From:	Phil Carver
To:	citycouncil; Heather Dimke; CityRecorder; SALEM Manager
Cc:	Laurie Dougherty
Subject:	Fwd: Document shared with you: "Council meeting 9/12/2022 re: Wasteful use of planned purchase of new fire equipment"
Date:	Sunday, September 11, 2022 8:52:54 PM
Attachments:	% of Fires.png Workload.png Cancelled Calls.png Salem Fire Standards of Co.pdf

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To: The Mayor, City Council, Climate Action Committee and City Manager
From: 350 Salem Oregon
Phil Carver, Co-coordinator

For the Sept. 12, 2022 meetings of the City Council and Climate Action Committee

Public Comment on $26 million portion of Infrastructure Bond Levy
RE: Wasteful use of large fire equipment in planned purchase

In response to our oral comment at the end of the August 22 Council meeting there seemed to be a recognition that there is a serious issue the Council should address to help passage of the Bond Levy. Many people have noted the wasteful use of very large fire trucks to respond to medical emergencies, sometimes arriving after the ambulance. Instead the City should have appropriate electric vehicles for such use at every fire station.

The planned bond levy includes $26 million to replace fire trucks that have been worn out by this inappropriate use. The lack of willingness to address this issue threatens public support for the Bond Levy. 350 Salem has submitted a statement for the Marion County voters' pamphlet for the November election supporting the Bond Levy. We asked at the Aug. 22 meeting that the Council ask for a formal public response and discussion on this issue from the Fire Chief at the next Council meeting. Yet there is no such item on the agenda for Sept. 12.

350 Salem brings the information below to the attention of the Climate Action Plan Committee and the Council related to this issue.

In 2018 the SFD developed a *Salem Fire Department Strategic Plan 2018-2023*. Included in the plan was this:

Objective 1-G
Responsibility:
Timeline: 2

Explore alternative non-emergency medical delivery systems.

Benmoussa, George
July 2019- July 2020
Critical Tasks:

- Investigate other organizations' alternative non-emergency medical delivery models.
- Identify which model(s) best serve the needs of the Salem community.
- Identify costs to implement recommended model(s).
- Research partnerships to fund the new delivery system(s).
- Propose implementation and funding requirements to Council and the budget process.

A few months ago 350 Salem made a public records request to ask for the results of this analysis which was supposed to be completed in July 2020. The response received was that this objective was not completed and that the SFD has no plans to complete it. The response cited the City's projected General Fund budget deficit in future years as the reason they are not going to pursue this objective. This makes absolutely no sense since successful "alternative non-emergency medical delivery systems" would presumably save money rather than cost more money. It would help resolve budget deficits.

Even if the City decides immediately to buy appropriate vehicles with Bond Levy funds for the Fire Department's response to medical emergencies, we urge the Council to have the Fire Dept. conduct and expand the study above to address both emergency and non-emergency medical problems. It is not clear how often the Fire Dept. response is after or virtually simultaneous with the ambulance. There may be a way to have the ambulance be the only responder if the Fire Dept. response would be essentially simultaneous. Other systems, such as a completely adequate ambulance response also should be studied.

Summary;
There is no available discussion that would indicate it is reasonable to send huge fire trucks to respond to medical emergencies. The attached Fire Standards of Cover from around 2018 is 140 pages but has zero discussion of types of vehicles used for various purposes.

The most recent data (attached) show 2 percent of responses were for fire emergencies, 73 percent were for medical emergencies and 23 percent were for other uses of vehicles. This

indicates huge potential cost savings from not using large fire vehicles for medical emergencies. These are very expensive vehicles to buy, operate and maintain. Much of the planned $26 million cost of the new fire vehicles and the added cost of maintenance and operation will be wasted compared to buying and using appropriate sized electric vehicles for such responses.

At a minimum the Council should demand an explanation for this apparently wasteful practice by the Fire Chief. It is not clear why this discussion is not on the agenda for the Council meeting of Sept. 12. Private discussions of the issue with the Fire Chief do not address the public's concerns over wasting Bond Levy funds on using large vehicles for medical emergencies.

Types of Calls Reported by the Salem Fire Department to the State Fire Marshall in 2020

Source: OSFM 2020 Annual Report Supplement

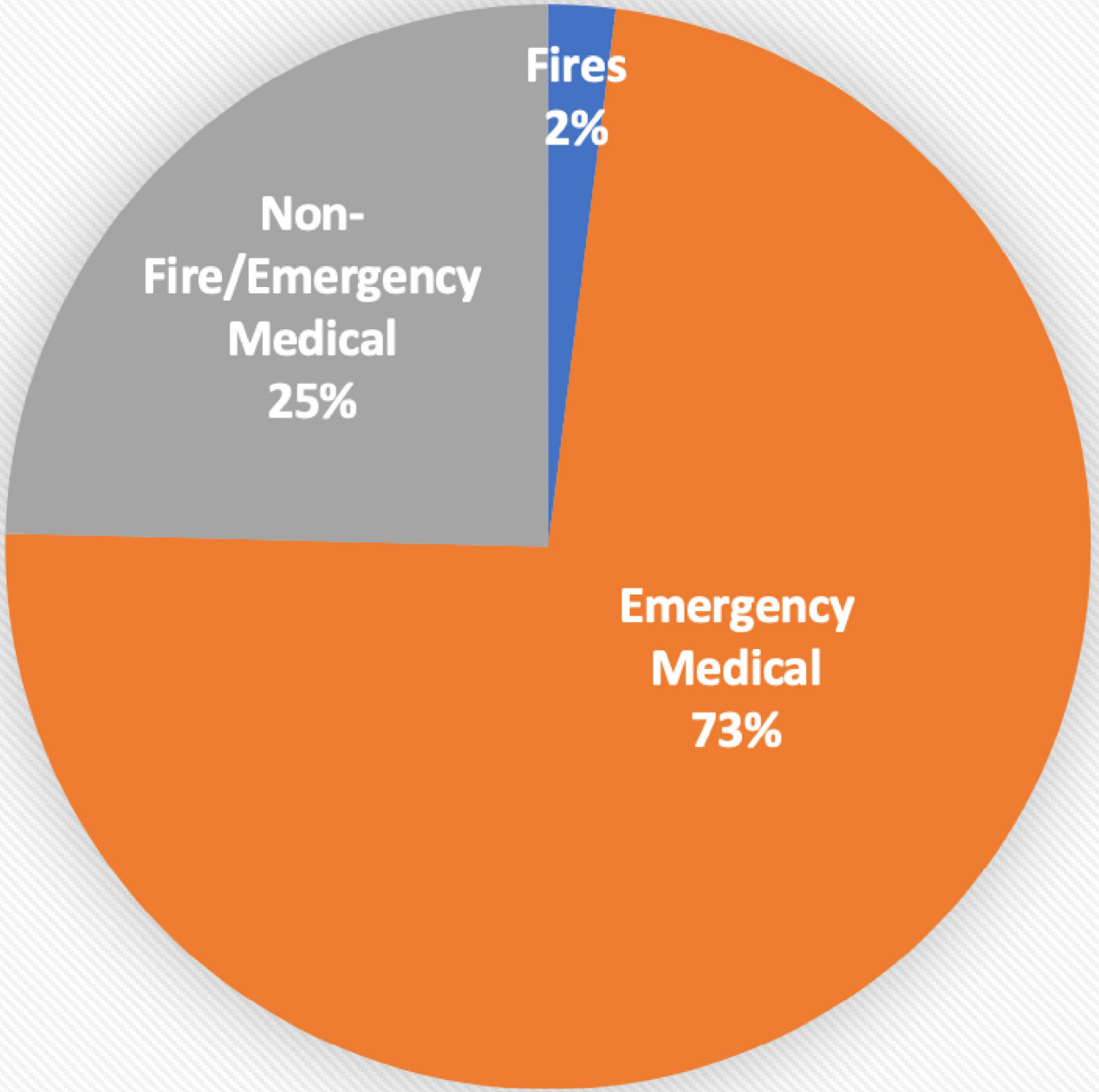
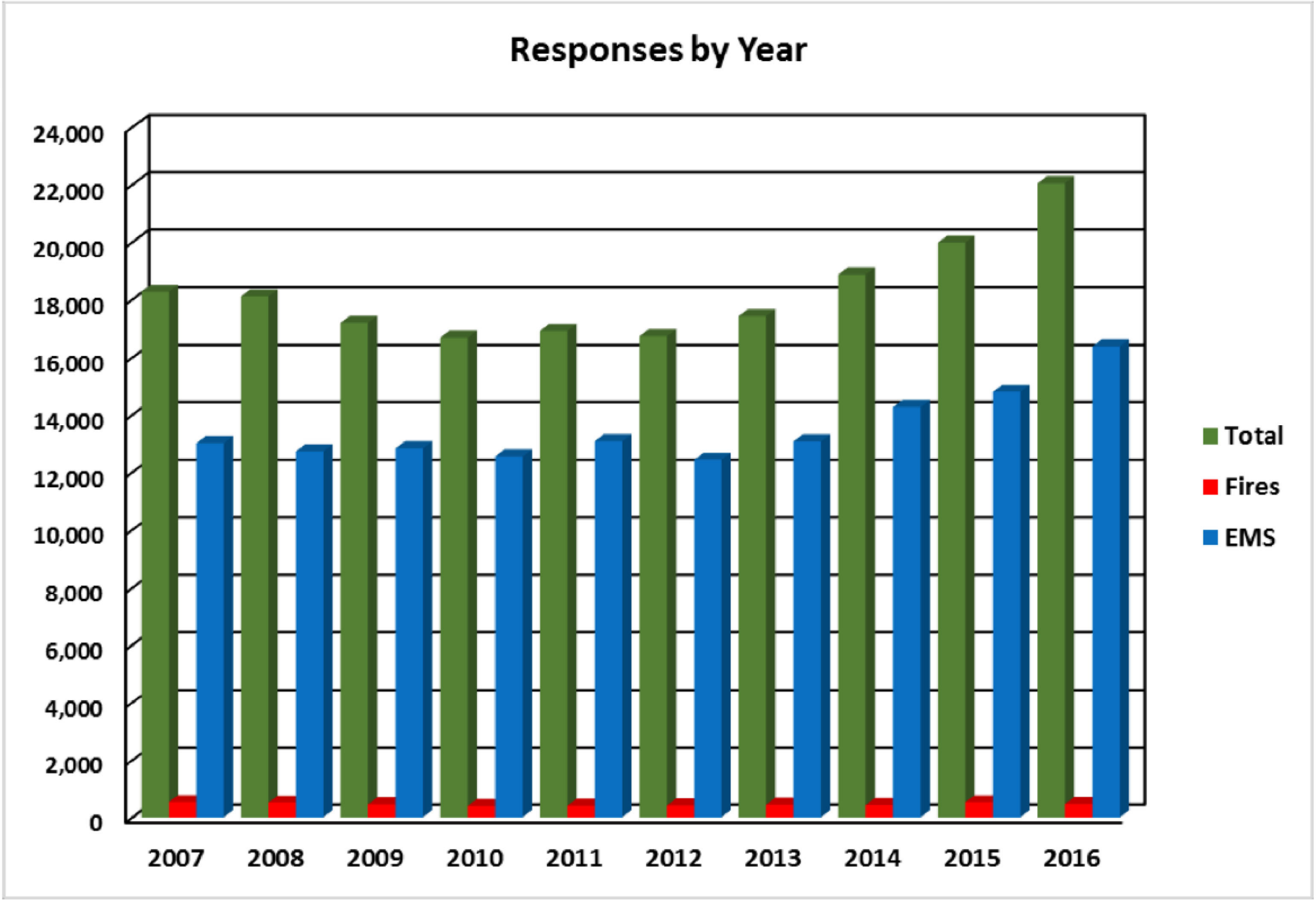
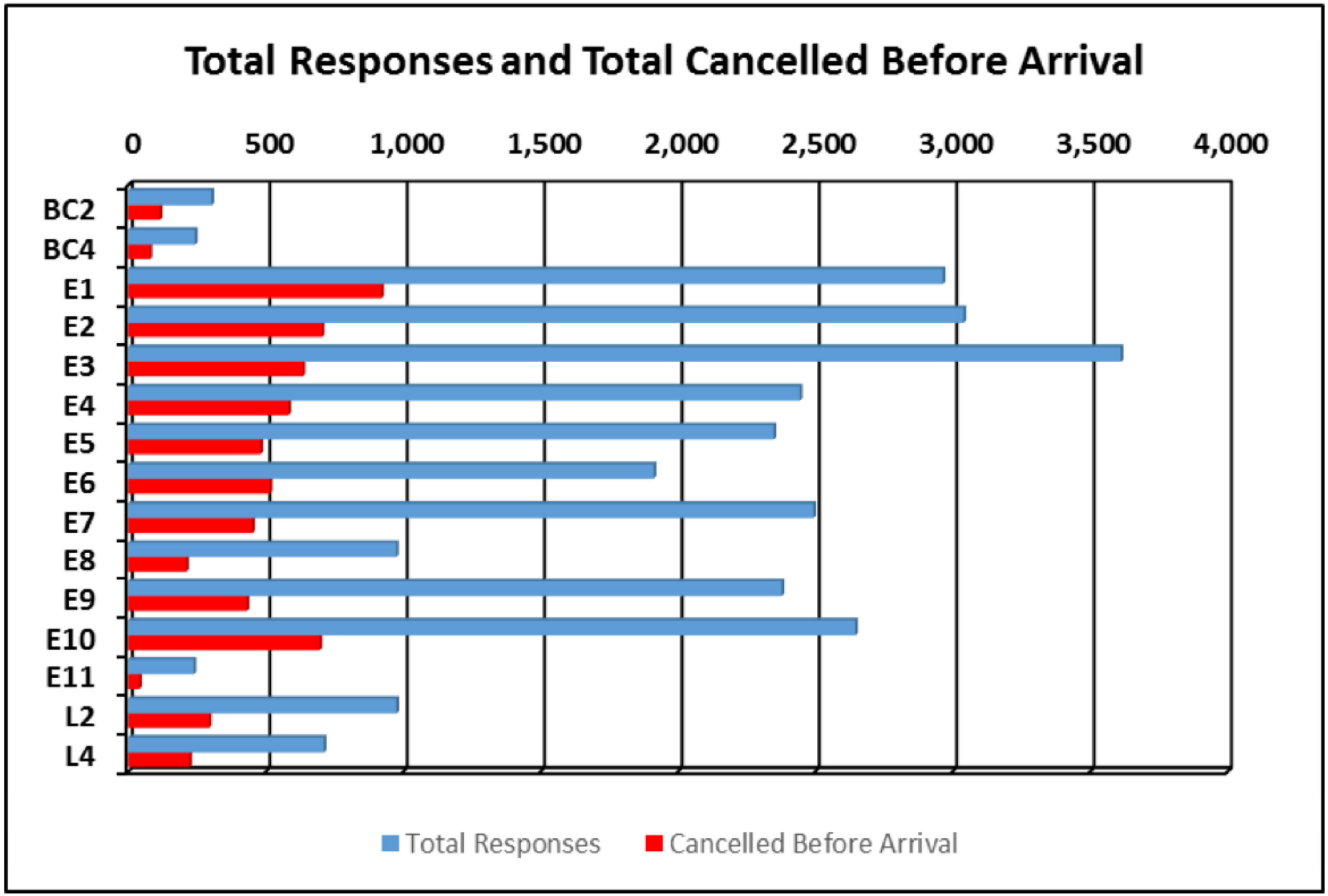


Figure 33: Workload History, 2007 – 2016



Fire Department units respond frequently to calls for service that end up as cancelled respo

Figure 68: Unit Responses and the Number Cancelled Before Arrival



2018 - 2023

Salem Fire Department
Standards of Cover

Introduction

The following report serves as the Salem Fire Department "Standards of Cover" document. The Center for Fire Public Safety Excellence (CPSE) defines the process, known as "deployment analysis," as written procedures that determine the distribution and concentration of fixed and mobile resources of an organization. The purpose for completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations in addition to homeland security issues.

Creating a Standards of Cover document requires that many areas be researched, studied, and evaluated. The following report will begin with an overview of both the community and the agency. Following this overview, the plan will discuss areas such as risk assessment, critical task analysis, agency service level objectives, and distribution and concentration measures. The report will provide documentation of reliability studies and historical performance through charts and graphs. The report will conclude with policy recommendations.

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Executive Summary

This document identifies Salem Fire Department's Standards of Cover (SOC) for the City of Salem, Oregon. Response resources, deployment strategies, operational elements, and overall community risks have been evaluated in this document. It establishes response time objectives and standards for measuring the effectiveness of resources within the department and the deployment of those resources. The document is segregated into components generally based on the format recommended by the Center for Public Safety Excellence, *Standards of Cover 5th Edition*.

The Salem Fire Department (SFD) is a direct operating department of the City of Salem and provides fire protection, rescue, advanced life support (ALS) emergency medical services, and prevention services to the community. The department's service area encompasses all of the area within the governmental boundaries of the City of Salem and the Salem Suburban Fire District (a contractual service area). This document will only address the area within the city limits of Salem.

The City of Salem has a resident population of 162,077.[1] Population in the Salem Suburban Fire District is estimated to be 7,000, for a total resident population of 169,077. It is estimated that employment brings an additional 26,401[2] people into the city, raising the SFD's daytime service population to approximately 195,478.

The department serves an area of approximately 49 square miles within the City of Salem and an additional 30 square miles for the Salem Suburban Fire District. The department operates 10 fire stations and 52 apparatus. The Willamette Valley Communications Center provides emergency call receipt and dispatch service.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection 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. As of the latest rating, ISO gave the service area a rating of Class 2 for properties within 1,000 feet of a fire hydrant and Class 2y for all other areas. This rating was conducted in 2003.

[1] Portland State University Center for Population Research, May 2017.

[2] City-Data.com research, May 2017

In the typical SOC process, potential service area classifications are broken down into five categories:

- **Metropolitan** - geography with populations of over 200,000 people in total and/or a population density of over 3,000 people per square mile. These areas are distinguished by mid-rise and high-rise buildings, often interspersed with smaller structures.
- **Urban** - geography with a population of over 30,000 people and/or a population density of over 2,000 people per square mile.
- **Suburban** - geography with a population of 10,000 to 29,999 and/or a population density of between 1,000 and 2,000 people per square mile.
- **Rural** - geography with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile.
- **Wilderness/Frontier/Undeveloped** - geography that is both rural and not readily accessible by a publicly or privately maintained road.

An analysis of the City of Salem's population density reveals that it is primarily of two classifications: urban, and suburban. The Salem City Council, however, has determined that its response performance objectives should be uniform across the entire city, thus the city will be evaluated as one designation; urban.

A Performance Statement and Goals for the services provided by the Salem Fire Department to the City of Salem have been developed. These further define the quality and quantity of service expected by the community and consistently pursued by the Salem Fire Department.

Overall Performance Statement

Because of the analysis in this report and consideration of community input, the following performance statements and goals are established.

Performance Statement (Mission Statement)

Protecting lives, property, and the environment placing safety and service above all

The Salem City Council has adopted a response performance goal describing its desired level of response performance. This is a goal to be achieved in the future as funding is available to provide the necessary resources.

- *The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within 5 minutes 30 seconds from receipt of the call at the dispatch center, 85 percent of the time.*

The Salem Fire Department has adopted a response performance goal describing its desired level of performance for the full Effective Response Force. This, also, is a goal to be achieved in the future as funding is available to provide the necessary resources.

- *For moderate or high-risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 10 minutes from receipt of the call at the dispatch center, 85 percent of the time.*

The analysis conducted during the evaluation phase of this process identified opportunities to improve service. The following performance improvement goals are offered for consideration.

Improvement Goal A: Consider aligning SFD response performance goals more closely with national standards

City Council may wish to consider adopting response performance goals more in line with national standards. This will allow a better comparison of performance with other similar fire agencies.

Improvement Goal B: Improve SFD response unit turnout times

Response personnel are taking longer to initiate response than national standards. Evaluation of station engineering and continuing to enforce performance expectations are recommended.

Improvement Goal C: Acquire needed technology and implement closest unit dispatch

Technology is available to ensure the closest response unit is dispatched to an emergency. Agencies that have implemented this technology have realized a significant improvement in response performance.

Improvement Goal D: Improve system reliability through better response unit location management

The more response units remain within their primary service area the better response performance becomes. Several suggestions to do so are offered.

Improvement Goal E: Explore opportunities to slow response workload growth

Emergency medical incidents have increased faster than population over the past three years. There are several initiatives that can help control this rate of growth.

Improvement Goal F: Relocate Station 8 to a location that can better serve the City of Salem

Fire station 8 is not located well for service to the city. An alternate location is proposed near Lancaster Dr. and NE Ward Ave.

Improvement Goal G: Prepare for and request a rating review by the Insurance Services Office

The city was last surveyed for its public protection classification in 2003. Much has changed in the SFD system. A new rating survey may prove valuable.

Improvement Goal H: Improve the capture and analysis of incident data

SFD already captures and uses data quite well. However, there are opportunities to both improve the capture of information and the use of it to make deployment and service delivery decisions.

Improvement Goal I: Continually evaluate response workload to determine when peak activity response units should be implemented

Response workload is not constant across the 24-hour day. Additional smaller response units can improve response performance during times of high response workload. At some point, response workload will provide an opportunity to utilize peak activity units. At present the little benefit provided does not justify the cost of this type of resource.

Improvement Goal J: Staff and operate a response unit from Fire Station 11

Staffing Station 11 provides a number of response system benefits. Station 11 should be staffed and operated as soon as funding is available to do so.

Improvement Goal K: Construct and Staff Fire Station 12

The area in and around the Mill Creek Corporate Center has, and will continue to experience, significant development. With this comes an increasing response workload. The addition of Fire Station 12 should be considered in the near term.

Improvement Goal L: Plan for the addition of Fire Station 13

The southwest area of Salem is underserved. Although response workload in this area is light, adding response capability should be considered for the future.

Component A – Description of Community Served

Organization Overview

Governance and Lines of Authority

The City of Salem is a municipal corporation and operates as a charter city that is provided the authority to levy taxes for operating a fire protection system. The City operates under a Council-Manager form of governance and the City Council is provided with necessary power and authority to govern the provision of fire protection and emergency services. The City Council maintains strictly policy-level involvement, avoiding direct management and hands-on task assignment—an arrangement established within written policy.

Extraterritorial services to the Salem Suburban Fire District are provided through contractual agreements between the city and the district. The terms of that agreement do not specify response be provided to any defined standard.

Organizational Finance

Financial oversight of Salem Fire Department is the responsibility of an elected City Council and City Manager. The Fire Chief is appointed by the City Manager and is tasked with responsibility for fire and life safety emergency services within the city.

The city uses a one-year budget cycle to prepare the annual operating budget and capital improvement plan based on a July through June fiscal year. The total fire department General Fund budget for fiscal year 2016-2017 is $29,897,610. The department also maintains the Emergency Medical Services (EMS) fund with an annual operating budget for FY 2016-2017 of $783,900.

Revenue for fire department services is received through general revenue of the city. A large segment of the municipal revenue is property tax receipts and, to a lesser degree, fees for service and other revenues. The total revenue generated by the fire department for General Fund operations for fiscal year 2016-2017 is expected to be $2,496,580. This leaves a net cost for fire and rescue (EMS) services to Salem taxpayers for the fiscal year 2016-2017 of $27,401,030. The EMS Fund receives revenue for advanced life support care and transport provided by the department during high volume call times, and remuneration from the City's contracted ambulance (medical transport) provider.

Figure 1 lists the source and amount of non-tax revenue for Salem Fire Department for fiscal year 2016-2017.

Figure 1: Generated Revenue

Revenue Source	FY 2016-2017 (General Fund)	FY 2016-2017 (EMS Fund)
Service Contracts	$1,164,350	$621,540
Service Fees	$150,730	$96,010
Fire Permit Fees	$360,000	-
Grants	$781,500	-
Donations	$40,000	-
Total	**$1,912,379**	**$717,550**

Figure 2 shows the General Fund expenditure history for the previous three fiscal years and the current year. Actual expenditures were used for fiscal years 2013-2014 through 2015-2016 and the budgeted amount was used for 2016-2017. Three major divisions of the budget are shown.

Figure 2: Budget/Expenditures by Year and Category, FY 13-14 – FY 16-17

Year	Salaries and Benefits	Services and Supplies	Capital Outlay	Total
FY 13-14	$21,033,158	$3,545,997	$121,384	$24,700,539
FY 14-15	$21,327,356	$3,621,304	$0	$24,948,660
FY 15-16	$21,981,406	$3,661,584	$13,440	$25,656,430
FY 16-17	$24,686,080	$5,141,530	$70,000	$29,897,610

A comprehensive capital improvement and replacement program is important to the long-term financial stability of any fire and emergency medical service organization. Such programs provide systematic development and renewal of the physical assets and rolling-stock of the agency. Items usually included in capital improvement and replacement programs are facilities, apparatus, land acquisition, and other major capital projects.

The City of Salem has an adopted “Capital Improvement Plan 2016-17-2020-21”. This document describes capital facility and other improvement needs for the five-year timeframe and schedules those improvements based on available funding. The Salem Fire Department does not currently have any projects addressed in this plan.

Service Area Overview

The Salem Fire Department (SFD) is a direct operating department of the City of Salem and provides fire protection, rescue, emergency medical services and fire and life safety services to the community. The department's jurisdiction encompasses all of the governmental boundaries of the city along with the Salem Suburban Fire District (SSFD), a contractual service area).

SFD provides emergency services to a city with a resident population of 162,077.[3] Salem Suburban Fire District has an estimated population of 7,000, for a total service area resident population of 169,077. It is estimated that employment brings an additional 26,401[4] people into the city, raising the SFD's daytime service population to approximately 195,478.

The department serves an area of approximately 79 square miles; 49 within the city limits and 30 within the SSFD. The department's services are provided from 10 fire stations.

The department maintains a fleet of 52 apparatus, including engines, ladder trucks, brush engines, and specialty vehicles. The Willamette Valley Communications Center provides emergency call receipt and dispatch service.

There are 167 individuals involved in delivering services to the jurisdiction. Staffing coverage for emergency response is through the use of career firefighters on 24-hour shifts. For immediate response and at full staffing, no less than 38 personnel would be on duty at all times.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating. The rating system evaluates three primary areas: the emergency communication system, the fire department, and the community's pressurized hydrant or tanker-based water supply. The overall rating is expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. As of the latest rating, ISO gave the service area a rating of Class 2 for properties within 1,000 feet of a fire hydrant and Class 2y for all other areas. This rating was conducted in 2003.

[3] Portland State University Center for Population Research, May 2017.

[4] Source: city-data.com, May 2017

Component B – Review of Services Provided

Services Provided

The Salem Fire Department provides a variety of response services, including fire suppression, advanced life support emergency medical service, entrapment extrication, high-angle rescue, trench, confined space, hazardous materials emergency response (Level A), water rescue, and aircraft rescue and firefighting.

The following chart provides basic information on each of the department's core services, its general resource capability for that service, and information regarding staff resources for that service. Additional detail on service capabilities will also be provided throughout this document.

Figure 3: Core Services Summary

Service	General Resource/ Asset Capability	Basic Staffing Capability per Shift
Fire Suppression	10 staffed engines 2 staffed ladder trucks 2 command vehicles Additional mutual aid engines, aerials, and support units as available	38 suppression-trained personnel per shift Additional automatic and mutual aid firefighters as available
Emergency Medical Services	10 engines - ALS equipped 2 ladder trucks - ALS equipped 2 backup ambulances	9 certified emergency medical technicians basic 138 certified emergency medical technicians paramedic
Vehicle Extrication	2 ladder trucks equipped with hydraulic rescue tools, hand tools, air bags, stabilization cribbing, and combination cutter-spreader hydraulic rescue tool	All firefighters vehicle extrication and rescue trained
High-Angle Rescue	1 cross-staffed heavy rescue and 1 urban search and rescue trailer equipped with rescue-rated rope, harnesses, and technical rescue equipment	All personnel trained to the operations level. 7 personnel per shift trained to the technician level in high-angle rope rescue.
Trench and Collapse Rescue	1 cross-staffed heavy rescue equipped with pneumatic shores, cribbing, limited lumber and hand tools for initial stabilization	All personnel trained to the operations level. 7 personnel per shift trained to the technician level in trench and collapse rescue.

Service	General Resource/ Asset Capability	Basic Staffing Capability per Shift
Swift-Water Rescue	All engines and ladders are equipped with rescue throw bags, PFD's and helmets 2- aluminum hull rescue boats, 1-raft with row frame, 1-Rapid Deployment Craft	All personnel trained to the awareness level. 3 personnel per shift trained to the SRT1 and Rescue Boat Operator level
Confined Space Rescue	1 cross-staffed heavy rescue equipped with tripod, cribbing, pneumatic shores, air monitoring equipment, basket stretchers, rescue-rated rope	All personnel trained to the operations level. 7 personnel per shift trained to the technician level in confined space rescue.
Hazardous Materials Response	Hazardous materials response vehicle equipped with Level A&B PPE, multi-gas and radiation monitors, spill containment supplies, spectrometer, and non-sparking tools	All personnel trained to the operations level. 8 personnel per shift trained to the technician level in hazardous materials.
Aircraft Rescue and Firefighting	Aircraft Firefighting and Rescue vehicles equipped with 1500 gallons of water, 200 gallons of AFFF foam and 450 pounds of a dry chemical extinguishing agent.	3 personnel trained per shift to meet the requirements of FAR part 139.
Urban Search and Rescue	35 foot cargo trailer and truck equipped with an assortment of cutting saws, concrete hammers, hydraulic tools, breaching tools, sounding devices and generators. In conjunction with the Heavy Rescue vehicle can handle a Level 1 Heavy Rescue deployment.	10 personnel trained to the USAR technician level. In addition, 4 personnel are trained as medical specialist.
Special Weapons and Tactics (SWAT) Medic	Salem Fire personnel who are sworn reserve police officers and are trained to perform the duties of both a police officer and paramedic for the Salem Police SWAT team.	4 personnel trained to function as paramedics and police officers under the Salem police SWAT command.
Community Emergency Response Team (CERT)	CERT training provided each month to interested citizens. One emergency manager provides training	

Service	General Resource/ Asset Capability	Basic Staffing Capability per Shift
CPR & AED Training	4500 people, including all eighth graders in the Salem Keizer School District trained each year in CPR and AED usage. The Salem Fire Foundation provides the funding to accomplish this task.	4-6 paramedics per school per day provide the training (off-duty)

Assets and Resources

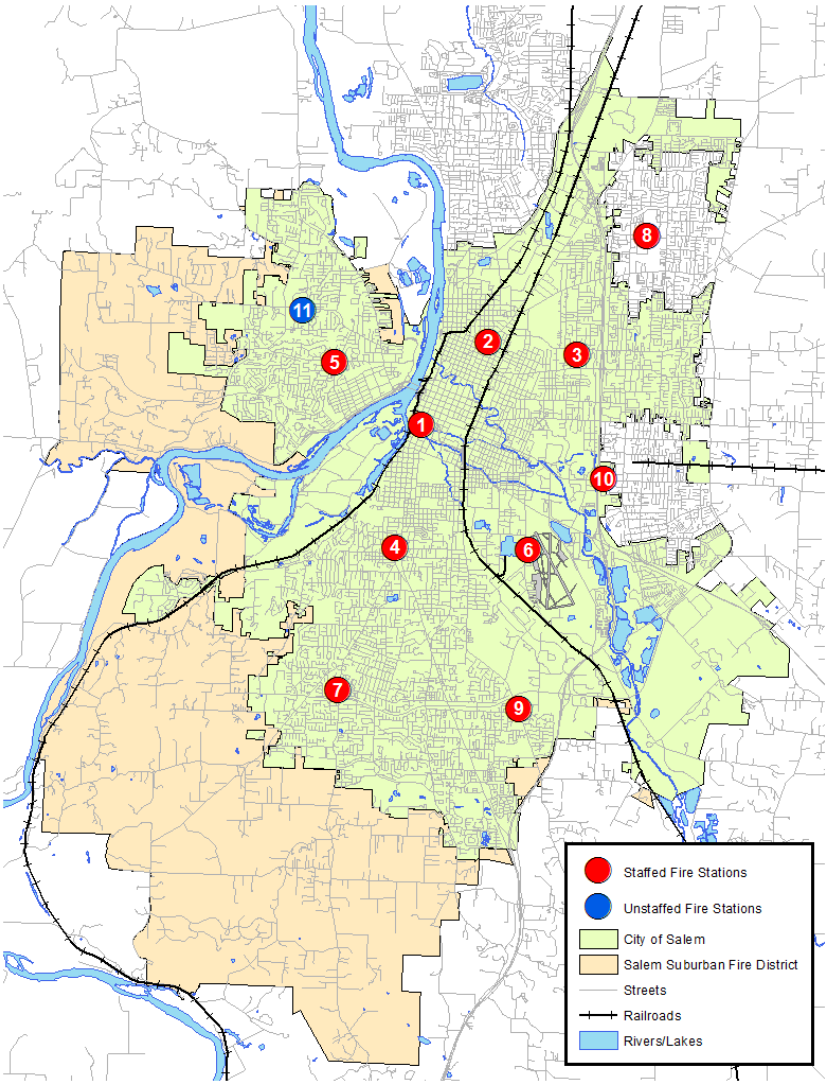
Fire Stations

Fire stations play an integral role in the delivery of emergency services for a number of reasons. A station's location will dictate, to a large degree, response times to emergencies. Fire stations also need to be designed to adequately house equipment and apparatus, as well as the firefighters and other personnel assigned to the station. Appendix C contains more detailed descriptions of each Salem fire station.

Station Location and Deployment

The SFD delivers fire and EMS response from 10 city-owned fire stations located throughout the city. Station 11 in West Salem is currently not staffed. The following map shows the city boundaries, Salem Suburban Fire District boundaries, and fire station locations.

Figure 4: Current Facility Deployment



Apparatus

Other than the firefighters assigned to stations, response vehicles are probably the next most important resource of the emergency response system. In 2007 SFD replaced nearly all its fleet. The following lists apparatus assigned to each of the stations.

Figure 5: Apparatus Assigned to Salem Fire Stations

Station	Apparatus	Year Built	Condition
Station 1	Engine 1	2007	Fair
	Tender 1	2008	Very Good
	Air 1	2009	Very Good
	Grass 1	2008	Good
	BC 1	2000	Fair
	Engine 14	2009	Fair
	FM 5	2014	Excellent
Station 2	Engine 2	2007	Fair
	Ladder 2	2009	Fair
	BC 2	2009	Fair
Station 3	Engine 3	2010	Fair
	Engine 13 (reserve)	2007	Fair
Station 4	Engine 4	2007	Fair
	Ladder 4	2009	Fair
	Rescue 4	2005	Fair
	BC 4	2009	Fair
Station 5	Engine 5	2007	Fair
	Engine 15	2007	Fair
	Boat 5/Tow	2017/2002	Excellent/Fair
	Boat 15	2005	Fair
	Tender 5	2008	Very Good
	Grass 5	2008	Very Good
Station 6	Engine 6	2007	Fair
	Foam 6	2007	Very good
	Foam 16	1984	Fair
	Medic 16	2002	Fair
Station 7	Engine 7	2007	Fair
	Tender 7	2008	Very Good
	Grass 7	2008	Good
	USAR 4	2001	Fair
	Air 7	1991	Fair
	DFM Trailer	2007	Good
Station 8	Engine 8	2007	Fair
Station 9	Engine 9	2007	Fair
	Medic 19	2002	Fair
Station 10	Engine 10	2007	Fair
	HazMat 13	2010	Very Good
	Tow 7/MCI		Poor
	Decon 13	2007	Very Good
	FM7	2011	Excellent
	BC 3	2000	Fair
Station 11	Engine 11	2007	Fair
	Tow 11/Deployment trailer	1992	Poor
	Engine 15 (reserve)	2007	Fair

Station	Apparatus	Year Built	Condition
Station 11 (cont)	FM 4	2009	Very Good
	Ladder 11	1992	Fair

SFD uses several types of apparatus as shown in the previous table. Some are further described as follows:

- Engine – Primary response unit from each station for most types of service requests. Each is equipped with a 1,500 gallon-per-minute pump and carries 500 gallons of water. All engines are equipped with advanced life support equipment and personnel.
- Ladder Truck – A specialized aerial apparatus equipped with long ladders, salvage and overhaul equipment, and rescue tools. Used for structure fires, rescues, and other service requests. All ladders are equipped with advanced life support equipment and personnel.
- Water Tender – A truck that carries 3000 gallons of water and has a 500 gallon-per-minute pump for firefighting purposes and is used in areas without fire hydrants or areas with fire hydrants that have low flow capacity.
- Grass Rig – Smaller 4-wheel drive fire engine with a 275 gallon-per-minute pump and 300 gallons of water. Used for wildland fires and fires in the wildland-urban interface.
- HazMat – Specialized response unit for containment and control of hazardous materials releases. It is accompanied by the Decon unit, which specializes in cleanup of decontaminated persons and equipment.
- Air Rig – Incident support unit with breathing air bottle refill capability/rehab supplies.
- ARFF- Specialized response unit utilized for Aircraft rescue/firefighting, and given the large amount of foam which is carried, can be utilized for petroleum based fires.

The department's apparatus are generally in fair condition, properly equipped, and well maintained. However, they are approximately three-quarters through their usable service life and are anticipated to be replaced in 2021.

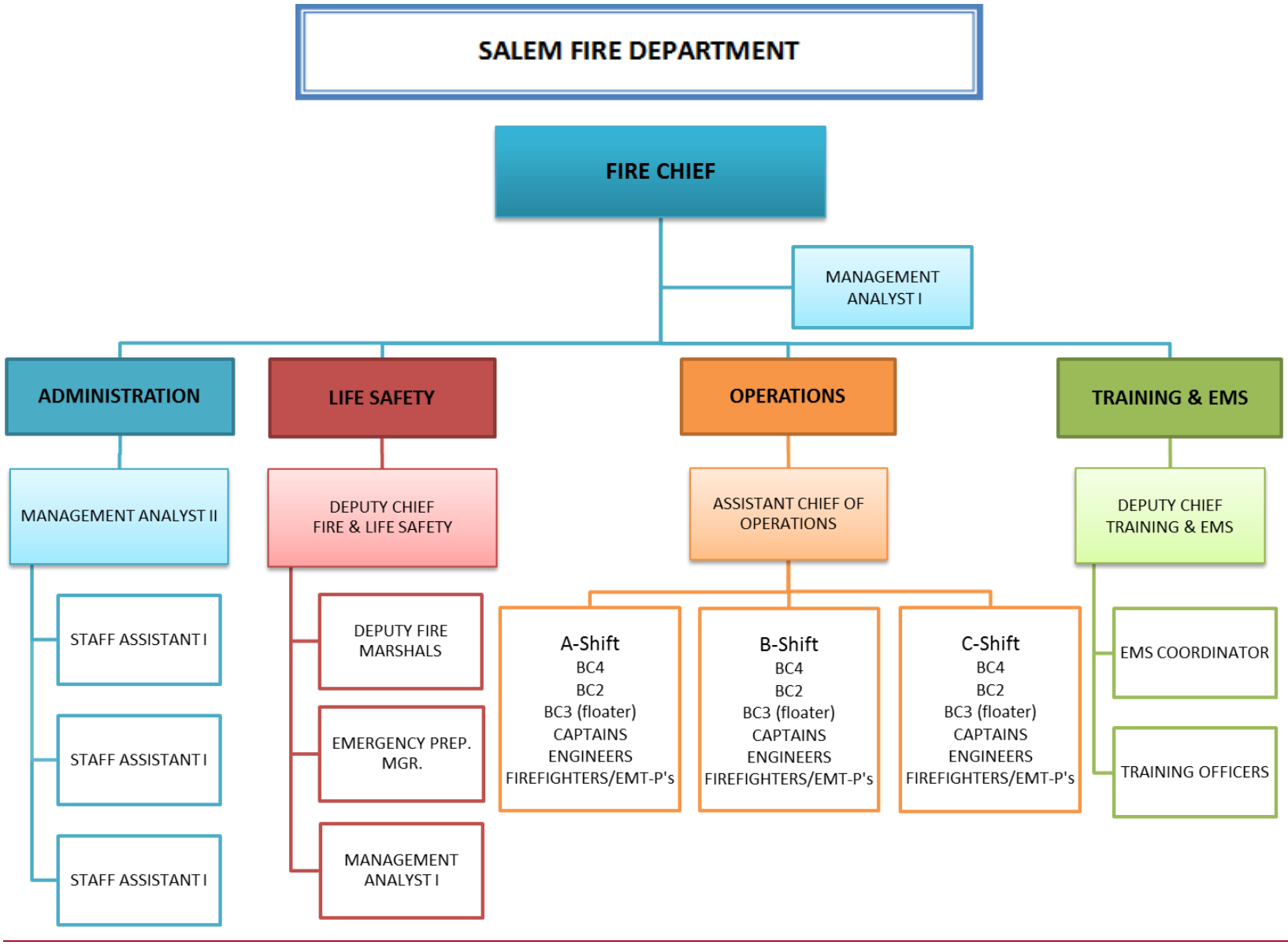
Staffing Information

Fire and emergency medical service organizations must provide adequate staffing in four key areas: emergency services, administration, risk mitigation (prevention), and support.

Organizational Structure

SFD is organized in the typical top-down hierarchy. The chain of command is identified with common roles for a department of this size. SFD has 11 stations that house emergency response resources. 10 of these stations are constantly staffed. The department's administrative office is located at Fire Station 1. The department's multiple facilities and its three-shift, 24-hour-per-day, seven-day-per-week operational schedule create numerous internal communications and management challenges. The department's organizational chart is functional and primary roles are well identified.

Figure 6: Organizational Structure



Administration and Support Staff

One of the primary responsibilities of a department's administration and support staff is to ensure that the operational entities of the organization have the ability and means to accomplish their service delivery responsibilities to the public. Without sufficient oversight, planning, documentation, training, and maintenance, the operational entities of a department will struggle to perform their duties well. Like any other part of a fire department, administration and support require appropriate resources to function properly.

There are 167 individuals involved in delivering services to the combined City of Salem/Salem Suburban Fire District service area. The department's primary management team includes a Chief, an Assistant Chief of Operations, two Deputy Chiefs, and a Management Analyst II. Additional support personnel include office staff, training officers, and deputy fire marshals. SFD has 19 total administration and support staff.

Figure 7: Administration and Support Personnel by Position

Position	Number
Fire Chief	1
Assistant Chief of Operations	1
Deputy Chief/Fire Marshal	1
Deputy Chief/Training-EMS	1
EMS Coordinator	1
Training Officers	2
Deputy Fire Marshals	5
Emergency Preparedness Manager	1
Management Analysts	3
Administrative Assistants	3
Total	**19**

Statistically, the department maintains a ratio of 11 percent of administration and support staff to total personnel (19 out of 167 total personnel).

Emergency Services Staff

It takes an adequate and well-trained staff of emergency responders to put the community's emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an operational scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved.

SFD uses career staffing to carry out its functions. All administrative, support, and response staff are career personnel. The following figure shows the distribution of emergency personnel by rank. Note that the Assistant Chief of Operations and the two Deputy Chiefs are also included in the following table since they also respond to emergencies

Figure 8: Emergency Response Personnel by Rank

Position	Number
Assistant Chief of Operations	1
Deputy Chiefs	2
Battalion Chief	7
Fire Captain	39
Fire Apparatus Operator	39
Firefighter	63
Total	**151**

As shown in the previous figure, SFD employs 151 emergency response personnel for EMS, rescue, and fire suppression activities. The estimated resident population of the Salem Fire Department service area (City of Salem and SSFD) is 169,077. SFD provides its service area with 0.89 career firefighters per 1,000 population. Including employment populations, this ratio drops to 0.77.

Regardless of the raw numbers of personnel available to a department, what matters most is actual numbers of emergency responders the agency can produce at an emergency scene. This almost always relates to the actual number of emergency responders available for immediate deployment. SFD provides no less than 38 personnel on duty at full staffing.

Methodology for Incident Staffing

This document will provide an analysis of how well this department is doing at providing its own personnel for incidents within its primary service area. This data is important and can be an indicator for the department as to the effectiveness of its staffing efforts.

It is also true that for larger incidents this fire department is typically acting together with one or more neighboring fire departments in providing fire and life protection through a coordinated regional response system of mutual and automatic aid agreements. This is particularly true for large structure fires, other high-risk incidents where staffing needs are high, and during periods of high incident activity. Therefore, the document will go on to provide an overall view of aggregate staffing in this department and the neighboring agencies.

The prompt arrival of at least four personnel is critical for structure fires. Oregon Occupational Safety and Health Division (OR-OSHA) regulations require that personnel entering a building involved in fire must be in groups of two. Further, before personnel can enter a building to extinguish a fire, at least two personnel must be on scene and assigned to conduct search and rescue in case the fire attack crew becomes trapped. This is referred to as the two-in, two-out rule.

There are, however, some exceptions to this regulation. If it is *known* that victims are trapped inside the building, a rescue attempt can be performed without additional personnel ready to intervene outside the structure. Further, there is no requirement that all four arrive on the same response vehicle. Many departments rely on more than one unit arriving to initiate interior fire attack. The Salem Fire Department staffs fire engines with three firefighters; thus, it must wait for a second unit to arrive before it can initiate interior fire attack operations in a non-rescue incident.

Some incidents (such as structure fires) require more than one response unit. The ability of this department and its automatic aid neighbors to assemble an effective response force for a multiple unit incident within the specific period of time, also known as *resource concentration*, will be analyzed in a later section of this document.

SFD fire engine staffing is constant at three personnel per shift. Ladder truck staffing varies between three and four personnel per shift, but is typically three. The following table lists each station, staffed unit, and the staffing assigned to each. Cross-staffed means that firefighters assigned to another response unit in the station may transfer to the cross-staffed unit as needed.

Figure 9: Minimum Staffing Complement

Station	Apparatus	Minimum Staffing
Station One	Engine 1	3
	Air 1 (scene support)	Cross-staffed
Station Two	Engine 2	3
	Ladder 2	3
	Battalion Chief 2	1
Station Three	Engine 3	3
Station Four	Engine 4	3
	Ladder 4	3
	Battalion Chief 4	1
	Rescue 4	Cross-staffed
Station Five	Engine 5	3
	Grass 5	Cross-staffed
	Tender 5	Cross-staffed
	Boat 5	Cross-staffed
Station Six	Engine 6	3
	Foam 6	Cross-staffed
	Foam 16	Cross-staffed
	Medic 16	Cross-staffed
Station Seven	Engine 7	3
	Grass 7	Cross-staffed
	Tender 7	Cross-staffed
	USAR 4	Cross-staffed
	Air 7	Cross-staffed
Station Eight	Engine 8	3
Station Nine	Engine 9	3
	Medic 19	Cross-staffed

Station	Apparatus	Minimum Staffing
Station Ten	Engine 10	3
	MCI Trailer	Cross-staffed
	HazMat 13	Cross-staffed
	Decon 13	Cross-staffed
Station Eleven	Engine 11	0
	Ladder 11	NA
	Tow 11	NA
	Total	**38**

The Salem Fire Department relies on regional mutual and automatic aid agreements for major structure fires and other higher risk incidents, as well as during periods of high incident activity. The following figure represents the apparatus and staffing for fire stations in reasonable proximity to the city and available for immediate dispatch. This is useful for reviewing the aggregate firefighter staffing capacity available in the immediate region.

Figure 10: Immediate Regional Aid

Department	Engines	Ladders Trucks	Other Units	Total Available Staffing
Marion County Fire District 1	2	0	Rescue. Tender, Brush unit, Medic unit	12
Keizer Fire District	1	1	Rescue, Brush unit, Medic unit, Rehab unit	7
Turner Fire District	2	0	Rescue, Tender, Brush unit Medic unit	Varies by availability
Jefferson Fire District	2	0	Rescue, Tender, Brush unit, Medic unit, Rescue boat	Varies by availability
Polk County Fire District 1	2	1	Rescue, Tender, Brush unit, Medic unit	Varies by availability

There are additional resources available for the rare major fire emergency. The State of Oregon Conflagration Act system provides resources from around the State of Oregon as requested and available. This can include one or more “strike teams” (groups of five similar resources) or “task forces” (groups of five dissimilar resources) staffed and equipped for the specific emergency. Wildland fires bring the firefighting resources of other cooperating agencies such as the Oregon Department of Forestry, Bureau of Land Management, and United States Forest Service.

Prior to 2013 the State of Oregon sponsored a state-wide Urban Search and Rescue Team in which Salem Fire Department was a participant. When the State withdrew support for the USAR program, the City was awarded approximately $400,000 worth of specialized equipment to assist the department in its ability to function as a USAR resource.

Current Service Delivery Goals

On October 2, 1995, based on a unanimous recommendation from the Fire Service Sub-Committee, the Salem City Council adopted an emergency response time goal. This is a goal to be achieved in the future as funding is available to provide the necessary resources.

- *The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within 5 minutes 30 seconds from receipt of the call at the dispatch center, 85 percent of the time.*

The Salem Fire Department has adopted a response performance goal describing its desired level of performance for the full Effective Response Force. This, also, is a goal to be achieved in the future as funding is available to provide the necessary resources.

- *For moderate or high-risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 10 minutes from receipt of the call at the dispatch center, 85 percent of the time.*

Component C – Review of the Community Expectations and Performance Goals

The ultimate goal of any emergency service delivery system is to provide sufficient resources (personnel, apparatus, and equipment) to the scene of an emergency in time to take effective action to minimize the impacts of the emergency. This need applies to fires, medical emergencies, and any other emergency situation to which the fire department responds. Obtaining and understanding the desires and expectations of community stakeholders is an important first step. SFD is committed to incorporating the needs and expectations of residents and policy makers in the service delivery planning process.

The City of Salem mayor, seven of the eight city council members, and the city manager were interviewed to learn their opinions about SFD and the services it provides. As the community's elected representatives, they are in a good position to know the attitudes of the community about its fire and emergency services. The following is a summary of those interviews.

Expectations

Expectations of SFD included the ability to provide prompt and reliable response to emergencies, deliver professional and effective services, and provide compassionate care. SFD should be fiscally efficient and should seek innovative approaches to deliver services.

SFD should constantly be evaluating its capability and make effective use of data-driven decision making. It should be future oriented anticipating and responding to changing community conditions. Its planning must be aligned with other city planning efforts.

SFD should continue to explore shared service opportunities with other city departments and neighboring agencies.

SFD should be actively engaged with the community promoting fire and life safety. Programs such as the recent bike rodeo and helmet program are valued.

Regarding the current Council adopted response time goal, several of those interviewed suggested adoption of national standards as the goal would be preferred.

Concerns

The concern most often shared was the practice of sending both a fire engine or ladder truck plus an ambulance on emergency medical incidents. Those interviewed were concerned this was an overuse of resources that leads to a less reliable response system and longer response times.

It is recognized that response times are not in keeping with the Council goal particularly in the outer areas of the city.

Concerns were also expressed that SFD may not be able to keep pace with a growing response workload. SFD needs to explore innovative approaches used by other fire agencies around the country.

Finally, SFD should better advertise its safety programs such as the smoke alarm and CO monitor program.

Services

Those interviewed believe SFD is providing the right type of services and none recommended stopping any service currently delivered.

There were suggestions that SFD should increase the amount of community outreach conducted at neighborhood fire stations. Additional resources are needed to improve fire prevention and inspection delivery so that buildings are inspected more often and public education programs are increased. A few of those interviewed suggested exploring a requirement for residential fire sprinkler systems.

Deployment strategy

Those interviewed were asked to indicate their preference between two deployment strategies. One distributes response resources across the city to provide everyone a relatively similar response time. The other concentrates resources to provide the shortest response time to the next most likely incident to occur, typically areas of higher population. Most indicated a preference for the latter, although expressed a desire to provide a reasonable response time to all areas of the city.

Component D – Overview of Community Risk Assessment

This section analyzes certain categorical risks that are present within the City of Salem that potentially threaten the persons and businesses within the community and that can create response workload for the SFD. These risks are identified to assist the Salem Fire Department in identifying where to locate response resources in the types and numbers needed to effectively respond to likely emergencies.

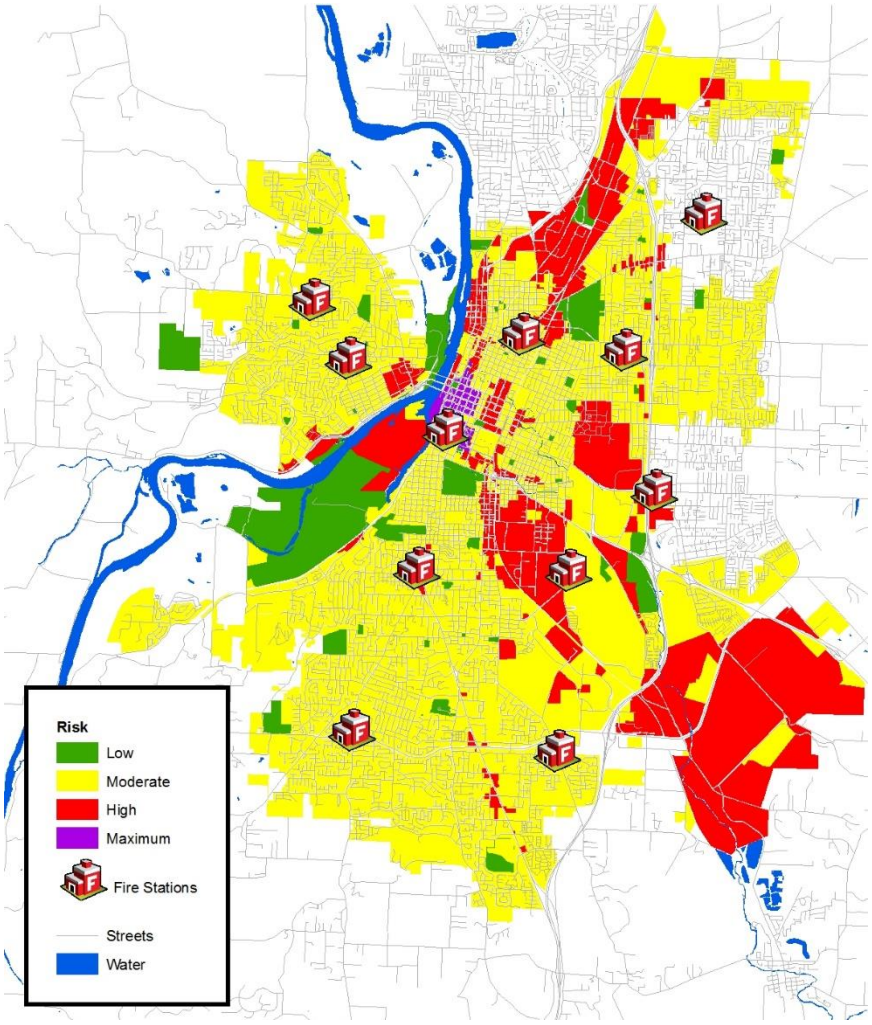
Overall Geospatial Characteristics

The fire service assesses the relative risk of properties based on many factors. Properties with high fire and life risk often require greater numbers of personnel and apparatus to effectively mitigate a fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk within geographic sub-areas of a community.

The community's risk assessment has been developed based on current land use within jurisdictional boundaries. These uses are found in the area's geographic parcel data. The following map translates land use to categories of relative fire and life risk.

- Low risk–Areas zoned and used for agricultural purposes, open space, low-density residential, and other low intensity uses.
- Moderate risk–Areas zoned for medium-density single family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- High risk–Higher-intensity business districts, mixed use areas, high-density residential, industrial, warehousing, and large mercantile centers.
- Maximum risk – Primarily the downtown area characterized by older high-rise buildings typically without built-in fire protection systems.

Figure 11: Community Risk Assessment



This map accurately depicts current development. The color-coding depicts current development as follows:

- Green - Open space, parks, golf courses, etc.
- Yellow - Single family neighborhoods, small office, and small neighborhood commercial
- Red - Large commercial properties, larger multi-family buildings, and industrial development
- Purple - Downtown mid and high-rise structures

The downtown area is dominated by mid and high-rise structures. The state capitol campus lies on the downtown's east end. Commercial and light industrial uses border the downtown area along with single family and multi-family properties. To the south, development is largely single-family homes, multi-family properties, and neighborhood commercial centers. To the extreme southeast is a yet largely undeveloped industrial site.

To the north, single-family and multi-family properties dominate. Along arterial streets, neighborhood commercial uses and some industrial uses are found. The most significant industrial area in the city is located to the extreme north end between Salem Parkway and Portland Road.

West Salem, other than the area just west of the Marion Street bridges, is pre-dominantly single-family neighborhoods. This area is quite hilly, contributing to slower response speeds and to less than ideal street interconnectivity, both of which affect response time performance.

Geographic and Weather-Related Risks

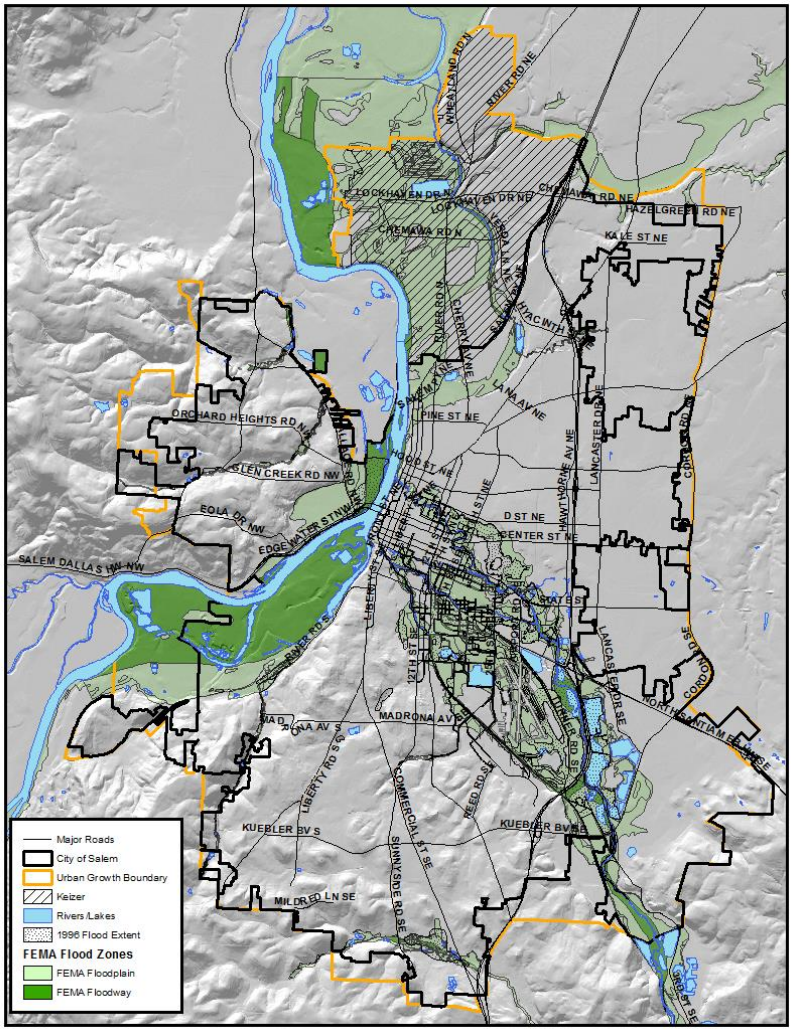
Weather Risk

Salem's climate is influenced by the currents of the Pacific Ocean, producing cool, wet winters and warm, dry summers. Rainfall averages about 40 inches per year. In the winter, Salem can get light to moderate snowfall averaging about five to ten inches per year.

Mean high temperatures range from the low 80s in the summer to about 40° F in the winter. Extreme temperatures are rare. 90° F or more temperatures occur only five to 15 times per year. Temperatures below 0° F occur only once every 25 years or so.

Extreme weather, though rare, does occur. Thunderstorms, high wind storms, and significant rain events happen infrequently. Recently a tornado passed through the town of Aumsville, just to the east of Salem, causing significant damage. During fall and winter rain events local streams can flood. The last significant flood event was in 1996, the result of a tropical rain system causing a rapid melt of the Cascades snowpack.

Figure 12: Flood Area Map

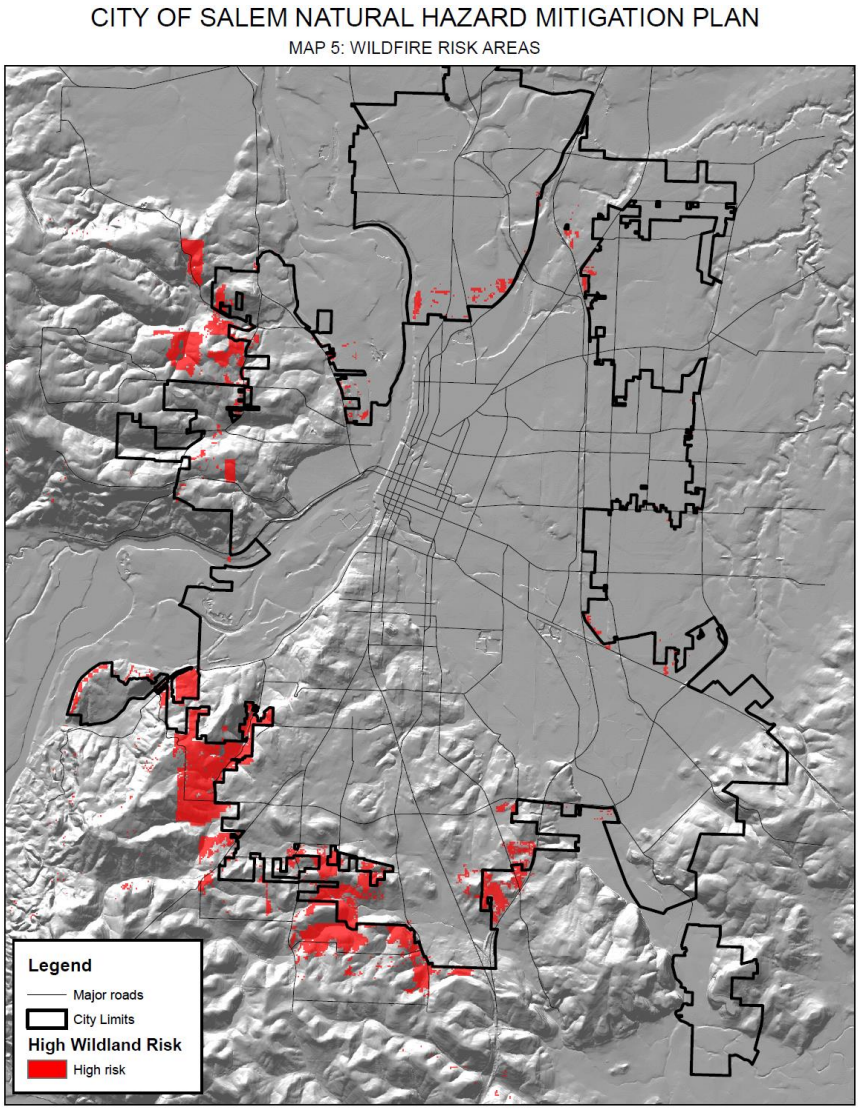


Wildfire Risk

Salem's climate, vegetation, and topography make wildland fire a rare but real risk to the community. Parts of the city have homes interspersed with large areas of natural vegetation. Many of these homes are located at the top of moderate to steep slopes, increasing the risk.

Historically, Salem experiences small, slow moving, wildland fires on a regular basis. Warm summer temperatures and strong winds can carry wildland fires into homes. However, fuel types found in this region do not support aggressive fire behavior. The following map illustrates higher risk areas in and near the city. This information was developed from the Oregon Department of Forestry wildfire risk classification data.

Figure 13: Wildland Fire Risk Areas



Geographic/Geological Risk

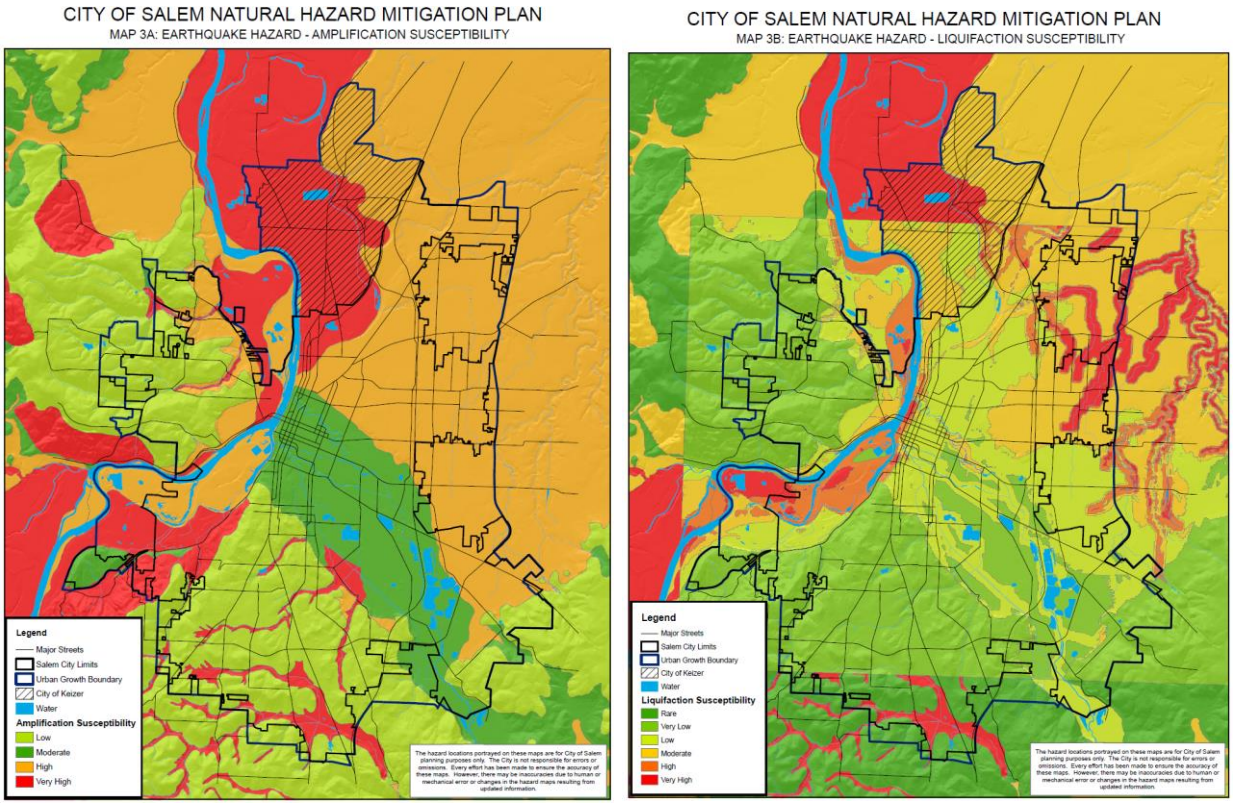
Certain geographic and geologic risks create situations that threaten the community or are physical barriers to street connectivity for emergency service response. Steep slopes, water barriers such as rivers, and other geographic features can impede rapid response.

Salem's urban area is relatively flat and does not present unusual risk. However, areas in the city's south and west do have moderate grades that can slow fire apparatus. The Willamette River traverses the city's center from north to south. There is only one bridge crossing in each direction, complicating the river's obstructive effect on emergency response.

Of further concern is the limited seismic strength of the two Willamette River bridges. The Marion Street Bridge is reported by the Oregon Department of Transportation to be able to withstand up to a magnitude 6.0 earthquake. The Center Street Bridge is able to withstand up to a 5.0 earthquake.

The Salem region is geologically active. Small to moderate earthquakes occur with regularity. Active fault lines exist in the near vicinity. The City of Salem has an active earthquake and disaster preparedness program. All city-owned fire stations have been seismically reinforced to current standards for emergency service facilities. The following maps illustrate the city's relative seismic risk.

Figure 14: Relative Earthquake Hazard Maps



Transportation Risks

Transportation corridors provide necessary access and egress for the city. These take the forms of roads, airports, and railways. These can also affect the response capability of emergency services. Unless elevated, limited access freeways and rail lines can interrupt street connectivity, forcing apparatus to negotiate a circuitous route to reach an emergency scene. Street-level rail lines can impede traffic at crossings when the trains traverse through the city.

Roads

Salem is located in the center of the Willamette Valley. Situated just 60 miles east of the Pacific Ocean and 60 miles west of the Cascade Mountains, Salem enjoys ready access to the entire west coast via Interstate Highway 5 (I-5). The Portland metropolitan area is located 47 miles to the north, close enough to create employment opportunities and facilitate international freight shipment through the Port of Portland, Portland International Airport, and two transcontinental railroads.

The cities of Albany and Eugene are located 24 and 64 miles, respectively, to the south along I-5. Highway 22 is the major east-west freeway through Salem and connects the Marion County side of the city to the Polk County side via two one-way bridges (Center Street and Marion Street).

Roadways have played an important role in the growth and development of Salem. The two systems of most significance were the radial system of market roads connecting the city with farming areas, and the major highways that joined Salem with regional and national centers.

The initial regional route through the area was U.S. Highway 99E. This highway was constructed more than 85 years ago and was the major north-south route between Seattle and California until 1956, when I-5 was completed through the Salem area. Radial market roads such as Commercial Street, Liberty Road, Wallace Road, and Silverton Road have become major arterials in the city.

One challenge to SFD's response performance lies with the transportation network throughout the city. In many parts of the city, this network is underdeveloped for population density and increasingly burdened by heavy traffic. Periods of "rush hour" congestion are steadily increasing in length, and in some areas, particularly Highway 22, Wallace Road, Commercial Street, Lancaster Drive, and Market Street, the traffic is heavy throughout daytime hours.

Efforts to expand streets and improve traffic flow are limited by constraints on government finances, topography (Willamette River), and infrastructure (number of and width of current bridges, etc.), and the continued reliance of most of the working population on using private motor vehicles as the transportation mode of choice. Within the city's suburban and rural areas, limited road networks; terrain; bridges that will not bear the weight of traditional fire apparatus; and long, narrow, winding private driveways further confound response performance efforts.

The capacity and number of bridges connecting Salem with West Salem are of particular concern to the fire department. This is largely the reason a second fire station was constructed on the Polk County side of Salem. The next closest fire stations on the west side of the Willamette River are located at Zena Road and Highway 226 (three miles from the north city limits) and in Rickreall (a very distant 15 miles away). Both are staffed exclusively with volunteer firefighters.

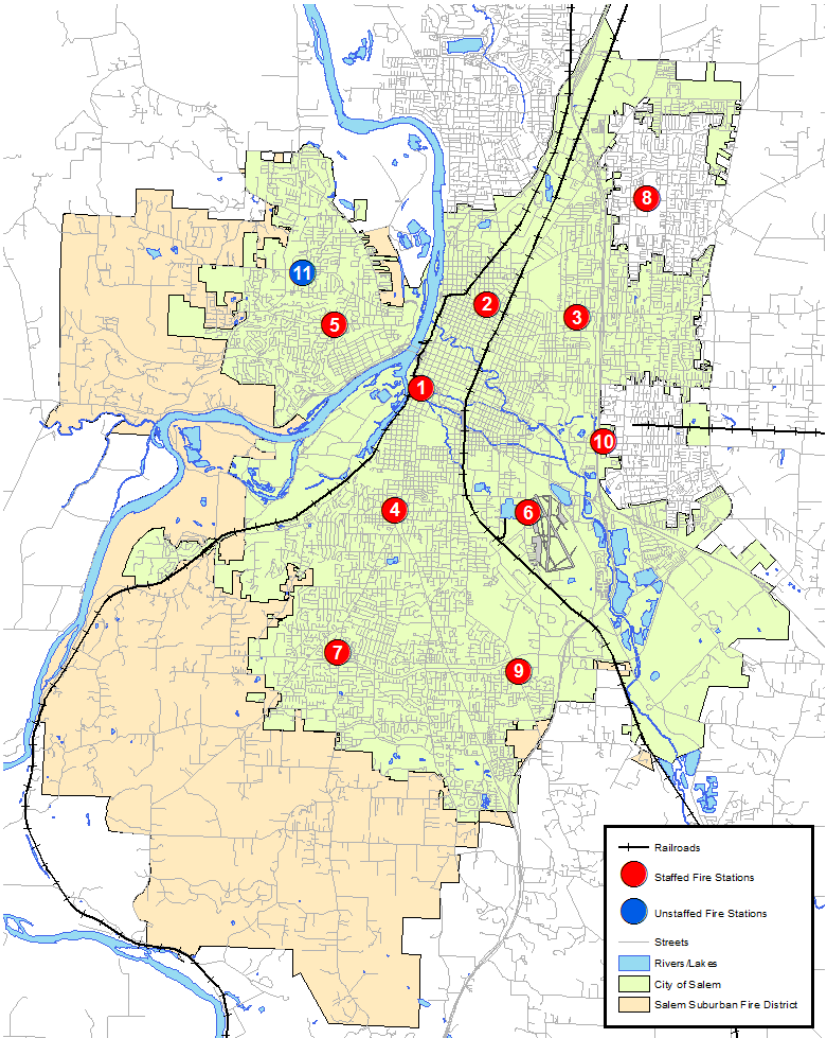
Traffic signals within the service area are equipped with signal pre-emption equipment. This provides a significant response time performance advantage as well as improved safety to motorists.

Rail

The Union Pacific Railroad operates on lines that traverse the city north to south in the city's eastern area. The Willamette and Pacific Railroad operates on a line that also traverses the city north to south in the city's western area. Both can cause delays in emergency vehicle response when trains are passing through. Neither line is predominately grade-separated throughout the city.

Also of concern with active rail lines is the amount of hazardous cargo carried by freight trains. The Union Pacific Railroad, for example, carries approximately 20,000 railcars of hazardous materials through the city each year. Though rare, railroad accidents involving the release of hazardous materials can occur.

Figure 15: Railroad System

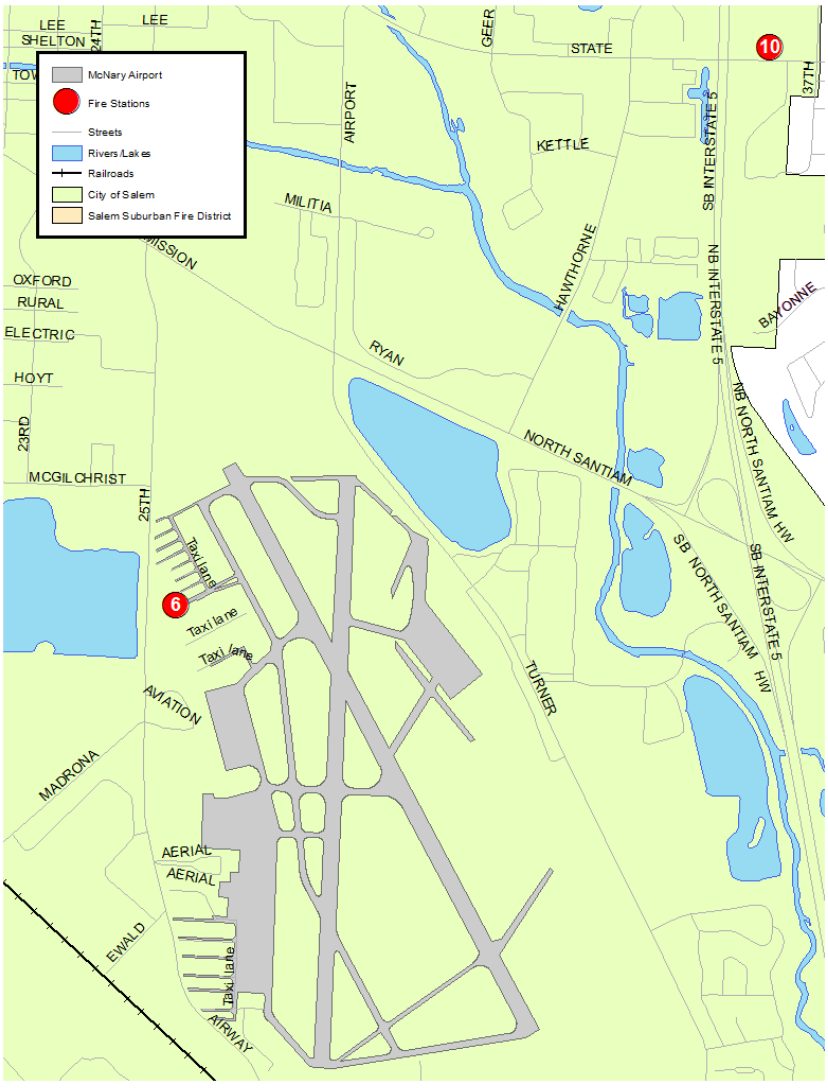


Airport

McNary Field is owned and operated by the City of Salem. It lies in the central area of the city and hosts numerous private and commercial flight activities. Approach and departure paths take aircraft over populated areas.

Aircraft crash rescue and firefighting (ARFF) services are provided by the Salem Fire Department. When flight operations requiring standby ARFF services are conducted, the Salem Fire Department also provides this service. Fire Station 6 is the ARFF station.

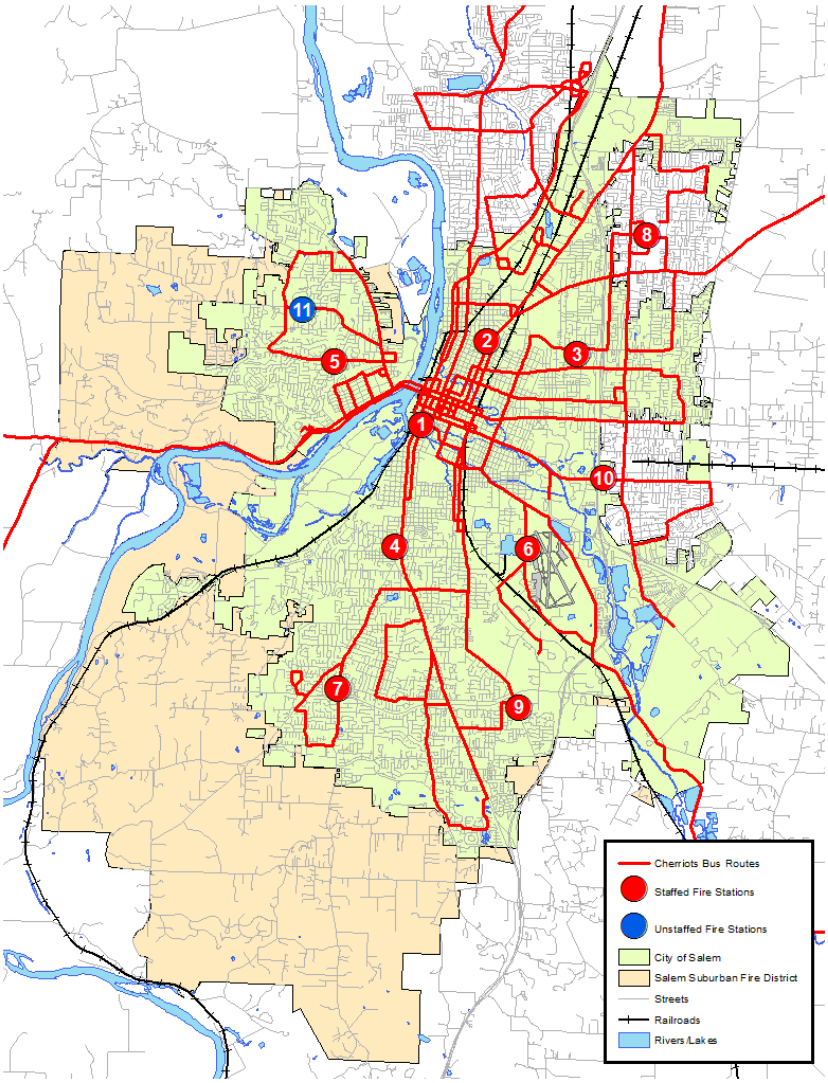
Figure 16: McNary Airport



Bus

Salem-Keizer Transit (Cherriots) operates mass transit services in the Salem region. Local bus service as well as commuter service between Salem and elsewhere in the region is available. More than five million passenger trips are logged by Cherriots each year. The following map shows bus routes in the Salem area.

Figure 17: Salem Area Bus Routes

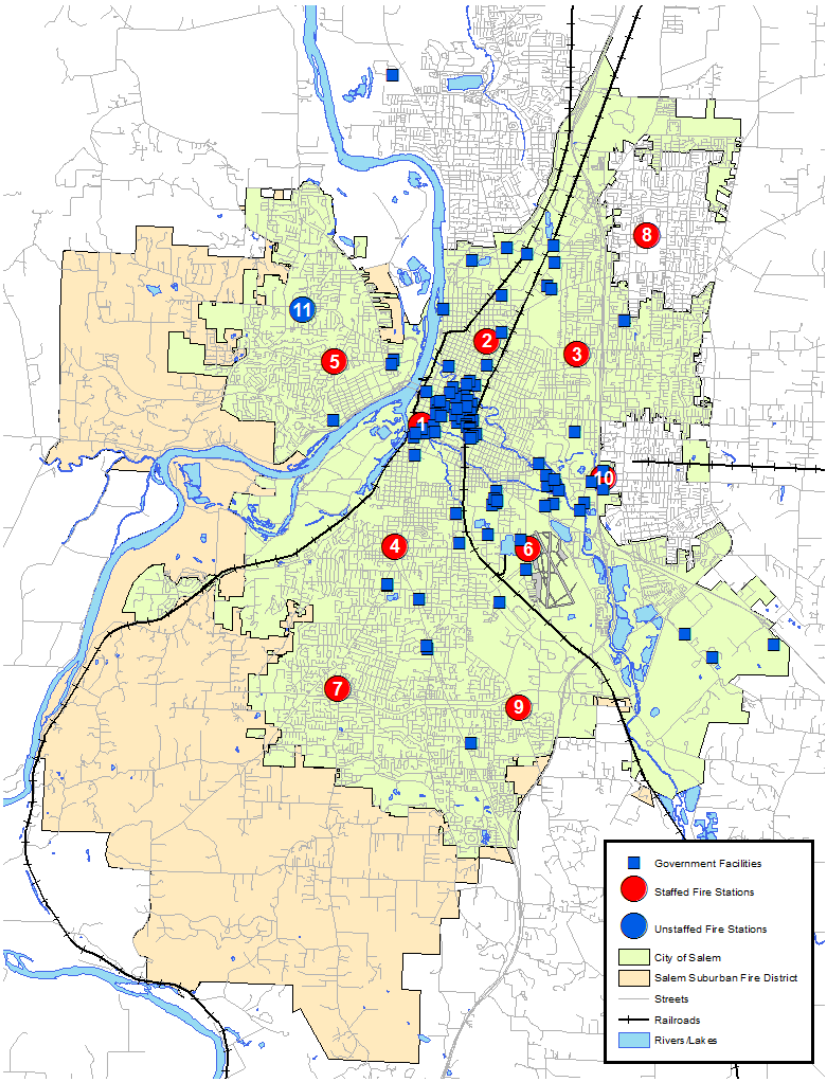


Physical Assets Protected

Government Buildings

There is a variety of government buildings in Salem considered important to providing critical services to the community in times of disaster. Salem is the Marion County seat and Oregon's capital city. Buildings such as city hall, fire stations, federal, state, and county offices, police stations, and the like provide important services to the community. The following map shows the locations of government buildings within the city.

Figure 18: Government Buildings

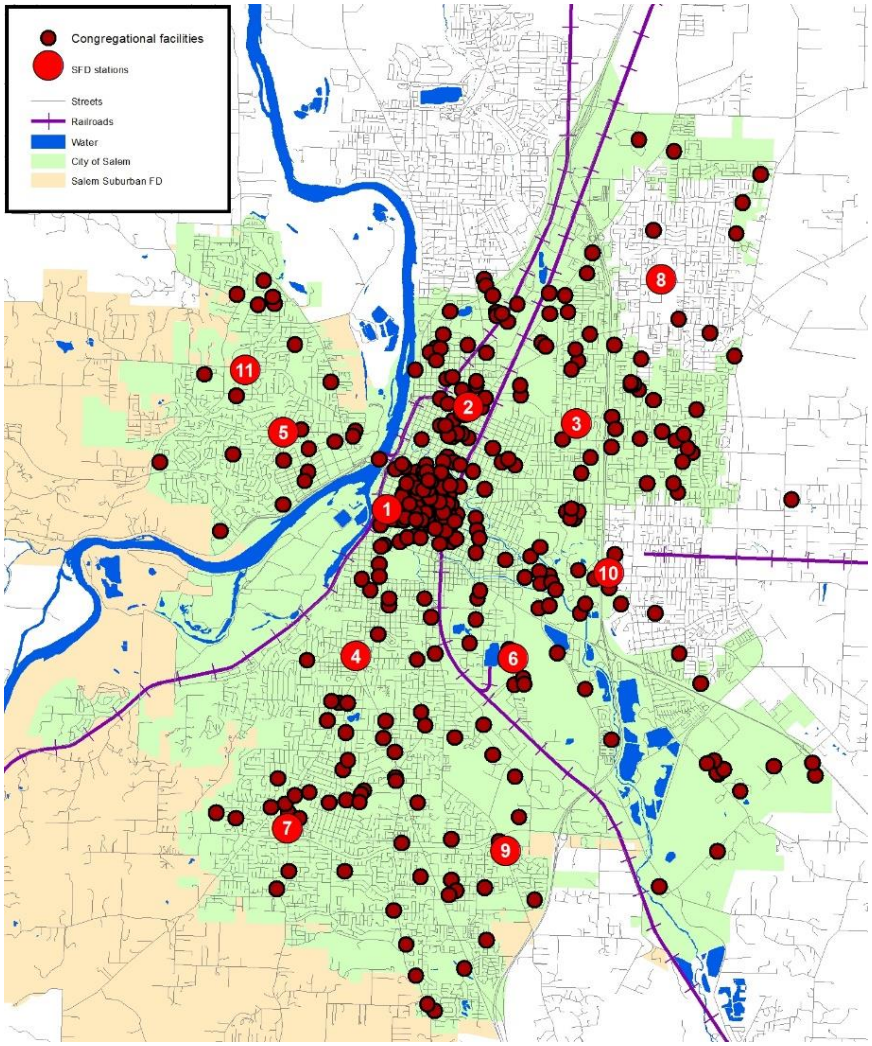


Congregational

Numerous buildings lie within Salem in which large numbers of people gather for entertainment, worship, and such. A variety of nightclubs, theaters, and other entertainment venues exist in the downtown area. Facilities such as the Salem Conference Center and others regularly hold events that draw large crowds of people. Other events, such as Summer in the City, The Bite of Salem, Salem Art Fair, and the World Beat Festival, draw large outdoor crowds.

These facilities present additional risk, primarily for mass casualty incidents. Fire, criminal mischief, and potentially terrorism could cause a major medical emergency requiring significant emergency service resources. The following map shows the locations of congregational facilities.

Figure 19: Congregational Facilities



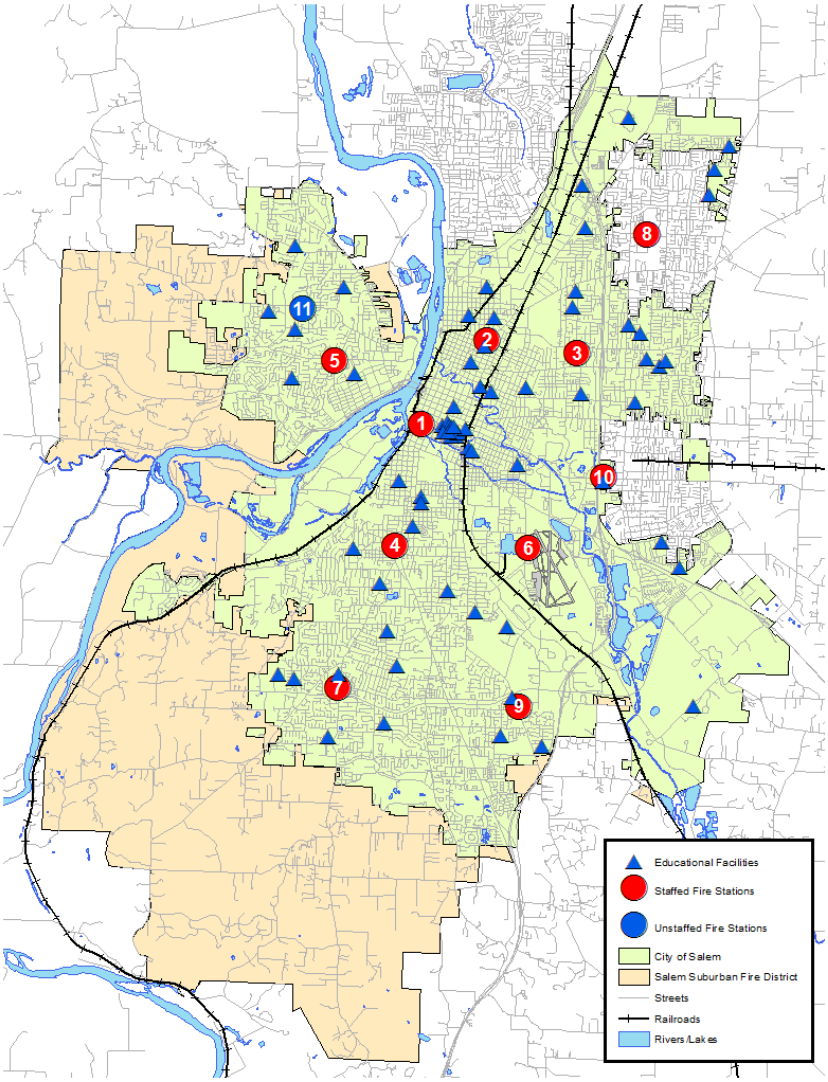
Schools/Universities

The Salem-Keizer School District is the second largest school district in Oregon. It operates 45 elementary schools, 10 middle schools, 8 high schools, 4 charter schools, and 7 support facilities within the district. Forty of these schools are within the City of Salem. Total enrollment as of October 2010 was 40,638.

There are also 51 private schools within the SFD service area. These schools offer education from kindergarten through the 12th grade.

Lastly, Willamette University and Corban University have campuses in the City of Salem. A number of other colleges and universities have satellite campus in Salem as well. The following map shows the locations of most public and private schools in the SFD service area.

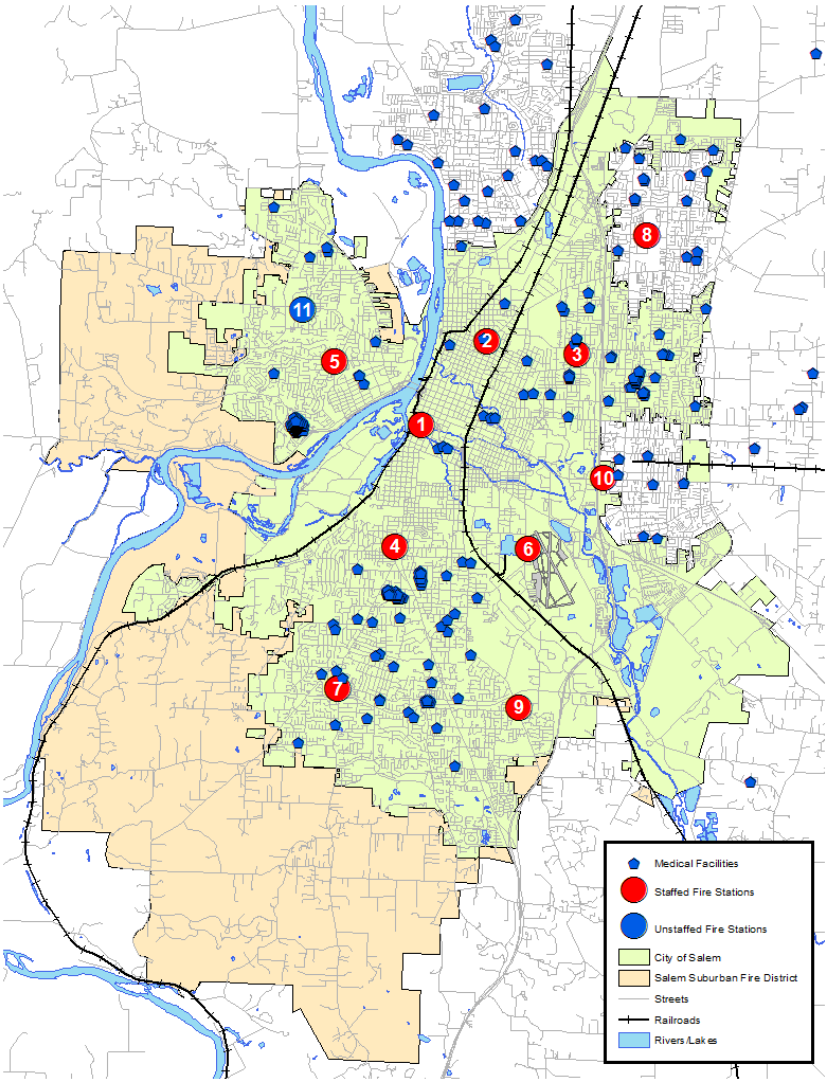
Figure 20: Salem Area Schools, Colleges, and Universities



Medical Facilities

The city is home to many important medical care facilities, including the Salem Hospital and the Oregon State Hospital. Additional facilities include skilled nursing facilities and other in-patient care facilities. The following map shows the location of many of these important community resources.

Figure 21: Medical and Care Facilities



Other Critical Infrastructure

In this section, other types of critical infrastructure to a community are discussed in general terms. Although Salem does not have any unusual critical community infrastructure, it is important the fire department plan for emergencies at these facilities.

Water Distribution

The most obvious element of this infrastructure of concern to the fire department is the reservoir, water main, and fire hydrant system. Providing sufficient storage, distribution, and access to this valuable firefighting resource through well-distributed fire hydrants is very important.

Firefighting water service from fire hydrants is available to nearly every developed property within the city. Fire flows are generally acceptable for risks protected. Some areas in and around the downtown area have old, smaller diameter water mains. The Salem Public Works Department is addressing these deficiencies through its capital improvement planning process.

The city's primary water source is the Santiam River. A water treatment plant on the river cleans and distributes water through large mains to the city. Water is pumped into water reservoirs at a number of locations. Water service to distribution mains is nearly exclusively gravity fed. The city has a number of sub-surface wells that serve as an emergency reserve source.

The last Insurance Services Office (ISO) review of the city's water system was in 2003. At that time ISO gave the city's water system a relative classification of "1" indicating that the system provides very good delivery of firefighting water supply.

Communications

Emergency communication centers and the transmitting and receiving equipment are essential facilities for emergency response. The Salem Police Department manages the Willamette Valley Communications Center (WVCC). This center provides for the receipt of 9-1-1 calls for help, dispatching of fire and other emergency responders, and important support to the incident management function. There are other communication facilities and equipment that are equally important to the community and government operations. These are the telephone company central offices and the transmission lines of local telephone providers. Internet service providers, along with wireless cellular communication providers, provide essential communication capabilities for the community as well as emergency personnel through their facilities and equipment.

Energy

Previously discussed community services, from communications to traffic signals to normal operations, require the use of energy. Whether it is electricity generation and transmission systems, fuel distribution and storage tanks, or natural gas pipelines and regulator stations, the community is dependent upon energy sources.

The city is well supplied by energy sources. The SFD maintains a current Energy Assurance Plan that catalogues energy sources, identifies essential energy needs as well as maintains contingency plans in the event of the loss of energy sources.

Bridges

These structures provide essential crossings and unimpeded travel across physical and man-made barriers. In the event of an emergency, these are crucial as evacuation routes as well as for aid supplies to be brought into the area. Given the level of earthquake risk in this region, reinforcement of bridges is essential to preserve routes of transportation for emergency relief supplies. The Salem community has numerous bridges mostly associated with freeway, river, and rail line crossings.

As mentioned earlier in this report, the seismic strength of bridges is of concern. The two bridges crossing the Willamette River are not sufficiently reinforced to withstand the level of earthquake possible for this region. The Oregon Department of Transportation (ODOT), working with the Oregon Department of Geological and Mineral Industries (DOGAMI), has also identified concerns with freeway overpasses exposed to the earthquake magnitude possible for this region.

Commercial Food & Cargo Distributors

These suppliers and their storehouses are critical not only during an emergency for aid but to the everyday distribution of needed goods and food products to sustain a community. Salem's proximity to agricultural operations makes it an important hub for services to this industry. A number of food processing facilities are located in Salem. Other food distribution facilities are located in and near the city.

Structural

The protection of property in most cases refers to a building and its contents. This has been the basic mission of the fire department since its inception. Certain buildings, their contents, functions, and size present a greater firefighting challenge and require special equipment, operations, and training.

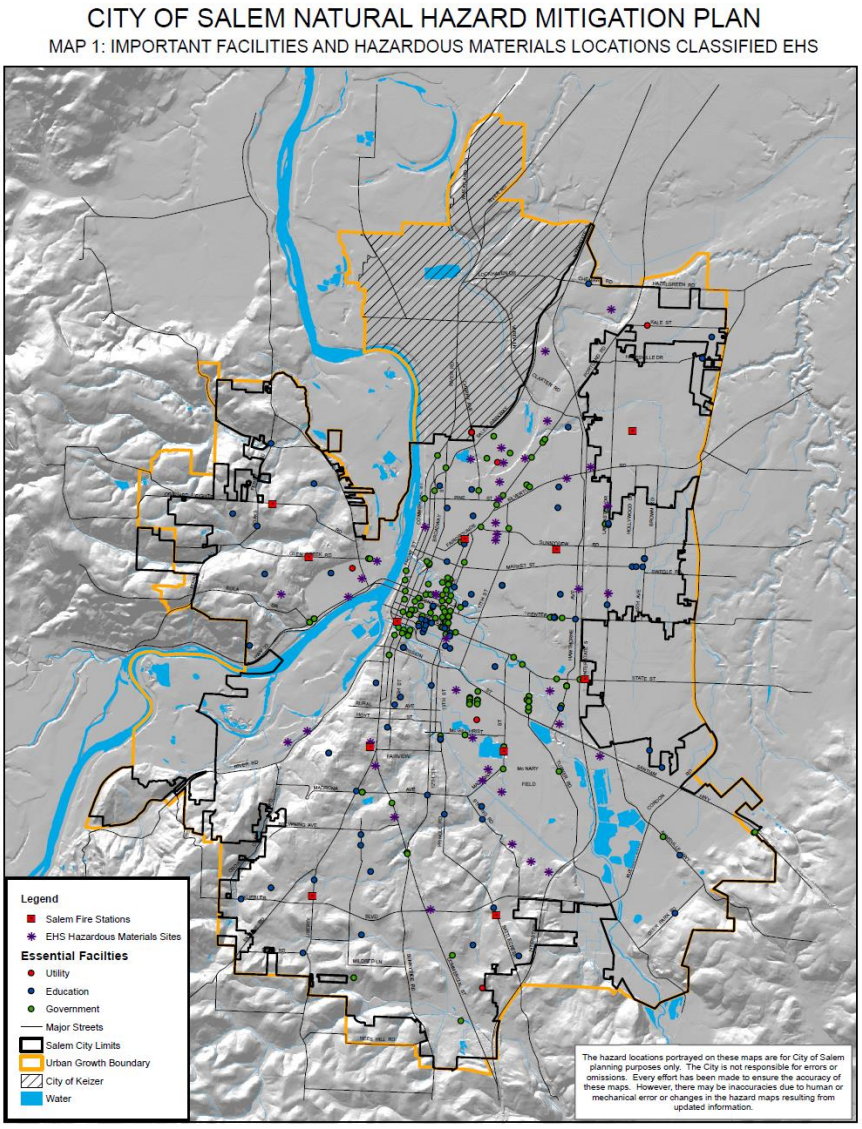
Hazardous Materials

Buildings that have been identified as containing hazardous materials can create a dangerous environment during a spill, rupture, or fire to the community as well as the firefighters. Special equipment such as protective clothing and sensors, along with specialized training, is necessary to successfully mitigate a hazardous materials incident.

The Salem Fire Department operates a hazardous materials response team capable of conducting "A" level intervention (typically the highest level of emergency response service).

The following map shows the locations of facilities classified as using more than small quantities of hazardous materials along with other important facilities within the city. The hazardous material site information comes from the Oregon State Fire Marshal's data base.

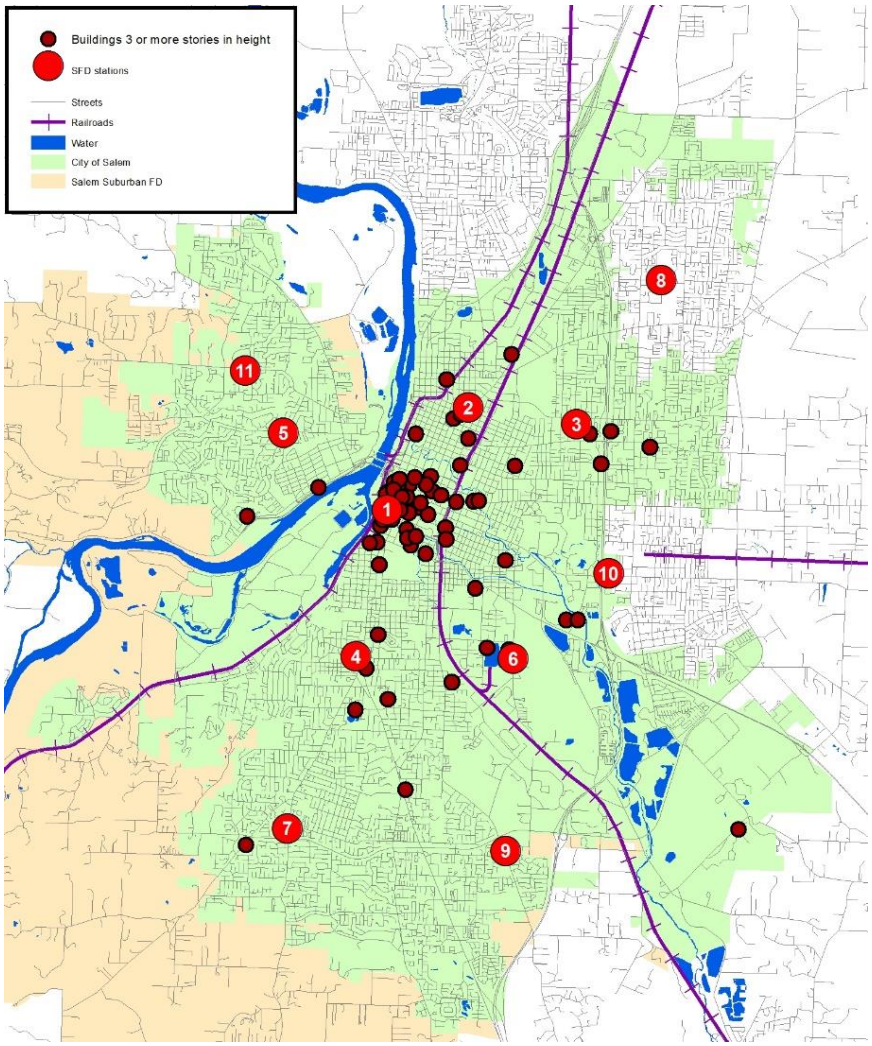
Figure 22: Hazardous Material and Other Important Facility Locations



Multi-Storied Buildings

Buildings that are more than three floors in height pose a special risk in an emergency. Fire on higher floors may require a ladder truck to be able to deliver water into a building that does not have standpipe systems. For victims trapped on higher floors, a ladder truck may be their only option for escape. The following map shows the locations for buildings more than three stories in height according to the ISO database. Most are clustered in the downtown.

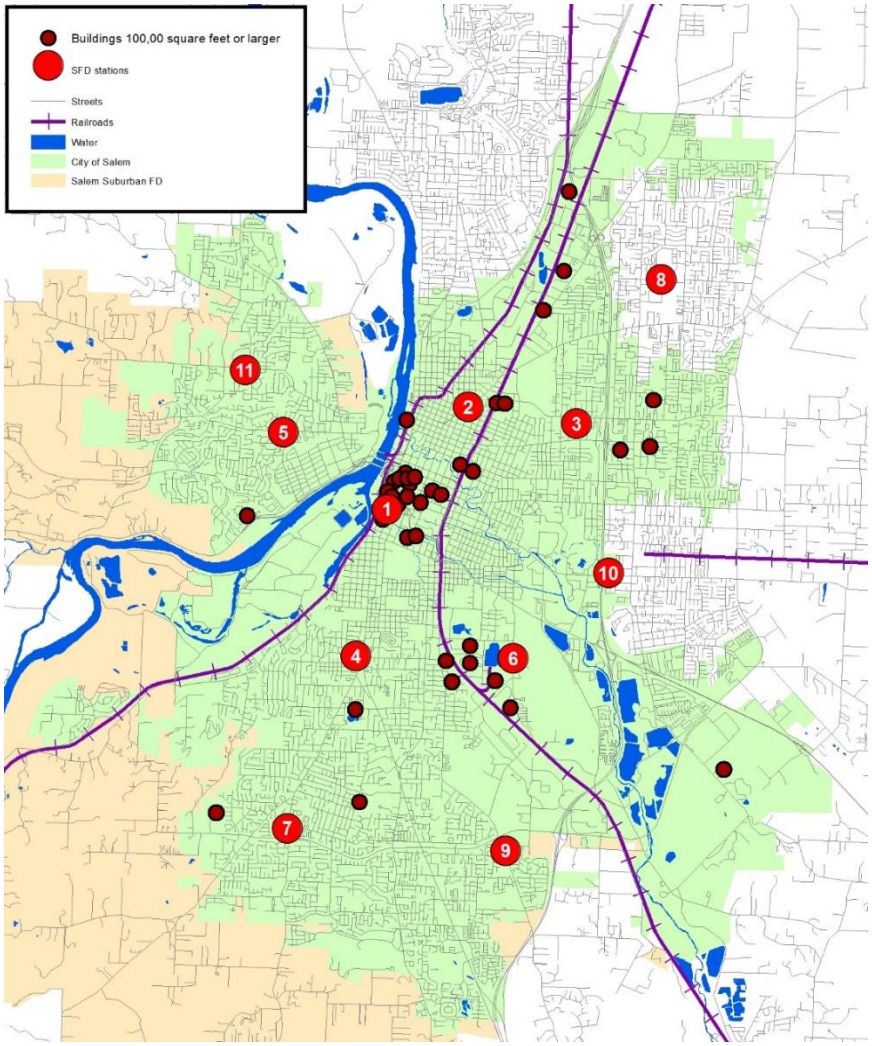
Figure 23: Buildings – More Than Three Stories in Height



Large Square Footage Buildings

Large buildings, such as warehouses, malls, and large 'box' stores typically require greater volumes of water for firefighting and require more firefighters to advance hose lines long distances into the building. The following map shows the locations for buildings 100,000 square feet and larger according to the ISO database.

Figure 24: Buildings – 100,000 Square Feet and Larger

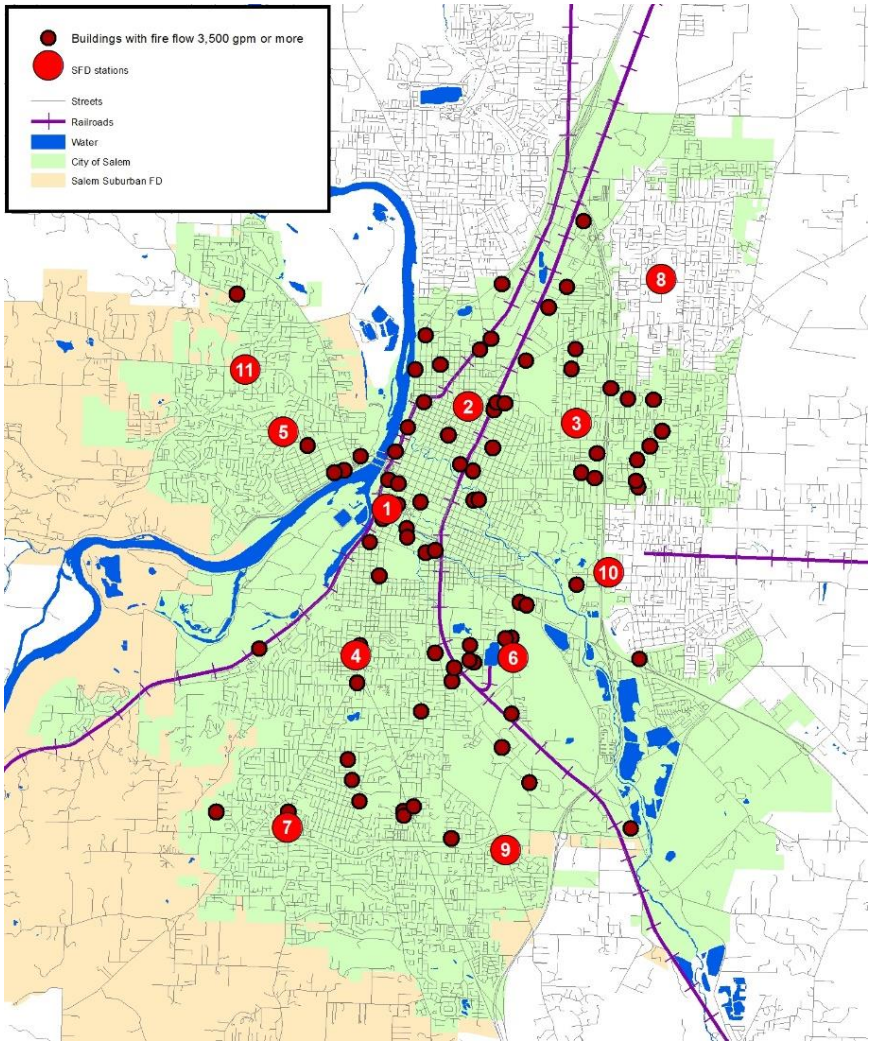


Needed Fire Flow

The Insurance Services Office (ISO) inspects buildings within a community to develop an estimate of "needed fire flow" (NFF) or the amount of water flow (in gallons per minute [gpm]) that a fire department would need to produce in order to suppress the fire in a building based on its height, square footage, construction material, and roof type, among other factors.

The following map shows the locations of buildings identified by the ISO as having a needed fire flow in excess of 3,500 gallons per minute.

Figure 25: Buildings – NFF Greater Than 3,500 Gallons Per Minute



Terrorism

Salem's size and its role as Oregon's capital city raises the level of concern of possible terrorist activity compared to other areas of the country. Most of the previous categorized risks in the community are potential targets for such activity. The fire department needs to be vigilant in its training and preparedness in the event one or more coordinated acts of terror occur in the region.

Hazard Vulnerability Analysis

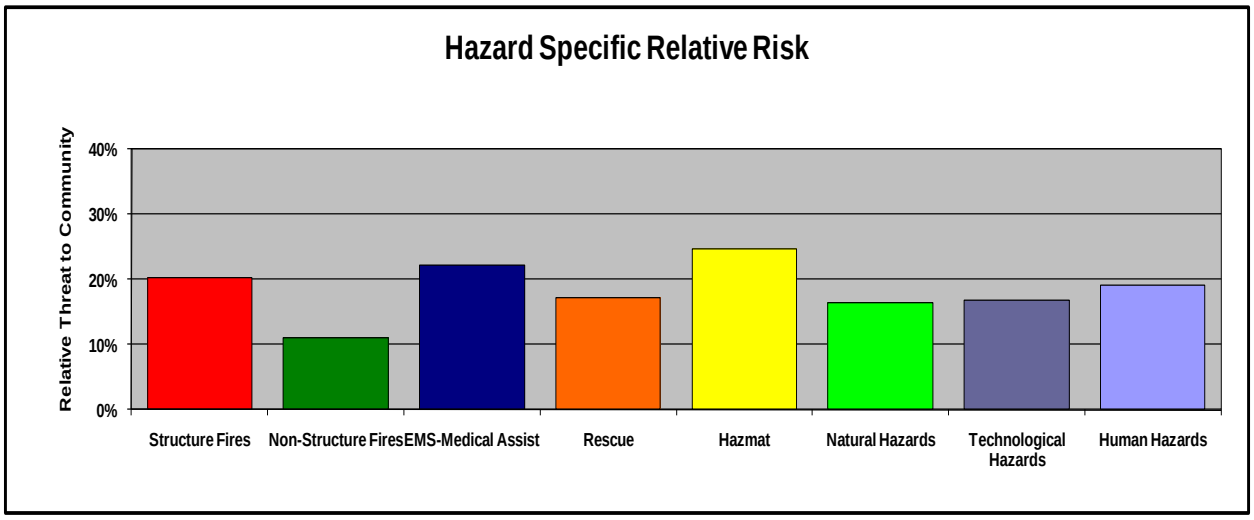
Based on the narrative descriptions of the various hazards commonly found throughout the Salem Fire Department's primary response area, a numerical ranking of community hazards has been developed. Historical incident data as well an assessment of the community and its vulnerabilities was used to numerically rate each potential hazard. Community hazards were segregated into broad categories as follows:

- Structure Fires
- Non-Structure Fires
- EMS-Medical Assist
- Rescue
- Hazardous Materials
- Natural Hazards
- Technological Hazards
- Human Hazards

Within each of the aforementioned categories, more specific hazards were identified and a probability score between zero (representing "Not Applicable") and three (representing "High") was assigned to each. A severity score was then developed for each of the sub-categories using the same scale for impact and a reverse scale for preparedness and response. The overall scores were then used to generate a relative risk score based on what percentage of each risk applied to Salem. Complete documentation of categorical scoring can be found in the appendix of this document.

Based on the completed hazard vulnerability analysis, the following representation of relative community risk was developed.

Figure 26: Hazard Specific Relative Risk



Hazardous materials incidents represent the highest level of relative risk within Salem, followed by EMS-medical assist and structure fires.

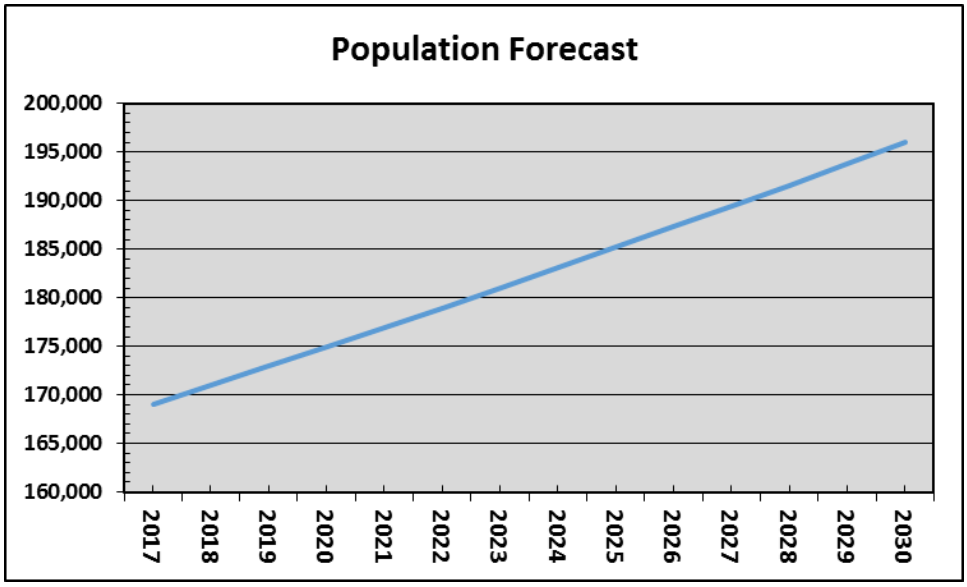
Development and Population Growth

Current Population Information

Salem's population has grown steadily, with an average annual growth rate of 2.2 percent between 1990 and 1995, and between 1.4 and 2.0 percent annually from 1995 to present. The current city population (2017), according to the Portland State Center for Population Studies, is 162,077.

A population forecast for the Salem / Keizer urban growth boundary (UGB) was published in September 2016 by the Population Research Center, College of Urban and Public Affairs, Portland State University. Population growth for Salem area UGB is forecast to be approximately 1.2 percent per year to 2030, or an increase of nearly 41,000 over the next 23 years. The chart below illustrates the projected growth as applied to both the city's and Salem Suburban Fire District's population[5].

Figure 27: Current and Projected Population

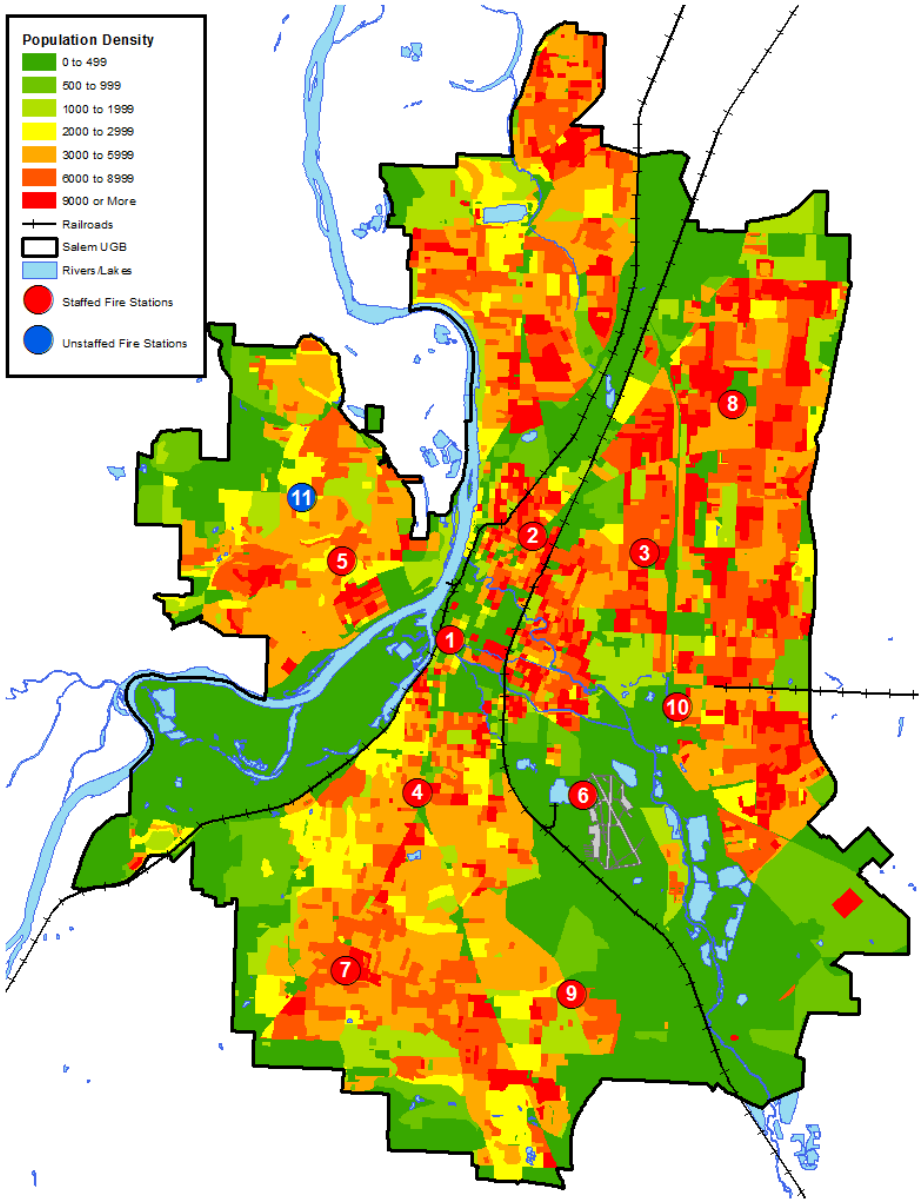


The Salem Area Comprehensive Plan predicts the areas of highest growth to be in west, south, and southeast Salem. The more developed areas of the city will increase in population as in-fill development occurs and housing density increases.

[5] Salem Suburban Fire District has been estimated at 7,000 people for the entire period. Some population growth is expected but will likely be offset by annexation of district territory to Salem.

It is useful to assess the distribution of the population within the region, since there is a direct correlation between population density and service demand. The following map displays the population density of the City of Salem based on Census 2010 data (the most current information available).

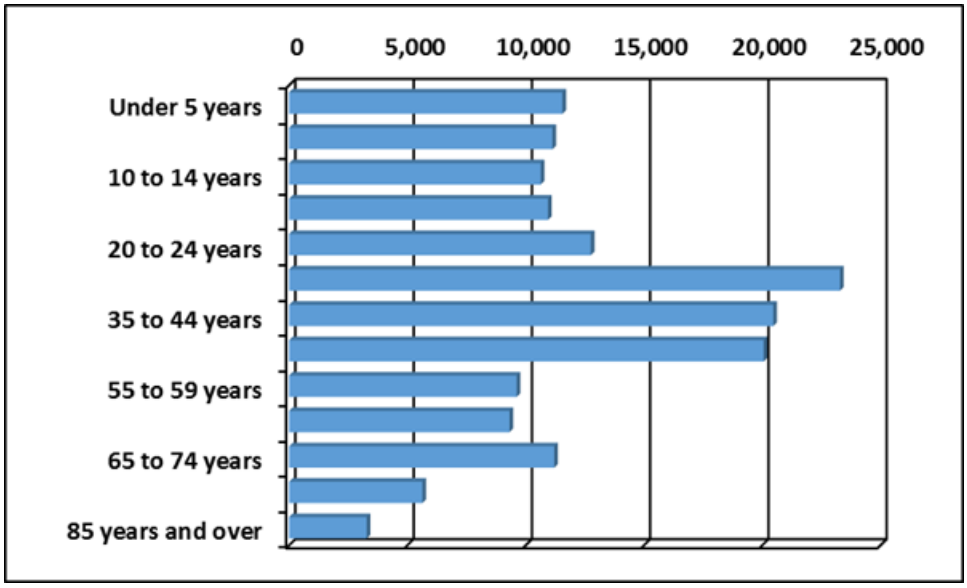
Figure 28: Population Density - 2010



Higher concentrations of population are located within downtown and east-central areas, with less dense population elsewhere.

One of the factors that can influence emergency service demand, particularly emergency medical services, is the population's age. The following chart examines Salem's population segmented by age groups.

Figure 29: Estimated Population by Age



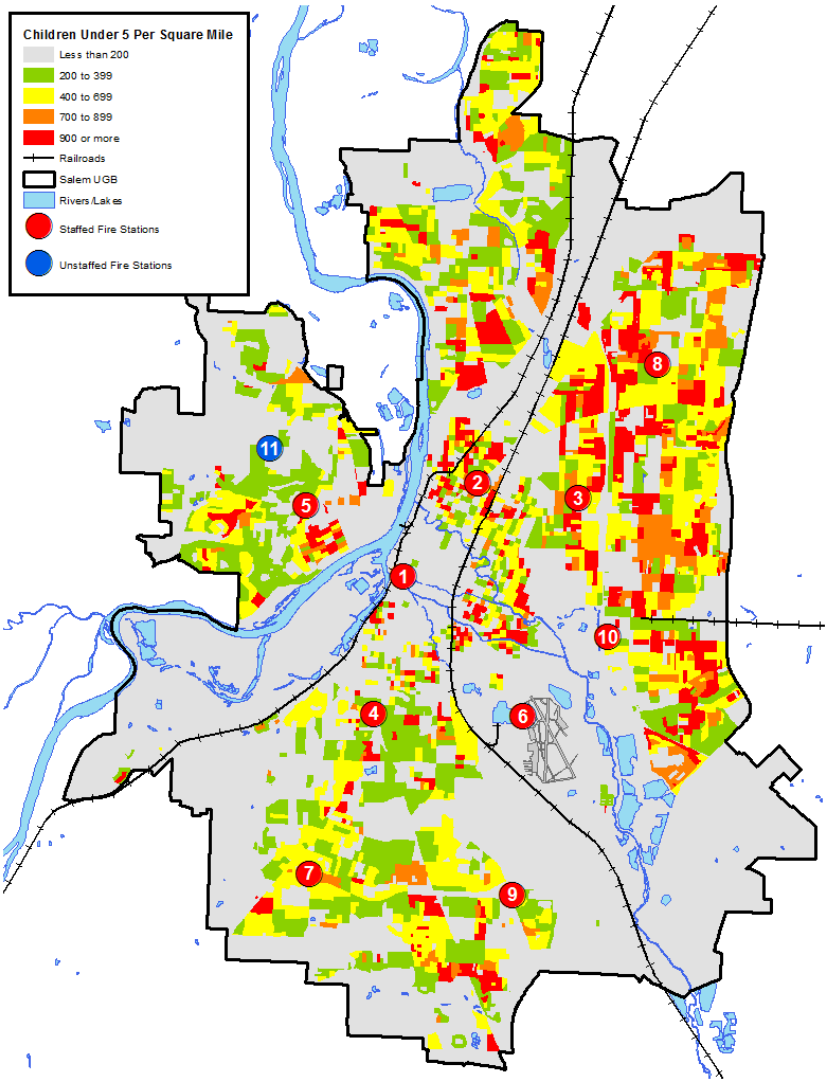
Source: US Census Bureau, 2015 Census Estimation

Based on the preceding figure, 12.6 percent of the population is 65 years of age or older and 7.2 percent of the population is under five years of age. This places a total of nearly 20 percent of the area's population within the age groups that are at highest risk in residential fire incidents and account for some of the highest use of emergency medical services. Senior citizens can have difficulty escaping from fire due to physical limitations. Seniors also tend to use emergency medical services more frequently than younger persons. As the population ages, this will create a significant increase in service demand for emergency medical services.

The very young also represent a vulnerable population, both in regard to their ability to escape a structure fire as well as their susceptibility to serious medical ailments such as asthma, traumatic events, choking, or vehicular accidents.

Determining where the higher amounts of these target risk populations tend to live within the region can help in the deployment of apparatus, especially rescue units. This map is based on 2010 Census data. The highest concentrations of pediatric populations reside primarily the city's northeast area.

Figure 30: Pediatric Population Density



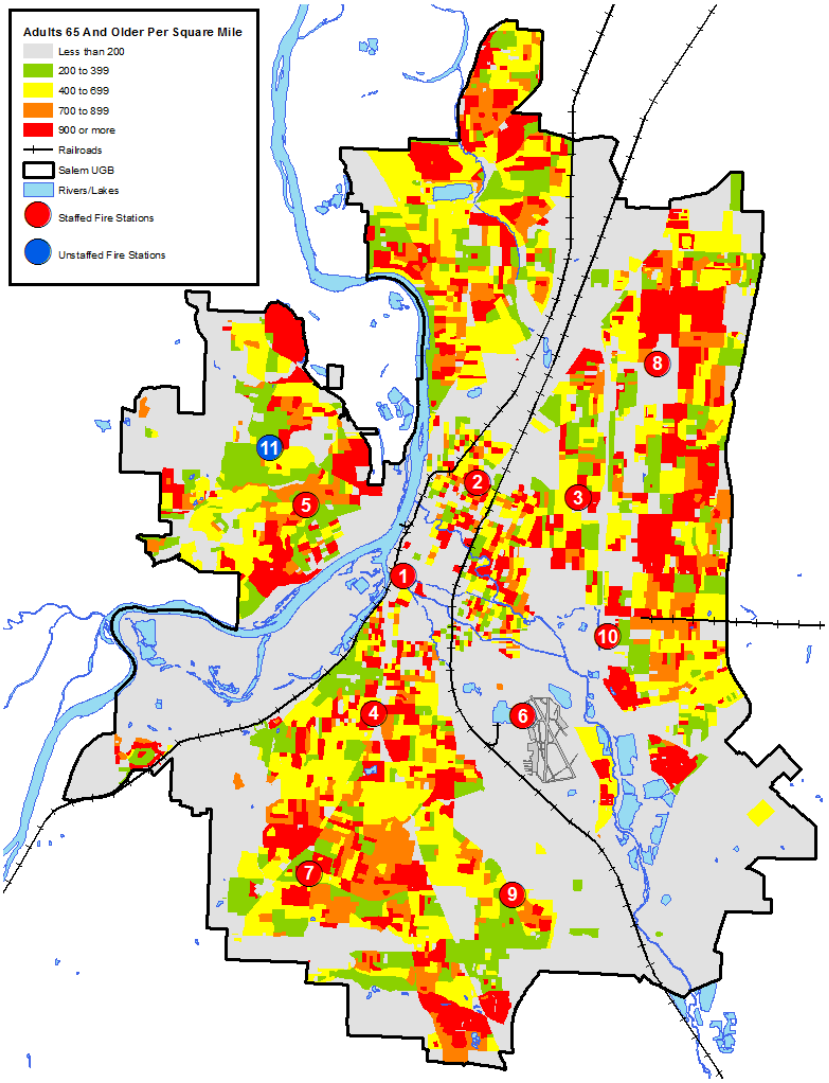
The impact of the elderly population on emergency medical services has been extensively studied. The high utilization rate of emergency departments and the associated need for ambulance transportation by the elderly is in part due to challenges in the access to primary care physicians by the elderly at home and in nursing homes. The elderly can account for approximately one-third of emergency ambulance use and two-thirds of non-urgent ambulance use.

The "Baby-Boom" generation includes those individuals born between 1946 and 1964. In 2016, the oldest member was 70 years of age and the youngest was 52 years of age. This is the largest segment of the population in the United States. The growth of the elderly population (65 years and older) is expected to

increase dramatically over the next 30 years across the country. As this population ages, the demand on emergency medical services is expected to increase

The following map illustrates the density of the elderly population by geographic area. This map is also based on 2010 Census data. Higher concentrations of elderly populations reside in several areas of the city.

Figure 31: Senior Population Density



Future Geographic Growth Potential

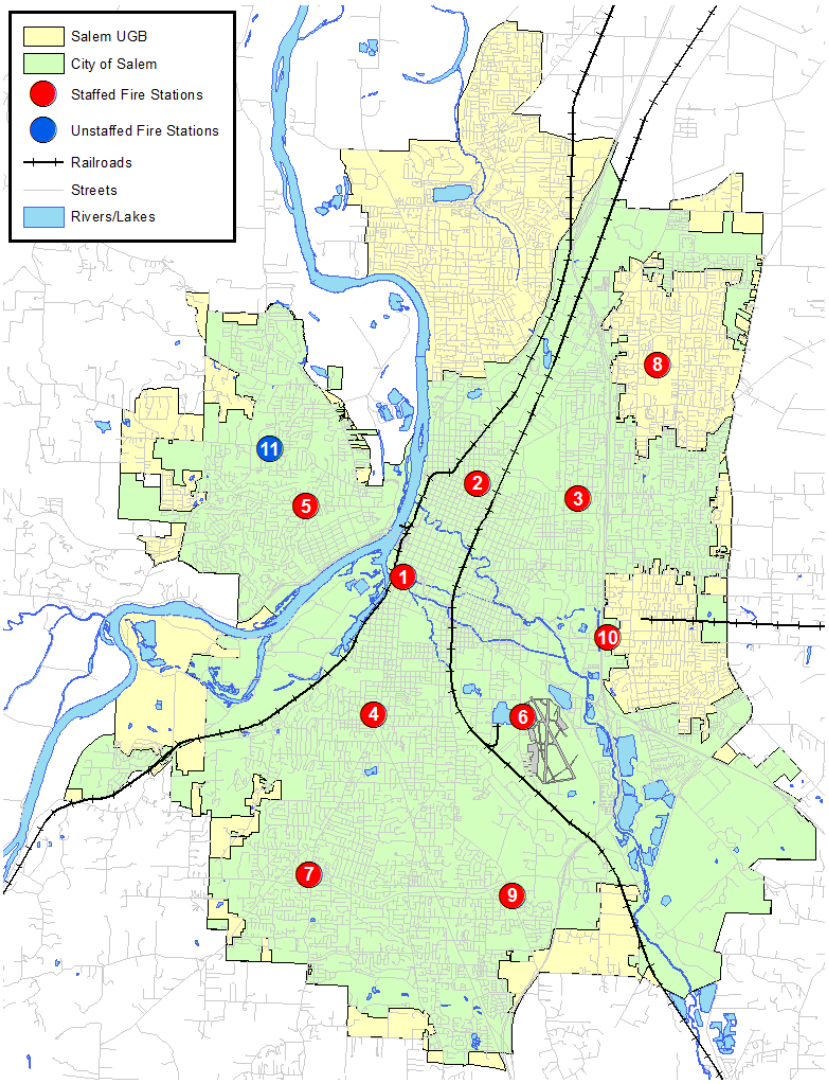
Annexation of unincorporated territory into the city limits occurs sporadically, usually when a property owner wishes to develop his or her land in a manner that requires urban services.

The Salem Area Comprehensive Plan (SACP) was first adopted in 1973. Objectives of the SACP are to promote a desirable balance and location of land uses in the Salem community, and relate these uses to

the location of public facilities and infrastructure. Additionally, the SACP identifies the geographical limits of future urban development within which basic urban services can be most efficiently and economically provided. The Urban Growth Boundary (UGB) is the outer limit of land that may ultimately be annexed into the city. The city and counties have agreed through their respective comprehensive plan policies that no new service districts will be created inside the UGB to provide sewer, water, or fire protection facilities and services.

While some of the area inside the UGB is presently suburban with varying densities and some of it is rural in nature, the city has determined that it is prudent to assume this area will ultimately become part of the city, developed to urban densities and be a Salem Fire Department service responsibility. The following map illustrates area intended for future city growth.

Figure 32: Urban Growth Area



Risk Classification

Areas of higher fire risk require greater numbers of personnel and apparatus to effectively mitigate emergencies. Areas with a higher incident activity require additional response units to ensure reliable response. Staffing and deployment decisions for different regions of the city should be made in consideration of the level of risk.

Most communities contain areas with different population densities and property risk allowing the community's policy makers to specify different response performance objectives by geographic area. The categories are identified as:[6]

- **Metropolitan**—Geography with populations of over 200,000 people in total and/or a population density of over 3,000 people per square mile. These areas are distinguished by mid-rise and high-rise buildings, often interspersed with smaller structures.
- **Urban**—Geography with a population of over 30,000 people and/or a population density of over 2,000 people per square mile.
- **Suburban**—Geography with a population of 10,000 to 29,999 and/or a population density of between 1,000 and 2,000 people per square mile.
- **Rural**—Geography with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile.
- **Wilderness/Frontier/Undeveloped**—Geography that is both rural and not readily accessible by a publicly or privately maintained road.

The City of Salem currently contains urban and suburban areas. The fire department currently reports its response performance based on "Urban" areas. The community's risk designation should influence how response resources are distributed now and in the future. Many resource distribution decisions have long-term implications.

The Salem City Council, through its adoption of a single response performance goal, has determined that the entire city should be considered as one risk classification: urban. This is reasonable given that a significant portion of the city's territory, based on population density, meets the urban definition.

[6] CFAI *Standards of Cover, 5th edition*, pages 20-21.

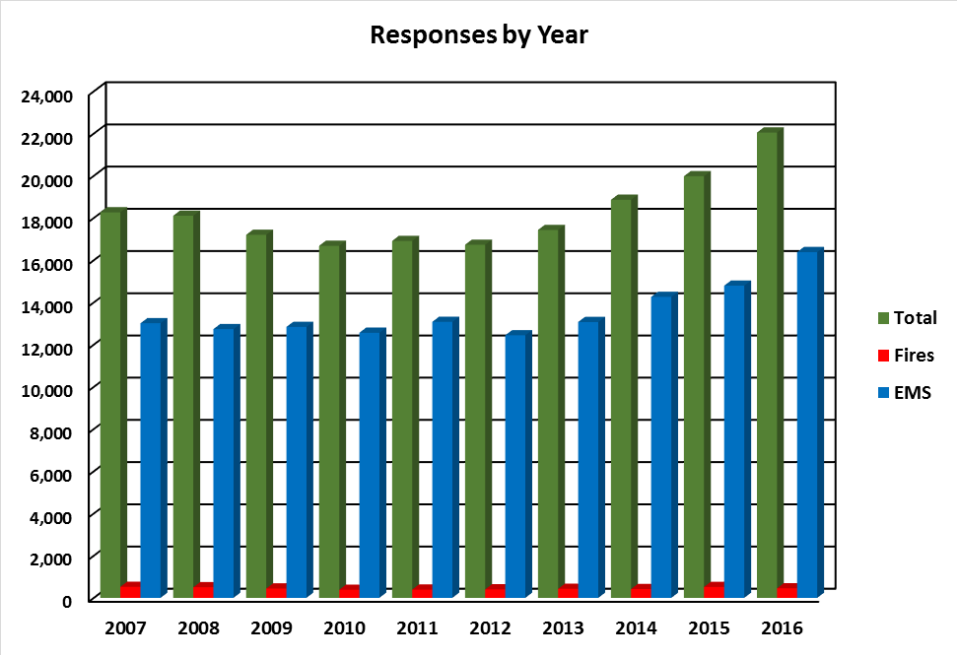
Historic System Response Workload

Before a full response time analysis is conducted, it is important to first examine the level of workload (service demand) that a fire department experiences. Higher service demands can strain the resources of a department and may result in a negative effect on response time performance.

The following chart shows response workload for ten previous calendar years. These totals reflect incidents within the city and within the Salem Suburban Fire District.

Response workload increased by a total of 20.7 percent between January 1, 2007 (18,266 total responses), and December 31, 2016 (22,046 total responses), an average of 2.2 percent per year.

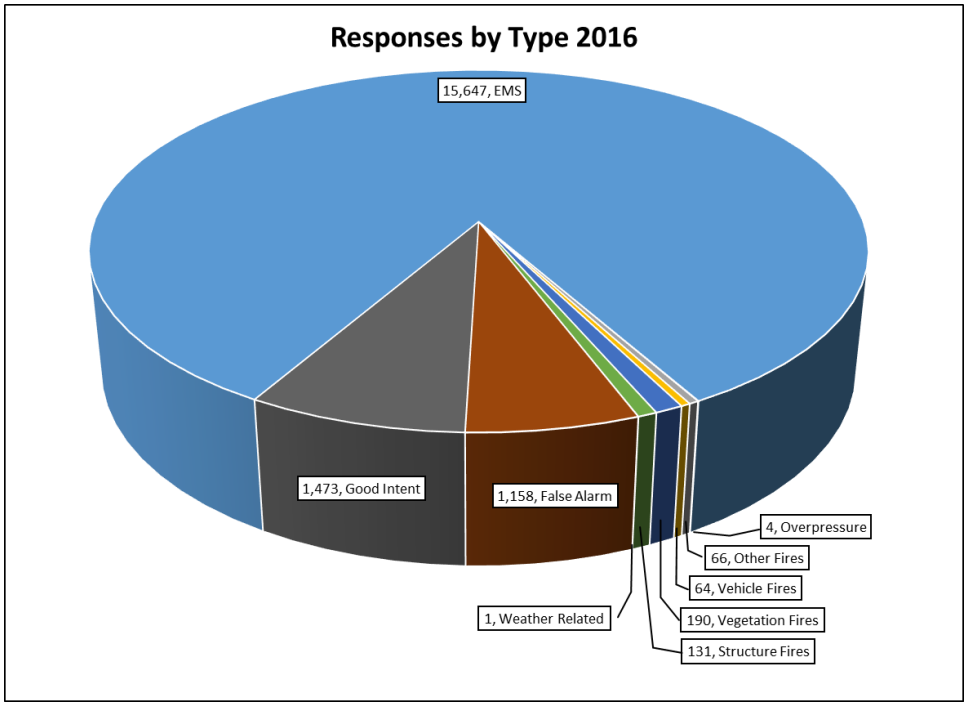
Figure 33: Workload History, 2007 – 2016



Total responses have been increasing steadily over the last nine years and this trend is expected to continue at a rate of about seven percent a year. EMS responses have also increased at a similar rate. Fire responses have increased at a slower rate.

The next chart shows responses by type of incident for calendar year 2016. Emergency medical responses are the most common at 72 percent of total responses.

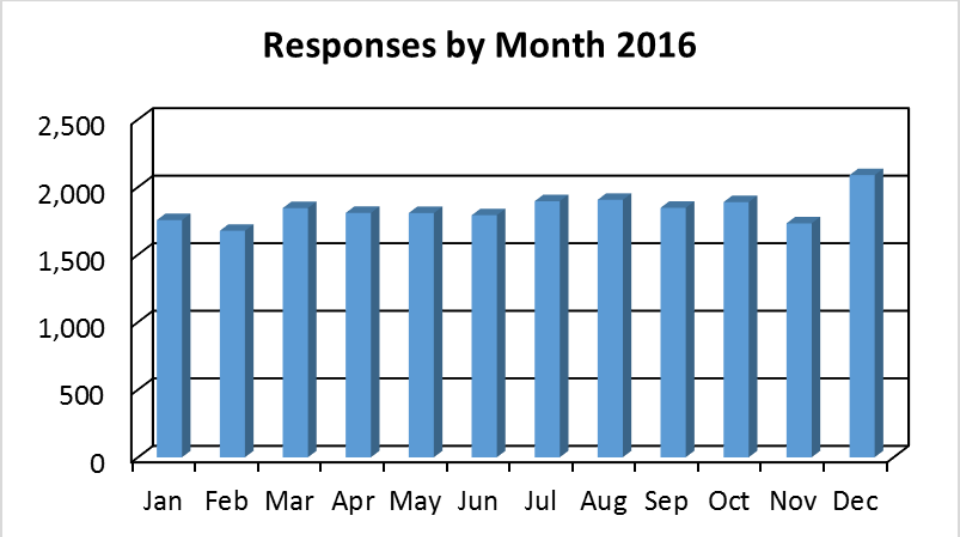
Figure 34: Responses by Type of Incident



Temporal Analysis

A review of incidents by time of occurrence also reveals when the greatest response demand is occurring. The following charts show how activity and demand changes for SFD based on various measures of time. The following chart shows response activity for calendar year 2016 by month.

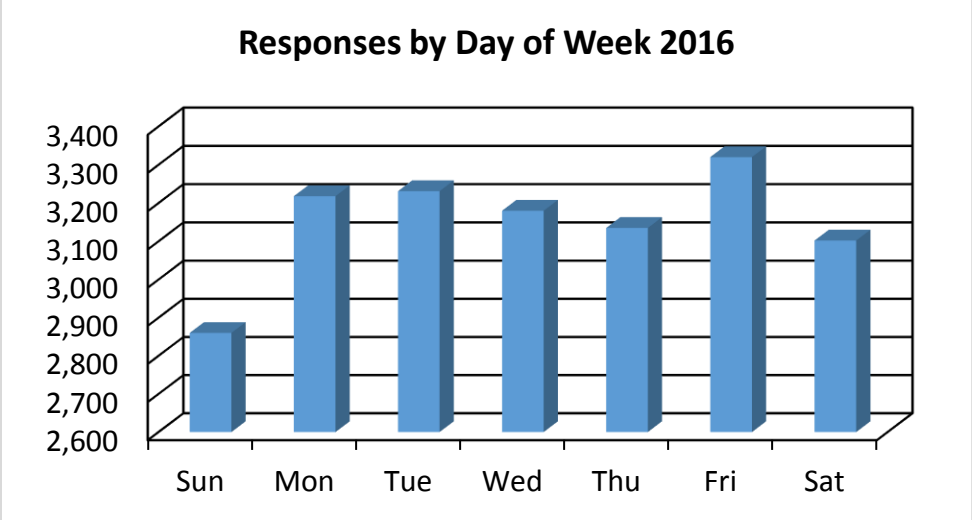
Figure 35: Monthly Workload



During the study period, there was 24.6 percent more incident activity in the busiest month, December, versus the slowest month, February. Winter weather events contributed to a higher than usual response workload during December.

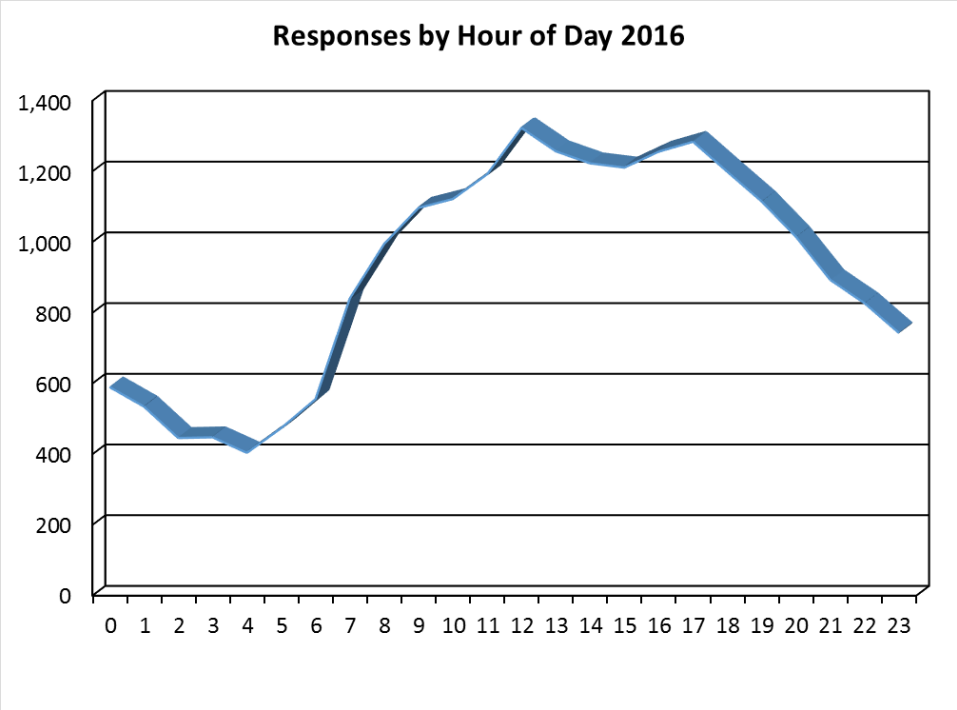
Next, response workload is compared by day of week. In this case there is 16.1 percent more incident activity on the busiest day, Friday, versus the slowest day, Sunday.

Figure 36: Daily Workload



The time analysis that always shows significant variation is response activity by hour of day. Response workload directly correlates with the activity of people, with workload increasing during daytime hours and decreasing during nighttime hours as shown in the following chart. Incident activity is at its highest between 9:00 AM and 6:00 PM.

Figure 37: Hourly Workload

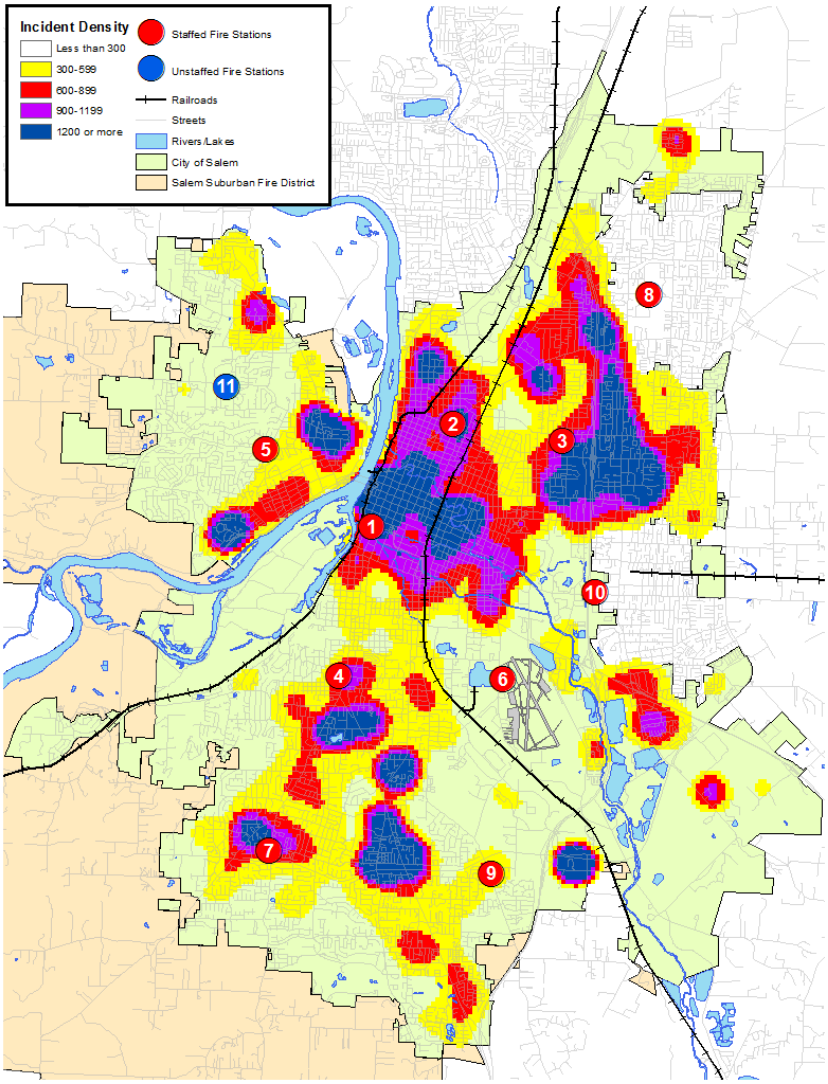


Service Demand Density

In addition to the temporal analysis of the current service demand, it is useful to examine geographic distribution of service demand. The following map series indicates the distribution of emergency incidents in Salem during calendar year 2016.

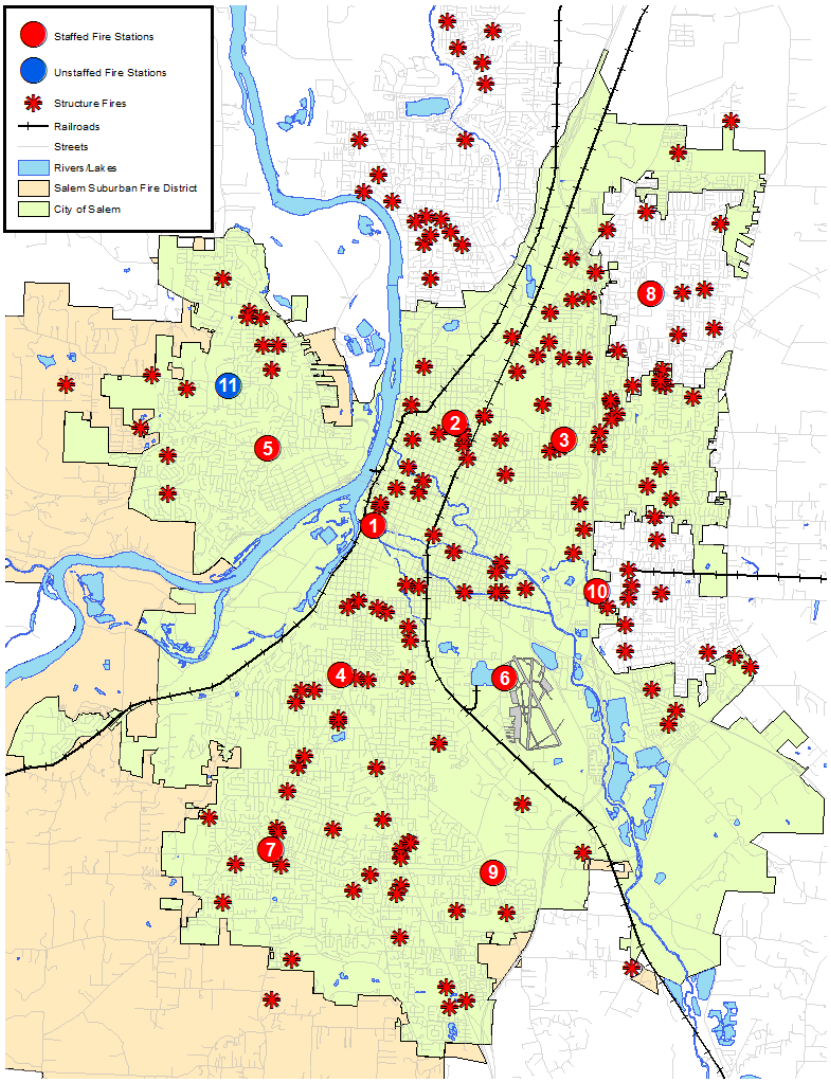
The first map displays the number of incidents per square mile within various parts of the city. The area of greatest service demand is around Fire Stations 1, 2, 3, 4, and 5.

Figure 38: Service Demand Density



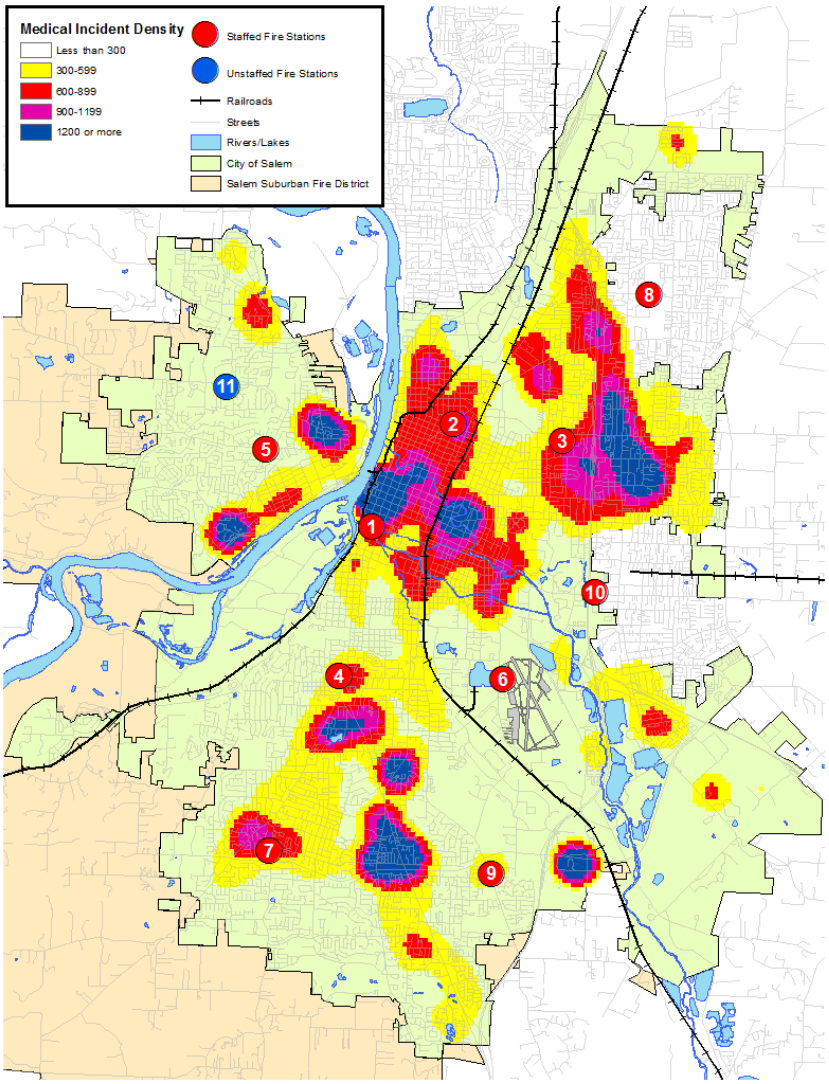
The preceding map reflects all calls served by SFD. Service demand can vary by area based on incident type. The following map displays the location of structure fires during this time period. It illustrates that actual structure fire incidents are also concentrated in the more densely populated area of Salem.

Figure 39: Structure Fires



Similarly, emergency medical incidents also occur in greater concentration in areas of higher population density. The following map displays emergency medical incident density during calendar year 2016.

Figure 40: Emergency Medical Incident Density



Station and Unit Workload Analysis

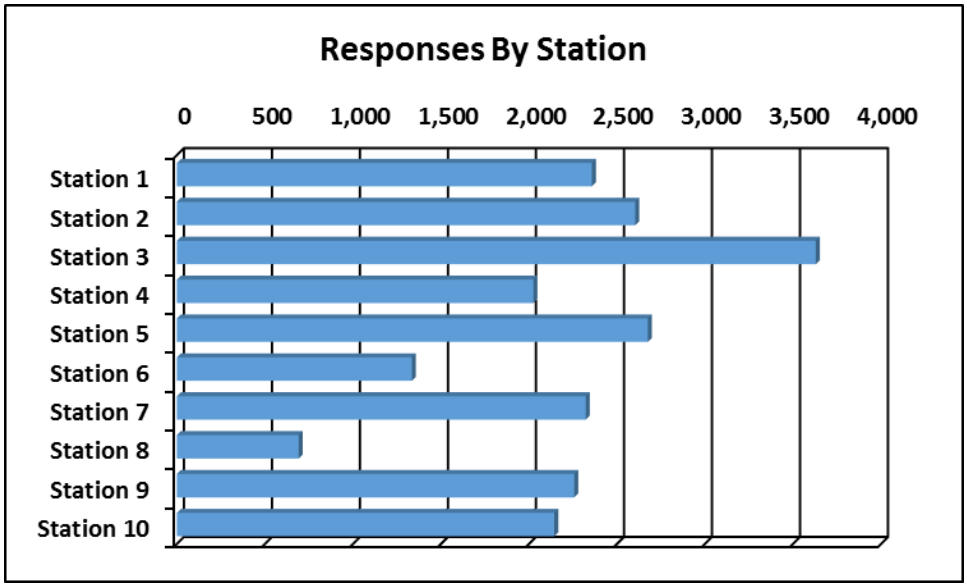
A review of workload by station and response unit can reveal much about why response performance may be as it is. Although fire stations and response units may be distributed in a manner to provide quick response, that level of performance can only be obtained when the response unit is available in its primary service area. If a response unit is already on an incident and a concurrent request for service is received, a more distant response unit will need to be dispatched. This will increase response times.

Fire Station Workload

As noted earlier, response workload is not evenly distributed across the City of Salem. Areas of higher population typically present a greater demand for fire department services. The following table lists response activity by fire station area during calendar year 2016. Workload in the Fire Station 3 area is the highest at 3,630 calls for service.

It is important to note that with the closure of Station 11 in 2012, the Station 5 area was increased to encompass incidents in Station 11's area. In 2016 there were 2,676 calls for service in the Station 5 area, 1,052 of those were in what was previously Station 11's area. Station 8 was re-opened in July of 2016. The responses for Station 8 in the chart below are from July through December. The 594 calls from January through June were largely part of Station 3's area.

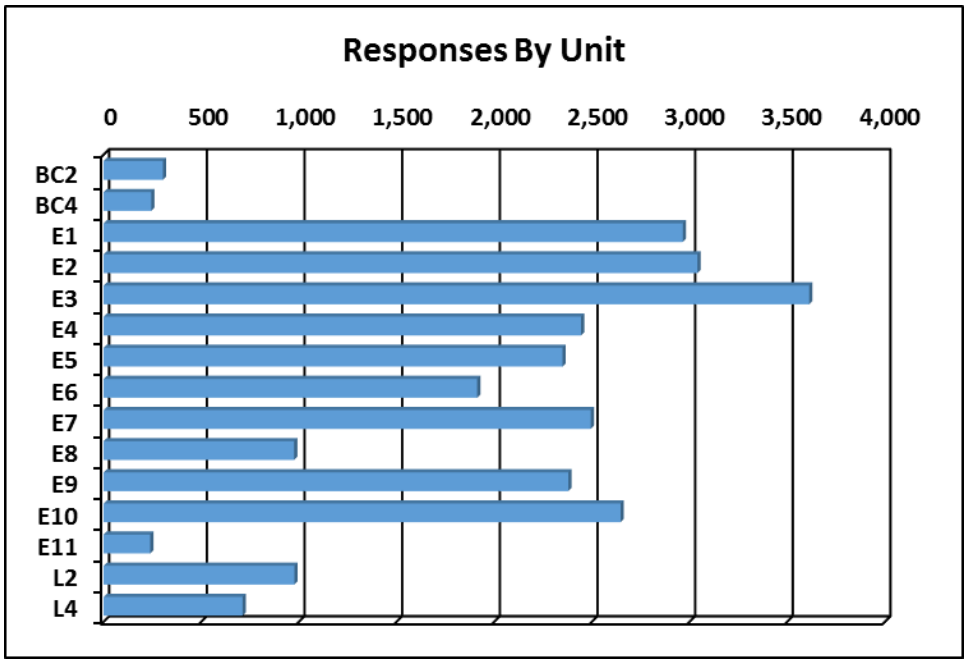
Figure 41: Responses by Fire Station Area – 2016



Response Unit Workload

The workload on individual response units during calendar year 2016 is shown in the following table. Individual response unit workload can be greater than the workload in its home station area. Many incidents, such as structure fires, require more than one response unit.

Figure 42: Response Unit Workload – 2016



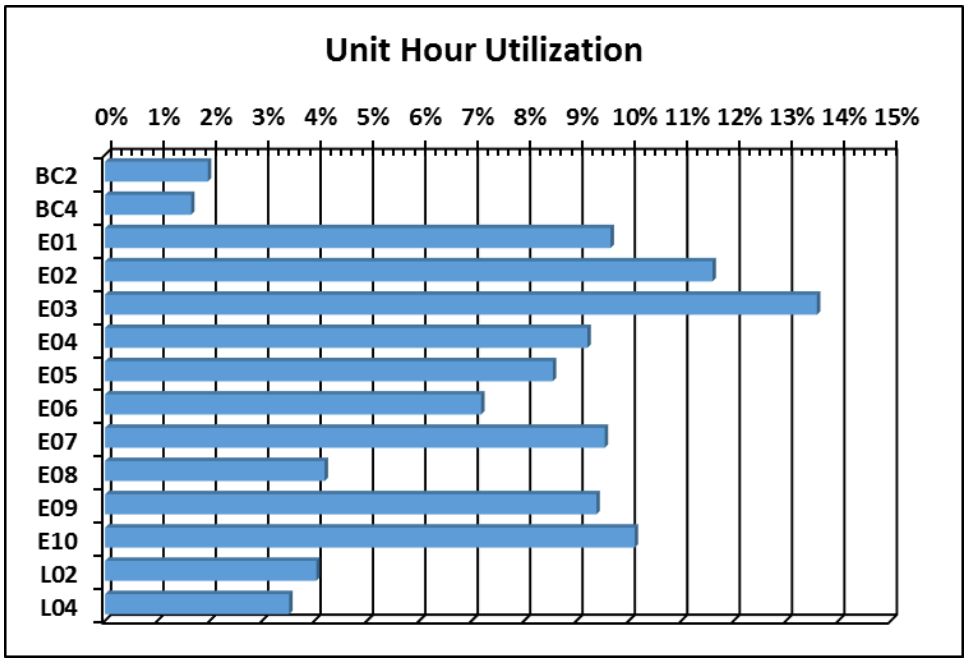
The amount of time a given unit is committed to an incident is also an important workload factor. The following table illustrates the average time each unit was committed to an incident, from initial dispatch until it cleared the scene.

Figure 43: Average Time Committed to an Incident by Unit

Unit	Responses	Average Minutes per Response
BC2	304	34.1
BC4	244	35.5
E1	2,966	17.2
E2	3,041	20.1
E3	3,613	19.8
E4	2,445	19.9
E5	2,350	19.2
E6	1,913	19.8
E7	2,495	20.2
E8	976	22.6
E9	2,380	20.8
E10	2,647	20.1
E11	239	28.1
L2	977	21.8
L4	712	26.0

Unit hour utilization is an important workload indicator. It describes the amount of time a unit is not available for response since it's already committed to an incident. The larger the number, the greater a unit's utilization and the less available it is for assignment to an incident.

Figure 44: Unit Hour Utilization 2016



Unit hour utilization is an important statistic to monitor for those fire agencies using percentile based performance standards, as does SFD. In Salem's case, where performance is measured at the 85th percentile, unit hour utilization greater than 15% means that the response unit will not be able to provide on-time response to its 85 percent target even if response is its only activity. Engine 2 and Engine 10 have both surpassed a UHU of 10% and Engine 3 is approaching a UHU of 14%. Engine 8 is showing an artificially low UHU for the year as it was placed back into service on July 1st.

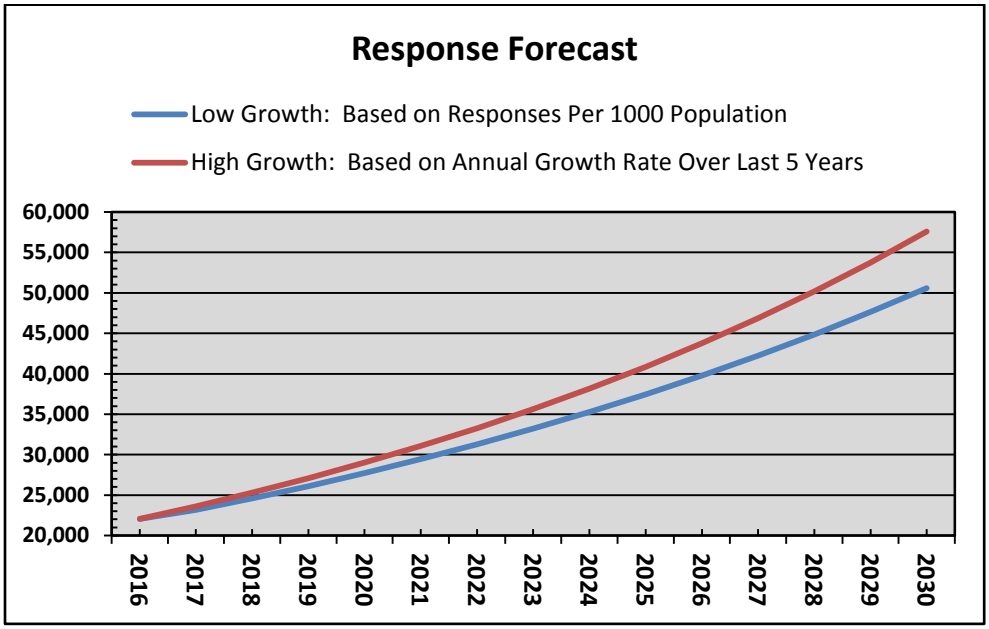
Incident Workload Projection

The most significant predictor of future incident workload is population; 100 percent of requests for emergency medical service are people-driven. The National Fire Protection Association reports that approximately 70 percent of all fires are the result of people either doing something they should not have (i.e., misuse of ignition source) or not doing something they should have (i.e., failure to maintain equipment). It is reasonable to use future population growth to predict future fire department response workload.

Earlier in this report a growth scenario, developed by Portland State University Center for Population Studies, was presented. The following chart forecasts response workload for that scenario. The chart uses changes in fire department service usage rates to forecast future response activity based on

population growth and a 5 year average of incident volume growth of approximately 7 percent. The current utilization rate is 130 incidents per 1,000 population. Utilization is expected to grow at a rate of 5 percent per year. If the average annual call load increase trend continues, the Salem area could see an incident volume in excess of 57,000 by the year 2030. Based purely on expected increases in responses per 1000 population, this volume is likely to still surpass 50,000 responses annually.

Figure 45: Response Forecast



Component E – Critical Tasking and Alarm Assignments

The SFD service area has a densely populated urban environment and, as such, contains an elevated number, density, and distribution of risk. Further, its suburban and rural areas present unique challenges such as wildland fires. The fire department 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 self-preservation action. 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.

The following chart illustrates the emergency incident staffing recommendations of the Commission on Fire Accreditation, International.

The following definitions apply to the chart:

Low Risk – Minor incidents involving small fires (fire flow less than 250 gallons per minute), single patient non-life threatening medical incidents, minor rescues, small fuel spills, and small wildland fires without unusual weather or fire behavior.

Moderate Risk – Moderate risk incidents involving fires in single-family dwellings and equivalently sized commercial office properties (fire flow between 250 gallons per minute to 1,000 gallons per minute), life threatening medical emergencies, hazardous materials emergencies requiring specialized skills and equipment, rescues involving specialized skills and equipment, and larger wildland fires.

High Risk – High risk incidents involving fires in larger commercial properties with sustained attack (fire flows more than 1,000 gallons per minute), multiple patient medical incidents, major releases of hazardous materials, high risk rescues, and wildland fires with extreme weather or fire behavior.

Figure 46: Staffing Recommendations Based on Risk

Incident Type	High Risk	Moderate Risk	Low Risk
Structure Fire	29	15	6
Emergency Medical Service	12	4	2
Rescue	15	8	3
Hazardous Materials	39	20	3
Wildland Fire	41 (Red Flag level)	20	7

The Salem Fire Department 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. ESCI's analysis of the Critical Task analysis is that all are in keeping with industry standards and provide the minimum number of personnel needed for effective incident operations.

Critical Tasking

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.

Structure Fire (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIG	3
Other (hydrant)	1
Total	**14**

Structure Fire (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIG	3
Tender Operator	2
Total	**15**

Wildland Interface High Risk (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Exposure Lines	2
Structure Protection	3
Water Supply	1
Total	**10**

Wildland Interface High Risk (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Exposure Lines	2
Structure Protection	3
Tender Operator	2
Total	**11**

Non-Structure Fire High Risk (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Back-up Line	2
Hydrant-Water Supply	1
Structure Protection	3
Total	**10**

Non-Structure Fire High Risk (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations/Lookout	1
Attack Line	2
Back-up Line	2
Tender Operator	2
Structure Protection	3
Total	**11**

Aircraft Alert II and III

Task	Number of Personnel
Command/Safety	1
Aircraft Fire Suppression	2
Pump Operations	2
Attack Line	2
Back-up Line	2
Rescue	2
Emergency Medical Care	2
Water Supply	1
Total	14

Non-Structure Fire Low Risk (Hydranted & Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line	1
Total	**3**

Odor of Smoke

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Interior Investigation	2
Ventilation	2
Total	**6**

Smoke In Structure (Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line-Interior Investigation	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIG	3
Other (hydrant)	1
Total	**14**

Smoke In Structure (Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pump Operations	1
Attack Line-Interior Investigation	2
Back-up Line	2
Search and Rescue	2
Ventilation	2
RIG	3
Tender Operator	2
Total	**15**

Outdoor Smoke Investigation (Hydranted & Non-Hydranted)

Task	Number of Personnel
Command/Safety	1
Pumper Operator	1
Investigation	1
Total	**3**

Hazardous Materials- Minor

Task	Number of Personnel
Command	1
Research Support/Mitigation	2
Total	**3**

Hazardous Materials- Major

Task	Number of Personnel
Command	1
Liaison	1
Decontamination	3
Research/Support	2
Entry team, and backup team provided by OFSM Haz Mat Response Team (not subject to response time performance objective)	6
Total	**13**

Emergency Medical Aid

Task	Number of Personnel
Patient Management	1
Patient Care	1
Documentation	1
Total	**3**

Mass Casualty Incident (10+ Patients)

Task	Number of Personnel
Incident Command/Safety	1
Triage	1
Treatment Manager	1
Patient Care	9
Transportation Manager	1
Documentation	1
Total	**14**

Motor Vehicle Accident (Non Trapped)

Task	Number of Personnel
Scene Management/Documentation	1
Patient Care/Extrication	2
Total	**3**

Motor Vehicle Accident (Trapped)

Task	Number of Personnel
Command/Safety	1
Scene Management	1
Patient Care	2
Extrication	4
Pump Operator/Suppression Line	2
Extrication/Vehicle Stabilization	3
Total	**13**

Technical Rescue – Water

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup Team	2
Patient Care	2
Rope Tender	2
Upstream Spotter	1
Downstream Safety	1
Boat Operator	1
Total	**12**

Technical Rescue – Rope

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup/Support Team	2
Patient Care	2
Rigger	1
Attendant	1
Ground Support	4
Edge Person	1
Total	**14**

Technical Rescue – Confined Space

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup/Support Team	2
Patient Care	2
Attendant	1
Rigger	1
Ground Support	4
Total	**13**

Technical Rescue – Trench

Task	Number of Personnel
Command/Safety	1
Rescue Team	2
Backup/Support Team	2
Patient Care	3
Shoring	5
Total	**13**

Alarm Assignments

In order to ensure sufficient personnel and apparatus are dispatched to an emergency event the following first alarm response assignments have been established. "Total Staffing Needed" is the number identified in the Critical Tasking analysis above.

Structure Fire (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	12
Ladder Truck	1	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Structure Fire (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	10
Tender	2	2
Ladder Truck	1	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Wildland Interface High Risk (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	3	5
Grass Unit	2	4
Battalion Chief	1	1
Total Staffing Provided		**10**

Wildland Interface High Risk (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	6
Grass Unit	2	4
Tender	2	2
Battalion Chief	1	1
Total Staffing Provided		**13**

Non-Structure Fire High Risk (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	3	7
Grass Rig	1	2
Battalion Chief	1	1
Total Staffing Provided		10

Non-Structure Fire High Risk (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	8
Tender	2	2
Grass Unit	1	2
Battalion Chief	1	1
Total Staffing Provided		13

Aircraft Alert II and III

Unit Type	Number of Units	Total Personnel
Engine	3	9
Ladder Truck	1	3
ARRF	1 or 2	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Non-Structure Fire Low Risk (Hydranted & Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	1	3
Total Staffing Provided		**3**

Odor of Smoke

Unit Type	Number of Units	Total Personnel
Engine	1	3
Ladder Truck	1	3
Total Staffing Provided		**6**

Smoke In Structure (Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	12
Ladder Truck	1	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Smoke In Structure (Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	4	10
Ladder Truck	1	3
Tender	2	2
Battalion Chief	1	1
Total Staffing Provided		**16**

Outdoor Smoke Investigation (Hydranted & Non-Hydranted)

Unit Type	Number of Units	Total Personnel
Engine	1	3
Total Staffing Provided		**3**

Hazardous Materials – Minor

Unit Type	Number of Units	Total Personnel
Engine	1	3
Total Staffing Provided		**3**

Hazardous Materials – Major

Unit Type	Number of Units	Total Personnel
Engine	3	6
Ladder Truck	1	3
Battalion Chief	1	1
Hazardous Materials Unit	1	3
Total Staffing Provided		**13**

Emergency Medical Aid

Unit Type	Number of Units	Total Personnel
Engine or Ladder Truck	1	3
Total Staffing Provided		**3**

Mass Casualty Incident (10+ Patients)

Unit Type	Number of Units	Total Personnel
Engine	4	11
Ladder Truck	1	3
MCI Trailer	1	1
Battalion Chief	1	1
Total Staffing Provided		**16**

Motor Vehicle Accident (Non-Trapped)

Unit Type	Number of Units	Total Personnel
Engine or Ladder Truck	1	3
Total Staffing Provided		**3**

Motor Vehicle Accident (Trapped)

Unit Type	Number of Units	Total Personnel
Engine	3	9
Ladder Truck	1	3
Battalion Chief	1	1
Total Staffing Provided		**13**

Technical Rescue – Water

Unit Type	Number of Units	Total Personnel
Engine w/ Boat	3	9
Ladder Truck	1	3
Battalion Chief	1	1
Total Staffing Provided		**13**

Technical Rescue – Rope

Unit Type	Number of Units	Total Personnel
Engine	3	9
Ladder Truck	1	3
Heavy Rescue	1	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Technical Rescue – Confined Space

Unit Type	Number of Units	Total Personnel
Engine	3	9
Ladder Truck	1	3
Heavy Rescue	1	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Technical Rescue – Trench

Unit Type	Number of Units	Total Personnel
Engine	3	9
Ladder Truck	1	3
Heavy Rescue	1	3
Battalion Chief	1	1
Total Staffing Provided		**16**

Component F – Review of Historical System Performance

Incident data for the calendar year 2016 was evaluated in detail to determine SFD's current performance. Data was obtained from department incident reports and the dispatch center's computer-aided dispatch system.

Each phase of the incident response sequence was evaluated to determine current performance. This allows an analysis of each individual phase to determine where opportunities might exist for improvement.

The total incident response time continuum consists of several steps, beginning with initiation of the incident and concluding with the appropriate mitigation of the incident. The time required for each of the components varies. The policies and practices of the fire department directly influence some of the steps.

Detection

The detection of a fire (or medical incident) may occur immediately if someone happens to be present or if an automatic system is functioning. Otherwise, detection may be delayed, sometimes for a considerable period. The time period for this phase begins with the inception of the emergency and ends when the emergency is detected. It is largely outside the control of the fire department and not a part of the event sequence that is reliably measurable.

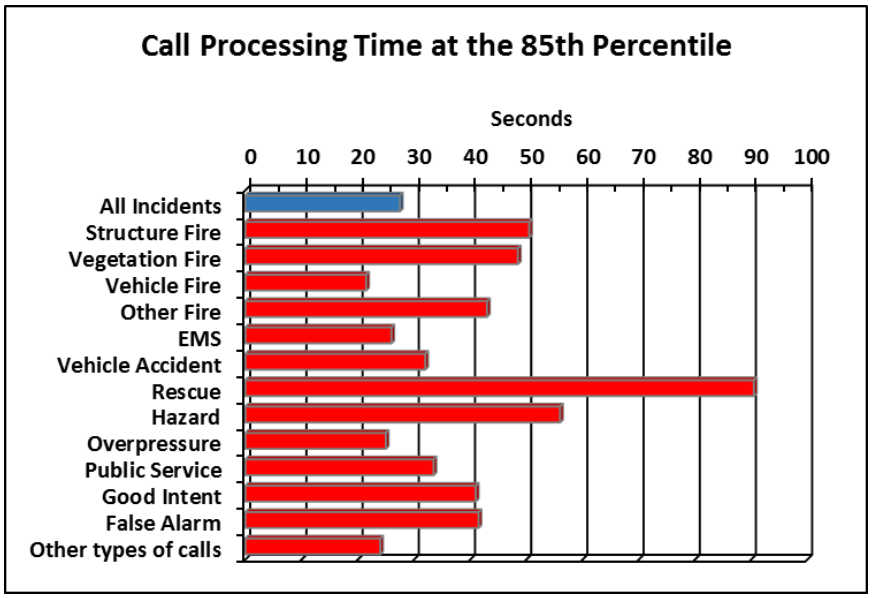
Call Processing

Today most emergency incidents are reported by telephone to the 9-1-1 center. Call takers must quickly elicit accurate information about the nature and location of the incident from persons who are apt to be excited. A citizen well-trained in how to report emergencies can reduce the time required for this phase. The dispatcher must identify the correct units based on incident type and location, dispatch them to the emergency, and continue to update information about the emergency while the units respond. This phase typically begins when the 9-1-1 call is answered at the dispatch center and ends when response personnel are notified of the emergency.

WVCC reports that they answer 9-1-1 calls within 15 seconds 68.2% of the time and within 40 seconds 97.2% of the time.

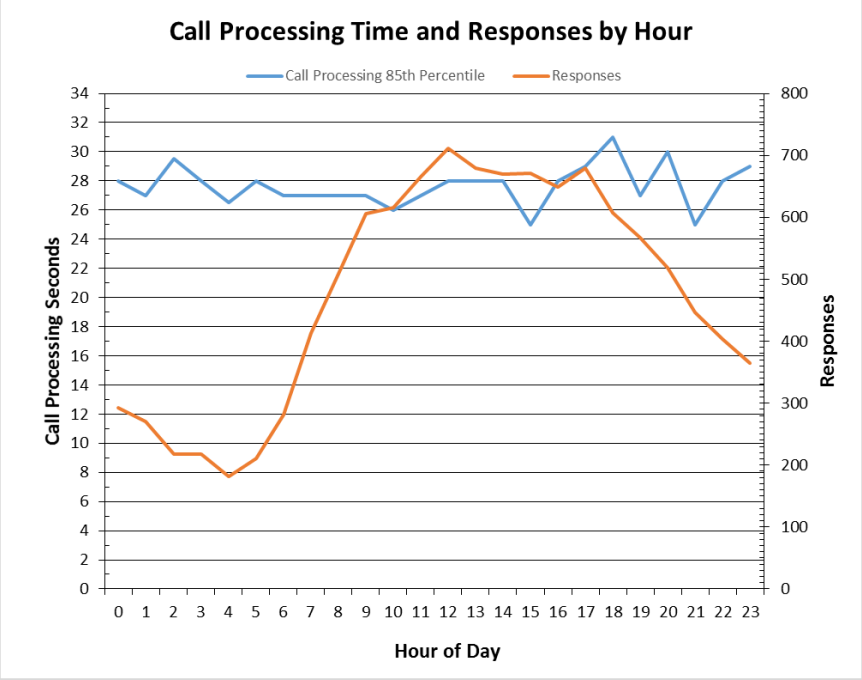
The following chart lists the call processing time for all incidents as well as specific incident types. Overall, the time from first notification to the dispatch center until notification of response personnel is within 28 seconds, 85 percent of the time.

Figure 47: Call Processing Performance



Activity levels at the dispatch center can affect the time it takes to receive, process and dispatch a request for service. The following chart shows call processing time by hour of day compared to response load. Although call processing time varies throughout the day, it remains relatively flat and does not appear to be affected by response volume. In recent years, steps have been taken in increase efficiency of call processing. These steps have involved procedural changes, software enhancements, and station alerting automation.

Figure 48: Call Processing Time at 85th Percentile compared to Responses by Hour of Day



Turnout Time

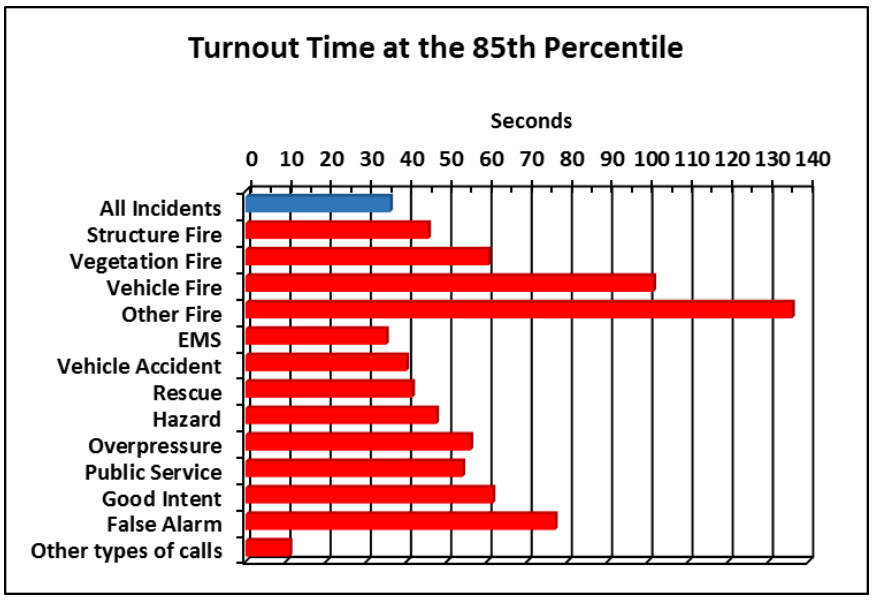
Turnout time is the first of the response phases controllable by the fire department. This phase begins at notification of an emergency in progress by the dispatch center and ends when personnel and apparatus begin movement towards the incident location. Personnel must don appropriate equipment, assemble on the response vehicle, and begin travel to the incident. Good training and proper fire station design can minimize the time required for this step.

The following chart lists turnout time for all incidents as well as specific incident types. Overall, turnout time for all incidents is within 36 seconds, 85 percent of the time.

These turnout times include both Salem Fire Department units and Falck Ambulance units. SFD and Falck work in a partnership in the delivery of emergency medical services. Falck turnout times are expectedly short at within 29 seconds, 85 percent of the time due to its deployment configuration. Falck personnel are typically in their response units on standby at the time of incident dispatch.

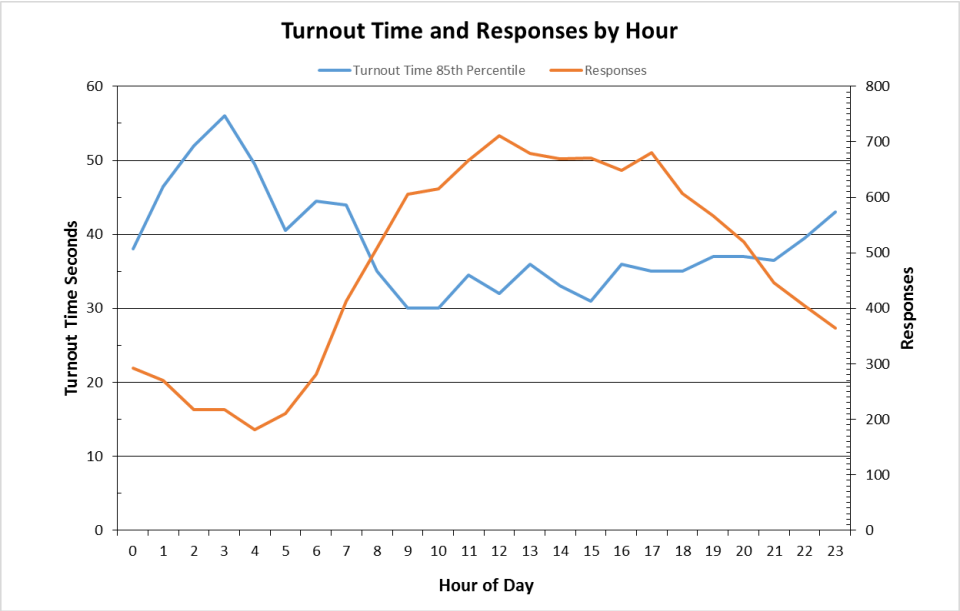
Salem Fire Department response unit turnout times are longer at within 94 seconds, 85 percent of the time.

Figure 49: Turnout Time Performance



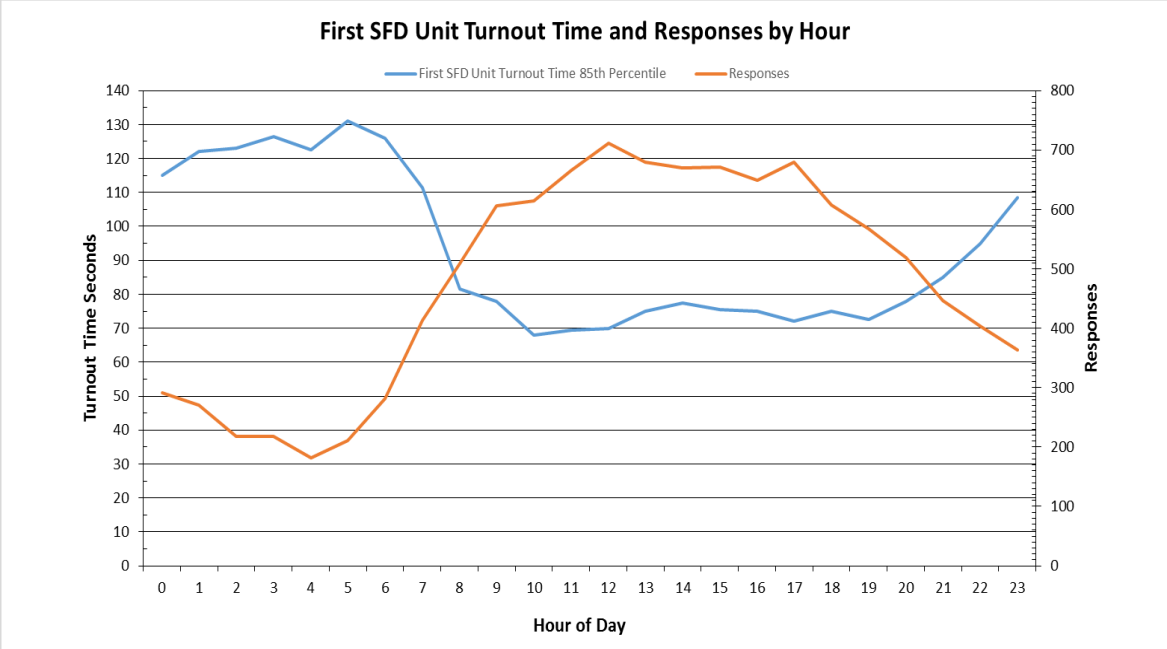
Turnout time can vary by hour of day. In this case turnout time varies by one minute between the early morning hours and daytime hours. The following figure illustrates turnout time by hour including Faulk ambulance units.

Figure 50: Turnout Time by Hour of Day



The next figure illustrates turnout time by hour of day for SFD response units. Turnout time varies by as much as 60 seconds between night and day.

Figure 51: Turnout Time and Responses by Hour - SFD Units

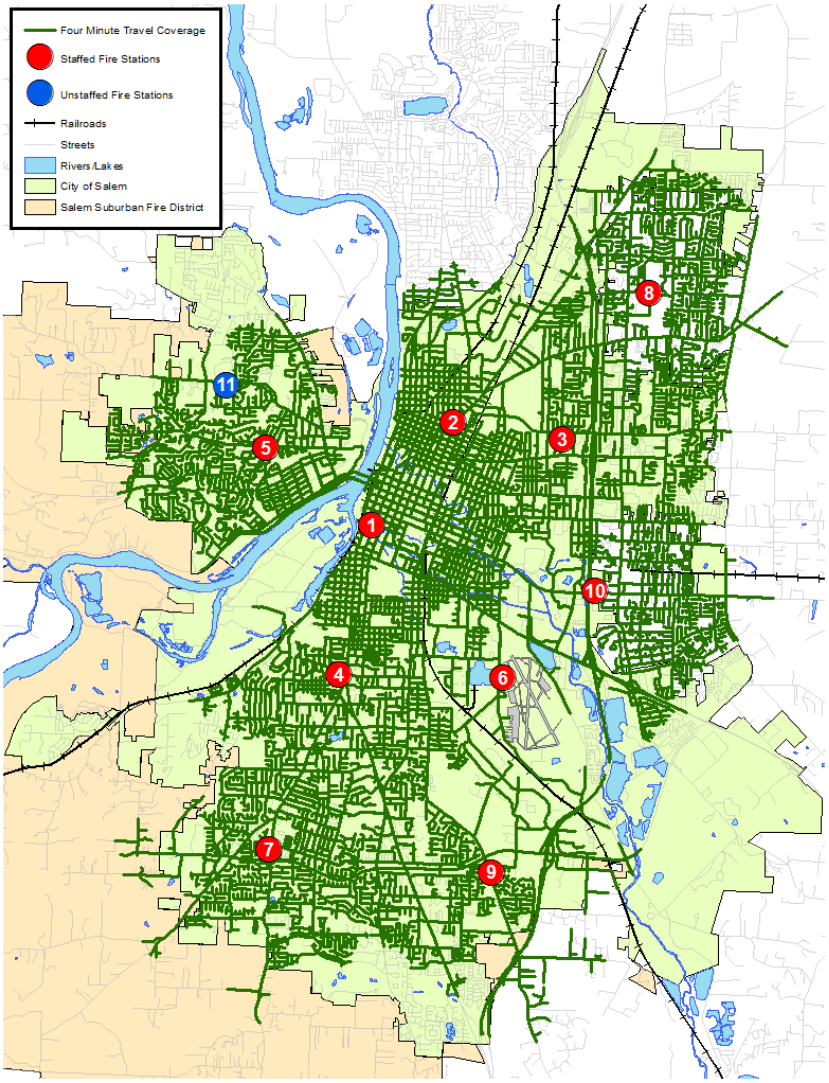


Distribution and Initial Arriving Unit Travel Time

Travel time is potentially the longest of the response phases. The distance between the fire station and the location of the emergency influences total response time the most. The quality and connectivity of streets, traffic, driver training, geography, and environmental conditions are also factors. This phase begins with initial apparatus movement towards the incident location and ends when response personnel and apparatus arrive at the emergency's location.

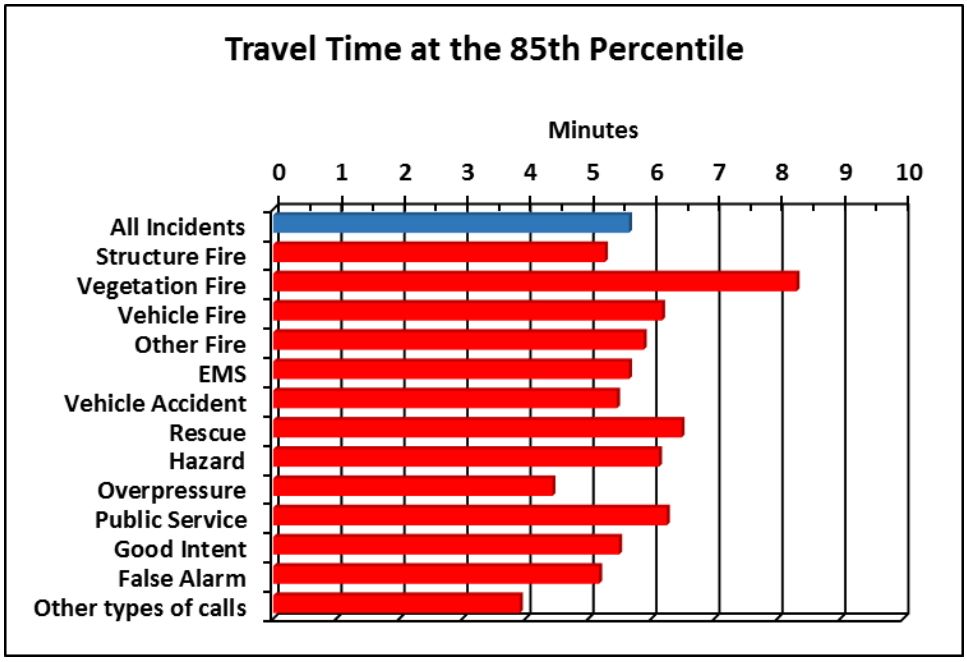
The following map illustrates the area that can be reached from all Salem fire stations in four minutes of travel time. It is based on posted road speeds compensated for slowing at intersections, slowing for turns, and the like. Four minutes was selected for the following analysis because it is the time allowed for travel within the City Council adopted first unit response time goal.

Figure 52: Initial Unit Travel Time Capability



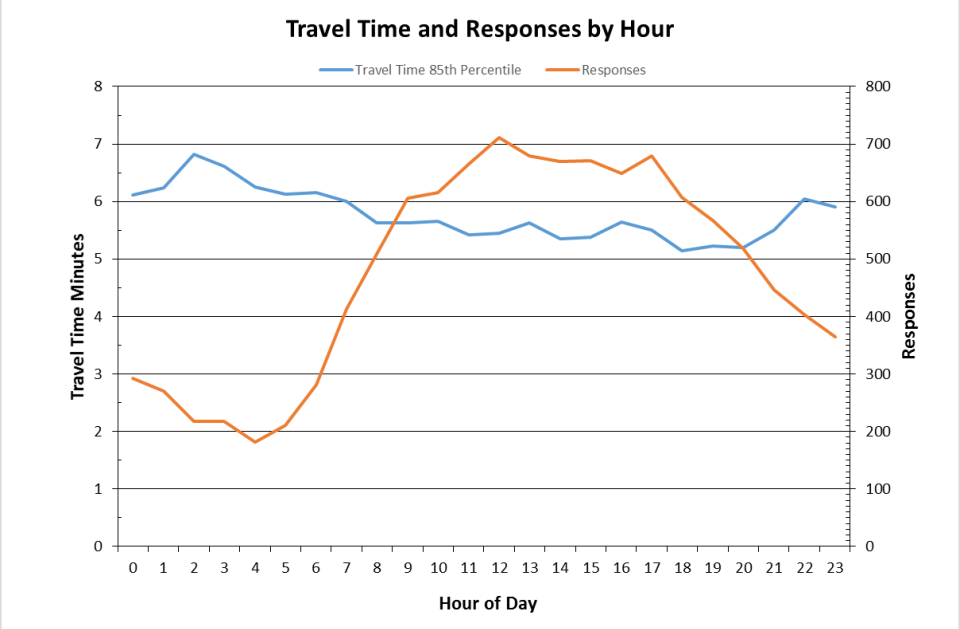
The following chart lists travel time for all incidents as well as specific incident types. Overall, travel time for all incidents is within 5 minutes 39 seconds, 85 percent of the time.

Figure 53: Overall Travel Time Performance – First Arriving Unit



Travel time can, in some situations, vary considerably by time of day. Heavy traffic at morning and evening rush hour can slow fire department response. Travel time varies by nearly two minutes during the course of the day.

Figure 54: Overall Travel Time by Hour of Day – First Arriving Unit



GIS analysis was completed to determine how much of the city's street system was within four minutes of fire stations. The following table shows the result of this analysis.

Figure 55: Street Mile Coverage by Fire Stations

	Total	Percent of Total
Total street miles in city	785	100.0%
Total street miles within four travel minutes of a fire station	626	79.7%

Current fire stations can provide a response of four travel minutes to 79.7% percent of the existing city street system, assuming the fire engine is in its station at the time of the alarm. This also assumes that street congestion, weather, and other factors do not impede response.

The next analysis compared coverage of incidents that occurred during 2016. The following table shows the results of this analysis. The majority of actual responses occur within four travel minutes of fire stations.

Figure 56: Incidents Within Four-Travel Minute Coverage

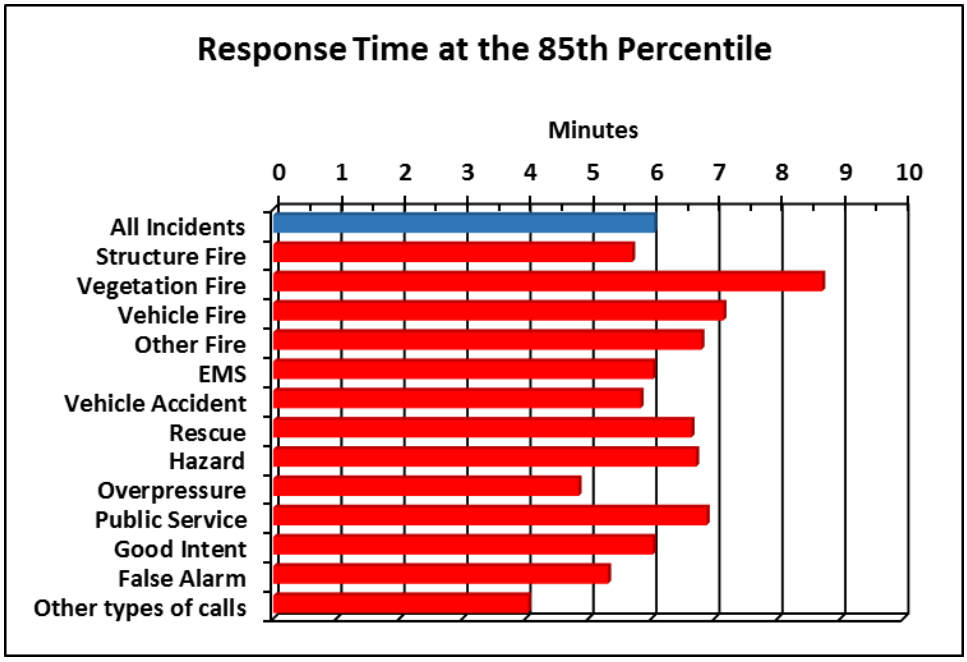
	Total	Percent of Total
Total incidents	22,046	100.0%
Total incidents inside station four-travel minute coverage	18,458	83.7%

First Arriving Unit Total Response Time

Response time is defined as that period between notification of response personnel by the dispatch center that an emergency is in progress until arrival of the first fire department response unit at the emergency. This is the time period of the response phases most controllable by the fire department.

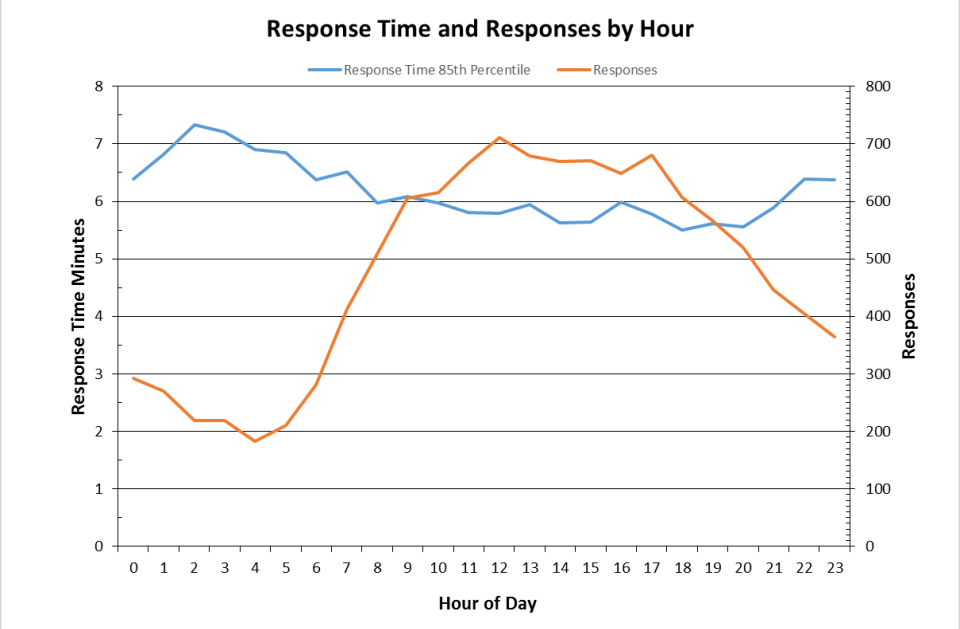
The following chart lists response time for all incidents as well as specific incident types. Overall, response time for all incidents is within 6 minutes, 85 percent of the time.

Figure 57: Response Time Performance – First Arriving Unit



The next chart shows response time by hour of day for all incidents. Response time is slowest during the night-time hours and fastest during the day. SFD's best response times occur during the period of the day when response activity is at its highest.

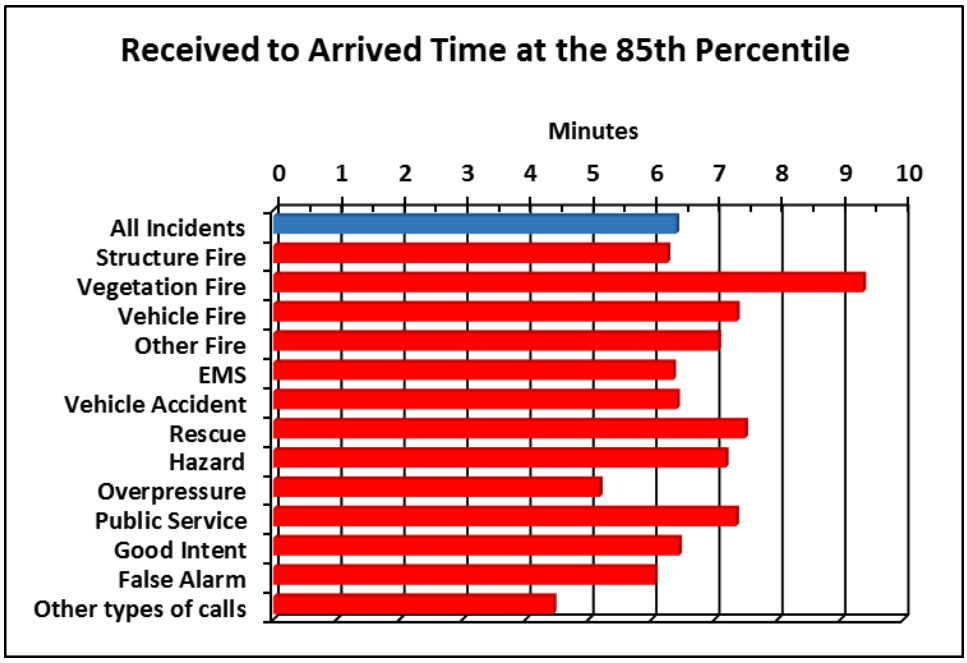
Figure 58: Hourly Response Time Performance



Received to Arrived Time

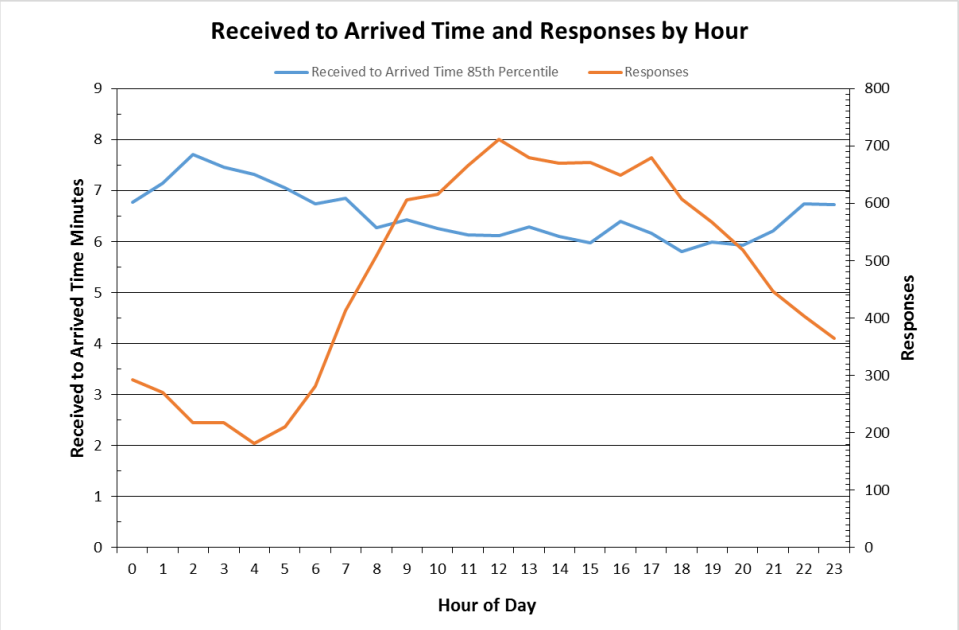
From the customers' standpoint, time begins when the emergency occurs. Their first contact with emergency services is when they call for help, usually by dialing 9-1-1. "Received to arrived" time is also the City Council's adopted performance goal. The next chart shows response time performance at the 85th percentile from the time the phone rings at the dispatch center until the first unit arrives at the incident location. This is a combination of all the time phases discussed in this section of the report. Overall, received to arrived time for all incidents is within 6 minutes 24 seconds, 85 percent of the time. SFD met City Council's goal of 5 minutes 30 seconds, 73.1 percent of the time.

Figure 59: Received to Arrived Time



The next chart shows received to arrived performance by time of day. Again, total response time, from the customer's standpoint is quickest during the day and slowest during the early morning hours.

Figure 60: Received to Arrived Performance by Hour of Day

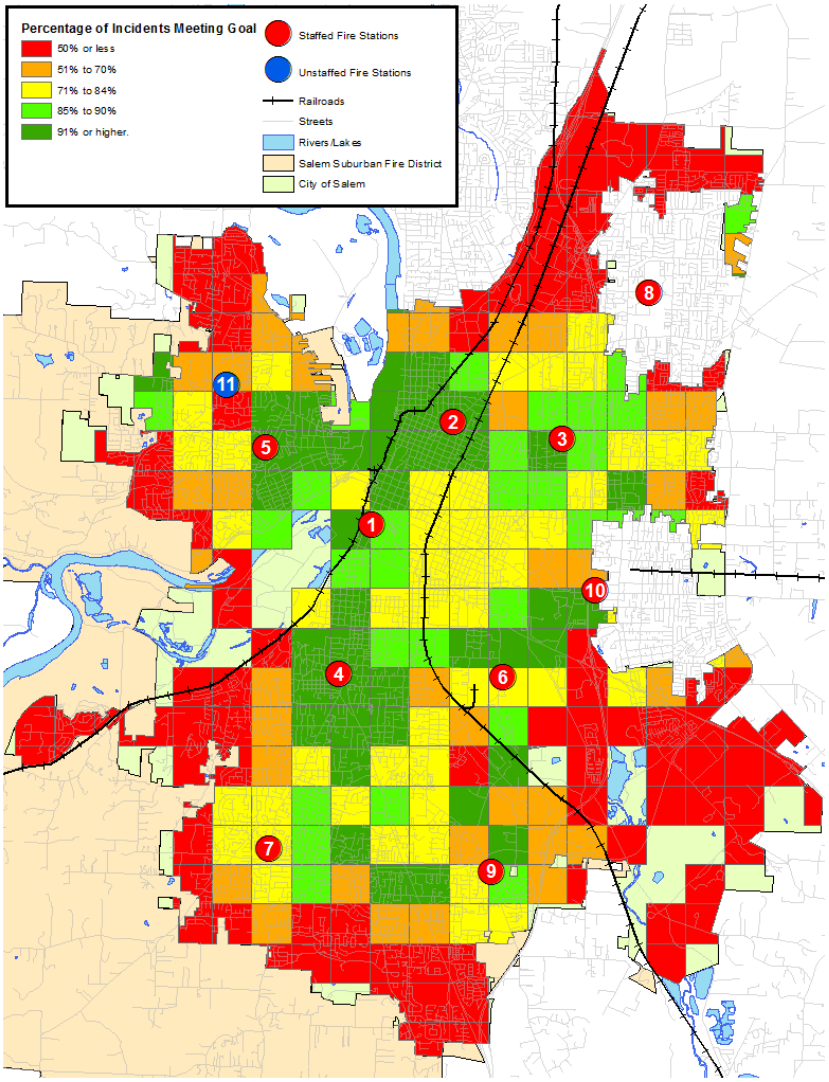


Received to Arrived Time Performance by Region

Received to arrived time performance by region is highly variable. This is influenced by a number of factors, including individual station area workload and the number of times a station must cover another station's area. Additional factors include the size of the station area and the street system serving it. More highly connected, grid patterned street systems contribute to faster response times than do areas with meandering streets with numerous dead-ends.

The following map shows the percentage of priority incidents meeting the City Council's received to arrived goal of within 5 minutes 30 seconds, 85 percent of the time by sub-areas of the city.

Figure 61: Received to Arrived Time Performance by Area



Concentration and Current Effective Response Force Capability Analysis

Effective Response Force (ERF) is the number of personnel and apparatus required to be present on the scene of an emergency incident to perform the critical tasks in such a manner to effectively mitigate the incident without unnecessary loss of life and/or property. The ERF is specific to each individual type of incident, as are the critical tasks that must be performed. Moderate risk structural fires are used as the primary risk category for this analysis as these present the most frequent type of incident requiring four or more response units.

The concentration analysis begins with a review of the physical capability of SFD's resources to achieve a target ERF response time to the city. Then analysis will determine whether or not SFD's *actual* ERF assembly performance matches this physical concentration capability.

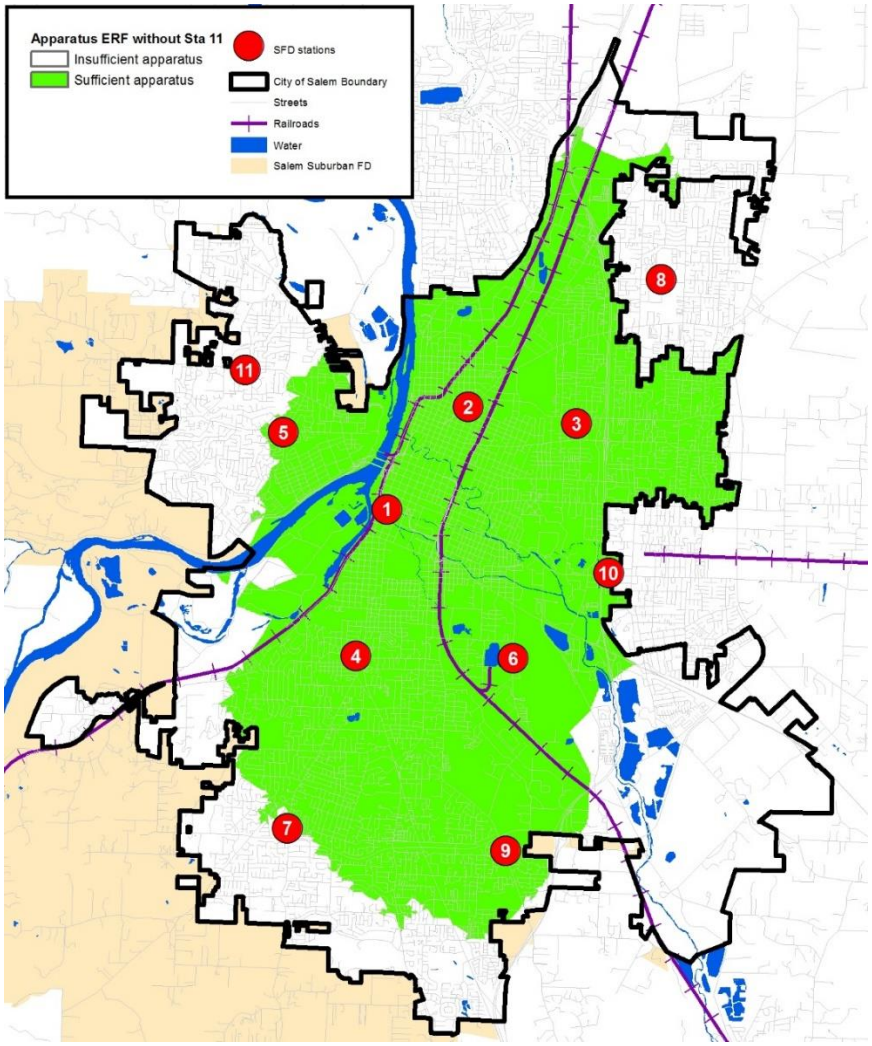
The SFD goal for ERF response time is "for moderate or high risk incidents, the Salem Fire Department shall assemble an Effective Response Force (ERF) consisting of personnel sufficient to effectively mitigate the incident based on risk within 10 minutes from receipt of the call at the dispatch center, 85 percent of the time. This is the department's adopted performance goal since one has not been established by City Council.

Historically, call processing times for structure fires is 50 seconds. Structure fire turnout time is 1 minutes 42 seconds. Thus to achieve a ten-minute ERF response time, eight minutes of travel time is available. The following maps depict the physical capability of SFD to assemble various concentrations of apparatus and firefighters within eight minutes of travel time. The modeled analysis shown assumes that all response units are available.

Finally, for the purpose of this analysis, a full effective response force to a moderate risk structure fire is four fire engines, one ladder truck and one battalion chief, with a total complement of at least 14 firefighters.

The following map shows the city and areas that can be reached by the apparatus that make up the target ERF. The requirement for a ladder truck and battalion chief to achieve ERF is the most significant limiter, since only two of each are available citywide. This map does not include the coverage provided by Station 11 and assumes that all response units are available.

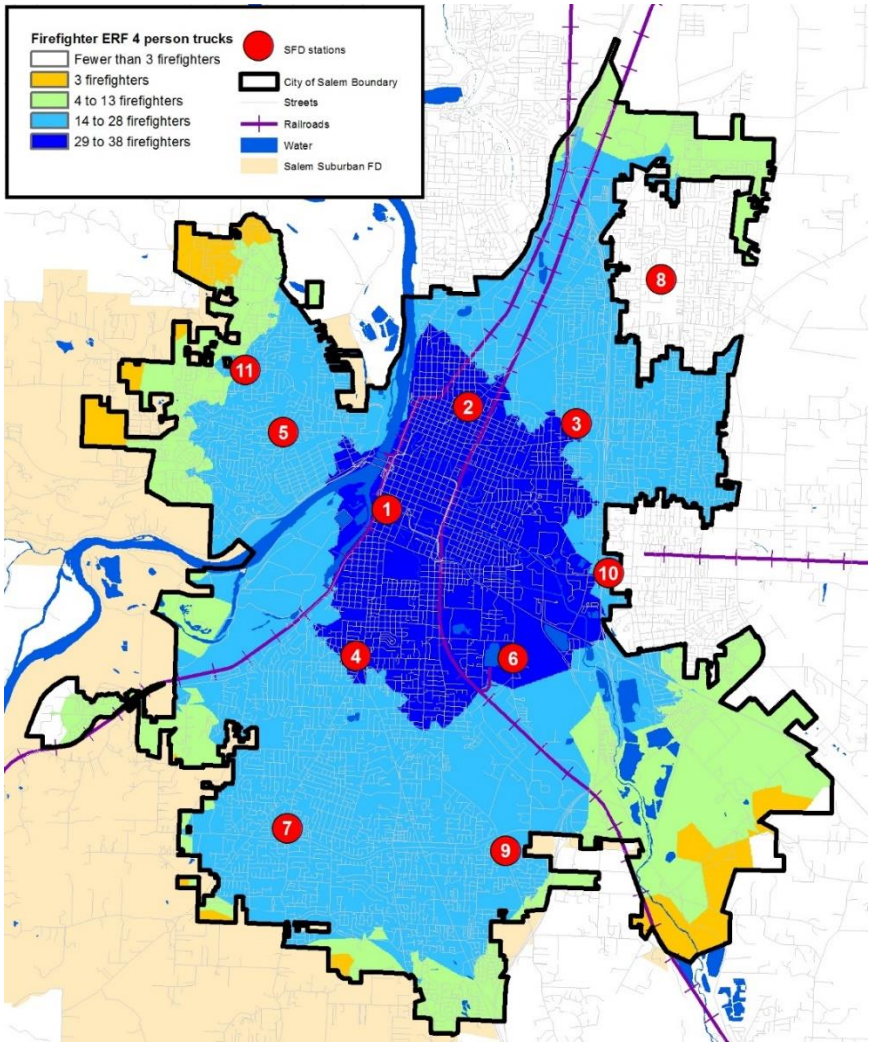
Figure 62: Effective Response Force – Apparatus Resources



The previous figure illustrates that the city is well resourced with fire apparatus within the city's central area but not in the outer perimeter.

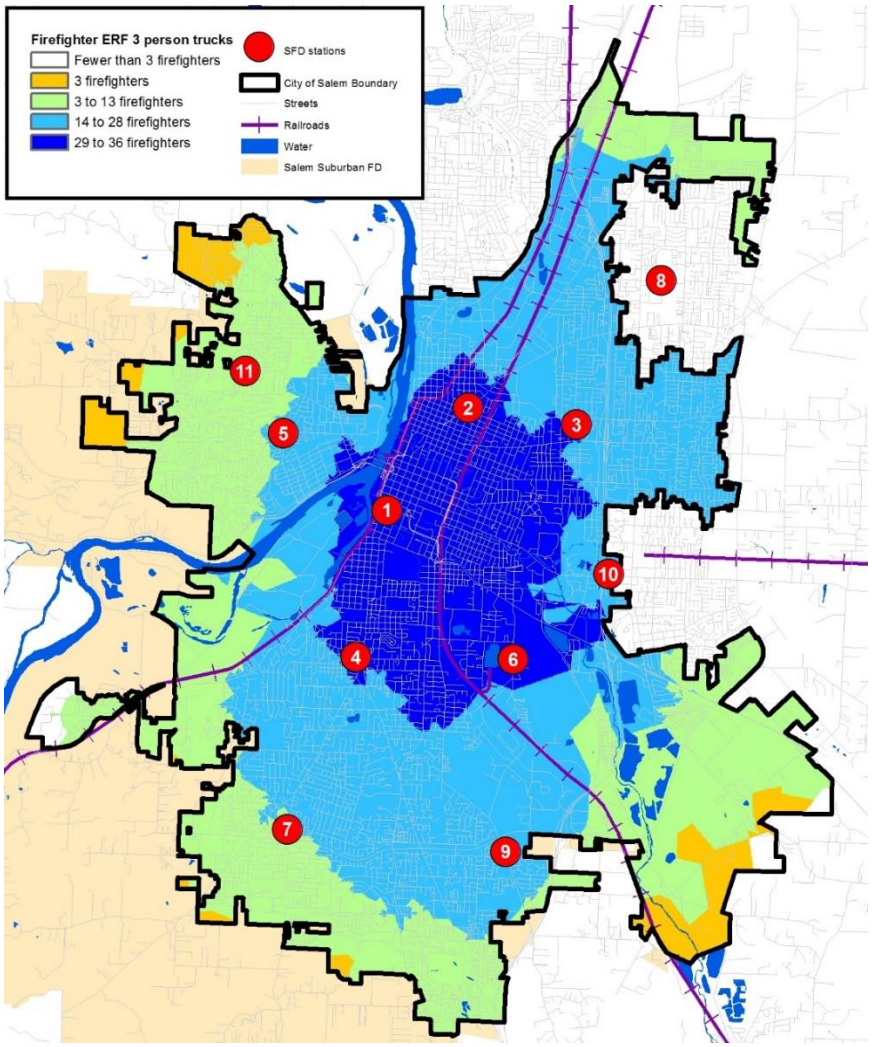
Equally important is the number of firefighters that can arrive on the fire ground to make rapid use of this equipment. The following map illustrates the potential concentration of firefighters that could be achieved with the arrival of this apparatus, based upon normal staffing levels assigned to each unit. This map assumes that both ladder trucks are staffed with four personnel each.

Figure 63: Effective Firefighting Force – Staffing Resources, Four Person Ladder trucks



The next map illustrates the potential concentration of firefighters that could be achieved with the arrival of this apparatus, based upon minimum staffing levels assigned to each unit. This map assumes that both ladder trucks are staffed with three personnel each.

Figure 64: Effective Firefighting Force – Staffing Resources, Three-Person Ladder Trucks

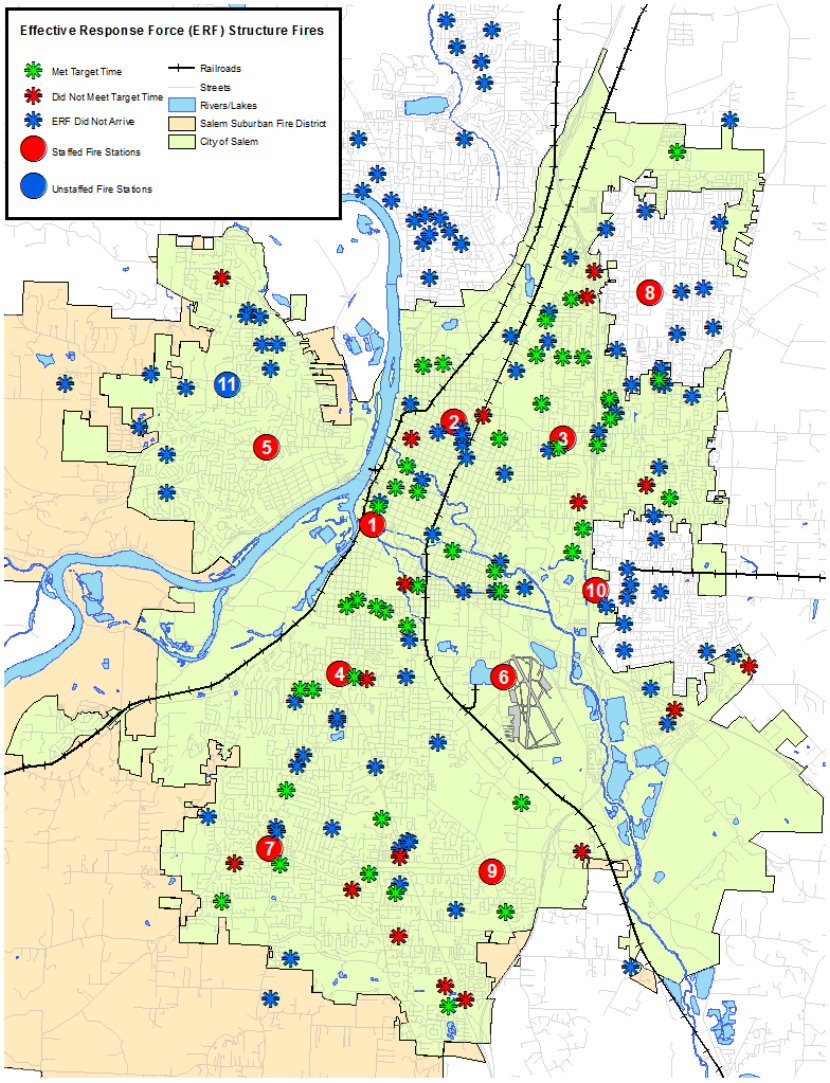


These two maps show that an adequate force of on-duty firefighters can be mustered within a reasonable timeframe in the central region but not to the city's perimeter. The impact of reduced ladder truck staffing can be seen in the city's perimeter as well. The analysis in the previous maps assumes all apparatus are in service and available for dispatch. During periods of concurrent calls when some apparatus are already committed to other incidents, the ability to achieve this concentration of apparatus and firefighters would be affected.

Salem Fire Department's actual full effective response force performance for calendar year 2016 was within 10 minutes, 71.4 percent of the time.

The next map shows all structure fires during this time period. The markers in green are those for which the 10-minute objective was achieved. The red markers are those structure fires where the objective was not achieved. The blue markers are structure fires to which the full effective response force did not arrive because all units were not needed.

Figure 65: Structure Fires Meeting and Not Meeting Target



Second Unit Arrival Time

The same group of structure fires was reviewed to determine the time the second response unit arrived on the scene. According to the data the second unit arrived on scene within 7 minutes 28 seconds, 85 percent of the time, only 1 minute 46 seconds, 85 percent of the time after the first unit's arrival.

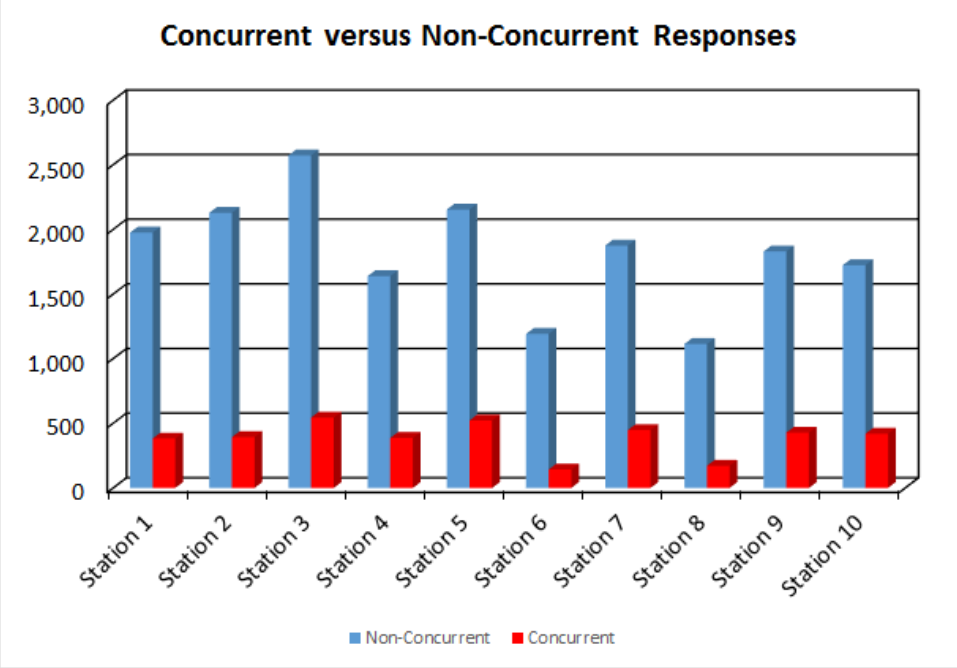
Call Concurrency, Reliability and Cancelled Responses

When evaluating the effectiveness of any resource deployment plan, it is necessary to evaluate the workload of the individual companies to determine to what extent their availability for dispatch is affecting the response time performance. In simplest terms, an engine company cannot make it to an incident across the street from its own station in four minutes if it is unavailable to be dispatched to that incident because it is committed to another call.

Concurrency

One way to look at resource workload is to examine the number of times multiple calls happen within the same time frame on the same day in each station area. Calls during 2016 were examined to determine the percentage of times multiple calls occurred within a station's response area at one time. This is important because more calls occurring simultaneously can stretch available resources and extend response times by causing the community to rely on more distant responding apparatus.

Figure 66: Call Concurrency Rates



Note that in most cases station areas with the highest workload typically have the highest rate of concurrent calls. When the reliability of a station to respond within its prescribed territory is lower, response time performance for the back-up station/apparatus can also be negatively affected.

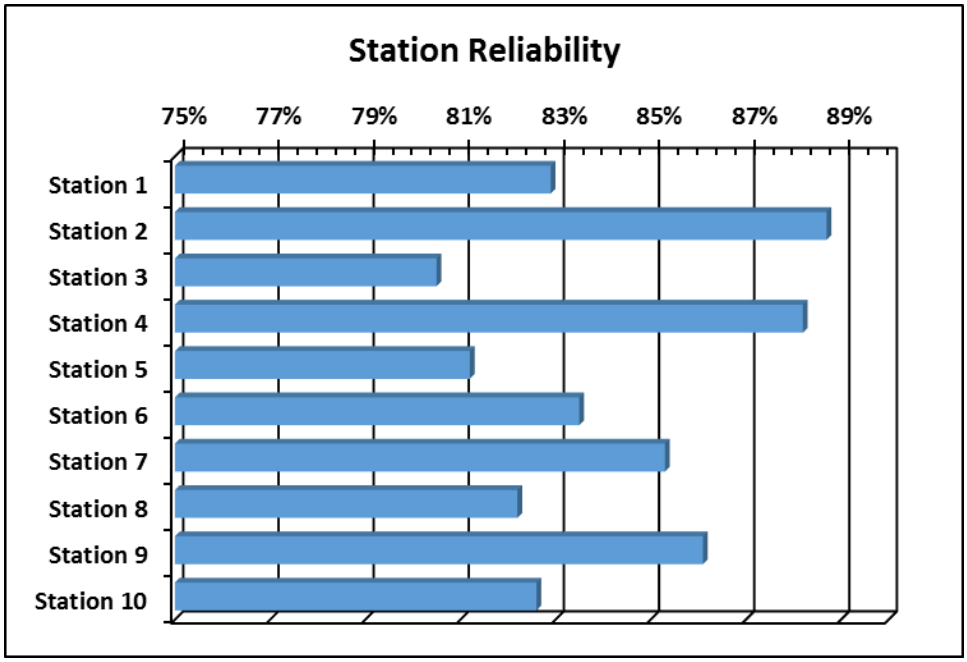
Reliability

The ability of a fire station's first-due unit(s) to respond to an incident within its assigned response area is known as unit *reliability*. The reliability analysis is done by measuring the number of times response unit(s) assigned to a given fire station in the City of Salem was available to respond to a request for service within that fire station's primary service area.

The following table illustrates the number of times the "home station" had a response unit available to respond to an incident in its primary service area.

Reliability ranges from a low of 80.5 percent to a high of 88.7 percent. Shorter travel times result as reliability increases.

Figure 67: Station Reliability Rates

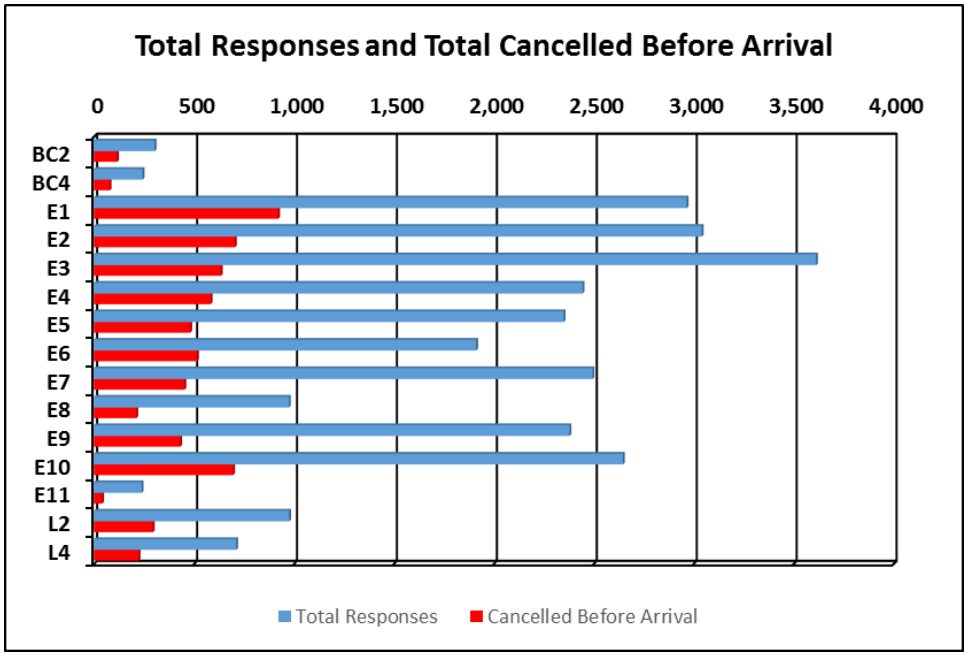


Cancelled Responses

Sometimes response units are cancelled prior to arrival at the incident. This can occur when the person reporting the emergency calls back to the dispatch center that no real emergency existed. More often it's when another response unit arrives and determines no additional response units are needed. While cancelled responses are unavoidable, minimizing them helps improve unit reliability. An unnecessary response makes the unit unavailable for a concurrent request for service.

Salem Fire Department units respond frequently to calls for service that end up as cancelled responses.

Figure 68: Unit Responses and the Number Cancelled Before Arrival



Component G – Performance Objectives and Performance Measures

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.[7] 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.

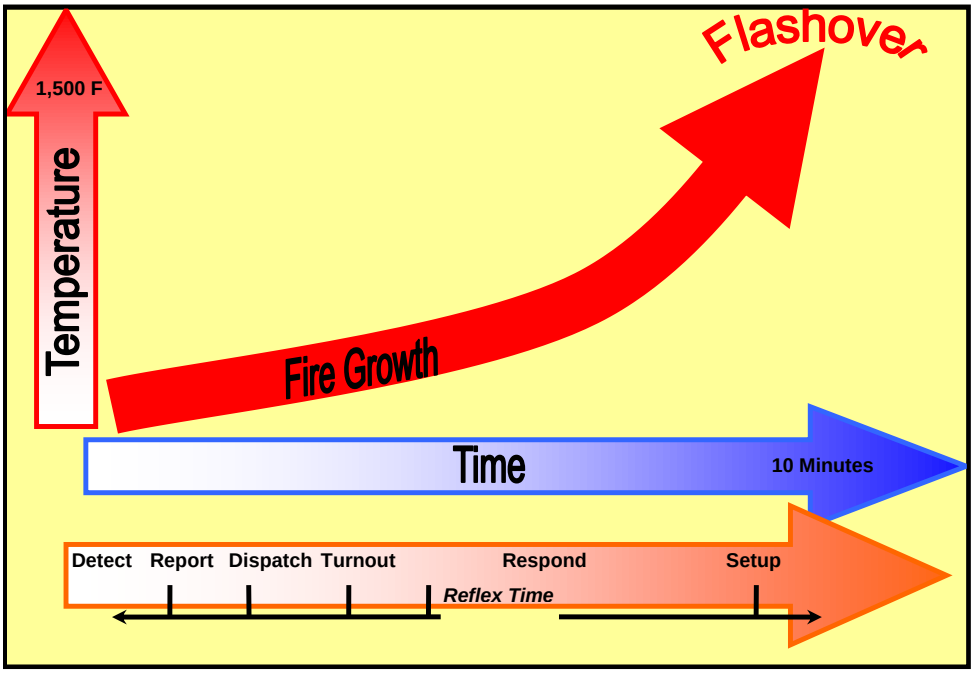
Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. "Light weight" roof

[7] 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.

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. Figure 69 illustrates the sequence of events.

Figure 69: 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 can 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 70: 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

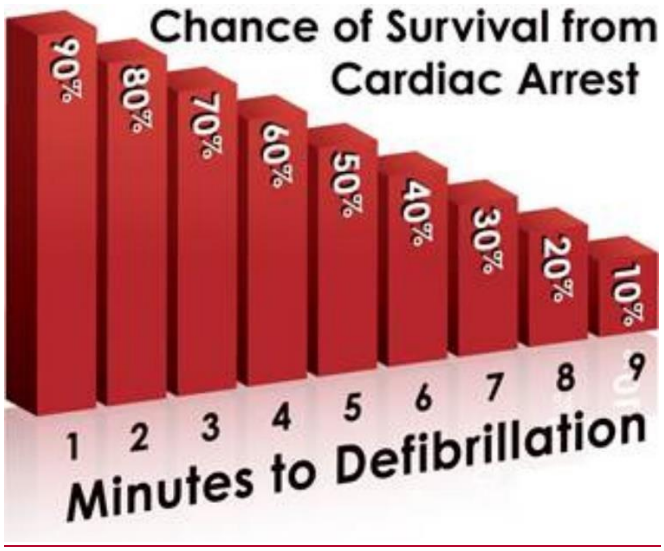
Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation.

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 7 to 10 percent for every minute between collapse and defibrillation. Consequently, the AHA recommends cardiac defibrillation within five minutes of cardiac arrest.

As with fires, the sequence of events that lead to emergency cardiac care can be graphically illustrated, as in the following figure.

Figure 71: 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.

People, Tools, and Time

Time matters a great deal in the achievement of an effective outcome to an emergency event. Time, however, is not the only factor. Delivering sufficient numbers of properly trained, appropriately equipped personnel within the critical time period completes the equation.

For medical emergencies this can vary based on the nature of the emergency. Many medical emergencies are not time critical. However, for serious trauma, cardiac arrest, or conditions that may lead to cardiac arrest, a rapid response is essential.

Equally critical is delivering enough personnel to the scene to perform all of the concurrent tasks required to deliver quality emergency care. For a cardiac arrest, Salem Fire Department EMT's are trained to perform High Performance CPR (HP-CPR). High-quality cardiopulmonary resuscitation has been determined as the primary component in influencing survival from cardiac arrest. High Performance Cardiopulmonary Resuscitation (HP-CPR) is an effective way to standardize and apply current American Heart Association (AHA) Advanced Cardiac Life Support Guidelines. The focus of HP-CPR is on continuous chest compressions. Continuous chest compressions of adequate rate and depth, delivered with minimal

interruption, improve the receptivity of the heart to defibrillation shocks and emergency cardiac drugs, thereby increasing the chance of survival.

Thus, for a medical emergency, the real test of performance is the time it takes to provide the personnel and equipment needed to deal effectively with the patient's condition, not necessarily the time it takes for the first person to arrive.

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate application of water to a fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover. The arrival of one person with a portable radio does not provide fire intervention capability and should not be counted as "arrival" by the fire department.

Component H – Overall Evaluation, Conclusions, and Recommendations

Overall Evaluation

The standards of cover process based on the *CFAI Standards of Cover 5th Edition* required the completion of an intensive analysis on all aspects of the SFD deployment policies. The analysis used various tools to review historical performance, evaluate risk, validate response coverage, and define critical tasking. The analysis relied on the experience of staff officers and their historical perspective combined with historical incident data captured by both the dispatch center and the department's in-house records management system.

The Description of Community Served section provided a general overview of the organization, including governance, lines of authority, finance, and capital and human resources, as well as an overview of the service area including population and geography served. The Review of Services Provided section detailed a brief overview of the core services the organization provides based on general resource/asset capability and basic staffing complements. During the Review of Community Expectations and Performance Goals, it was determined that the community had high expectations of the department, felt generally positive about its services, and shared certain areas of concern particularly as it has to do with emergency medical services.

An overview of community risk was provided to form the basis for the department's development of mitigation plans. Geospatial characteristics, topographic and weather risks, transportation network risks, physical assets, and critical infrastructure were reviewed and developed into a hazard vulnerability assessment that identified medical incident non-structure fires, structure fires, and rescues as the primary risks within the community. As a factor of risk, community populations and demographics are evaluated against historic and projected service demand. Population and service demand has increased over time.

Evaluating risk using advanced geographic information systems (GIS) provided an increased understanding of community risk factors, which can lead to an improved deployment policy.

During the analysis of service level objectives, critical tasking assignments were completed for incident types ranging from a basic medical emergency to a high-risk structure fire. Critical tasking required a review of on-scene staffing capability to mitigate the effects of an emergency. These tasks ultimately determine the resource allocation necessary to achieve a successful operation. The results of the analysis indicate that a moderate risk structure fire required 14 personnel, including command.

The Review of Historical System Performance evaluated each component of the emergency incident sequence. Total response time included a number of components such as call processing, turnout, and travel. Beyond the response time of the initial arriving units, the additional components of concentration and effective response force, reliability, call concurrency, and resource drawdown were evaluated.

Incident call processing time at 21 seconds, 85 percent of the time is excellent. Incident turnout time, dispatch to first unit enroute, is very good at within 36 seconds 85 percent of the time when ambulance times are included. However, fire unit turnout times are much slower at 94 seconds 85 percent of the time. Decreasing nighttime turnout times is an opportunity to reduce overall incident time.

Travel times to actual incidents are currently within 5 minutes 8 seconds, 85 percent of the time. Distance from existing fire stations is not the issue impeding performance. Other factors are in play, keeping response units from providing timely response such as unit availability, traffic, and units being away from their home areas.

Travel time modeling was conducted, using computer modeling, to evaluate engine and truck responses using four minutes as the maximum travel time for the first arriving engine. The modeling indicated that the station locations regularly staffed provide coverage of 91.9 percent of requests for service within a four-minute travel time.

Overall response time (received to arrival) at the 85th percentile is within 6 minutes 43 seconds, 85 percent of the time. This exceeds the department's performance goal of within 5 minutes 30 seconds, 85 percent of the time.

Concentration is measured by the ability of the department to assemble a certain number of apparatus and personnel within a pre-determined amount of time. Historical data indicate that the department has been able to assemble three engines, one ladder truck, and one battalion chief (14 firefighters) within 12 minutes 22 seconds, 85 percent of the time.

Historical reliability is defined as the probability that the required amount of staffing and apparatus will be available when an emergency call is received. Analysis indicates that as calls for service increase, overlapping calls become increasingly frequent. The SFD is already experiencing numerous concurrent responses.

Recommendations

During the course of this study a number of issues, concerns, and opportunities were identified. The following recommendations are intended to accomplish two primary objectives:

1. Improve service delivery with no or minimal expenditure of funds.
2. Identify service level improvement opportunities that can be implemented as funding becomes available.

The recommendations are described as improvement goals and should be implemented as funding allows. Each will improve the Salem Fire Department's ability to provide effective service to the community.

Improvement Goal A: Consider aligning SFD response performance goals more closely with national standards

In 1995 the Salem City Council adopted a response time goal of first unit arrival within 5 minutes 30 seconds, 85 percent of the time. This goal has provided a solid target for service delivery improvement planning.

Council may wish to consider adopting goals more closely aligned with national standards, particularly those found in National Fire Protection Association (NFPA) Standards 1221 (Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems) and 1710 (Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments). The advantages of doing so are two-fold. First, these standards provide more detail for each phase of an incident. Second, it facilitates performance comparison with other similar agencies in the country.

The following are the standards found in NFPA 1221 and 1710.

Call-Processing Performance Goal

The first phase of overall response time is call processing time. This phase begins when the call is received at the PSAP center and ends when response resources are notified of an emergency. There are two components; answer time and dispatch time.

Recommended Call Processing Goal

- 9-1-1 calls will be answered at the primary PSAP within 15 seconds, 95 percent of the time.
- Response resources shall be notified of a priority incident within 64 seconds from receipt of the call at the dispatch center, 90 percent of the time.
    - Exceptions – These call types shall be processed and dispatched within 90 seconds, 90 percent of the time
        - Calls requiring emergency medical dispatch questioning
        - Calls requiring language translation
        - Calls requiring use of TTY/TTD devices
        - Calls of criminal activity
        - Hazardous materials and technical rescue incidents

Current performance: *Within 15 seconds 98.5 percent of the time*

Turnout Time Performance Goal

Turnout time is one area over which the fire department has total control and is not affected by outside influences. Turnout time, or the time between when the call is received by the response units (dispatched) and when the unit is enroute to the incident location (responding), affects overall response times. Reducing this time component reduces total response time.

National Fire Protection Association Standard 1710 recommends turnout time performance of 80 seconds or less for fire and special operations response and 60 seconds or less for all other priority responses.

Recommended Turnout Goal:

- Response personnel shall initiate the response of a unit capable of mitigating an incident to a priority fire and special operations incident 80 seconds from notification 90 percent of the time.
  Current performance: *Within 80 seconds 78.8 percent of the time*
- Response personnel shall initiate response to all other priority incidents within 60 seconds from notification 90 percent of the time.
  Current performance: *Within 60 seconds 96.6 percent of the time (within 60 seconds 42 percent of the time for SFD units)*

Response Time for the First-due Unit Goal

The time required to deliver the first response unit capable of intervening in the emergency includes both turnout time and travel time but not call processing time. When the NFPA 1710 recommended standards for turnout time and travel time are combined response time should be within 5 minutes 20 seconds 90 percent of the time for fire and special operations incidents and within 5 minutes 90 percent of the time for all other priority incidents.

Recommended First-Due Response Time Goal:

- The first response unit capable of initiating effective incident intervention shall arrive at a priority fire or special operations incident within 5 minutes 20 seconds from notification of response personnel, 90 percent of the time.
  Current performance: *Within 5 minutes 20 seconds 61.1 percent of the time*
- The first response unit capable of initiating effective incident intervention shall arrive at all other priority incidents within 5 minutes from notification of response personnel, 90 percent of the time.
  Current performance: *Within 5 minutes 70.6 percent of the time*

Effective Response Force Performance Goal

A fire department's resource *concentration* is the spacing of multiple resources close enough together so that an initial "Effective Response Force" (ERF) for a given risk can be assembled on the scene of an emergency within the specific time frame identified in the community's performance goals for that risk type. An initial effective response force is defined as that which will be most likely to stop the escalation of the emergency.

The minimum ERF for structure fires is identified as the arrival of at least four fire engines, one ladder truck, and one battalion chief (14 personnel total). This initial ERF does not necessarily represent the entire alarm assignment as additional units may be assigned based on long-term incident needs and risks. Additional engines, ladders, or other specialty companies are assigned to higher risk responses in order to accomplish additional critical tasks that are necessary beyond the initial attack and containment.

Recommended Effective Response Force Goal:

- The full effective response force shall arrive at a moderate risk structure fire within 9 minutes 20 seconds of notification of response personnel, 90 percent of the time.

  Current performance: *Within 9 minutes 20 seconds 65.1 percent of the time*

Cost to implement: None

Improvement Goal B: Improve SFD response unit turnout times

SFD response crew turnout time performance is currently within 94 seconds, 85 percent of the time. National guidance suggest turnout time should be within 80 seconds, 90 percent of the time for fire and special operations incidents and within 60 seconds, 90 percent of the time for all other priority incidents.

A review of station configuration, alerting systems, and other factors should be conducted to identify and remove any obstacles to prompt initiation of response.

In early 2017, the process to capture the enroute time in CAD was modified to provide a more accurate accounting. A review of turnout time since then shows a slight improvement (1.4 percent) in performance over 2016.

Crew performance must also be addressed. Personnel should be provided regular reports of their turnout time performance. Performance standards should be adopted and enforced.

Cost to implement: Dependent on changes needed

Improvement Goal C: Acquire needed technology and implement closest unit dispatch

Many departments across the country have implemented technology that ensures the closest available response unit is sent to an emergency. This technology incorporates global positioning systems on fire apparatus linked to the dispatch center's computer-aided dispatch system. When a call is received at the dispatch center, the incident's location is instantly compared to the actual location of every available response unit. Travel times are computer calculated and the closest unit selected for dispatch. Implementation of this system requires:

- Dispatch center computer software capable of this function.
- Street information for use in the system that includes data points required to conduct "closest unit analysis".

- Global positioning equipment installed on fire apparatus (SFD has already installed this equipment).

Communities that have implemented this technology have realized significant improvements in response times and emergency event outcomes. Battalion chiefs can better redistribute response resources to ensure effective city-wide response coverage during large incidents and periods of significant incident workload.

Cost to implement: Approximately $1 million to upgrade the computer aided dispatch software at WVCC. The City is currently in an RFP process to identify and select a new CAD system. The anticipated cost is approximately one million dollars, which would be shared between the 29 agencies that are serviced through WVCC.

Improvement Goal D: Improve system reliability through better response unit location management

Incident workload, response practices, and deployment can impact response time performance. One factor that contributes to this is daily non-emergency response movements of units within the system. The majority of this type of movement is a result of crews being summoned from their station and first due areas for training, meetings, and other scheduled or non-scheduled events.

SFD should review non-response crew movement to ensure that only mission critical movements are taking place. Web-based and in-station training should be incorporated into the training schedule whenever and wherever possible. For those times when it is necessary for a unit to move out of its first due area (such as mandatory multi-company training), stations should be back-filled strategically with other response units to ensure that the ability to meet response performance goals is being maintained.

During periods of high incident activity, dispatch personnel and SFD battalion chiefs implement “move-up and cover” procedures to ensure available response units are positioned to provide the shortest possible response times. Software is available for computer aided dispatch systems that can automate this process.

Additional daytime response units should be considered and systematically incorporated into the delivery system. These units would be placed in service and used to refill stations vacated for non-response reasons. These units can be staffed by personnel on overtime, or if it is found that these are used often enough, with full-time personnel. The number of daytime response units that may be needed will vary on a day-to-day basis. SFD should review required non-response crew movements to determine the number of daytime units that may be needed. Although, as noted below, the overall benefit to the system is low, it will make a measurable improvement to individual station reliability.

Cost to implement: None unless additional daytime response units are placed in service.

If additional daytime response units are placed in service, several options are available with costing and service delivery impacts listed below:

Peak Activity Engine
12 hours/7 days per week - $975,000 with a projected overall impact to response times of 1%

40-Hours per week - $444,000 with a projected overall impact to response times of less than 1%

Peak Activity Squad
12 hours/7 days per week - $575,000 with a projected overall impact to response times of 0.30%
40-Hours per week - $260,000 with a projected overall impact to response times of 0.10%

Improvement Goal E: Explore opportunities to slow response workload growth

Response workload has grown by 32 percent between 2012 and 2016. Most of this has been the growth in requests for emergency medical services, also at 32 percent. During the previous six years EMS workload changed very little. It's not clear what has caused the recent increase in EMS workload. EMS workload has increased much faster than growth in population.

At this rate of growth, SFD will be unable to maintain service levels without new resources. Response workload is expected to more than double over the next 25 years. The city's ability to fund new resources to maintain service levels is limited.

Utilize data to reduce community risk
An emerging trend in the fire service nationally is a concept called Integrated Community Risk Reduction (CRR). CRR is an integrated approach to risk management that combines emergency operations and prevention strategies into a more comprehensive approach to reducing risks within the community.

The concept starts with the fire department evaluating its data to quantify community risk. These risks are not limited to structures. Risks can include high frequency emergency medical incidents, areas with significant wildland/urban interface exposure, or any risk that could generate a fire department response.

Once the community risks have been identified, each are prioritized based on frequency of emergency service demand, consequence to the victim, to the community, or to the local economy. Once risks are prioritized, strategies can be developed to mitigate the risks. These strategies are incorporated into a CRR plan that can integrate the resources of the fire department, partner agencies, and the community to implement the various strategies. After plan implementation, the results are reviewed to determine its impact on the risks. Adjustments are made as necessary based on the results and the process is refined and continuously re-implemented.

Risk can also be identified by station area. Station staff, in collaboration with fire prevention staff and community groups, can develop and manage a station area-specific CRR plan as a subset of the fire department's plan. CRR lends itself well to a volunteer supported effort, led by professional leadership.

For example, a review of EMS incident records might reveal that in one particular area of the community senior citizens are experiencing a large number of slip and fall injuries. The fire department could partner with senior citizen organizations to conduct in-home safety checks to identify and correct trip hazards.

SFD has identified that homeless shelters generate a significant number of EMS responses. SFD could work with each shelter to improve their level of first aid training, help identify the types of medical

conditions that generate an EMS response to identify strategies to mitigate those conditions, and work with individuals using the shelters to help improve their healthy living practices.

Implementing the CRR approach will not only improve the quality of life in the community but could also help reduce the fire department's response workload.

Cost to implement: Staff time and some material resources dependent on risks identified

Work with frequent users of EMS services to reduce utilization

Most fire service agencies have patients and facilities who routinely call multiple times for a response from the local fire department. While some of these patients are undoubtedly having acute medical challenges that require a response and assessment, many others have chronic illnesses and have become reliant upon first responders as their primary care provider. Still others are living alone but struggling to live independently, relying instead on first responders to address their routine challenges. A smaller subset may be relying upon first responders for social needs or may have mental health challenges that cause them to call inappropriately for first responders.

Fire agencies can also have significant response workload at single facilities such as nursing homes, assisted living and mobility-impaired resident facilities. Many calls for service are legitimate medical emergencies, while some are lift-assists where a mobility-impaired resident falls from bed and needs assistance getting back into bed. First responders in these cases perform a quick assessment of the latter group and place them back into bed. While this may seem to be an appropriate service to provide to the residents of such facilities, in many cases it is a liability shift and/or a staffing shift from a fee-for-service facility to the taxpayer-provided emergency responders. Further, it misuses critical emergency response resources to address decidedly non-emergent problems.

There are different approaches available to fire departments that experience the high frequency individual and the high frequency facility. These approaches are explained more fully in the two following subsections.

Responses to High Frequency Patients

A growing concept nationally is the community para-medicine program. The concept of this approach is to better support high frequency EMS system users. Community para-medicine is intended to decrease 9-1-1 over-users or abusers, decrease on-scene time for response units, and provide a higher level of service to customers.

There are a variety of models in use throughout the country. Some employ a single paramedic in a vehicle who conducts follow-up visits of patients recently released from the hospital. The purpose is to ensure the patient is taking appropriate medications, following up with their primary care physician, and to check the patient's overall well-being. These single paramedic units can also be dispatched to incidents known to be non-life threatening.

Other models team a paramedic with community social service workers who can also address other needs such as food, housing, mental health care, and the like.

Agencies that have successfully implemented a community para-medicine type program include Mesa, Arizona, which developed the concept; Spokane, Washington, Tualatin Valley Fire and Rescue, Oregon, and Bellevue, Washington.

Responses to High Frequency Facilities

There are a number of care facilities within Salem that generate frequent requests for emergency medical assistance. Some of these facilities have medical professionals on site. Others may not.

For facilities with qualified medical professionals the dispatch center does have the ability to send only an ambulance when all that is needed is transportation of the patient to a medical facility. SFD should review this practice to ensure it is working as effectively as it should be.

For facilities without qualified medical professionals a full response is typically sent to a request for emergency medical assistance. However, many of these requests can turn out to be lift-assists, or other minor problems.

SFD should work with managers of high frequency facilities to ensure fire department resources are not being overused. This may involve providing training to facility staff, modifying EMS system regulations to allow alternative response practices, and the like.

Cost to implement: $169,000 for 1.3 FTE for the community para-medicine program plus vehicle and equipment. It is expected that community health partners would likely provide subsidies for a program of this type.

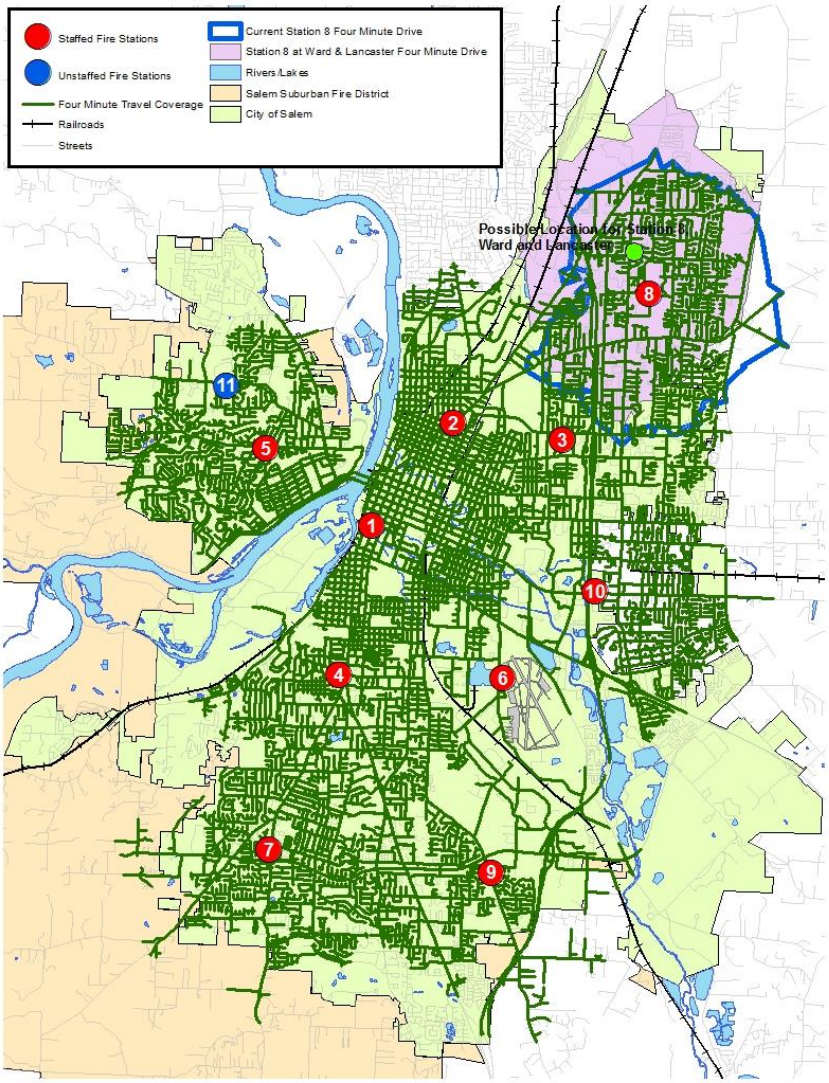
Improvement Goal F: Relocate Station 8 to a location that can better serve the City of Salem

SFD and Marion County Fire District No. 1 currently share space in Fire Station 8 located on the Chemeketa Community College campus. Both agencies operate fire engines from this location.

Egress from the campus station to the surrounding community is slow. As a result, much of the area within northeast Salem lies outside four-minute travel coverage.

SFD should consider relocating its response unit to a new facility located in the area of Lancaster Blvd. and NE Ward Dr. This location provides better access to areas within the city's northeast. It will also position SFD to serve areas inside the urban growth area but not yet annexed.

Figure 72: Proposed Station 8 Location and Travel Coverage



Cost to implement: $4.5 million for land acquisition and station construction

Improvement Goal G: Prepare for and request a rating review by the Insurance Services Office

The last Public Protection Class rating review by the Insurance Services Office was conducted in 2003. Although SFD's Class 2 rating is quite good, the rating is quite dated. There have been many system improvements since 2003.

Preparing for a rating review is a time intensive process. Much information needs to be assembled for the ISO reviewer. Also, it's unlikely that a lower rating would decrease the cost of fire insurance to

homeowners. Commercial properties would likely see a small decrease dependent on the insurance carrier.

When staff time is available, SFD should consider requesting an ISO rating review.

Cost to implement: Staff time

Improvement Goal H: Improve the capture and analysis of incident data

SFD regularly collects and evaluates incident data and prepares system performance reports. Staff also incorporate incident data with geographic information systems to provide a spatial view of performance.

Currently data is captured in two different records management systems (RMS). One is the dispatch center's computer aided dispatch (CAD) system. The other is the Oregon State Fire Marshal's on-line RMS. Data from both systems must be manually extracted and merged to develop a complete incident data base. This is a time intensive process and limits real-time evaluation of system performance.

SFD should acquire a new RMS system that can automatically extract CAD data and import it into the new RMS. The balance of needed data can be entered into the new RMS by response personnel.

This approach will streamline the data collection process. It will also allow the development of "dashboard" style real-time analysis.

Implementation of this Improvement Goal will require the acquisition of an appropriate RMS system. It will require integration with the dispatch center's CAD and the Fire and Life Safety Division's RMS, programming of real-time "dashboards", and preparation of needed report templates. Finally, staff will need to be trained in the systems use so that the system is populated with the most accurate and complete data.

Cost to implement: $60,000 for the acquisition and set-up of a new RMS system

Improvement Goal I: Continually evaluate response workload to determine when peak activity response units should be implemented

Fire stations should be located, staffed, and equipped to provide response resources using two primary considerations:

1. Provide sufficient resources to effectively intervene in predictable requests for emergency service.
2. Provide sufficient resources to ensure a reliable response to any predictable emergency service request.

The first consideration suggests that there should be sufficient resources available 24 hours per day to effectively respond to an incident based on risk. For example, resources should be deployed so that the full effective response force can be provided to a building fire in any area at any time of the day. In most of Salem that means a minimum of four fire engines, one ladder truck, and a battalion chief (14 firefighters total) should be available to respond and arrive within a set amount of time. In areas with much larger buildings, high-rise buildings, or other unusual risks, additional resources are needed 24 hours per day.

The second consideration suggests that during periods of higher incident activity, additional resources should be available to respond. The additional resources should be of the type necessary for predictable requests for service; in SFD's case, emergency medical incidents.

Dynamic deployment practices should be, and to a degree are now, used during unusual events such as predicted significant storms, special events with large gatherings of people, and the like. Since the likelihood of a response is greater during these events, additional resources are assigned and positioned where incidents are likely to occur.

This dynamic approach to deployment provides two benefits. First, additional response resources can be made available during times each are predictably needed. Second, since these resources are not needed or assigned during slower workload periods, the organization is maximizing its ability to match resources with system demand.

An analysis of response workload was conducted to determine if smaller, two person staffed peak activity response units would improve system response performance. The results of the analysis indicate that only a small benefit can be gained at present. However, as response workload increases peak activity units may have value.

Peak workload periods occur every day of the week. The following figure illustrates workload by station and by time of day during the study period. Workload is based on responses made by each unit assigned to the station. Since Station 11 is not operating, its responses are included with Station 5.

Figure 73: Incidents by Station and by Period of Day – 2016

Station	Incidents 9:00 am to 8:59 pm	Incidents 9:00 pm to 8:59 am	Incidents per hour 9:00 am to 8:59 pm	Incidents per hour 9:00 pm to 8:59 am
1	1604	754	0.37	0.17
2	1665	857	0.38	0.20
3	1958	1159	0.45	0.26
4	1288	738	0.29	0.17
5	1711	965	0.39	0.22
6	881	454	0.20	0.10
7	1491	832	0.34	0.19
8	781	504	0.18	0.12
9	1490	768	0.34	0.18
10	1423	721	0.32	0.16
11	NA	NA	NA	NA

A process called “queuing analysis” has been used to determine the number of units needed in each station area by time of day. This process utilizes probability analysis to determine the number of units needed in each station area to reduce the likelihood that a response unit would not be available to serve an incident to 10 percent or less. It uses the variables incidents per hour, number of available response units, and average time committed per incident.

Though very useful to this effort, queuing analysis has some limitations. It assumes that customers (incidents) arrive at a constant rate. This is not always true in emergency services. It also assumes that each customer requires an equal amount of time from servers (response units). While the average time committed to an incident was used for service time, some incidents require less or substantially more than the average.

The following figure illustrates the current deployment and proposed deployment for both daytime (9:00 am to 8:59 pm) and night-time (9:00 pm to 8:59 am) based on current station locations. The figure includes individual station workload based on unit responses and the current and proposed probability of wait analysis based on the current number of stations. Seven stations exceed 10 percent probability of wait during the day and two stations at night.

Figure 74: Current and Proposed Response Units

Station	Current Units Day	Current Units Night	Current Probability of wait - day	Current probability of wait - night	Proposed Units Day	Proposed Units Night	Proposed probability of wait - day	Proposed probability of wait - night
1	1	1	18.3%	8.6%	2	1	1.5%	8.6%
2	2	2	1.6%	0.5%	2	2	1.6%	0.5%
3	1	1	22.4%	13.2%	2	2	2.2%	0.8%
4	2	2	1.0%	0.3%	2	2	1.0%	0.3%
5	1	1	19.5%	11.0%	2	2	1.7%	0.6%
6	1	1	10.1%	5.2%	1	1	10.1%	5.2%
7	1	1	17.0%	9.5%	2	1	1.3%	9.5%
8	1	1	8.9%	5.8%	1	1	8.9%	5.8%
9	1	1	17.0%	8.8%	2	1	1.3%	8.8%
10	1	1	16.2%	8.2%	2	1	1.2%	8.2%
11	0	0	NA	NA	0	0	NA	NA
Total units	**12**	**12**		**Total units**	**18**	**14**		

This analysis suggests that to improve reliability, six additional response units would be needed during the day and two at night. Rather than adding additional fire engines or ladder trucks, smaller peak activity units would be proposed. These two person staffed response vehicles would be used as the only response unit for non-life threatening medical incidents as well as other incident types not requiring a full sized and staffed fire engine.

A second analysis was conducted using SFD's deployment modeling system. The results of that modeling were reviewed and verified by ESCI. The results indicate that overall system performance (percentage of time SFD met its response time goal), assuming all peak activity units were in place and operating, would only improve by 0.4 percent. This low of a percentage does not justify the expense of these resources.

SFD should periodically review system response workload and evaluate whether the cost of adding peak activity units can be justified by overall response system performance improvement.

Cost to implement: None

Improvement Goal J: Staff and operate a response unit from Fire Station 11

Staffing Station 11 has value for several reasons. It adds response capacity in West Salem to improve system reliability. It also improves effective response force capability. It reduces the number of times Engine 1 must cover concurrent incidents in West Salem. Finally, should the Willamette River bridges be unusable, the additional response unit improves service capability by being already positioned on the west side of the river.

An analysis of the system benefit to response time performance was conducted. The model indicated that response time performance against the City Council goal would improve by 2.6 percent system-wide.

SFD should staff Station 11 when finances allow. Doing so would also eliminate the need for a peak activity unit at Station 5.

Cost to implement:
Engine – *24 hours per day/7 days per week - $1,398,000. Analysis indicates that staffing Station 11 with an engine will result in a 2.6 percent increase in response time compliance.*

ALS Squad – *24 hours per day/7 days per week - $822,000. Analysis indicates that staffing Station 11 with a squad will result in a 1.2 percent increase in response time compliance.*

Improvement Goal K: Construct and staff Fire Station 12

As noted in previous sections, response workload will continue to increase within the current service area boundaries. To compound the issue, the city's boundaries are intended to change in the coming years. This will increase the geographic size of the fire department's service area and the number of people it serves. This will also mean an increase in response workload.

SFD built and opened two fire stations, Station 10 and Station 11. When both are staffed, these additions provided significant improvement to response coverage in both the West Salem area and east Salem. With the addition of Station 10, the SFD is well positioned to serve urban growth area along the city's eastern boundary. However, another area deserves consideration for a new fire station. Recent commercial/industrial development and near-term proposals for new development are contributing to increased workload and a degradation of overall system response time performance.

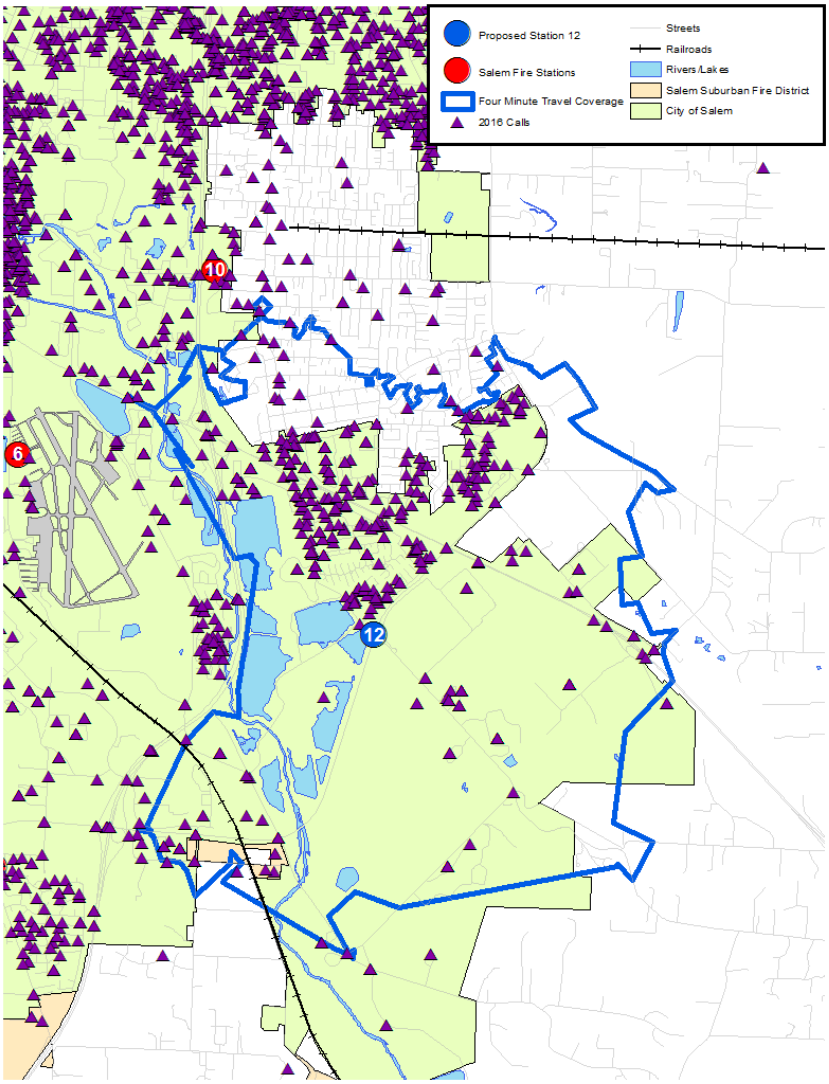
The Mill Creek Employment Center (north and south of Aumsville Highway east of Cordon Rd.) is a cooperative venture between the City of Salem and the State of Oregon. This area is slated for significant industrial development, including warehousing, manufacturing, and miscellaneous supporting uses. Infrastructure to support this level of development is largely in place and the land is being actively marketed to prospective developers. Surrounding the Mill Creek area is a significant inventory of vacant land zoned for residential and commercial use.

This area has seen the addition of large facilities with numerous employees such as FedEx, Home Depot, and others. Amazon recently announced intent to locate a 1 million square feet fulfillment center in this area employing up to 1,000 full-time workers.

Population, whether transient, residential, or employment, increases demand on fire department services. The past and expected future growth in this area has increased the need for new fire department capability to serve it.

The following map shows the proposed location for the Cordon Road/Aumsville Highway station (Station 12), adjacent stations, incident locations during 2016 and four-minute travel coverage from the proposed location.

Figure 75: Proposed Location for Fire Station 12



During 2016 there were 1,260 incidents within the Station 12 coverage area. The number of responses by type is shown in the following table.

Figure 76: Incidents by Type – Station 12 Area

Incident Type	2016
Emergency medical	573
Non-emergency medical	396
Structure fire	6
Other fire	14
Other incidents	271
Total	**1260**

Response time performance to priority incidents was calculated and is shown in the following table. Responses times are significantly longer than the City Council defined response time goal

Figure 77: Response Time by Incident Type – Station 12 Area

Incident Type	Response Time at 85th percentile	Percentage of Incidents Meeting Council Goal
Emergency medical	7 min 47 sec	44%
Structure fire	7 min 46 sec	33%

System response time was modeled to determine the extent to which Station 12 would improve system performance. The results of that analysis indicate compliance with the 5 minute 30 second response goal would increase by 4 percent.

Predictable response increases, combined with this location's ability to provide second due support to the Fire Station 6, 9, and 10 response areas, will make this station and response company a valuable addition to the SFD deployment system.

It is important to note that the projected increase in response time compliance noted above is for Station 12 only. Overall response time compliance with both Station 11 and 12 staffed is projected to improve by 5.1 percent.

Cost to Implement:
One-time capital costs (station, apparatus, equipment) - $5 million

Personnel costs:
***Engine** – 24 hours per day/7 days per week - $1,398,000. Analysis indicates that building and staffing Station 12 with an engine will result in a 4 percent increase in response time compliance.*

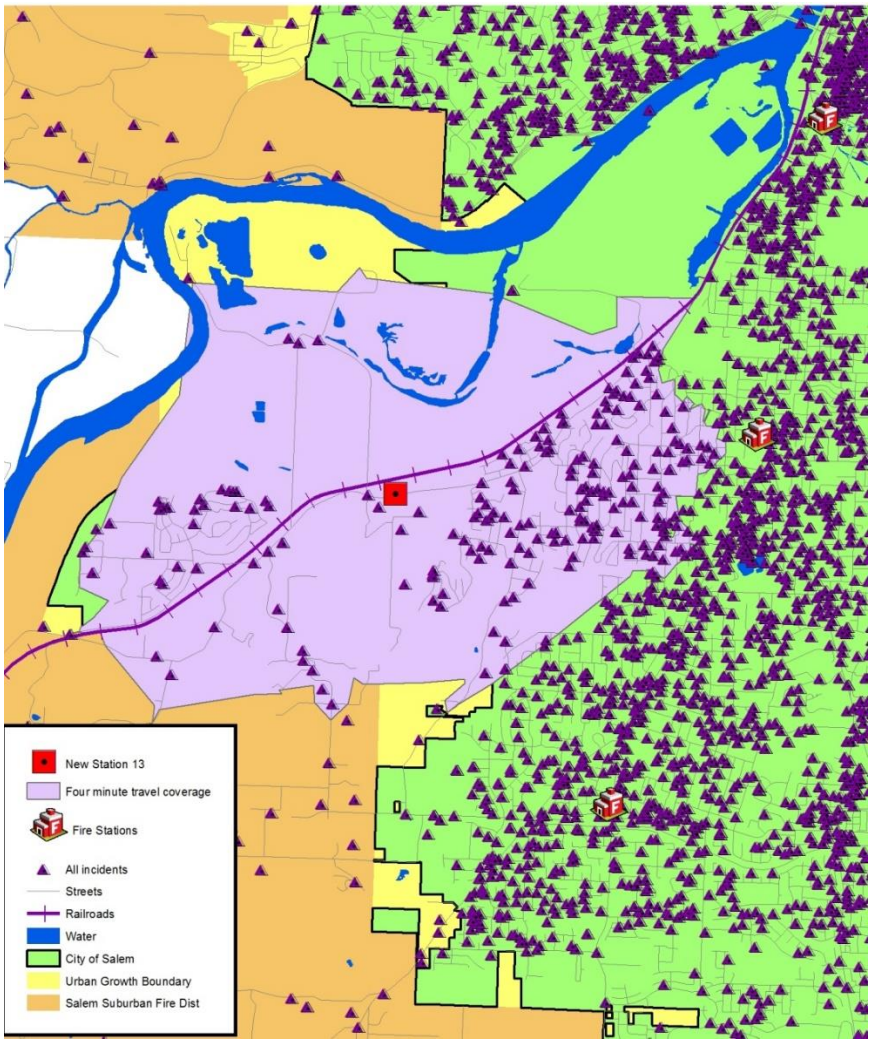
***ALS Squad –** 24 hours per day/7 days per week - $822,000. Analysis indicates that building and staffing Station 12 with a squad will result in a 2.6 percent increase in response time compliance.*

Improvement Goal L: Plan for the addition of Station 13

(Note: The following is carried forward from the 2011 Salem Fire Department Standards of Cover plan. Data has not been updated but likely has changed very little.)

The following map shows the proposed location for the River Road/Homestead Road station (Station 13), adjacent stations, incident locations during 2010, and the four-minute travel coverage area for Station 13.

Figure 78: Proposed Location for Fire Station 13



The population within the station's service area is approximately 1,762, based on the 2000 Census. Responses during 2010 within the River Road station service area are summarized below.

Figure 79: Incidents by Type – Station 13 Area

Incident Type	2010
Emergency medical	173
Structure fire	4
Other fire	2
Other incidents	88
Total	**267**

Emergency incident response times to this area rarely meet the Council's response time goal. The table below summarizes response time for priority incidents for 2010.

Figure 80: Response Time by Incident Type – Station 13 Area

Incident Type	Response Time at 85th Percentile	Percentage of Incidents Meeting Council Goal
Emergency medical	**8 min 54 sec**	**49%**
Structure fire	**7 min 48 sec**	**13%**

Response activity and workload is closely tied to population. South Salem is expected to experience significant development activity and corresponding population growth in the coming years. Some of this development will occur within the River Road station "first-due" service area.

The development potential within the station's service area is shown in the following table. The area's zoning is a mix of rural/agricultural (RA), single-family residential (RS), and public amusement (PA).

Figure 81: Land Inventory – Station 13 Area

Land Type	Acres
Total acreage within station service area	3,200
Less: Acreage within designated flood area	1,342
Less: Area zoned as Public Amusement	218
Less: 50% of area with slopes in excess of 25%[8]	113
Less: Street right-of-way	174
Less: Land already developed	329
Net Developable Land	**1,024**

[8] Only a portion of land with slopes greater than 25% will be developable. It is assumed that 50% could be developed through re-grading and retention

Potential development density and how population growth would affect emergency response workload are shown in the next table. The analysis assumes all 1,024 developable acres would be developed at the densities listed.

Figure 82: Development Potential – Station 13 Area

Units per acre	Potential dwelling units	New population at 2.5 persons per household	Existing population	Total population	Total potential responses
5	5,120	12,800	1,762	14,562	1,238
4	4,096	10,240	1,762	12,002	1,020
3	3,072	7,680	1,762	9,442	803
2	2,048	5,120	1,762	6,882	585

It's very unlikely that development densities of five units per acre would be achieved given slope and other constraints. A more reasonable assumption is three units per acre.

Total response activity at three units per acre is estimated at 803 incidents per year. This quantity of responses, by itself, would not justify the addition of a fire station, staffing, and other associated costs. However, response times will not improve unless response resources are located more closely to the area.

The pace at which development of this area will occur cannot be accurately predicted. A variety of influences, such as the overall health of the economy, will impact growth. The population growth projection used for the Salem Transportation System Master Plan for south Salem is 58 percent between the years 1993 and 2015, and 40 percent for the city as a whole. Applying the 58 percent figure to the existing figures projects that population within the Station 13 area will increase to 2,784 by the year 2015. Response activity for this population is forecast to be 237 incidents.

In conclusion, it's unlikely that response workload created by future development will drive the addition of the River Road station. Addressing the currently existing response time problem will be the primary motivation for a future investment in fire station facility, apparatus, and the ongoing cost of staffing.

Component I – Appendices, Exhibits, and Attachments

Appendix A – Hazard Vulnerability Analysis

STRUCTURE FIRES

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Moderate Risk Urban	1	3	2	3	1	1	1	**20%**
High Risk Urban	1	3	3	3	1	1	1	**22%**
Moderate Risk Suburban	2	3	2	2	1	1	1	**37%**
High Risk Suburban	1	3	2	2	1	1	1	**19%**
Moderate Risk Rural	2	3	3	2	1	2	2	**48%**
High Risk Rural	0	0	0	0	0	0	0	**0%**
Low Risk Rural	1	3	2	1	1	2	2	**20%**
AVERAGE SCORE	**1.14**	**2.57**	**2.00**	**1.86**	**0.86**	**1.14**	**1.14**	**20%**

NON-STRUCTURE FIRES

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
High Risk Urban	1	1	1	1	1	1	1	**11%**
Moderate Risk Urban	1	1	1	1	1	1	1	**11%**
Low Risk Urban	1	1	1	1	1	1	1	**11%**
Urban/Wildland Interface	1	1	1	1	1	1	1	**11%**
AVERAGE SCORE	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**11%**

EMS-MEDICAL ASSISTS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
High Risk	1	3	0	0	1	1	1	**11%**
Moderate Risk	2	2	1	1	2	1	1	**30%**
Low Risk	3	1	0	0	1	1	1	**22%**

RESCUE

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Rescue - MVA	3	3	1	0	1	1	1	**39%**
Rescue - Structural Collapse	1	3	3	3	1	1	1	**22%**
Rescue - Trench	1	3	1	1	1	1	1	**15%**
Rescue - Low/High Angle	1	3	1	1	1	1	1	**15%**
Rescue - Confined Space	1	3	1	1	1	1	1	**15%**
Rescue - Swiftwater	2	3	0	0	1	1	1	**22%**
Rescue - Stillwater	2	3	0	0	1	1	1	**22%**
Rescue - Ice	0	0	0	0	0	0	0	**0%**
Rescue - Other	1	2	0	0	2	2	2	**15%**
AVERAGE	**1.33**	**2.56**	**0.78**	**0.67**	**1.00**	**1.00**	**1.00**	**17%**

HAZARDOUS MATERIALS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
High Risk Hazmat - Urban	1	3	3	3	1	1	1	**22%**
Moderate Risk Hazmat - Urban	2	2	2	2	1	1	1	**33%**
Low Risk Hazmat - Urban	2	2	2	2	1	1	1	**33%**
High Risk Hazmat - Suburban	1	3	3	3	1	1	1	**22%**
Moderate Risk Hazmat - Suburban	2	2	2	2	1	1	1	**33%**
Low Risk Hazmat - Suburban	2	1	1	1	1	1	1	**22%**
High Risk Hazmat - Rural	1	3	3	3	1	1	1	**22%**
Moderate Risk Hazmat - Rural	1	2	2	2	1	1	1	**17%**
Low Risk Hazmat - Rural	1	1	1	0	1	1	1	**9%**
AVERAGE	**1.44**	**2.11**	**2.11**	**2.00**	**1.00**	**1.00**	**1.00**	**25%**

NATURALLY OCCURRING EVENTS

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Hurricane	0	0	0	0	0	0	0	**0%**
Tornado	1	1	2	2	2	2	2	**20%**
Severe Thunderstorm	2	1	1	1	2	2	2	**33%**
Snow Fall	1	1	1	1	2	2	2	**17%**
Blizzard	1	1	1	1	2	2	2	**17%**
Ice Storm	1	1	1	1	2	2	2	**17%**
Earthquake	2	2	2	2	2	2	2	**44%**
Tidal Wave	0	0	0	0	0	0	0	**0%**
Temperature Extremes	1	1	1	1	2	2	2	**17%**
Drought	1	1	1	1	2	2	2	**17%**
Flood, External	2	1	2	2	2	2	2	**41%**
Wild Fire	1	1	1	1	2	2	2	**17%**
Landslide	1	1	1	1	2	2	2	**17%**
Dam Inundation	1	1	1	1	2	2	2	**17%**
Volcano	1	1	1	1	2	2	2	**17%**
Epidemic	1	2	0	2	2	2	2	**19%**
AVERAGE SCORE	**1.06**	**1.00**	**1.00**	**1.13**	**1.75**	**1.75**	**1.75**	**16%**

TECHNOLOGIC EVENTS

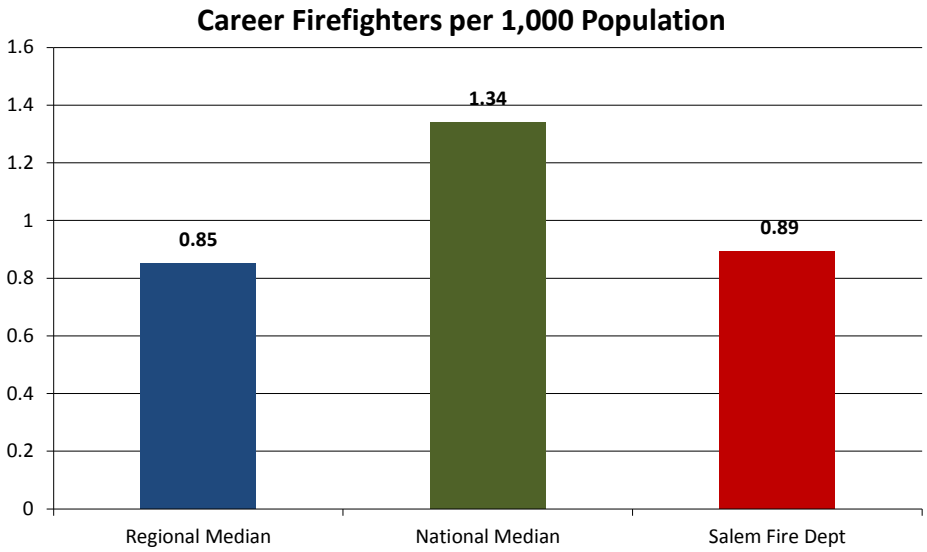
EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Electrical Failure	1	1	1	1	2	2	2	**17%**
Generator Failure	1	1	1	1	2	2	2	**17%**
Transportation Failure	1	1	1	1	2	2	2	**17%**
Fuel Shortage	1	1	1	1	2	2	2	**17%**
Natural Gas Failure	1	1	1	1	2	2	2	**17%**
Water Failure	1	1	1	1	2	2	2	**17%**
Sewer Failure	1	1	1	1	2	2	2	**17%**
Steam Failure	1	1	1	2	2	2	2	**19%**
Fire Alarm Failure	1	1	1	1	2	2	2	**17%**
Communications Failure	1	1	1	1	2	2	2	**17%**
Medical Gas Failure	1	1	1	1	2	2	2	**17%**
Medical Vacuum Failure	1	1	1	1	2	2	2	**17%**
HVAC Failure	1	1	1	1	2	2	2	**17%**
Information Systems Failure	1	1	1	1	2	2	2	**17%**
Fire, Internal	1	1	1	1	2	2	2	**17%**
Flood, Internal	1	1	1	1	2	2	2	**17%**
Hazmat Exposure, Internal	1	1	1	1	2	2	2	**17%**
Supply Shortage	1	1	1	1	2	2	2	**17%**
Structural Damage	1	1	1	1	2	2	2	**17%**
AVERAGE SCORE	**1.00**	**1.00**	**1.00**	**1.05**	**2.00**	**2.00**	**2.00**	**17%**

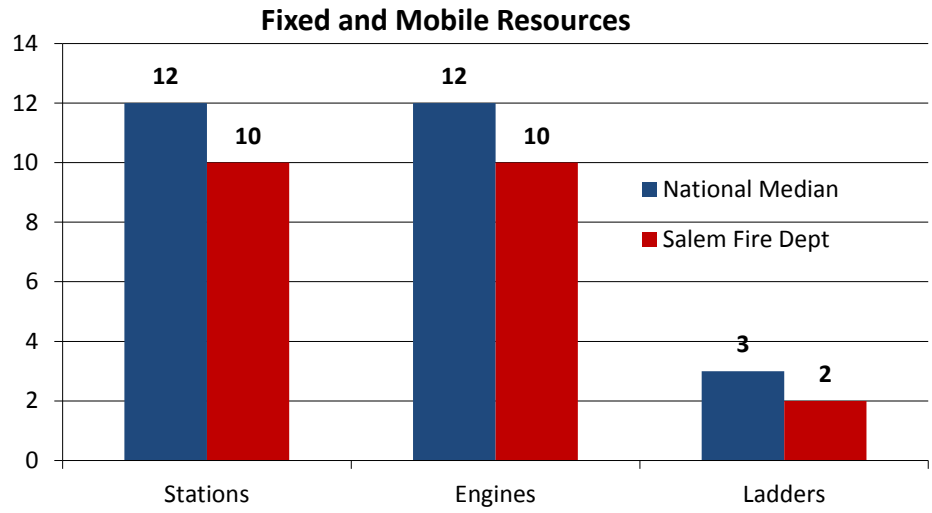
HUMAN RELATED EVENTS

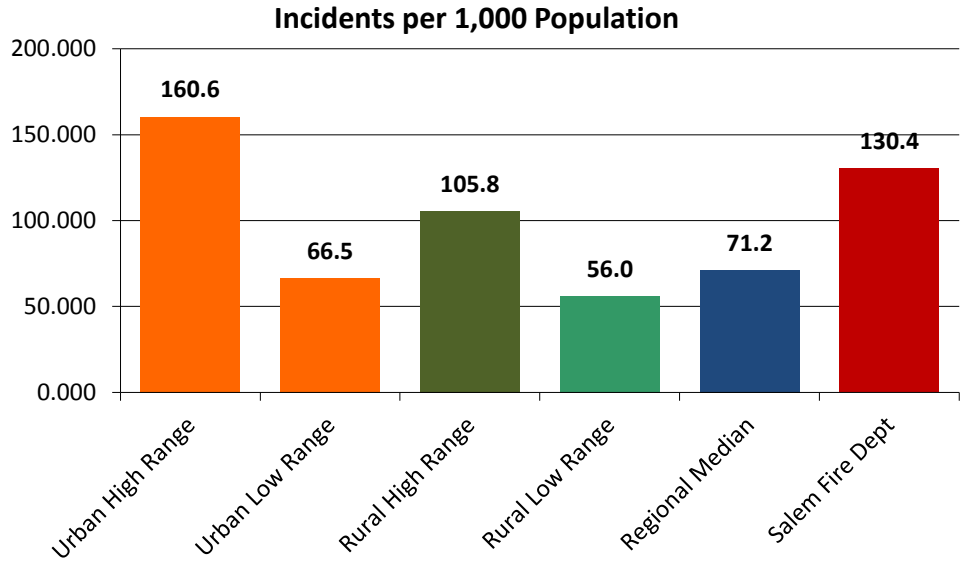
EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)						RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	PREPARED-NESS	INTERNAL RESPONSE	EXTERNAL RESPONSE	
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interuption of services*	*Preplanning*	*Time, effectivness, resouces*	*Community/ Mutual Aid staff and supplies*	*Relative threat**
SCORE	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= Low 2 = Moderate 3 = High*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 = N/A 1= High 2 = Moderate 3 = Low or none*	*0 - 100%*
Mass Casualty Incident (trauma)	1	3	3	3	1	1	1	**22%**
Mass Casualty Incident (medical/infectious)	1	2	1	2	1	1	1	**15%**
Terrorism	1	3	3	3	2	2	2	**28%**
VIP Situation	1	1	1	1	2	2	2	**17%**
Infant Abduction	1	1	1	1	2	2	2	**17%**
Hostage Situation	1	3	1	1	2	2	2	**20%**
Civil Disturbance	1	1	2	2	2	2	2	**20%**
Labor Action	1	1	2	1	2	2	2	**19%**
Forensic Admission	1	1	1	1	2	2	2	**17%**
Bomb Threat	1	1	1	1	2	2	2	**17%**
AVERAGE	**1.00**	**1.70**	**1.60**	**1.60**	**1.80**	**1.80**	**1.80**	**19%**

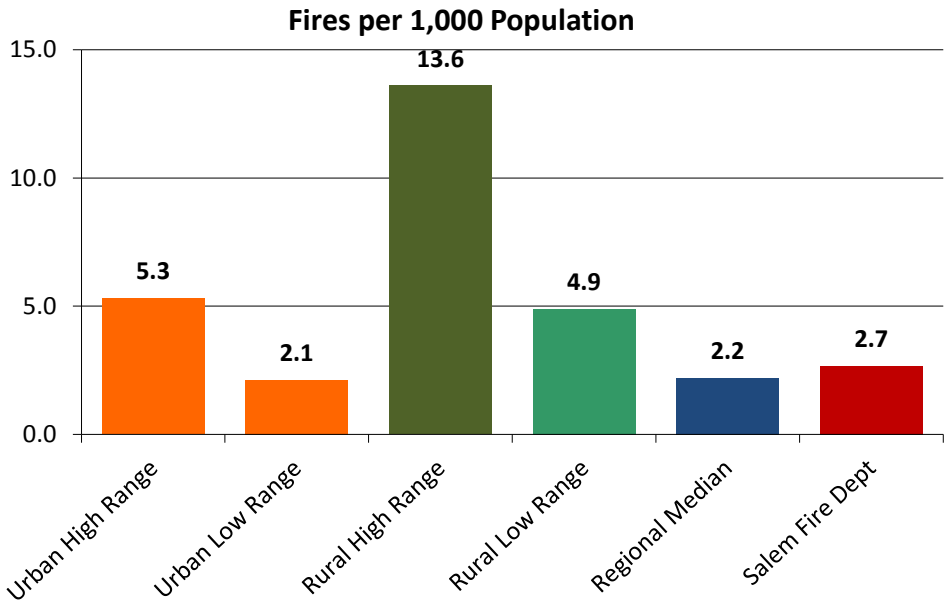
Appendix B – Salem Fire Department Compared to Others

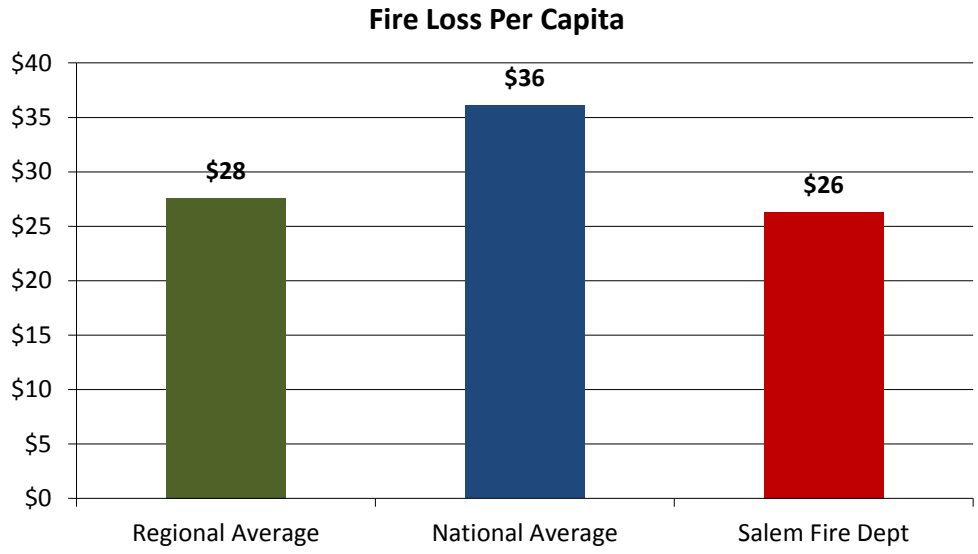
The following charts provide a comparison of the Salem Fire Department to other similar fire service agencies. Comparable information is derived from several sources including the National Fire Protection Association.






Incidents per 1,000 Population
200.000
150.000
100.000
50.000
0.000
160.6
66.5
105.8
56.0
71.2
130.4
Urban High Range
Urban Low Range
Rural High Range
Rural Low Range
Regional Median
Salem Fire Dept


Fires per 1,000 Population
15.0
10.0
5.0
0.0
5.3
2.1
13.6
4.9
2.2
2.7
Urban High Range
Urban Low Range
Rural High Range
Rural Low Range
Regional Median
Salem Fire Dept


Fire Loss Per Capita
$40
$35
$30
$25
$20
$15
$10
$5
$0
$28
$36
$26
Regional Average
National Average
Salem Fire Dept

Appendix C – Fire Station Descriptions

Salem Fire Department Station 1

370 Trade Street SE

Built in 1971, this two-story 12,204 square foot headquarters fire station consists of eight drive-through bays. This fire station has recently been completely remodeled and is located in the downtown core. This building is located on the City Hall property.

Design:	Modern fire station with above average amenities for staff and operations.
Construction:	Type I, cast in place concrete construction with a flat built up membrane roof reported to be in good condition. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 2

875 Madison Street SE

Built in 1977, this single story, 6,378 square foot fire station consists of four drive-through and one back in apparatus bay. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, brick construction with modified gable roof and composition shingles. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 3

1884 Lansing Avenue NE

Built in 1970, this single story, 4,887 square foot fire station consists of four drive-through apparatus bays. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, wood framed construction with a gable roof that has composition shingles. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 4

200 Alice Street SE

Built in 1974, this single story, 6778 square foot fire station consists of two drive-through and one back in double deep apparatus bay. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, brick construction with modified gable roof and composition shingles. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 5

1520 Glen Creek Road NW

Built in 2008, this single story 10,481 square foot fire station consists of four drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 6

2740 25th Street SE

Built in 1966, this single story, 4087 square foot fire station consists of three drive-through apparatus bays. This fire station is located on the grounds of the Salem Airport and is an industrial area. This location also houses the Training and EMS divisions in a adjoining building along with the Fire Training Tower. This fire station has recently been completely remodeled.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, masonary block construction, flat roof with built up membrane. Recent remodel includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is locally monitored for smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 7

5021 Liberty Road S

Built in 2008, this single story 10,481 square foot fire station consists of eight drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 8

4000 Lancaster Drive NE

Built in 1977, this single story, 10,289 square foot fire station consists of two drive-through apparatus bays. Salem Fire Department occupies 1,585 square feet of space and shares another 1,282 square feet of living space. This building is home to two different fire engines from different fire departments and the main home of the fire protection program of the local community college.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type III, brick construction with a flat roof with a built up membrane.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 9

5080 Battlecreek Road SE

Built in 1982, this two-story, 4,000 square foot fire station consists of three back in apparatus bays. This facility has recently been remodeled for modern earthquake standards and is located in a residential area.

Design:	Medium aged fire station with average amenities for staff and operations.
Construction:	Type V, wood framed with gable roof and composition shingles. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

	**<u>Salem Fire Department Station 10</u>** **3611 State Street** Built in 2008, this single story 10481 square foot fire station consists of four drive-through apparatus bays. This building is located in a residential area.
Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.

Salem Fire Department Station 11

1970 Orchard Heights Road NW

Built in 2008, this single story 10,481 square foot fire station consists of four drive-through apparatus bays. This building is located in a residential area.

Design:	Brand new fire station with above average amenities for staff and operations.
Construction:	Type V, wood framed construction with a gable roof and composition shinges. Includes seismic accomodations to withstand a 7.0 magnitude earthquake. Station also has emergency generator power with enough power for the entire station.
Safety:	Building is 100% sprinklered and monitored externally for heat and smoke.
Environment:	No issues noted.
Code Compliance:	No issues noted.
Staff Facilities:	Adequate space for working on or around apparatus and adequate space provided for living, eating, and hygiene.
Efficiency:	No issues noted.