REDMOND, WASHINGTON

COMMUNITY RISK ASSESSMENT & STANDARDS OF COVER

REDMOND FIRE DEPARTMENT

2022 - 2027

This Standards of Cover (SOC) document provides a complete and objective assessment of the risks and needs of the community served by the Redmond Fire Department. It includes a detailed account of the areas served, services provided, response history, risk assessment, performance goals & more.

This detailed analysis will help fire department members, elected officials and other important decision makers make informed choices about the level of emergency services appropriate for the community.

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EXECUTIVE SUMMARY

In early 2021, the Redmond Fire Department (hereinafter "RFD"), under the direction of Fire Chief Adrian Sheppard, initiated a program to objectively evaluate the fire department's value to the community. The program involved the development of a master plan, a strategic plan, and a standards of cover report. The RFD sought to ensure that the current level of agency performance met the expectations of the community they serve, and that the methodologies used to evaluate community risk and response were aligned with the performance goals, performance objectives, and outcome measures established by the fire department administration and the community-driven strategic planning process.

The Commission on Fire Accreditation International (CFAI) defines a fire department's Standards of Cover (SOC) document as the "adopted written policies and procedures that determine the distribution, concentration and reliability of fixed and mobile response forces for fire, emergency medical services, hazardous materials and other technical types of responses." An honest and objective assessment of the risks gives the elected body and city administrators confidence that their fire department meets the needs and expectations of the community. Applying a proven and consistent risk model is essential for a fire department to develop an SOC performance document that has credibility with the community and all its stakeholders.

An agency is responsible for providing the city's decision-makers with an educated calculation of the expected risk, the resources available to respond to that risk, and what outcomes can be expected. All these factors play a role in providing the community's emergency services. Fire departments that do not apply a valid risk assessment model to their community are not able to adequately educate their community leaders of their true needs. The application of a tested risk assessment model allows the fire department and elected officials to make educated decisions about the level of emergency service they desire.

RFD is committed to the philosophy of risk management embedded within and modeled after the fire service accreditation process. This risk assessment is crucial to the operation of the fire department. In addition, the process of performing continuous risk assessment of the community provides vital information for first responders, elected officials, city administrators and residents.

RFD uses a community risk and hazard valuation methodology to determine fire risk within the community. This analysis uses building occupancy classifications to establish base risk ratings on occupancy classification. Moderating values for the presence of automatic sprinkler systems, fire pumps, and standpipes were included to reduce the occupancy classification base risk rating. These datapoints create a quantifiable risk-rating matrix that was used to categorize 2,990 occupancies into high and low risks. Using Occupancy Classification is an effective and accepted practice.

However, it likely overstates community fire occupancy-related risk. Therefore, other local data was included, such as call volume, location of calls, assessed value and community impact (economic, cultural, environmental). Other pertinent geographic information system (GIS) data was also used to determine the best possible deployment model of fire department assets throughout the community. Armed with this information, RFD leaders, elected officials, and residents can make more educated decisions about the level of emergency service they can anticipate.

This SOC represents commitment to a comprehensive assessment of our community's risks. The key elements of this SOC include levels of service to be provided, analysis of current response capabilities by geographic area, and recommendations to maximize efficiency of all resources to obtain the best possible emergency response while keeping consistent with community expectations. The RFD evaluated the performance of the first arriving unit (distribution) and the arrival of the effective response force (ERF; concentration). ERF is the minimum number of personnel, equipment, and apparatus

needed to mitigate a given type of incident and its level of risk (low, moderate, and high/special).

Additionally, in October 2021, the RFD completed a community-driven strategic planning session to establish goals, objectives, and outcome measures for the next five years. RFD exists to make things better. By uncovering blind spots, incorporating best practices, and ensuring transparency, RFD will be deliberate and proactive in meeting community expectations. RFD is dedicated to providing the best service and outcomes possible within the limits of funding and resource allocation, making our community a safer and better place to live, work, and play.

Summary of Observations and Recommendations

Overall, the RFD is performing well within the current system. The community enjoys high-quality services from a professional and well-trained department. Predominantly, the Department's distribution and concentration delivery models are appropriately aligned with the City's unique risks. Yet, they are challenged to meet growing demands and to improve performance within the current distribution of stations, especially in light of the rapid vertical development occurring within the city. Much of the success in the fire protection efforts so far can be attributed to early adoption of fire prevention best practices such as sprinkler systems, regular inspections, and proper enforcement of the fire code. Historically, the practice of cross-staffing units has provided operational and fiscal efficiencies. However, population and workload has grown over the years will create the need to provide distinctively staffed units in the future. Finally, there are areas that have been identified where the Department could make incremental system adjustments to improve.

All recommendations were subcategorized as either a Specific Recommendation or a Strategic Recommendation. In this report, Specific Recommendations are projects or efforts with a narrow and objectively measurable outcome with usually a shorter

implementation period. Strategic Recommendations are considered broader in nature, with outcomes that are more difficult to quantify fully but are generally considered to result in a positive impact on the organization overtime.

Observations

- There is a significant gap in fire suppression capabilities in the areas served by fire stations 16 and 17.
- Fire prevention and community risk reduction planning efforts have been highly effective so far but are no longer keeping pace with population and occupancy growth.
- Travel time is no longer an adequate measurement of performance due to the growing number of people above the third floor throughout the jurisdiction.
- Cross-staffed units experience extended turnout times as compared to units with dedicated staff.
- Using "time to intervention" is the best measurement for community outcomes.
- Overall, the performance by NORCOM is one of the best in the industry as compared to the national fire service experience.
- The City of Redmond and the areas served by the Medic One program have had one of the best out-of-hospital cardiac arrest survival rates in the nation for almost two decades.
- Results suggest that a four-station configuration can serve the City of Redmond efficiently with a 4-minute travel time if the stations are properly relocated.
- Results suggest that the current three-station configuration can serve Fire District 34 efficiently with an 8-minute travel time.

Specific Recommendations

- Add (1) additional firefighter daily to upstaff Station 17 with a full engine company and a cross-staffed Aid Car.
- Add a new engine company to Station 16, move Ladder 16 to Fire Station 11.
- Relocate Fire Station 12 to an area more efficient and effective in providing coverage to the areas of Overlake and Idylwood.
- Use outcome measurements as the primary measurement of fire department performance.
- Use pre-determined and objective criteria and measurements for opening (or closing) a fire station or adding (or removing) response units.

Strategic Recommendations

- Redesign the response system within the urban core to meet a 4-minute travel time for Fire/EMS units.
- Prepare a modified response model in case Fire District 34 chooses to close Fire Station 13.
- Relocate Fire Station 11 to the area northwest of downtown on the west side of the Sammamish River (near Willows Road) and built a new Fire Station 19 in the area southeast of downtown Redmond (near Avondale Way).
- Add an engine company (possibly move Engine 16) to the new Fire Station 19.
- Analyze adding Aid Cars to stations to lessen the practice of cross-staffing and improve response times.

Description of Community Served

Introduction

The Redmond Fire Department is a full-service emergency services organization providing fire suppression, emergency medical services (EMS) first response and transport, technical rescue, hazardous materials, and prevention and life safety services to the residents, visitors and transitory workforce of the City of Redmond and King County Fire District 34.

The Department serves a total area of 266 square miles between the City of Redmond (17 sq mi), King County Fire District 34 (28 sq mi), and the EMS response area served by the Medic One program (with a population of over 333,000). The RFD serves the area from seven fixed-facility fire stations strategically located throughout the City of Redmond and Fire District 34.

There are also medical response units assigned to additional facilities outside the fire suppression response jurisdictions. Emergency communications/dispatch services (911) are provided by Northeast King County Regional Public Safety Communication Agency (NORCOM), a regional fire/EMS service center located in Bellevue.

Legal Basis

The City of Redmond was incorporated on December 31, 1912. The City is governed by a mayor-council form of government with the mayor and the seven council members elected at-large on staggered four-year terms. Under Washington state law, the city operates as a Non-Charter, Code City. The Redmond Fire Department was established through the City of Redmond Ordinance No. 503 on October 7, 1969. According to the ordinance, the Fire Department is to be headed by a Fire Chef appointed by the mayor.

History of the Agency

In 1948, the King County Fire Protection District 34 was formed to provide fire protection services to the unincorporated area east of the City of Redmond, as well as the city itself. During this time, King County Fire District provided services to the City of Redmond in the early years of the organization. The Redmond Fire Department was formally established on October 7, 1969.

In December 1969, due to the growth of the City, the contract with District 34 was reversed and the City began to provide services to District 34. The contract has been renewed every few years since 1969 and will expire on December 31, 2022.

Fire District 34 is currently governed by a three-member Board of Commissioners who are elected to six-year terms. The District is approximately 28 square miles and has an estimated population of 23,885 residents. Fire protection services are provided from three fire stations located within the District.

Today the Redmond Fire Department is contracted to provide fire protection services to King County Fire Protection District 34 and provide Advanced Life Support services to all northeast King County through the Medic One program.

King County Medic One

The City of Redmond has an Interlocal Agreement with King County to provide Advanced Life Support (ALS) services to the cities of Redmond, Duvall, Kirkland, Woodinville, as well as Fire District 34 and other unincorporated portions of Northeast King County.

The Redmond Fire Department is the lead agency for the Northeast King County Medic One response area that includes 266 square miles and a population of over 333,000 residents. The City of Redmond and King County Fire District 34 are responsible for Basic Life Support (BLS) treatment and transport.

Financial Basis[1]

Overview

The budget is a tool with which the city allocates its financial, human, and capital resources in an effective and efficient manner to meet residents' needs. Through the budget process, the city makes decisions on the allocation of human and financial resources to achieve long- and short-term goals and objectives as set forth by the City Council.

The City of Redmond prides itself on being fiscally responsible and providing financial transparency. As a long-standing recipient of the Distinguished Budget Presentation Award presented by the Government Finance Officers Association (GFOA), the City of Redmond and RFD have maintained an excellent level of service for many years through conservative financial management.

The City of Redmond operates on a biennial budget starting on the first day of odd-numbered years and ending on the last day of the second year (i.e., January 1, 2021, to December 31, 2022). Budget preparations begin each January of the second fiscal year starting with a long-term financial strategy review.

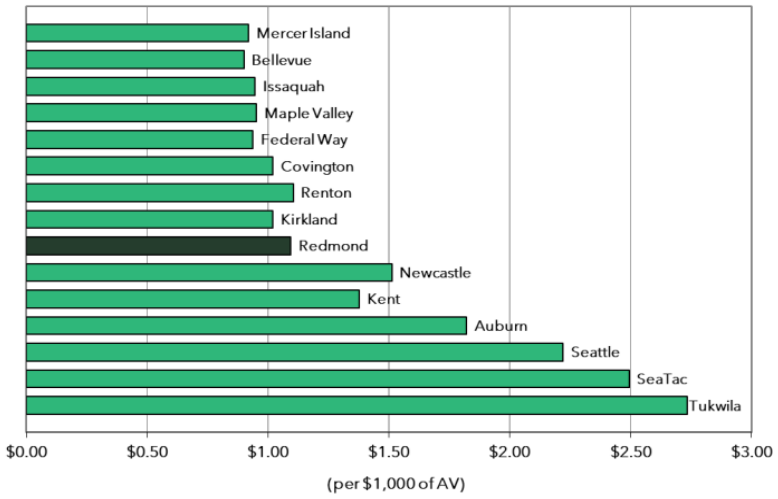
[1] City of Redmond FY 2020-2021 Biennial Budget-https://www.redmond.gov/DocumentCenter/View/17433/1-2021-2022-Adopted-Budget-PDF

The City of Redmond uses a budgetary process known as Budget by Priorities, which uses community feedback to align financial and personnel allocations with community expectations. Also, unique to the City of Redmond is use of a ratio measurement called Price of Government to evaluate the balance between revenues (price) received versus total personal income (personal income x population). The current ratio is 5.6% with a historical range between 5% and 6%.

After extensive financial analysis and outreach to the community to derive the budget priorities, the Council and Mayor provide direction to each department for their respective budget request, which is completed within approximately six months. The first draft of the proposed biennial budget is presented to Council by October, with final adoption occurring by December.

The two main sources of revenue for the city come from property and sales tax. However, the fire department also receives significant long-term funding from Medic One, Fire District 34 and fees associated with fire prevention and plan review. Short-term, RFD is receiving a significant source of revenue from the Microsoft campus remodel (refresh) and the construction projects associated with Sound Transit and the arrival of light rail into the downtown.

Figure 1: Levy Rate Comparisons



The budget for RFD is found primarily in the General Fund. However, there are a number of other funding sources such as the Medic One levy and the District 34 contract. The General Fund accounts for the revenues and expenditures necessary to carry out basic governmental activities of the City such as police and fire protection, recreation, and legal and administrative services.

The FY 2021-2022 budget for the Department is $49,592,403, which comprises approximately 17% of the General Fund expenditures. The total RFD budget, counting all sources and funds, is $70,323,324 and represents approximately 9% of the Grand Total of funds.

Table 1: Departmental Budgets by Fund Type – FY 2021-2022

Departmental Budgets by Fund Type

Departments	General Fund	Special Revenue	Debt	General Government Capital	Utility Capital	Utility Operations	Internal Service	Grand Total
Executive	$ 8,267,320	$ 587,960	$ -	$ -	$ -	$ 557,539	$ -	$ 9,412,819
Finance	105,947,519	43,655,402	9,583,033	49,624,528	58,181,136	41,512,220	43,297,324	351,801,162
Fire	49,592,403	19,183,584	-	1,547,337	-	-	-	70,323,324
Human Resources	3,370,298	-	-	-	-	-	3,792,210	7,162,508
Parks	27,210,075	722,194	-	18,364,261	-	-	-	46,296,530
Planning	32,470,715	7,947,708	-	-	-	4,893,788	-	45,312,211
Police	41,514,962	-	-	-	-	-	-	41,514,962
Public Works	25,973,216	3,052,547	-	22,195,214	47,176,028	96,366,126	5,489,646	200,252,777
Technology and Information Systems	-	-	-	-	-	-	23,103,404	23,103,404
Grand Total	$ 294,346,508	$ 75,149,394	$ 9,583,033	$ 91,731,340	$ 105,357,164	$ 143,329,673	$ 75,682,585	$ 795,179,696

Figure 2: Revenues by Type – All Funds 2021-2022 ($795.2 Million)

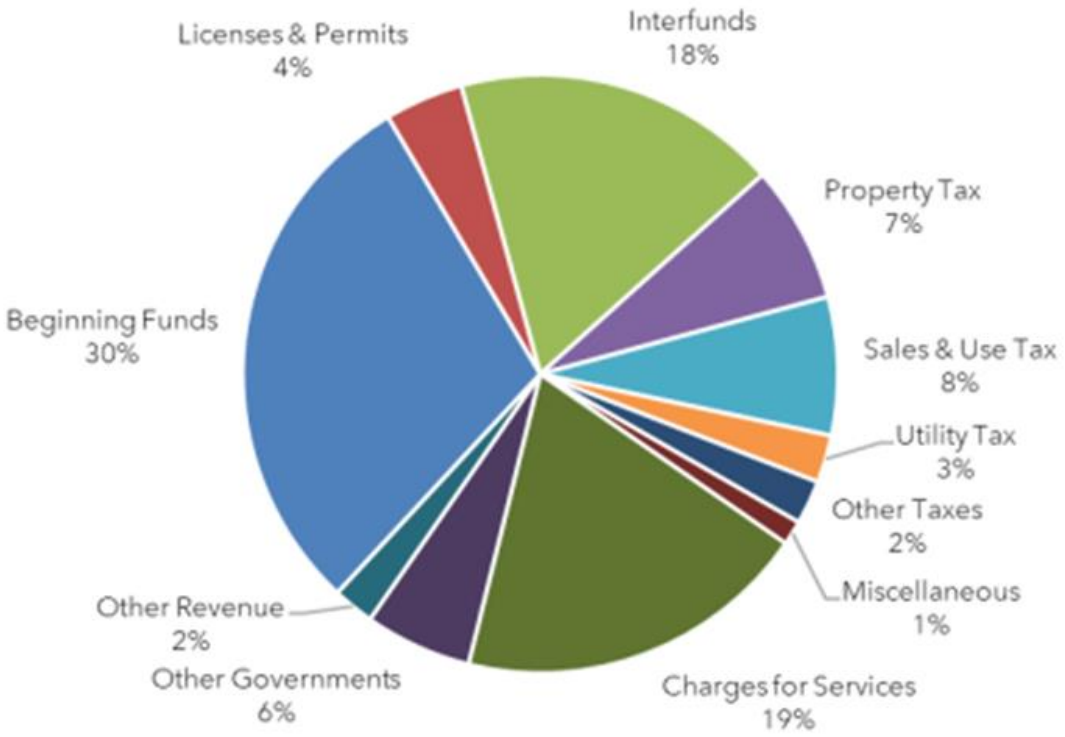
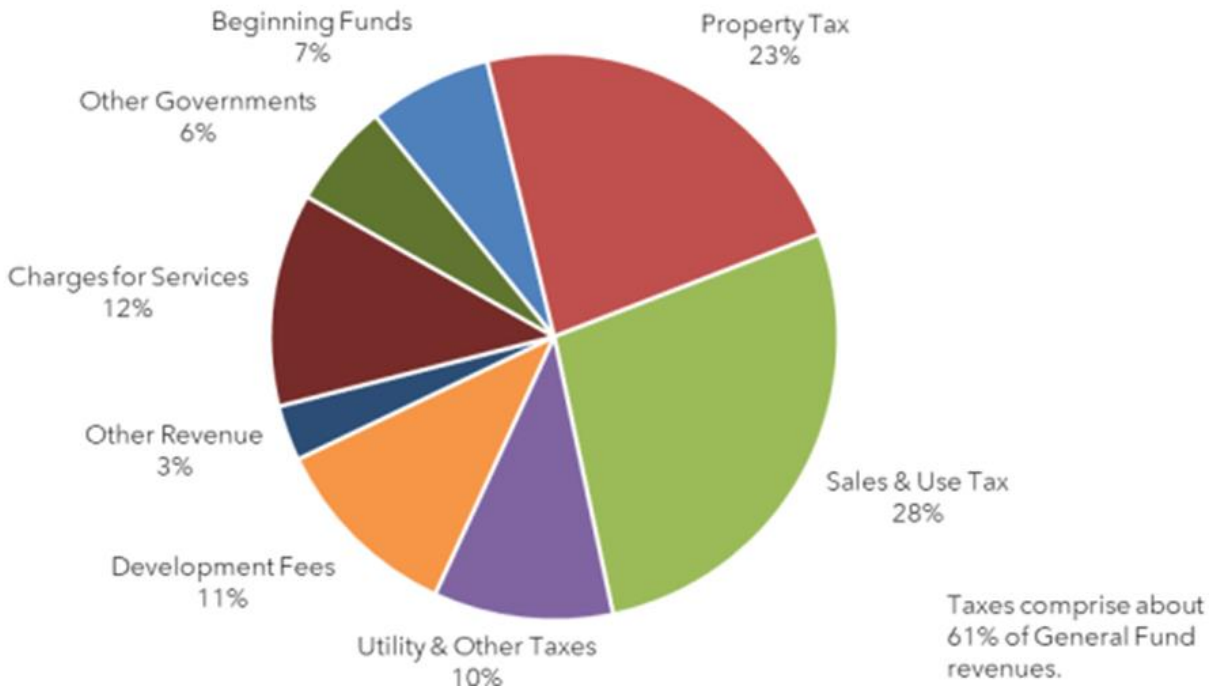


Figure 3: General Fund Revenues by Type – FY2021-2022 ($201.7 Million)



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Finance	105,947,519	43,655,402	9,583,033	49,624,528	58,181,136	41,512,220	43,297,324	351,801,162
Fire	49,592,403	19,183,584	-	1,547,337	-	-	-	70,323,324
Human Resources	3,370,298	-	-	-	-	-	3,792,210	7,162,508
Parks	27,210,075	722,194	-	18,364,261	-	-	-	46,296,530
Planning	32,470,715	7,947,708	-	-	-	4,893,788	-	45,312,211
Police	41,514,962	-	-	-	-	-	-	41,514,962
Public Works	25,973,216	3,052,547	-	22,195,214	47,176,028	96,366,126	5,489,646	200,252,777
Technology and Information Systems	-	-	-	-	-	-	23,103,404	23,103,404
Grand Total	$ 294,346,508	$ 75,149,394	$ 9,583,033	$ 91,731,340	$ 105,357,164	$ 143,329,673	$ 75,682,585	$ 795,179,696

Table 3: Departmental Budgets by Priority FY 2021-2022

Departmental Budgets by Priority

Departments	Healthy and Sustainable	Safe and Resilient	Strategic and Responsive	Vibrant and Connected	Intra-City Transfers and Fund Balances	Grand Total
Executive	$ 1,261,794	$ 1,324,143	$ 6,769,674	$ 57,208	$ -	$ 9,412,819
Finance	799,508	-	64,581,580	1,931,980	284,488,094	351,801,162
Fire	-	64,776,020	1,266,128	4,281,176	-	70,323,324
Human Resources	-	-	7,162,508	-	-	7,162,508
Parks	34,380,026	-	66,418	11,850,086	-	46,296,530
Planning	14,161	7,174,606	(96,134)	38,219,578	-	45,312,211
Police	-	38,578,550	2,936,412	-	-	41,514,962
Public Works	144,808,278	11,930,689	(170,856)	43,684,666	-	200,252,777
Technology and Information Systems	-	-	23,103,404	-	-	23,103,404
Grand Total	$181,263,767	$123,784,007	$105,619,134	$100,024,695	$284,488,094	$795,179,696

Revenue and Expenditure Forecast

The city of Redmond maintains all budgeted funds during the year using the modified accrual basis of accounting. Revenues are recorded when earned, and expenses are recorded at the time liabilities are incurred, regardless of when the related cash flows take place. On an accrual basis, revenue from property taxes is recognized in the fiscal year for which the taxes are levied.

The City uses forecasting tools to anticipate cashflow and fund balances based on the actual fund balances for ten prior years. The City then uses this information to forecast the next six years. The region has enjoyed many years of measurable economic growth, but this growth was adversely impacted by the COVID 19 pandemic and resulting economic

shutdown. Future revenues are much harder to anticipate given the recent volatility in the economy. Therefore, the City is taking a conservative approach to future budget investments.

Figure 4: Revenues and Expenditures Over Time, with Six-Year Outlook

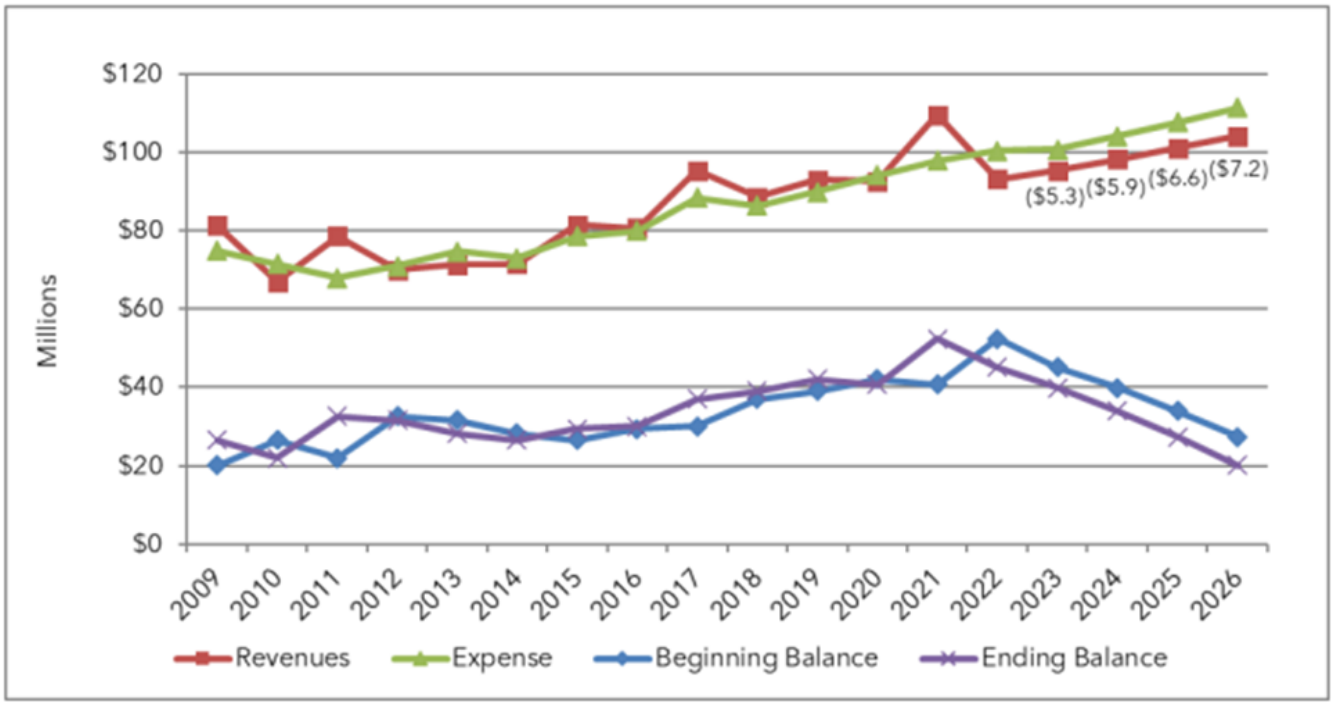


Table 4: Redmond Top 20 properties by Assessed Value

Redmond Parcel ID	Year_	Total
118686	2022	1,101,282,500
117674	2022	202,899,800
90592	2022	193,880,200
114738	2022	163,541,200
9357	2022	153,502,000
112310	2022	139,041,600
90587	2022	135,247,400
7420	2022	128,943,300
6120	2022	126,787,000
11182	2022	125,217,000
10295	2022	121,459,000
7150	2022	121,093,700
118141	2022	118,821,000
14778	2022	118,373,000
118199	2022	116,198,850
14926	2022	115,360,000
6632	2022	113,350,100
90589	2022	113,116,000
10293	2022	113,109,000
118120	2022	113,080,250

Area Description

Geography

The city of Redmond is in the Puget Sound area of King County, Washington. It's located approximately 15 miles east of Seattle. The city is bordered by Kirkland to the west, Bellevue to the southwest, and unincorporated areas in all other directions, including King County Fire District 34. There is access to Lake Sammamish to the south with the Sammamish River running north and south along the western section of the city.

The city covers approximately 17 square miles with Washington State Route 520 connecting Redmond to Seattle and to I-405, a major north/south highway that is just west of the city. The estimated population was 71,400 residents in 2021. This creates a population density of approximately 4,231 people per square mile. However, aside from during the pandemic shutdowns, the daytime population of the city typically spikes by 111% as commuters travel to their jobs.

Figure 5: King County, Washington

Figure 6: Redmond in Relation to Regional Fire Agencies

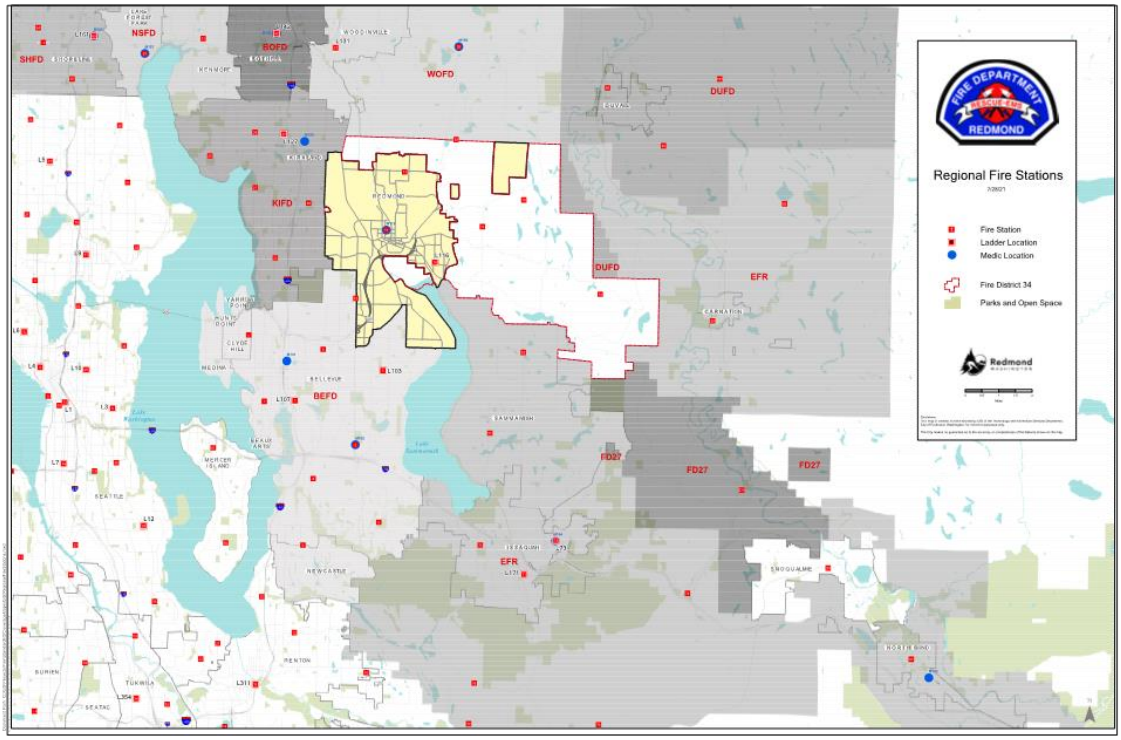


Figure 7: King County Medic One Response Area Administered by the Redmond Fire Department

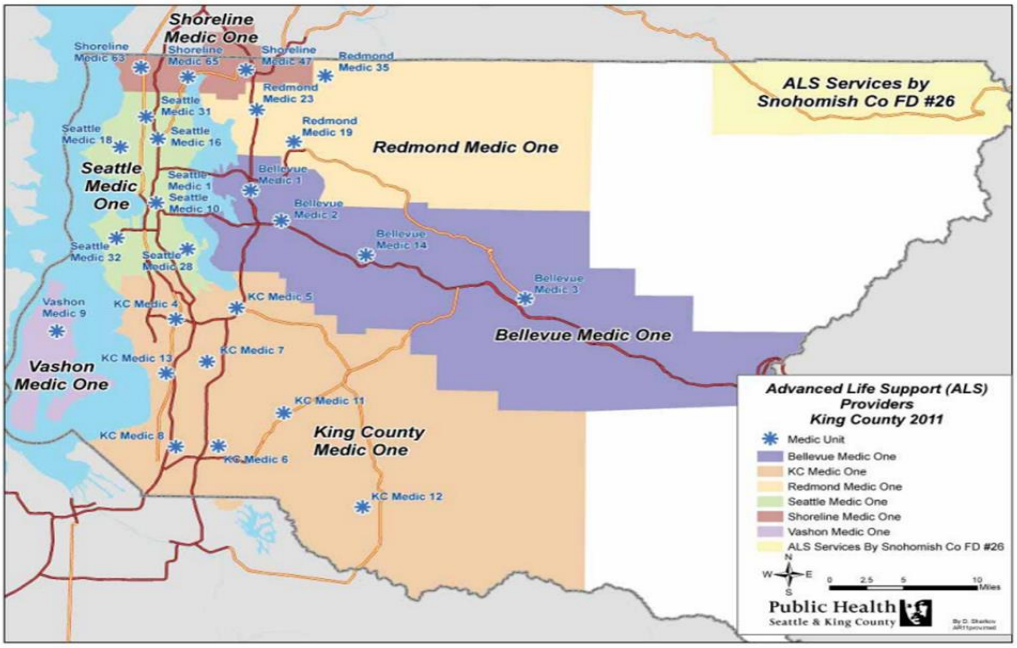
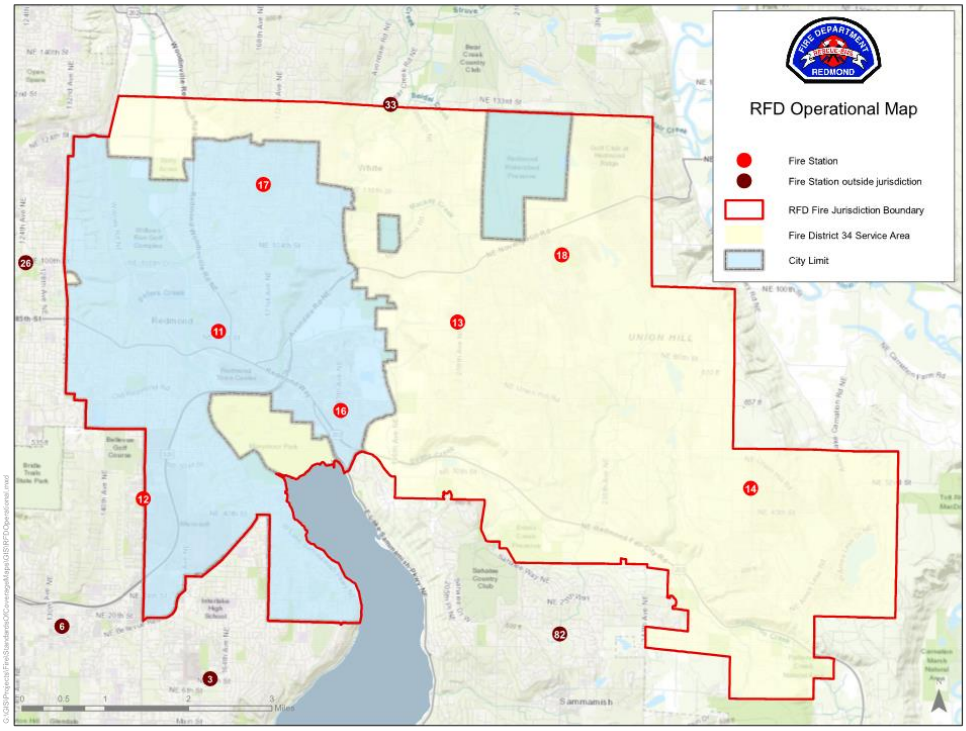


Figure 8: City of Redmond and King County Fire District 34



Topography

Redmond is located four miles east of Seattle and is bordered by Kirkland to the west, Bellevue to the southwest, and Sammamish to the southeast. Unincorporated King County lies to the north and east. The city's urban downtown lies just north of Lake Sammamish at an elevation of 20 feet above sea level. The City of Redmond is characterized by low-lying relatively flat areas in the downtown, with hills rising to plateaus to the east and west, as well as a spur ridge that bifurcates the northern half of the city. Hills to the east of the city rise to a high point of 646 feet.

Climate[2]

Redmond has a mild climate for its latitude. Summers tend to be warm and dry, with low rainfall and sunny or partly sunny days from June to September. Winters tend to be cool and wet, with November being the rainiest month. Snowfall is uncommon, but sometimes cold air forms a high-pressure system that drives rain from the area. Snowfall is not as rare as in other cities like Seattle near the moderating effects of Puget Sound. The warmest month, on average, is August. The highest recorded temperature was 111 °F on June 28, 2021. On average, the coolest month is January. The lowest recorded temperature was −7 °F in January 1950. The maximum average precipitation occurs in December. Redmond has a Mediterranean climate with warm to hot summers and cool winters.

Figure 9: City of Redmond Monthly Climate Matrix

Climate data for Redmond, Washington [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °F (°C)	68 (20)	72 (22)	80 (27)	90 (32)	95 (35)	111 (44)	105 (41)	102 (39)	101 (38)	91 (33)	76 (24)	67 (19)	111 (44)
Average high °F (°C)	43 (6)	46 (8)	54 (12)	59 (15)	66 (19)	70 (21)	78 (26)	80 (27)	72 (22)	60 (16)	52 (11)	43 (6)	60 (16)
Daily mean °F (°C)	37 (3)	40 (4)	46 (8)	50 (10)	57 (14)	61 (16)	66 (19)	68 (20)	62 (17)	53 (12)	46 (8)	37 (3)	52 (11)
Average low °F (°C)	30 (−1)	33 (1)	38 (3)	42 (6)	47 (8)	52 (11)	55 (13)	56 (13)	52 (11)	46 (8)	39 (4)	31 (−1)	43 (6)
Record low °F (°C)	−7 (−22)	−5 (−21)	9 (−13)	26 (−3)	26 (−3)	35 (2)	40 (4)	41 (5)	32 (0)	26 (−3)	3 (−16)	−1 (−18)	−7 (−22)
Average precipitation inches (mm)	4.49 (114)	3.67 (93)	3.84 (98)	2.84 (72)	2.10 (53)	1.68 (43)	0.97 (25)	0.97 (25)	1.71 (43)	3.32 (84)	4.92 (125)	5.45 (138)	35.96 (913)
Average snowfall inches (cm)	2.3 (5.8)	2.6 (6.6)	1.1 (2.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.4 (3.6)	2.6 (6.6)	10.0 (25)
Source: [15]													

[2] https://en.wikipedia.org/wiki/Redmond,_Washington

Population and Demographic Features

The RFD serves a year-round population of approximately 100,000 people (city/district combined), according to current U.S. Census Bureau data. Many residents reside in multi-family dwelling units found in large apartment and condominium complexes. The city of Redmond has observed manageable growth over the years, experiencing a 2.9% increase in population since the last U.S. Census dated April 1, 2010.

Figure 10: Population Density by Census Block – 2021

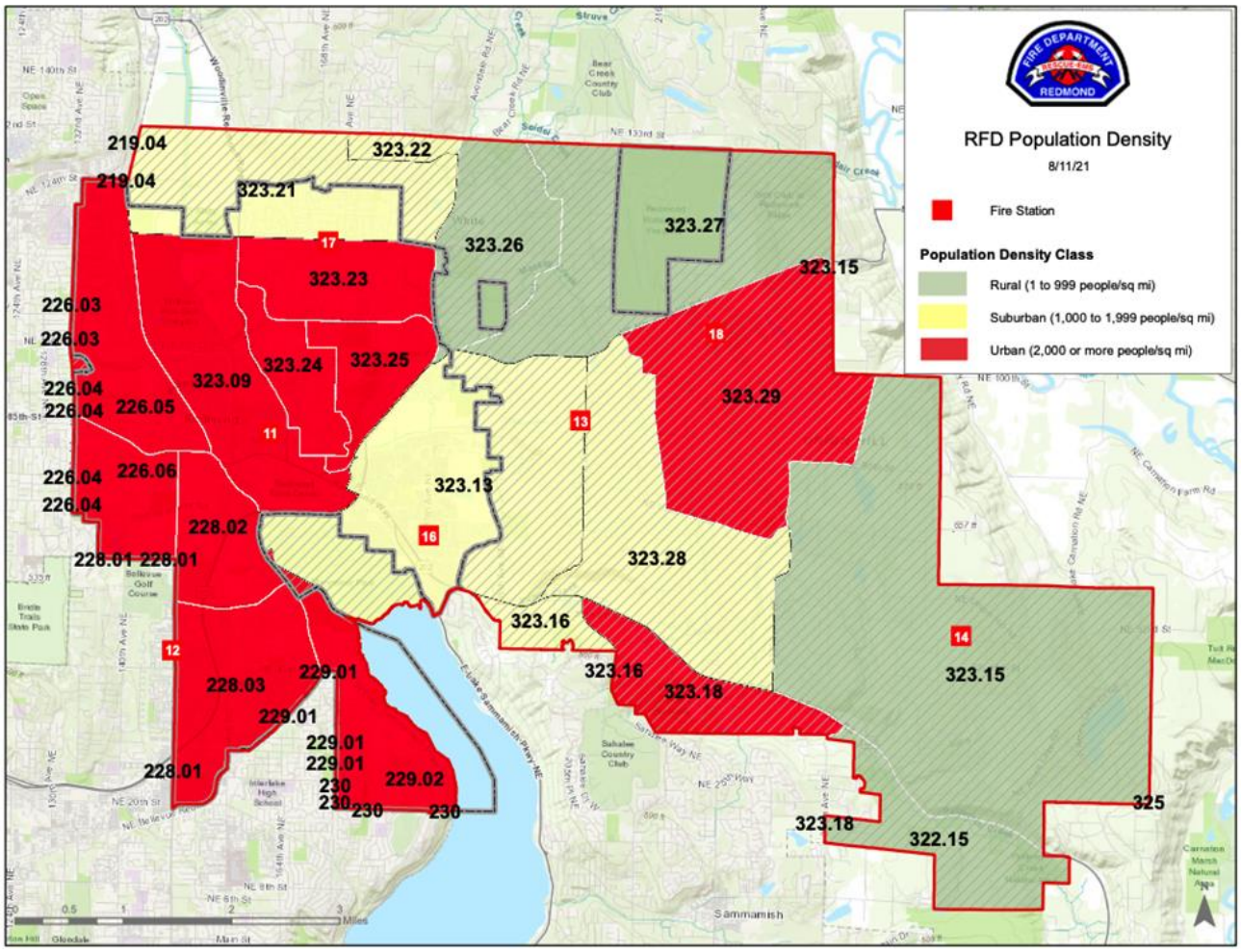


Figure 11: City of Redmond Zoning Map

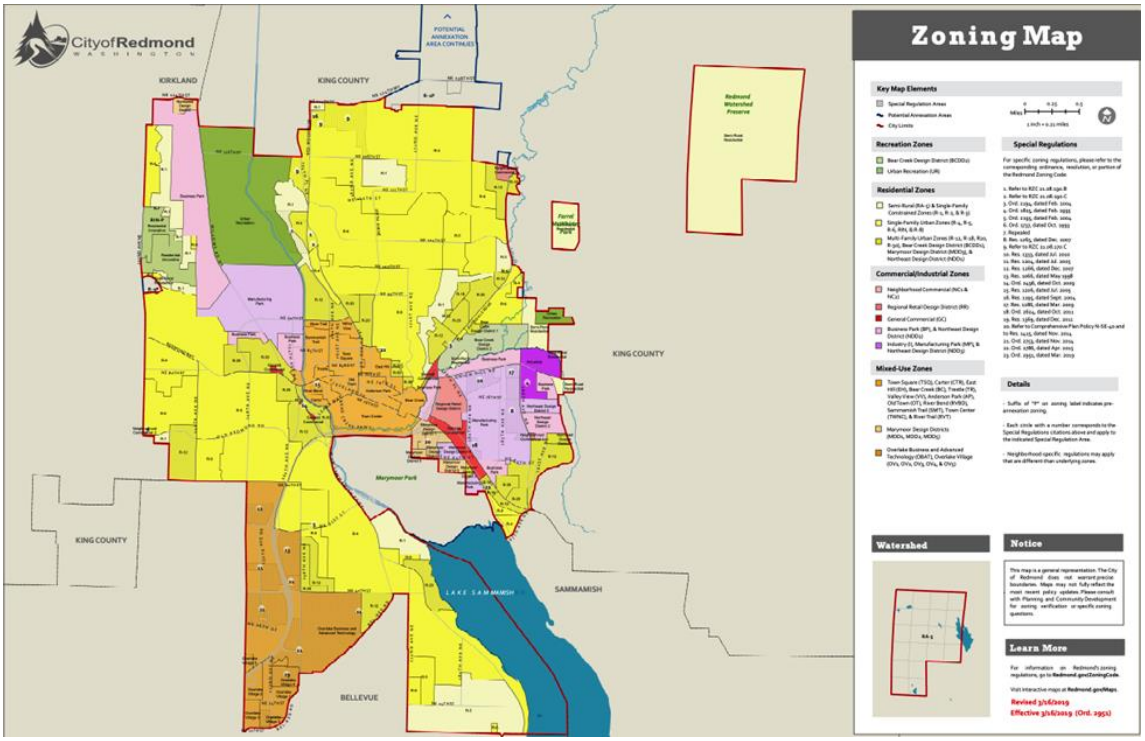
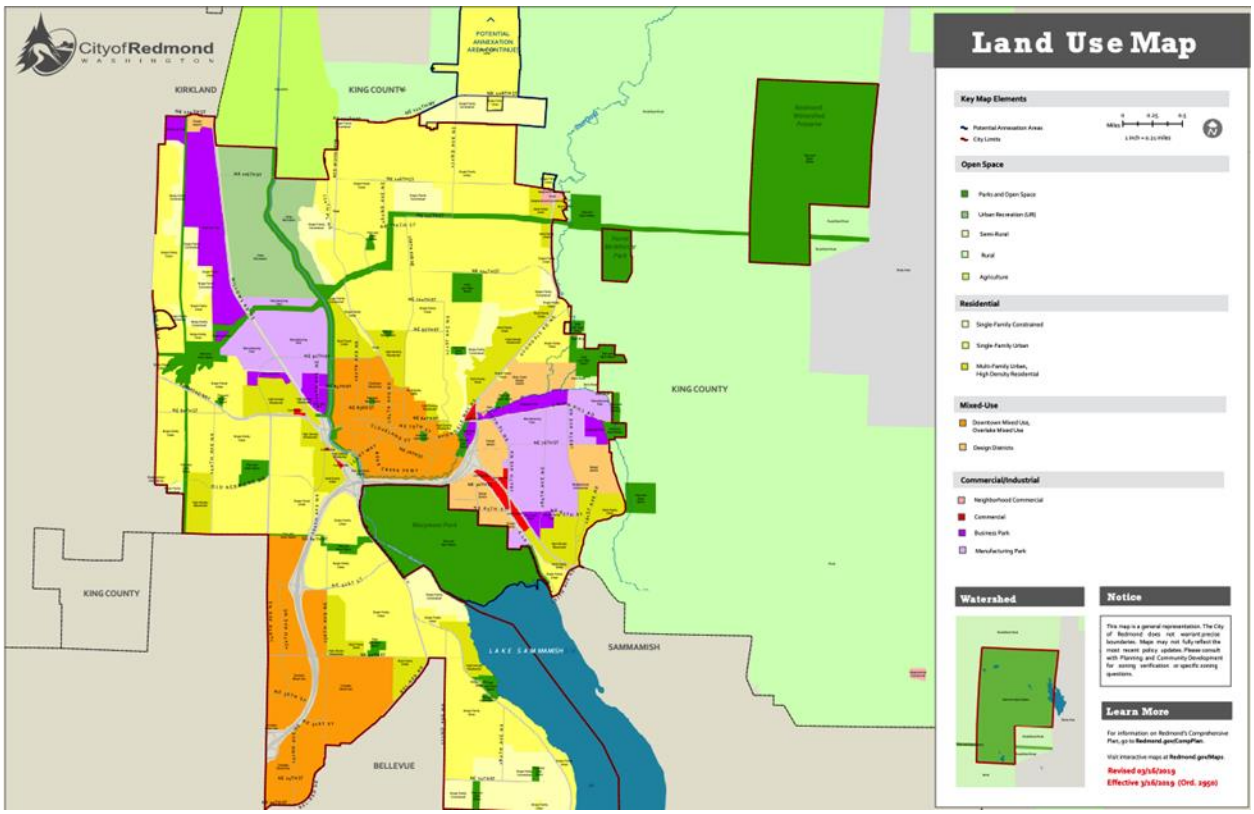


Figure 12: City of Redmond Land Use Map



The annual population growth rate has remained steady at approximately 2% to 3% per year. The number of emergency incidents (and demand for service) has increased accordingly.

In 2020, the national fire service, as a whole, experienced a significant reduction in 911 calls during the early stages of the COVID-19 pandemic and associated governmental interventions. In many cases, a 30% reduction in calls for service occurred between March 2020 and approximately July 2020. Since then, calls for service for most agencies, including Redmond, have returned to pre-COVID levels, and are now rising slightly above trend.

Figure 13: Annual Population Growth vs. Demand for Service

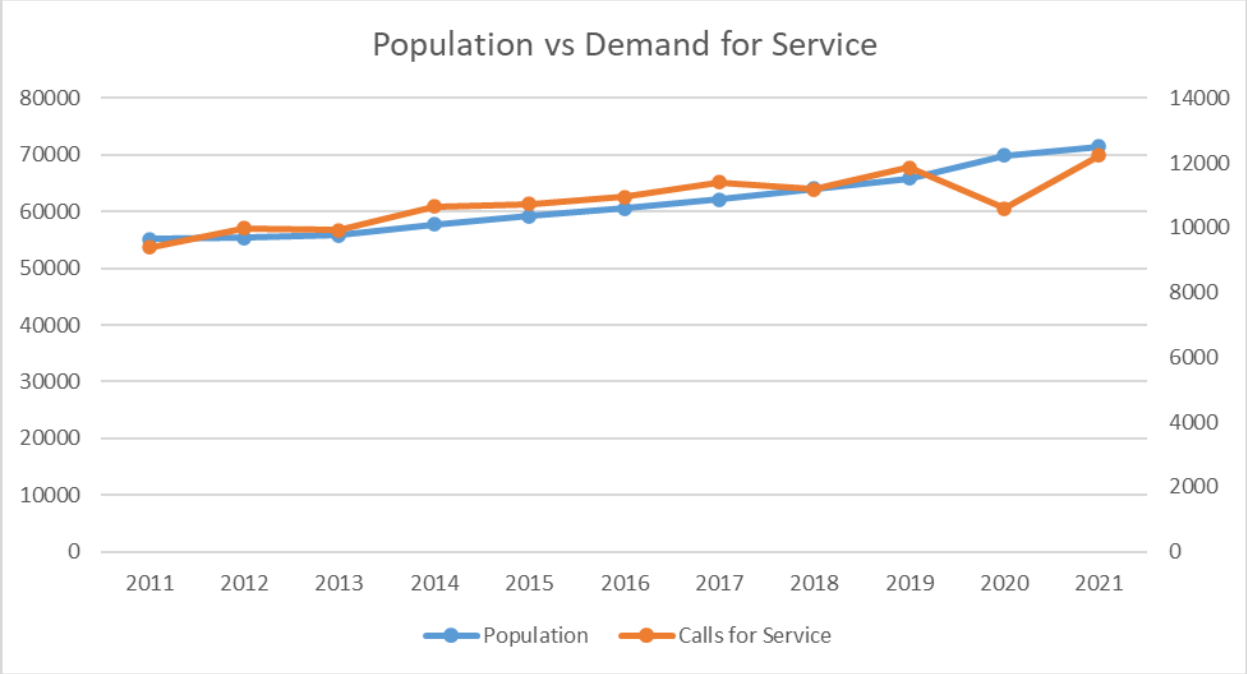
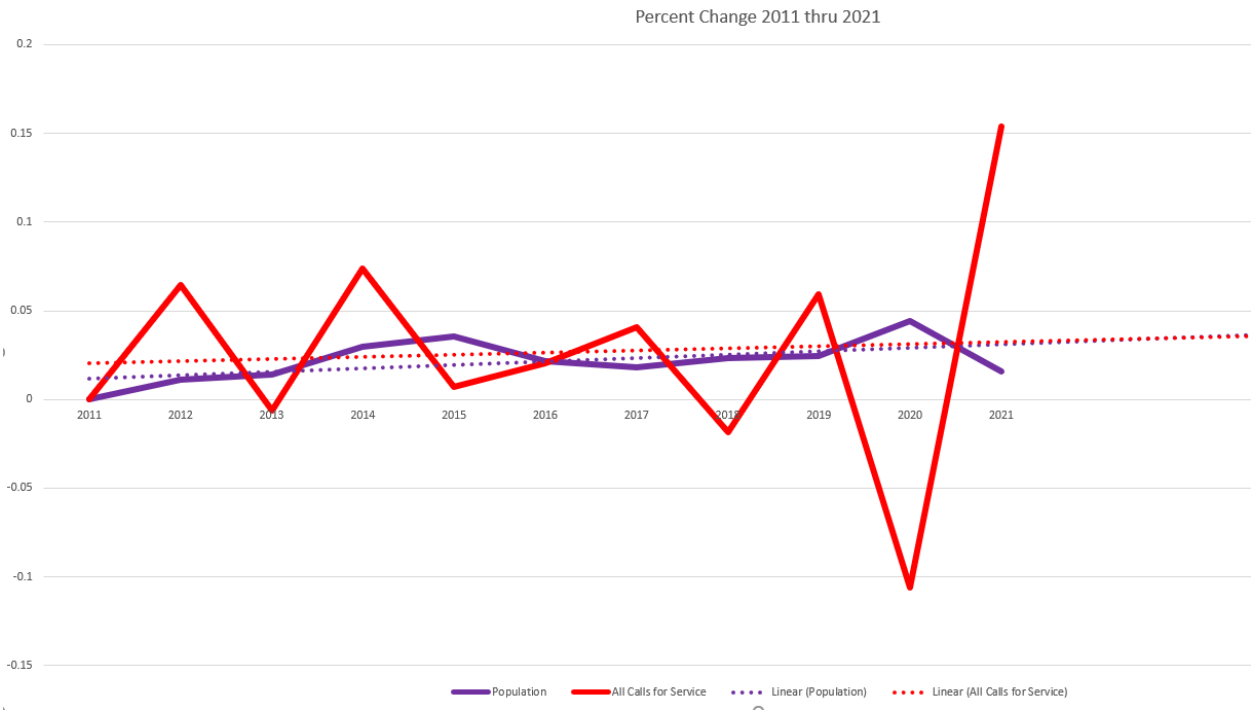


Figure 14: Percent Population and Calls for Service Change



Projected Population Growth

Several reports have aimed to quantify and manage the growth in King County and the Puget Sound.

In 2014 the King County Buildable Lands report identified the City of Redmond as a core city and provided a target of 10,200 new residential units between 2006 and 2031. The report also identified an employment capacity for 25,075 new jobs in the same time frame.

The report identified the Overlake area of Redmond as the third largest employment center in King County with approximately 46,000 jobs. The Overlake Urban Center is a new development that will provide almost twenty million square feet of retail, office, research and development and manufacturing space, and over 9,000 housing units. In the 2021 - 2022 City Budget, the Overlake Urban Center is identified as a continuing capital investment project with completion timelines as far out as 2027. Some of these projects are completed and nearing completion while others are just beginning. In addition, the

Downtown Urban Center is also identified in the budget with capital investments with completion timelines to 2024.

The Vision 2050 report from the Growth Management Policy Board of the Puget Sound Regional Council provides additional considerations for the prospects of growth in the area. This report also identifies the city of Redmond as a "core city" with the downtown area being further identified as a regional growth center. According to the report, the 16 core cities are expected to accommodate 28% of the region's population growth and 35% of the region's employment growth by the year 2050. The report states the core cities in King County are expected to accommodate a larger share of the growth than those core cities in Kitsap, Pierce, and Snohomish counties.

In 2011, the Redmond Comprehensive Plan 2030 projected that the population would be 78,000 by the year 2030, and that there would be approximately 119,000 jobs in the city. However, the current projection based on data from the Washington Office of Financial Management (WOFM) is 96,090 residents by 2030. The Comprehensive Plan also projected a growth of 36,500 dwelling units and approximately 40M square feet of commercial space by 2030. The Plan predicted that the growth would be focused in the two Urban Core areas: Downtown and Overlake and it did not expect much growth in other areas of the city.

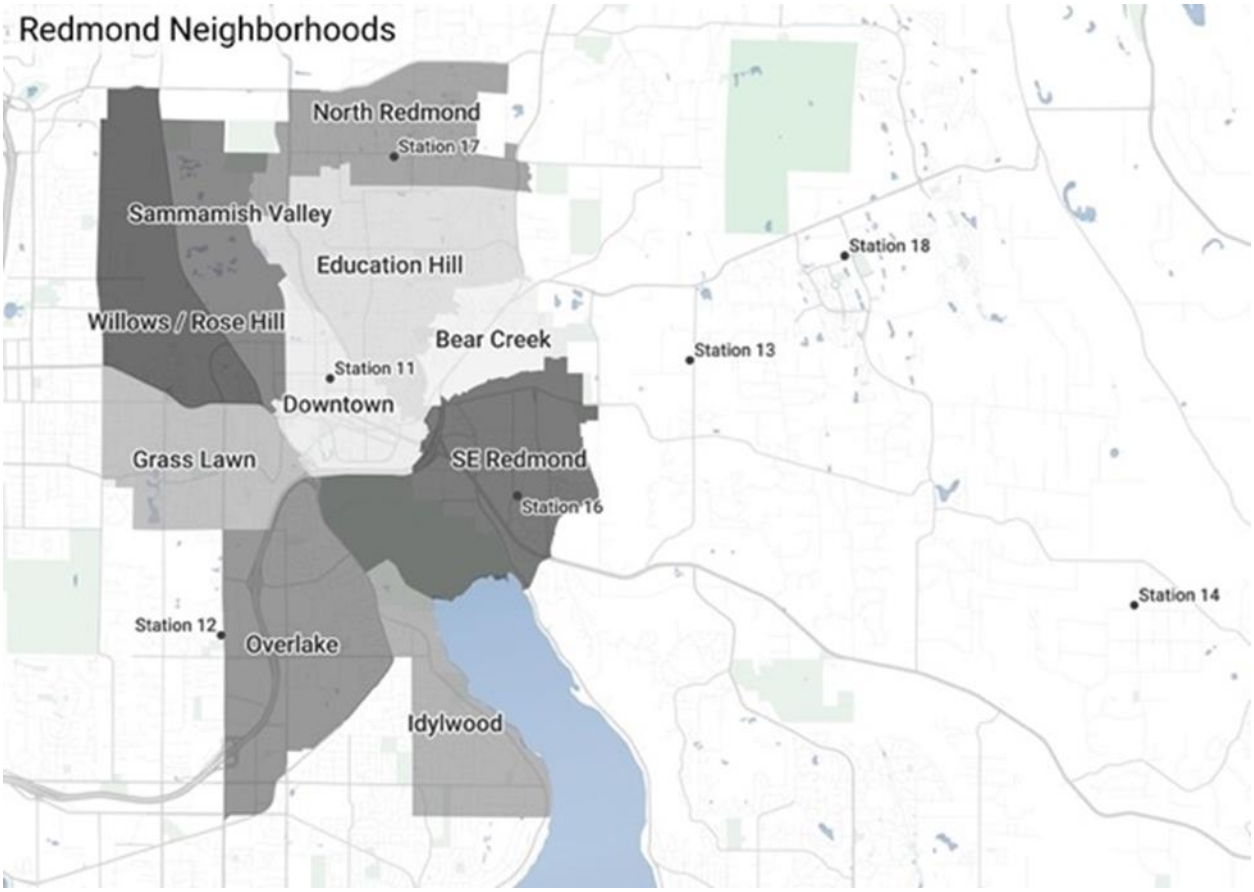
The 2021-2022 Redmond City Budget further outlined projects for these two urban centers.

The 2030 vision for the Downtown area included approximately 13,000 residents and 12,400 jobs. The Overlake Urban Center is projected to have 16,000 residents and approximately 70,000 jobs. There has been and continues to be a significant investment in these two areas in terms of infrastructure improvements.

For example, The Sound Transit Light Rail Extension is moving forward. The Overlake Area and Redmond Technology station will be completed first. Two additional stations, SE Redmond and Downtown, will be scheduled for completion in 2024.

The following map illustrates the various neighborhoods that were used as planning zones for the population estimates.

Figure 15: Planning Zone Neighborhoods



The beginning neighborhood populations in the following table are based on estimated data from the City of Redmond Planning Department.

Table 5: Population Projection by Neighborhood

	2019	2020	2025	2030	2035	2040
Bear Creek	2,707	2,818	3,616	4,637	5,049	5,285
Downtown	4,045	4,211	8,472	14,601	17,073	18,487
Education Hill	14,842	15,451	16,768	17,789	18,201	18,437
Grass Lawn	9,483	9,873	10,960	11,981	12,393	12,629
Idylwood	10,204	10,623	11,741	12,762	13,175	13,410
North Redmond	3,863	4,022	4,868	5,890	6,302	6,537
Overlake	8,748	9,107	13,569	19,698	22,170	23,584
Southeast	5,669	5,901	6,825	7,847	8,259	8,494
Sammamish Valley	6,070	6,320	7,261	8,282	8,694	8,930
Willows/Rose Hill	6,311	6,570	7,522	8,543	8,955	9,191
Total Population	**71,941**	**74,897**	**91,601**	**112,030**	**120,271**	**124,984**

Certain assumptions were made while developing the previous table. The annual growth rate used for these calculations (4.1%) was based on the estimated 2019 population and the 2010 U.S. Census Bureau data.

According to the Redmond Planning Department, the Downtown Urban Center and the Overlake Urban Center would accommodate approximately 2/3 of the population growth through 2030. As such, 30% of the estimated population growth was allocated to the

Downtown neighborhood and 30% to the Overlake neighborhood. The other neighborhoods split the remaining population growth evenly.

When the two urban centers are completed in 2030, this will likely slow the population growth. The predicted growth rate shifts in 2032 to 0.8% annually. This means that it will be 2044 before we reach the anticipated population projection for 2040 of 125,916.

U.S. Census Bureau data estimates the annual population growth of Fire District 34 to be 1.2% over the past seven years. The Vision 2050 report anticipates that the unincorporated areas of the County will accommodate approximately 3% of the growth. The following table outlines the population growth for Fire District 34 using a 3% annual growth factor.

Table 6: Fire District 34 Population Projection

	2019	2025	2030	2035	2040
Fire District 34	22,862	27,458	31,987	37,262	43,406

With the anticipated growth in the City of Redmond, the Fire District could have a slightly higher growth rate depending on the various economic factors that will likely affect the housing market.

Projected Economic Growth

Within the Comprehensive Plan for the City there are two urban centers identified as having growth potential for commercial activity. The Downtown area is being redeveloped with residential, retail, and commercial buildings. These buildings are typically six to eight story vertical structures, with residential on the upper floors and retail or business office space on the lower floors.

The 2030 vision for this urban center, based on the 2020 Redmond Adopted Budget, is to have approximately 12,400 jobs in the area. There were approximately 8,100 jobs in the same area in 2010.

The other urban center identified in the Comprehensive Plan is the Overlake Neighborhood Area in the southern portion of the city. In this area the Microsoft Corporation is expanding their existing corporate campus, which will bring numerous jobs to the area. Within the Redmond 2020 Budget document, the vision for this area includes approximately 70,000 jobs in addition to the 16,000 residents. Much like the Downtown Urban Center, this area will also include six to eight story buildings used for office space, residential/retail spaces, and mid-rise residential buildings.

The daytime population in these two areas will likely increase by 85,000 people. Thanks to the light rail extension and the continued expansion of the Microsoft Campus, the daytime population of these two areas could exceed 125,000 people by 2030.

Service Demand Projections

Redmond has experienced significant growth over the past decade and is expected to continue to grow over the next 20 years. The new development is likely to be a combination of infill, mixed use development, and redevelopment in different areas of the city.

As the populations of each neighborhood grow, we can use the previous three years of calls for service to predict the next year's total (and future years). Based on the past three years, an average annual rate can be used to forecast calls for service in the future. The average annual rate was established using the calls for service as a percentage of the population. Based on this, the current call volume equals approximately 8.8% of the population of the City of Redmond. An additional 0.5% was added to account for the

daytime population increase. For purposes of this assessment and planning, the following table illustrates the neighborhoods and the Fire Station to provide services.

Table 7: Redmond Station Assignments by Neighborhood

Neighborhood	Station
Bear Creek	11/13/16/17
Downtown	11
Grass Lawn	11/12
Willow/Rose Hill	11
Idylwood	12
Overlake	12
SE Redmond	16
Education Hill	11/17
North Redmond	17
Sammamish Valley	11/17
Marymoor	16
Fire District 34	13/14/18

The following table provides a projection of the calls for service by station based on the estimated population growth of the neighborhoods assuming fire stations 16 and 17 had suppression capabilities.

Table 8: Redmond Calls for Service Projection

	2021	2025	2030	2035	2040
Station 11	2534	2,843	3,698	4,043	4,240
Station 12	1688	2,354	3,019	3,287	3,440
Station 16	989	675	770	809	830
Station 17	906	2,647	2,932	3,047	3,113
Total	**6177**	**8,519**	**10,419**	**11,185**	**11,624**

Calls for service are projected to increase proportionally to the population projections through the year 2040. By 2040, a total of 11,624 calls for service are expected to be received by the fire department. Note, this table covers calls for service in the area, rather than the number of responses by the individual units.

For example, Ladder 16 is the only ladder company in Redmond and responds to calls outside the Station 16 response area which is not reflected in Table 8. Additionally, the table only displays calls within the City of Redmond.

During the time period 2017 – 2019 there were an average of 1,500 calls per year outside the city.

For Fire District 34 the average annual rate was established using the calls for service as a percentage of the population. Based on this, the current call volume equals approximately 6.5% of the population of the district. An additional 0.5% was added to account for the daytime population increase. The following table provides a projection of the calls for service based on the population projection of the District.

Table 9: Fire District 34 Calls for Service Projection

	2019	2025	2030	2035	2040
Fire District 34	1,483	1,922	2,239	2,608	3,038

Calls for service are projected to increase proportionally to the population projections through the year 2040. By 2040, a total of 2,608 calls for service are expected to be received in the Fire District.

Services Provided

Fire Suppression

The RFD provides high-quality fire suppression services within the city of Redmond and King County Fire District 34 while assisting surrounding communities as requested through the established automatic-aid agreements. Fire suppression services are currently provided from five fixed-facility fire stations that are strategically distributed throughout the City and District.

Presently, two of the fire stations within Redmond do not have fire suppression capabilities (Station 16 & 17). All fire suppression personnel of RFD are trained as certified firefighters and King County Emergency Medical Technicians (EMT's). Additionally, 33 members are trained and certified as King County Paramedics. Currently there are a minimum of 31 personnel on staff per day, including the on-duty Battalion Chief. In 2020, fire suppression incidents accounted for 20.3% of the total incidents responded to by RFD. The following is a description of resources and staffing configurations currently deployed by RFD:

1. Five Engine companies (Stations 11, 12, 13, 14, 18)
2. One Ladder Truck (Station 16)
3. Three ALS transport-capable medic units (Redmond Station 11, Evergreen Health Medical Center (Kirkland), and (Woodinville Station 35)
4. Three BLS transport-capable Aid Cars (Station 11, 12, & 17)
5. Four cross-staffed BLS transport-capable Aid Cars (Station 13, 14, & 18)
6. One Battalion Chief (Station 11)

Rescue

The RFD provides initial response for technical rescue services within the City and District 34. A technical rescue is one that requires specific skills or tools, such as vehicle extrication, structural collapse rescue, water rescue and more.

RFD will respond to technical rescue incidents and is equipped to extricate and treat injured patients and victims involved in specialty rescue situations. The RFD cross-staffs an Urban Search and Rescue (USAR) Heavy Rescue unit at Station 16. This unit has equipment suited to handling most technical rescue incidents that occur within the jurisdiction.

The team is composed of approximately 50 members (across several area agencies) and can respond to incidents related to heavy structural collapse, high-angle rescue, machinery entrapment, trench rescue, and confined space rescue. In 2020, rescue incidents accounted for 1.9% of the total incidents responded to by the RFD.

Emergency Medical Services

Emergency medical services are provided by fire suppression personnel, who respond in a tiered manner. All medical emergencies are initially dispatched with a Basic Life Support (BLS) aid car (ambulance), fire engine or ladder truck. Following further questions by the 9-1-1 call taker, using a criteria-based process, a medic unit with Paramedics is dispatched to provide advanced life support (ALS). Either the aid car or medic unit can provide transport

to the appropriate hospital. In extreme cases, the agency is authorized to transport with any available department vehicle.

The City of Redmond participates in and is a signatory to an Interlocal Agreement with King County. According to this agreement, the City of Redmond provides Advanced Life Support (ALS) services to the Cities of Redmond, Duvall, Kirkland, Woodinville, Fire District 34, and other unincorporated portions of Northeast King County in accordance with this agreement. The Redmond Fire Department is the lead agency for the Northeast King County Medic One response area that include 266 square miles and a population of 333,000 residents. Basic Life Support (BLS) treatment and transport is a function of the fire department within the City of Redmond and King County Fire District 34.

Hazardous Materials

A hazardous material is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Responses to hazardous materials releases and/or spills within the Redmond Fire Department (RFD) response area may occur in transportation, fixed facility, industrial pipeline, natural cause, or terrorism settings. RFD personnel are trained at three levels: 1) Awareness, 2) Operations, and 3) Technician. Each level of training offers capabilities and limitations, including emergency response, hazard recognition, defensive and offensive mitigations.

Within RFD, a limited-scope hazardous materials response vehicle (Haz-Tac) is centrally located with the ability to handle some incidents. In addition, this response vehicle can supplement larger incidents requiring additional vehicles and equipment. RFD's vehicle is one of two Haz-Tac vehicles in eastern King County. A larger, fully equipped vehicle is in nearby Bellevue.

Current Deployment Strategy

Like most communities, the geographical placement of physical resources available for deployment is determined by such factors as call volume, geographical concerns, and risk-assessment criteria throughout the community. Each fire station in Redmond has a defined first-response area. However, the deployment of resources is determined in real-time using the GPS location of the response apparatus. This is detected by the Automatic Vehicle Locator (AVL) technology that is located on all response units.

The Computer-Aided Dispatching (CAD) system assigns the closest and most appropriate apparatus to the emergency. The apparatus is assigned based on factors such as the type and severity of the emergency.

Fire Stations and Apparatus

Fire Headquarters and Station 11: 8450 161st Ave NE, Redmond

Table 1: Station 11 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Engine 111	3
Medic 119	2
Aid 111	2
Battalion 111	1
Total	**8**

Station 12: 4211 148th Ave NE, Bellevue

Table 2: Station 12 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Engine 112	3
Aid 112	2
Total	**5**

Station 13: 8701 208th Ave NE, Redmond

Table 3: Station 13 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Engine 113	3 (cross-staffed)
Aid 113	(cross-staffed)
Total	**3**

Station 14: 5021 264th Ave NE, Redmond

Table 4: Station 14 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Engine 114	3 (cross-staffed)
Aid 114	(cross-staffed)
Brush 114	(cross-staffed)
Total	**3**

Station 16: 6502 185th Ave NE, Redmond

Table 5: Station 16 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Ladder 116	3 (cross-staffed)
Rescue 116	(cross-staffed)
Total	**3**

Station 17: 16917 NE 116th St, Redmond

Table 6: Station 17 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Aid 117	2
MSO 117	1
Total	**3**

Station 18: 2710 NE Aldercrest Dr, Redmond

Table 7: Station 18 Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Engine 118	3 (cross-staffed)
Aid 118	(cross-staffed)
Total	**3**

Evergreen Hospital: 12040 NE 128th St, Kirkland
(Redmond Unit Medic 123 collocated within Hospital property)

Table 3: Evergreen Hospital Station Resources

Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Medic 123	2
Total	**2**

Station 35: 17825 Avondale Place NE, Woodinville
(Redmond Unit Medic 135 co-located within Woodinville Fire Station)

Table 14: Woodinville Station 23 Resources

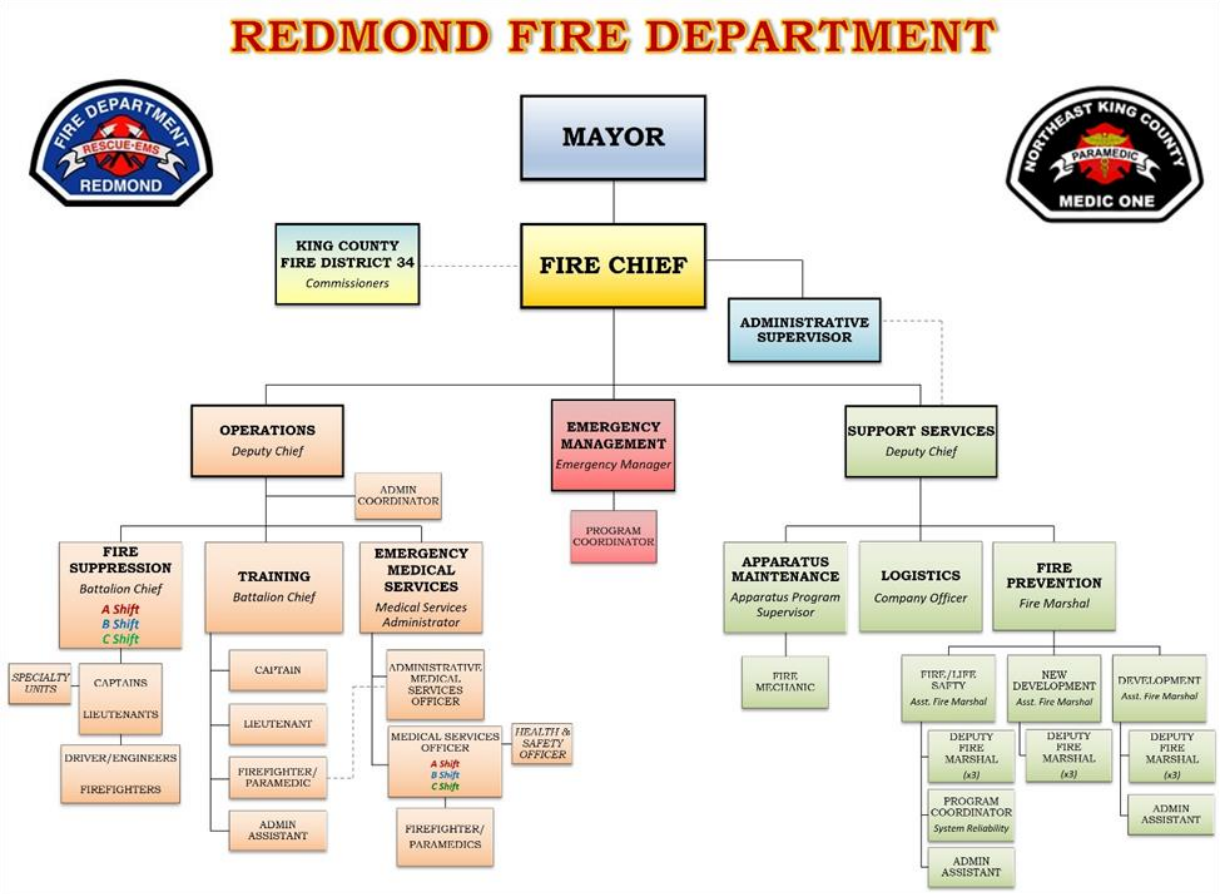
Apparatus Identifier and Capability	Minimum Number of Personnel Assigned
Medic 135	2
Total	**2**

Current Staffing Strategy

Organizational Structure

The RFD currently responds to emergency and non-emergency incidents out of seven fire stations, with its administrative headquarters building co-located at Fire Station 11 on 8450 161st Avenue NE, Redmond, Washington. The organizational chart below illustrates the general organizational structure for RFD.

Figure 16: Redmond Fire Department Organizational Chart



Administration, Emergency Services, and Support Staff

The organizational structure reflects a typical paramilitary fire service organization. The Executive Team is composed of the Fire Chief, Deputy Chief of Operations, and Deputy Chief of Support Services. The Fire Chief is responsible for the overall fiscal and operational management of the organization and reports directly to the Mayor through the Chief Operating Officer (COO). The members of the Executive Team are tasked with providing oversight and day-to-day management within the organization. This includes leading the Operations, Training, and Emergency Medical Services (including the Medic One program), Fire Prevention, Emergency Management, Apparatus Maintenance and Central Purchasing/Facilities (logistics).

The Deputy Chief of Operations is supported by three Battalion Chiefs who are assigned to shift work. These Chiefs are tasked with managing on-duty line personnel and serving as the Incident Commander during emergency events. RFD currently has 110 personnel assigned to the fire suppression division. They are assigned to three platoons, and they work an average of 48 hours per week. Each shift currently has an authorized on-duty minimum staffing level of 32 personnel. The Battalion Chief of Emergency Medical Services and the Battalion Chief of Training also support the Deputy Chief of Operations by ensuring all personnel are compliant with the required training set forth by the organization, NFPA, ISO, and the Medical Director.

The Deputy Chief of Support Services is supported by several staff members, including a Battalion Chief of Fire Prevention who serves as the Fire Marshal and provides supervision to the organization's Assistant and Deputy Fire Marshals, a Captain in charge of Central Purchasing/Facilities (Logistics), and a Fire Apparatus Supervisor.

Community Response History

Methodology

Response data was analyzed for calendar years 2016 through 2021. As such, the report includes at least five full reporting periods of Redmond Fire Department baseline workload data, property and contents loss data, and fire spread disposition data, where available and applicable/ the last section of the report includes summary tables for each program, for each year (2017 through 2021), as well as an average of the baseline for all years combined.

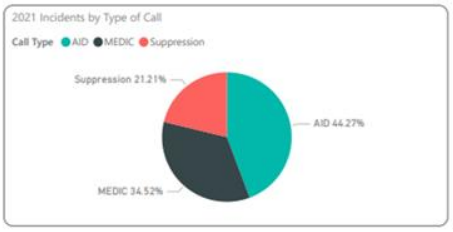
Two distinct measures are used in this report—call volume and workload. Number of requests for service are defined as “incidents” or “calls” (i.e., call volume). Call volume reflects the number of times a distinct incident was created involving one or more RFD units, and/or calls received in the RFD’s jurisdiction. “Responses” are the number of times that an individual unit (or units) responded to a call (i.e., workload).

The data files were audited to eliminate any anomalies and outliers before we analyzed the data. For example, we excluded any entries with negative times, times of 0 minutes or entries with high busy or performance times.

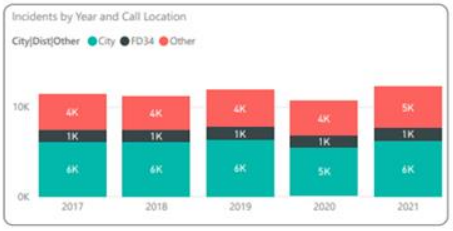
Overview of Community Response Performance

Figure 17: Call for Service 2017 to 2021

EMS_Suppression	2017	2018	2019	2020	2021	Total
EMS	8932	8967	9193	8382	9632	**45106**
Suppression	2471	2223	2663	2215	2593	**12165**
Total	**11403**	**11190**	**11856**	**10597**	**12225**	**57271**



City|Dist|Other (groups)	2017	2018	2019	2020	2021	Total
City	6013	6048	6287	5493	6193	**30034**
FD34	1449	1361	1491	1276	1454	**7031**
Other	3941	3781	4078	3828	4578	**20206**
Total	**11403**	**11190**	**11856**	**10597**	**12225**	**57271**



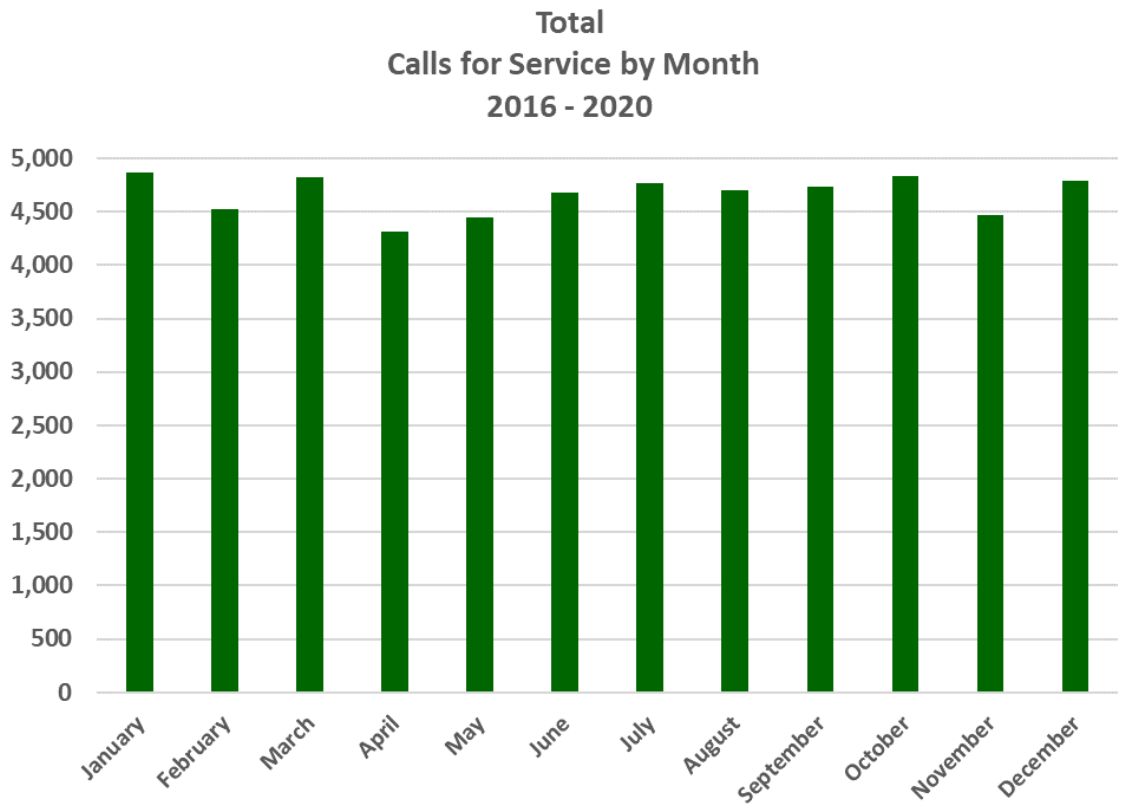
We looked at response history from 2016 through 2020 and measured the frequency of incidents by month, day of the week and hour of the day. We used this data to evaluate patterns in community demands.

Overall, average requests per month ranged from a low of 4,317 calls in April to a high of 4,866 in January. Also, important to note is the higher number of fire related calls for service during the months of July to October. Fire related calls have a heavier impact on the agency due to the staffing intensive work for these types of calls.

Table 10: Overall: Total Calls per Day by Month

MONTH	*Aid*	*Medic*	EMS	Suppression	Total
January	2212	1699	3911	955	4866
February	1992	1571	3563	963	4526
March	2201	1736	3937	889	4826
April	1926	1599	3525	792	4317
May	2009	1544	3553	893	4446
June	2058	1636	3694	986	4680
July	2066	1615	3681	1081	4762
August	1992	1594	3586	1118	4704
September	2030	1600	3630	1100	4730
October	2073	1711	3784	1045	4829
November	2024	1530	3554	915	4469
December	2110	1641	3751	1042	4793
TOTAL	24693	19476	44169	11779	55948

Figure 18: Overall: Calls per Day by Month

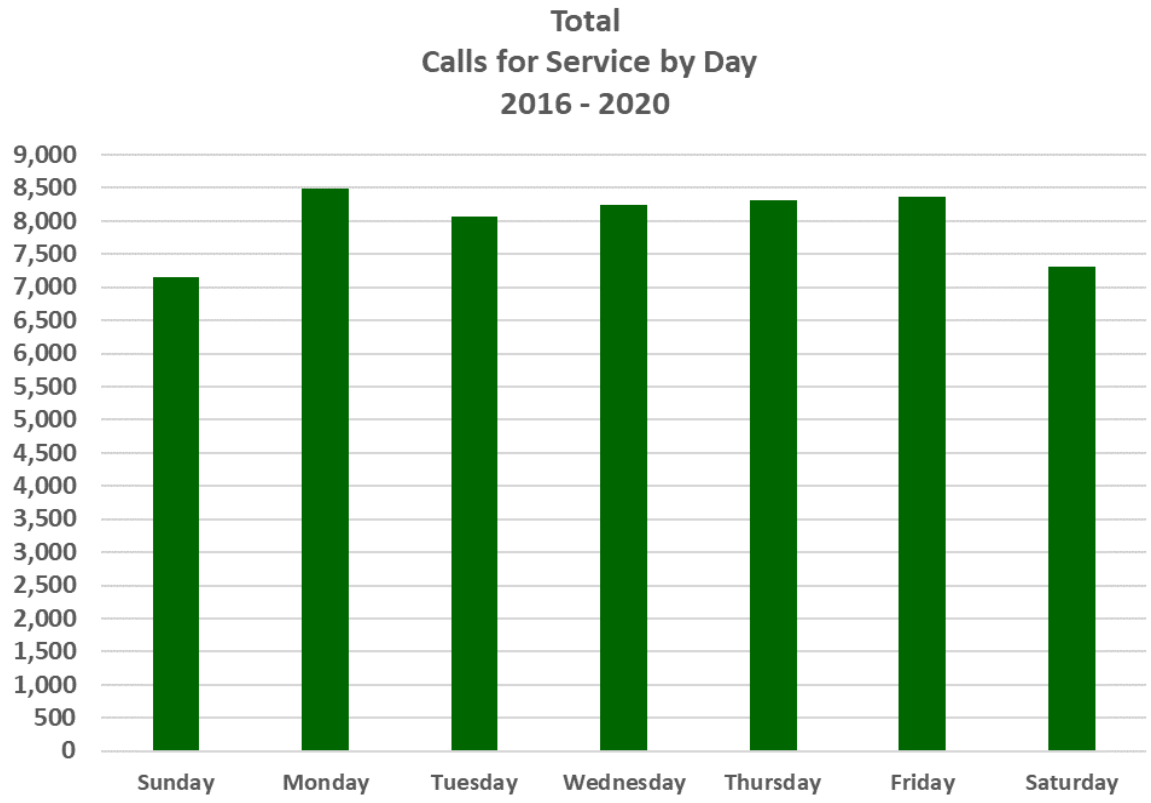


Similar analyses were conducted for requests by day of week. The lowest average number of calls per day occurs during the weekends This is likely due to the absence of a higher workforce in the jurisdiction. There is higher demand for service during the weekdays, with the highest demand on Mondays.

Table 11: Overall: Total Calls per Day by Day of Week

DAY	*Aid*	*Medic*	EMS	Suppression	Total
Sunday	3051	2641	5692	1469	7161
Monday	3725	2983	6708	1787	8495
Tuesday	3579	2773	6352	1712	8064
Wednesday	3646	2890	6536	1709	8245
Thursday	3634	2880	6514	1795	8309
Friday	3807	2808	6615	1748	8363
Saturday	3251	2501	5752	1559	7311
	24693	19476	44169	11779	55948

Figure 19: Overall: Calls per Day by Day of Week

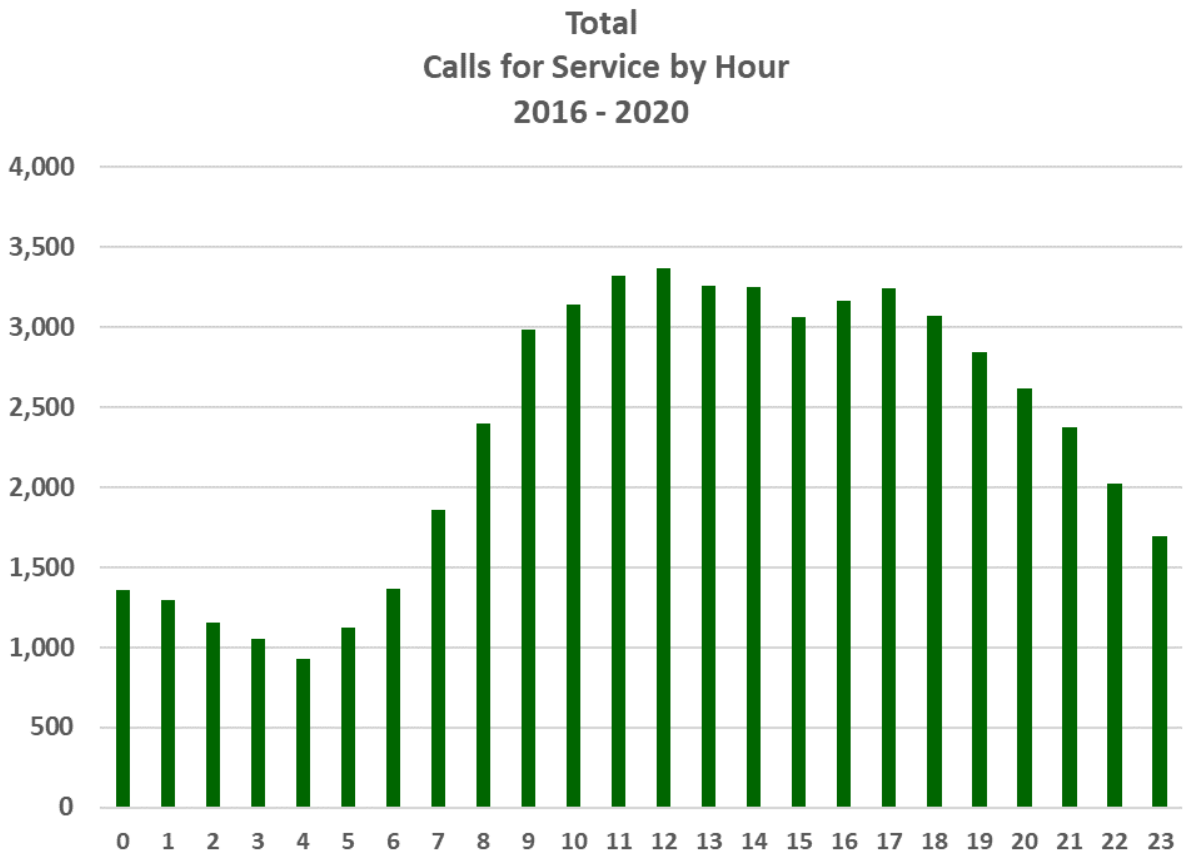


Overall demands were also evaluated by the variations according to hour of day. Peak demand occurred at 12 p.m., with higher demand between 8 a.m. and 9 p.m.

Table 12: Overall: Total Calls per Day by Hour of Day

HOUR	*Aid*	*Medic*	EMS	Suppression	Total
0	605	493	1098	257	1355
1	579	501	1080	217	1297
2	528	425	953	202	1155
3	462	406	868	188	1056
4	406	332	738	192	930
5	478	396	874	249	1123
6	562	506	1068	296	1364
7	891	601	1492	363	1855
8	1034	870	1904	495	2399
9	1335	1057	2392	594	2986
10	1320	1108	2428	715	3143
11	1383	1212	2595	726	3321
12	1460	1186	2646	720	3366
13	1424	1128	2552	703	3255
14	1432	1084	2516	735	3251
15	1351	1016	2367	696	3063
16	1407	1062	2469	697	3166
17	1507	1043	2550	692	3242
18	1395	998	2393	680	3073
19	1280	923	2203	639	2842
20	1135	896	2031	588	2619
21	1104	830	1934	442	2376
22	874	754	1628	392	2020
23	741	649	1390	301	1691
TOTAL	24693	19476	44169	11779	55948

Figure 20: Overall: Calls per Day by Hour of Day



In 2020, RFD responded to over 10,000 calls for service and made over 15,000 vehicle movements to meet this demand. The number of vehicle movements is higher because multiple vehicles will respond to certain types of calls

Station 11 had the highest number of calls for service at 2,149 and Station 14 had the lowest at 227.

Table 13: Overall Workload by Station

	Suppression Calls						EMS Calls						Total Calls			
Station	City	City %	FD34	FD34 %	Other	Other %	City	City %	FD34	FD34 %	Other	Other %	Total	City %	FD34 %	Other %
None	4	0.78%			512	99.22%	10	0.31%			3245	99.69%	3771	0.37%		99.63%
Station 11	491	99.19%			4	0.81%	1626	98.31%	3	0.18%	25	1.51%	2149	98.51%	0.14%	1.35%
Station 12	312	99.68%			1	0.32%	1124	99.82%			2	0.18%	1439	99.79%		0.21%
Station 13	48	40.00%	72	60.00%			408	74.73%	138	25.27%			666	68.47%	31.53%	
Station 14			68	100.00%					159	100.00%			227		100.00%	
Station 16	159	84.57%	29	15.43%			500	89.61%	58	10.39%			746	88.34%	11.66%	
Station 17	116	74.84%	36	23.23%	3	1.94%	505	82.11%	107	17.40%	3	0.49%	770	80.65%	18.57%	0.78%
Station 18			117	100.00%					464	100.00%			581		100.00%	
Total	**1130**	**57.30%**	**322**	**16.33%**	**520**	**26.37%**	**4173**	**49.81%**	**929**	**11.09%**	**3275**	**39.10%**	**10349**	**51.24%**	**12.09%**	**36.67%**

Responses Per Station by Area

	Suppression Responses						EMS Responses						Total Responses			
Station	City	City %	FD34	FD34 %	Other	Other %	City	City %	FD34	FD34 %	Other	Other %	Total	City %	FD34 %	Other %
Medic	17	19.54%	5	5.75%	65	74.71%	968	25.64%	259	6.86%	2549	67.51%	386	25.28%	6.74%	67.98%
Station 11	866	81.70%	59	5.57%	135	12.74%	2301	94.42%	66	2.71%	70	2.87%	349	90.63%	3.64%	5.73%
Station 12	572	65.90%	5	0.58%	291	33.53%	1221	65.12%	6	0.32%	648	34.56%	274	65.29%	0.32%	34.38%
Station 13	208	54.45%	138	36.13%	36	9.42%	386	63.38%	206	33.83%	17	2.79%	991	60.52%	34.02%	5.46%
Station 14	4	3.25%	97	78.86%	22	17.89%	1	0.46%	194	88.99%	23	10.55%	341	1.51%	85.80%	12.69%
Station 16	547	76.40%	96	13.41%	73	10.20%	555	76.34%	79	10.87%	93	12.79%	144	77.21%	12.45%	10.34%
Station 17	152	50.00%	35	11.51%	117	38.49%	853	50.00%	184	10.79%	669	39.21%	201	49.12%	10.83%	40.04%
Station 18	30	12.45%	168	69.71%	43	17.84%	10	1.77%	465	82.16%	91	16.08%	807	5.01%	78.02%	16.97%
Total	**2396**	**63.37%**	**603**	**15.95%**	**782**	**20.68%**	**6295**	**52.84%**	**1459**	**12.25%**	**4160**	**34.92%**	**15695**	**50.47%**	**11.90%**	**37.63%**

The analysis in this section focuses on performance times related to dispatch, turnout, travel, and response times of the first arriving units of distinct incidents.

The best practice is to measure performance at the 90th percentile. In other words, 90% of all performance is captured, expecting that 10% of the time the department may experience abnormal conditions that would typically be considered an outlier. For example, if the department were to report an average response time of six minutes, then in a normally distributed set of data, half of the responses would be longer than six minutes and half of the responses would be less than six minutes. Measuring performance based on the 90th percentile reflects the fact that 9 out of 10 times the department's performance is predictable. This helps to articulate the data more clearly to policy makers and the community.

The performance for dispatch time at the 90th percentile was 1 minute and 13 seconds, turnout time at the 90th percentile was 2 minutes and 5 seconds, travel time at the 90th percentile was 6 minutes and 35 seconds, and total response time at the 90th percentile was 8 minutes and 54 seconds (Fire/EMS combined).

Typically, performance varies across call types or categories for a variety of reasons. For example, turnout time may be longer for fire related calls because the crews have to dress in their personal protective ensemble (bunker gear) prior to leaving the station. When responding to an EMS incident, they do not. However, due to the impacts of COVID and the need for additional PPE, turnout times are becoming more equal.

Table 14: 90th Percentile Dispatch, Turnout, Travel, and Response Times by Program and Determinant - First Arriving Units (2017 through 2021) - City

Program or Determinant	Dispatch Time	Turnout Time	Travel Time	Response Time – 911 Call to Arrival	911 Call to Pt Contact	911 Call to Water on Fire
EMS - BLS	1:14	2:09	6:49	9:17	12:17	N/A
EMS - ALS	1:08	2:02	6:14	8:26	10:05	N/A
Fire	1:14	1:58	6:25	8:38	-	-
Hazmat	-	-	-	-	N/A	N/A
Rescue	-	-	-	-	-	N/A
Total						
Station 11	1:14	1:59	6:00	8:18	11:06	-
Station 12	1:14	1:59	7:10	9:23	13:07	-
Station 16	1:14	2:18	6:13	8:47	11:11	-
Station 17	1:05	2:20	6:43	9:19	12:26	-

Table 8: 90th Percentile Dispatch, Turnout, Travel, and Response Times by Program and Determinant - First Arriving Units (2016 through 2020) – FD34

Program or Determinant	Dispatch Time	Turnout Time	Travel Time	Response Time – 911 Call to Arrival	911 Call to Pt Contact	911 Call to Water on Fire
EMS - BLS	1:05	2:09	6:49	9:17	13:11	N/A
EMS - ALS	1:04	2:02	6:14	8:26	12:19	N/A
Fire	1:14	1:58	6:25	8:38	N/A	-
Hazmat	-	-	-	-	N/A	N/A
Rescue	-	-	-	-	N/A	N/A
Total						
Station 11	0:58	2:51	7:31	10:07	12:22	-
Station 12	1:02	2:43	9:37	12:14	14:08	-
Station 16	1:11	2:34	7:08	9:48	12:34	-

Community Expectations and Performance Goals

Stakeholder Input Process

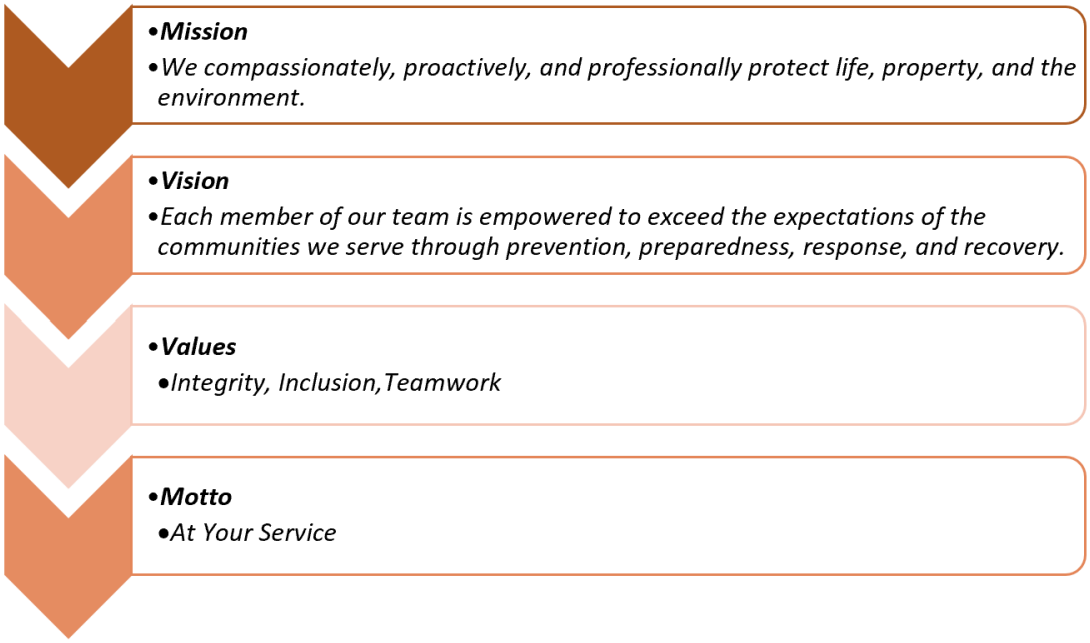
A Strategic Planning process was conducted by the RFD in October 2021, during which time stakeholder input was obtained by the organization's personnel and community members. Organizational stakeholders included members from all ranks of the organization as well as

members assigned to different divisions including Operations, EMS, Training, Prevention, Emergency Management, Purchasing, and Fleet Maintenance. Community stakeholders were composed of residents, business owners, and service providers within the RFD coverage area. A broad representation from both the organization and the community provided input into the planning process.

Community Expectations

Community expectations were evaluated through the Strategic Planning process as well as communication with fire administration, line personnel, elected officials and community stakeholders from both the city of Redmond and Fire District 34. The representativeness of the organizational structure and continuous community interactions was determined to provide the requisite assessment of community expectations.

Guiding Principles and Internal Performance Expectations and Goals



Community Risk Assessment and Risk Levels

Risk Assessment Methodology

Methodology

The risk assessment process used a systematic methodology to evaluate the unique risks specific to Fire Rescue's response areas. This process evaluated risk from two broad perspectives. First, risk is identified through retrospective analyses of historical data. Second, risk is evaluated prospectively providing the necessary structure to appropriately allocate personnel, apparatus, and fire stations in order to mitigate those risks. This methodology also provides information for the Town to consider alternative solutions to assist in the mitigation of risks.

Service areas that either had little quantitative data or did not require that level of analysis were evaluated through both retrospective analysis as well as structured interviews with Department staff members. In an effort to improve clarity, the following terminology is used for the remainder of the risk assessment description and analyses: retrospective risk will be referred to as Community Service Demands and prospective risk will be referred to as Community Risks.

The overall community risk assessment process and methods used by the agency are presented in the figure below.

Figure 21: Community Risk Assessment Process – Areas Served by Redmond Fire Department

Community service demands were analyzed by the incident history, type, locations, and incident frequencies. Within this process, a temporal analysis was completed for each major program area and evaluated by station demand zone and the frequency of incidents. Each program area evaluated community risks, and risks are identified in each demand zone.

These methods allow for resources to be allocated sufficiently, and for the costs of readiness to be balanced by the probability of events.

Probability

Probability is defined as the relative frequency of occurrence of the risk as determined by the RMS system for unique incidents.

Consequence

Consequence is defined as the relative consequence of the event occurring. This measure is generally the most subjective of the three variables. It reinforces the value of an occupancy-level risk approach, which is a more refined assessment at the building level rather than the

code description. However, it is also valuable to measure the potential consequences of differentiated risks in an escalation model.

Impact

Impact is defined as the relative impact of the event occurring on the agency. In other words, what is the risk to the Department's resiliency and ability to handle the residual incidents in the community during these events?

Planning Areas/Zones

The RFD has seven distinct Station Demand Zones (SDZ) that are determined by using the closest fire station on the road network serving that part of the community. Although the RFD uses AVL technology to dispatch the closest and most appropriate resources to incidents, service demand, demographic characteristics, and risks are assessed and tracked for planning purposes on the basis of these SDZs.

The risks analyzed within each SDZ can include factors such as the probability and consequence of a given emergency, historical call demand and population density. The analysis also includes the type of construction and occupancies in the SDZ that may have an impact on factors such as fire flow and water distribution capacity. Effective planning efforts and analysis within each of the SDZs allow the agency to ensure the proper concentration and distribution of resources are present to meet the unique risks associated with each SDZ.

Community Characteristics of Risk

The risk categories presented in this section are described as hazards that the city of Redmond and Fire District 34 may be vulnerable to and that can have a significant impact on the local economy, residents of the community, and the RFD's service delivery capabilities. Hazards were assessed by probability of occurrence and vulnerability, as well as the likely impact on the community. Redmond uses the 2015 Redmond Comprehensive Emergency

Management Plan[3] and 2009 King County Regional Hazard Mitigation Plan (RHMP) – Redmond Annex[4], which evaluates hazards using numerous criteria including:

- Geographic location: should the event occur, will it affect the entire state, region, or local jurisdiction?
- Previous occurrences: how often has this type of event occurred in the past?
- Future probability: what is the likelihood of this type of event occurring in the future?
- Magnitude/Severity: if the event were to occur, what would the impact be on the community and the economy?

The Hazard Mitigation Plan is currently being updated based on more current findings.

Table 16: Overall Hazard Ranking

Rank	Hazard Type	Risk Rating Score (Probability x Impact)
1	Severe Winter Weather	48
2	Severe Weather	48
3	Earthquake	32
4	Flood	12
5	Wildfire	6
6	Landslide	6
7	Dam Failure	6
8	Volcano	0
9	Tsunami	0
10	Avalanche	0

[3] City of Redmond – Comprehensive Emergency Management Plan 2015 (currently under revision)

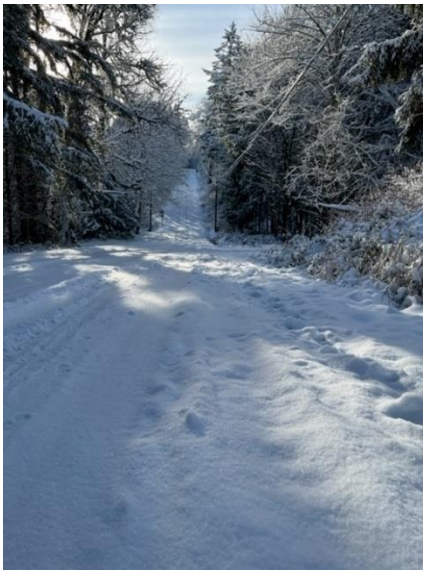
[4] King County Regional Hazard Mitigation Plan – Redmond Annex - Updated 2015

Geographic and Weather-Related Risks

Severe Winter Weather

Winter storms can be very disruptive, particularly in areas where they are not frequent occurrences. They are one of the top ranked hazard types according to the King County RHMP. Winter weather in Redmond is characterized by overcast skies, rain, occasional snow and ice, and cold temperatures. The average winter snowfall total is 4 inches, with an average rainfall total of 41 inches. Two of the past three years have had snowfall totals exceeding the average, with temperatures also dropping into single digits, which is uncommon in Redmond.

In 2019, several feet of snow fell in Redmond, causing wide-spread power outages and transportation disruption. In 2021-22, a significant snowstorm resulted in large ice accumulations that lasted for two weeks.

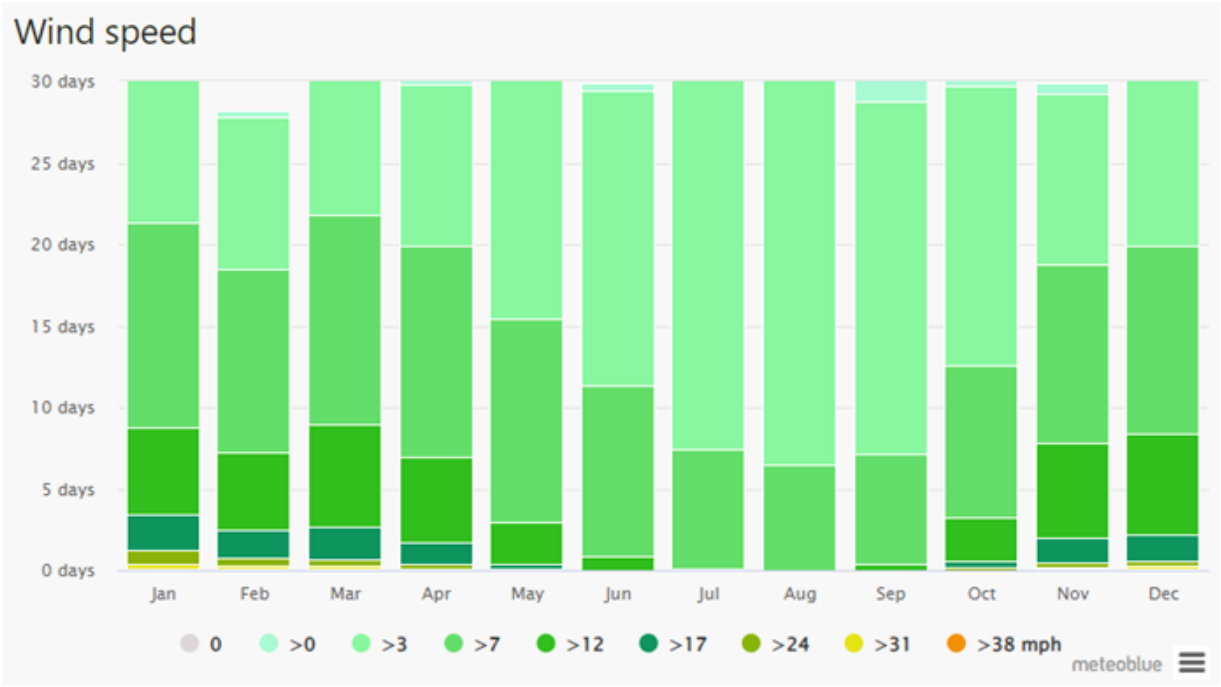


Severe Weather

In addition to severe winter weather, severe wind, rain, and thunderstorms are also ranked high in the King County RHMP. When storms arrive, they can come from the north or south through the convergence zone created between the hills and mountains to the east and

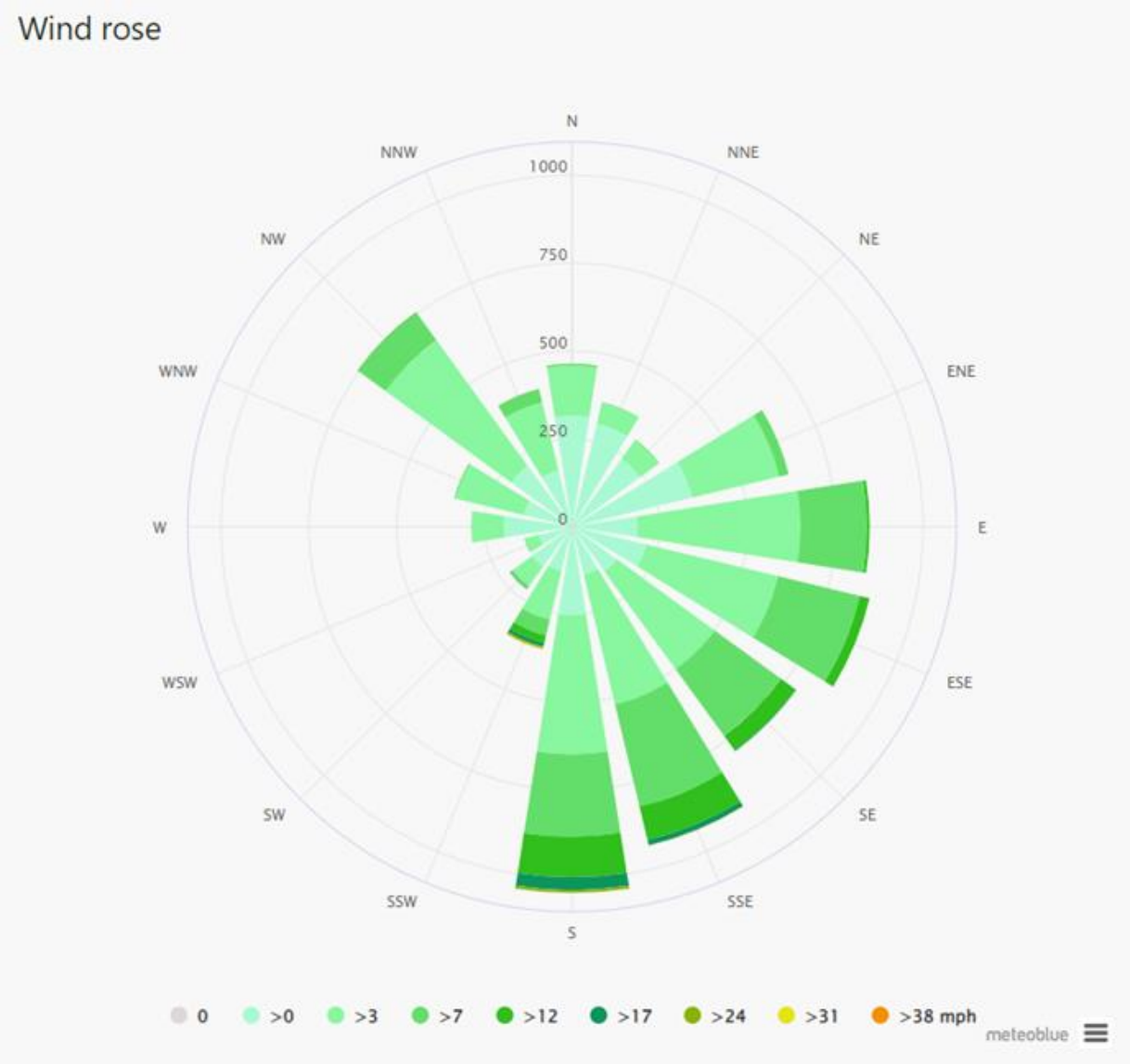
west of Redmond. Winds from the south and southeast are the most common[5]. Foehn winds can occur in the summer months, when low pressure pulls warm, dry winds from higher pressure over the desert to the east.

Figure 22: Average Wind Speed by Month



[5] https://www.meteoblue.com/en/weather/

Figure 23: Average Wind Direction and Speed



Earthquakes

Earthquakes are classified according to their magnitude which is the measurement of the maximum motion recorded by a seismograph. The most used scale is the magnitude local, which is used by the Richter Scale. The United States Geological Service (USGS) rates areas of the United States for their susceptibility to earthquakes based on a 10% probability of a given peak force being exceeded in a 50-year period.

Due to soil composition, the area depicted in red is considered a seismic hazard area. Property in this area will be subject to increased damage due to ground shaking. Much of this area will also be subject to flooding following a large earthquake.

Figure 24: Seismic Hazard Areas

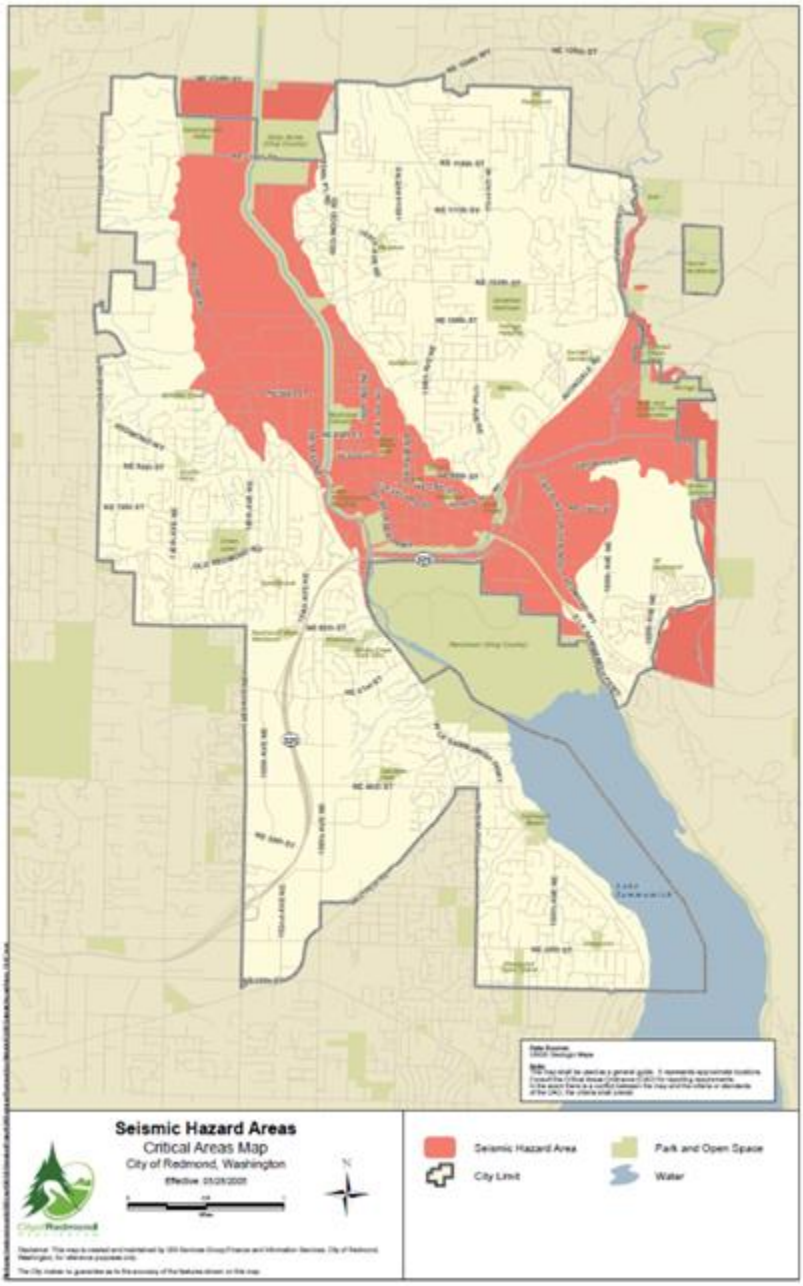
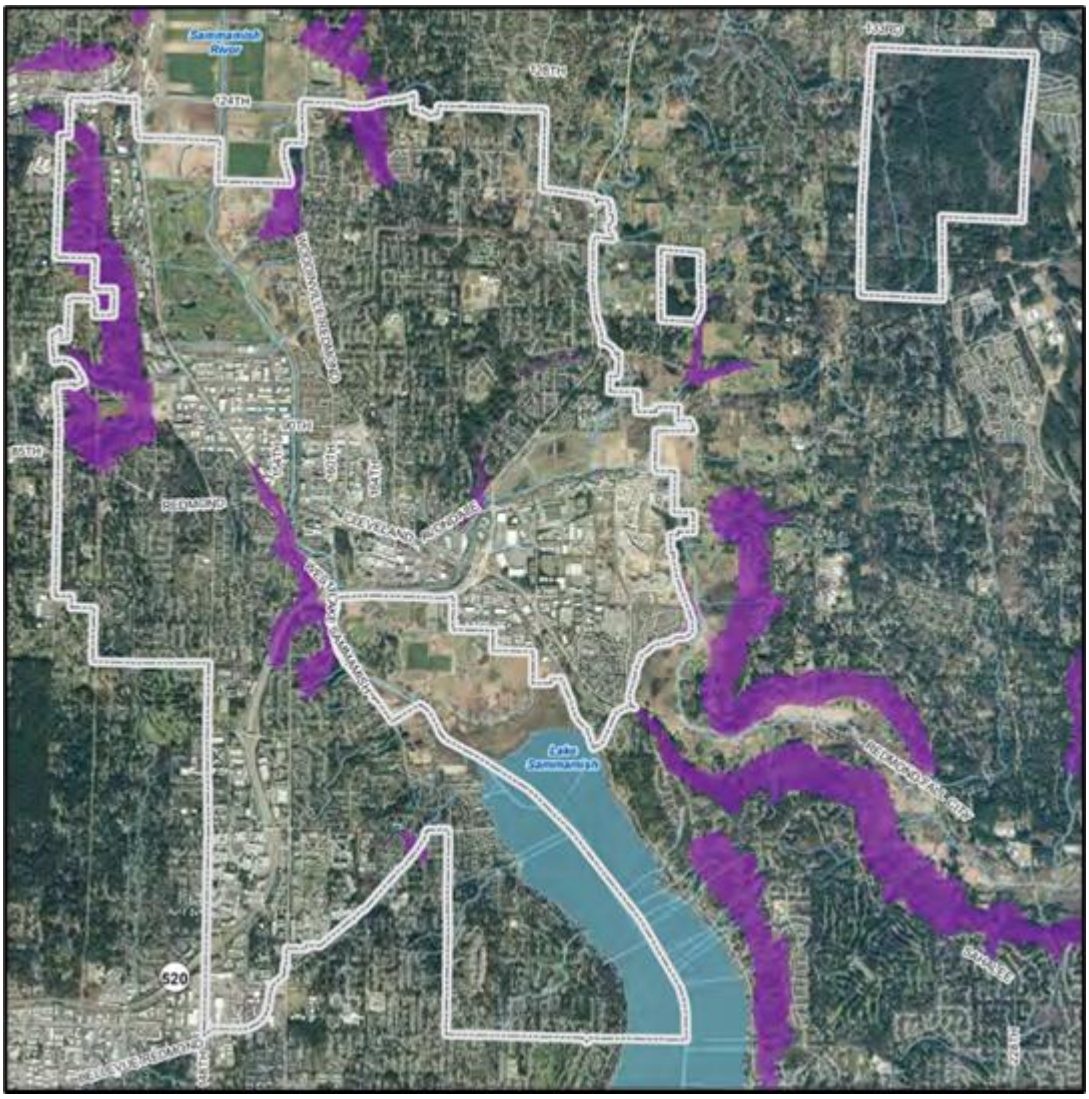


Figure 25: Landslide Hazard Areas



There are several earthquake faults within the Redmond area. The Seattle Fault Zone and Cascadia Subduction Zone are two most directly related to the threat. Even a strong earthquake (magnitude 6.0 to 6.9) within the Seattle Fault Zone will cause wide-spread damage, injuries, and fatalities with the region. A major or great earthquake (magnitude 8.0 or above) will cause catastrophic damage to property and people.

Figure 26: Seattle Fault Zone

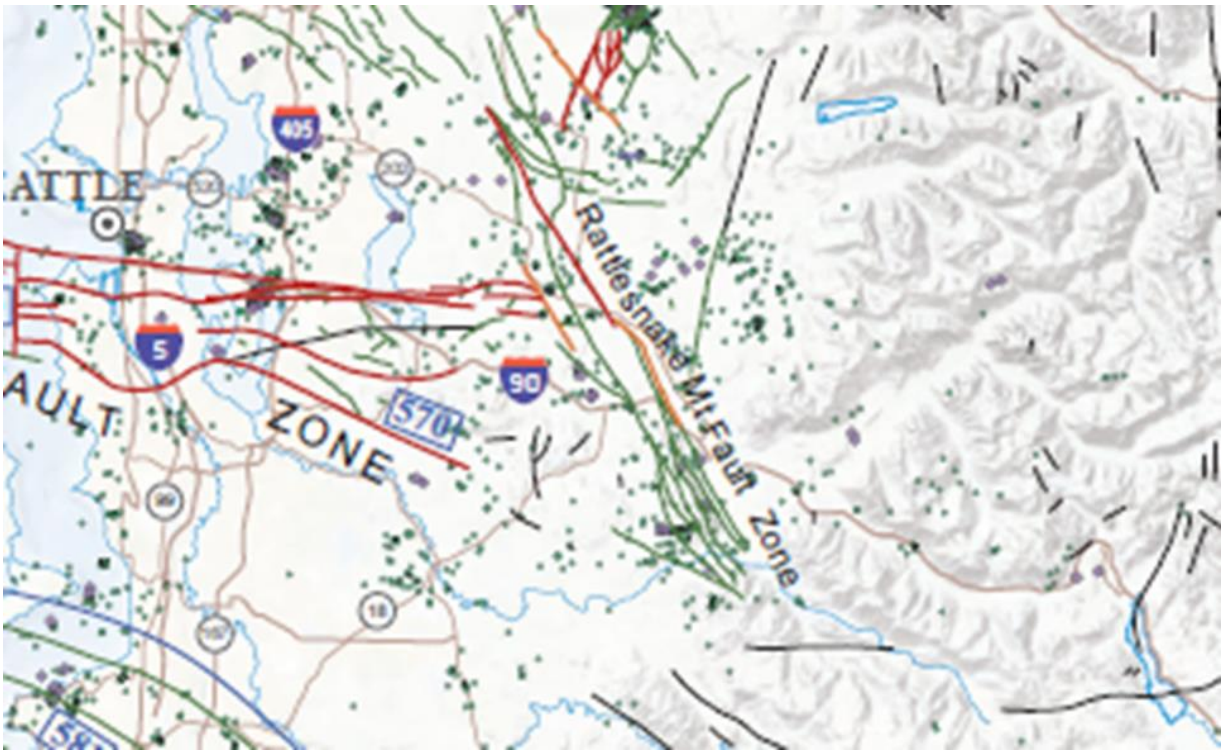
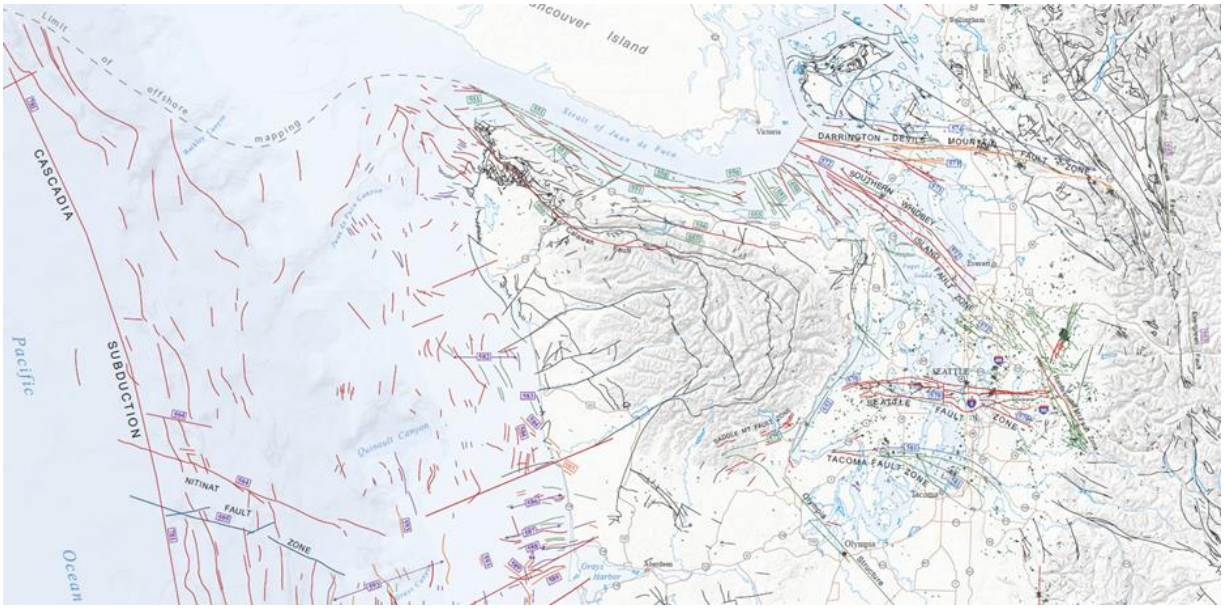


Figure 27: Cascadia Subduction Zone



Flooding

Three large bodies of water coupled with a high water table pose a risk of flooding in Redmond. Minor and moderate flooding occurs during winter months in both the City and District during periods of heavy rainfall, particularly after prolonged soil saturation. Seasonal and non-seasonal streams may flood during these periods. Major flooding within the City and District is uncommon, although the risk of flooding roadways and some commercial businesses within the city is considered moderate.

The Sammamish River, Bear Creek, Evans Creek, and parts of Lake Sammamish are located within the city limits of Redmond. A large portion of Redmond's downtown district lies within the 100-year Sammamish River floodplain. Swelling or over-topping of the Lake Sammamish will flood lakeside homes and docks. The high water table, with an estimated average depth of 25 feet, increases the likelihood of seepage flooding.

Areas regularly flooded include parts of the Sammamish River and Bear Creek trail systems, portions of the City's Municipal Campus, condominium developments along Lake Sammamish, and an area near Bear Creek's Friendly Village Mobile Home Park. The majority of structural flooding in Redmond occurs in buildings with crawl spaces, basements, subsurface parking, or other underground development. The swelling of the Sammamish River causes the water table to rise, which then seeps into underground spaces.

A strong earthquake on the Seattle Fault line or a major earthquake along the Cascadia Subduction Zone could cause significant flooding within the downtown area of the City due to water movement in Lake Sammamish.

Figure 28: City of Redmond Flood Zones

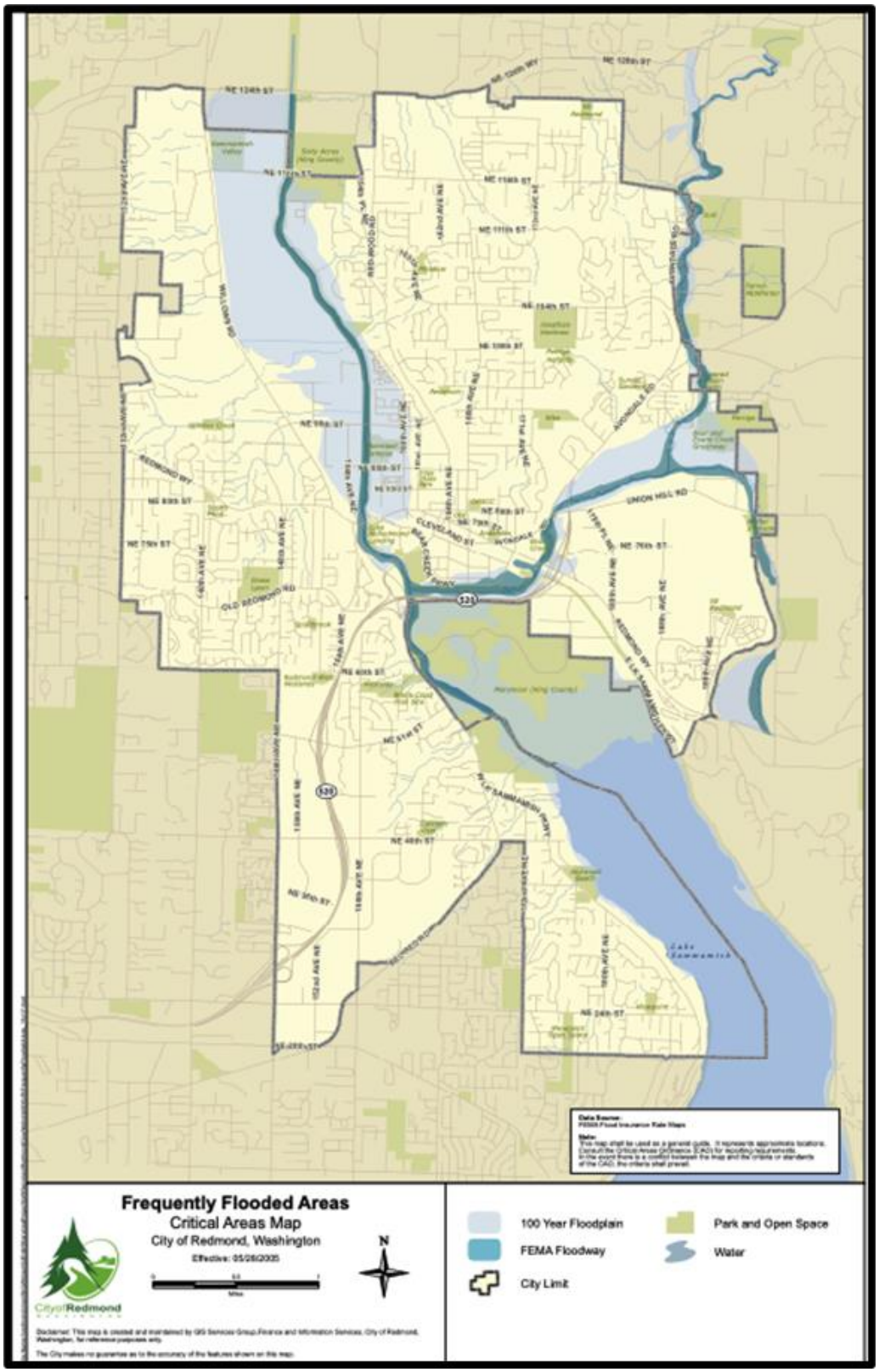
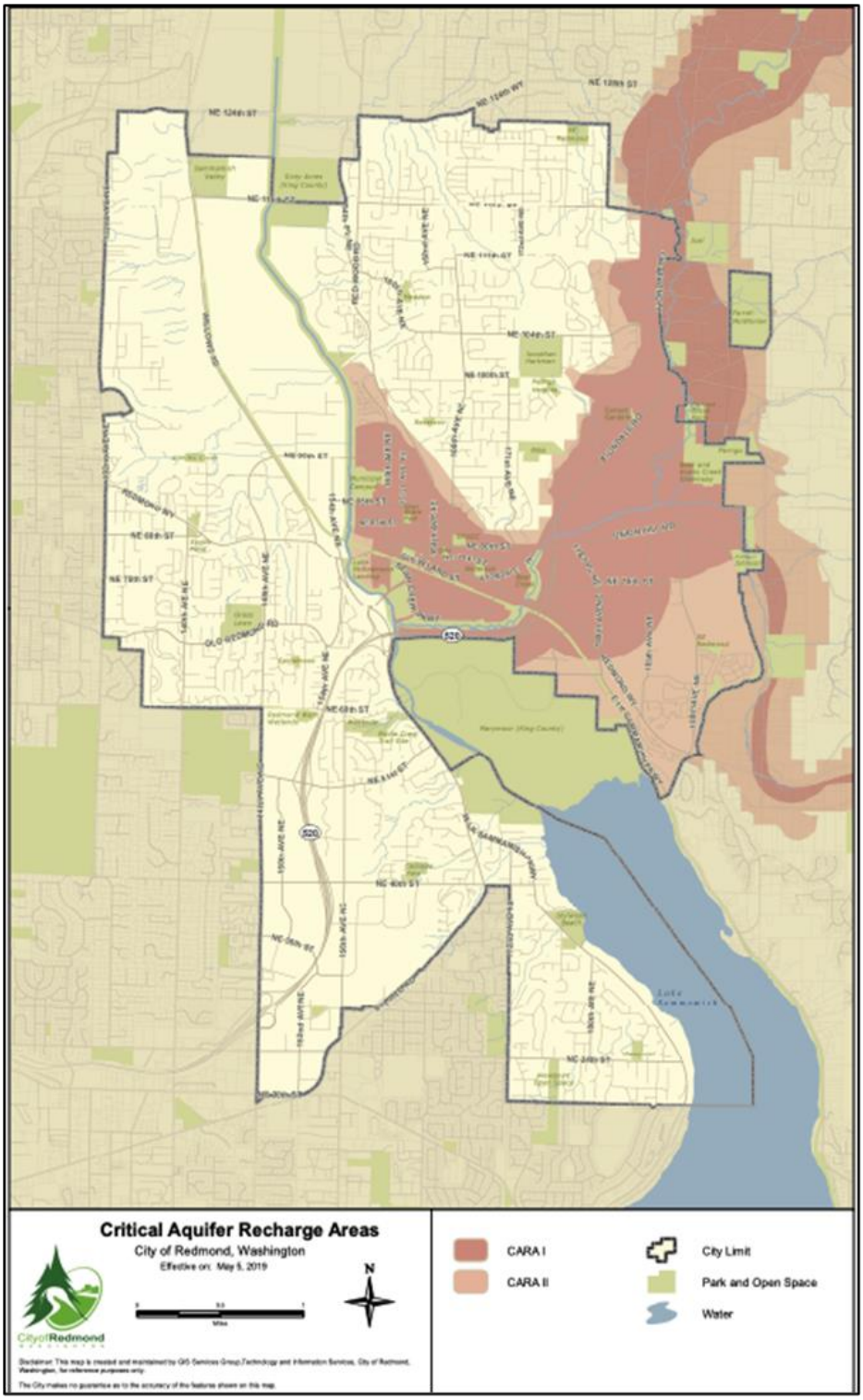


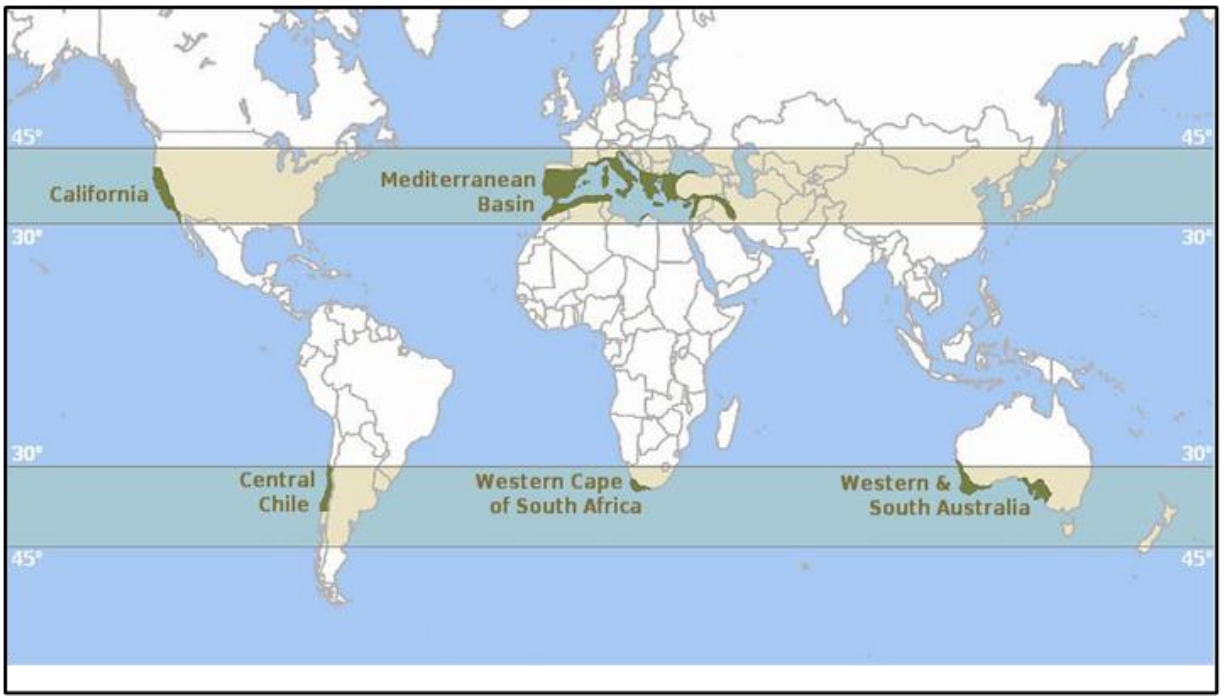
Figure 29: Critical Aquifer Areas



Wildland Fire

The City of Redmond lies at the edge of a Mediterranean Climate Zone characterized by hot, dry summers, and wet winters. This makes areas just to the south of King County prone to fires; frequently caused by either human activity or lightning. During the summer months, morning fog is common, which typically dissipates by late morning or early afternoon. Afternoon winds are common when the marine layer lifts. Most of the annual rainfall occurs during the winter; snow is infrequent.

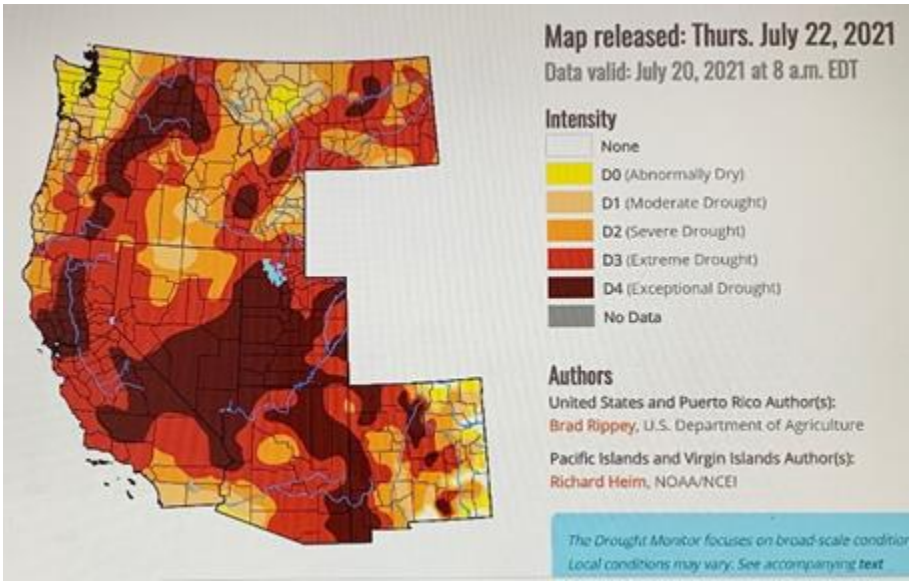
Figure 30: World Climate Zones



Over the past two decades, the 'fire season' in the western United States has become year-round in many areas and has moved further north year-by-year. Larger and more serious fires are becoming more common. These fires have now reached Washington and British Columbia. Drought conditions leading to prolonged and never-ending fire seasons are now common. This is expected to both intensify fire-friendly weather conditions, as well as

lengthen the season during which very large fires tend to spread. The National Oceanic and Atmospheric Administration (NOAA) predicts that, nationwide, the risk of very large fires will increase by a factor of six (6) by 2050[6].

Figure 31: Drought Monitor Map - 2021



Temperatures are also predicted to remain above normal, which will cause fuel and soil moisture to be below normal. Fuel moisture is the predominant factor as temperatures rise and fall. These conditions have already become apparent in the dead and stressed vegetation within RFD's boundaries. Mature vegetation in this condition, particularly in dense stands, has the potential to develop into very large fires. This trend of warmer temperatures, drought, and increased fire activity is predicted to continue, and the situation will worsen in the coming years.

Mediterranean Climate Zones

All vegetation in the region reaches some degree of flammability during the dry summer months and, under certain conditions, during the winter months. For example, as

[6]https://www.climate.gov/news-features/featured-images/risk-very-large-fires-could-increase-sixfold-mid-century-us

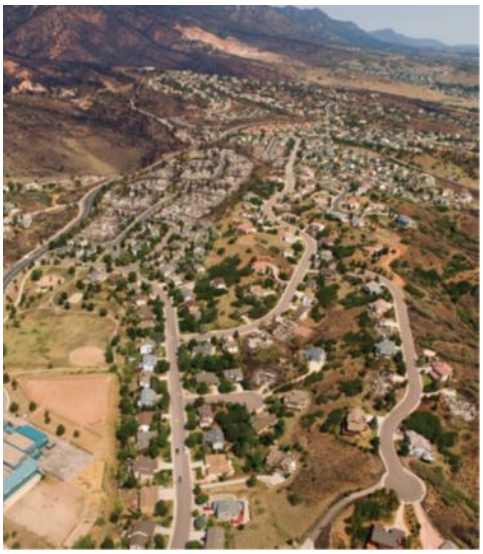
vegetation ages, twigs and branches within the plants die and are held in place. A stand of 10 to 20-year-old brush that is completely dry usually has enough dead material to match the rate of spread of a grass fire.

In severe drought years, additional plant material may die, contributing to the fuel load. There will normally be enough dead fuel load accumulated in 20- to 30-year-old brush to give rates of spread about twice as fast as in a grass fire. Under moderate weather conditions that produce a spread rate of one-half foot per second in grass, a 20- to 30-year-old stand of chaparral may have a rate of fire spread of about one foot per second. Fire spread in old brush (40 years or older) has been measured at eight times faster than grass (4-feet per second). Under extreme weather conditions, the fastest fire spread rate in grass can be 12 feet per second or about eight miles per hour. Under extreme weather conditions, the fastest fire spread rate in grass can be 12 feet per second or about eight miles per hour. Ember showers in strong winds can spread fire even faster. Residential structures within the wildland intermix or interface are therefore at greater threat from a wildfire.

Wildland Interface vs. Intermix

The ability of firefighters to defend and protect structures within an interface area is much more favorable than in an intermix area. Once dense fuel burns, the opportunity to extinguish the fire and protect structures becomes extremely difficult and dangerous. As seen in the maps below from the 2008 City of Redmond Hazards Mitigation Plan Update, large areas of Redmond have both interface and intermix areas.

Figure 32: Sample Interface versus Intermix Areas

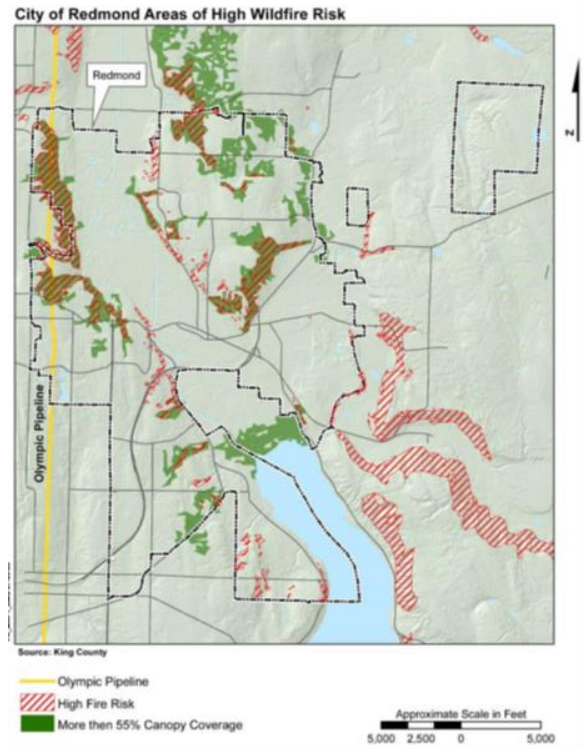
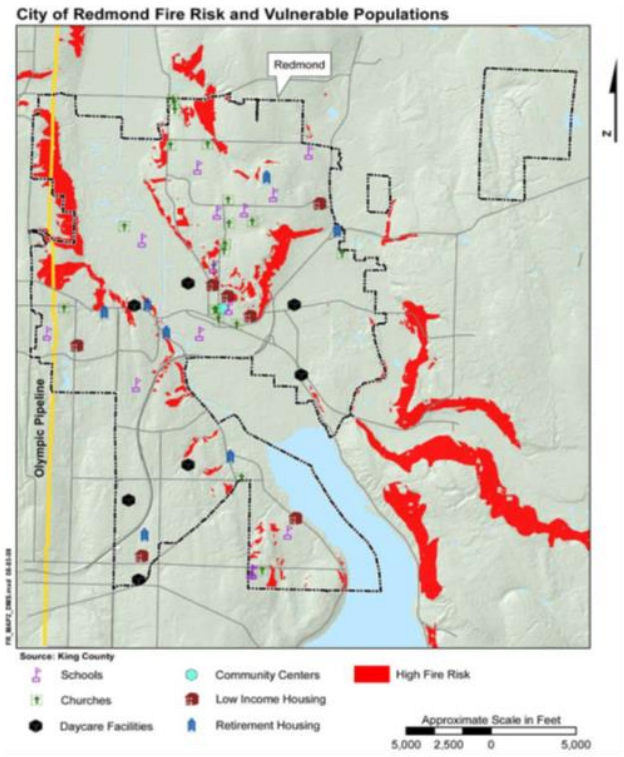
Interface	Intermix
	
16 or more houses per square mile and <50% covered with wildland vegetation	16 or more houses per square mile and >50% covered with wildland vegetation

As can be seen in the figures above, there are several areas within the city that are classified as intermix. Within Fire District 34, much of the area is intermix. On days when there is a strong east wind present, a large fire that begins within the District, or the east side of the City, could spread into areas of the city that would support continued fire growth.

In 2021, the Washington State Department of Natural Resources published a statewide map, which also highlights the areas where vegetation is above and below 50% coverage.

Together, these maps underscore the volume of fuel and the challenges it will create for firefighters during dry months.

Figure 33: Wildfire Risk in Relation of Vulnerable Populations

Wildfire Risk	Wildfire Risk and Vulnerable Populations
	

Drought

Drought is caused by lack of precipitation but can be heightened or worsened by other circumstances such as high temperatures, high winds, and low relative humidity. Droughts can result in a shortage of water for consumption and can affect hydroelectric power, recreation, and navigation. Severe droughts can lead to losses of crops, wildlife, and livestock as well as increase the risk of wildfires. Additional risk comes with the impact of

drought on trees and other vegetation that is more accustomed to wetter climates, has shallower root systems, and is generally not drought resistant.

Transportation and Infrastructure Risks

Aviation

Redmond does not have an airport and is not in the normal flight path for inbound flights at the Seattle-Tacoma International Airport (SeaTac). Out bound flights from SeaTac do over-fly Redmond and those aircraft can include very large commercial and cargo jets (e.g.) 747s. Although the probability of a large jet crash in Redmond is low, it is possible. Smaller aircraft, including jets and propeller planes frequently fly over Redmond. The agency also has recorded a history of small float planes and hot air balloons in the region.

Railroad

Sound Transit is the light rail train system that serves King County. Presently, the system serves the Seattle area and is being expanded north, south, and east. There are four new stations currently under construction within the City of Redmond. The trains are electric and don't travel at very high speeds. However, whenever heavy, complex machines are transporting passengers there are inherent risks.

Highway

State Highway 520 enters the city from Bellevue and extends to the southeast portion of the city, where it terminates into city streets. Although speeds on Highway 520 are higher, most serious vehicle accidents occur on surface streets (particularly in Fire District 34) where undivided two-lane roads are present.

Water Distribution System

The City of Redmond has a very robust water distribution system. The 2019 Washington Surveying and Rating Bureau reviewed the adequacy of the water system for the city and

gave it a score of 97 percent or better. The systems within Fire District 34 scored 77% of better for adequacy.

Figure 34: Fire Hydrant Coverage (+1,000 feet)

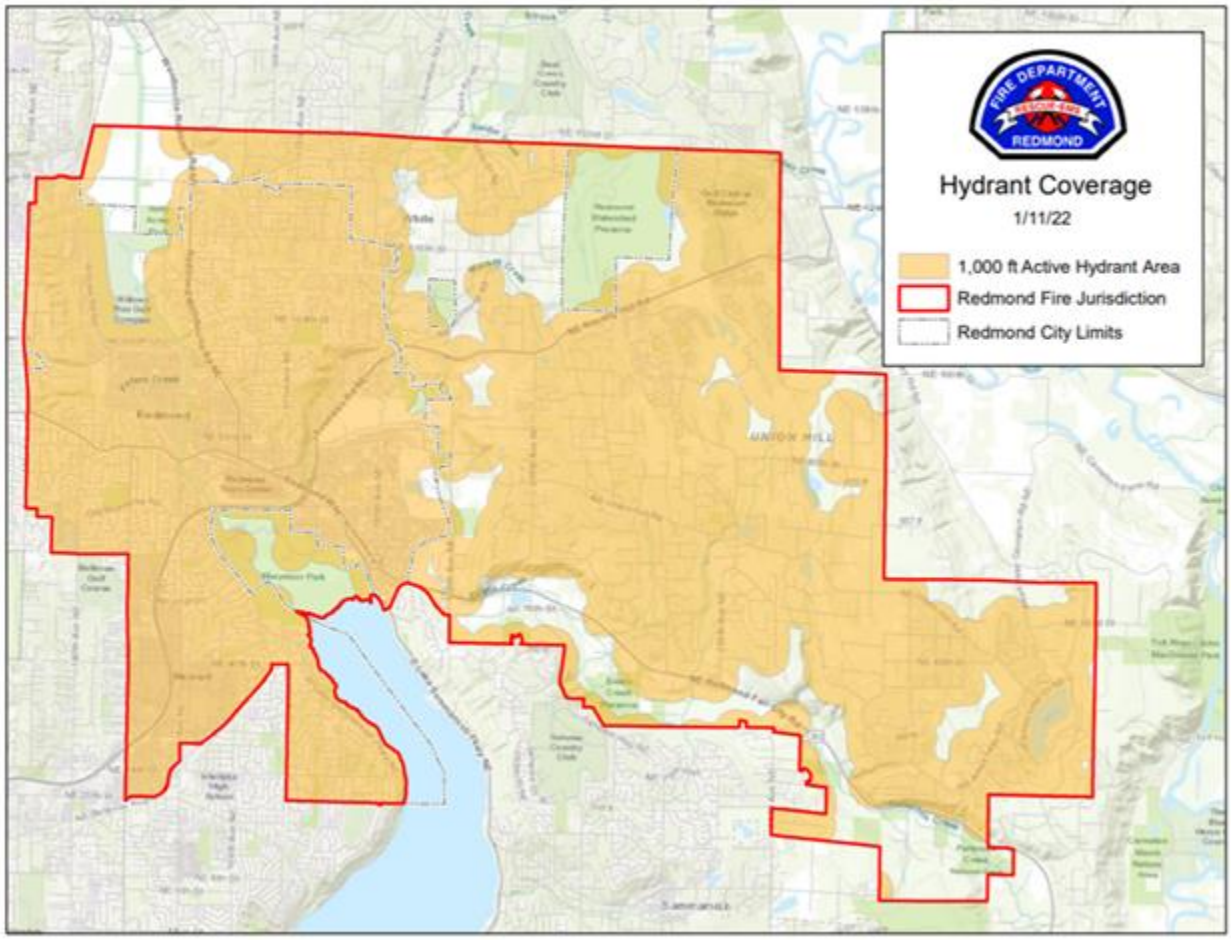
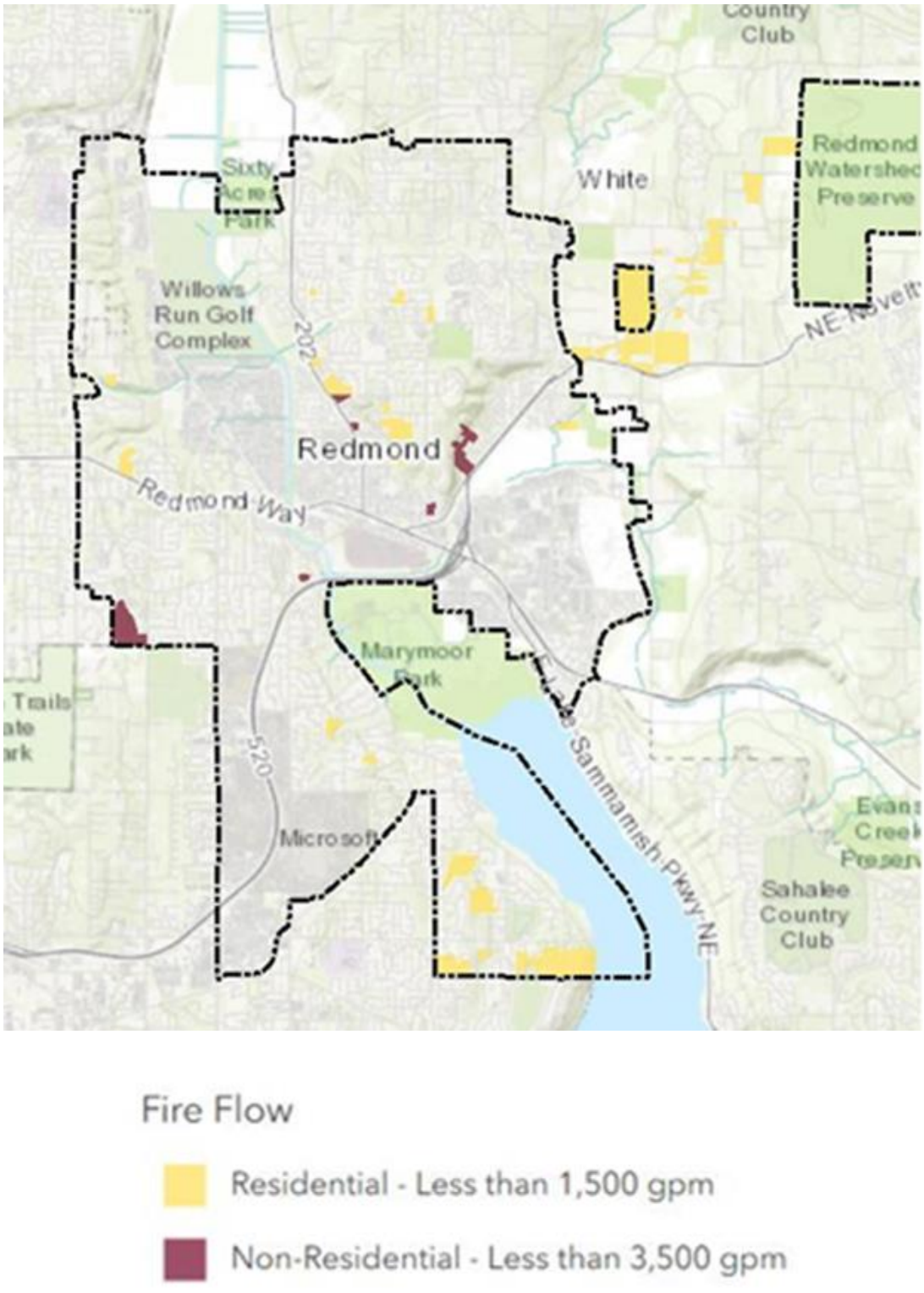


Figure 35: City of Redmond Fire Flow



Community Risks

Hazardous materials are part of everyday life and include everything from industrial chemicals and toxic waste to household detergents. Substances that are classified as hazardous materials because of their chemical nature pose a potential risk to life, health, or property if they are released or improperly used.

Production, storage, transportation, use, or disposal may be hazardous. Emergency incidents can range from a chemical spill on a highway to groundwater contamination by naturally occurring methane gas. Facilities that manufacture, use, or store hazardous materials are required to report them to county Local Emergency Planning Committees (LEPCs) by the Emergency Planning and Community Right-to-Know Act (EPCRA). This act is also known as Sara Title III.

Within the City of Redmond and Fire District 34, there are several fixed facilities where large quantities of concentrated chemicals are safely stored and used under normal operating conditions. When these chemicals leak, spill or become aerosolized (vapor), they can present a significant danger to people, animals, and the environment.

Population Density, Development, and Growth

As of the 2010 census, the overall density for the City of Redmond and a few areas within Fire District 34 are urban and the rest is classified as rural as defined by the Commission on Fire Accreditation International (CFAI)[7]. The Commission's definition is that rural designations have a population density of less than 1,000 people per square mile and suburban is for areas with a population density between 1,000 and 2,000 people per square mile. The city has an overall population density of approximately 5,000 per square mile within its 17 square miles of land. CFAI has combined urban and suburban densities

[7] CFAI. (2009). Fire & Emergency Service Self-Assessment Manual, 8th (ed.). Chantilly, Virginia: Author. (p. 71)

for first arriving apparatus at a baseline of 5 minutes and 12 seconds with a benchmark goal of 4 minutes in the more recently released 9th edition Interpretation Guide that accompanies the 9th edition Self-Assessment Manual.[8]

Using the CFAI's traditional recommendations as a guide, rural population densities are afforded a travel time of 13 minutes or less to 90% of the incidents.[9]

Table 17: Comparison of Response Times by Agency to Best Practices and National Experience

Call Category	90th Percentile Travel Time City	CFAI[10] 90th Percentile Urban Travel Time	NFPA 1710[11] 90th Percentile Urban Travel Time	90th Percentile Travel Time District 34	CFAI[12] 90th Percentile Rural Travel Time	NFPA 1720 90th Percentile Urban Travel Time
Fire	6:25	5:12	4:00	8:21	13:00	13:00
EMS	6:49	5:12	4:00	7:48	13:00	13:00

[8] CFAI. (2016). Fire & Emergency Service Self-Assessment Manual: Interpretation Guide, 9th (ed.). Chantilly, Virginia: Author. (p. 99)

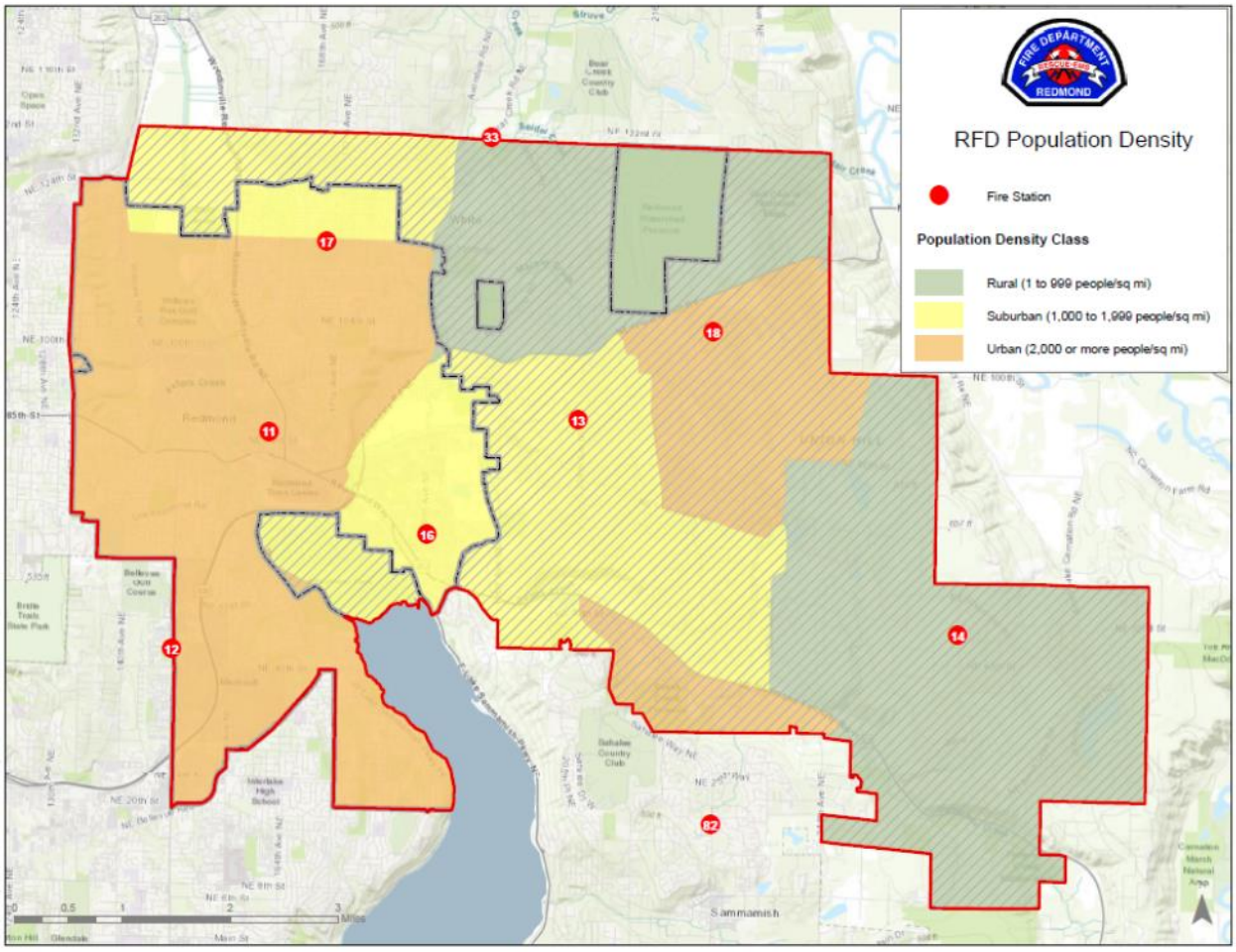
[9] Ibid

[10] CFAI. (2009). Fire *& emergency service self-assessment manual*, (8th ed.). Chantilly, Virginia: Author.

[11] National Fire Protection Association. (2016). NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. Boston, MA: National Fire Protection Association.

[12] Ibid.

Figure 36: Urban and Rural Call Density Map

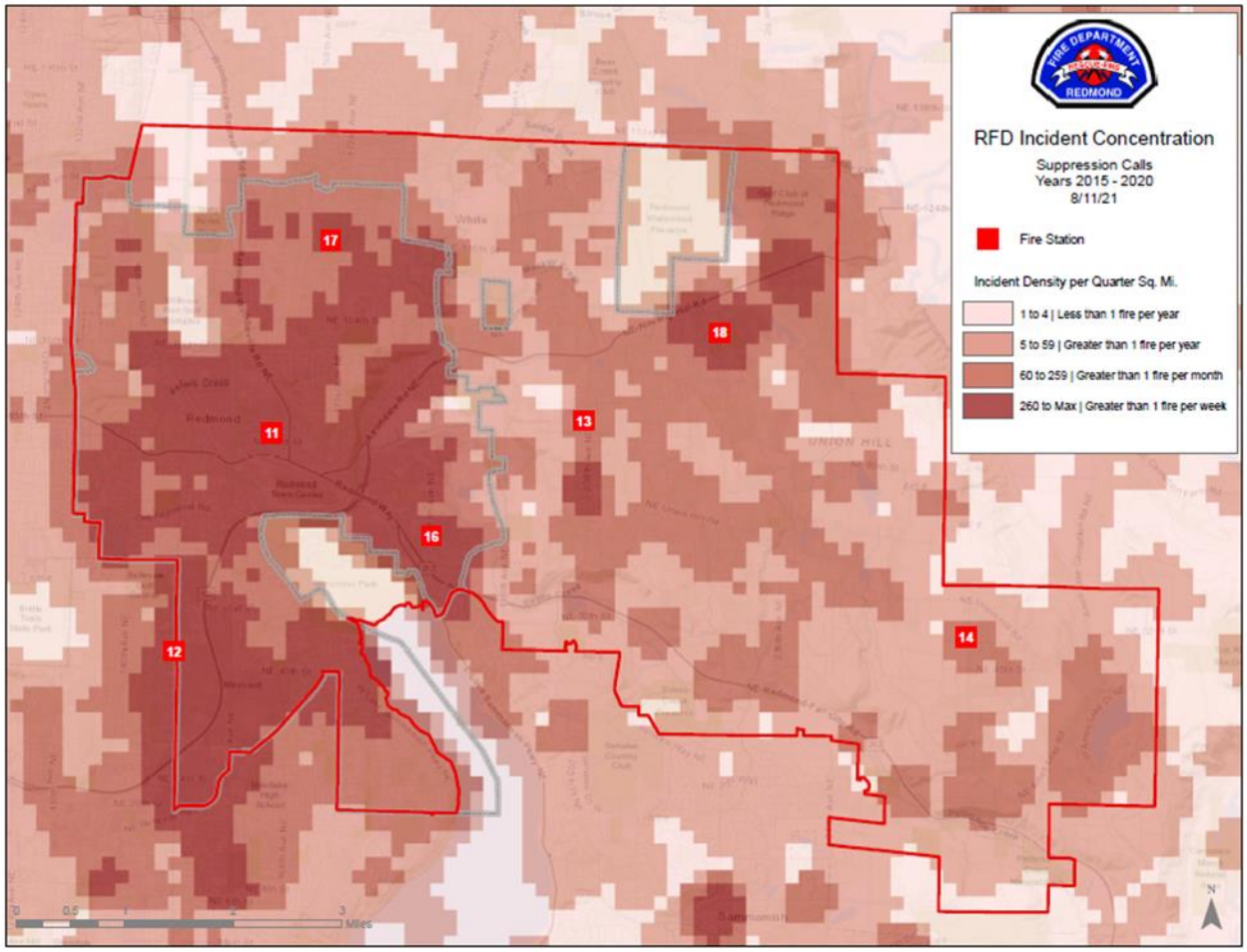


Risk Assessment and Critical Task Analysis

Fire Suppression Services

Heat maps were created to identify the concentration of the historic demand for service by program area. Therefore, the following mapping will present the relative concentration of fire-related service demands. The blue areas have the lowest concentration of demand, and the dark red areas have the highest concentration of demand.

Figure 37: Heat Map for Fire Calls



Occupancy-Level Risk

Occupancy risk was evaluated across the jurisdiction using the most recent internal occupancy-level data available. The available data provided specific building occupancy classifications that established base risk ratings on the occupancy classification alone. Next, automatic sprinkler systems, fire pumps, and standpipes were factored in to reduce the occupancy classification base risk rating. Ultimately, a quantifiable risk-rating matrix was developed that categorized 2,990 occupancies within the jurisdiction into high, moderate, and low risks.

The risks that garnished the highest numeric risk values are assumed to require higher needs for personnel and apparatus to mitigate events safely and effectively. Conversely, the presence of an automatic sprinkler system reduced the overall risk score. The fact that 92% of the fires are controlled (but not extinguished) with sprinkler activation[13] is incorporated into the matrix for a more realistic risk factor rating. The results of the risk assessment process categorized the 2,990 occupancies into 1,395 high-risk structures, 709 moderate-risk structures, and 864 low-risk structures.

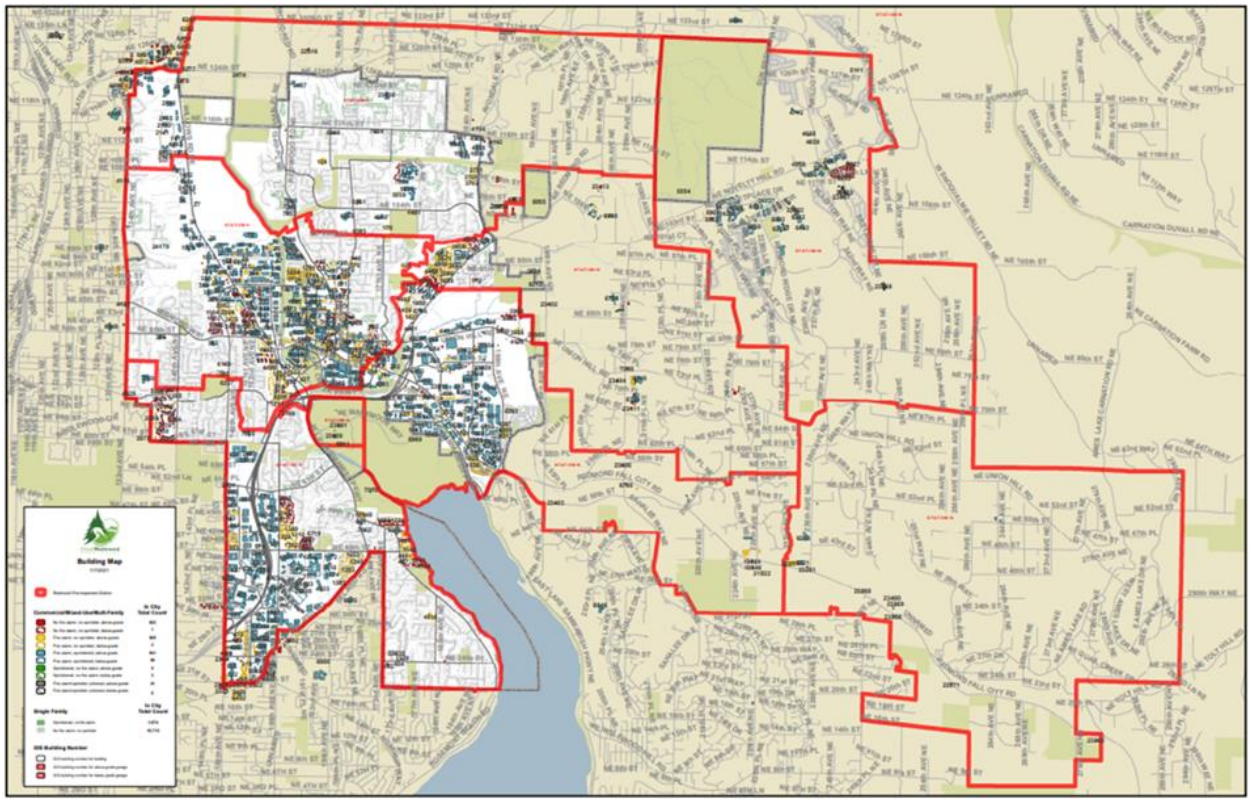
Geospatial analyses were completed to map each of the commercial occupancies included in the risk matrix process and overlay them within each of the fire station locations. This analysis lends validity to the risk assessment matrix and the process used by the Department, as the concentration of risks is correlated with the historical demand for fire related services. The results of the geospatial analyses of all structures by risk (categorizing all structures into high-, moderate-, and low-risk) are presented in the figures on subsequent pages. From a broad perspective, this provides validation of the risk assessment process developed with the Department as well as the necessary deployment strategy to cover the historical demand for services.

[13] US Experience with Sprinklers – National Fire Protection Association. October 2021. https://www.nfpa.org/-/media/files/news-and-research/fire-statistics-and-reports/suppression/ossprinklers.pdf

Table 17: Summary of Occupancy Risk Matrix

Occupancy Class	Occ Description	Base Risk Rating	System Information	Adjusted Risk Rating if Present
A1	Assembly	High	SYSTEMS AS/FA/SP	Low
A2	Assembly	High	SYSTEMS AS/FA	Low
A3	Assembly	High	SYSTEMS AS/FA/H	Low
A4	Assembly	High	SYSTEMS AS/FA/FP	Low
A5	Assembly	High	SYSTEMS AS/H	Moderate
B	Business	Moderate	SYSTEMS AS	Moderate
E	Education	High	SYSTEMS AS/H/FA	Low
E - DAY CARE	Day Care	High	AS/FA	Low
E1		High	AS/FA/H	Low
F1	Factory	High	SYSTEMS AS/FA/FP/H	Low
F2	Factory	High	SYSTEMS SP	Moderate
H2	High Hazard	High	SYSTEMS AS/FAH/SP	Low
H3	High Hazard	High	SYSTEMS AS/FA/H/SP	Low
H4	High Hazard	High	AS/FA/FP/H	Low
I1	Institution	High	SYSTEMS AS/FA/FP/SP	Low
I2	Institution	High	SYSTEMS AS/FA/H/TC	Low
I3 COND 1	Institution	High	SYSTEMS FA/SP	Moderate
I3 COND 3	Institution	High	SYSTEMS FA/FP/SP	Moderate
I3 COND 5	Institution	High	SYSTEMS AS/FA/TC	Low
M	Mercantile	High	SYSTEMS AS/FP/H/SP	Moderate
R1	Residential	High	SYSTEMS FA/SP/FP	Moderate
R2	Residential	High		
R3	Residential	High		
R4	Residential	High		
S1	Storage	High		
S2	Storage	High		
S3	Storage	High		
S4	Storage	High		
S5	Storage	High		
U1	Utility and Miscellaneous	Moderate		

Figure 32: All Risk Occupancies by Station Demand Zone



Critical Task Analysis

The key to any fire department's success at a fire is a rapid response and efficient fire scene deployment, as well as adequate staffing and coordinated teamwork. 'Critical tasks' are tasks that must be conducted in a rapid and coordinated manner at structure fires to control the fire prior to flashover or to extinguish a larger fire beyond the room of origin.

Interior firefighting operations are dangerous and require the use of protective equipment (which includes personal protective clothing), a self-contained breathing apparatus (SCBA), and a minimum of a 1¾" diameter hose line. Additional personnel must be staged to perform rescue functions for interior firefighting personnel, and a command structure must also be established.

Below are definitions of the minimum critical tasks that must be performed at a structure fire.

1. **Fire Attack:** A medium-sized hose that produces a water flow of at least 150 gallons per minute (GPM) and is handled by a minimum of two firefighters is required. Larger hose lines can flow over 200 GPM and must be handled by three or more fire fighters.
2. **Search and Rescue:** A minimum of two firefighters must be assigned to search for living victims and remove them from danger while the fire attack crew moves between the victims and the fire to stop the fire from advancing towards them. A two- person crew is normally sufficient for most small to medium sized structures, but more crews are required in multi-story buildings, high-risk structures and/or those with people who are immobile, incapacitated, or in any way not capable of self-preservation.
3. **Ventilation:** A minimum of three fire fighters are required to open a horizontal or vertical channel. Vertical ventilation or ventilation of a multi-story building can require more than three firefighters depending on the size and complexity of the structure involved. For example, pressurizing multiple stairwells in a multi-story building. Ventilation removes superheated gasses and smoke, preventing flashover and fire attack crews from seeing and working close to the seat of the fire. The same benefits apply to a search crew that is operating with or without a hose line. Removal of the superheated gasses provides an improved atmosphere within the structure that will increase a victim's chance for survival.
4. **Back-up Line/2-Out:** A back-up hose line is used to protect the fire attack crew in case the fire overwhelms them, or a problem develops with the fire attack hose line. This function requires a minimum of two firefighters.
5. **Rapid Intervention Crew (RIC):** When the first four fire fighters are on scene, the two outside firefighters are also known as the "2-Out". When the balance of the effective response force arrives, a primary search for victims is complete, and interior fire attack is continuing in hazardous atmospheres and conditions, a full company is assigned to be the rapid intervention crew. This team assembles a cache of equipment designed to

locate and extricate firefighters if they become trapped or lost within the structure. At very large fires, multiple rapid intervention crews may be assembled.

6. **Exposure Line:** This is an attack line or master stream appliance of any size staffed by two or more fire fighters and taken above, below, or next to the fire to protect nearby structures (or apartments).
7. **Pump Operator:** One firefighter should be assigned to deliver water under the right pressure to the various hose lines in use (attack, backup, and exposure lines), and monitor the pressure changes caused by the changing flows on each hose line. This firefighter also completes the hose hookups to the correct discharges and completes the water supply hookup to the correct intake. As the water from the fire engine is being used for firefighting, the pump operator will simultaneously locate and establish a continuous water supply from a hydrant, another engine, or a static water source. In areas where hydrants are present, the pump operator can secure water from a near-by hydrant or have water brought from a distant hydrant by coordinating with another pump operator. In any case, the initial attack hose line and back-up line will use water from the fire engine before a continuous water supply is established, and a rapid and there needs to be a coordinated effort to secure a permanent water supply before the fire engine water supply is exhausted.
8. **Water Supply:** A crew of one or more firefighters must pull the large diameter hose between the fire engine pump and the nearest hydrant. This crew can be redeployed once this task is complete.
9. **Incident Commander:** An officer must be assigned to remain outside of the structure to coordinate the fire attack, evaluate results, request additional resources, and monitor fire conditions which might jeopardize firefighter safety. This officer sets strategic and tactical objectives for the incident, which become extremely complex as the incident escalates.

10. **Safety Officer:** This is an officer assigned to ensure that fire department personnel on scene are following department safety policies and procedures. This officer has the authority to stop unsafe actions.

Evaluating critical tasks which need to be accomplished depending upon the risk involved determines the appropriate level of resources necessary to simultaneously handle the tasks of fire attack, search and rescue, ventilation, backup lines, pump operation and water supply and command. The goal is to accomplish these tasks within approximately 9 minutes or arrival of the first due unit. If fewer firefighters and equipment are available, or if they have longer travel distances, then the agency will not be able to accomplish an objective such as confining the fire near or to the room of origin.

The fire department reviewed historical data, existing time standards, and completed several time measured training exercises to determine which tasks can be accomplished under different circumstances. For example, task times were measured in single-family residences, multi-family residences and commercial occupancies. This data was then correlated with existing actual fire call tasks and time criteria to validate the departments capability of completing all critical tasks outlined in the tables below.

The critical tasks were developed by the RFD staff through a facilitated process that includes recommendations from the CFAI and the NFPA, as well as the current staffing and deployment model operating within the Department. Risks were categorized by program area and stratified by risk by the Department based on the CAD "Event Type", prior to the development of the critical task matrices. Critical tasks were developed for low-, moderate-, high-, and maximum-risk fire events. In addition to the critical tasks for personnel requirements, a similar process was conducted to determine the appropriate apparatus required to assemble the requisite personnel and equipment. A spreadsheet of all CAD "Event Types" and their associated risk severity is provided in the appendices.

Critical tasks were further refined to reflect the **initial response force (IRF)** necessary to provide the most important and timely actions to limit growth of fire or effect a rescue. A larger number force that follows, **the effective response force (ERF),** will have a more important role in providing sufficient safety for the responding personnel while they are operating on the emergency incident.

The RFD has very robust response matrices for all call types, and this section is intended as a reference for non-system experts as to the resource commitment typically sent to each risk level and the critical tasks required to mitigate events. Examples of critical tasks are provided below for low-, moderate-, and high-risk fire events.

Low-risk: Small outbuildings, park facilities, sheds, outside fires not otherwise classified.

Table 18: Critical Tasks for Fire Responses - Low Risk

Critical Task	Needed Personnel
Command	1
Investigation / Extinguishment	2
Personnel Required by Critical Tasks	**3**

Table 19: Apparatus and Personnel Requirements for Fire Responses - Low Risk

Responding Units	Minimum Staffing
Engine/Ladder	3
Total Response Provided	**3**

Moderate-risk: One-, two- or three family dwellings.

High-risk: Schools, apartments, hospitals, nursing homes, low-rise to high-rise buildings, commercial structures, dwellings in water deficient areas, and other high life hazard or large fire potential occupancies.

Table 20: Critical Tasks for Fire Responses - Moderate Risk

Critical Task	Needed Personnel
Command/Safety	1
Pump Operator	1
Fire Control/Initial Rescue	2
Primary Search or Ventilation	3
Water Supply/Back Up Hose Line	3
Exposure Protection	2
Initial Response Force	**12**
Rapid Intervention	3
Safety	1
Medical/Rehab	2
Primary Search or Ventilation	3
Effective Response Force	**21**

Table 21: Apparatus and Personnel Requirements for Fire Responses - Moderate and High Risk

Responding Units	Minimum Staffing
Battalion Chief	1
Battalion Chief	1
Engine	3
Engine	3
Engine	3
Ladder	3
Ladder	3
Aid Car	2
Medic Unit	2
MSO	1
Total Response Provided	**22**

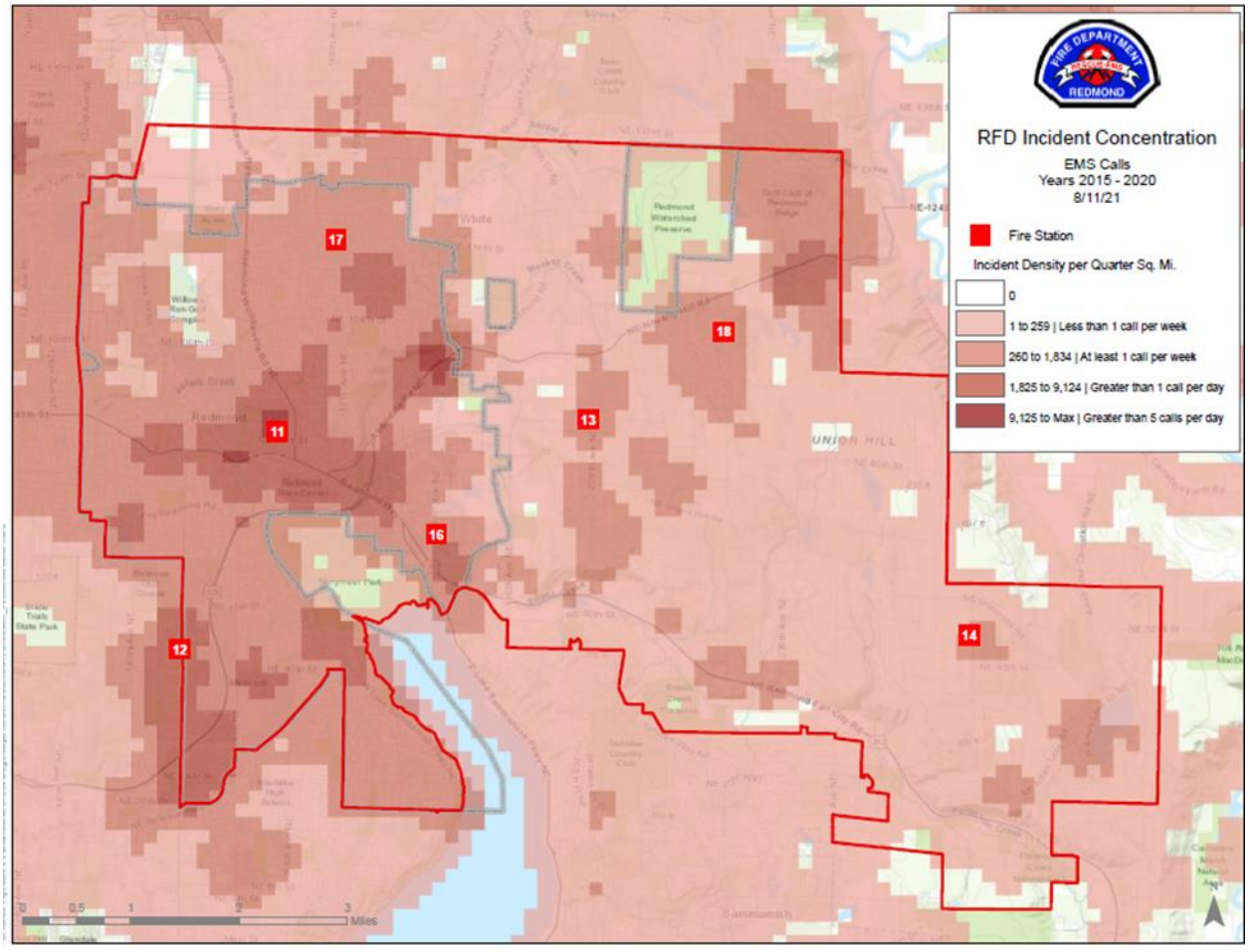
Emergency Medical Services

Emergency medical services are provided by fire suppression personnel, who respond in a tiered manner. All medical emergencies are initially dispatched with a Basic Life Support (BLS) aid car (ambulance), fire engine or ladder truck. Following further questions by the 9-1-1 call taker, using a criteria-based process, a medic unit with Paramedics may be dispatched to provide advanced life support (ALS). Either the aid car or medic unit can provide transport to the appropriate hospital.

The City of Redmond has an Interlocal Agreement with King County to provide Advanced Life Support (ALS) services to the Cities of Redmond, Duvall, Kirkland, Woodinville, Fire District 34, and other unincorporated portions of Northeast King County. The Redmond Fire Department is the lead agency for the Northeast King County Medic One response area. This area covers 266 square miles and has a population of 333,000 residents. Basic Life Support (BLS) treatment and transport is a function of the fire department within the City of Redmond and King County Fire District 34.

Heat maps were created to identify the concentration of the historic demand for service by program area. Therefore, the following mapping will present the relative concentration of service demands by EMS. The darkest red areas have the highest concentration of demand.

Figure 33: Heat Map for EMS Calls



Critical Task Analysis

In order to align resource allocation and risk for EMS, a critical task analysis was completed. Results found that the most efficient strategy is to allocate resources depending on the identified level of risk and patient acuity. Therefore, low-risk events may receive a single EMS resource while a moderate-risk incident may receive two resources. As a matter of pre-determined dispatch, high risks require multiple resources. Similarly, the process determined the personnel required for these critical tasks. The tables below reflect call types and resource allocations.

Each of the following risk severity levels follow the internationally protocolized call triage system from Medical Priority Dispatch and the International Academies of Emergency Dispatch (IAED).

Low-risk EMS responses included incidents such as lift assists or medical concerns that do not require advanced medical intervention.

Table 22: Critical Tasks for EMS Responses - Low Risk

Critical Task	Needed Personnel
Patient Assessment	1
Medical Support	1
Effective Response Force	**2**

Table 23: Apparatus and Personnel Requirements for EMS Responses - Low Risk

Responding Units	Minimum Staffing
Aid Car or Engine	2(3)
Total Response Provided	**2 (3)**

Moderate-risk EMS responses include call types of an emergent nature including difficulty breathing. Response for all moderate-risk EMS responses will include one engine and one aid unit (ambulance). Depending on the location in the service area in which the incident occurs, automatic and mutual aid companies may be used to achieve the required ERF and ensure the quickest response for the patient.

Table 24: Critical Tasks for EMS Responses - Moderate Risk

Critical Task	Needed Personnel
Patient Assessment/Handling/Transport	2
ALS Treatment	2
Effective Response Force	**4**

Table 25: Apparatus and Personnel Requirements for EMS Responses - Moderate Risk

Responding Units	Minimum Staffing
Aid/Engine	2 (3)
Medic Unit	2
Total Response Provided	**4(5)**

High-risk EMS responses are incidents that can be handled by agency resources. However, the responses require resource allocation beyond a moderate-risk response. These types of incidents include responses where there are multiple patients.

Table 26: Critical Tasks for EMS Responses - High Risk

Critical Task	Needed Personnel
Command	1
Medical Oversite	1
Medical Treatment including ALS	5
*CPR, Ventilation, AED	
Patient handling/Transport	2
Effective Response Force	**9**

Table 27: Apparatus and Personnel Requirements for EMS Responses - High Risk

Responding Units	Minimum Staffing
Battalion Chief	1
Aid Car	2
Medic Unit	2
Engine	3
MSO	1
Total Response Provided	**9**

Hazardous Materials Services

A hazardous material is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Responses to hazardous materials releases and/or spills within the Redmond Fire Department (RFD) response area may occur in transportation, fixed facility, industrial pipeline, natural cause, or terrorism settings. RFD personnel are trained at three levels: 1) Awareness, 2) Operations, and 3) Technician. Each level of training offers capabilities and limitations, including emergency response, hazard recognition, defensive and offensive mitigations.

Within RFD, a limited-scope hazardous materials response vehicle (Haz-Tac) is centrally located with the ability to handle some incidents. In addition, this vehicle can supplement larger incidents requiring additional vehicles and equipment. RFD's vehicle is one of two Haz-Tac vehicles in eastern King County. A larger, fully equipped vehicle is located in nearby Bellevue.

Critical Task Analysis

Low-risk hazardous materials responses involve an identifiable substance that may have leaked in a small quantity or an incident that can be handled by the first arriving unit. These incidents may include gasoline spills, carbon monoxide alarms, and the smell of natural gas not specific to a location.

Table 28: Critical Tasks for Hazardous Materials Responses - Low Risk

Critical Task	Needed Personnel
Command	1
Investigate/Isolate/Deny Entry	2
Effective Response Force	**3**

Table 29: Apparatus and Personnel Requirements for Hazardous Materials Responses - Low Risk

Responding Units	Minimum Staffing
Engine /Ladder	3
Total Response Provided	3

When it comes to moderate or high-risk incidents that exceed the capability of the agency, these incidents may require assistance beyond the first arriving engine company.

This may include flammable and combustible liquid spills, or releases that require specialized equipment to identify the product, its properties, and any special protective equipment for stabilizing the incident. Depending on the location in the service area in which the incident occurs, automatic and mutual aid resources may be used to achieve the required ERF and ensure the quickest response. Of course, it is recognized that these types of incidents require a slightly slower and more methodical approach to ensure safety of responders and surrounding exposures.

Table 30: Critical Tasks for Hazardous Materials Responses – Moderate Risk and High Risk

Critical Task	Needed Personnel
Command	1
Investigate/Isolate/Deny Entry	1
Identification (Tech/Ref)	1
Medical	2
Contain	2
Initial Response Force	**7**
Haz Mat Team Leader	1
Entry Team Leader	1
Decontamination	2
Safety Officer - Incident	1
Safety Officer – Haz Mat Team	1
Entry Team	2
Back up Team	2
Air Monitoring	2
Rehab	2
Effective Response Force	**21**

Table 31: Apparatus and Personnel Requirements for Hazardous Materials Responses – Moderate Risk and High Risk

Responding Units	Minimum Staffing
Battalion Chief	1
Battalion Chief	1
Engine	3
Engine	3
Engine	3
Engine	3
Ladder	3
Ladder	3
Aid Car	2
Medic Unit	2
MSO	1
Haz Tac	1
Haz Tac	1
Haz Mat Unit	1
Total Response Provided	**27***

All units after Initial Response Force are called in as needed and not Code 3 is not called unless needed.

Rescue Services

The RFD provides initial response for technical rescue services within the City and District 34. RFD will respond to technical rescue incidents and is equipped to extricate and treat injured patients and victims involved in specialty rescue situations. The RFD cross-staffs an Urban Search and Rescue (USAR) Heavy Rescue unit at Station 16. This unit has equipment and operation capabilities to handle most technical rescue incidents within the jurisdiction.

The team is composed of approximately 50 members (across several area agencies) and can respond to and mitigate incidents related to heavy structural collapse, high-angle rescue, machinery entrapment, trench rescue, and confined space rescue. In 2020, rescue incidents accounted for 1.9% of the total incidents responded to by the RFD.

Critical Task Analysis

Low-risk technical rescue incidents include events such as elevator rescues and lockouts and can routinely be handled by the first arriving unit.

Table 32: Critical Tasks for Technical Rescue Responses - Low Risk

Critical Task	Needed Personnel
Command	1
Extrication	2
Effective Response Force	**3**

Table 33: Apparatus and Personnel Requirements for Technical Rescue Responses - Low Risk

Responding Units	Minimum Staffing
Engine /Ladder	3
Total Response Provided	3

Moderate-risk technical rescue incidents include responses to events such as trench rescue, high-angle and low-angle rescues, structure collapses, motor vehicle accidents with entrapment and extrications that require specialized equipment and additional personal.

Table 34: Critical Tasks for Technical Rescue Responses - Moderate Risk and High Risk

Critical Task	Needed Personnel
Command	1
Patient Stabilization	2
Extrication	2
Pump Operator	1
Hose line	1
Medical oversite	1
Initial Response Force	**8**
Safety	1
Incident Support	7
Rescue Group Supervisor	1
Effective Response Force	**17**

Table 35: Apparatus and Personnel Requirements for Technical Rescue Responses - Moderate Risk

Responding Units	Minimum Staffing
Battalion Chief	1
Engine	3
Ladder	3
Ladder	3
Ladder	3
Aid Car	2
Medic Unit	2
MSO	1
Total Response Provided	**18**

Review of System Performance

The first step in determining the current state of the RFD deployment model is to establish baseline measures of performance. This analysis is crucial to the ability to discuss alternatives to the status quo and identify opportunities for improvement. This portion of the analysis will focus on elements of response time and the cascade of events that lead to timely response with the appropriate apparatus and personnel to mitigate the event. Response time goals should be looked at in terms of total response time, which includes the dispatch or call processing time, turnout time, and travel time, respectively.

Cascade of Events

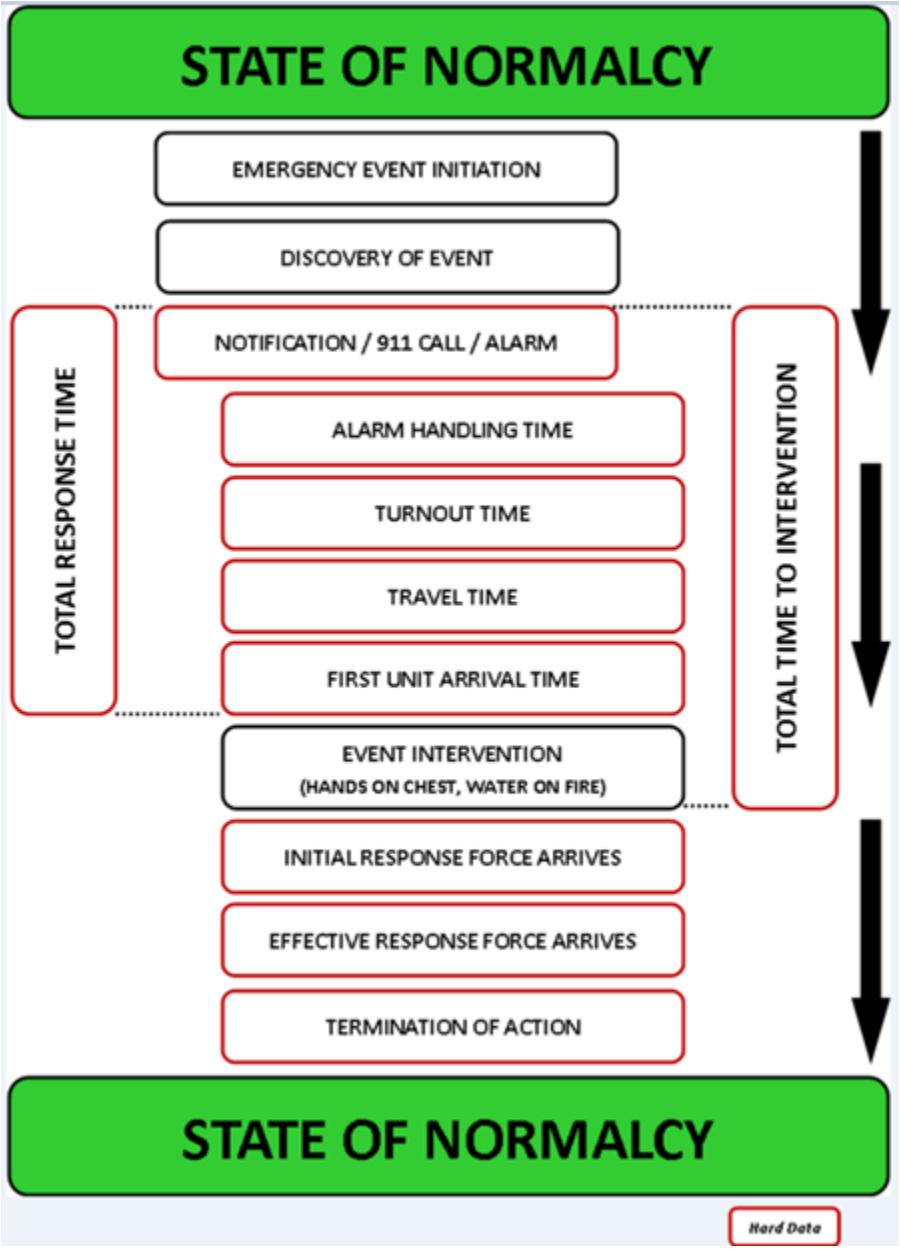
The cascade of events is the sum of the individual elements in time, beginning with a state of normalcy and continuing until normalcy is once again returned via the mitigation of the event. The elements of time that are important to the ultimate outcome of a structure fire or critical medical emergency begin with the initiation of the event. For example, the biological clock for heart damage begins at the first onset of chest pain, regardless of when 911 is notified.

Similarly, a fire may begin and burn undetected for a period of time before the fire department is notified. The emergency response system does not have control over the time interval for manual recognition or the choice to request assistance.

Therefore, RFD uses quantifiable "hard" data points to measure and manage system performance. These elements include alarm handling, turnout time, travel time, time to intervention (patient contact, water on fire, etc.), initial response force, effective response force, and the time spent on-scene. An example of the cascade of events and the elements of performance used by the RFD is provided in the figure below.[14]

[14] Olathe Fire Department. (2012). Adapted from Community Risk and Emergency Services Analysis: Standard of Cover. Olathe, Kansas: Author.

Figure 34: Cascade of Events

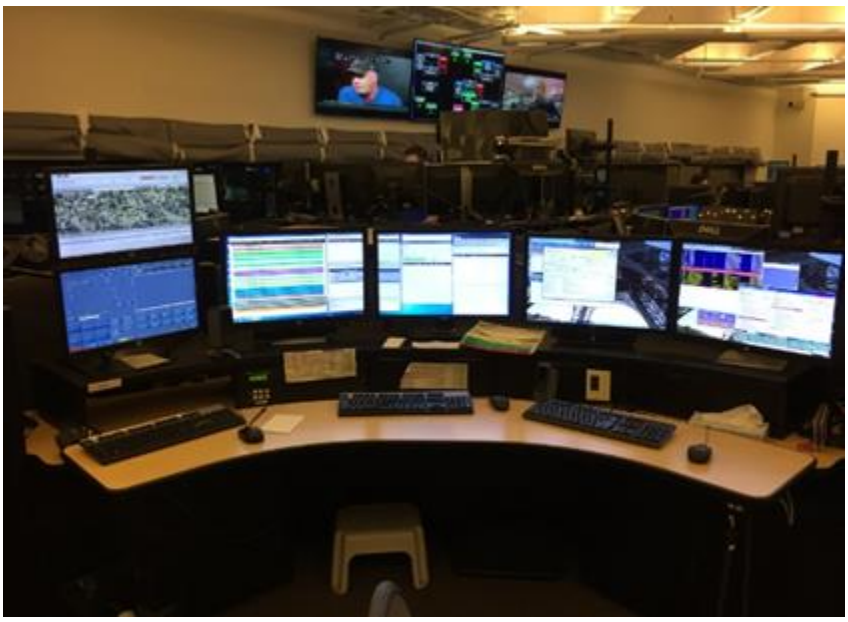


Detection Time

Detection is the element of time between when an event occurs, someone detects it, and the emergency response system is notified. This is typically accomplished by calling the 911 Public Safety Answering Point (PSAP). Throughout King County, 911 calls are routed based on mode. Wireless/cellular calls go directly to Northeast King County Regional Public Safety

Communication Agency (NORCOM), a regional fire/EMS service center located in Bellevue, and landline calls go to the appropriate law enforcement agency for the caller's physical location, such as the city of Redmond Police Department PSAP or the King County Sheriff's Department PSAP.

Alarm Handling



This is the element of time measured between when the communication center answers the 911 call (usually NORCOM), processes the information, and subsequently dispatches the appropriate agency resources (Alert or Tone Out). The RFD, through NORCOM, handled 11,850 calls for service in 2020. 7,778 calls originated within either the city of Redmond or King County Fire District 34. 4,072 calls originated from areas where base services are provided by another agency (i.e., Kirkland, Duvall, Woodinville) but ALS/Paramedic services are provided by RFD through the Medic One program. As opposed the typical 911 call routing, approximately 70% of all 911 calls are wireless, so they are routed directly to NORCOM.

Overall, the performance by NORCOM is one of the best in the industry as compared to the national fire service experience.

Figure 35: Call Processing Path within NORCOM

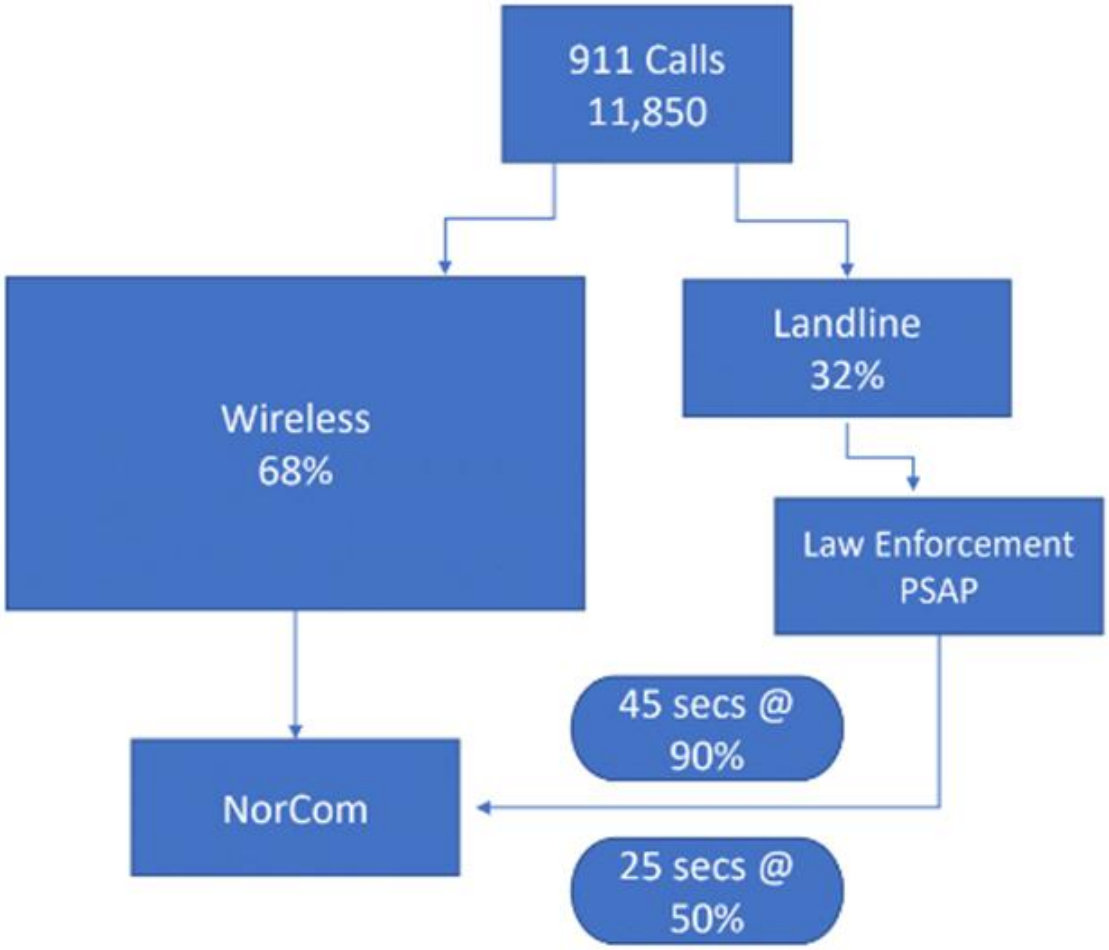
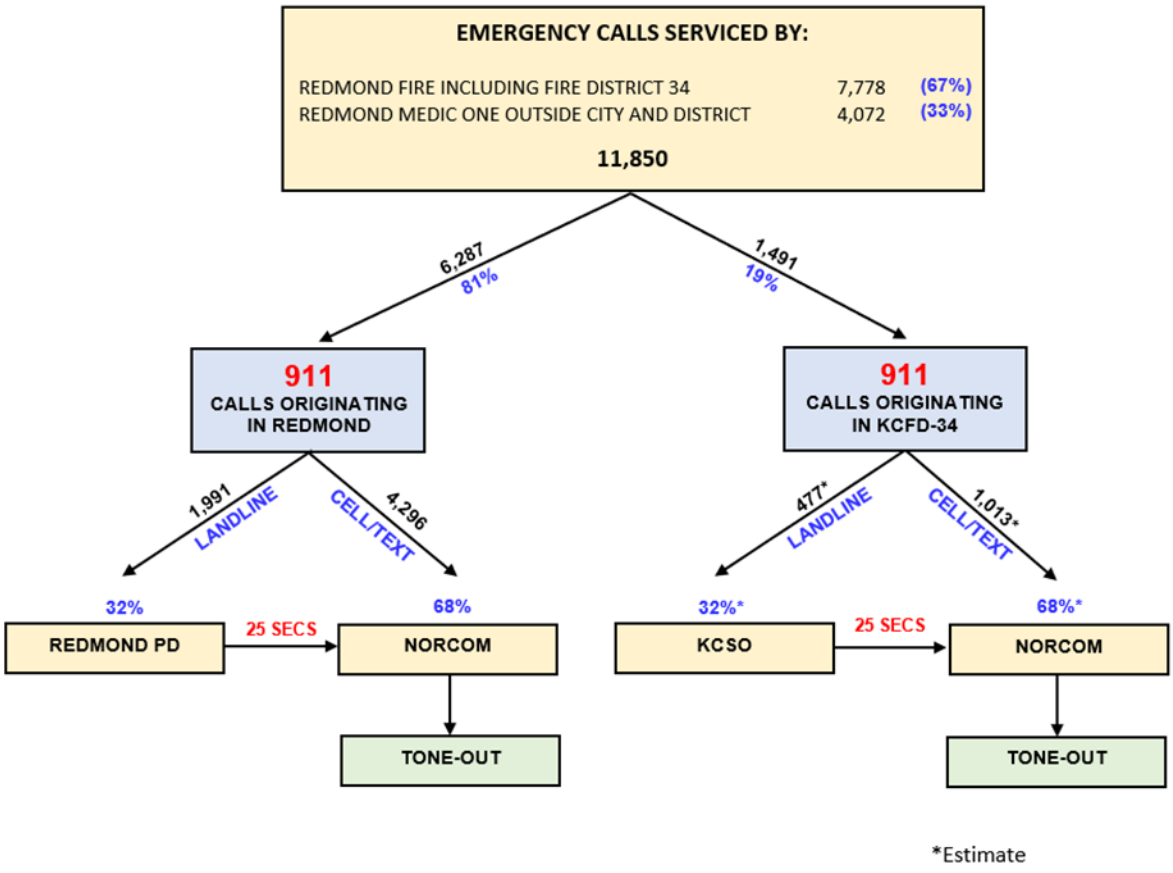


Figure 36: Call Processing When Not Received Directly by NORCOM



Turnout Time

The time between when the fire department is dispatched or alerted of the emergency incident and when the fire apparatus or ambulance is enroute to the call. This is the time needed for responders to don any specialized protective clothing/equipment.

Travel Time

The time between when the unit went enroute, or began to travel to the incident, and their arrival on scene.

Total Response Time

The time between when the 911 call is received at the communication center (NORCOM) and the first unit arrives on scene of the incident.

Time to Intervention

The time between when the 911 call is received at the communication center (NORCOM) to the initiation of some type of action that begins the mitigation of the event (i.e., water on fire, hands on chest, stop the bleed).

Time to intervention is the best measurement for community outcomes.

Response Time Continuum

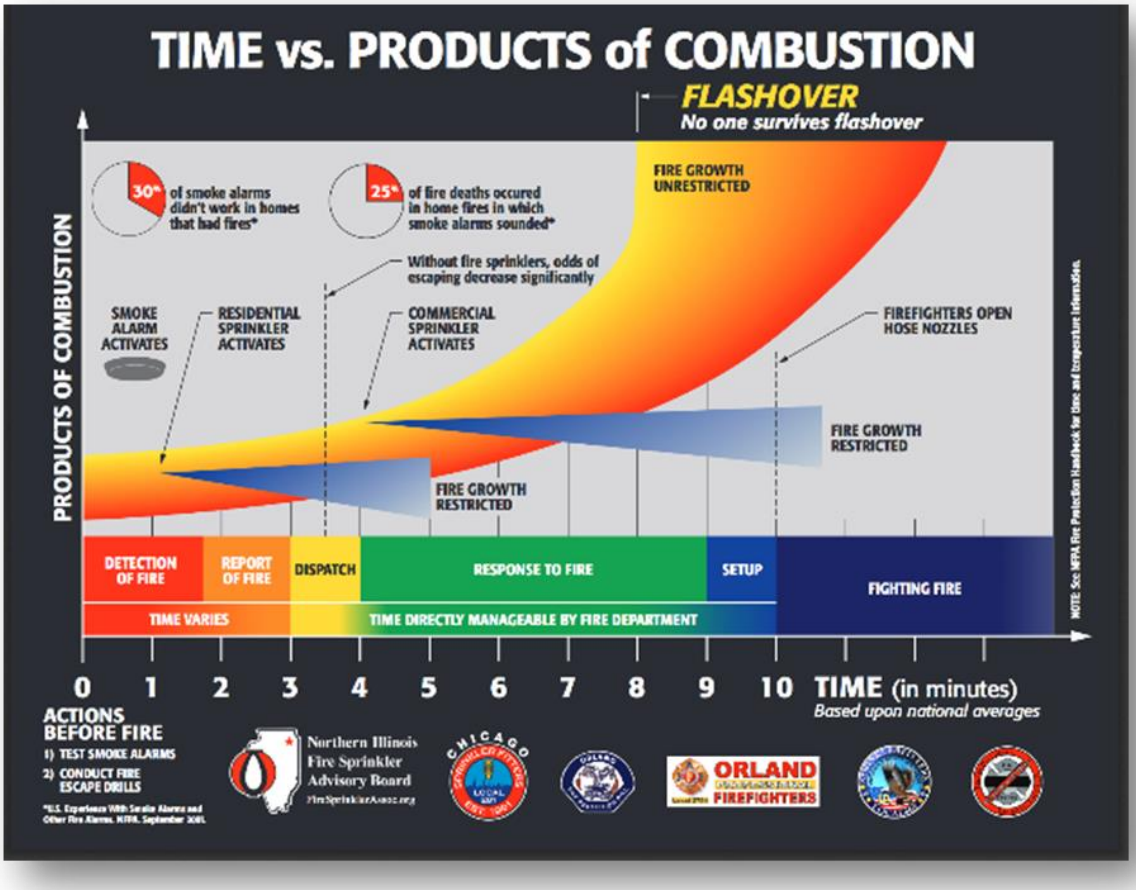
Fire

The number one priority with structural fire incidents is to save lives followed by the minimization of property damage. A direct relationship exists between the timeliness of the response, the survivability of unprotected occupants and the prevention of property damage. The most identifiable point of fire behavior is flashover.

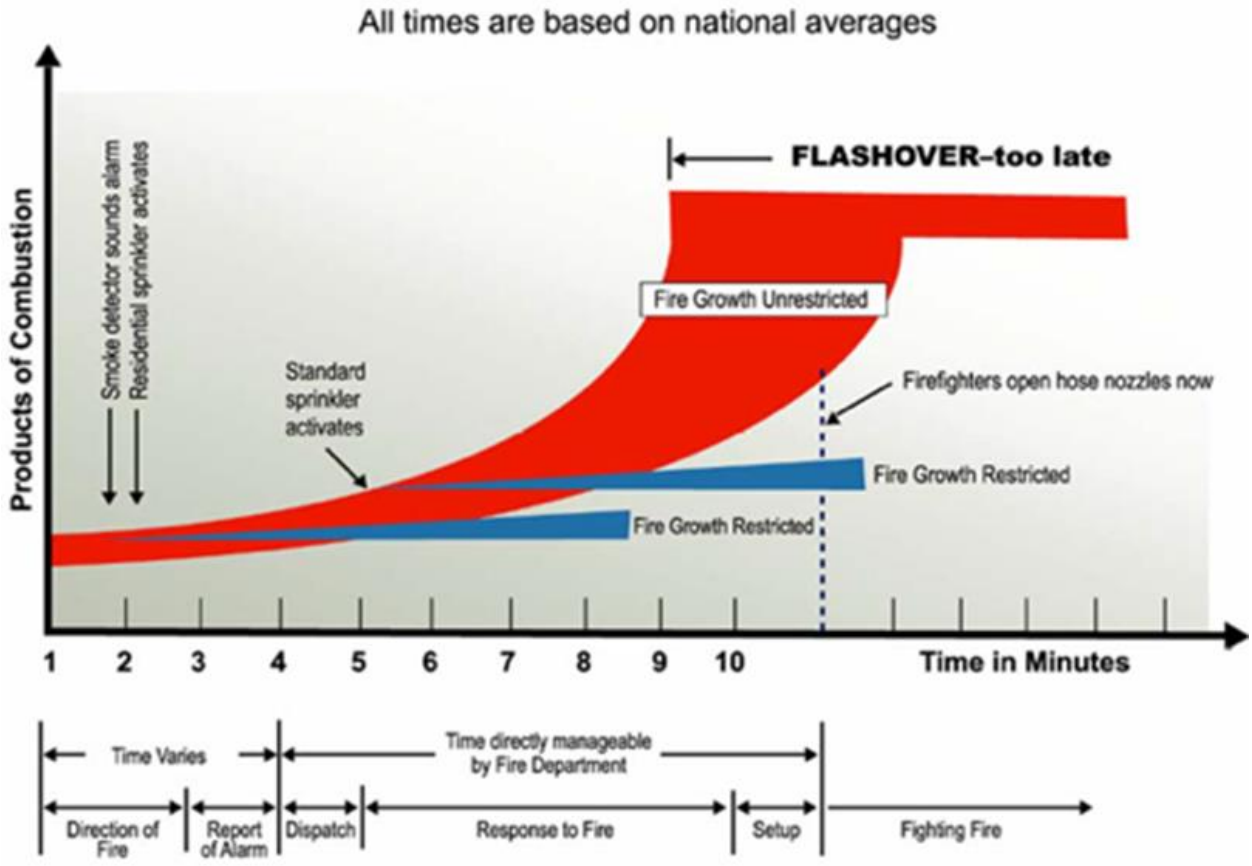
Flashover is the point in fire growth when the contents of an entire area, including the smoke, reach their ignition temperature. This results in rapid fire spread, rendering the area un-survivable by civilians and untenable for firefighters. It is always best to arrive and

attack the fire prior to the point of flashover. A representation of the traditional time temperature curve and the cascade of events is provided below.[15]

Figure 37: Examples of Traditional Time Temperature Curves



[15] Example of Traditional Time Temperature Curve. Retrieved at http://www.usfa.fema.gov/downloads/pdf/coffee-break/time-vs-products-of-combustion.pdf

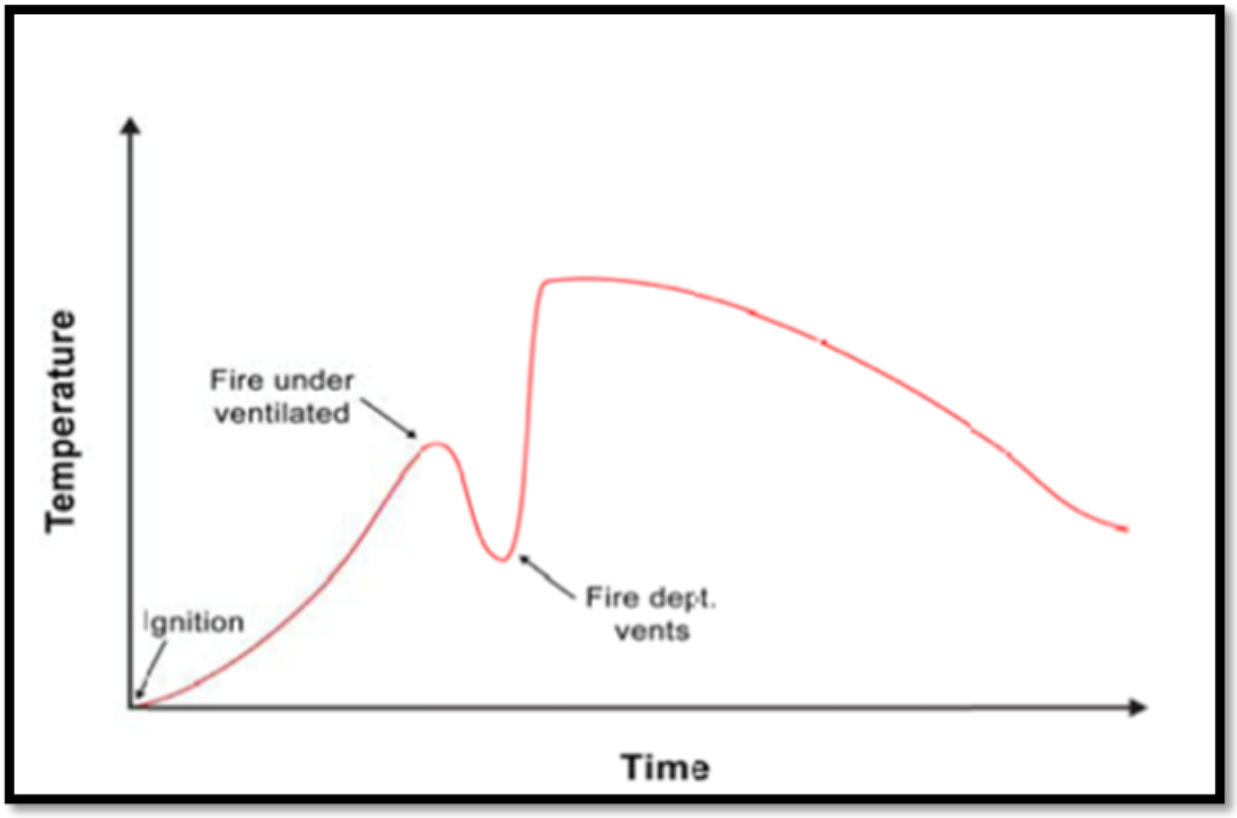


Recent studies by Underwriter's Laboratories (UL) have found that in compartment fires such as structure fires, flashover occurs within 4 minutes in a modern fire environment. Modern home environments differ from traditional home environments due to the addition of consumer furnishings made from petroleum-based products, such as foam cushions and plastics. The energy efficiency of modern windows and insulation also has a compounding effect.

In addition, the UL research has identified an updated time temperature curve due to fires being ventilation-controlled rather than fuel-controlled (as represented in the traditional time temperature curve.) While a ventilation-controlled environment will create a high risk to unprotected occupants due to smoke and high heat, it will give an advantage to property conversation efforts. Water may be applied to the fire prior to ventilation and flashover.

An example of UL's ventilation-controlled time temperature curve is provided below.[16]

Figure 38: Ventilation Controlled Time Temperature Curve



EMS

Responding effectively to EMS incidents means being able to respond within a specified period. However, unlike structure fires, responding to EMS incidents introduces considerable variability in the level of clinical acuity. From this perspective, the relationship between response time and clinical outcome varies depending on the severity of the injury or the illness. Research has demonstrated that the overwhelming majority of requests for

[16] UL/NIST Ventilation Controlled Time Temperature Curve. Retrieved from http://www.nist.gov/fire/fire_behavior.cfm

EMS services are not time sensitive between 5 minutes and 11 minutes for emergency and 13 minutes for non-emergency responses.[17] The 12-minute upper threshold is only the upper limit of the available research and is not a clinically significant time measure. Patients were not found to have a significantly different clinical outcome when the 12-minute threshold was exceeded.[18]

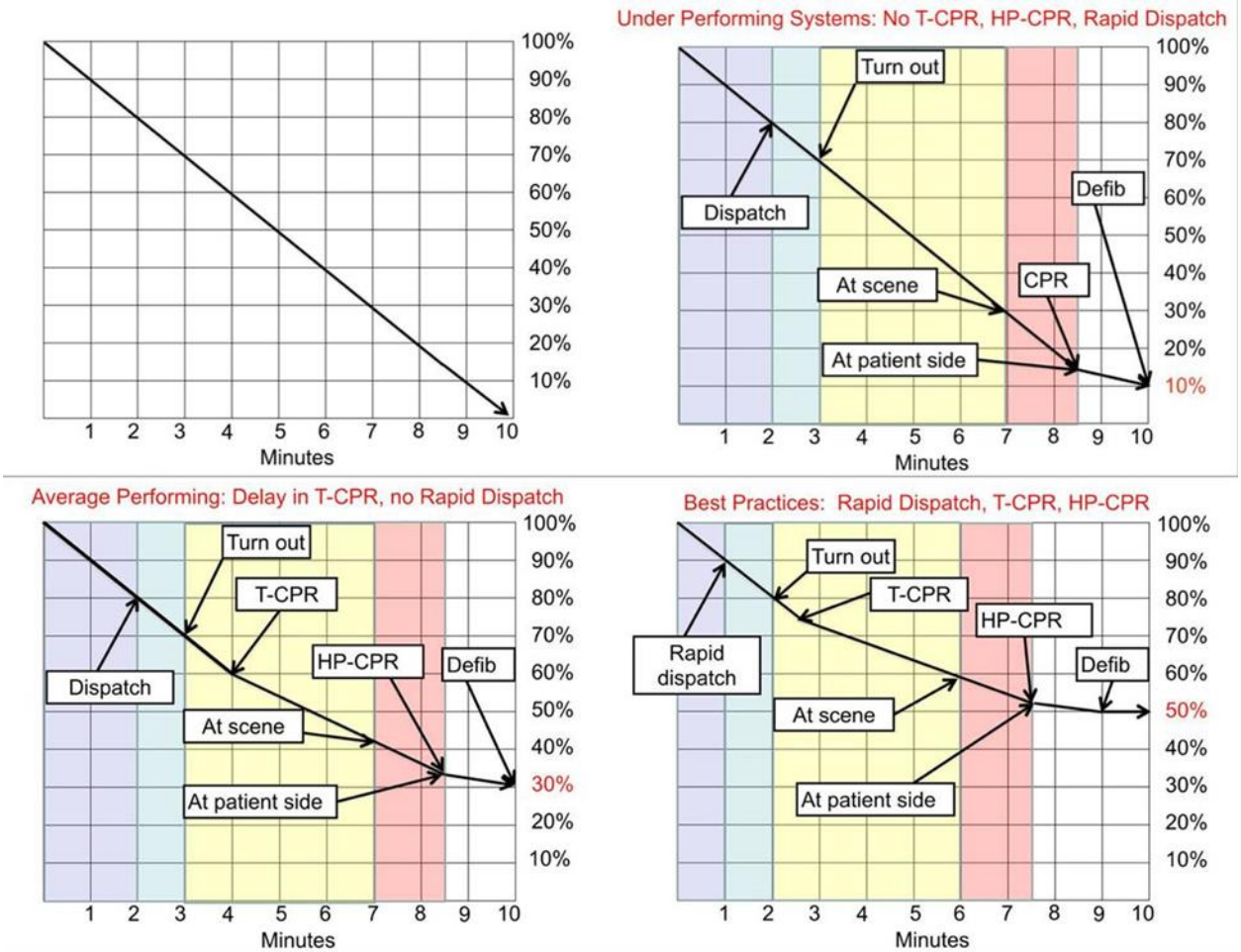
Out-of-hospital sudden cardiac arrest is the most identifiable and measured incident type for EMS. In an effort to demonstrate the relationship between response time and clinical outcome, a representation of the cascade of events and the time to defibrillation (shock) is presented below. The American Heart Association (AHA) has determined that brain damage will begin to occur between four and six minutes and become irreversible after 10 minutes without intervention.

Modern sudden cardiac arrest protocols recognize that high quality CPR at the BLS level is a quality intervention until defibrillation can be delivered in shockable rhythms. The figure below is representative of a sudden cardiac arrest that is presenting in a shockable heart rhythm such as Ventricular Fibrillation (V-Fib) or Ventricular Tachycardia (V-Tach). The right axis is reflective of the survivability to discharge.

[17] Blackwell, T.H., & Kaufman, J.S. (April 2002). Response time effectiveness: Comparison of response time and survival in an urban emergency medical services system. Academic Emergency Medicine, 9(4): 289-295.

[18] Blackwell, T.H., et al. (Oct-Dec 2009). Lack of association between prehospital response times and patient outcomes. Prehospital Emergency Care, 13(4): 444-450.

Figure 39: CPR Performance Analysis[19]



It is important to note that many confounding variables are present in any of the broad response time-to-outcome relationships. For example, the recognition and detection phase previously discussed could have the greatest impact on the efficacy of the response system.

[19] Eisenberg, M., MD, PhD. Who shall live? Who shall die? Presentation from Seattle / King County Resuscitation Academy.

Distribution Factors

Comparison of Demand Zones

Geospatial analyses were completed regarding drive times, incorporating the RFD's current performance and nationally recommended best practices. Drive times from each of the current fixed-facility fire stations were created using existing road miles and impedance for a 4-, 5-, and 6-minute travel time. These drive times are based on past practice and most closely represent current performance. Additional analyses were conducted to explore various travel time and road mile requirements as required by other entities that, from time to time, will evaluate the RFD's performance.

Table 36: List of Travel Time/Distance Parameters by Entity

Parameters	Entity
10-minute travel time	Fire District 34 past practice
8-minute travel time	WSRB for Ladder Trucks
6-minute travel time	City of Redmond past practice
5 minute and 20 second travel time	WSRB for Engines
5 minute and 12 second travel time	CFAI (7th Ed)
5-minute travel time	City of Redmond optional standard
4-minute travel time	City of Redmond optional standard
4-minute travel time	NFPA 1710
13-minute travel time	NFPA 1720
2.5-mile travel distance	WSRB for Ladder Trucks
1.5-mile travel distance	WSRB for Engine Companies

This analysis suggests that the majority of the jurisdiction is receiving service in moderately above 6 minutes (6:35). However, this measurement is strictly measuring time and distance, not capabilities. For example, Station 17 can statistically meet a 6-minute response time for a majority of its primary response area. However, if the call for service is a fire, the first suppression unit might be coming from Station 11 or possibly outside the city boundaries through mutual aid. In that case, the travel time could be significantly longer.

Another factor absent from this type of narrow analysis is the impact of vertical growth within the city. Over time, more and more people will live above the 2nd, 3rd, 4th, etc., floor in the vast number of multi-family residential units coming into Redmond. The response time it takes to get to the curb of the property will not likely change much over the coming years but the Time to Intervention (time to patient contact, hands on chest, water on fire, etc.) will degrade more and more. A stark example of the impact of the vertical challenge on response times can be illustrated with this comparison: the time it takes to get firefighters to someone above the 5th story of an apartment complex across the street from Station 11 can be equivalent to driving to a single-family house next to Station 12 or Station 17.

Therefore, additional analyses were conducted to explore shorter travel times so the time allocated for travel could be attributed to the time it will take to achieve/maintain outcomes for the patients and victims.

The time it takes to get firefighters to someone above the 5th story of an apartment complex across the street from Station 11 can be equivalent to driving to a single-family house next to Station 12 or 17.

4-, 5- and 6-Minute Travel Time Analysis (City Only)

A 4, 5 and 6-minute travel time analysis was conducted to evaluate the agency's capabilities with the current station configuration within the city. Results suggest that a four-station configuration can service the city efficiently within a 4-minute travel time if all four stations were properly relocated. Currently, even with a 6-minute travel time, the areas of Idylwood and Willows/Rose Hill are underserved for emergency medical services. When looking at fire suppression capabilities, the areas of Education Hill, Bear Creek and SE Redmond are also underserved.

Results suggest that a four-station configuration can serve the city efficiently with a 4-minute travel time if they are properly relocated.

Figure 40: 4-, 5-, and 6-Minute Travel Time Comparison for Emergency Medical Service

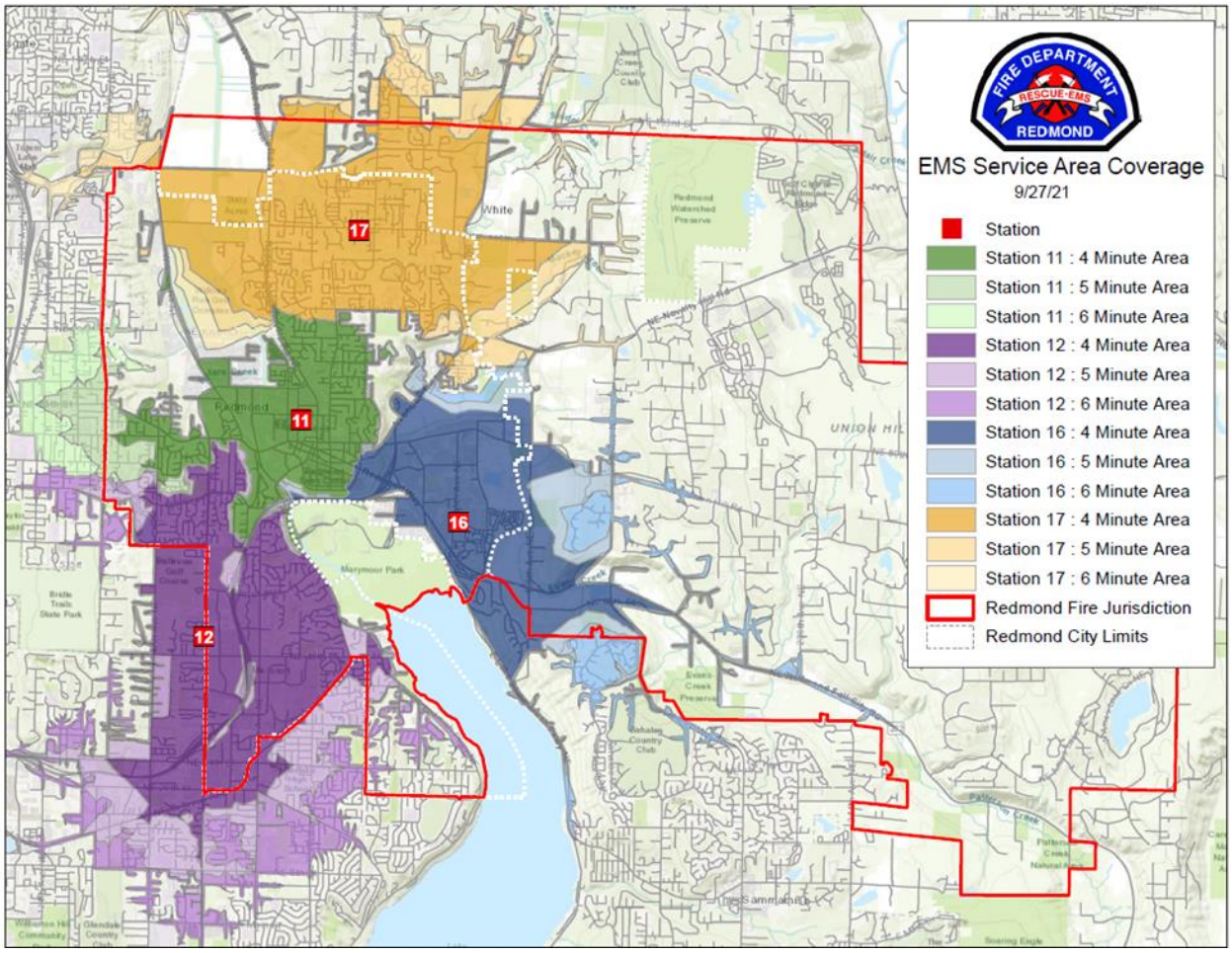
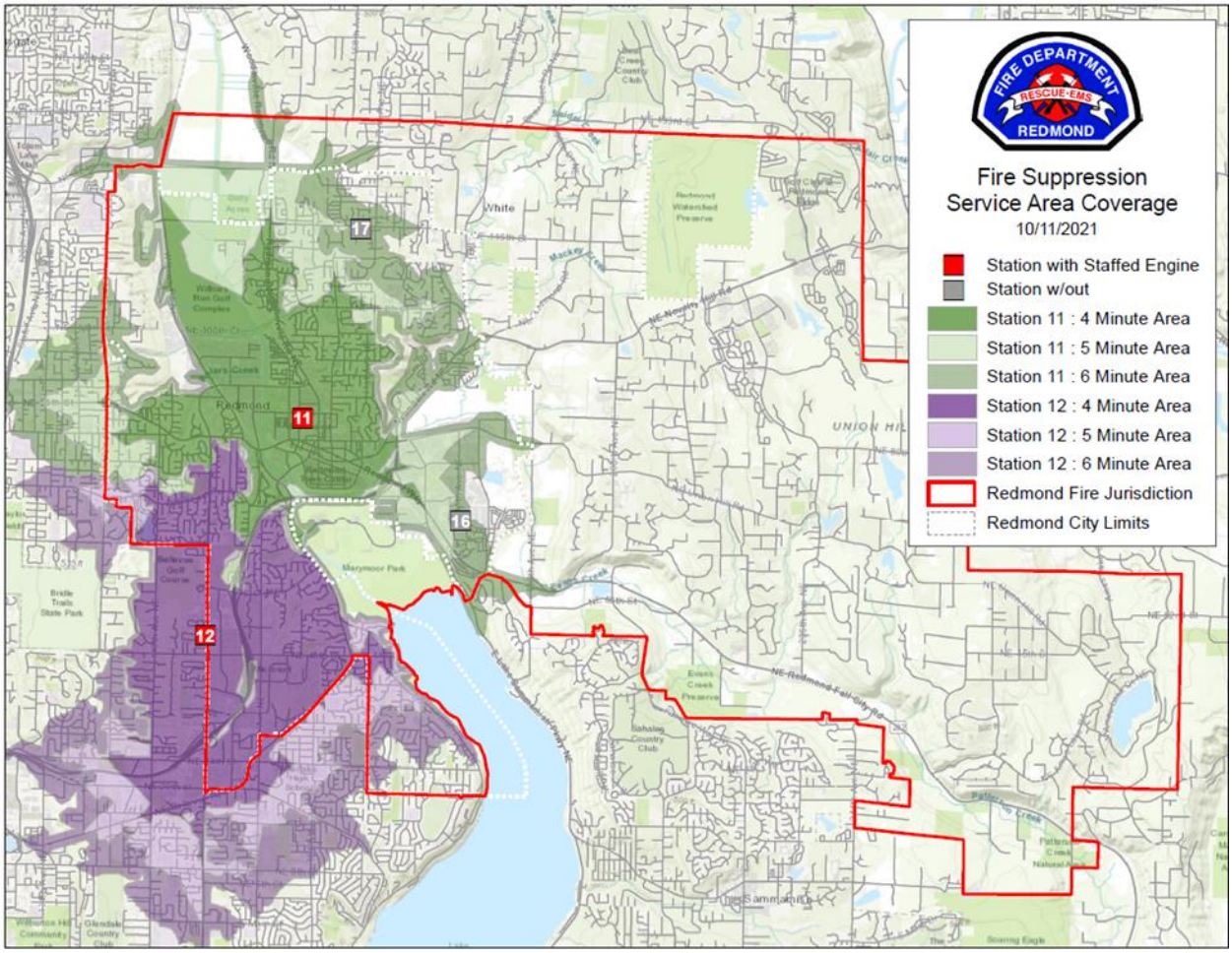


Figure 41: 4-, 5-, and 6-Minute Travel Time Comparison for Fire Suppression Units Only

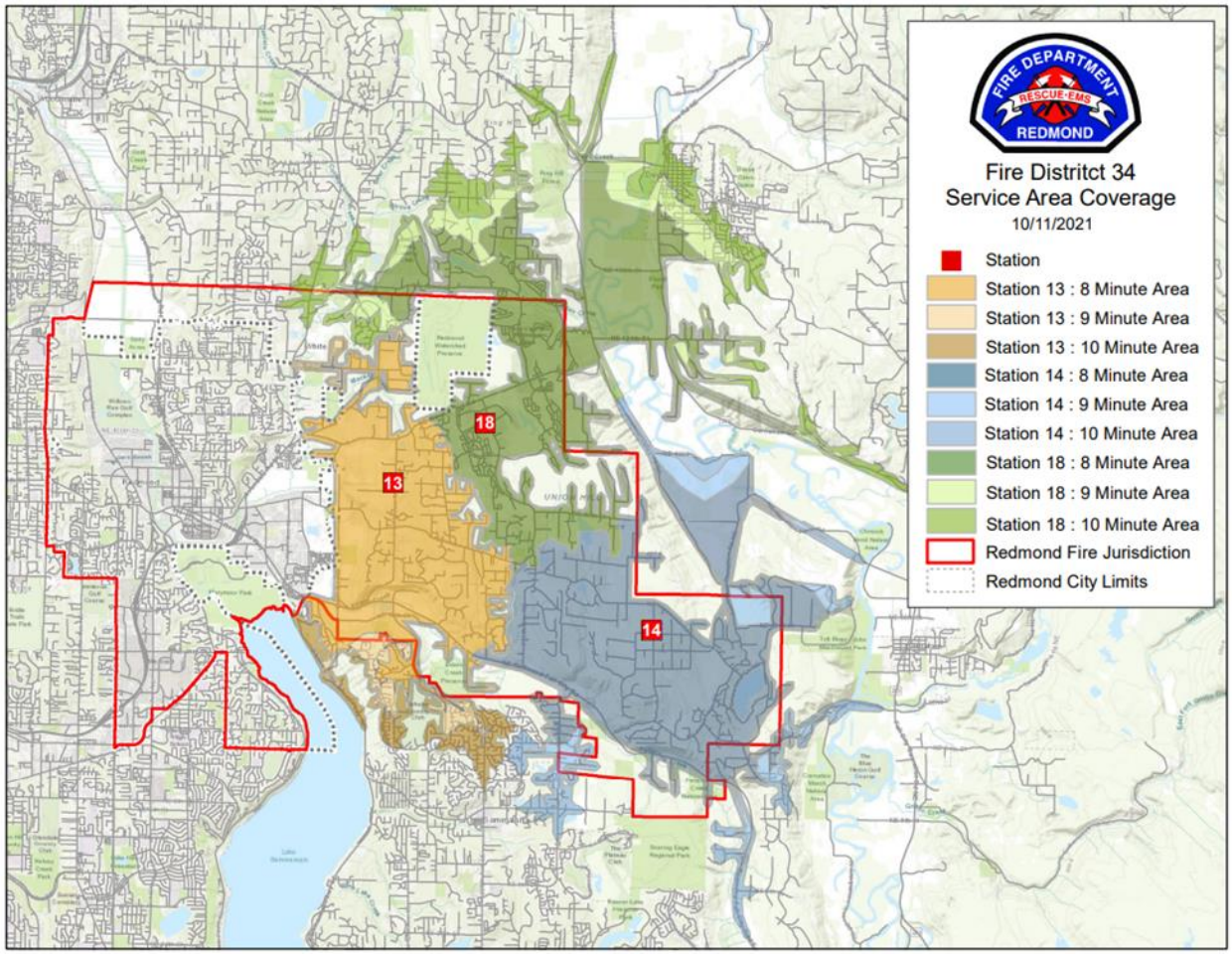


8-, 9- and 10-Minute Travel Time Analysis (Fire District 34)

An 8-, 9- and 10-minute travel time analysis was conducted to evaluate the agency's capabilities with the current station configuration within the areas administered by Fire District 34. Traditionally, the District has accepted a 10-minute travel time (although there is no evidence of a formal adoption of that performance standard). However, results suggest that the current three-station configuration could service the District efficiently with an 8-minute travel time.

Results suggest that the current three-station configuration can serve the District efficiently with an 8-minute travel time.

Figure 42: 8-, 9-, and 10-minute Travel Time for FD34



Comparison of Workloads by Unit Hour Utilization (UHU)

Another measure, time on task, is necessary to evaluate best practices in efficient system delivery and consider the impact workload has on personnel. Unit Hour Utilization (UHU) determinants were developed by mathematical model. This model includes both the

proportion of calls handled in each major service area (Fire, EMS, Haz Mat, Rescue) as well as total unit time on task for these service categories in 2020. The resulting UHUs represent the proportion of the work period (24 hours) that is used responding to requests for service. Historically, the International Association of Fire Fighters (IAFF) has recommended that 24-hour units use 0.30, or 30% workload as an upper threshold.[20] In other words this recommendation would mean personnel should spend no more than 7.2 hours per day on emergency incidents. These thresholds take into consideration the need for non-emergency activities such as training, health and wellness, public education, and fire and community risk reduction inspections.

The 4th edition of the IAFF EMS Guidebook no longer specifically identifies an upper threshold. However, a review of industry best practices suggests that an upper Unit Hour Utilization threshold of approximately 0.30, or 30%, is still valid. In other words, units and personnel should not exceed 30%, or 7.2 hours, of their workday responding to calls. These recommendations are also validated in the literature. For example, in their review of the City of Rolling Meadows, the Illinois Fire Chiefs Association used a UHU threshold of 0.30 as an indication of the need to add additional resources.[21] Similarly, in a standards of cover study facilitated by the Center for Public Safety Excellence, the Castle Rock Fire and Rescue Department (CO) uses a UHU of 0.30 as the upper limit in their standards of cover due to the need to accomplish other non-emergency activities.[22] Lincoln Fire & Rescue (NE) uses a

[20] International Association of Firefighters. (1995). Emergency Medical Services: A Guidebook for Fire-Based Systems. California, DC: Author. (p. 11)

[21] Illinois Fire Chiefs Association. (2012). An Assessment of Deployment and Station Location: Rolling Meadows Fire Department. Rolling Meadows, Illinois: Author. (pp. 54-55)

[22] Castle Rock Fire and Rescue Department. (2011). Community Risk Analysis and Standards of Cover. Castle Rock, Colorado: Author. (p. 58)

.30 as an upper limit in their standards of cover and can show a strong correlation between UHU and other outcome measurements over time.[23]

UHU analyses included units designated as 24-hour per day units. Several 24-hour per day units were cross-staffed (i.e., had their busy time combined), as follows:

- Aid Car A117 was cross staffed with Engine E117.
- Engine E113 was cross staffed with unit Aid A113.
- Engine E114 was cross staffed with unit Aid A114.
- Engine E118 was cross staffed with unit Aid A118.
- Ladder L116 was cross staffed with both unit Aid A116 and Engine E116.

All units currently maintain UHU values < 0.30.

[23] Lincoln Fire & Rescue. (2018). Standard of Cover. Lincoln, Nebraska: Author. (p. 140)

Table 37: Unit Hour Utilization by Crew

Unit(s)	2015	2016	2017	2018	2019	2020	2021
A111	12.5%	13.1%	11.7%	12.4%	13.2%	11.4%	14.0%
A112	13.3%	13.0%	12.0%	11.9%	11.8%	10.4%	12.2%
A113 | E113	7.7%	7.9%	7.9%	7.5%	7.9%	6.3%	8.3%
A114 | E114	2.7%	2.8%	2.8%	2.4%	3.0%	2.8%	2.5%
A116 | E116 | L116	7.0%	6.4%	6.8%	6.5%	6.4%	5.6%	6.0%
A117 | E117	7.6%	7.9%	8.4%	8.3%	8.1%	7.0%	8.0%
A118 | E118	7.0%	6.7%	6.9%	6.7%	7.0%	5.6%	6.7%
B111	3.7%	3.0%	1.9%	2.4%	2.4%	2.1%	2.2%
E111	6.4%	6.6%	6.5%	6.5%	6.7%	5.4%	6.5%
E112	6.0%	6.0%	5.6%	5.3%	5.7%	4.7%	5.7%
M119	10.2%	11.4%	10.6%	11.0%	11.4%	10.7%	11.0%
M123	10.1%	9.8%	10.8%	10.1%	10.4%	10.1%	11.0%
M135	5.2%	5.4%	5.6%	6.5%	6.3%	6.6%	6.5%

[1]Based on a 40-hour per week schedule; all other units considered 24-hour per day units.

Table 38: Unit Hour Utilization by Apparatus

Unit	2015	2016	2017	2018	2019	2020	2021
A111	12.5%	13.1%	11.7%	12.4%	13.2%	11.4%	14.0%
A112	13.3%	13.0%	12.0%	11.9%	11.8%	10.4%	12.2%
A113	6.2%	5.9%	5.5%	5.5%	5.5%	4.5%	5.8%
A114	1.8%	1.9%	1.8%	1.6%	2.0%	2.0%	1.8%
A116	3.2%	2.7%	2.8%	2.2%	2.3%	1.9%	0.0%
A117	7.4%	7.7%	8.1%	8.0%	7.5%	6.7%	7.5%
A118	5.1%	5.0%	5.0%	5.1%	5.2%	4.4%	4.9%
B111	3.7%	3.0%	1.8%	2.4%	2.4%	2.1%	2.2%
E111	6.4%	6.6%	6.5%	6.5%	6.7%	5.4%	6.5%
E112	6.0%	6.0%	5.5%	5.3%	5.7%	4.7%	5.7%
E113	1.5%	2.1%	2.4%	2.1%	2.4%	1.9%	2.5%
E114	0.9%	0.9%	1.0%	0.8%	1.0%	0.8%	0.7%
E116	2.1%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%
E117	0.2%	0.2%	0.3%	0.3%	0.6%	0.3%	0.5%
E118	1.9%	1.7%	1.9%	1.7%	1.8%	1.3%	1.9%
L116	1.7%	3.6%	4.0%	4.1%	4.1%	3.7%	6.0%
M119	10.2%	11.4%	10.6%	11.0%	11.4%	10.7%	11.0%
M123	10.1%	9.8%	10.8%	10.1%	10.4%	10.1%	11.0%
M135	5.2%	5.4%	5.6%	6.5%	6.3%	6.6%	6.5%

Description of First Arriving Unit Performance

Additional analyses related to the response characteristics of first arriving units were conducted. The analyses in this first section focused on emergency (lights and sirens) responses from primary front-line units arriving first on scene for all distinct incidents. All RFD responses were considered to be dispatched emergency (lights and sirens).

To first recap the data presented previously, RFD had an overall dispatch time of 1 minute and 13 seconds at the 90th percentile for calls that went direct to NORCOM. Calls that originate via 911 landline had an additional 35 seconds of call handling time. Overall, RFD had a turnout time of just over 2 minutes at the 90th percentile for both Fire and EMS calls. The overall travel time performance was 6 minutes and 35 seconds at the 90th percentile for Fire and EMS calls combined. The overall Total Response Time was 8 minutes and 54 seconds at the 90th percentile for Fire and EMS calls combined.

For FD34, overall travel time performance was 7 minutes and 55 seconds at the 90th percentile for Fire and EMS calls combined. The overall Total Response Time was 10 minutes and 31 seconds at the 90th percentile for Fire and EMS calls combined.

Table 9: First Arriving Unit Response Performance - Fire & EMS (2017-2021) – City

Measure	90th Percentile
Dispatch Time – through RPD to NORCOM	1:48
Dispatch Time – via NORCOM	1:13
Turnout Time - Fire	1:58
Turnout Time - EMS	2:09
Travel Time – Fire	6:25
Travel Time – EMS	6:49
Total Response Time – Fire	8:38
Total Response Time – EMS	9:17

Table 10: First Arriving Unit Response Performance - Fire & EMS (2017-2021)–FD34

Measure	90th Percentile
Dispatch Time – via NORCOM	1:06
Turnout Time - Fire	2:56
Turnout Time - EMS	2:42
Travel Time – Fire	8:21
Travel Time – EMS	7:48
Total Response Time – Fire	10:25
Total Response Time – EMS	11:02

Initial and Effective Response Force Capabilities

The capability of an Initial Response Force (IRF) and Effective Response Force (ERF) to assemble in a timely manner with the appropriate personnel, apparatus, and equipment is important to the success of a significant structure fire event. Therefore, it is important to measure the capabilities of assembling an ERF. In most fire departments, the distribution model performs satisfactorily. However, it is not uncommon to be challenged to assemble an ERF in the recommended time frames. Several factors affect the capabilities to assemble an ERF, such as the number of fire stations, number of units, and number of personnel on each unit. Each of these policy decisions should be made in relation to the community's specific risks and the willingness to assume risk.

Similar to previous discussion, there are two prevailing recommendations for the time to assemble an ERF for structure fires. First, NFPA 1710 suggests that the ERF should arrive in

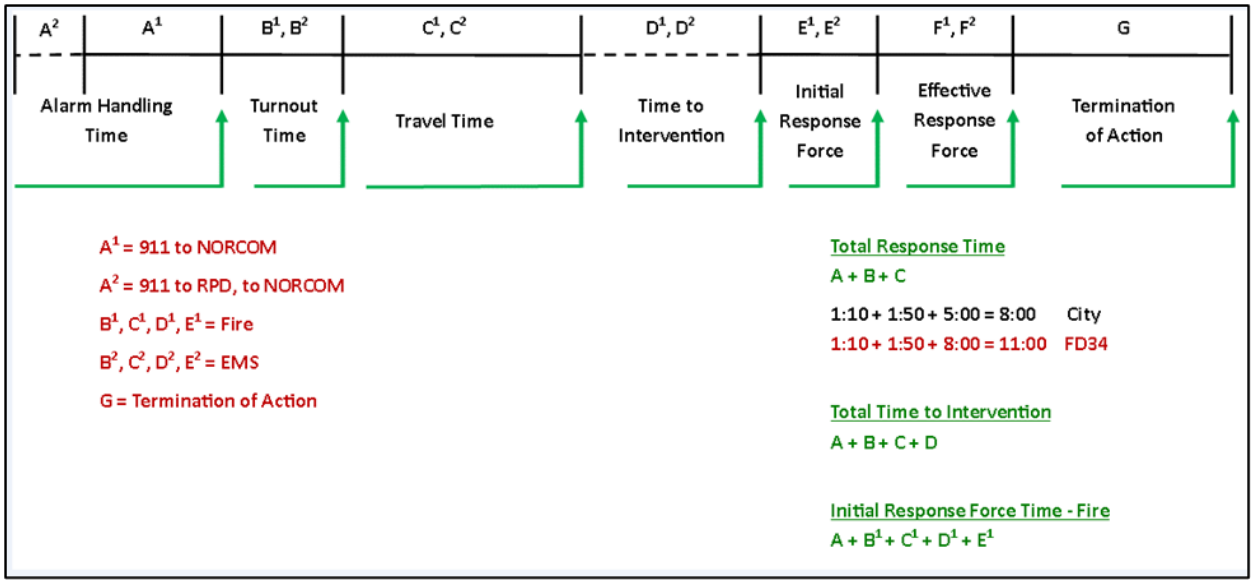
eight minutes travel time or less. Second, the CFAI provides a baseline travel time performance objective of 10 minutes and 24 seconds or less 90% of the time, as well as a 13-minute travel time ERF for suburban areas.

Table 11: Comparisons of Effective Response Force Configurations

Travel Time Objective	Current
8-Minute	1.37%
10-Minute	13.03%
13-Minute	51.42%

Overall, the ERF coverage is more robust in the center of the jurisdiction where the greatest historical demand exists. The areas in the North and South of the Town are challenged since they do not benefit from concentric response zones.

Figure 43: Time Elements for Developing Benchmark Response Measures



Reliability Factors

Overlapped or Simultaneous Call Analysis

Overlapped or simultaneous calls are defined as another call being received by the Department while one or more calls are already ongoing. In general, the larger the call volume in the Department, the greater the likelihood of overlapped calls occurring. The distribution of the demand throughout the day will impact the chance of having overlapped calls. Additionally, the duration of a call plays a significant role. The longer it takes to clear a request, the greater the likelihood of having an overlapping request. Results for these analyses are reported by program area.

Table 42: Overlapped Calls by Program

Program	Overlapped Calls	Percentage of Overlapped Calls
EMS	2,970	39.6
Fire	529	7.0
Hazmat	12	0.2
Rescue	57	0.8
Total	**3,568**	**47.5**

[1]Three calls were missing maximum clear dates and times.

Performance Objectives & Measurement

Benchmark

Benchmark statements describe the ultimate level of performance the Agency is striving to attain. It is not expected that the Agency meets this goal as much as they are using the goal in relation to actual performance, year over year, to show progress or continuous improvement. In other words, over time, the agency should be moving closer and closer to the benchmark performance goal.

Baseline

Baseline statements describe the agency's actual (current) performance. Best practice in the industry is to maintain a baseline within 70% to 80% of the benchmark so as not to fall into a state of gross deviation from the benchmark.

Performance Objectives – Benchmarks

Fire Suppression Services Program (Urban)

For 90% of all structure fire incidents, the first-due unit shall arrive, with a minimum of 3 personnel, within 8 minutes total response time. The first-due unit shall be capable of providing 500 gallons of water and 1,500 gallons per minute pumping capacity; initiating command; establishing and advancing an attack line flowing a minimum of 150 gpm; containing the fire; and/or rescuing at-risk victims and requesting additional resources if needed.

For 90% of all priority moderate- and high-risk- structure fire incidents, the Initial Response Force, with a minimum of 12 personnel, shall arrive within 11 minutes total response time.

The IRF shall be capable of establishing an uninterrupted water supply; advancing a back-up line; complying with the Occupational Safety and Health Administration (OSHA) requirements for 2-In/2-Out; completing forceable entry; searching and rescuing at-risk victims; ventilating the structure; controlling utilities; and protecting exposures. The full ERF, with a minimum of 21 personnel, shall arrive within 15 minutes total response time, and shall be capable of providing a Rapid Intervention Crew and a Safety Officer.

These operations shall be done in accordance with departmental standard operating procedures while providing for the safety of responders and the general public.

Emergency Medical Services Program (Urban)

For 90% of all priority emergency medical incidents, the first due unit, with a minimum of 2 personnel, shall arrive within 8 minutes total response time. The first due unit shall be capable of assessing scene safety; providing an initial patient assessment; initiating basic life support treatment and calling for additional resources (law enforcement, Mobile Integrated Healthcare, other EMS units, etc.) if needed.

For 90% of all moderate-risk incidents, the ERF, consisting of a minimum of 4 personnel, shall arrive within 10 minutes. The ERF should be capable of providing advanced life support patient care and transport support.

For 80% of all high-risk incidents, the ERF, consisting of a minimum of 9 personnel, shall arrive within 12 minutes. The ERF should be capable of providing advanced cardiac life support, high performance CPR, and transport support.

These operations shall be done in accordance with departmental standard operating procedures while providing for the safety of responders and the general public.

Hazardous Materials Services Program (Urban)

For 90% of all hazardous materials incidents, the first-due unit shall arrive with a minimum of 3 personnel, within 8 minutes and 45 seconds, total response time (unit alert to arrival). The unit shall be capable of assessing scene safety, isolating the area, providing emergency medical care to any patients, providing initial identification of the material released, establishing command, and calling for additional resources if needed.

For 90% of all moderate- and high-risk hazardous materials incidents, the Initial Response Force, consisting of a minimum of 7 personnel, shall arrive with 12 minutes total response time. The Initial Response Force shall be capable of identifying the type of material released and determining a course of action to control/contain/mitigate the hazard.

For 90% of all high-risk hazardous materials incidents, the full Effective Response Force, consisting of a minimum of 21 personnel, shall arrive within 30 minutes total response time. The Effective Response Force shall be capable of mitigating a hazardous materials incidence that may include entry, identification, recon, decontamination, and rehabilitation.

These operations shall be done in accordance with departmental standard operating procedures while providing for the safety of responders and the general public.

Rescue Services Program (Urban)

For 90% of all technical rescue incidents, the first-due unit shall arrive, with a minimum of 3 personnel, within 8 minutes and 45 seconds total response time. This unit shall be capable of assessing scene safety, providing emergency medical care to any patients, establishing command, and calling for additional resources if needed.

For 90% of all moderate- and high-risk technical rescue incidents, the Initial Response Force, with a minimum of 8 personnel, shall have a total response time within 11 minutes.

The Initial Response Force shall be capable of extricating patient from vehicle or machinery and providing advanced life support.

For 90% of all high-risk technical rescue incidents, full Effective Response Force, with a minimum of 17 personnel, shall have a total response time within 13 minutes. The Effective Response Force shall be capable of assisting with more complex extrications (trench, confined space, low angle, high angle, structural collapse, etc.).

These operations shall be done in accordance with departmental standard operating procedures while providing for the safety of responders and the general public.

Performance Objectives – Baselines

Fire Suppression Services Program (Urban)

For 90% of all priority structure fire incidents, the first-due unit arrived, with a minimum of 3 personnel, within 8 minutes and 38 seconds total response time.

For 90% of all priority moderate- and high-risk structure fire incidents, the Initial Response Force, with a minimum of 12 personnel, arrived within 11 minutes total response time. The full Effective Response Force, with a minimum of 21 personnel, arrived within 20 minutes total response time.

Emergency Medical Services Program (Urban)

For 90% of all priority emergency medical incidents, the first due unit, with a minimum of 2 personnel, arrived within 8 minutes total response time.

For 90% of all moderate-risk incidents, the Effective Response Force, consisting of a minimum of 4 personnel, arrived within 10 minutes total response time.

For 90% of all high-risk incidents, the Effective Response Force, consisting of a minimum of 9 personnel, arrived within 12 minutes total response time.

Hazardous Materials Services Program (Urban)

For 90% of all hazardous materials incidents, the first-due unit arrived with a minimum of 3 personnel, within 8 minutes and 45 seconds total response time.

For 90% of all moderate-risk hazardous materials incidents, the Initial Response Force, consisting of a minimum of 7 personnel, arrived with 12 minutes total response time.

For high-risk hazardous materials incidents, there was an insufficient number of call to calculate an IRF or ERF.

Rescue Services Program (Urban)

For 90% of all technical rescue incidents, the first-due unit arrived, with a minimum of 3 personnel, within 8 minutes and 45 seconds total response time.

For 90% of all moderate-risk technical rescue incidents, the Initial Response Force, with a minimum of 8 personnel, arrived within 11 minutes total response time.

For 90% of all high-risk technical rescue incidents, the full Effective Response Force, with a minimum of 17 personnel, arrived within 13 minutes total response time.

Future Fire Station Opening Criteria

Due to various state and county regulation regarding urban growth, it is anticipated that very little population growth will occur in the boundaries of King County Fire District 34. However, with most of the urban growth that will stay within the urban boundaries of Redmond, the agency should anticipate a continuous, if not rapid, increase in demand for service over the coming years. As development continues, it is important to develop a set of objective criteria before an additional fire station or response unit is needed to ensure the expectations of the fire department, city council, the community, and other stakeholders, are aligned and pre-established. In the absence of consensus on a plan, one high-profile fire or medical emergency could create political strife which may cause stakeholders to make decisions based on emotions and not an objective risk management model. Therefore, the following matrix outlines the measurable benchmarks that will guide the decision-making process for any future fire stations or additional response units (or perhaps their removal).

Figure 44: Criteria for Adding or Removing Stations or Response Units

Criteria to Design New Station, Begin Hiring Process, or Add a Response Unit
▪ **Area to be served receives more than 300 call for service per year for more than one year**
▪ **The First-In performance for any adjacent fire station drops below 80%**
▪ **The proposed area is at least 50% developed or there is an adequate funding source coming into existence**
***Must meet at least two criteria**

Criteria to Open New Station, or Add a Response Unit
▪ **Area to be served receives more than 500 call for service per year for more than one year**
▪ **The First-In performance for any adjacent fire station drops below 75%**
▪ **The proposed area is at least 70% developed or there is an adequate funding source coming into existence**
***Must meet at least two criteria**

Compliance Methodology

This SOC document is designed to guide the Department as they continuously monitor performance and seek areas for improvement, as well as to clearly articulate service levels and performance to the community we have the privilege of serving. Therefore, the Fire Chief has established an Internal Stakeholder Group (used for the most recent strategic planning process as well) to continuously monitor elements of this SOC and make recommendations for system adjustments or improvement quarterly.

Internal Stakeholder Group / Responsibility

The Internal Stakeholder Group will have the responsibility of continuously monitoring changes in risk, community service demands, and department performance in each program area, fire department demand zone, and/or risk category.

- Chair – Deputy Chief of Support Services
- 7 to 10 members including Labor, representatives of each rank, administrative and support staff.

Performance Evaluation and Compliance Strategy

The group will evaluate system performance by measuring first due unit performance at the 90th percentile at least annually. In addition, the Department will evaluate first due performance by each individual fire station demand zone and by program area. Measures for the IRF and ERF by each program area, fire station demand zone, and risk category will be evaluated annually. Annual reviews will be conducted in January/February of each year regarding the previous year. All response performance monitoring will exclusively evaluate emergency responses.

Ultimately, it is recommended that outcome measures are adopted and serve as the primary evaluation tool and that the traditional performance objectives and measures presented previously are used primarily as a management tool. In this manner, the Department will not be overly sensitized to incremental changes in performance criteria if the outcomes continue to be met.

In concert with this standards of cover analysis, the fire department has also completed a five-year strategic plan which provides an array of outcome measurements that can be used to satisfy this recommendation.

It is recommended that outcome measures are adopted and serve as the primary evaluation tool for performance of the fire department.

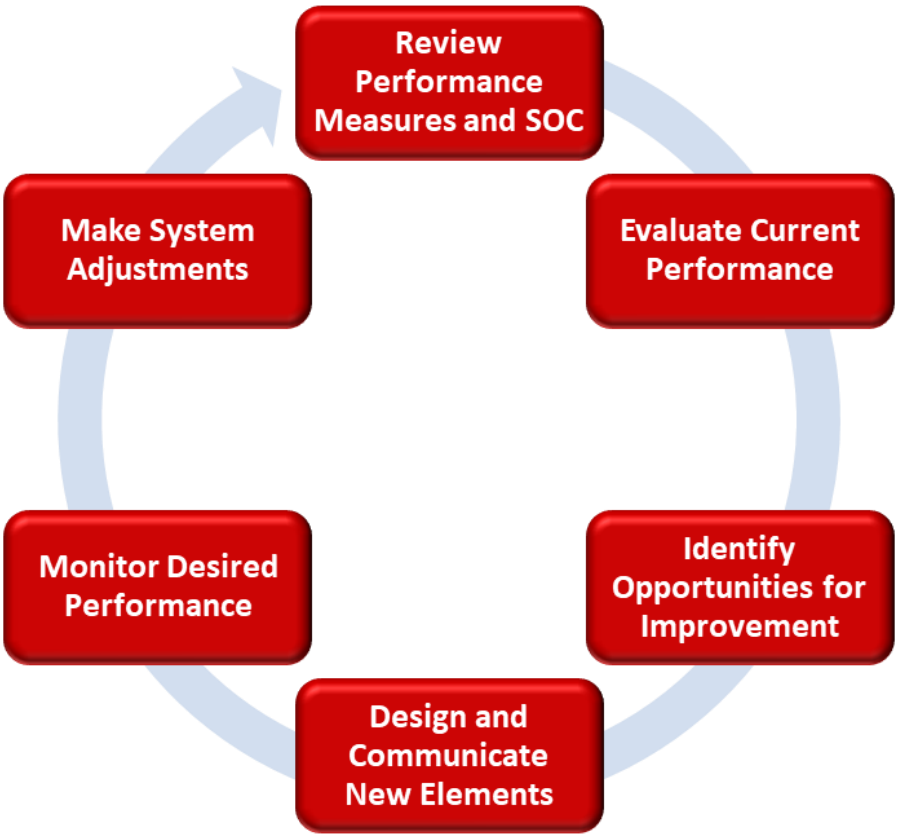
Compliance Verification Reporting

The group will communicate results of the period evaluations to the Fire Chief. The Fire Chief will disseminate the results and any system adjustments in a timely manner so that both performance measurement and continuous improvement becomes part of the organization's culture. All performance and risk measures will be reported through the Fire Chief to the Mayor, City Council and Fire District 34 Board.

Constant Improvement Strategy

The Department uses the following conceptual model to facilitate both compliance and continuous improvement.

Figure 45: Continuous Improvement and Compliance Model



Overall Evaluation, Observations, and Recommendations

Overall Evaluation

The overall evaluation is the final component of the SOC process. As a process that incorporates risk, mitigation, and outcomes measures, the Fire Department and City leadership can more easily discuss service levels, outcomes, and the associated cost allocations based on community risk.

Overall, the RFD is performing well within the current system. The community enjoys high-quality services from a professional and well-trained department. Predominantly, the Department's distribution and concentration delivery models are appropriately aligned with the City's unique risks. Yet, they are challenged to meet growing demands and to improve performance within the current distribution of stations, especially in light of the rapid vertical development occurring within the city. Much of the success in the fire protection efforts so far can be attributed to early adoption of fire prevention best practices such as sprinkler systems, regular inspections, and proper enforcement of the fire code. Historically, the practice of cross-staffing units has provided operational and fiscal efficiencies. However, population and workload has grown over the years will create the need to provide distinctively staffed units in the future. Finally, there are areas that have been identified where the Department could make incremental system adjustments to improve.

All recommendations were subcategorized as either a Specific Recommendation or a Strategic Recommendation. In this report, Specific Recommendations are projects or efforts with a narrow and objectively measurable outcome with usually a shorter implementation period. Strategic Recommendations are considered broader in nature, with outcomes that are more difficult to quantify fully but are generally considered to result in a positive impact on the organization overtime.

Observations

- There is a significant gap in fire suppression capabilities in the areas served by fire stations 16 and 17.
- Fire prevention and community risk reduction planning efforts have been highly effective so far but are no longer keeping pace with population and occupancy growth.
- Travel time is no longer an adequate measurement of performance due to the growing number of people above the third floor throughout the jurisdiction.
- Cross-staffed units experience extended turnout times as compared to units with dedicated staff.

- Using “time to intervention” is the best measurement for community outcomes.
- Overall, the performance by NORCOM is one of the best in the industry as compared to the national fire service experience.
- The City of Redmond and the areas served by the Medic One program have had one of the best out-of-hospital cardiac arrest survival rates in the nation for almost two decades.
- Results suggest that a four-station configuration can serve the City of Redmond efficiently with a 4-minute travel time if the stations are properly relocated.
- Results suggest that the current three-station configuration can serve Fire District 34 efficiently with an 8-minute travel time.

Specific Recommendations

- Add (1) additional firefighter daily to upstaff Station 17 with a full engine company and a cross-staffed Aid Car.
- Add a new engine company to Station 16, move Ladder 16 to Fire Station 11.
- Relocate Fire Station 12 to an area more efficient and effective in providing coverage to the areas of Overlake and Idylwood.
- Use outcome measurements as the primary measurement of fire department performance.
- Use pre-determined and objective criteria and measurements for opening (or closing) a fire station or adding (or removing) response units.

Strategic Recommendations

- Redesign the response system within the urban core to meet a 4-minute travel time for Fire/EMS units.
- Prepare a modified response model in case Fire District 34 chooses to close Fire Station 13.
- Relocate Fire Station 11 to the area northwest of downtown on the west side of the Sammamish River (near Willows Road) and built a new Fire Station 19 in the area southeast of downtown Redmond (near Avondale Way).
- Add an engine company (possibly move Engine 16) to the new Fire Station 19.
- Analyze adding Aid Cars to stations to lessen the practice of cross-staffing and improve response times.