards to fire departments. The large footprint of the structures (over 35,000 square feet) qualify as structures needing an aerial apparatus to effectively mitigate a fire based on ISO recommendations. Currently, the only aerial apparatus is at WFD Station 1—a substantial distance away from the proposed development. In addition, the low rail bridge on East Street limits the size of apparatus that can pass under.

In addition to square footage, the height of some buildings within the development (those over three stories) also qualifies as structures needing an aerial apparatus. Although surrounding departments have aerial apparatus, the closest is approximately ten minutes from the University Station area.

While these large buildings are primarily retail and will be open during routine business hours, some are mixed-use and function as residential units as well. Fire risk is primarily static; that is, it does not change dramatically with human movement. Although there is a human factor associated with most fires, the risk associated with the fire itself remains the same regardless of occupancy. Medical risk, however, is dependent purely on human activity.

This is important for several reasons. The senior housing planned for the development will house those residents that fall into the highest risk category (65 and over) for fire fatalities and injuries. In addition, the structure is intended to also contain a memory care unit that could produce a significant medical service demand based on the types of patients housed there. Aside from the senior housing elements of this development, general residential units may increase the service demand as people move into these units from the surrounding area. In addition, the proposed hotel will contain transient populations that could generate variable service demand based on season and clientele.

As with the previously proposed project, University Station will be constructed in at least two phases. The first phase will include 550,000 square feet of retail space along with 350 housing units (60 percent one-bedroom and 40 percent two-bedroom) and construction is expected to begin in 2013 with occupancy some time in 2014. The senior housing associated with this phase will contain up to 50 percent general assisted living and 50 percent memory (Alzheimers) care. Phase II will include an additional 200,000 square feet of retail space, 300,000 square feet of office space, and a 160-room hotel with construction planned for 2014 and occupancy some time in 2015. Full occupancy of all structures is expected to take 10 to 15 years.

Additional assisted living development is planned at 100 High Street along with 20,000 square feet of office space on Everett Street. In addition, 30 to 40 townhomes/assisted living units are also planned for in the vicinity of Blue Hills Drive and Canton Street. Another assisted living structure with approximately 80 units is planned for High Street and three single-family residential developments are planned: Fox Meadow, a total of 20 homes is currently under construction; Westview Estates, 12 homes also under construction; and Morgan Farm, a 10 home development to be built in the future.

Based on 2010 Census data, the Town has an average of 2.7 persons per household in owner-occupied housing and an average of 1.4 persons per household in renter-occupied housing. Given these occupancy rates, ESCI estimates the total impact of future development (planned) based on the following figure.

Figure 46: Development-Based Population Projections

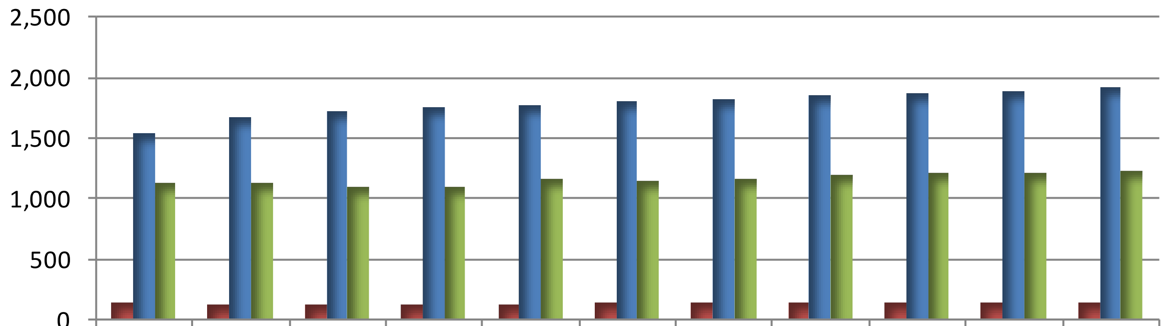
Occupancy Type	Estimated Total New Population
University Station Phase I Housing	680
University Station Phase I Senior/Memory Housing	150
University Station Phase II	Transient
100 High Street Assisted Living	112
Everett Street Assisted Living	56
Fox Meadow	54
Westview Estates	32
Morgan Farm	27
Total at Build-Out	**1,111**

Service Demand Projections

Given the historical usage rates within the Town combined with estimated future population projections based both on historical use and proposed development, ESCI applied an estimated usage rate based on population projections to derive an estimate of future service demand. The estimate of 1,111 additional residents at a usage rate of 0.175 would produce an additional service demand of 168 incidents annually.

The analysis above illustrates only residential population estimates that are translated into potential service demand in the following section. University Station also includes retail/commercial areas that typically produce less severe demand than do residential areas. For the purposes of this analysis, a rate of 1.84 incidents per retail/commercial unit has been used to estimate service demand for a total of approximately 100 additional incidents annually at full build-out of the project. Similarly, office space will account for a portion of the new development within the community and should account for an increase in service demand of approximately 30 incidents annually based on the usage rate of 1.84. The combined service demand projection is provided in the figure below.

Figure 47: Service Demand Projection with Proposed Development



	2014	2016	2018	2020	2022	2024	2026	2028	2030	2032	2034
Fire	134	122	131	131	133	137	138	141	143	145	148
EMS	1550	1675	1725	1760	1775	1801	1826	1849	1872	1896	1919
Other	1125	1126	1096	1101	1161	1155	1164	1191	1208	1213	1233

Fire EMS Other

Future Delivery System Models

Although the foregoing sections of this report focused primarily on the conditions that currently exist within the emergency services system of Westwood, the intent of this study is to combine that evaluation with a look into the future and provide policy makers with information necessary to carry the system forward over the next 10 to 20 years given projections in development, population, and service demand. This portion of the report provides recommendations related to the deployment of facilities, apparatus, and personnel with a focus on future service delivery and an improvement in overall efficiency within the system.

Response Standards and Targets

The current system of defining desired response performance is through the use of three classifications that are common to the fire services industry: urban, suburban and rural. These classifications are based on population density as illustrated below.

- Urban Greater than 1,000 population per square mile
- Suburban Between 500 and 1,000 population per square mile
- Rural Less than 500 population per square mile

Given the geographic size and population density of Westwood, combined with the career fire department model currently in place, the urban level of service should be the established response performance objective in accordance with *NFPA 1710* recommendation. That is, WFD should establish a response performance objective such that 90 percent of all emergency incidents are responded to in five minutes or less.

Based on analysis of current performance of 6:34 when measured at the 90th percentile, the department should work to identify ways to improve response performance toward the established goal.

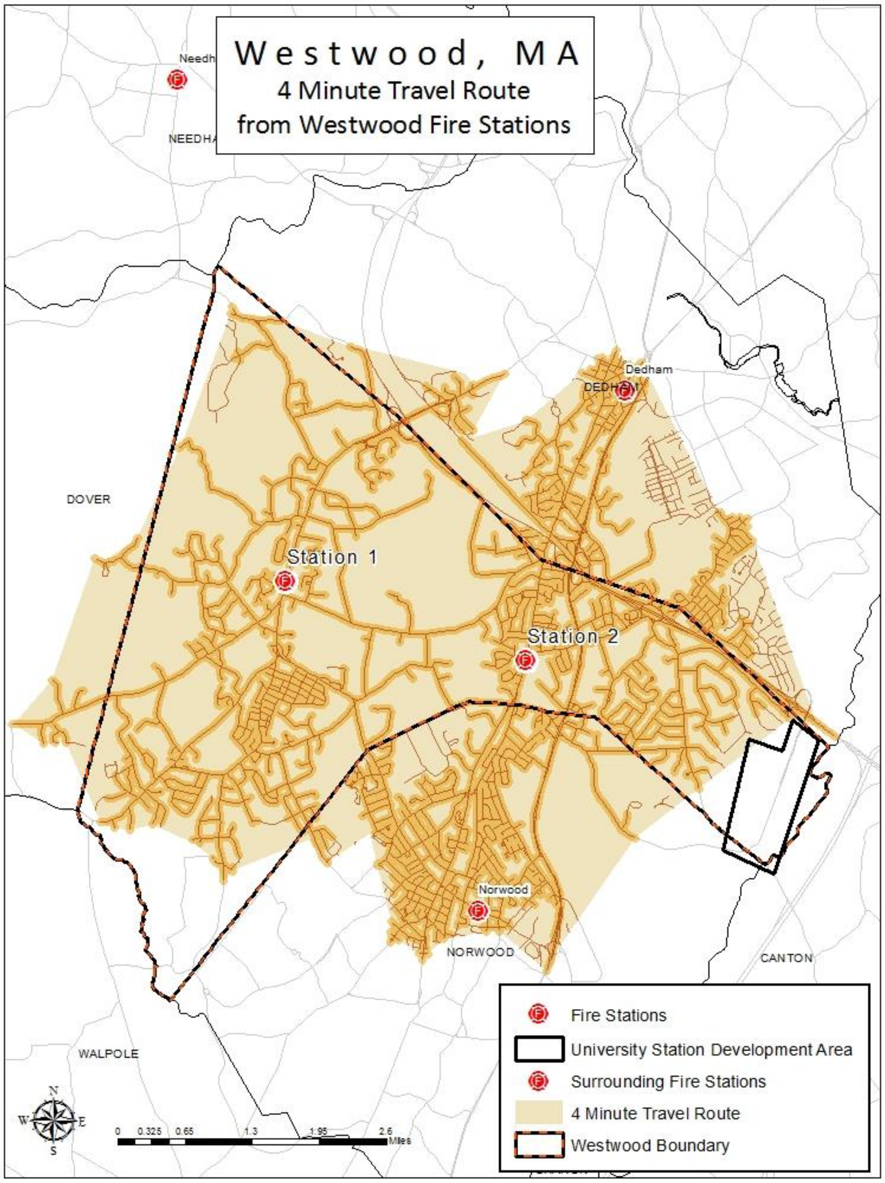
Long-Term Strategies

The intent of this project is two-fold: To provide policymakers with information relative to current conditions within the fire department (provided in the summary report issued previously); and to address future needs within the fire department relative to planned development, particularly that of University Station.

Service demand projections have already been provided in this report showing an approximately 22.2 percent increase in fire service demand, 30.9 percent increase in medical service demand, and 28.6 percent increase in other incidents such as alarms and service calls based on future development and population growth. This section of the report is intended to provide information relative to addressing those future issues in regard to the three primary issues of facilities, apparatus, and personnel.

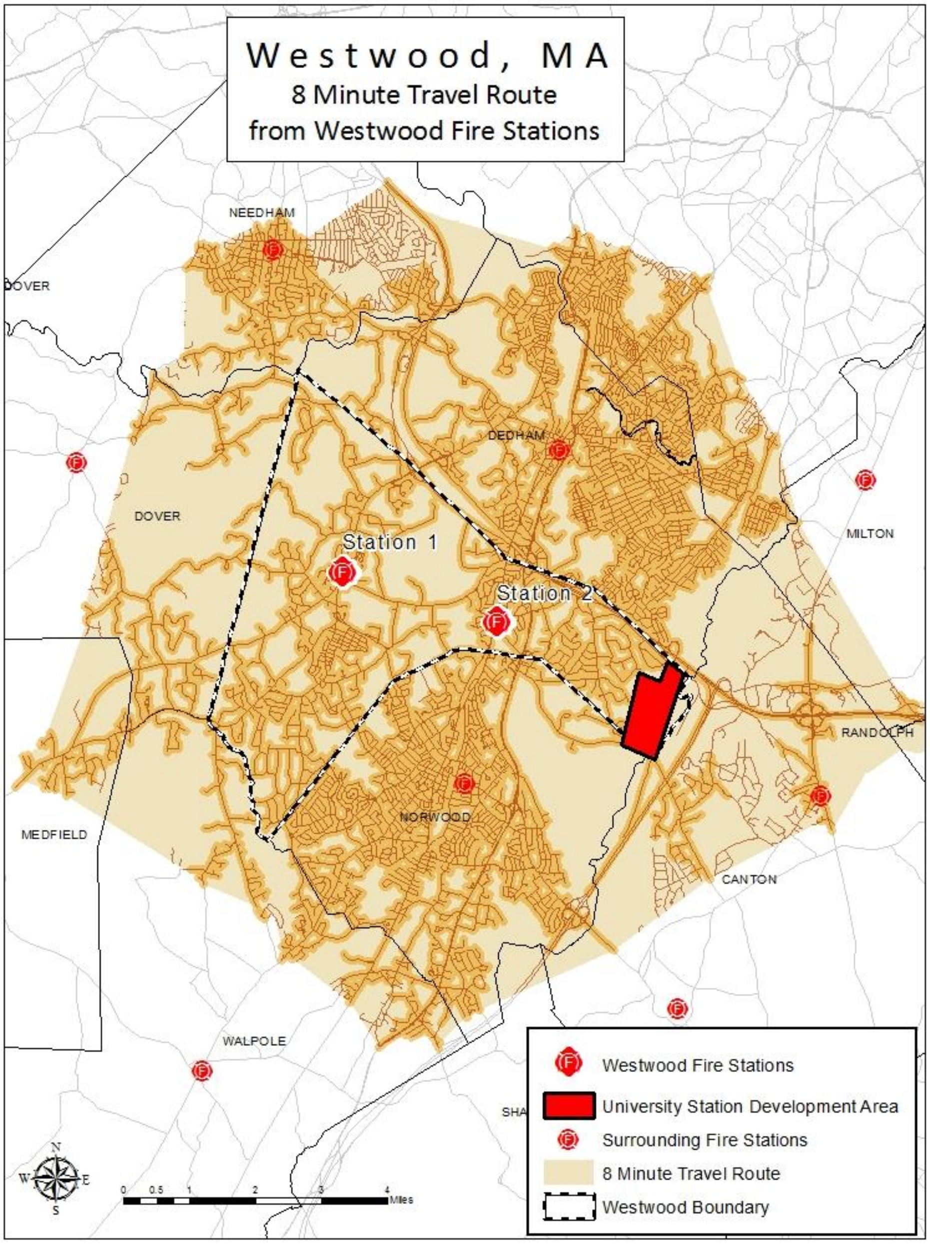
Facilities

The appropriate deployment of fixed facilities (fire stations) allows a fire department to effect a quick response to a majority of the response area and provides additional benefits through decreased homeowners' insurance rates as scored by ISO. Given the current street network of the Town combined with proposed changes to streets including the closing of Blue Hills Drive near the University Station development, ESCI has evaluated several facility deployment strategies that the project team believes offer the Town the best options for addressing future service delivery demand. The following map illustrates the University Station development as compared to the department's current four-minute travel model.



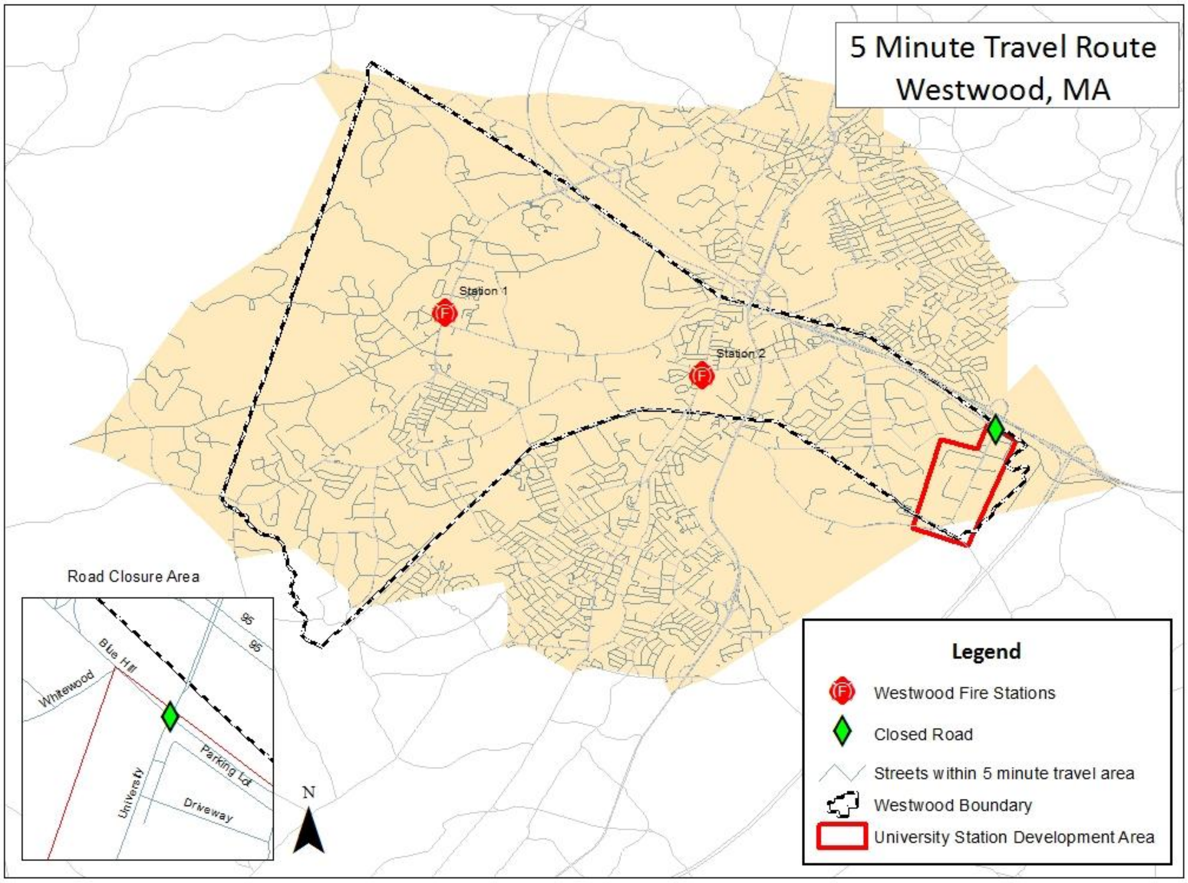
The illustration does not consider the closure of Blue Hills Drive; but even without this closure, the new development is outside the four-minute model. If the Town and department would accept an eight-minute travel model, which exceeds NFPA recommendations, the new development would be well within this distance as illustrated in the following map.

Figure 48: Optional Eight-Minute Travel Model



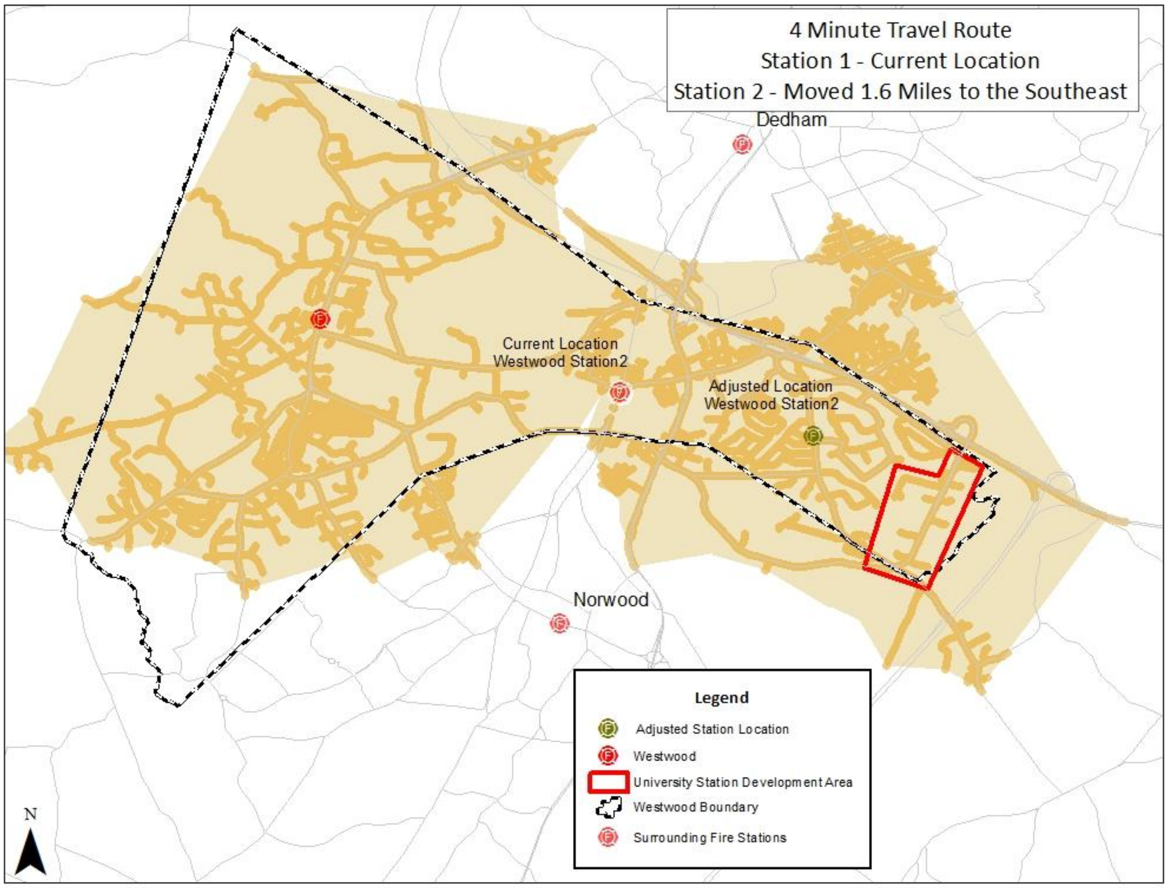
If an eight-minute model is outside the Town's response expectations, ESCI would recommend a five-minute model, which, even with the closure of Blue Hills Drive, would provide sufficient response capability to the new development as illustrated in the following figure.

Figure 49: Optional Five-Minute Travel Model



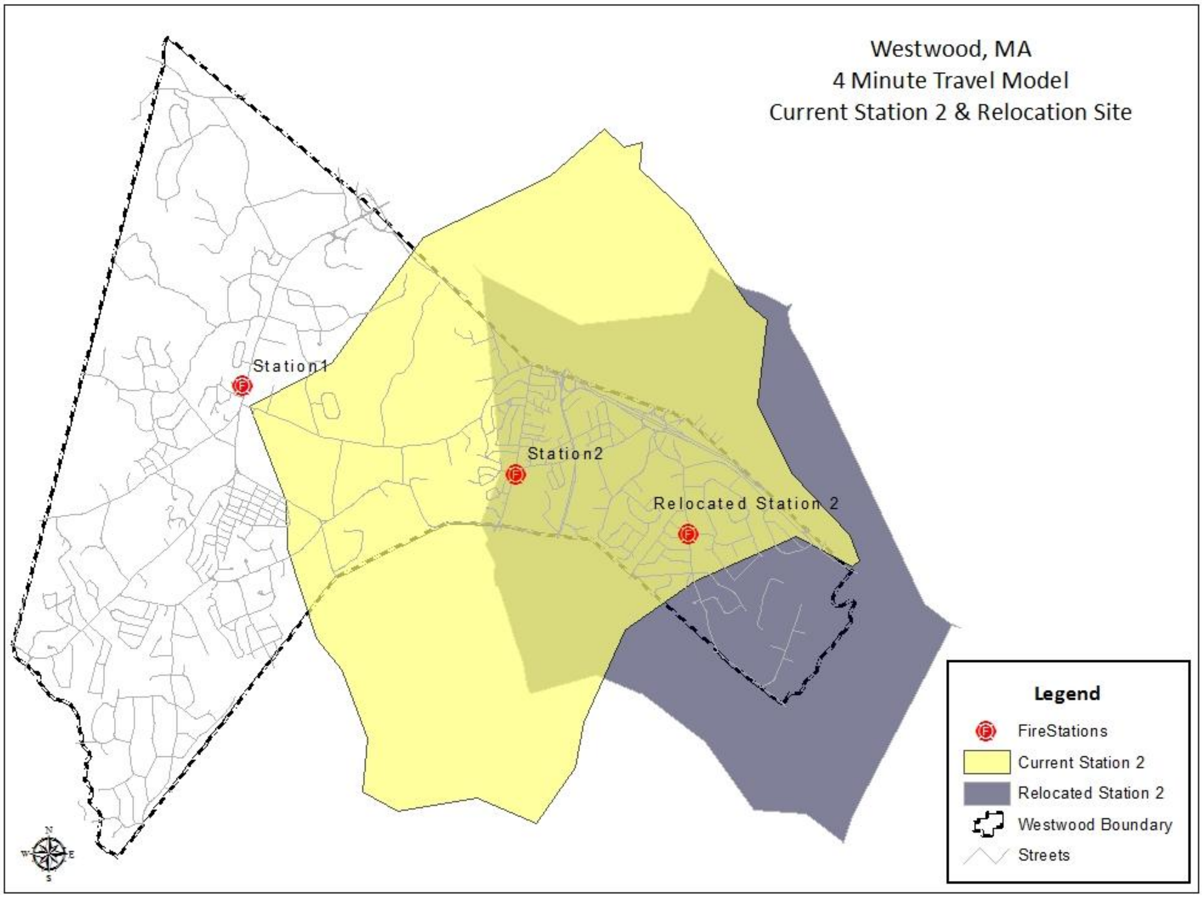
Given the current condition of Station 2 and the difficulty in reaching both the new development as well as the core of the Town's service demand, ESCI evaluated an alternative station location that would reduce redundancy in the center of the Town while improving response capability to University Station, as illustrated in the following figure.

Figure 50: Alternative Station 2 Location



This model moves Station 2 approximately 1.6 miles to the southeast and locates it in an area that would provide better coverage; however, the exact location will need to be addressed as land is available. This location places University Station within the four-minute travel model and reduces response redundancy with Station 1. It also, however, increases response time back into the Station 1 primary response area as highlighted in the following figure.

Figure 51: Comparative Travel Models - Alternative Station 2 Location



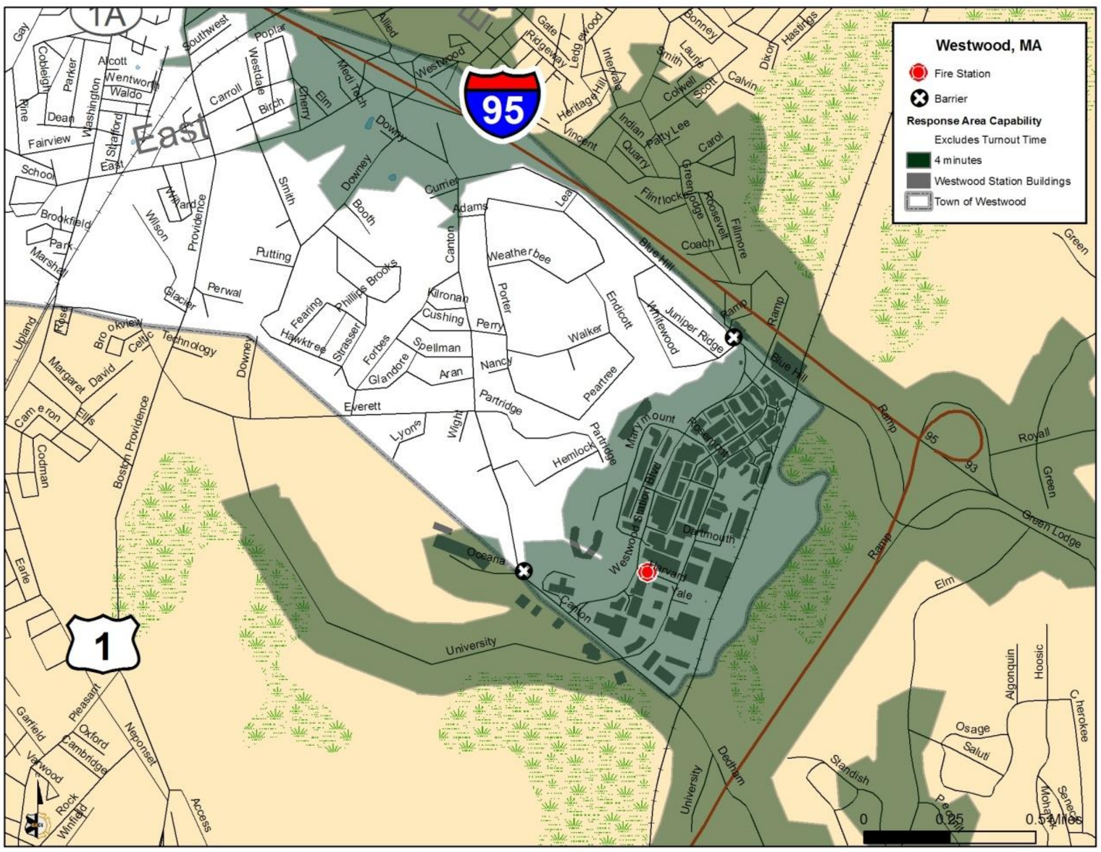
Since the current practice is to have Engine 2 respond to all medical incidents within its own district as well as all motor vehicle accidents throughout the entire Town, it would be recommended that this model be implemented with a change in policy regarding response protocols. This will be address in the apparatus and staffing recommendations below.

Three-Station Deployment Option

In addition to the two options presented above, the initial study completed in 2005 by ESCI included an analysis of a three-station scenario based on land provided by the developer of what is now University Station. The information below has been extracted from the 2005 report in order to illustrate the current advantages and disadvantages of this scenario.

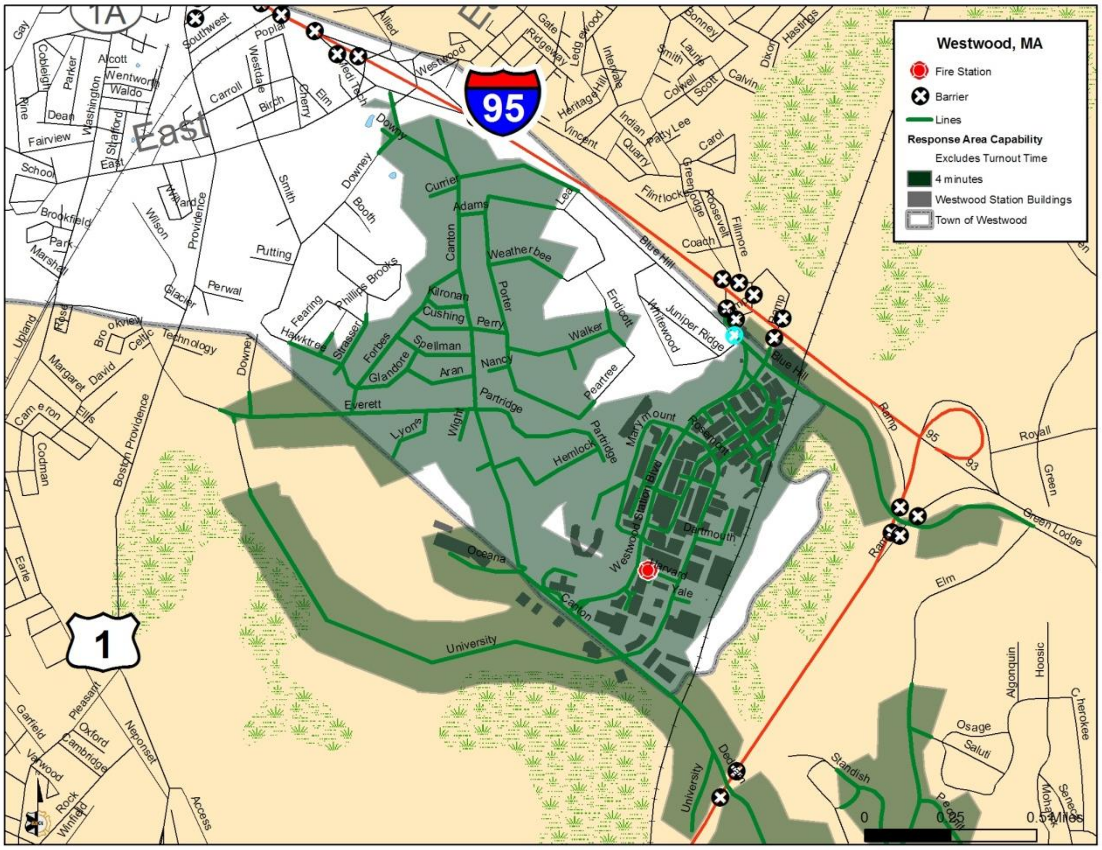
Space was proposed by the developer of what is now University Station for an additional fire station within the new development. The proposed site is near the intersection of University Station Blvd and Harvard Street. Apparatus would exit onto Harvard Street to be en route to incidents. As seen in the figure below, there are areas on the east of Town that are outside the five minute response capability of the existing Station 2. These areas could be served by an additional fire station in University Station, but only if access via Canton Street and Blue Hill Drive were possible. Even with interstate access, which would allow for an exit near the rotary, the apparatus would have to backtrack. A similar, extended route would occur as apparatus would need to travel on University Avenue to Everett Street, before backtracking could commence. To illustrate this point, the following map restricts this new station's access to Canton Street and Blue Hill Drive.

Figure 52: Fire Station 3 with Local Street Barriers and Interstate Use



The following map illustrates the response capability of gated access only on Canton Street and not Blue Hills Drive.

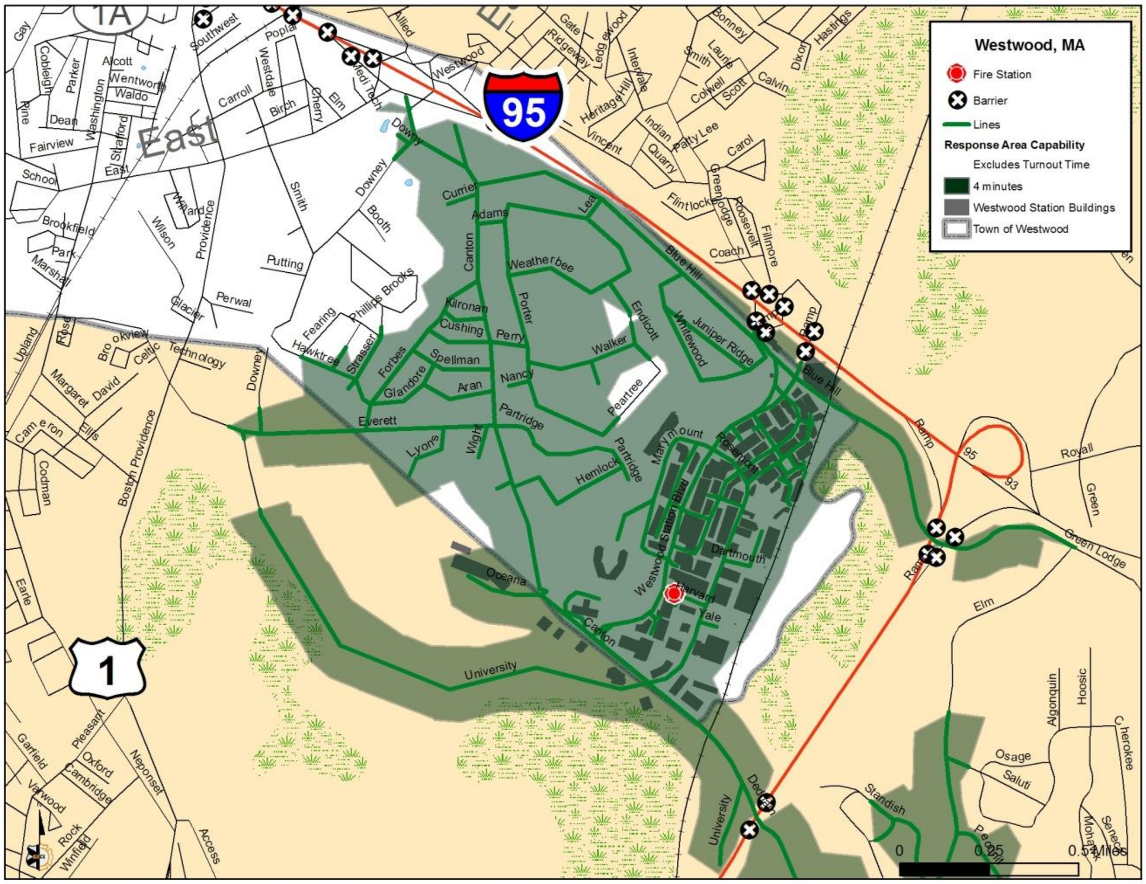
Figure 53: Station 3 Response Capability with Canton Street Access and No Interstate Use



Areas southwest of Blue Hills Drive, up to and including Lea Street, would have extended response times from Station 3. The existing deployment travel time analysis does indicate that Station 2 can reach down Blue Hills Drive to the first intersection of Westwood Drive. Nonetheless, limiting access to either local route reduces the optimal response capability for fire apparatus.

The following figure illustrates gated access capability on both Canton Street and Blue Hills Drive.

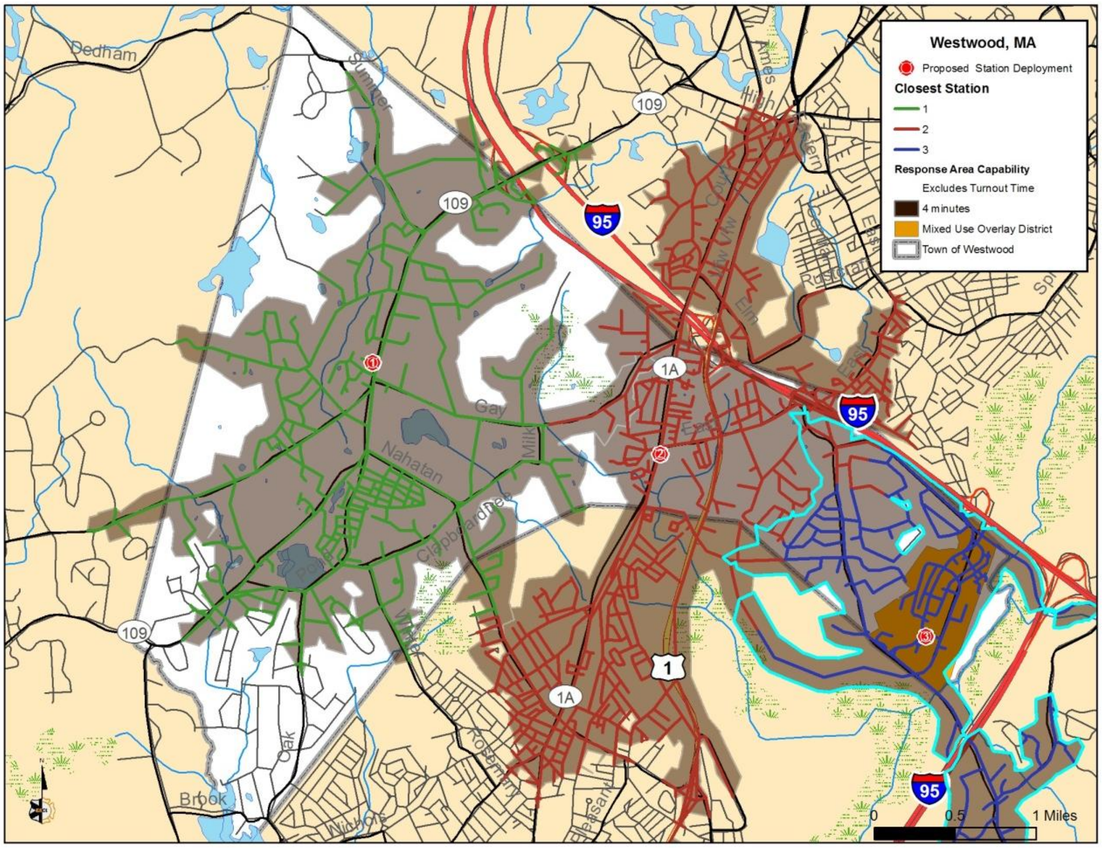
Figure 54: Station 3 Response Capability with Gated Access and Interstate Restricted



This station, where it is proposed, would provide necessary and timely fire protection to not only University Station, but also the nearby neighborhoods, if dual gated access is installed. To reiterate, unrestricted local access is favored over the gated option.

The following map adds the other existing stations within the Town and color-codes the streets by station to indicate the closest station apparatus for future districting. The dual gated access option is shown in the figure and all stations are shown with a four-minute travel model.

Figure 55: Three Station Travel Response Capability



While it is intuitive that having more stations decreases response times across a given area, the benefit of that response time reduction should be weighed against the cost of the facility, apparatus, and personnel. Given the coverage ability from the models outlined above, ESCI does not believe that a three-station model would be cost effective or produce a significantly more efficient system of providing fire protection and emergency medical services to the Town.

Apparatus

Replacement of existing apparatus has already been discussed in the capital assets section of the report; but, looking forward, modifications to the current fleet will be determined by the chosen facility deployment strategy discussed above. It should be noted, however, that the low rail bridge on East Street will impact the deployment of certain apparatus, particularly aerial trucks. The current aerial device at Station 1 is not a staffed unit. This unit is primarily staffed on an 'as needed' basis with call-back personnel. On-duty personnel at Station 1 currently staff one engine and one ambulance while personnel at Station 2 staff one engine. If a second medical call is dispatched, personnel at Station 1 staff a second ambulance; leaving the engine as well as the aerial ladder unstaffed should a fire incident be dispatched. The overall response protocol is complicated based on the cross-staffing of certain critical apparatus. All apparatus staffing patterns are dependent upon the call dispatched and the incidents currently underway when a second incident occurs.

If no incidents are currently underway, WFD can staff two engines or one engine and one aerial ladder. If a medical incident has already been dispatched, the aerial ladder waits for call-back personnel, which creates an average response time of as much as 20 minutes. Mutual aid aerial apparatus can only reach portions of the Town within this timeframe and their availability is always uncertain given the other departments' workload and available staffing. Given the variability of apparatus availability, it is evident that apparatus deployment is directly tied to personnel deployment, although discussed separately here. Any given future apparatus deployment plan will be dependent upon the personnel available to staff those apparatus.

Personnel

While current staffing issues were addressed in the summary report delivered previously, this section intends to provide policymakers with direction regarding future staffing due to increased development and service demand within the Town, primarily the University Station development. This scenario provides direction for staffing of a two-station deployment model with the deployment of a second ambulance.

Based on critical tasking, NFPA benchmarks, community risk and hazard assessment, and assembly of an effective response force to handle emergency medical service risks as well as fire suppression (given the additional development at University Station as well as throughout the Town at full build-out), ESCI recommends that fire department staffing be increased such that the minimum on-duty staffing is nine personnel. This would allow Station 1 to be staffed with five daily with a three-person fire suppression company and a two-person ambulance and would also allow Station 2 to be staffed with four personnel daily, staffing a two-person suppression engine/quint and an additional two-person ambulance.

Assuming a full staffing of 11 personnel per shift and a mutual aid response of an additional four-person engine company from the adjacent municipality, WFD would have an effective response force of 14 to 15 firefighters. This would also double the emergency medical transport capacity for concurrent medical calls anticipated from an increase in the population base and demand from University Station. The following figure summarizes the potential staffing pattern and apparatus deployment scenarios discussed within the body of the report.

Figure 56: Summary of Future Staffing and Apparatus Options

	Station 1	Station 2	Minimum Staffing per Shift	Full Staffing per Shift
Scenario 1 – Two-Station Deployment (from current conditions assessment)	Engine – 3 Ambulance – 2 Ladder – Cross	Engine – 2 Ladder – Cross	**7**	**9**
Scenario 2 – Two-Station Deployment (University Station Build-Out)	Engine – 3 Ambulance – 2 Ladder – Cross	Engine/Quint – 2 Ambulance – 2	**9**	**11**

Apparatus

Station 3 would require, at minimum, a fire engine. Additional apparatus deployment could take on various configurations. This section will describe the options for apparatus deployment in the three station strategy.

Station 3 Full Complement Option

A full complement of apparatus would include an engine, an aerial apparatus, and an ambulance. This would satisfy all issues described earlier in this report in the most effective manner. The community would receive optimal ISO company distribution credit for the Community Risk Rating and tenants would be assured that employees, visitors, and residents have full protection within the community in a short period of time. Medical service demand on the west side, due to numerous senior housing and other high volume locations, warrants a continued ambulance presence at Station 1. An additional ambulance in the University Station area will be necessary to handle increased volume.

Station 3 Quint and Ambulance Option

A quint-type apparatus has similar capabilities as an aerial ladder apparatus. It is a combination engine with an elevated master stream capability that meets the requirements for additional credit as a ladder truck. The limitation of this apparatus is that it cannot be staffed with enough firefighters to perform all the tasks capable with this vehicle, until more manpower arrives. The next nearest staff would either be the ambulance personnel (if cross-staffing is eliminated) or from Station 2. However, it is an industry-recognized option that is widely used in many parts of the country

Staffing

Under a three-station option, the cross-staffing of the ladder company at Station 1, while not necessarily desirable, may continue to be an acceptable situation. Station 3 would require, at minimum, a fully staffed fire company due to the risks presented by the proposed land uses; due to the increased ambulance workload, a staffed ambulance company for the eastern end of the Town is also highly advisable. Even with continued cross-staffing of the units at Station 1, a full structure alarm response within the Town could produce two engines and a ladder company using resources from all three stations. This would be true regardless of the type of apparatus assigned to Station 3.

Conclusions

WFD has been providing fire suppression and emergency medical services to the Town of Westwood at a high level for a number of years. There is little expectation that this level of service should be decreased given the development occurring throughout the Town. In order to maintain the current level of service or to improve it based on current benchmarks and industry standards, ESCI believes that certain modifications are necessary in the current facility, apparatus, and staffing protocols.

In today's fire service environment, no fire department can be expected to be completely self-sufficient. Thus WFD has worked diligently with its neighbors to establish automatic and mutual aid agreements that provide additional resources for certain types of incidents or when service demand surpasses the department's ability to respond. Even with these agreements in place, there remains a certain level of uncertainty in the availability of resources. In addition, fire departments must ensure the safety of their own personnel, as well as the safety of the community protected, by adequately staffing the deployed resources. In the case of WFD, it is ESCI's opinion that minimum daily staffing should be increased to seven per shift to accommodate current service demand and industry safety standards. As development continues and University Station becomes occupied, particularly the senior/memory care housing units, an additional ambulance should be deployed at Station 2 and minimum staffing should be increased to nine per shift as previously described.

If the Town decides to retain a performance objective built around a four-minute travel model, then Station 2 should be relocated to the vicinity of Canton Street and Everett Street. In fact, regardless of the decided upon performance objective, this location will reduce overlap with Station 1 and will provide a better response to the University Station development. In regards to apparatus, specific deployment will be based on the deployment model implemented but should be matched with the recommended staffing patterns already discussed.

ESCI began collecting data and information for this project early in 2013 and relied heavily on data provided by the fire department, police department, Town administration, and planning staff. It is the project team's sincere hope that the information contained within this document is found to be useful in future planning for the provision of fire suppression and emergency medical services to the Town of Westwood.

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