CITYGATE ASSOCIATES, LLC
FOLSOM (SACRAMENTO), CA MANAGEMENT CONSULTANTS

COMMUNITY RISK ASSESSMENT, STANDARDS OF COVER STUDY, AND STRATEGIC PLAN AND TRAINING FACILITIES REVIEW

EL DORADO HILLS FIRE DEPARTMENT

VOLUME 2 OF 3 – TECHNICAL REPORT

July 5, 2016

2250 East Bidwell St., Ste #100 Folsom, CA 95630
(916) 458-5100 Fax: (916) 983-2090

TABLE OF CONTENTS

Section ***Page***

Table of Tables

Table of Figures

Appendices

Appendix A—Risk Assessment Exhibits

VOLUME 3 of 3 – Map Atlas (separately bound)

This page was intentionally left blank

SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC was retained by the El Dorado Hills County Water District Fire Department (Department) to conduct a Community Risk Assessment and Standards of Cover Study, along with a Strategic Plan and Training Facilities Review. Citygate's scope of work and corresponding Work Plan was developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with the self-assessment criteria of the Commission on Fire Accreditation International (CFAI).

1.1 REPORT ORGANIZATION

This report volume is structured into the following sections. Volumes 1 (Executive Summary) and 3 (Map Atlas) are separately bound.

Section 1 Introduction and Background: An introduction to the study and background facts about the Department.

Section 2 Standards of Response Coverage Introduction: An introduction to the Standards of Coverage (SOC) process and methodology used by Citygate in this review.

Section 3 Deployment Goals/Measures and Risk Assessment: An in-depth examination of the Department's deployment ability to meet the community's risks, expectations, and emergency needs.

Section 4 Staffing and Geo-Mapping Analysis: A review of (1) the critical tasks that must be performed to achieve the Department's desired outcome; and (2) the Department's existing fire station locations and future locations.

Section 5 Response Statistical Analysis: A statistical data analysis of the Department's incident responses and an overall deployment evaluation.

Section 6 SOC Evaluation and Deployment Recommendation: A summary of deployment priorities and an overall deployment recommendation.

Section 7 Facilities Master Plan Review: A review of the Training Center Plan, facility location, total training environment concept, and best practices.

Section 8 Strategic Plan Review: A review of the Department's Strategic Plan.

Section 9 Next Steps: A summary of deployment short- and long-term next steps.

1.1.1 Goals of Report

As each of the sections mentioned above imparts information, this report will cite findings and make recommendations, if appropriate, that relate to each finding. The findings and recommendations are numbered sequentially throughout Sections 3 through 8 of this report. A complete list of all these same findings and recommendations, in order, is found in the Executive Summary. Section 9 of this report brings attention to the highest priority needs and possible next steps.

This document provides technical information about how fire services are provided, legally regulated, and how the Department currently operates. This information is presented in the form of recommendations and policy choices for the Department leadership to discuss.

1.2 Project Scope of Work

1.2.1 Standards of Response Coverage Review

The scope of the Standards of Response Coverage review included the following elements:

- Modeling the need and effects of the current fire station locations. Although this is not a study of fire departments adjacent to the Department, the study considered the impacts of the Department's existing or potential automatic and mutual aid agreements on the Department's needs.
- Establishing performance goals consistent with best practices and national guidelines from the NFPA and CFAI.
- Using an incident response time analysis program called StatsFD™ to review the statistics of prior historical performance.
- Using a geographic mapping response time measurement tool called FireView™ to measure fire and ambulance driving coverages.

SOC Study Questions

To prepare and develop a Standards of Coverage document for the Department, Citygate reviewed computer data, response time analysis, and past performance. As a result, this study addresses the following questions:

1. Is the type and quantity of apparatus and personnel adequate for the Department's deployment to emergencies?
2. What is the recommended deployment to maintain adequate emergency response times as growth continues to occur?

1.3 DEPARTMENT OVERVIEW

Located on the western edge of El Dorado County immediately east of the City of Folsom, the El Dorado Hills County Water District Fire Department (Department) resides in an expanding suburban/rural community. Bordered generally by Folsom Lake and the American River on the north; Rescue Fire Protection District, Cameron Park Community Services District, and El Dorado County Fire Protection Districts to the east; Cosumnes River on the south; and Sacramento County on the west; the Department encompasses approximately 79 square miles on both the north and south sides of U.S. 50 with an estimated population of approximately 43,000 residents. The Department provides fire suppression, prevention, emergency medical, rescue, hazardous materials, disaster preparedness, and public education services. The Department employs a staff of 65 full-time employees, two part-time employees, and operates from five strategically located fire stations. The Department consolidated with the Latrobe Fire Protection District to the south in 2014, and also provides contractually shared administrative services with the adjacent Rescue Fire Protection District to the northeast.

Situated just east of the City of Folsom and the greater Sacramento metropolitan area, the area's modern development began in the 1960s as a master planned community. Between the late-1960s and mid-1990s, growth occurred at a moderate pace as new families relocated from Sacramento, Southern California, and the San Francisco Bay Area. This growth consisted primarily of residential housing and two shopping centers. Growth slowed during the early part of the 1990s due to economic recession throughout California, but resumed at a fast pace by the mid-1990s. Businesses, particularly those interested in escaping the high costs of Silicon Valley began to set up operations in the El Dorado Hills Business Park south of U.S.50. In 1995, the Parker Development Company acquired 3,500 acres along the eastern boundary of El Dorado Hills to create Serrano, one of the largest master planned communities in Northern California.

Around 2000, the Department's population growth and commercial development accelerated significantly. Development began in the Town Center Zone to form a downtown business area, and the Business Park experienced increasing rates of construction and occupancy. Today, the Department contains a combination of residential, commercial, office, light industrial, agricultural, and recreational/open space uses, with approximately 15,000 housing units.

With its Sierra Nevada foothills location, the Department offers an attractive environment for residents, including Folsom Lake, the American River, natural vegetation, and undulating terrain ranging from approximately 450 feet to 1,000 feet in elevation. The Department's climate is characterized by long, hot summers, and cool, wet winters. Average temperatures range from 38 degrees in January to 94 degrees in July and August. Rainfall averages approximately 26 inches annually, occurring generally between mid-October and mid-April.

The Department obtains dispatch services from the West Slope Ambulance Joint Powers Authority (JPA) whom in turn contracts with CAL FIRE[1] for its fire dispatch services. CAL FIRE also provides dispatch services for most other fire agencies in El Dorado County.

1.3.1 Legal Basis for Agency

The El Dorado Hills County Water District was formed to provide water and sewer services to the community of El Dorado Hills in 1963. In that same year, the Districts services were expanded to include fire protection. In 1973, District residents voted to have the water and sewer services operated by the El Dorado Irrigation District, leaving only fire protection under the County Water District Board. The District annexed with the Latrobe Fire Protection District on June 10, 2014, and is governed by a five-member Board of Directors elected by District residents to staggered four-year terms.

1.3.2 Funding Sources and Restrictions

At its September 17, 2015 meeting, the Department Board approved a Final Budget of $20.476 million, including $3.66 million in capital expenditures and a $1.2 million payment toward the Department's unfunded CalPERS retirement contract liability. Revenues inclusive of property taxes and fees were projected to be $15.81 million, with the balance of the budgeted expenditures funded from reserves.

The Board of Directors places a high priority on closely monitoring the impact of local economic conditions on the Department's finances and on the Department's ability to maintain current service levels, meet infrastructure needs, and build and maintain healthy reserve balances. The budget preparation and adoption process is guided by several basic fiscal tenets:

- Ongoing operating expenditures are to be paid with ongoing operating revenues.
- Some services provided by Department staff have a cost recovery element that is close to 100% cost recovery.
- Alternate revenue sources such as grants are encouraged with the caveat that the associated expenditures have a limited life equal to that of the revenue source.
- Paid time off balances, such as annual leave, will be funded at 100% pay out values per Memorandum(s) of Understanding and compensation and benefit plans effective at the end of each fiscal year.

The Department has incorporated these tenets into its fiscal strategies and uses them to set fiscally responsible short- and long-term goals. The Department also continues to provide a high level of

[1] CAL FIRE's Amador-El Dorado Administrative Unit Headquarters in Camino, CA

reliable service to Department residents, businesses, and visitors. Despite the recent difficult economic conditions, the Department's reserves are healthy and its long-term financial outlook is strong. Fire stations have not been closed and no fire engines were removed from service. Employees have not been laid off or furloughed, and service levels have been maintained. Effective leadership and prudent fiscal practices continue to ensure that the community the Department serves will receive the service level that it has come to expect.

This page was intentionally left blank

SECTION 2—STANDARDS OF COVERAGE INTRODUCTION

2.1 STANDARDS OF COVERAGE STUDY PROCESSES

The core methodology used by Citygate in the scope of its deployment analysis work is the "Standards of Response Coverage" 5th Edition, which is a systems-based approach to fire department deployment, as published by the CFAI.[2] This approach uses local risk and demographics to determine the level of protection best fitting the Department's needs.

The Standards of Response Coverage methodology evaluates deployment as part of a fire agency's self-assessment process. This approach uses risk and community expectations on outcomes to help elected officials make informed decisions on fire and emergency medical services deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the study, the depth of the components may vary.

Such a systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination of service level. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board "purchases" the fire and emergency medical service levels the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than using only a singular component. For instance, if only travel time is considered, and frequency of multiple calls is not considered, the analysis could miss over-worked companies. If a risk assessment for deployment is not considered, and deployment is based only on travel time, a community could under-deploy to incidents.

[2] Commission on Fire Accreditation International

The Standards of Response Coverage process consists of the following eight elements:

Table 1—Standards of Response Coverage Process Elements

Element	Meaning
1. Existing Deployment Policies	Reviewing the deployment goals the agency has in place today.
2. Community Outcome Expectations	Reviewing the expectations of the community for response to emergencies.
3. Community Risk Assessment	Reviewing the assets at risk in the community. (In this Citygate study, see Section 3.3 Community Risk Assessment.)
4. Critical Task Study	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation for the Effective Response Force.
5. Distribution Study	Reviewing the spacing of first-due resources (typically engines) to control routine emergencies.
6. Concentration Study	Reviewing the spacing of fire stations so that building fires can receive sufficient resources in a timely manner (First Alarm assignment or the Effective Response Force).
7. Reliability and Historical Response Effectiveness Studies	Using prior response statistics to determine the percent of compliance the existing system delivers.
8. Overall Evaluation	Proposing Standard of Cover statements by risk type as necessary.

Fire service deployment, simply stated, is about the speed and weight of the response. *Speed* relates to first-due, all-risk intervention units (engines, trucks, and/or rescue ambulances) strategically located across a service area to respond to emergencies within an effective travel time to control simple to moderate emergencies, preventing the incident from escalating to greater size or complexity. *Weight* relates to multiple-unit responses for more serious emergencies such as a building fire, multiple-patient medical incident, vehicle accident with extrication required, or heavy rescue incident. In these situations, a sufficient number of appropriately trained personnel must be assembled within a reasonable time frame to safely control the emergency and keep it from escalating into a catastrophic event.

This deployment design paradigm is illustrated in Table 2:

Table 2—Fire Department Deployment Simplified

	Meaning	Purpose
***Speed* of Attack**	Travel time of first-due, all-risk intervention units strategically located across a service area	Controlling simple to moderate emergencies without the incident escalating in size or complexity
***Weight* of Attack**	Number of firefighters in a multiple-unit response for serious emergencies	Assembling enough firefighters within a reasonable time frame to safely control the emergency

Thus, small fires and medical emergencies require a single- or two-unit response (engine and specialty unit) with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late, or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The science of fire crew deployment is to spread crews out across a jurisdiction's service area for quick response to keep emergencies small with positive outcomes, without spreading the crews so far apart that they cannot amass together quickly enough to be effective in major emergencies.

This page was intentionally left blank

SECTION 3—DEPARTMENT DEPLOYMENT GOALS/MEASURES AND RISK ASSESSMENT

3.1 WHY DOES THE DEPARTMENT EXIST AND HOW DOES IT DELIVER THE EXISTING FIRE CREW DEPLOYMENT SERVICES?

3.1.1 Existing Response Time Policies or Goals—Why Does the Agency Exist

SOC ELEMENT 1 OF 8
EXISTING DEPLOYMENT POLICIES

The Department Board of Directors over the decades has not adopted detailed response time policies by type of risks. However, the Department has a long history of striving to provide a high level of service that can be documented in budgeted resources, response times, number of fire companies, and minimum staffing. The Department does measure a response time goal of 6 minutes from the time of fire crew notification that is reported to the Department Directors each month.

For emergency medical services (EMS), the current countywide pre-hospital emergency medical system includes local fire agency response personnel trained to either the Emergency Medical Technician (EMT) or Paramedic level, and a fire-agency-based Paramedic ambulance system operated by the El Dorado County Regional Prehospital Emergency Services Operations Authority. Under this EMS system model, each local fire agency provides initial pre-hospital response and medical care at either the Basic Life Support (BLS) or Advanced Life Support (ALS) level, and the Ambulance Authority provides Paramedic ambulance transport services with eight ALS ambulances dynamically deployed in the western area of the County. The Department provides staffing for one of the eight JPA ambulances, and in addition, daily Department response staffing includes Paramedics on each fire apparatus. Table 3 summarizes JPA ambulance contract response performance standards.

Table 3—JPA Ambulance Response Performance Standards

Response Zone	Maximum Response Time (Minutes:Seconds)[1]	Compliance Percentage
Urban[2]	10:00	90%
Semi-Rural[3]	20:00	90%
Rural[4]	20:00	90%
Wilderness[5]	As soon as possible	N/A

[1] Time interval from ambulance crew notification to arrival at medical emergency or patient
[2] Population density greater than 999 per square mile
[3] Population density from 100-999 per square mile
[4] Population density from 10-99 per square mile
[5] Population density less than 10 per square mile
Note: The JPA population density levels are unique to it and not the ones used by the NFPA or CFAI.

Another source to look for community response time policies is the Safety Element of the County General Plan. Citygate's review of that Plan[3] revealed that while it contains broad goals for overall community fire safety, no specific fire service response time goals or explicit desired outcomes are included. Thus, today it is impossible to measure current performance to national best practices or local standards that define a start and end time by type of risk to be protected for non-EMS incidents.

The lack of formally adopted response time goals by the Department is not congruent with best practices for emergency response time tracking. Nationally recognized standards and best practices call for a time line with several important time measurements that include a definition of response time.

The Department also has not identified response goals for technical rescue and hazardous material responses; in addition to firefighting and EMS, these incident types response time goals also are required to meet the Standards of Coverage model for the Commission on Fire Accreditation International (CFAI). In this Standards of Coverage study, Citygate will recommend revised response time goals to include all risks including fire, EMS, hazardous materials, and technical rescue responses. The goals will be consistent with the CFAI systems approach to response.

[3] Public Health, Safety, and Noise Element, El Dorado County General Plan (Amended December 2015)

3.2 Outcome Expectations

SOC Element 2 of 8
Community Outcome Expectations

The Standards of Response Cover Process begins by reviewing existing emergency services outcome expectations. This can be restated as follows: for what purpose does the response system exist? Has the governing body adopted any response performance measures? If so, the time measures used need to be understood and good data collected.

Current best practice nationally is to measure percent completion of a goal (e.g., 90% of responses) instead of an average measure. Mathematically this is called a "fractile" measure.[4] This is because the measure of average only identifies the central or middle point of response time performance for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were way over the average or just over. For example, if a department had an average response time of 5 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5 minutes were answered in the 6th minute, or way out at 10 minutes. This is a significant issue if hundreds or thousands of calls are answered far beyond the average point. Fractile measures will identify, per minute, the number of incidents that are reached up to 100%.

More importantly within the Standards of Response Coverage Process, positive outcomes are the goal, and from that crew size and response time can be calculated to allow efficient fire station spacing (distribution and concentrations). Emergency medical incidents have situations with the most severe time constraints. In a heart attack that stops the heart, a trauma that causes severe blood loss, or in a respiratory emergency, the brain can only live 8-10 minutes without oxygen. Not only heart attacks, but also other events can cause oxygen deprivation to the brain. Heart attacks make up a small percentage; drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in 8 to 10 minutes. If fire service response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, ***all*** responding crews must arrive, size-up the situation, and deploy effective measures before brain death occurs or the fire leaves the room of origin.

Thus, from the time of 9-1-1 receiving the call, an effective deployment system is ***beginning*** to manage the problem within a 7- to 8-minute total response time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point to leave the room of origin and become very serious. Thus, the Department needs a first-due response goal within this time frame

[4] A *fractile* is that point below which a stated fraction of the values lie. The fraction is often given in percent; the term percentile may then be used.

to give the situation hope for a positive outcome. It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine actually starts to drive the response route. Ideally, the emergency is noticed immediately and the 9-1-1 system is activated promptly. This step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes, in the best of circumstances, 1 minute. Then crew notification and travel time take additional minutes. Once arrived, the crew must walk to the patient or emergency, size-up the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take 2 or more minutes. This time frame may be increased considerably due to long driveways, apartment buildings with limited access, multi-storied apartments or office complexes, or shopping center buildings such as those found in parts of the Department.

Unfortunately, there are times that the emergency has become too severe, even before the 9-1-1 notification and/or fire department response, for the responding crew to reverse; however, when an appropriate response time policy is combined with a well-designed system, then only issues like bad weather, poor traffic conditions, or multiple emergencies will slow the response system down. Consequently, a properly designed system will give citizens the hope of a positive outcome for their tax dollar expenditure.

The Department Board of Directors conducted a public listening session for this study on May 5, 2016, which was attended by approximately 25 persons. Comments relative to fire service expectations included:

- "Was the Latrobe School considered in identifying the prospective location for a new Station 91?"
- "Is the projected growth in senior housing being considered in this study?"
- "Does the study consider the Department's engine-based ALS emergency medical care capability?"
- "This is a good analysis of risk vs. deployment"
- "Looking forward to the EMS analysis"
- "The Board should give great consideration to long-term fiscal strategic modeling"
- "Do safety standards adversely impact deployment options?"
- "Desired time increments are driven by desired outcome expectations"
- "The current deployment model adversely impacts EMS response times; should this service line be addressed differentially?"
- "Should we be building these traditional fire station facilities going forward?"

For this report, "total" response time is the sum of dispatch call processing and crew notification time, crew turnout time, and road travel time. This is consistent with the recommendations of the CFAI.

Finding #1: The Department Directors have not adopted a complete and best-practices-based deployment measure or set of specialty response measures for all-risk emergency responses that includes the beginning time measure from the point of fire dispatch receiving the 9-1-1 phone call, nor a goal statement tied to risks and outcome expectations. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations of the Commission on Fire Accreditation International.

3.3 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

The third element of the Standards of Coverage (SOC) process is a community risk assessment. The objective of a community risk assessment is to:

1. Identify the hazards with potential to adversely impact the community or jurisdiction
2. Quantify the probability of occurrence for each identified hazard
3. Identify and evaluate factors likely to influence impact severity for each identified hazard
4. Determine overall risk by hazard.

A *hazard* is broadly defined as a situation or condition that can cause or contribute to harm. Hazard examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. *probability* is the likelihood of occurrence of a particular hazard, and *impacts* or *consequences* are the adverse effects that a hazard occurrence has on people, property, and/or the community as a whole. *Risk* is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts*, and *risk vulnerability* is a measure of the probability of the existing deployment model's ability to protect against or mitigate a specific hazard.

3.3.1 Risk Assessment Methodology

The methodology employed by Citygate to assess and quantify community risk as an integral element of an SOC study incorporates the following elements:

1. Identification of geographic risk assessment sub-zones (risk zones) appropriate for the community or jurisdiction
2. Identification of the fire and non-fire natural and human-caused hazards with potential to adversely impact the community or jurisdiction
3. Determination of *probability of future occurrence* for each hazard by risk zone considering historical service demand and the probability of occurrence criteria described in Table 4

Table 4—Probability of Occurrence Criteria

Probability Score	Description	Criteria
1	Very Low	Less than 5% probability of occurrence within next 12 months
2	Low	5%-10% probability of occurrence within next 12 months
3	Moderate	11%-50% probability of occurrence within next 12 months
4	High	51%-95% probability of occurrence within next 12 months
5	Very High	Greater than 95% probability of occurrence within next 12 months

4. Identification and evaluation of appropriate *impact severity factors* for each hazard by risk zone using agency/jurisdiction-specific data and information and the impact severity factor score criteria described in Table 5 and in Appendix A.

Table 5—Impact Severity Factor Score Criteria

Risk Factor Score	Description
1	Risk factor ***negligibly*** contributes to increased overall impact severity, or significantly contributes to reducing overall impact severity
2	Risk factor ***minimally*** contributes to increased overall impact severity, or contributes moderately to reducing overall impact severity
3	Risk factor ***moderately*** contributes to increased overall impact severity
4	Risk factor ***significantly*** contributes to increased overall impact severity
5	Risk factor ***seriously*** contributes to increased overall impact severity

5. Calculation of *overall risk score* for each hazard by multiplying the sum of *impact factor scores* by the *probability of occurrence* score for each risk zone

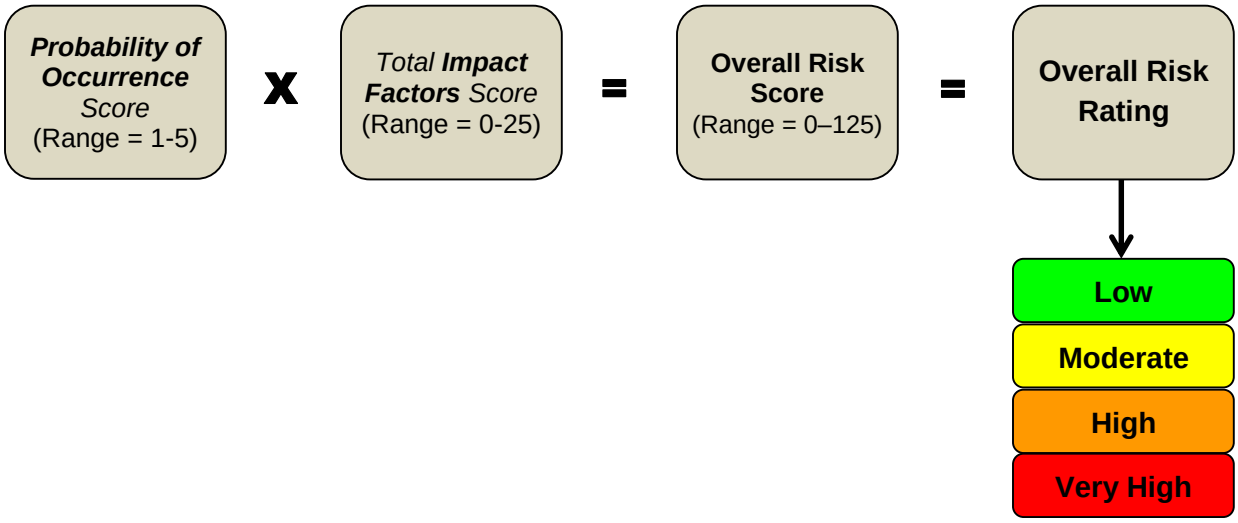
6. Determination of overall *risk rating* by risk zone based on overall risk score as described in Table 6.

Table 6—Overall Risk Rating

Overall Risk SCORE	Overall Risk RATING
0 - 31	LOW
32 - 62	MODERATE
63 - 94	HIGH
95 - 125	VERY HIGH

Figure 1 illustrates the methodology used to quantify overall risk for each hazard by risk zone.

Figure 1—Overall Risk Calculation Flowchart



Citygate used multiple data sources for this study to understand the risks to be protected in the Department as follows:

- U.S. Census Bureau population data and demographics
- Insurance Services Office (ISO) building fire flow and construction data
- El Dorado County Geographical Information Systems (GIS) data

- El Dorado County General Plan and Zoning documents
- El Dorado County Multi-Jurisdiction Hazard Mitigation Plan (MJHMP).

3.3.2 Risk Assessment Summary

Citygate's evaluation of the various risks likely to adversely impact the El Dorado Hills Fire Department yields the following conclusions:

1. The Department has very diverse population densities, with suburban densities in the core business/residential areas, and rural densities in the outlying areas
2. The Department's population is projected to grow by over 75% over the next 15 years
3. The Department has a mix of residential, commercial, office, and industrial buildings typical of a suburban community
4. The Department has varying levels of risk relative to seven hazards specifically relating to fire department services as follows:
    a. Building Fire Risk
    b. Wildland Fire Risk
    c. Emergency Medical Service Risk
    d. Hazardous Materials Risk
    e. Technical Rescue Risk
    f. Transportation Risk
    g. Flood Risk

Table 7 summarizes the Department's overall risk by hazard and risk zone.

Table 7—Overall Risk Summary by Risk Zone

Risk Zone	RISK						
	Building Fire	Wildland Fire	EMS	Hazardous Material	Technical Rescue	Trans-portation	Flood
84A	Low	High	Low	Low	Low	Low	Low
84B	Low	Moderate	Low	Low	Low	Low	Low
84C	Moderate	Moderate	Low	Low	Low	Low	Low
84D	Low	Moderate	Low	Low	Low	Low	Low
84E	Low	Moderate	Low	Low	Low	Low	Low
84F	Low	Moderate	Low	Low	Low	Low	Low
84G	Low	Moderate	Low	Low	Low	Low	Low
84H	Low	High	Low	Low	Low	Low	Low
85A	Moderate	Moderate	Low	Low	Low	Low	Low
85B	Low	Moderate	Low	Low	Low	Low	Low
85C	Low	Moderate	Low	Low	Low	Low	Low
85D	Low	Moderate	Low	Low	Low	Low	Low
86A	Low	Moderate	Low	Low	Low	Low	Low
86B	Low	Moderate	Low	Low	Low	Low	Low
86C	Low	Moderate	Low	Low	Low	Low	Low
86D	Low	Moderate	Low	Low	Low	Low	Low
86E	Low	High	Low	Low	Low	Low	Low
87A	Moderate	Moderate	Low	Low	Low	Low	Low
87B	Low	Moderate	Low	Low	Low	Low	Low
87C	Low	Moderate	Low	Low	Low	Low	Low
87D	Low	Moderate	Low	Low	Low	Low	Low
87E	Low	Moderate	Low	Low	Low	Low	Low
87F	Low	Moderate	Low	Low	Low	Low	Low
91	Moderate	High	Moderate	Low	Low	Low	Low

The following sections will describe the risk analysis process and risk factors used to determine overall risk as shown in Table 7 in more detail.

3.3.3 Community Demographics

Table 8 summarizes key demographic data for El Dorado Hills.[5]

Table 8—El Dorado Hills Demographics

Demographic	2000	2014	Percentage / *Percent Change*
Population	**18,016**	**43,862**	***143.46%***
Under 5 years	1,281	2,442	5.57%
5-19 years	5,099	10,884	24.81%
20-64 years	10,315	24,724	56.37%
Over 65 years	1,321	5,812	13.25%
Median age	37.6	41.5	***10.37%***
Housing Units	**6,071**	**14,800**	***143.78%***
Owner-Occupied	5,319	12,209	82.49%
Renter-Occupied	577	2,032	13.73%
Median Household Size	3.06	3.11	***1.47%***
Median Home Value	$277,900	$518,730	***86.66%***
Birthplace			
U.S.	17,179	37,579	85.68%
Foreign-Born	904	6,283	14.32%
Ethnicity			
White	15,338	34,094	77.73%
Hispanic/Latino	896	3,563	8.12%
Black/African American	139	1,025	2.34%
Asian	740	4,566	10.41%
Other	903	614	1.40%
Education (age 25 and over)			
High School Graduate	1,213	3,694	13.08%
Undergraduate College Degree	3,872	9,703	34.34%
Graduate/Professional Degree	1,991	4,902	17.35%
Employment[1]			
Labor Force	N/A	21,400	48.79%
Employment	N/A	20,600	96.26%

[1] California Employment Development Department data (December 2015)
Source: U.S. Census Bureau

[5] El Dorado Hills Census Designated Place (U.S. Census Bureau)

3.3.4 Growth and Development

Overview

The El Dorado County General Plan[6] envisions future County growth to include the following:

- Maintaining and protecting the County's natural beauty and environmental quality, vegetation, air and water quality, natural landscape features, cultural resource values, and maintaining the rural character and lifestyle while ensuring the economic viability critical to promoting and sustaining community identity.
- Where appropriate, encouraging clustered development as an option to maintaining the integrity and distinct character of individual communities, while protecting open space and promoting natural resource uses.
- Making land use decisions in conjunction with comprehensive transportation planning and pursuing economically viable alternative transportation modes, including light rail.
- Adopting a Circulation Element providing for rural and urban flows that recognize limitations of topography and natural beauty with flexibility of road standards.
- Promoting a better balance between local jobs and housing by encouraging high technology activities and value added activities tied directly to available resource based industries such as the timber industry, tourism, agriculture, mining, and recreation.
- Increasing the amount of affordable housing by providing a variety of housing types and encouraging residential projects to reflect affordability in light of the existing local job base and/or infrastructure.
- Encouraging efforts to locate a four-year college and supporting the ability of elementary, middle, and high schools to keep pace with population growth.
- Improving and expanding local park and recreational facilities throughout the County.

[6] 2004 El Dorado County General Plan (July 2004)

Projected Growth

Table 9 summarizes key growth projections for El Dorado Hills.

Table 9—Projected Growth – El Dorado Hills

Growth Factor	2014[1]	2030[2]	Projected Growth (Units)	Projected Growth (Percentage)
Population	43,862	77,862	34,000	**77.52%**
Housing Units	14,800	25,750	10,950	**73.99%**

[1] 2014 data – U.S. Census Bureau
[2] 2030 projections – El Dorado Hills Fire Department estimate based on proposed residential development projects and median household size (3.11 persons)

Land Use and Future Development

Land uses within the Department include a mix of low, medium, and high-density residential, multi-family residential, rural residential, commercial, light industrial, agriculture, public facilities, recreation, open space, and natural resources.

The Land Use Element of the 2004 El Dorado County General Plan includes the following land use goals:

- Protection and conservation of existing communities and rural centers
- Creation of new sustainable communities
- Curtailment of urban/suburban sprawl
- Location and intensity of future development consistent with the availability of adequate infrastructure
- Mixed and balanced uses that promote use of alternate transportation systems.

The General Plan also provides policy direction for specific community regions, including El Dorado Hills, that allow for continued population growth and economic expansion while preserving the character and extent of existing rural centers and urban communities, emphasizing both the natural setting and built design elements which contribute to the quality of life and economic health of the County. The County General Plan includes Specific Plans for the following areas of the Department:

- Carson Creek
- Promontory

- Valley View
- El Dorado Hills
- Town Center West
- Town Center East
- Bass Lake Hills
- Northwest El Dorado Hills

The Plan further provides policy direction for rural centers, including Latrobe, which provides a focus of activity and the provision of goods to the surrounding rural area. Table 10 summarizes prospective key future residential development projects within the Department.[7]

Table 10—Prospective Future Development

Project	Location	Project Area (Acres)	Maximum Residential Units	Potential Residents[1]
Bass Lake North	Starbuck Road	90	90	279
Bell Ranch	Morrison Rd. / Holy Trinity Church	113	113	351
Bell Woods	Adjacent to Hollow Oak Subdivision	54	54	168
Blackstone W	Latrobe / Clubview	73	73	227
Blackstone X	Latrobe / Clubview	61	61	189
Blackstone V	Latrobe / Royal Oaks	70	70	217
Carson Creek 1	Carson Crossing	285	285	885
Carson Creek 2	Carson Crossing	634	634	1,969
Carson Creek 3	Carson Crossing	321	321	997
Central El Dorado Hills	N of Hwy. 50 to Station 85	1,000	1,000	3,105
Diamonte Estates	Malcom Dixon Rd.	19	19	59
Dixon Ranch	Green Valley Rd.	605	605	1,879
El Dorado Springs 23	White Rock	49	49	152
Hawk View	Bass Lake Rd. / Hawk View	114	114	354
Lime Rock Valley	SE Marble Valley	800	800	2,484
Marble Valley	South Bass Lake	3,236	3,236	10,048

[7] Source: El Dorado Hills Fire Department

Project	Location	Project Area (Acres)	Maximum Residential Units	Potential Residents[1]
Promontory Lot D1	Sophia / Alexandria	63	63	196
Promontory Lot H	Beatty / Alexandria	64	64	199
Promontory Village 8	Via Baragio / Via Trevisio	63	63	196
Ridgeview Village 9	Beatty / Powers	49	49	152
Ridgeview West 4	Via Barlogio / Via Trevisio	20	20	62
Saratoga Estates	Wilson / Folsom boundary	316	316	981
Serrano J 5/6	Bass Lake Rd. / Serrano Pkwy.	119	119	369
Serrano K6	Greenview	74	74	230
Serrano K1/K2	Pannini / Da Vinci	43	43	134
Serrano K5	Greenview	151	151	469
Serrano Village A-14	Russi Ranch	55	55	171
Serrano Village C-2	Russi Ranch	50	50	155
Serrano Village D1	Meadow Wood / Boundary Oaks Dr.	65	65	202
Serrano Village J	Serrano / Bass Lake	75	75	233
Serrano Westside	Serrano Parkway	763	763	2,369
Silver Springs	Silver Springs / Green Valley	245	245	761
Springs Equestrian Ctr.	Deer Valley / Green Valley	445	445	1,382
Valley View East Ridge	Above Blackstone	701	701	2,177
West Valley Village W	Blackstone Entrance	37	37	115
Wilson Estates	Malcom Dixon	28	28	87
	Total	**6,164**	**10,950**	**34,000**

[1] Assuming U.S. Census Bureau 2014 Mean Household Size (3.11 persons)
Source: El Dorado Hills Fire Department

3.3.5 Prior Risk Studies

The federal Disaster Mitigation Act of 2000 (DMA2000), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), emphasizes the need for state and local entities to closely coordinate disaster planning and mitigation efforts to reduce the severity of disaster impacts. In addition to continuing the requirement for a state mitigation plan as a condition of federal disaster assistance, DMA2000 creates a similar requirement for local entities and creates incentives for increased coordination and integration of mitigation activities among local jurisdictions.

The 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan (MJHMP) (November 2004) identifies six natural hazards likely to impact the County as shown in Table 11 using the criteria described in Table 12.

Table 11—El Dorado County Hazard Summary

Hazard		Likelihood	Spatial Extent	Potential Impact	Hazard Rating
1	Avalanche	2	1	1	**4**
2	Earthquake/Landslide	1	2	1	**4**
3	Erosion	1	2	1	**4**
4	Dam Failure	0	1	4	**5**
5	Flood	2	2	3	**7**
6	Winter/Seasonal Storms	3	3	2	**8**

Source: 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan (Page III-21)

Table 12—Criteria for Qualitative Hazard Assessment

Criteria	Assigned Value	Definition
Likelihood of Occurrence		
Highly Likely	3	Near 100% annual probability
Likely	2	Between 10% and 100% annual probability
Possible	1	Between 1% and 10% annual probability
Unlikely	0	Less than 1% annual probability
Spatial Extent		
Large	3	More than 50% of area affected
Moderate	2	Between 10% and 50% of area affected
Small	1	Less than 10% of area affected
Potential Impact		
Catastrophic	4	High number of deaths/injuries possible; more than 50% of roadways and transportation facilities damaged or destroyed; complete shutdown of facilities for 30 days or more
Critical	3	Multiple deaths/injuries possible; more than 25% of roadways and transportation facilities damaged or destroyed; complete shutdown of facilities for more than one week
Limited	2	Minor injuries only; more than 10% of roadways and transportation facilities damaged or destroyed; complete shutdown of facilities for more than one day
Minor	1	Very few injuries, if any; only minor roadway and transportation facility damage; minimal disruption on quality of life; temporary shutdown of facilities

Source: 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan (Page III-2)

The results from this hybrid qualitative/quantitative analysis resulted in the six natural hazards being assigned to one of three risk categories as shown in Table 13.

Table 13—El Dorado County Hazards by Risk Category

Risk Category	Hazards
HIGH	Floods Winter/Seasonal Storms
MODERATE	Avalanche Dam Failure Earthquake/Landslide Erosion
LOW	None Identified

Source: 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan (Page III-22)

It is important to note that the natural hazards listed above were evaluated specifically to their potential impact on the County's transportation system. Although not included in the above risk analysis, the MJHMP cites wildland fire as the predominant hazard for El Dorado County.[8] The MJHMP also includes a Countywide Community Wildfire Protection Plan (CWPP) to address the wildland fire risk.

Values at Risk

Significant values at risk within the Department, besides residents and visitors, include a range of buildings and infrastructure such as public facilities, utilities, schools, care facilities, key economic businesses, bridges, and cultural and natural resources. Critical facilities are defined as any facility, including a structure, infrastructure, property, equipment, or service that, if adversely impacted by a hazard occurrence, may result in severe consequences to public health and safety or interrupted essential services and operations for the community at any time before, during, or after the hazard occurrence. The Department has identified 109 critical facilities as shown in Table 14 and Figure 2.

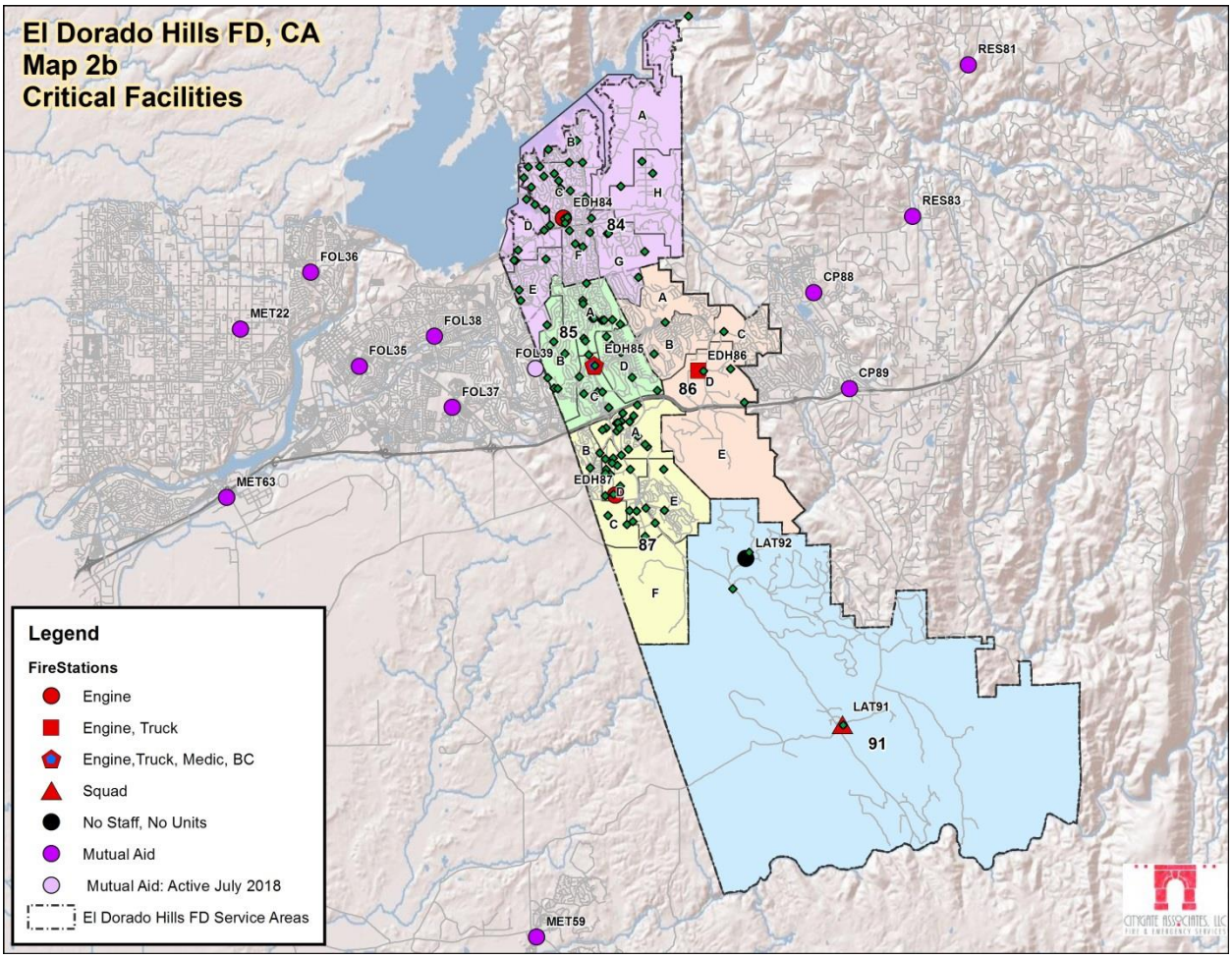
[8] 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan (Page III-21)

Table 14—Critical Facilities – El Dorado Hills

Critical Facility Category	Type of Facility	Number
Critical Infrastructure	Fire Station	6
	Sheriff's Dept. Sub-Station	1
	Other Government Services	3
	Lifeline Utilities	40
	Educational Facilities	25
	Bridges	2
Key Resources	Key Employers	16
	Churches, Places of Worship	8
	Multi-Family Residential	7
	Historic Buildings	1
	Total	**109**

Source: El Dorado Hills Fire Department

Figure 2—Critical Facilities



3.3.6 Hazard Identification

Citygate utilizes prior risk studies where available, fire and-non-fire hazards as identified by the Commission on Fire Accreditation International (CFAI), and agency/jurisdiction-specific data and information to identify the hazards to be evaluated for this study.

The primary hazards identified in the 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan, as they relate to Department services, include:

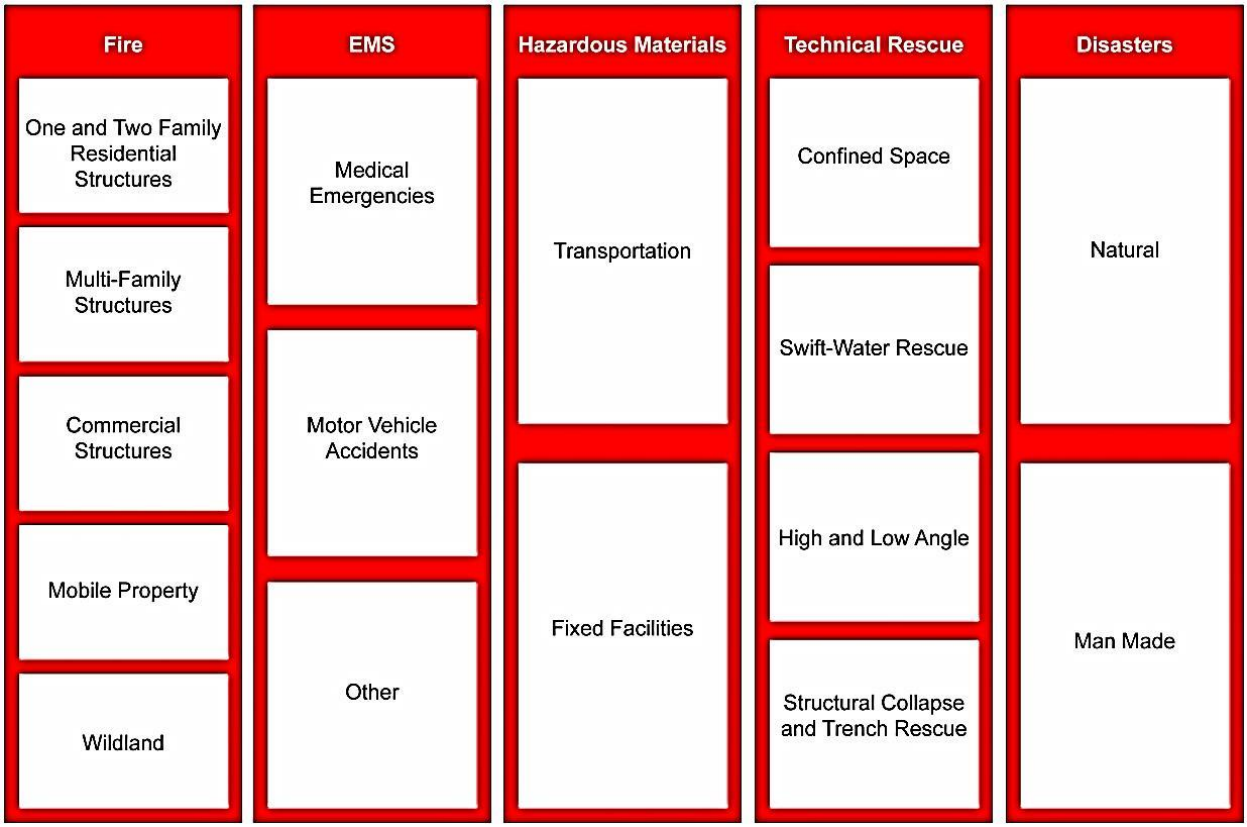
1. Earthquake
2. Floods
3. Landslide
4. Severe Seasonal Storms

5. Wildland Fire

Due to the lack of historical occurrence in or proximal to the Department, combined with a low probability of future occurrence, landslide risk and significant earthquake risk are not included in this analysis. The primary impact of severe seasonal storms as it relates to Department services is technical rescue and flooding.

Figure 3 additionally summarizes the fire and non-fire hazards established by CFAI.

Figure 3—CFAI Fire and Non-Fire Hazards



Source: CFAIS Standards of Cover (5th Edition)

The following risks were evaluated for this study based on the hazards identified in the 2004 El Dorado County Multi-Jurisdiction Hazard Mitigation Plan, and the fire and non-fire hazards identified by CFAI as they relate to services provided by the El Dorado Hills Fire Protection Department:

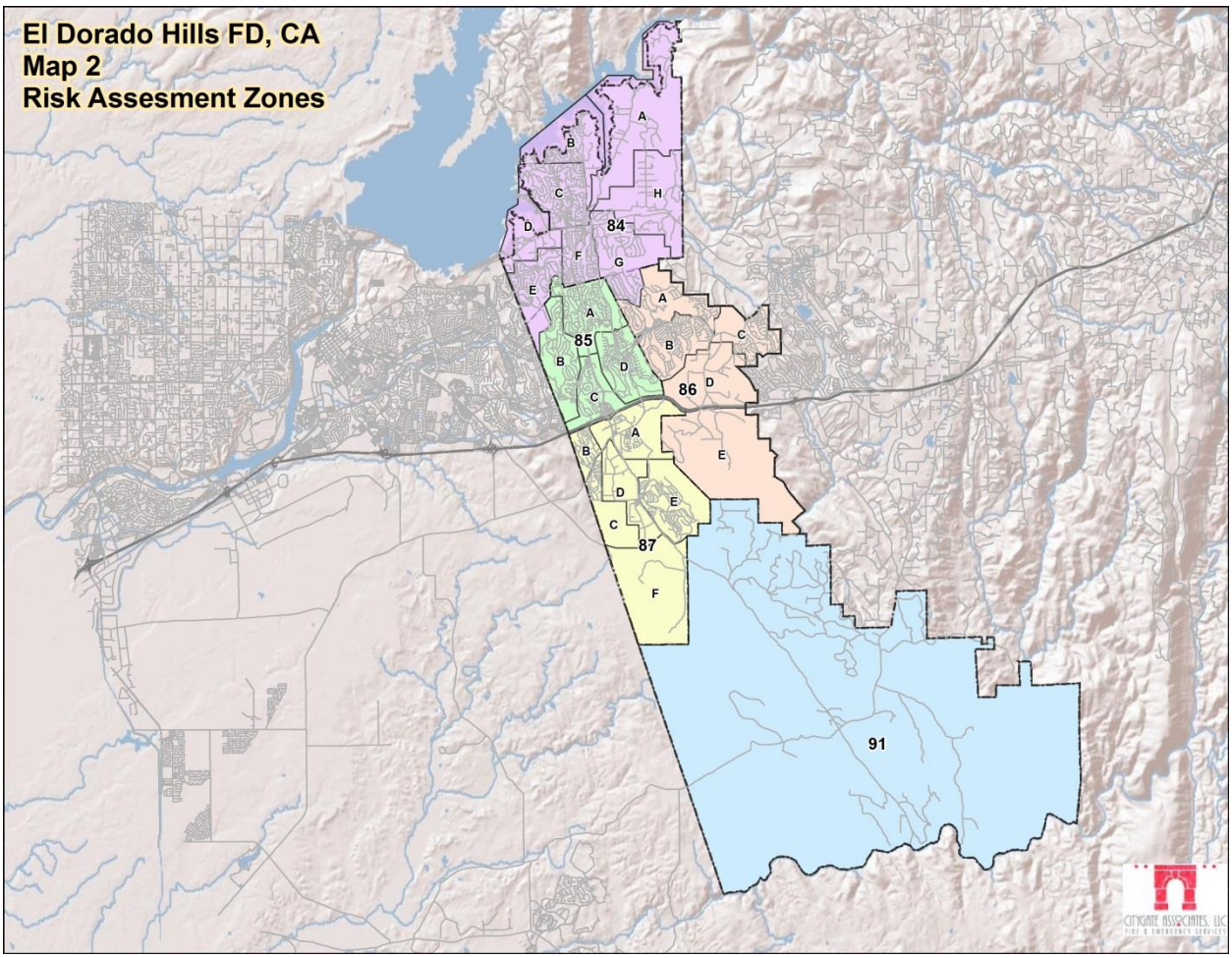
1. Building Fire Risk
2. Wildland Fire Risk
3. Emergency Medical Services (EMS) Risk

4. Hazardous Materials Risk
5. Technical Rescue Risk
6. Transportation Risk
7. Flood Risk

3.3.7 Risk Assessment Zones

In collaboration with the Department's Project Team, 24 risk assessment zones were identified for this analysis as shown in Figure 4.

Figure 4—Risk Assessment Zones



3.3.8 Probability of Occurrence

Probability of occurrence refers to the likely future occurrence of a hazard or risk over a specific time period. Since the CFAI Agency Accreditation process requires *annual* review of an agency's

risk assessment and baseline performance measures, Citygate recommends using the 12-month period following completion of an SOC study as an appropriate period for the probability of occurrence evaluation. Table 15 describes the criteria used in evaluating the probability of future occurrence for each hazard or risk as also discussed in Section 3.3.1.

Table 15—Probability of Occurrence

Probability of Occurrence	Description
Very Low	Less than 5% probability of occurrence within next 12 months
Low	5%-10% probability of occurrence within next 12 months
Moderate	11%-50% probability of occurrence within next 12 months
High	51%-95% probability of occurrence within next 12 months
Very High	Greater than 95% probability of occurrence within next 12 months

3.3.9 Risk Factors

Elements to be considered in a community risk assessment include factors that influence service demand, service capacity, probability of hazard occurrence, and severity of impacts or consequences of a hazard occurrence relative to life, property, the environment, and overall community resilience.

In conducting a community risk assessment, Citygate examines prior risk studies, community demographics including current and projected population, land use, future development potential, employment, and building occupancy data as available, prior service demand data, and risk-specific service capacity.

3.3.10 Service Capacity

Service capacity refers to the size of an agency's daily response force; the size, types, and condition of its response fleet and any specialized equipment; core and specialized performance competencies; resource distribution and concentration; availability of automatic and/or mutual aid; and any other agency-specific factors influencing its ability to meet current and prospective future service demand relative to the risks to be protected.

3.3.11 Building Fire Risk

One of the primary hazards in any community is building fire. Citygate used available data from the Department, El Dorado County, the U.S. Census Bureau, and the Insurance Services Office (ISO) to assist in identifying and quantifying the Department's building fire risk.

Building Risk Categories

CFAI identifies five building risk categories as follows:

Low Risk Occupancies – includes detached garages, storage sheds, outbuildings, and similar buildings that pose a relatively low risk of harm to humans or the community if damaged or destroyed by fire.

Moderate Risk Occupancies – includes detached single-family or two-family dwellings, mobile homes, commercial and industrial buildings less than 10,000 square feet without a high hazard fire load, aircraft, railroad facilities, and similar buildings where loss of life or property damage is limited to the single building.

High Risk Occupancies – includes apartment/condominium buildings, commercial and industrial buildings more than 10,000 square feet without a high hazard fire load, low-occupant load buildings with high fuel loading or hazardous materials, and similar occupancies with potential for substantial loss of life or unusual property damage or financial impact.

Special Risk Occupancies – includes single or multiple buildings that require an Effective Response Force (ERF) greater than what is appropriate for the risk which predominates the surrounding area such as apartment/condominium complexes more than 25,000 square feet, Critical Infrastructure/Key Resource (CIKR) facilities, commercial/industrial occupancies with fire flows greater than 3,500 GPM, vacant/abandoned buildings, buildings with required fire flow exceeding available water supply, and similar occupancies with high-life hazard or large fire loss potential.

Maximum Risk Occupancies – includes buildings or facilities with unusually high risk requiring an ERF involving a significant augmentation of resources and personnel, and where a fire would pose the potential for a catastrophic event involving large loss of life and/or significant economic impact to the community.

Building Fire Risk Factors

Table 16 illustrates the probability and consequences for each of the building fire risk categories. *Probability* is the likelihood of a fire occurring in a particular occupancy type, and *consequences* are the probable adverse impacts that the fire will have on people, property, and the community.

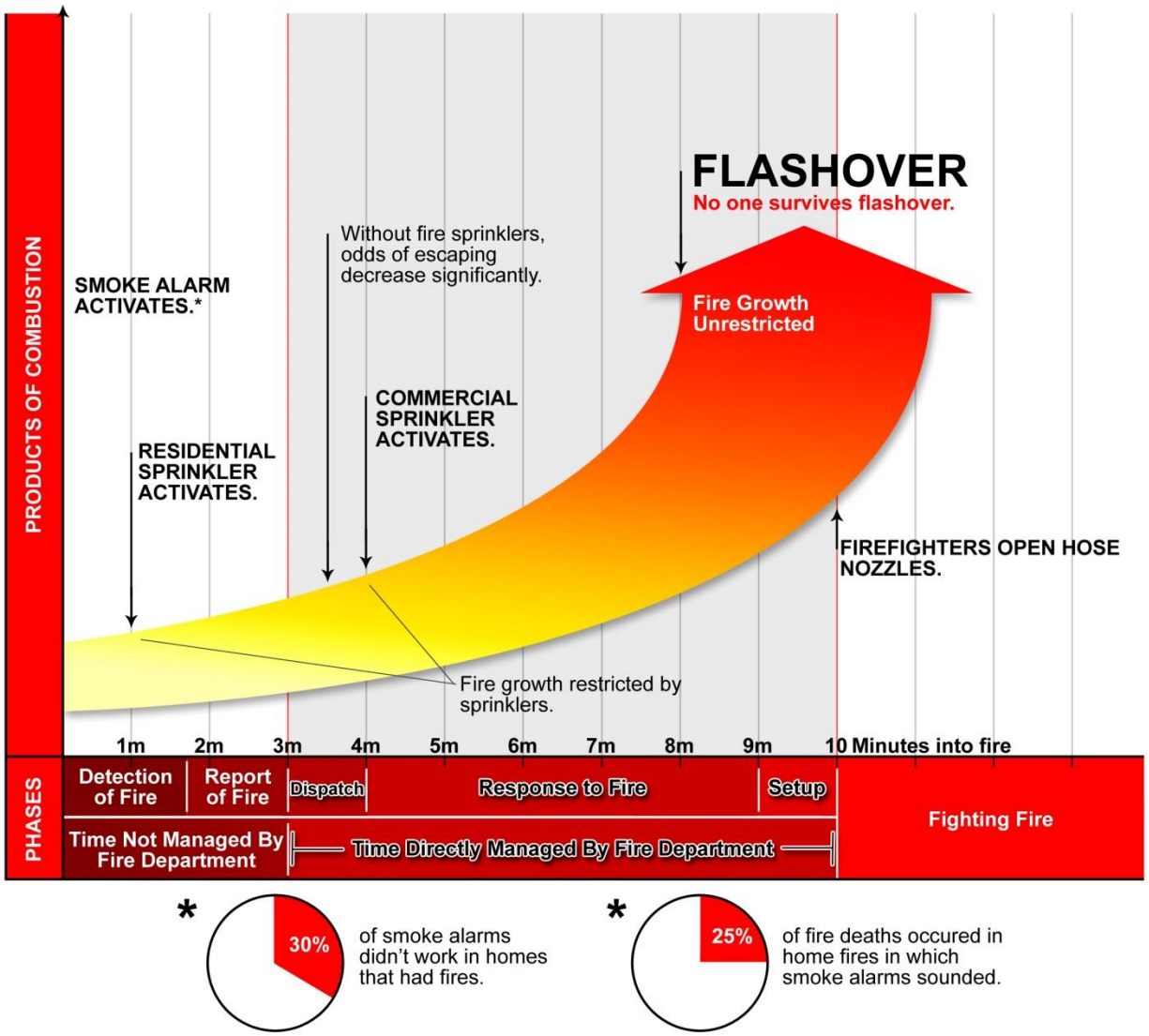
Table 16—Building Fire Probability/Consequence Matrix

	Low Consequence	High Consequence
High Probability	**Moderate Risk** (***High*** Probability) (***Low*** Consequence)	**Maximum Risk** (***High*** Probability) (***High*** Consequence)
Low Probability	**Low Risk** (***Low*** Probability) (***Low*** Consequence)	**High/Special Risk** (***Low*** Probability) (***High*** Consequence)

Resource deployment (distribution/concentration), staffing, and response time are three critical factors influencing favorable outcomes for building fire risk. Figure 5 illustrates the progression timeline of a building fire, and shows that a response time[9] of 7 minutes or less is necessary to stop a building fire before it reaches flashover, which is the point at which the entire room erupts into fire after all of the combustible objects in that room have reached their ignition temperature. Human survival in a room after flashover is extremely unlikely.

[9] Time interval from time of receipt of 9-1-1 call to initiation of suppression actions

Figure 5—Building Fire Progression Timeline



Source: http://www.firesprinklerassoc.org

Building Inventory

The Department has a mix of building occupancies typical of a suburban/rural community. Table 17 summarizes the Department's inventory of higher risk use categories, as defined by CFAI.[10]

[10] High, special, and maximum risk categories only

Table 17—Building Inventory by Occupancy Classification and Risk Category

Occupancy Classification		Number	Risk Category[1]
Assembly	A-1 Theater	2	Maximum
	A-2 Bar/Restaurant	47	High
	A-3 Public Assembly	37	High
	A-4 Indoor Sports	1	Maximum
	A-5 Outdoor	1	High
Education	Schools, Day Care	36	High
Factory	F-1 Moderate Risk	13	High
	F-2 Low Risk	6	High
Hazardous	H-3 High Hazard	3	Special
	H-4 Health Hazard	1	Special
Residential	R-1 Hotel/Motel	2	High
	R-2 Multi-Family	57	High
	R-2.1 Assisted Living	5	High
	R-3 Day Care ≤ 6	22	High
	R-3.1 Group Care ≤ 6	22	High
	R-4 Care Facility > 6	1	High
	Total	**256**	

[1] CFAI high, special, and maximum risk categories
Source: El Dorado Hills Fire Department

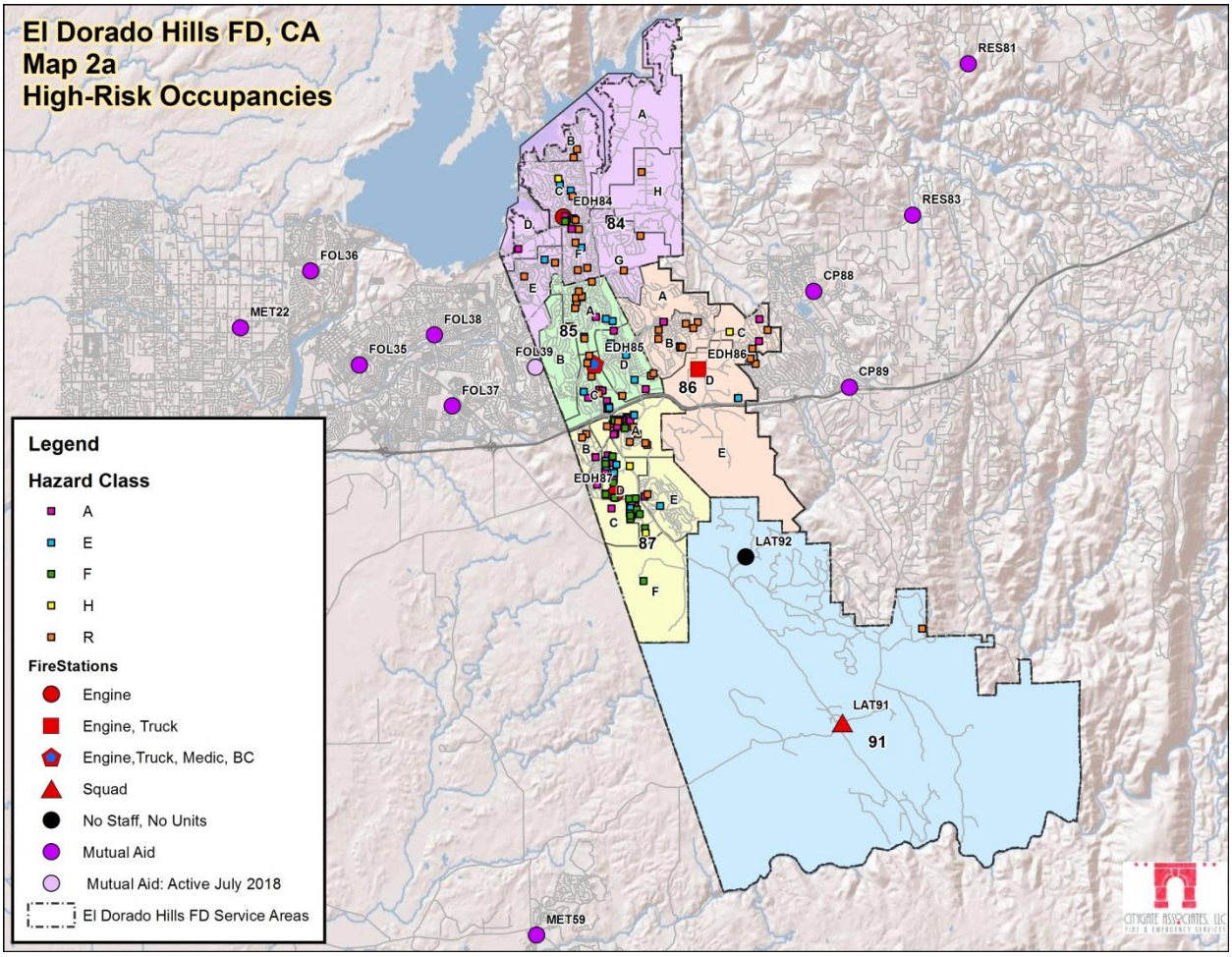
Table 18 further summarizes the Department's high-risk building inventory by risk zone.

Table 18—High Risk Building Inventory by Risk Zone

Risk Zone	Number	Percentage of Total
84-A	0	0.00%
84-B	2	0.78%
84-C	20	7.81%
84-D	1	0.39%
84-E	3	1.17%
84-F	13	5.08%
84-G	3	1.17%
84-H	1	0.39%
85-A	22	8.59%
85-B	0	0.00%
85-C	33	12.89%
85-D	9	3.52%
86-A	0	0.00%
86-B	10	3.91%
86-C	7	2.73%
86-D	3	1.17%
86-E	0	0.00%
87-A	79	30.86%
87-B	3	1.17%
87-C	2	0.78%
87-D	40	15.63%
87-E	3	1.17%
87-F	1	0.39%
91	1	0.39%
Total	**256**	**100.00%**

Figure 6 illustrates the distribution of the high-risk building occupancies.

Figure 6—High Risk Occupancies



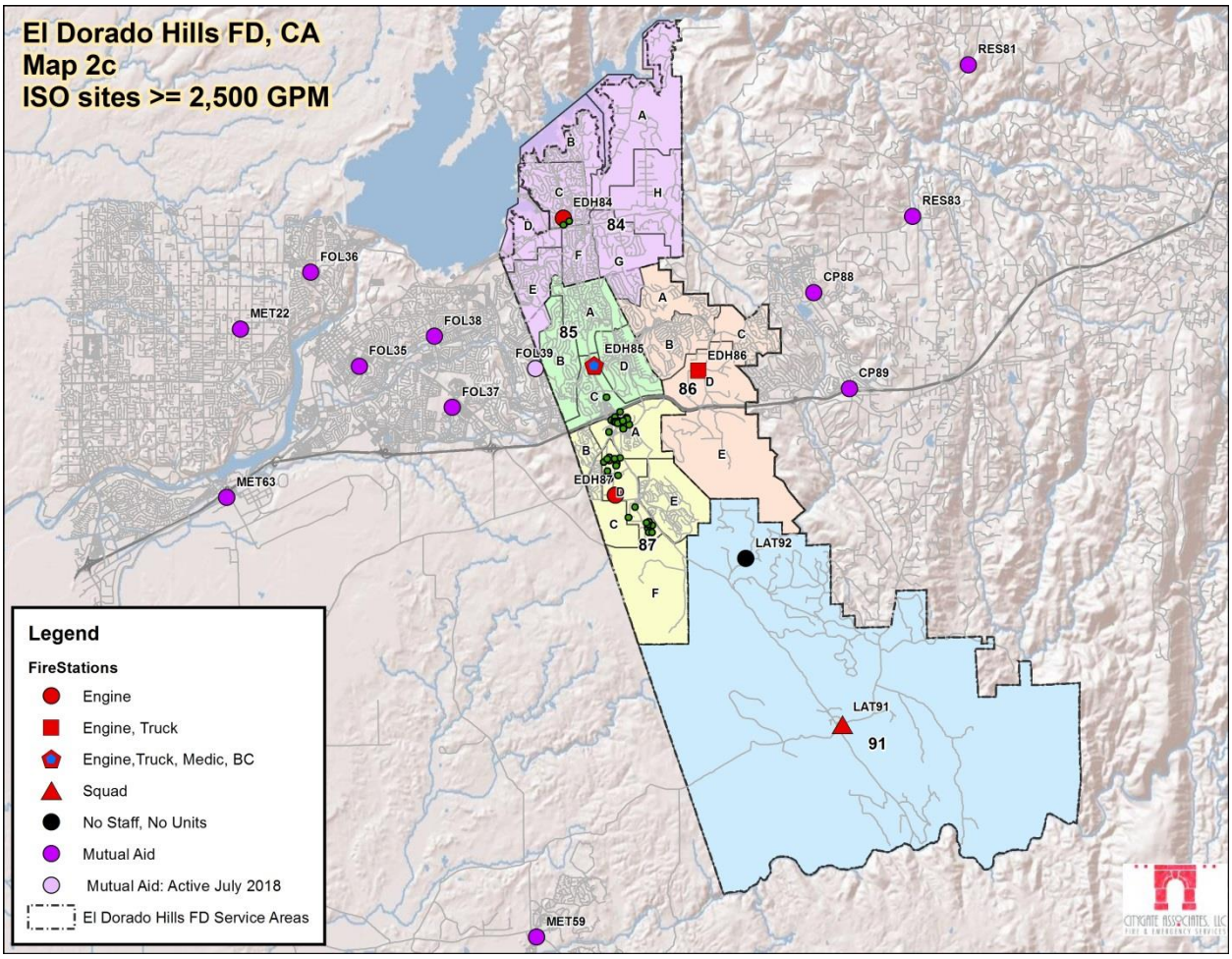
High Fire Flow Requirements

One of the factors used by the ISO is "Needed Fire Flow" (NFF), which is the amount of water that would be required in gallons-per-minute (GPM) if a building were seriously involved in fire. For El Dorado Hills, the ISO database identifies 172 buildings evaluated, of which 32 have a needed fire flow of less than 1,500 GPM, 49 have a needed fire flow of 1,500-2,000 GPM, 73 have a needed fire flow of 2,000-3,000 GPM, and 18 have a needed fire flow of more than 3,000 GPM. Table 19 and Figure 7 show the distribution of sites with a NFF of 2,500 GPM or more.

Table 19—High NFF Sites by Risk Zone

Risk Zone	Number	Percentage of Total
84-A	0	0.00%
84-B	0	0.00%
84-C	4	6.15%
84-D	0	0.00%
84-E	0	0.00%
84-F	1	1.54%
84-G	0	0.00%
84-H	0	0.00%
85-A	0	0.00%
85-B	0	0.00%
85-C	3	4.62%
85-D	0	0.00%
86-A	0	0.00%
86-B	0	0.00%
86-C	0	0.00%
86-D	0	0.00%
86-E	0	0.00%
87-A	19	29.23%
87-B	0	0.00%
87-C	0	0.00%
87-D	38	58.46%
87-E	0	0.00%
87-F	0	0.00%
91	0	0.00%
Total	**65**	**100.00%**

Figure 7—ISO High Fire Flow Sites



This is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would require a significant commitment of the Department's on-duty force. Using a generally accepted figure of 50 GPM per firefighter on large building fires, a fire in a building requiring 2,000 GPM would require 40 firefighters, which is more than the Department's current initial ERF of 23 firefighters for structure fires.

Critical Facilities

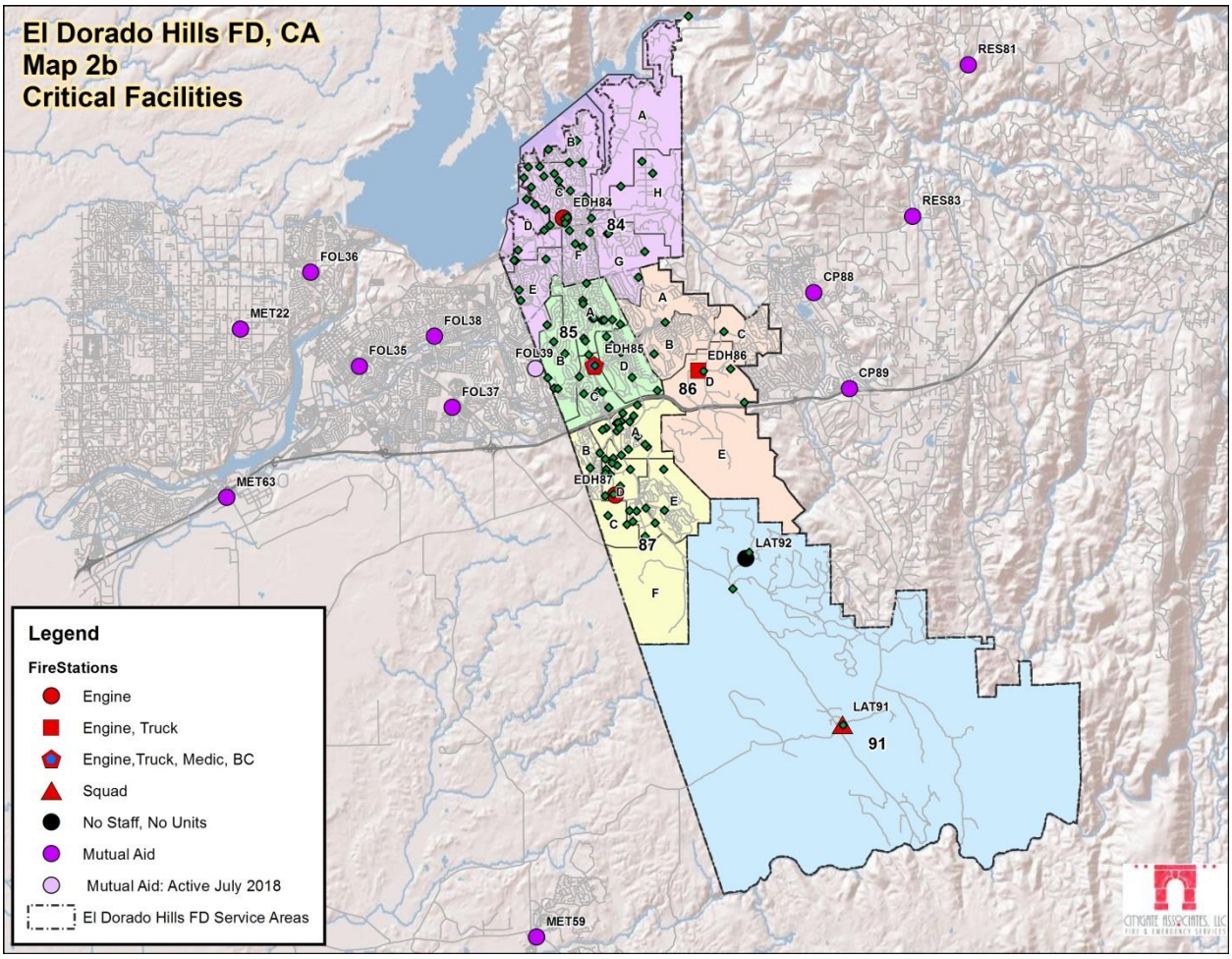
The Department identifies 127 critical facilities[11] as shown in Table 20 and Figure 8.

Table 20—Critical Facilities

Risk Zone	Number	Percentage of Total
84-A	0	0.00%
84-B	3	2.36%
84-C	19	14.96%
84-D	5	3.94%
84-E	5	3.94%
84-F	4	3.15%
84-G	5	3.94%
84-H	3	2.36%
85-A	14	11.02%
85-B	5	3.94%
85-C	6	4.72%
85-D	5	3.94%
86-A	1	0.79%
86-B	1	0.79%
86-C	1	0.79%
86-D	4	3.15%
86-E	0	0.00%
87-A	18	14.17%
87-B	1	0.79%
87-C	2	1.57%
87-D	17	13.39%
87-E	4	3.15%
87-F	0	0.00%
91	4	3.15%
Total	**127**	**100.00%**

[11] Essential public services and at-risk populations

Figure 8—Critical Facilities



Water Supply

A reliable public water system providing adequate volume, pressure, and flow duration in close proximity to all buildings is a critical factor influencing a community's building fire impact severity. The El Dorado Irrigation District provides potable water to a large area on the western slope of El Dorado County, including the El Dorado Hills Fire Department. Fire flow is generally adequate throughout the core population center of the Department, with the following exceptions:

1. Marble Mountain Community Services District (CSD) area south of U.S. 50
2. Salmon Falls Road north of Green Valley Road
3. Most of the former Latrobe Fire District south of Royal Oaks Drive

Fire flow outside of the core population areas of the Department is mostly inadequate, with few to no fire hydrants.

Building Fire Service Capacity

The Department's service capacity for building fire risk consists of a minimum daily on-duty response force of 19 personnel staffing six apparatus from five fire stations and two Battalion Chief. In addition, the Department has automatic aid agreements with the City of Folsom, the Cameron Park CSD, as well as the Rescue Fire District and the Sacramento Metropolitan Fire District, and is also a signatory to the El Dorado County Mutual Aid Agreement. The Department's Effective Response Force (ERF)[12] for building fires using Department and automatic aid is 5 engines, 1 ladder truck, 1 ambulance unit, and 2 Battalion Chiefs (23 total personnel).

Building Fire Service Demand

Over the past three years, there were a total of 55 building fires within the Department, comprising 0.83% of total service demand over the same time period, and resulting in estimated property damage/loss of $4.4 million. Of those 55 building fire incidents, 11 (20%) resulted in an ERF arriving at the incident from the initial dispatch. Table 21 summarizes the Department's building fire service demand by risk zone.

[12] ERF = First Alarm Assignment

Table 21—Building Fire Service Demand

Risk Zone	FY 2012-13	FY 2013-14	FY 2014-15	Total
84-A	3		1	**4**
84-B				**0**
84-C		3	3	**6**
84-D				**0**
84-E				**0**
84-F			1	**1**
84-G			1	**1**
84-H		1		**1**
85-A	4	2	8	**14**
85-B		4	2	**6**
85-C			2	**2**
85-D		1		**1**
86-A	2	1	1	**4**
86-B				**0**
86-C		2		**2**
86-D				**0**
86-E			1	**1**
87-A	5	3	2	**10**
87-B				**0**
87-C				**0**
87-D				**0**
87-E			1	**1**
87-F				**0**
91			1	**1**
Total	**14**	**17**	**24**	**55**
Percent of Total Service Demand	0.21%	0.26%	0.36%	**0.83%**

Source: El Dorado Hills Fire Department incident records

Table 22 summarizes Citygate's analysis of the Department's building fire risk.

Table 22—Building Fire Risk Analysis Summary

Risk Zone	Probability of Occurrence	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Building Density	High-Risk Occupancies & Critical Facilities[1,2]	Fire Protection Systems[3]	Water Supply	Service Capacity			
84-A	**2**	1	1	5	5	3	**15**	**30**	**Low**
84-B	**2**	2	1	5	4	2	**14**	**28**	**Low**
84-C	**3**	2	2	3	4	1	**12**	**36**	**Moderate**
84-D	**2**	2	1	4	4	1	**12**	**24**	**Low**
84-E	**2**	2	1	4	3	1	**11**	**22**	**Low**
84-F	**2**	2	1	4	3	2	**12**	**24**	**Low**
84-G	**2**	2	1	5	4	2	**14**	**28**	**Low**
84-H	**2**	1	1	5	5	2	**14**	**28**	**Low**
85-A	**4**	3	2	2	2	2	**11**	**44**	**Moderate**
85-B	**3**	3	1	2	2	2	**10**	**30**	**Low**
85-C	**2**	3	2	2	2	1	**10**	**20**	**Low**
85-D	**2**	3	1	2	2	1	**9**	**18**	**Low**
86-A	**3**	2	1	2	2	2	**9**	**27**	**Low**
86-B	**2**	2	1	2	2	2	**9**	**18**	**Low**
86-C	**2**	2	1	2	3	2	**10**	**20**	**Low**
86-D	**2**	1	1	4	4	2	**12**	**24**	**Low**
86-E	**2**	1	1	5	5	2	**14**	**28**	**Low**
87-A	**4**	3	4	1	1	1	**10**	**40**	**Moderate**
87-B	**2**	2	1	1	1	2	**7**	**14**	**Low**
87-C	**2**	3	1	1	1	2	**8**	**16**	**Low**
87-D	**2**	2	4	1	1	2	**10**	**20**	**Low**
87-E	**2**	3	1	1	1	2	**8**	**16**	**Low**
87-F	**2**	1	1	5	5	2	**14**	**28**	**Low**
91	**2**	1	1	5	5	4	**16**	**32**	**Moderate**

[1] Percentage of all buildings designated as CFAI high, special, or maximum risk
[2] Percentage of all buildings designated as critical facilities
[3] Percentage of high-risk occupancies and critical facilities protected by automatic fire sprinkler/alarm system

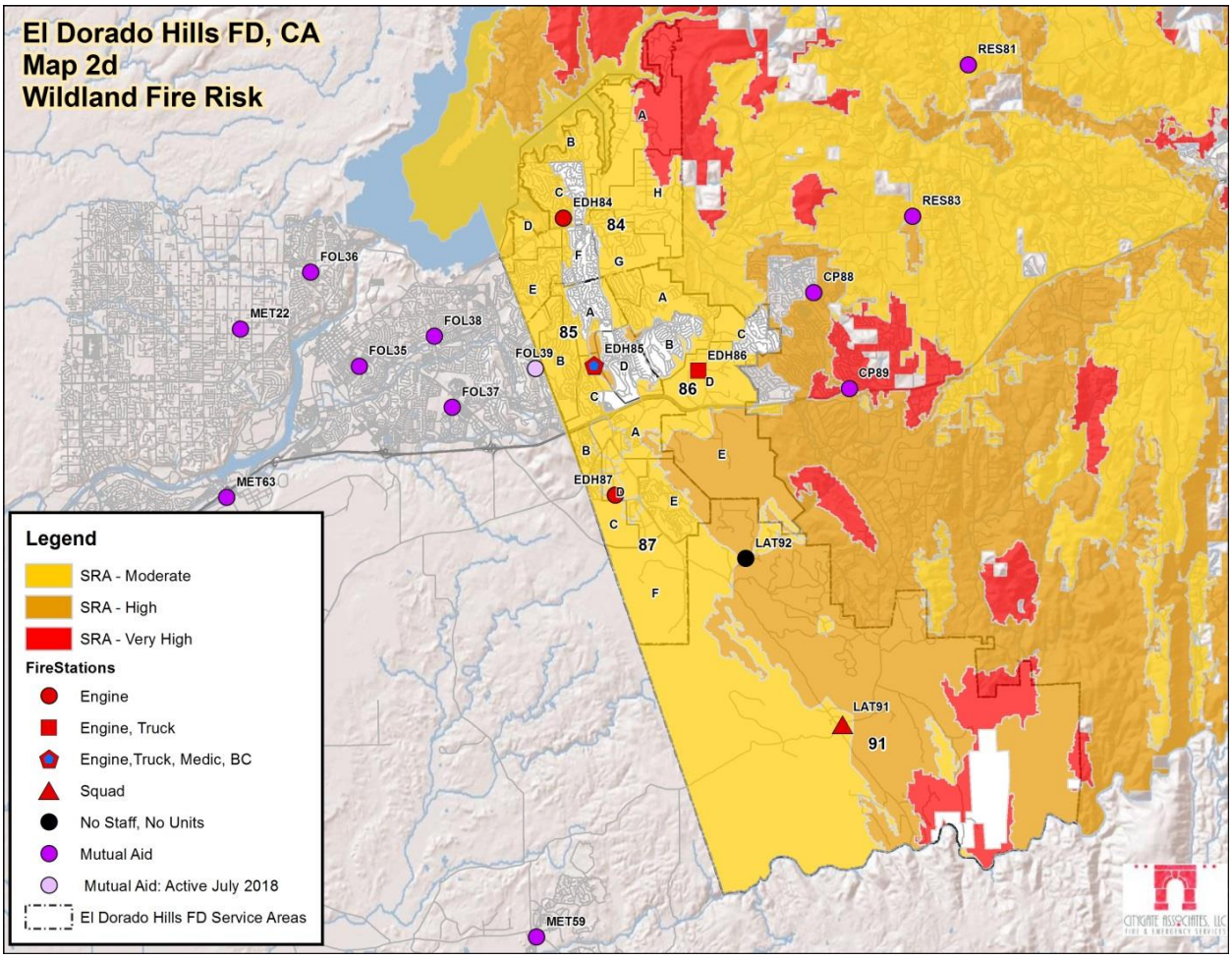
As Table 22 illustrates, the Department's building fire risk is ***Low*** across most risk zones reflecting a low probability of occurrence with lower building densities, low percentage of high-risk occupancies and critical facilities, moderate to high percentage of high-risk occupancies and critical facilities protected by automatic fire protection systems, and good water supply and building fire risk service capacity. Risk zones 84-C, 85-A, 87-A, and 91 have a ***Moderate*** building fire risk reflecting a higher probability of occurrence and/or higher building densities, lower percentage of high-risk occupancies and/or critical facilities with automatic fire protection systems, poor water supply, and reduced building fire risk service capacity.

3.3.12 Wildland Fire Risk

Fire Hazard Severity Zones

The California Department of Forestry and Fire Protection (CAL FIRE) designates *Moderate*, *High*, and *Very High* wildland Fire Hazard Severity Zones (FHSZ) throughout the state based on analysis of multiple wildland fire hazard factors and modeling of potential wildland fire behavior for State Responsibility Areas (SRA) where CAL FIRE has fiscal responsibility for wildland fire protection. CAL FIRE also identifies recommended *Moderate*, *High*, and *Very High* FHSZs for Local Responsibility Areas (LRA) where a local jurisdiction bears the fiscal responsibility for wildland fire protection, including cities. Most of the Department lies within a designated ***Moderate***, ***High***, or ***Very High*** wildland fire hazard severity zone as shown in Figure 9.

Figure 9—Wildland Fire Hazard Severity Zones



Wildland Fire Risk Factors

Wildland fire behavior is predominantly influenced by fuel, weather, and topography. Wildland fuels within the Department consist of a mix of annual grasses and weeds, brush, and deciduous and evergreen trees. Once ignited, wildland fires can burn intensely and contribute to rapid fire spread under the right fuel, weather, and topographic conditions.

Wildland fuel factors influencing fire intensity and spread include fuel type (vegetation species), height, arrangement, density, and fuel moisture. Weather elements such as temperature, relative humidity, wind, and lightning also affect wildland fire potential and behavior. High temperatures and low relative humidity dry out wildland fuels creating a situation where fuel will more readily ignite and burn more intensely. Wind is the most significant weather factor influencing wildland fire behavior; higher wind speeds increase fire spread and intensity. The annual wildland fire season in El Dorado County, when wildland fires are most likely to occur due to fuel and weather

conditions, is generally from late spring through fall due to a predominant climate pattern of low annual rainfall, hot and dry summers, and moderate winds. Wildland fire risk during drought conditions is even greater. The Department's varied topography, from flat to relatively steep, also has an influence on wildland fire behavior and spread.

Another significant wildland fire risk factor is the availability of an adequate water supply immediately available for suppression in wildland fire-prone or high-risk areas.

Wildland Fire History

El Dorado County has a history of significant wildland fires, including over 100 fires that burned more than 300 acres over the past 65 years. Despite significant wildland fuels throughout most of the Department, there have been relatively few significant wildland fires in recent years.

Wildland Fire Service Capacity

The Department's Response Plan for vegetation/wildland fires includes 2-4 engines,[13] 1-3 water tenders, one ambulance, and two Battalion Chief. In addition, the CAL FIRE response includes 2-8 engines,[14] one Air Attack, two Air Tankers, 1-3 helicopters, 1-2 bulldozers, 1-4 hand crews, and two Battalion Chief. The Department also has automatic aid or mutual aid agreements with adjacent fire agencies, and is a signatory to the El Dorado County Mutual Aid Agreement.

Wildland Fire Service Demand

Over the most recent 3-year period evaluated by Citygate for this study, there were a total of 65 vegetation-related fires comprising 0.98% of total service demand over the same time period as shown in Table 23.

[13] Dependent on daily wildland Fire Danger Rating: Low = 2 engines; Moderate = 3 engines; High/Extreme = 4 engines

[14] Dependent on daily wildland Fire Danger Rating

Table 23—Wildland Fire Service Demand

Risk Zone	FY 2012-13	FY 2013-14	FY 2014-15	Total
84-A	8	0	1	**9**
84-B		2		**2**
84-C		1	1	**2**
84-D		1		**1**
84-E			2	**2**
84-F				**0**
84-G			3	**3**
84-H			2	**2**
85-A	2	4	1	**7**
85-B		4	1	**5**
85-C		2		**2**
85-D			1	**1**
86-A	4	2		**6**
86-B		4		**4**
86-C				**0**
86-D		1	2	**3**
86-E		5	1	**6**
87-A	2			**2**
87-B				**0**
87-C			1	**1**
87-D		2		**2**
87-E				**0**
87-F		1		**1**
91		1	3	**4**
Total	**16**	**30**	**19**	**65**
Percent of Total Service Demand	0.24%	0.45%	0.29%	**0.98%**

Source: El Dorado Hills Fire Department incident records

Wildland Fire Risk Analysis

Table 24 summarizes Citygate's analysis of the Department's wildland fire risk based on evaluation of five wildland impact severity factors for each risk assessment zone (see Appendix A).

Table 24—Wildland Fire Risk Analysis

Risk Zone	Probability of Occurrence	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Wildland Fuels	Weather	Topography	Water Supply	Service Capacity			
84-A	**4**	5	4	4	5	2	**20**	**80**	**High**
84-B	**3**	4	4	3	1	2	**14**	**42**	**Moderate**
84-C	**3**	4	4	3	1	2	**14**	**42**	**Moderate**
84-D	**3**	4	4	3	1	2	**14**	**42**	**Moderate**
84-E	**3**	4	4	3	1	2	**14**	**42**	**Moderate**
84-F	**3**	3	4	3	1	2	**13**	**39**	**Moderate**
84-G	**3**	4	4	3	1	2	**14**	**42**	**Moderate**
84-H	**4**	4	4	4	4	2	**18**	**72**	**High**
85-A	**3**	3	4	2	1	2	**12**	**36**	**Moderate**
85-B	**3**	4	4	2	1	2	**13**	**39**	**Moderate**
85-C	**3**	4	4	2	1	2	**13**	**39**	**Moderate**
85-D	**3**	3	4	2	1	2	**12**	**36**	**Moderate**
86-A	**3**	4	4	2	1	2	**13**	**39**	**Moderate**
86-B	**3**	3	4	2	1	2	**12**	**36**	**Moderate**
86-C	**3**	4	4	2	1	2	**13**	**39**	**Moderate**
86-D	**3**	4	4	2	1	2	**13**	**39**	**Moderate**
86-E	**4**	4	4	3	5	2	**18**	**72**	**High**
87-A	**3**	4	4	2	1	2	**13**	**39**	**Moderate**
87-B	**3**	3	4	1	1	2	**11**	**33**	**Moderate**
87-C	**3**	4	4	1	1	2	**12**	**36**	**Moderate**
87-D	**3**	4	4	1	1	2	**12**	**36**	**Moderate**
87-E	**3**	5	4	2	1	2	**14**	**42**	**Moderate**
87-F	**3**	5	4	1	1	2	**13**	**39**	**Moderate**
91	**4**	5	4	2	5	2	**18**	**72**	**High**

As Table 24 shows, the Department's wildland fire risk is ***Moderate*** across most risk zones reflecting a moderate probability of occurrence in combination with low to moderate impact severity factor scores. Risk zones 84-A, 84-H, 86-E, and 91 have a ***High*** wildland fire risk reflecting a higher probability of occurrence and higher fuels, topography, and water supply impact severity scores.

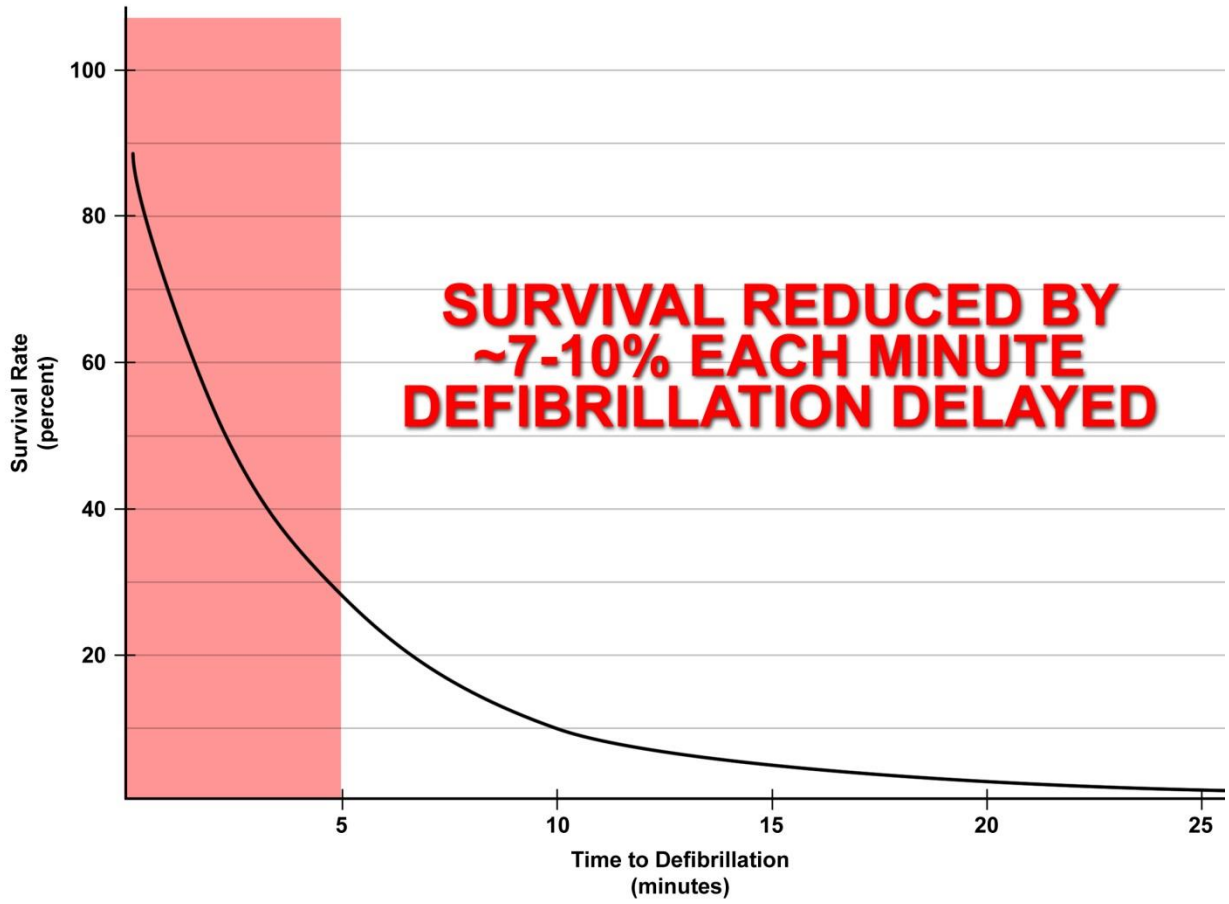
3.3.13 Emergency Medical Services Risk

EMS Risk Factors

Emergency medical services (EMS) risk in most communities is predominantly a function of population density, demographics, vehicle traffic, violence, and health insurance coverage. Relative to population demographics, EMS risk tends to be higher among poorer, older, less educated, and uninsured populations. As would be expected, EMS risk is also higher in communities or segments of communities with higher rates of violence. EMS risk is also higher in those areas of a community with high vehicle traffic loads, particularly those areas with high traffic volume travelling at higher speeds.

EMS risk can also be categorized as either a medical emergency resulting from a health-related condition or event, or a traumatic injury. One serious medical emergency is cardiac arrest or some other emergency where there is an interruption or blockage of oxygen to the brain. Figure 10 illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases. While early defibrillation is one factor in cardiac arrest survivability, other factors such as early CPR and pre-hospital Advanced Life Support (ALS) interventions can influence survivability as well.

Figure 10—Survival Rate vs. Time of Defibrillation

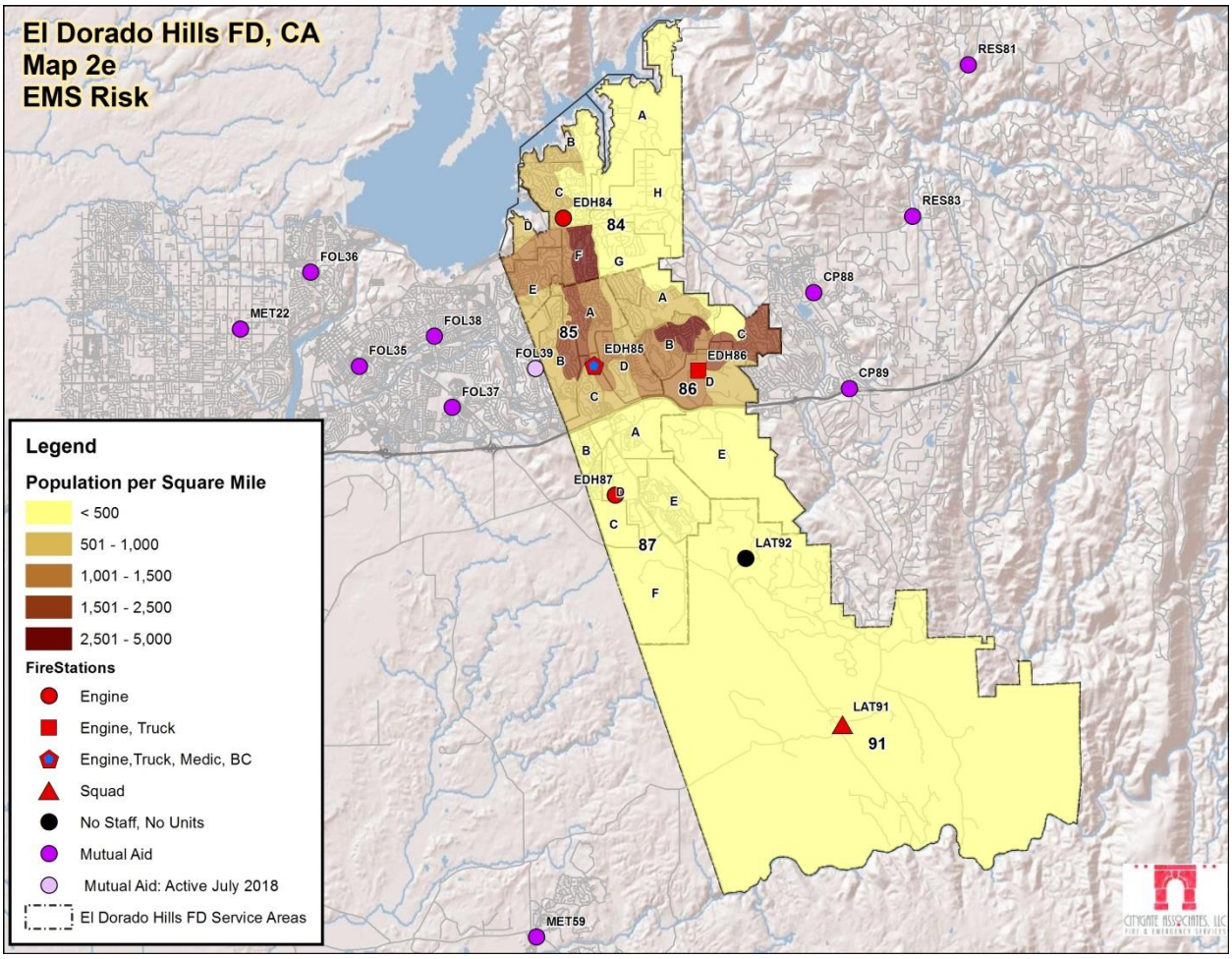


Source: www.suddencardiacarrest.org

Population Demographics

Figure 11 shows the Department's population density in 500 persons per square mile increments. Population density is a primary risk factor affecting EMS demand. As Figure 11 illustrates, higher EMS demand would be expected in the darker shaded areas of the Department.

Figure 11—Population Density



Of the Department's total population, 6.1%[15] is under 5 years of age and 18.2% is 65 and older. Only 4.8% of individuals 18 years of age and older, and 3.5% of families, have income below the federal poverty level. In addition, 96% of Department residents have health insurance coverage.[11] Also contributing to the Department's EMS risk is U.S. 50, carrying more than 90,000 vehicles daily, including 8,600 per hour at peak volume.[16]

EMS Risk Service Capacity

The Department's service capacity for EMS risk consists of a minimum daily on-duty response force of 19 personnel staffing six apparatus from five fire stations and two Battalion Chief. The

[15] U.S. Census Bureau, 2010-2014 American Community Survey 5-Year Estimates
[16] Source: California Department of Transportation

Department is also a partner in the El Dorado County Regional Prehospital Emergency Services Operations Authority, a Joint Powers Agency that operates eight Advanced Life Support (ALS) transport ambulances on the west slope of El Dorado County in partnership with five fire agencies, including the Department.[17] In addition, the Department has automatic aid agreements with the City of Folsom, the Cameron Park CSD, as well as Rescue Fire District and Sacramento Metropolitan Fire Protection District, and is also a signatory to the El Dorado County Mutual Aid Agreement.

All calls for medical assistance receive the closest Department unit response in addition to a JPA ALS transport ambulance. All Department response personnel are trained to either the Emergency Medical Technician (EMT) level capable of providing Basic Life Support (BLS) pre-hospital emergency medical care, or Paramedic level capable of providing Advanced Life Support (ALS) pre-hospital emergency medical services. All Department fire apparatus are staffed with a minimum of three personnel except for Truck 85 with four personnel, Patrol 91 with two personnel, and Medic 85 (ambulance) with two personnel, including at least one paramedic on each apparatus. Air ambulance services are available from CalSTAR and REACH Air Medical Services in Sacramento.

EMS Risk Service Demand

Table 25 summarizes the Department's EMS demand over the previous 3 years, which is 60.37% of total service demand over the same period.

[17] Partner Fire Agencies: El Dorado County FD, El Dorado Hills County Water District Fire Department, Georgetown FPD, Diamond / El Dorado FPD, and Cameron Park / CAL FIRE

Table 25—EMS Service Demand

Risk Zone	FY 2012-13	FY 2013-14	FY 2014-15	Total
84-A	356	32	31	**419**
84-B		25	31	**56**
84-C		112	128	**240**
84-D		20	13	**33**
84-E		34	37	**71**
84-F		87	85	**172**
84-G		36	38	**74**
84-H		24	15	**39**
85-A	367	168	161	**696**
85-B		23	31	**54**
85-C		126	158	**284**
85-D		80	71	**151**
86-A	229	35	42	**306**
86-B		68	94	**162**
86-C		86	66	**152**
86-D		33	42	**75**
86-E		7	8	**15**
87-A	341	155	134	**630**
87-B		26	22	**48**
87-C		60	75	**135**
87-D		53	56	**109**
87-E		20	27	**47**
87-F		1		**1**
91		3	50	**53**
Total	**1,293**	**1,314**	**1,415**	**4,022**
Percent of Total Service Demand	19.41%	19.72%	21.24%	**60.37%**

Source: El Dorado Hills Fire Department incident records

EMS Risk Analysis

Table 26 summarizes Citygate's analysis of the Department's EMS risk based on evaluation of five impact severity factors for each risk assessment zone (see Appendix A).

Table 26—EMS Risk Analysis

Risk Zone	Probability of Occurrence[1]	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Population Density	Demographics	Traffic Volume	Pre-Hospital EMS Capacity	Hospital Emergency Care Capacity			
84-A	**3**	0	1	0	3	4	**8**	**24**	**Low**
84-B	**2**	1	1	0	2	3	**7**	**14**	**Low**
84-C	**2**	1	1	0	1	3	**6**	**12**	**Low**
84-D	**2**	2	1	0	2	2	**7**	**14**	**Low**
84-E	**2**	2	1	0	2	2	**7**	**14**	**Low**
84-F	**2**	3	1	0	1	2	**7**	**14**	**Low**
84-G	**2**	0	1	0	2	2	**5**	**10**	**Low**
84-H	**2**	0	1	0	2	3	**6**	**12**	**Low**
85-A	**2**	2	1	0	2	1	**6**	**12**	**Low**
85-B	**2**	2	1	0	1	1	**5**	**10**	**Low**
85-C	**4**	1	1	2	1	1	**6**	**24**	**Low**
85-D	**4**	2	1	2	1	1	**7**	**28**	**Low**
86-A	**2**	1	1	0	2	1	**5**	**10**	**Low**
86-B	**2**	3	1	0	1	1	**6**	**12**	**Low**
86-C	**2**	3	1	0	2	1	**7**	**14**	**Low**
86-D	**4**	2	1	2	1	1	**7**	**28**	**Low**
86-E	**2**	0	1	2	2	1	**6**	**12**	**Low**
87-A	**3**	0	1	2	1	1	**5**	**15**	**Low**
87-B	**2**	0	1	2	1	1	**5**	**10**	**Low**
87-C	**2**	0	2	0	1	1	**4**	**8**	**Low**
87-D	**3**	0	1	0	1	1	**3**	**9**	**Low**
87-E	**2**	0	1	0	1	1	**3**	**6**	**Low**
87-F	**2**	0	1	0	2	3	**6**	**12**	**Low**
91	**3**	0	1	3	4	4	**12**	**36**	**Moderate**

[1] Mass-casualty incident requiring multiple-alarm resources and/or impacting multiple hospitals

As Table 26 illustrates, the Department's EMS risk is ***Low*** across all risk zones except 91, reflecting low to moderate probability of occurrence in combination with low to moderate impact severity risk factors. Risk zone 91 has ***Moderate*** EMS risk as a result of higher probability and impact severity risk factors due to its relative remoteness.

3.3.14 Hazardous Materials Risk

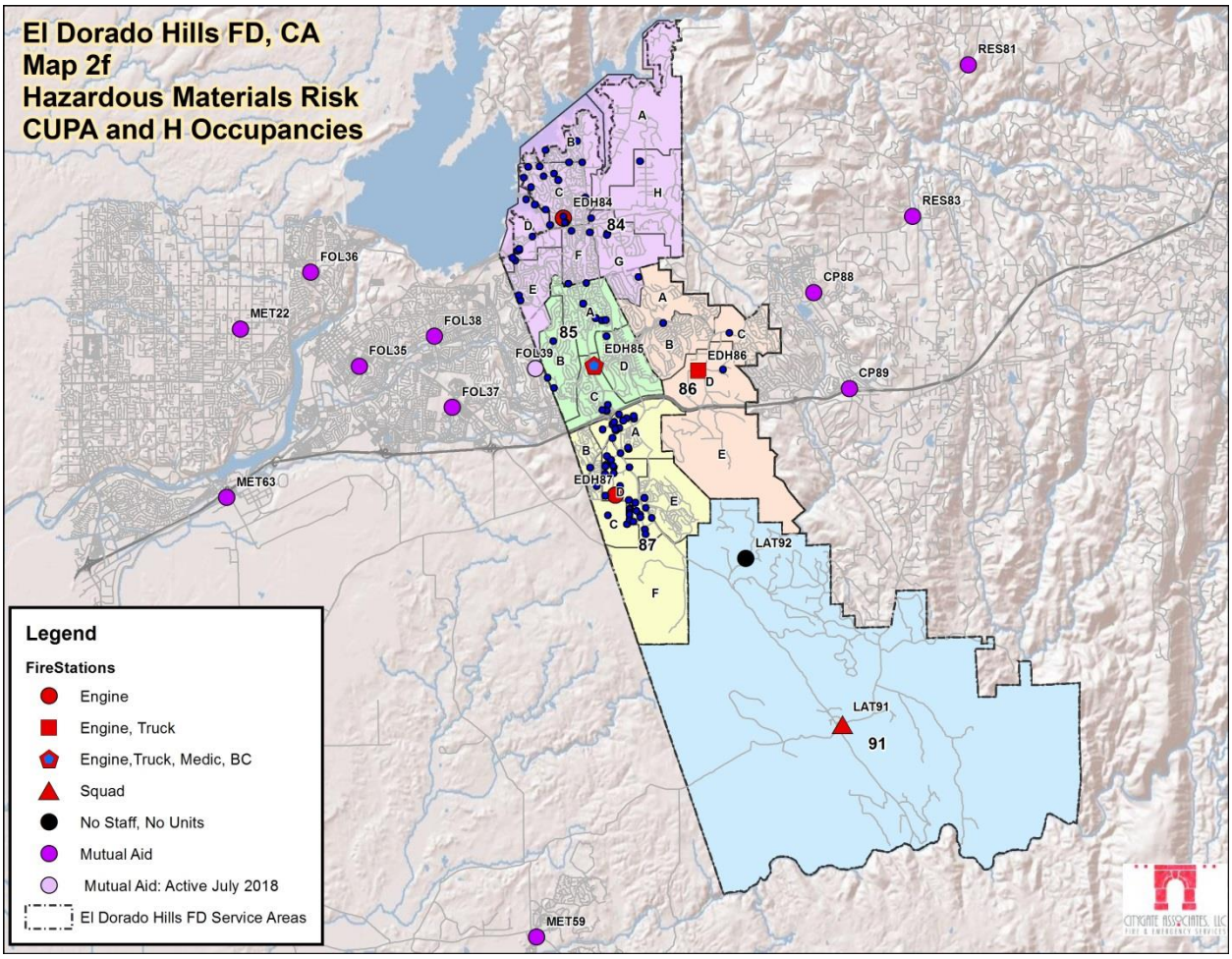
Hazardous Materials Risk Factors

Hazardous material risk factors include fixed facilities that store, use, or produce hazardous chemicals, or produce hazardous waste; underground pipeline(s) that transport hazardous materials; and aircraft, railroad, and vehicle transportation of hazardous materials.

Other hazardous material risk factors include at-risk populations and related demographics, service capacity, historic service demand, emergency evacuation planning and effectiveness, and presence and effectiveness of mass emergency notifications system(s).

The Department has four hazardous occupancies as classified by the California Building Code. Additionally, the Certified Unified Program Agency (CUPA) for El Dorado County identifies 61 sites with active operating permits as shown in Figure 12. CUPA facilities are permitted and operated under California Health and Safety Code and Fire Code regulations.

Figure 12—Hazardous Materials Sites



As Figure 12 illustrates, hazardous material sites are located in most risk zones, with the exception of zones 84-A, 86-E, 87-F, and 91.

In addition to the fixed facility hazardous materials risk discussed above, the Department also has transportation-related hazardous material risk as a result of U.S. 50 truck traffic. Table 27 summarizes the average annual daily truck traffic for U.S. 50 through the Department.

Table 27—Average Annual Daily Truck Traffic

Route	Crossing	AADT[1]	Truck AADT by Axles				% Truck AADT by Axles			
			2	3	4	5+	2	3	4	5+
US 50	Scott Rd.	5,760	2,460	789	138	2,373	42.7%	13.7%	2.4%	41.2%

[1] Average Annual Daily Trips
Source: California Department of Transportation

Other hazardous material risk factors include at-risk populations and related demographics, response capacity, historic service demand, emergency evacuation planning and effectiveness, and availability and effectiveness of mass emergency notifications system(s).

The Department does not have a formal emergency Evacuation Plan, rather it relies on the El Dorado County Operational Area Emergency Operations Plan, under which the Sheriff's Department is responsible for activating the County emergency alerting and warning systems as follows:

1. Emergency Alert System (EAS) – Local AM radio; local radio and television stations.
2. Emergency Digital Information System (E.D.I.S.) – Email notification to local public safety agencies and local media outlets.
3. Reverse 9-1-1 Emergency Notification System – Automated telephone notification system.
4. National Oceanic and Atmospheric Administration (NOAA) Weather Radio All Hazards (NWR) broadcasting system – Alerting system for severe weather watches and warnings.
5. Roadside Message Signs – Can be strategically deployed to inform drivers of specific dangers, evacuation routes, shelter locations, etc.

Emergency alerting and warning also involves door-to-door notifications in endangered areas by law enforcement officers, firefighters, and other first responders. Emergency evacuations are initiated and managed by the El Dorado County Sheriff's Office of Emergency Services (OES) Coordinator.

Hazardous Materials Service Capacity

Most Department response personnel are trained to the Hazardous Material First Responder Operational (FRO) level. The nearest Hazardous Materials Response Team is operated by

Sacramento Metropolitan Fire District from Station 109 in Carmichael approximately 19 miles (26 minutes) from El Dorado Hills. In addition, the City of Sacramento operates two Type-1 Hazardous Materials Response Teams from Station 30 in north Sacramento and Station 7 in south Sacramento.

Hazardous Material Service Demand

Table 28 summarizes the Department's hazardous material service demand over the previous three years, which is 0.93% of total service demand over the same period.

Table 28—Hazardous Material Service Demand

Risk Zone	FY 2012-13	FY 2013-14	FY 2014-15	Total
84-A	4			**4**
84-B				**0**
84-C		1		**1**
84-D				**0**
84-E		1	1	**2**
84-F		1	2	**3**
84-G			1	**1**
84-H				**0**
85-A	9	2	1	**12**
85-B		2		**2**
85-C		2	2	**4**
85-D			3	**3**
86-A	3	1		**4**
86-B		2		**2**
86-C		1		**1**
86-D			1	**1**
86-E				**0**
87-A	5	5	4	**14**
87-B			1	**1**
87-C			1	**1**
87-D		3		**3**
87-E		1		**1**
87-F				**0**
91			2	**2**
Total	**21**	**22**	**19**	**62**
Percent of Total Service Demand	0.32%	0.33%	0.29%	**0.93%**

Source: El Dorado Hills Fire Department incident records

Hazardous Materials Risk Analysis

Table 29 summarizes Citygate's analysis of the Department's hazardous material risk.

Table 29—Hazardous Material Risk Analysis

Risk Zone	Probability of Occurrence	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Vulnerable Populations	Fixed HazMat Risk	Trans. HazMat Risk	Service Capacity	Evacuation Capacity			
84-A	**1**	1	0	0	3	4	**8**	**8**	**Low**
84-B	**1**	1	0	0	3	4	**8**	**8**	**Low**
84-C	**1**	1	0	0	3	4	**8**	**8**	**Low**
84-D	**1**	1	0	0	3	4	**8**	**8**	**Low**
84-E	**1**	2	0	0	3	4	**9**	**9**	**Low**
84-F	**1**	2	0	0	3	4	**9**	**9**	**Low**
84-G	**1**	1	0	0	3	4	**8**	**8**	**Low**
84-H	**1**	1	0	0	3	4	**8**	**8**	**Low**
85-A	**2**	2	0	0	3	4	**9**	**18**	**Low**
85-B	**1**	2	0	0	3	4	**9**	**9**	**Low**
85-C	**1**	1	0	3	2	4	**10**	**10**	**Low**
85-D	**1**	2	0	3	2	4	**11**	**11**	**Low**
86-A	**1**	1	0	0	3	4	**8**	**8**	**Low**
86-B	**1**	2	0	0	3	4	**9**	**9**	**Low**
86-C	**1**	2	0	0	3	4	**9**	**9**	**Low**
86-D	**1**	2	0	3	2	4	**11**	**11**	**Low**
86-E	**1**	1	0	0	3	4	**8**	**8**	**Low**
87-A	**2**	1	1	1	2	4	**9**	**18**	**Low**
87-B	**1**	1	1	1	2	4	**9**	**9**	**Low**
87-C	**1**	2	1	0	3	4	**10**	**10**	**Low**
87-D	**1**	1	2	1	3	4	**11**	**11**	**Low**
87-E	**1**	1	0	0	3	4	**8**	**8**	**Low**
87-F	**1**	1	0	0	3	4	**8**	**8**	**Low**
91	**1**	1	0	1	4	4	**10**	**10**	**Low**

As Table 29 shows, the Department's hazardous material risk is ***Low*** across all risk zones reflecting a low probability of occurrence in combination with few vulnerable populations, low number of fixed hazardous material sites, low transportation risk, good service capacity, and moderate emergency evacuation capability.

3.3.15 Technical Rescue Risk

Technical Rescue Risk Factors

Technical rescue risk factors include construction activity, heavy industrial activity, confined spaces such as tanks and underground vaults, bodies of water and rivers or streams, urban flooding, transportation volume, and other factors that may create a need for technical rescue skills and/or equipment.

Technical Rescue Service Capacity

Both Sacramento Metropolitan Fire District and the City of Sacramento Fire Department have Type-1 Heavy Rescue capability within approximately 45-60 minutes response time to the Department. These resources are cross-staffed by on-duty personnel as needed, and are capable of conducting low-angle and high-angle rope rescue, structural collapse search and rescue, confined space rescue, and trench rescue. Both departments also have a marine program capable of deploying rescue boats and rescue swimmers.

In addition, the Sacramento Fire Department is the host agency for California Urban Search and Rescue (USAR) Task Force 7, one of eight California-based national USAR resources sponsored by the Federal Emergency Management Agency (FEMA) and coordinated and managed in California by the Governor's Office of Emergency Services. Each USAR Task Force consists of 70 specially trained and equipped members capable of performing complex search, rescue, medical, and other highly technical search and rescue functions.

The El Dorado Hills Fire Department is currently developing a water rescue capability that will operate from Station 84.

Technical Rescue Service Demand

Over the most recent 3-year period evaluated for this study, there were seven rescue incidents within the Department comprising 0.11% of total service demand over the same period as shown in Table 30.

Table 30—Technical Rescue Service Demand

Risk Zone	FY 2012-13	FY 2013-14	FY 2014-15	Total
84-A	2		1	**3**
84-B				**0**
84-C				**0**
84-D				**0**
84-E				**0**
84-F				**0**
84-G				**0**
84-H				**0**
85-A		1		**1**
85-B				**0**
85-C				**0**
85-D				**0**
86-A	1			**1**
86-B				**0**
86-C				**0**
86-D				**0**
86-E				**0**
87-A	1			**1**
87-B				**0**
87-C				**0**
87-D				**0**
87-E		1		**1**
87-F				**0**
91				**0**
Total	**4**	**2**	**1**	**7**
Percent of Total Service Demand	0.06%	0.03%	0.02%	**0.11%**

Source: El Dorado Hills Fire Department incident records

Technical Rescue Risk Analysis

Table 31 summarizes Citygate's analysis of the Department's technical rescue risk.

Table 31—Technical Rescue Risk Analysis

Risk Zone	Probability of Occurrence	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Construction Activity	Industrial / Manufacturing Activity	Water Rescue Risk	Traffic Volume	Service Capacity			
84-A	**1**	1	0	4	0	2	**7**	**7**	**Low**
84-B	**1**	1	0	4	0	2	**7**	**7**	**Low**
84-C	**1**	1	0	4	0	1	**6**	**6**	**Low**
84-D	**1**	1	0	4	0	1	**6**	**6**	**Low**
84-E	**1**	1	0	0	0	1	**2**	**2**	**Low**
84-F	**1**	1	0	0	0	1	**2**	**2**	**Low**
84-G	**1**	1	0	0	0	1	**2**	**2**	**Low**
84-H	**1**	1	0	0	0	1	**2**	**2**	**Low**
85-A	**1**	1	0	0	0	1	**2**	**2**	**Low**
85-B	**1**	1	0	0	0	1	**2**	**2**	**Low**
85-C	**1**	1	0	0	3	1	**5**	**5**	**Low**
85-D	**1**	1	0	0	3	1	**5**	**5**	**Low**
86-A	**1**	1	0	0	0	1	**2**	**2**	**Low**
86-B	**1**	1	0	0	0	1	**2**	**2**	**Low**
86-C	**1**	1	0	2	0	1	**4**	**4**	**Low**
86-D	**1**	1	0	0	3	1	**5**	**5**	**Low**
86-E	**1**	1	0	0	0	1	**2**	**2**	**Low**
87-A	**1**	1	0	0	3	1	**5**	**5**	**Low**
87-B	**1**	1	0	0	3	1	**5**	**5**	**Low**
87-C	**1**	1	0	0	0	1	**2**	**2**	**Low**
87-D	**1**	1	2	0	0	1	**4**	**4**	**Low**
87-E	**1**	1	0	0	0	1	**2**	**2**	**Low**
87-F	**1**	1	0	0	0	1	**2**	**2**	**Low**
91	**1**	1	0	2	1	2	**6**	**6**	**Low**

As Table 31 illustrates, the Department's technical rescue risk is ***Low*** across all risk zones, reflecting a low probability of occurrence combined with light construction activity, low industrial/manufacturing activity, none to high water rescue risk, low to moderate vehicle traffic risk, and good regional technical rescue service capacity.

3.3.16 Transportation Risk

Risk Factors

Transportation risk factors include motor vehicle, railway, watercraft, and aircraft use in and through the Department.

Primary Transportation Routes

U.S. 50 transects the Department carrying more than 90,000 vehicles daily, including 8,600 per hour at peak volume.[18] All other transportation routes within the Department are surface streets with a minimal number of signalized intersections.

Air / Rail Services

Mather Airport, with no commercial passenger service, is located approximately 20 miles west of the Department in Rancho Cordova. In addition, a single Union Pacific Railroad track loops through the Latrobe area of the Department.

Transportation Risk Service Capacity

The Department's service capacity for transportation risk consists of a minimum daily on-duty response force of 19 personnel staffing six apparatus from five fire stations and two Battalion Chiefs. The Department also has automatic aid and mutual aid agreements with adjacent fire agencies, and is also a signatory to the El Dorado County Mutual Aid Agreement.

Transportation Risk Service Demand

Over the most recent 3-year period evaluated for this study, there were 426 transportation-related incidents within the Department comprising 6.39% of total service demand over the same period as shown in Table 32.

[18] Source: California Department of Transportation

Table 32—Transportation Risk Service Demand

Risk Zone	FY 2012-13	FY 2013-14	FY 2014-15	Total
84-A	53	11	14	**78**
84-B		2	1	**3**
84-C		11	13	**24**
84-D		4	5	**9**
84-E		2	3	**5**
84-F		4	5	**9**
84-G		2	10	**12**
84-H		5	3	**8**
85-A	40	7	14	**61**
85-B			2	**2**
85-C		18	17	**35**
85-D		12	7	**19**
86-A	20		2	**22**
86-B		2	2	**4**
86-C		7	3	**10**
86-D		14	23	**37**
86-E		1	1	**2**
87-A	26	17	11	**54**
87-B			2	**2**
87-C			2	**2**
87-D		6	3	**9**
87-E		1	1	**2**
87-F				**0**
91		3	14	**17**
Total	**139**	**129**	**158**	**426**
Percent of Total Service Demand	2.09%	1.94%	2.37%	**6.39%**

Source: El Dorado Hills Fire Department incident records

Transportation Risk Analysis

Table 33 summarizes Citygate's analysis of the Department's transportation risk.

Table 33—Transportation Risk Analysis

Risk Zone	Probability of Occurrence[1]	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Population Density	Vehicle Traffic Volume	Railway Traffic	Aircraft Traffic	Service Capacity			
84-A	**3**	0	2	0	0	4	**6**	**18**	**Low**
84-B	**2**	1	0	0	0	3	**4**	**8**	**Low**
84-C	**2**	1	0	0	0	1	**2**	**4**	**Low**
84-D	**2**	2	0	0	0	1	**3**	**6**	**Low**
84-E	**2**	2	0	0	0	1	**3**	**6**	**Low**
84-F	**2**	3	0	0	0	1	**4**	**8**	**Low**
84-G	**2**	0	0	0	0	1	**1**	**2**	**Low**
84-H	**2**	0	0	0	0	1	**1**	**2**	**Low**
85-A	**2**	2	0	0	0	1	**3**	**6**	**Low**
85-B	**2**	2	0	0	0	1	**3**	**6**	**Low**
85-C	**4**	1	3	0	0	1	**5**	**20**	**Low**
85-D	**4**	2	3	0	0	1	**6**	**24**	**Low**
86-A	**2**	1	0	0	0	1	**2**	**4**	**Low**
86-B	**2**	3	0	0	0	1	**4**	**8**	**Low**
86-C	**2**	3	0	0	0	1	**4**	**8**	**Low**
86-D	**4**	2	3	0	0	1	**6**	**24**	**Low**
86-E	**2**	0	3	0	0	1	**4**	**8**	**Low**
87-A	**3**	0	3	0	0	1	**4**	**12**	**Low**
87-B	**2**	0	3	0	0	1	**4**	**8**	**Low**
87-C	**2**	0	0	0	0	1	**1**	**2**	**Low**
87-D	**2**	0	0	0	0	1	**1**	**2**	**Low**
87-E	**2**	0	0	0	0	1	**1**	**2**	**Low**
87-F	**2**	0	0	0	0	1	**1**	**2**	**Low**
91	**3**	0	2	2	0	4	**8**	**24**	**Low**

[1] Multiple-victim incident requiring multiple resources

Table 33 shows that the Department's transportation risk is ***Low*** across all risk zones, reflecting a low to high probability of occurrence combined with low to moderate population density, low to moderate vehicle traffic volume, no aircraft or rail traffic, and good to moderate transportation risk service capacity.

3.3.17 Flood Risk[19]

Flooding is the rising and overflowing of a body of water onto normally dry land. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. Flood hazards can result from intense rain, snowmelt, cloudbursts, or a combination of the three, or from failure of a water impoundment structure, such as a dam. Floods from rainstorms generally occur between November and April and are characterized by high peak flows of moderate duration. Snowmelt floods combined with rain have larger volumes and last longer than rain flooding.

Floodplains

A floodplain is the area that is inundated during a flood event. It is often physically discernible as a broad, flat area created by prior floods. The larger the floodplain, the greater the area at risk for flooding. The Federal Emergency Management Agency (FEMA), through its National Flood Insurance Program (NFIP), has created a Flood Insurance Rate Map (FIRM) that identifies and designates Special Flood Hazard Areas (SFHA) subject to a 1% chance of inundation in any given year. This 1% annual chance flood is also referred to as the base flood, or 100-year flood. Moderate Flood Hazard Areas (MFHA) are identified as those areas between the limits of the base flood and the 0.2 annual chance (or 500-year) flood. Areas of minimal flood hazard are those areas outside of the SFHA and higher in elevation than the MFHA.

The term "100-year flood" is misleading. It is not a flood that will occur once every 100 years. Rather, it is the flood elevation (or depth) that has a 1% chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. In summary, the 100-year flood is the flood that has a 1% chance in any given year of being equaled or exceeded.

Flood-Prone Areas

Historically, the western slope of El Dorado County is not subject to flooding due to a lack of extensive low-lying areas and many upland areas. Flooding results from prolonged heavy rainfall and is characterized by high peak flows of moderate duration and by a large volume of runoff. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The

[19] Source: El Dorado County Multi-Jurisdictional Hazard Mitigation Plan, November 2004

primary flood-prone areas on the west slope of the County within the Department include Bass Lake, the Cosumnes River, Deer Creek, and New York Creek.[20]

Flood Risk Analysis

Table 34 summarizes Citygate's analysis of the Department's flood risk.

[20] Source: Federal Emergency Management Agency, Flood Insurance Rate Maps (2012)

Table 34—Flood Risk

Risk Zone	Probability of Occurrence	Impact Severity Factors					Risk Factors Score	Overall Risk Score	Risk Rating
		Area Affected	Injuries / Fatalities	Property Damage	CIKR Impacts	Mid/Long-Term Community Impacts			
84-A	1	1	1	1	1	1	**5**	**5**	**Low**
84-B	1	1	1	1	1	1	**5**	**5**	**Low**
84-C	3	3	1	2	1	2	**9**	**27**	**Low**
84-D	1	1	1	1	1	1	**5**	**5**	**Low**
84-E	1	1	1	1	1	1	**5**	**5**	**Low**
84-F	3	3	1	2	2	2	**10**	**30**	**Low**
84-G	3	3	1	2	1	2	**9**	**27**	**Low**
84-H	1	1	1	1	1	1	**5**	**5**	**Low**
85-A	3	3	1	2	2	2	**10**	**30**	**Low**
85-B	1	1	1	1	1	1	**5**	**5**	**Low**
85-C	1	1	1	1	1	1	**5**	**5**	**Low**
85-D	1	1	1	1	1	1	**5**	**5**	**Low**
86-A	1	1	1	1	1	1	**5**	**5**	**Low**
86-B	1	1	1	1	1	1	**5**	**5**	**Low**
86-C	3	3	1	2	2	2	**10**	**30**	**Low**
86-D	1	1	1	1	1	1	**5**	**5**	**Low**
86-E	1	1	1	1	1	1	**5**	**5**	**Low**
87-A	1	1	1	1	1	1	**5**	**5**	**Low**
87-B	1	1	1	1	1	1	**5**	**5**	**Low**
87-C	1	1	1	1	1	1	**5**	**5**	**Low**
87-D	1	1	1	1	1	1	**5**	**5**	**Low**
87-E	1	1	1	1	1	1	**5**	**5**	**Low**
87-F	1	1	1	1	1	1	**5**	**5**	**Low**
91	3	3	1	2	1	2	**9**	**27**	**Low**

As Table 34 shows, the Department's flood risk is ***Low*** across all risk zones, with potential flooding limited to risk zones 84-C, 84-F, 84-G, 85-A, 86-C, and 91 in the creek/river drainages described above.

3.4 EXISTING DEPARTMENT DEPLOYMENT

3.4.1 Existing Deployment—What the Department Currently Has in Place

As the Board of Directors has not yet adopted a best-practices-based response time policy, this study will benchmark the Department for urban populated areas against the response time recommendations of NFPA 1710[21] for career fire service deployment. These are:

- Four (4) minutes travel time for the first-due unit to all types of emergencies
- Eight (8) minutes travel time for multiple units needed at serious emergencies (First Alarm).

Table 35 describes the Department's current daily staffing plan.

Table 35—Daily Minimum Staffing per Unit – 2016

Staffed Resource Type	No.	Minimum Staffing	Description	Extended Staffing
Engines	3	3	Firefighters per day	9
Ladder Truck	1	4	Firefighters per day	4
Patrol	1	2	Firefighters per day	2
Ambulance	1	2	Firefighters per day	2
Battalion Chief*	2	2	Per day for command	2
			Total Response Personnel per Day	**19**

*2nd Chief Officer from office or home

This daily staffing is adequate for most emergencies, however, automatic aid and/or mutual aid will be needed in a timely manner to provide the balance of the staffing needed for a serious building fire or other complex emergency incident.

Services Provided

The Department is an "all-risk" fire department providing the residents, businesses, and visitors it protects with services that include fire suppression and prevention, emergency medical, rescue, first-responder hazardous materials response, and other services. Given these risks, the Department

[21] NFPA 1710 Standard for the Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2016 Edition)

utilizes a tiered deployment model matching the type and number of resources dispatched to each risk type. The Department contracts for dispatching services with the CAL FIRE Amador-El Dorado Administrative Unit that uses a Computer Aided Dispatch (CAD) system to select and dispatch the appropriate resources to each emergency incident. Table 40 summarizes the Department's response plan for common risk types.

Table 36—Response Plan by Risk Type

Risk Type	Resources Dispatched	Total Personnel
Medical Emergency	1 Engine, 1 Ambulance	5
Rescue	4 Engines, 1 Ambulance, 1 BC	15
Traffic Collision	2 Engines, 1 Ambulance, 1 BC	9
Building Fire	5 Engines*, 1 Truck, 1 Ambulance, 2 Chief Officers	23
Wildland Fire	3 Engines, 1 Ambulance, 1 BC	12
Vehicle Fire	2 Engines, 1 BC	7
Hazardous Material	3 Engines, 1 Ambulance, 1 BC	12

* Two from mutual aid

Source: El Dorado Hills Fire Department

This page was intentionally left blank

SECTION 4—STAFFING AND GEO-MAPPING ANALYSIS

4.1 CRITICAL TIME TASK MEASURES—WHAT MUST BE DONE OVER WHAT TIME FRAME TO ACHIEVE THE STATED OUTCOME EXPECTATION?

SOC ELEMENT 4 OF 8
CRITICAL TASK TIME STUDY

Standards of Response Coverage (SOC) studies use time-task information to determine the firefighters needed within a timeframe to accomplish the desired fire control objective on moderate residential fires and modest emergency medical rescues. The time it takes to complete one specific task is called an "evolution." These time-task evolutions are shown on the following pages to demonstrate how much time the operations take. The following tables start with the time of fire dispatch notification, and finish with the outcome achieved. These tables are composite tables from Citygate clients in communities very similar to the El Dorado Hills Fire Department, with unit staffing similar to the Department's (three personnel per engine / four personnel per ladder truck). These tasks and times also are consistent with national published studies. There are several important themes contained in these tables:

1. The evolution test results were obtained at training centers under ideal conditions; structure fire response times are from actual events, showing how units arrive at staggered intervals
2. Note the time it takes after arrival, or after a task is ordered by command, to actually accomplish the tasks and arrive at the desired outcome; the fewer the firefighters, the longer it takes to complete many of the tasks (*Critical tasks* are highlighted in ***gray)***
3. Task completion time is generally a function of how many personnel are available so that some tasks can be completed ***concurrently***
4. Some tasks must be assigned to a minimum of two firefighters to comply with safety regulations. For example, two firefighters are required for searching a smoke-filled room for a victim.

The following tasks are taken from typical suburban fire department's operational procedures, which are entirely consistent with the customary findings of other agencies using the Standards of Response Cover process. No conditions existed to override the OSHA 2-in/2-out safety policy which requires that firefighters enter serious building fires in teams of two, while two more firefighters are outside and immediately ready to rescue them should trouble arise.

4.1.1 Firefighting Critical Tasks

The Department's response plan for building fires includes five (5) engines (two of which come from mutual aid), one Department ladder truck, one JPA ambulance, and two chief officers for a minimum response force of **23** personnel. NFPA 1710[22] recommends a minimum initial response force of 15 personnel; Table 37 shows critical task times for an initial response force of 16 personnel which is just under the Department's on-duty minimum force of 19. It is important to understand that the larger the response force (weight of attack), the quicker that critical tasks can be completed.

Scenario: *This was a simulated one-story residential dwelling fire with no rescue situation. Responding companies received dispatch information as typical for a witnessed fire. Upon arrival*

[22] NFPA 1710 *Standard for the Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2016 Edition)

they were told approximately 1,000 square feet of the home was involved in fire.

Table 37—First Alarm Structure Fire – 16 *Department* Firefighters

Task Description	Task Clock Time	Elapsed Time from 9-1-1
Pre-arrival time of dispatch, turnout, and travel time at desired goal point		07:00
First-due engine on scene, size up, pull fire attack line	Begin Scene Time	07:00
Ladder truck on scene / ventilation	00:40	07:40
First ladder to roof	02:54	
Forcible entry	04:05	
Attack team entry pre-connect	04:05	11:05
2nd engine on scene	04:20	
Provide water supply line	05:22	
Rescue-ambulance on scene	05:00	
1st Chief Officer on scene, transfer command	05:40	
3rd engine on scene, 2nd Chief Officer	07:27	
Primary search completed	08:03	15:03
Roof ventilation completed	08:06	
Rapid Intervention Crew established	08:21	
Water on fire	09:05	
Fire knocked down	09:10	16:10
Secondary search completed	09:20	
Fire under control	09:30	16:30
Total Time to Control:	***09:30***	**16:30**
Total Personnel:	**16**	

The personnel required to perform the above tasks, grouped together, form an *Effective Response Force* (ERF). Remember that many of the above distinct tasks must be performed concurrently and effectively to achieve the desired outcome; arriving on-scene does not stop the escalation of the emergency. While firefighters accomplish the above tasks, the clock keeps running.

Fire spread in a structure can double in size every minute during its free burn period. Many studies have shown that a small fire can spread to engulf the entire room in less than four to five minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire attack and search commence before the flashover point occurs if the outcome goal is to keep the fire damage in or near the room of origin, and to

maximize survival opportunity for any occupants.

4.1.2 EMS Critical Tasks

The Department responds to nearly 1,967 EMS incidents per year, including vehicle accidents, water emergencies, strokes, heart attacks, difficulty breathing, and many other medical emergencies. The wide variety and circumstances of EMS calls makes it difficult and impractical to chart the critical tasks for each call type.

The American Heart Association (AHA) recommends a minimum of two emergency medical technicians and two certified paramedics to complete the tasks required for a cardiac emergency. A 2010 EMS study conducted by the National Institute of Standards and Technology (NIST) clearly demonstrates a crew of four first responders on-scene, including two paramedics, is the most expedient and efficient means of delivering advanced emergency medical care.

The Department routinely responds to EMS calls that require treatment for more than one patient. These calls include vehicle accidents, water rescues, chemical exposures, construction or industrial accidents, and any other event that occurs with several people in close proximity. Patient conditions can range from minor cuts and bruises to life-threatening injuries.

Dispatchers are responsible for screening calls to establish the correct initial response. The first fire department officer on-scene amends the response once conditions have been assessed. Standard operating procedures are used to request adequate personnel and resources.

For comparison purposes, Table 38 shows the tasks for a typical cardiac arrest incident.

Scenario: *This was a simulated one-patient full arrest inside a residential dwelling. One engine*

and one ambulance responded with a total response force of 5 personnel.

Table 38—Cardiac Arrest – 1 Engine and 1 Ambulance

Task Description	Task Clock Time	Elapsed Time from 9-1-1
Pre-arrival time of dispatch, turnout, and travel time at desired goal point		07:00
First-due engine on scene	Begin Scene Time	07:00
Engine crew determine full arrest and start CPR	00:55	
Rescue ambulance on-scene	01:35	
Cardiac monitor attached to patient	02:10	
Auto pulse CPR unit attached	03:18	
Intravenous line placed	03:24	10:24
Bag valve mask ventilation started	03:42	
Epinephrine administered	05:32	12:32
Intubation completed	06:10	13:10
Defibrillate, positive change in patient rhythm	06:53	13:53
Patient on gurney	07:28	
Patient in ambulance	10:15	17:15
Total Time to Begin Transport:	***10:15***	**17:15**
Total Personnel:	**5**	

4.1.3 Critical Task Analysis and Effective Response Force Size

What does a deployment study derive from a response time and company task time analysis? The total task times to stop the escalation of the emergency, as shown in Table 37 and Table 38, must be compared to outcomes. We know from nationally-published fire service "time vs. temperature" tables that after about 4-5 minutes of free burning, a room fire will grow to the point of flashover. At this point, the entire room is engulfed in fire, the entire building becomes threatened, and human survival near or in the fire room becomes improbable. Additionally, we know that brain death begins to occur within 4-6 minutes of the heart having stopped. Thus, the Effective Response Force must arrive in time to stop these catastrophic events from becoming worse.

The on-scene tasks previously discussed show that Department residents are able to expect positive outcomes in all but the most time sensitive emergencies, and have a good chance of survival, in a

moderate severity medical emergency. This is because the Department's first responding units are typically available in 11 minutes or less first unit ***total response*** time as identified in Section 5.

Mitigating an emergency event is a team effort *once* the units have arrived. This refers back to the "weight" of response analogy; if too few personnel arrive too slowly, then the emergency will worsen instead of improve. The outcome times, of course, will be longer, with less desirable results, if the arriving force is later or smaller.

The quantity of staffing and the arrival time frame can be critical in a serious fire. Fires in older and/or multi-story buildings could well require the initial firefighters needing to rescue trapped or immobile occupants. If the initial response force is too small, it cannot simultaneously conduct rescue and firefighting operations.

Fires and complex medical incidents require that additional units arrive in time to complete an effective intervention. Time is one factor that comes from ***proper station placement***. Good performance also comes from ***adequate staffing*** and training. In the critical tasks identified previously, the Department's firefighters can only perform well in terms of time for serious fires with nearby automatic or mutual aid due to travel times given the Department's topography, road network, and station spacing.

Previous critical task studies conducted by Citygate, Standard of Response Cover documents reviewed from accredited fire departments, and NFPA 1710 recommendations all arrive at the need for 15 or more firefighters arriving within *11 minutes total response time* at a room and contents building fire to be able to ***simultaneously and effectively*** perform the tasks of rescue, fire attack, and ventilation. Given that the Department sends *at least* 17 of its own personnel, plus two automatic aid engines to building fire incidents, it is clear that the Department understands that firefighting crews arriving closely together are needed to deliver a positive outcome that protects lives and property by stopping the escalation of the emergency as found by the arriving response force. Given that the Department has not yet adopted a response time policy, its current response to building fires is, in effect, the de-facto deployment measure to built-up urban/suburban areas, thus becoming the Department's baseline deployment policy.

4.2 Distribution and Concentration Studies—How the Location of First-Due and First Alarm Resources Affects the Outcome

SOC Element 5 of 8
Distribution Study

SOC Element 6 of 8
Concentration Study

The Department is served today by five fire stations. It is appropriate to understand what the existing stations do and do not cover, if there are any coverage gaps needing one or more stations, and what, if anything, to do about them.

In brief, there are two geographic perspectives to fire station deployment:

- **Distribution** – the spreading out or spacing of first-due fire units to control routine emergencies.
- **Concentration** – the spacing of fire stations in sufficient proximity to each other so that more serious emergencies can receive sufficient resources from multiple stations quickly. As indicated, this is known as the **Effective Response Force**, or, more commonly, the "First Alarm Assignment"—the collection of a sufficient number of firefighters on scene, delivered within the concentration time goal to stop the escalation of the problem.

To analyze first-due fire unit travel time coverage, Citygate uses a geographic mapping tool called *FireView*^{TM} that can measure theoretical travel time over the street network. For this time calculation, Citygate staff uses the base map and street travel speeds calibrated to actual fire company travel times from previous responses to simulate real-world coverage. Using these tools, Citygate ran several deployment tests and measured their impact on various parts of the Department. The travel time measure used was 4 minutes over the road network, which is consistent with the "benchmark" recommendation in NFPA 1710 and desirable outcomes in critical emergencies in urban/suburban areas. When up to 3 minutes are added for dispatch call processing and crew turnout times, then the maps effectively show the area covered within 7 minutes of the dispatch center receiving the 9-1-1 call for first-unit arrival, and 11 minutes (8 minutes travel) for ERF (first-alarm) arrival.

4.2.1 Department Deployment Baselines

Map #1 – General Department Geography and Station Locations

This map shows the existing Department boundaries, road network, station locations, and location of mutual/automatic aid resources. This is a reference map view for the other map displays that follow.

Map #2 – Risk Assessment Zones

This map shows the 24 zones established by the Department for the Community Risk Assessment in Section 3.3.

Map #2a – Risk Assessment: High-Risk Occupancies

Risk assessment is an effort by the Department to classify properties by potential impact on service demand levels. This map shows the location of higher risk buildings which potentially require more firefighters in fewer minutes should a serious fire occur due to high occupancy loading, at-risk populations, or the presence of hazardous materials or processes.

Most of these buildings are located where zoning allows commercial buildings. The important finding from this geographic-based assessment is that most of these risks are concentrated within the core urban populated area of the Department, with some located in the most northern Station 84 service area. As such, the Department needs a strong, multi-unit response capacity for serious emergencies in the urbanized areas of the Department.

Map #2b – Risk Assessment: Critical Facilities

As another perspective of risk, the locations of the Department's 127 designated critical facilities are displayed here. Critical facilities are those that are deemed by federal and state criteria to be essential to the successful, economic and safe operation of a community. Over 91% of these facilities are located with Station 84, Station 85, and Station 87 service areas.

Map #2c – Risk Assessment: High Fire Flow Buildings

The Insurance Service Office (ISO) surveys buildings for fire risk, upon which underwriters base insurance premiums. One measure of a buildings risk is the calculated amount of water needed should a major fire occur in a building. This "Needed Fire Flow" calculation is based on many factors, such as type of construction and spacing from other buildings. This map displays the 34 buildings within the Department with larger required fire flows in excess of 2,500 gallons per minute and, almost all of which are located in Station 87's service area.

Map #2d – Wildland Fire Risk Zones

CAL FIRE, as required by state law, has classified most of the Department as moderate to very high risk for wildfire for the threat it poses to populated areas. As can be seen, all of the populated areas of the Department abut *Moderate* or *High* wildland Fire Hazard Severity Zones (FHSZ).

Finding #2: Given that all of the populated areas of the Department abut state-designated *Moderate* or *High* wildland Fire Hazard Severity Zones, the Department needs the "weight" of fire attack using multiple units in a timely manner to stop incipient wildfires before they become catastrophic.

Map #2e – EMS Risk

Population density is one of the predominant factors influencing EMS risk in most communities. This map shows the Department's population density in 500 person per-square-mile increments. The CFAI and the NFPA typically define population densities as shown in Table 39.

Table 39—Population Densities

Category	Population Density[1]	EL Dorado EMS Densities
Urban	2,000 or more	>999
Suburban	1,000-1,999	Semi-rural 100-999
Rural	Less than 1,000	10-99

[1] Average population density per square mile

As would be expected, urban population densities are located in those areas of the Department where zoning allows higher-density residential land use, including portions of Station 84, Station 85, and Station 86 service areas. As Map #10 will also show, these are the areas with the highest number of EMS incidents.

Finding #3: Much of the residential/commercial areas of the Department north of U.S. 50 are at or above suburban population densities as defined by CFAI. As such, it is appropriate to benchmark the Departments' response time and outcome goals in urban/suburban areas to those recommended by NFPA 1710 for career fire departments, *north of U.S 50*.

Finding #4: Due to semi-rural and rural population densities south of U.S. 50, the Department needs to adopt response time policies for differing population densities from urban to rural.

Map #2f – Hazardous Material Risk

This view shows the location of the four Hazardous (H) occupancy classification buildings and 61 additional sites with active El Dorado County Certified Unified Program Agency (CUPA) operating permits for hazardous materials. These sites are distributed throughout the built-up areas of the Department.

Map #3 – First-Due Unit Distribution: Current Fire Stations 4-Minute Engine Travel

This map shows, using a different color for each station, the *distribution of Department stations* per a best-practice-recommended response goal of 4 minutes *travel* time in urban/suburban areas. Therefore, the limit of each color per station area is the distance an engine could reach within 4 minutes, *assuming* it is in-station and encounters no unusual traffic delays. In addition, the computer-mapping tool uses actual fire company speed limits per roadway type, thus the projection line is a realistic travel distance for fire apparatus in normal traffic.

The purpose of computer response modeling is to determine and balance station locations. This geo-mapping design is then checked in the study against actual dispatch time data, which reflect real responses. There also should be some overlap between station areas so that a second-due unit can have a chance of an adequate response time when it covers a call in another fire station's service area.

This view illustrates the impacts of the Department's topography, road network, and large fire station service areas on travel times, with only approximately 50% of the Department's core populated areas, and less than 20% of the entire Department, covered within 4 minutes travel time from the nearest fire station.

Finding #5:	The Department's five fire station locations provide computer-predicted 4-minute travel time coverage to approximately half of the urban/suburban population densities, and less than approximately 20% of the entire Department. As such the Department should adopt tiered response time policies.

Map #3a – First-Due Unit Distribution 5-Minute Engine Travel with Mutual/Automatic Aid Stations

This map also shows the *distribution* using a test response goal of 5 minutes *travel* time in urban/suburban areas, using mutual and automatic aid stations as shown. Even with mutual and automatic aid, and 1 minute added to travel time, first-unit coverage in urban/suburban population densities improves to only approximately 75% of those areas, and approximately 30% of the entire Department.

Map #3b – Ambulance Distribution 9-Minute Travel – All JPA Ambulances

This map shows ambulance coverage in the JPA ambulance service plan, which uses a response goal of 10 minutes (turnout plus travel). Therefore, we modeled a 9-minute *travel* time assuming a best possible 1-minute turnout time.

Assuming the ambulance is responding from Station 85, the dark green color shows the overlap with other ambulances, where approximately 75% of the Department's road network is covered. It should be noted that the dynamic deployment model utilized by the Ambulance JPA results in Medic 85 being out-of-Department a large percentage of the time during daytime hours.

Map #3c – Ambulance Distribution 9-Minute Travel – No Ambulance 85

If the ambulance assigned to Station 85 is on an incident, or moved up to cover an area further east in the West Slope section of the County, this map shows the Folsom and other ambulance JPA coverage. Assuming those units are available, much of the core urban areas in the Department are covered.

Map #3d – Ambulance 85 Relocated to Station 86

This coverage tests the effect of moving Ambulance 85 easterly. Given the road network in the Department at present, the result is deceased coverage in the northwest Station 84 area, along with reduced coverage south of Station 87. The overlap with the JPA ambulances to the east of the Department is increased. Given these results, Citygate would *not* relocate the ambulance out of Station 85, unless in the future new roads being built would allow Station 86 to reach more quickly into Station 84's area.

Map #4 – ISO Coverage Areas

This map exhibit displays the ISO requirement that stations cover a 1.5-mile distance response area. Depending on a jurisdiction's road network and topography, the 1.5-mile measure generally equates to a 3.5- to 4.5-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. As can be seen, the ISO coverage is very similar to the 4-minute travel time coverage in Map #3.

Map #5 – Concentration: 8-Minute ERF Travel

This map shows the *concentration* or massing of fire crews for serious fire or rescue calls. As the map illustrates, coverage for the Department's building fire response of a *minimum* response force of five engines (3 Department; 2 mutual aid), one aerial ladder truck, one ambulance, and two chief officers within 8 minutes travel time (11:30 minutes total response time) is limited to a small percentage of the Department's total service area immediately adjacent to U.S. 50, and a small area at the western edge of Station 84's response area.

Finding #6:	Only a small percentage of the Department is within 8 minutes travel time of an Effective Response Force of five engines, one ladder truck, one ambulance, and two chief officers. For mutual aid units, the Department's topography and road network design do not allow a 5-engine best practice-recommended travel time to urban/suburban population densities.

Map #6 – Department Engines Only: 8-Minute Travel

This map shows distribution by illustrating the 8-minute, 3-engine travel time coverage using just Department engines. Here, coverage improves significantly from Map #5a to include all of the northern areas of the Department with the exception of two small areas at the extreme northern and northeastern areas of the Department, and an improvement south of U.S. 50 along Latrobe Road.

The difference from Map #5a is that the full assignment in Map #5a, includes two out-of-Department mutual aid engines. The engines from Folsom are dispatched by another communications center with a resultant 1-minute processing/request lag.

Map #7 – Battalion Chief 8-Minute Travel

This map displays the coverage for one Battalion Chief, including mutual aid at 8 minutes travel time from Station 85. Coverage from Station 85 is good to nearly all of the urban/suburban population densities in the Department.

Map #8 – Ladder Truck 8-Minute Travel

This map shows 8-minute travel time ladder truck coverage including automatic/mutual aid. As can be seen, nearly all of the developed areas of the Department can be reached within this response time goal.

Finding #7:	The Department's minimum multi-unit response of three Department engines, one ladder truck, one ambulance and two chiefs totaling 17 personnel to serious emergencies should be achievable within 9 minutes travel time to the most populated areas, which is close to an urban/suburban area best practice.

> Given the somewhat newer building construction in most of the Department, and the low rate of serious building fires, a Department only provided Effective Response Force of 17 personnel meets NFPA 1710 recommendations for urban/suburban areas. Using more units from mutual aid for rare, very serious fires is an acceptable deployment decision.

Map #9 – All Incident Locations

Maps #9-#12 are an overlay of the location of all incidents from January 1, 2013 through December 31, 2015. In map #9, it is apparent that there is a need for Department services on nearly every street segment of the Department. The greatest concentration of calls is also where the greatest concentration of Department resources is available. This view also shows the locations outside the Department where its units responded.

Map #10 – Emergency Medical Services and Rescue Incident Locations

This map further breaks out only the emergency medical and rescue call locations. With two thirds of the calls for service being emergency medical, virtually all areas of the Department need emergency medical services. Also, the highest concentration of EMS-related calls relates to the highest population densities.

Map #11 – All Fire Locations

This view illustrates the location of all fire incidents from January 1, 2013 through December 31, 2015, including fires of any type. This view also illustrates that there are obviously fewer fires than medical or rescue calls. Even given this, it is evident that all first-due engine districts have fire incidents; the fires are more concentrated in the higher population density areas of the Department.

Map #12 – Structure Fire Locations

Displayed on this map are all structure fire incident locations from January 1, 2013 through December 31, 2015. While the structure fire count is a smaller subset of the total fire count, there are two meaningful findings from this map. First, structure fires occurred in all of the five fire station service areas, of which many paralleling the higher risk building types where more significant risk and the ISO-evaluated buildings are more common. These areas and buildings are of significant fire and life loss risk to the Department. Second, fires in the more complicated building types must be controlled quickly or the losses will be significant. Fortunately, in the commercial and industrial zones where commercial buildings tend to have automatic fire sprinklers and good management practices, there were fewer fires over the 2-year period.

Map #13 – Emergency Medical Services and Rescue Incident Location Densities

This map view examines, by mathematical density, where clusters of emergency medical services incident activity occurred. In this set, the darker density color plots the highest concentration of all incidents. This type of map makes the location of frequent workload more meaningful than just mapping all locations, as done in Map #10.

This perspective is important because the deployment system needs an overlap of units to ensure the delivery of multiple units when needed for serious incidents or to handle simultaneous calls for service. When this type of map is compared with the concentration of engines in Map #6, the best concentration should be where the greatest density of calls for service occurs, which is the core, higher population density areas of the Department within Station 84, Station 85, and Station 87 response areas.

Map #14 – All Fire Location Densities

This map is similar to Map #12, showing the hot spots of activity for all fire types, which includes portions of Station 84, Station 85, Station 86, and Station 87 service areas.

Map #15 – Structure Fire Densities

This view shows only the building fire workload by density, which is more focused in the higher building density areas of the Department within Station 84, Station 85, Station 86, and Station 87s service areas.

Map #16 – 6-minute, and 8-Minute Travel Coverage for Proposed Station 91 Site

This map shows test tiered travel time coverage to rural areas from the proposed station site at Heffrin Drive and Dodson Road. As this map illustrates, the site effectively covers the more developed areas in Station 91's service zone. As the next map will show, Station 87, from its location, will connect southbound within 8 minutes to the new Station 91 8-minute reach. Therefore, most of the populated southern Department is within reach of one of the two fire stations within 8 minutes travel time.

Map #17 – 4-Minute to 9-Minute Travel Coverage – All Stations

This view shows travel time coverage for all Stations, and the proposed Station 91, in 1-minute increments from 4-9 minutes travel. The purpose of this map is to show per minute the coverage into the edges of the Department and how even northeast of Station 84 and 86, are within 6 minutes travel time of an existing fire station.

Finding #8: The Department's fire station locations north and just south of U.S. 50 can provide 4- to 6-minute travel time coverage to the Department's urban/suburban areas substantially meeting best practices. As such, these stations are well located, and additional stations in this 4-station area are not needed, absent a very high level of infill development.

Finding #9: The proposed relocation of Station 91 to the northeast is very good, providing the rural area travel time coverage from 6 to 8 minutes travel time, meeting best practices and Citygate's recommendations for rural areas.

This page was intentionally left blank

SECTION 5—RESPONSE STATISTICAL ANALYSIS

5.1 HISTORICAL EFFECTIVENESS AND RELIABILITY OF RESPONSE—WHAT STATISTICS SAY ABOUT EXISTING SYSTEM PERFORMANCE

SOC ELEMENT 7 OF 8
RELIABILITY & HISTORICAL RESPONSE EFFECTIVENESS STUDIES

The maps described in Section 4 show the GIS-projected response times given perfect conditions with no competing calls, without traffic congestion, and all initial response resources in their assigned stations. Examination of the actual response time data provides a picture of how response times are in the "real" world of simultaneous calls, rush hour traffic conditions, units out of position, and delayed travel time for events such as periods of severe weather.

5.1.1 Data Set Identification

The Department provided National Fire Incident Reporting System (NFIRS 5) incident records and computer-aided-dispatch (CAD) apparatus response data for the time period from January 1, 2013 through December 31, 2015. Analysis of this three-year data set yielded 8,547 incidents and 14,684 apparatus response records, which is considered to be a statistically significant data set.

5.2 SERVICE DEMAND

In 2015, the Department responded to 3,027 incidents, or an average of 8.29 calls for service per day. Of those, 3.73% were fire incidents, 64.91% were EMS incidents, and 31.36% were other incident types. During this same time period, there were 5,066 apparatus movements, an average of 1.67 apparatus movements per incident.

5.2.1 Service Demand

Service demand, expressed as calls for service, has increased slightly over the past three years as shown in Figure 13.

Figure 13—3-Year Service Demand

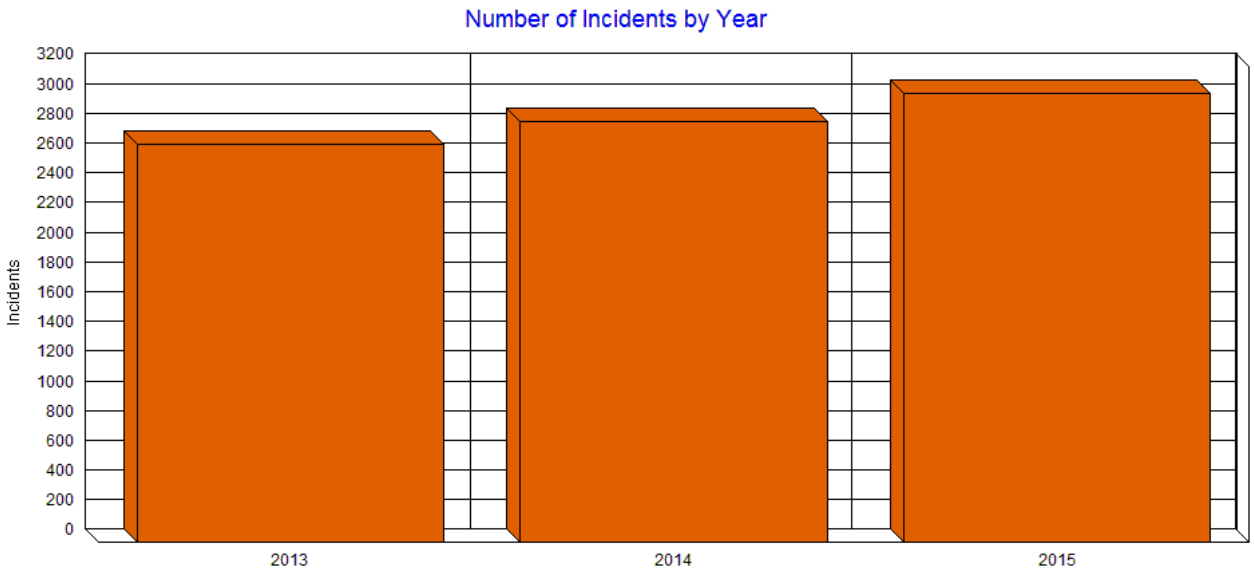
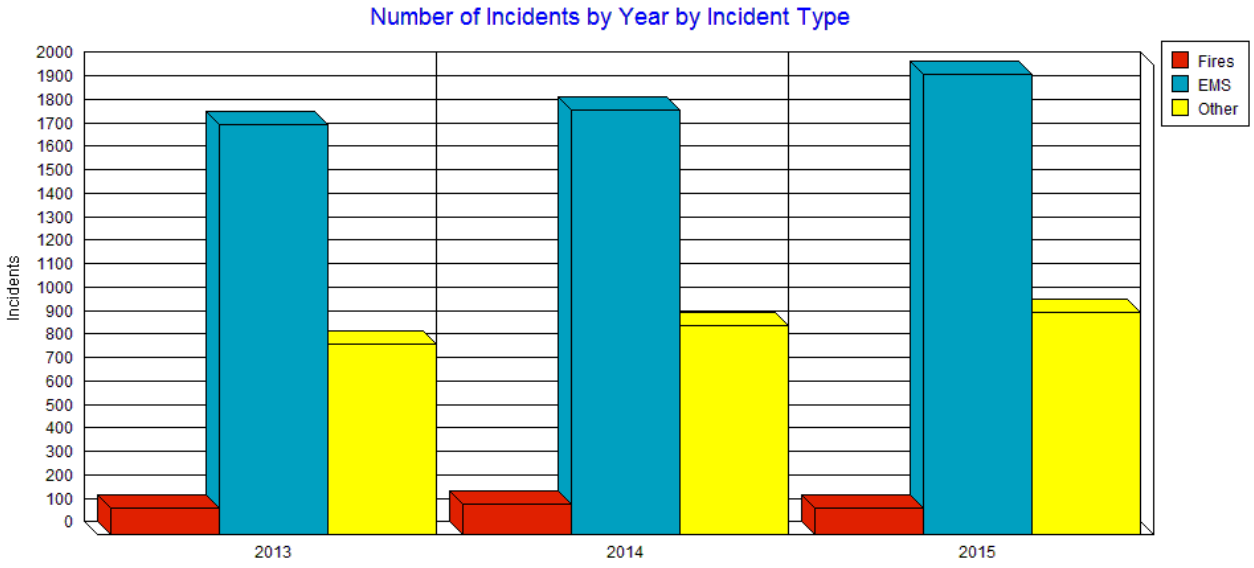


Figure 14 illustrates annual service demand by general incident category. Note that while service demand for fire incidents increased slightly from 2013 to 2014 and declined slightly in 2015, service demand for EMS and other incident types increased slightly over the three-year period.

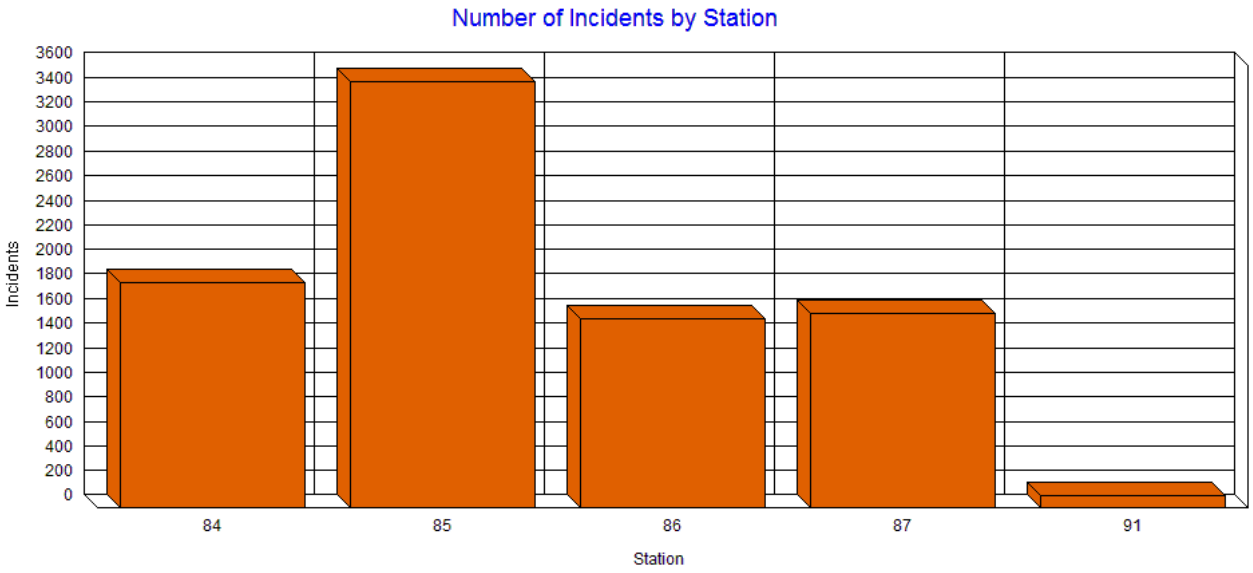
Figure 14—3-Year Service Demand by Incident Category



5.2.2 Service Demand by Station

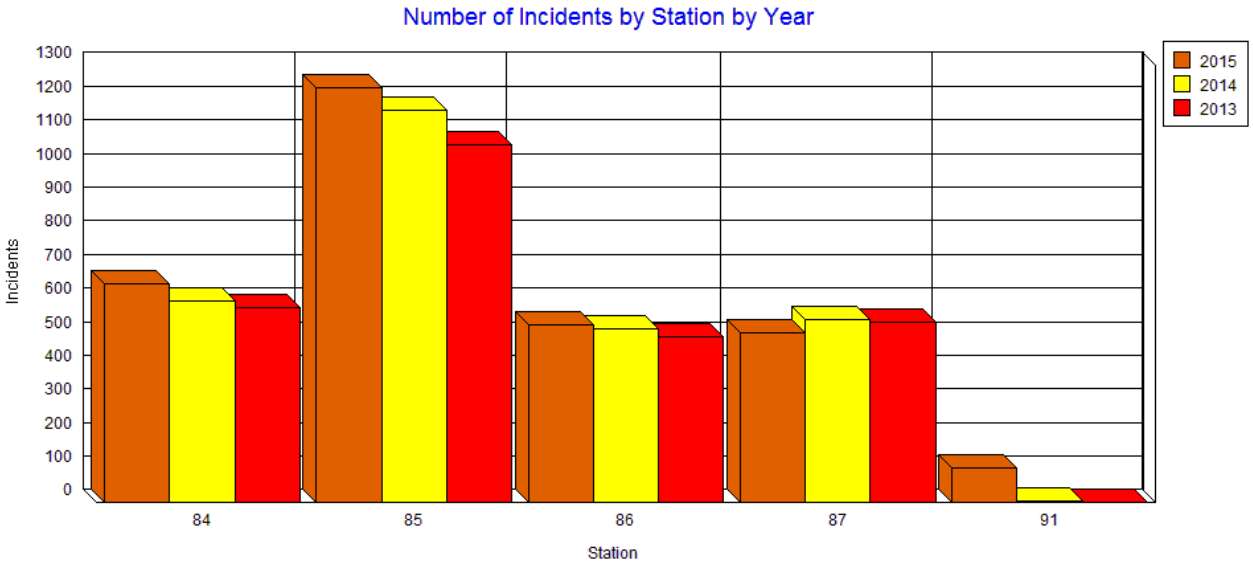
The following chart illustrates the number of incidents by station for 3 years. Station 85 has nearly 32 times the incidents occurring in Station 91's area.

Figure 15—3-Year Service Demand by Station



The following chart is a breakdown of the number of incidents by station area by year. The number of incidents at Station 91 increase in 2015. Only Station 87 experienced a slight decrease in incidents in 2015.

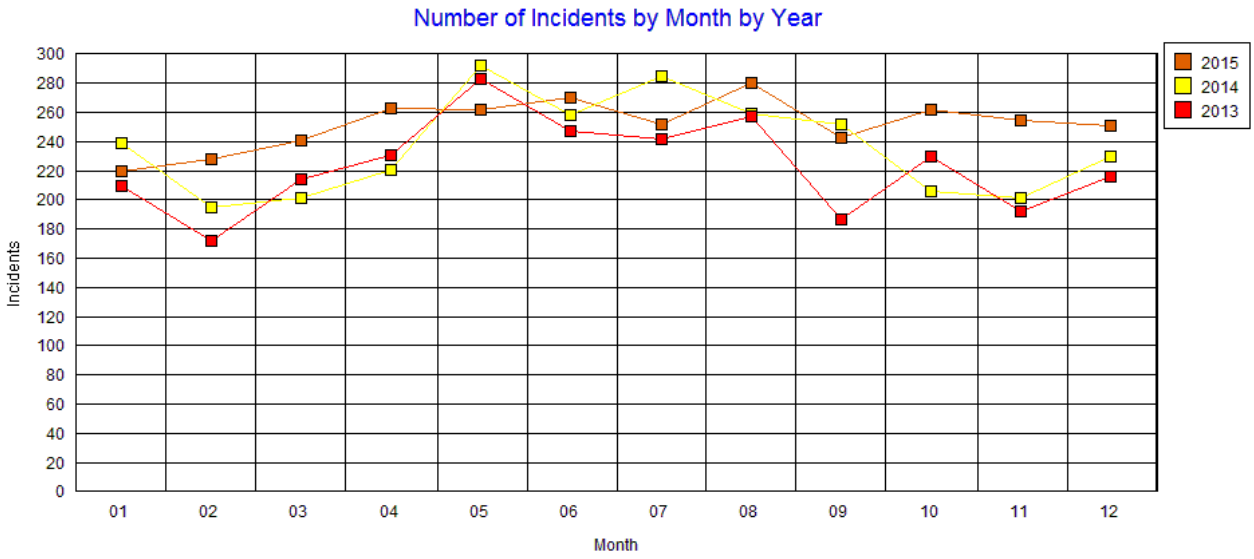
Figure 16—3-Year Service Demand by Station



5.2.3 Temporal Service Demand

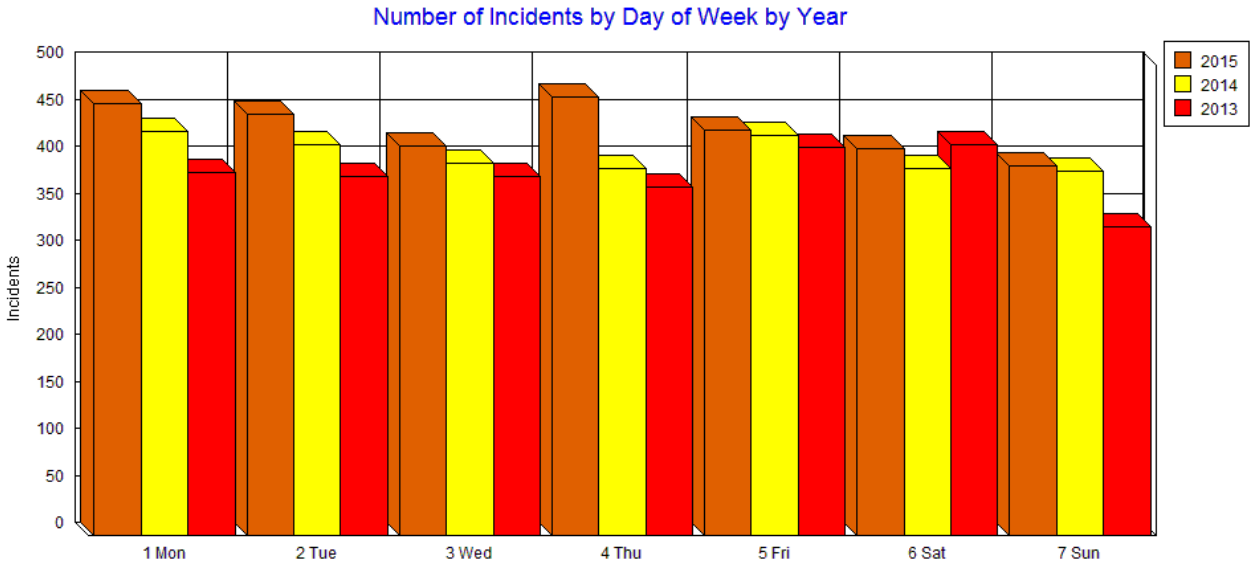
Figure 17 shows that service demand fluctuates by month from about 170 calls for service to about 290 calls, with no dramatic seasonal patterns.

Figure 17—3-Year Service Demand by Month



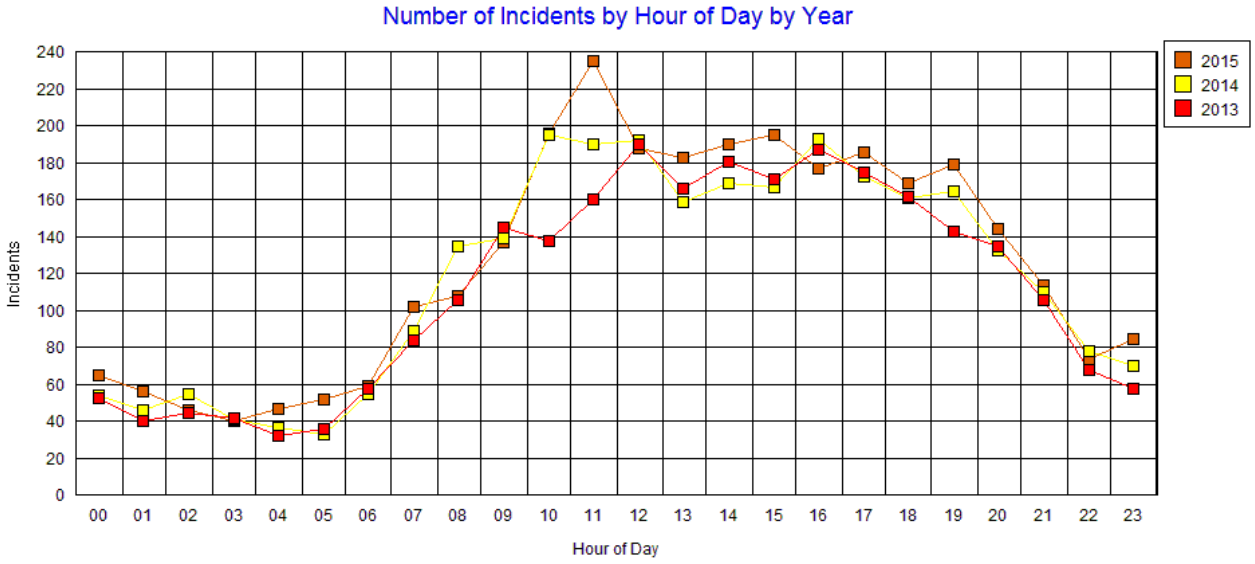
Service demand, as shown in Figure 18, dips slightly during mid-week.

Figure 18—3-Year Service Demand by Day of Week



This following graph compares incident activity by hour of day. The graph follows traditional fire department activity hours. The annual increase in incident activity appears to be roughly during business hours.

Figure 19—3-Year Number of Incidents by Hour of Day by Year



5.2.4 Service Demand by Incident Type

Table 40 shows annual service demand by incident type. Notice the strong ranking for EMS-related incidents and incidents cancelled prior to arrival. Only categories with 10 or greater occurrences are shown.

Table 40—2015 Service Demand by Property Type

Incident Type	2015
321 EMS call, excluding vehicle accident with injury	1,772
611 Dispatched & canceled en route	205
541 Animal problem	155
322 Vehicle accident with injuries	111
554 Assist invalid	70
324 Motor vehicle accident no injuries	66
510 Person in distress, other	62
571 Cover assignment, standby, moveup	44
700 False alarm or false call, other	38
550 Public service assistance, other	37
622 No incident found on arrival of incident address	28
511 Lock-out	28
500 Service Call, other	28
743 Smoke detector activation, no fire - unintentional	25
111 Building fire	23
733 Smoke detector activation due to malfunction	20
600 Good intent call, other	17
143 Grass fire	15
531 Smoke or odor removal	14
735 Alarm system sounded due to malfunction	14
131 Passenger vehicle fire	13
745 Alarm system sounded, no fire - unintentional	10

5.2.5 Incident Quantities by Property Use

The following chart illustrates the ranking of incidents by property use. The highest rankings for incidents by property use are residential dwellings followed by streets and roads. Only categories with 10 or greater occurrences are shown.

Table 41—Incidents: 2015 Quantity by Property Use

Property Use	2015
419 1 or 2 family dwelling	1,358
960 Street, other	136
331 Hospital - medical or psychiatric	125
429 Multifamily dwellings	82
961 Highway or divided highway	57
311 24-hour care Nursing homes, 4 or more persons	51
962 Residential street, road or residential driveway	49
340 Clinics, Doctors offices, hemodialysis centers	44
215 High school/junior high school/middle school	41
500 Mercantile, business, other	36
963 Street or road in commercial area	34
931 Open land or field	33
965 Vehicle parking area	28
459 Residential board and care	23
599 Business office	21
519 Food and beverage sales, grocery store	20
342 Doctor, dentist or oral surgeon's office	18
900 Outside or special property, other	17
213 Elementary school, including kindergarten	15

5.2.6 Simultaneous Activity

Simultaneous activity includes incidents that begin while other incidents are already underway. For 2015, 18.86% of all calls for service involved two concurrent incidents, as shown in Table 42.

Table 42—2015 Concurrent Activity

Concurrent Activity	Percentage of Overall Service Demand
1 or more concurrent incidents	**18.86%**
2 or concurrent incidents	**2.41%**
3 or more concurrent incidents	**0.33%**

Source: Department incident records

Figure 20—Simultaneous Activity by Station

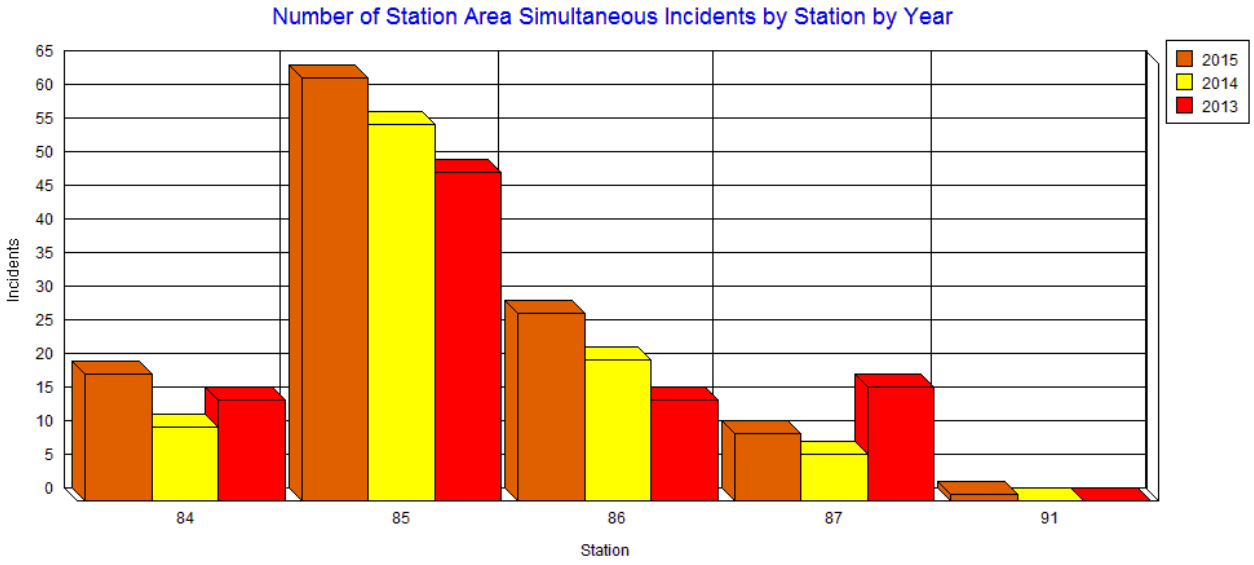


Figure 20 shows concurrent activity by station by year. As would be expected, Station 85 has the highest concurrent activity. However, the 2-incident rate of almost 19% is not worrisome in a Department with the quantity of units and mutual as that the Department has.

5.2.7 Unit-Hour Utilization

Unit-hour utilization percentage is calculated by two primary factors; the number of responses and duration of responses. Table 43 is a unit-hour utilization summary for 2015 with the busiest companies are listed first.

Table 43—2015 Unit Hour Utilization

Hour	M85	E84	E86	E87	T85	E85	E91
00:00	5.74%	1.50%	1.52%	1.42%	1.75%	0.57%	0.00%
01:00	5.34%	1.49%	6.10%	1.96%	1.49%	0.15%	0.00%
02:00	3.17%	1.78%	3.12%	1.02%	2.43%	0.20%	0.00%
03:00	3.74%	1.08%	2.02%	0.74%	1.64%	0.37%	0.00%
04:00	3.51%	3.43%	1.99%	1.32%	4.23%	0.62%	0.00%
05:00	4.81%	1.57%	2.18%	1.88%	1.05%	0.54%	0.00%
06:00	3.88%	1.59%	1.88%	1.87%	0.89%	0.31%	0.00%
07:00	9.02%	6.51%	2.11%	2.51%	2.17%	0.56%	0.00%
08:00	7.14%	4.08%	1.70%	3.19%	3.92%	0.40%	0.11%
09:00	8.41%	3.73%	2.53%	2.21%	2.50%	0.37%	0.33%
10:00	15.03%	11.66%	3.46%	5.36%	7.67%	1.05%	0.35%
11:00	14.45%	9.56%	3.81%	4.48%	3.90%	0.87%	0.83%
12:00	12.44%	4.09%	5.48%	3.93%	4.75%	1.03%	0.12%
13:00	11.91%	4.21%	3.98%	2.80%	3.41%	2.40%	0.68%
14:00	14.20%	4.76%	9.68%	11.30%	3.00%	1.04%	0.80%
15:00	11.43%	6.01%	4.95%	4.22%	5.64%	5.06%	1.60%
16:00	11.53%	5.95%	4.49%	3.88%	3.28%	2.30%	0.72%
17:00	12.76%	3.84%	3.47%	2.75%	3.29%	0.62%	0.00%
18:00	9.56%	5.34%	4.29%	5.73%	3.34%	0.92%	0.13%
19:00	11.24%	4.59%	2.49%	5.27%	3.68%	0.90%	0.14%
20:00	8.00%	4.97%	3.21%	3.09%	2.72%	0.79%	0.00%
21:00	7.37%	3.84%	2.62%	1.71%	2.53%	0.73%	0.00%
22:00	5.42%	2.30%	1.46%	1.37%	2.59%	0.23%	0.00%
23:00	7.67%	2.67%	4.20%	2.06%	1.83%	0.33%	0.00%
Overall	**8.66%**	**4.19%**	**3.45%**	**3.17%**	**3.07%**	**0.93%**	**0.24%**
Responses	**1,686**	**707**	**559**	**589**	**673**	**172**	**34**

What should the maximum utilization percentage for a firefighting resource be? For a 9-hour daytime work period, when crews on a 24-hour shift need to also pay attention to apparatus and equipment checkout, station maintenance, training, public education, and incident reports, plus required physical training and meal breaks, Citygate believes the maximum commitment UHU per hour should not exceed 30%. Beyond that, the most important element to suffer will be training.

For a dedicated unit, such as an ambulance or low acuity squad working less than a 24-hour shift, then UHU can rise to 40-50% at a maximum. At that UHU level, peak hour squad crews must then have additional duty days for training only, and not responding to incidents, in order to meet their annual continuing education and training hours requirements.

For the Department, the modest hourly service demand shown above and associated incident commitment time is not yet high enough to consider needing additional unit(s) solely for peak hour workload. Department resources have additional capacity for more incident workload per hour *absent a significant increase in concurrent activity*.

5.3 Response Time Analysis

Once incident types are quantified, incident analysis shifts to the time required to respond to those incidents. Fractile analysis tracks the percentage (and number) of incidents meeting defined criteria, such as the first unit to reach the scene within progressive time segments.

5.3.1 Department-Wide Response Time Performance

Department residents, businesses, and visitors measure the speed of fire department response from the time assistance is requested until the assistance arrives. This measurement is called "Call to First Unit Arrival" (or "Call to Arrival"). Police and sheriff's departments, under state law, serve as Public Safety Answering Points (PSAP) for all 9-1-1 calls. All 9-1-1 calls for fire service within the Department are routed to the CAL FIRE Amador - El Dorado Emergency Communications Center in Camino for call processing and dispatch.

Based on national recommendations, Citygate's response time test goal is 90% Call to Arrival in 7 minutes (420 seconds) or less, incorporating three component elements as follows:

Call Processing Time: 1 minute or less to receive the call, determine the appropriate resources to dispatch, and alert (dispatch) the appropriate crew(s) crew).

Turnout Time: 2 minutes or less to receive the dispatch alert, don required protective gear, and board the apparatus and fasten seat belt.

Travel Time: 4 minutes or less travel time to the incident for urban/suburban population densities.

Table 44 shows 90th percentile Call to First Unit Arrival times for the overall Department, and also by station by year *for fire and emergency medical* incidents.

Table 44—90th Percentile Call to Arrival Response Performance

Station	Overall	2013	2014	2015
Department-Wide	11:45	11:30	12:04	11:31
84	11:30	11:10	12:10	11:02
85	12:07	12:18	12:23	11:41
86	11:45	11:41	11:57	11:24
87	10:42	10:21	10:39	11:16
91	15:02	N/A	10:01	15:22

The 90th percentile Call to Arrival times in Table 44 above are beyond the Citygate-recommended 7 minutes or less in urban/suburban areas, or rural areas for Station 91. The next set of tables will present the individual segments of total response time—dispatch time, crew turnout time, and travel time—to better understand which measure(s) are contributing to the total response time being significantly longer than desired.

Finding #10: Department total response times are significantly longer than best practice and Citygate's customary recommendation for *urban/suburban* communities with mostly flat terrain of 7 minutes or less from receipt of the call at fire dispatch to arrival at the incident in both urban/suburban and rural areas.

5.3.2 Dispatch Call Processing Time

Call processing time is the time it takes to answer a 9-1-1 call transferred from the Sheriff to the CAL FIRE Emergency Communications Center, determine the nature of the emergency, enter information into the computer-aided-dispatch system, and alert the appropriate station(s). Best practice call processing performance is 90% of calls dispatched within 64 seconds, and 95% of calls dispatched within 106 seconds.[23] Where language barriers exist, or medical self-help instructions are needed, these calls should be dispatched within 120 seconds. Table 45 shows 90th

[23] NFPA 1710 *Standard for the Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2016 Edition)

percentile dispatch call processing performance for the CAL FIRE Amador-El Dorado Emergency Communications Center.

Table 45—90th Percentile Dispatch Call Processing Performance

Location	Overall	2013	2014	2015
Department-Wide	02:16	02:14	02:17	02:16

As Table 45 shows, dispatch call processing performance, while trending fairly steady from year-to-year, is well over best practice performance standards. This is primarily due to CAL FIRE's dispatch procedures that are tailored to a large, statewide wildland fire organization where total response times are significantly longer than most local jurisdiction emergency incident responses.

Finding #11: The Department's 90th percentile dispatch processing time is consistently well past best practices for urban/suburban fire and EMS incidents. The Department and CAL FIRE must make a concerted effort to significantly improve dispatch processing, and if the time cannot meet urban area needs, then the Department should research joining the Sacramento Regional Fire Communications JPA, which dispatches Folsom, its nearest, most-staffed mutual aid partner.

5.3.3 Turnout Time

Turnout time is the time interval required for all crew members to hear and understand the dispatch notification, don appropriate safety clothing, determine the most appropriate response travel route, and to board the apparatus and fasten their safety belts prior to apparatus movement. While the NFPA and CFAI recommend 60-80 seconds for turnout time, it has long been recognized as a standard rarely met in practical experience. Because of this, and the floor plan design of some stations, Citygate has long recommended a more reasonable and achievable 90th percentile turnout time standard of 2 minutes or less. Table 46 summarizes the Department's 90th percentile turnout time performance for the previous three years.

Table 46—90th Percentile Turnout Time Performance

Location	Overall	2013	2014	2015
Department-Wide	02:29	03:13	02:22	01:48

As Table 46 shows, overall Department turnout time performance was approximately 63% slower than Citygate's recommended 2-minute performance goal for 2013, which improved significantly for 2014 to approximately 17% slower than Citygate's recommended 2-minute goal, and improved again for 2015 to nearly 13% *faster* than Citygate's recommended 2-minute turnout time performance goal. It should also be noted that Department staff have determined that they have noticed a significant time lag from the time the CAL FIRE Emergency Communication Center transmits dispatch alert tones to the time they open up the station radio receivers. To date, neither the Department nor CAL FIRE has been able to determine the cause of this delay, and in 2015 the Department implemented a third-party application to track dispatch times more closely aligned with the actual transmission of the dispatch alert tones. This is likely at least a partial explanation for the significant reduction in crew turnout time performance in 2015.

Finding #12: The Department's 90th percentile turnout time performance has improved over the previous two years to a level consistently below 2 minutes for all stations, which is good progress. A robust goal would be a 90-second turnout time. The Department's goal for turnout time should be 2-minutes at night and closer to 90-seconds during waking hours.

5.3.4 Travel Time

Travel time is the time interval from the start of apparatus movement to the incident until the apparatus comes to a complete stop at the incident. Nationally recognized best practice travel performance is 4 minutes or less for urban/suburban areas[24]. Given the topography in each fire station area, and the low count of incidents in some districts, the following table breaks down travel time by district:

[24] NFPA 1710 *Standard for the Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (2016 Edition)

Table 47—90th Percentile Travel Time Performance

District	2015 Time / Count
84-A	12:04 (34)
84-B	06:51 (31)
84-C	05:06 (126)
84-D	05:14 (14)
84-E	06:29 (41)
84-F	04:51 (87)
84-G	08:18 (45)
84-H	09:17 (17)
85-A	05:02 (167)
85-B	05:19 (36)
85-C	04:28 (151)
85-D	05:27 (72)
86-A	07:15 (41)
86-B	07:21 (93)
86-C	06:17 (68)
86-D	05:55 (42)
86-E	10:19 (10)
87-A	06:02 (137)
87-B	06:59 (22)
87-C	06:52 (77)
87-D	04:22 (57)
87-E	05:56 (29)
87B	03:14 (1)
91-A	12:39 (14)
91-B	12:43 (7)
91-C	17:47 (14)

Citygate's analysis finds that Department travel times in many districts do not meet nationally recognized best practices for urban/suburban areas by a significant margin. Several factors influence this, including large geographic fire station service areas, hilly topography, a non-grid

road network, limited cross-access boulevards, simultaneous incidents, open spaces, and security gates, none of which can be cost-effectively improved.

However, there are 14 districts that contain urban/suburban population density. Of these, two have travel times less than 5 minutes, and they are the higher population/incident demand areas close to Stations 84 and 85. Another six have travel times less than 6 minutes. Three others have travel times less than 7 minutes. Out of 14 zones, 8, or 57% of the zones, are reached in under 6 minutes. Another 21% have travel times less than 7 minutes. To place this in perspective, Citygate has metropolitan fire department clientele that cannot easily achieve less than 6 minutes in areas with far greater populations.

In addition, total incident quantities must be taken into account. Citygate always recommends deployment that "covers the most incidents in the least time…". Of the 1,433 incidents in 2015 measured in Table 47, 68% of the incidents are in the urban/suburban population density zones. *Of these 48.5% receive travel times of less than 6 minutes.* Given that some of these zones also have some rural edges to them, we can effectively say that 50% of the Department's incidents are receiving travel times of less than 6 minutes, on a challenging topography and road network.

Finding #13: The Department's very constrained road network over difficult terrain makes it unfeasible to deliver first-due travel times of 4 minutes to all of the urban/suburban population density areas. Given this, the Department should adopt revised performance measures tiered to population density.

5.3.6 Effective Response Force (First-Alarm) Performance to Building Fires

The Department's ERF for building fires is 5 engines (2 from mutual aid), 1 ladder truck, 1 ambulance, and 2 chief officers. This response force is needed to provide enough units when fires are very serious at the time of the 9-1-1 call. However, in a given year, there are few building fires in each station area where the entire force, including mutual aid units, are needed. Therefore, the following multi-unit response time sample size is very small.

The best representation for the ERF or first-alarm units is **travel** time across the Department's road network as shown in Table 48. NFPA 1710 recommends all units arrive within 8 minutes travel time or less. The numbers in parentheses in Table 48 next to the arrival time of the last due unit is the number of occurrences for that year per station area. The reader is cautioned that some of these sample sizes are very small and can readily change year-to-year depending on the exact locations of serious fires and the various units' availability. A "no occurrence" (designated by a blank cell) simply means that there were no building fires in the station areas listed where **all** of the units dispatched arrived at the incident.

Table 48—90th Percentile ERF Travel Time Performance:

Station	Overall	2013	2014	2015
Department-Wide	12:46 (11)	10:19 (2)	15:29 (4)	12:46 (5)
84	15:29 (2)		15:29 (1)	10:15 (1)
85	09:09 (7)	08:38 (1)	08:16 (2)	12:46 (4)
87	10:19 (2)	10:19 (1)	06:47 (1)	

Finding #14: The Department's travel time for the last needed unit to arrive at serious building fires, known as the Effective Response Force (ERF or First Alarm), ranging from 10:15 to 12:46, are longer than a NFPA 1710 recommendation of 8 minutes travel time for the last-due unit in urban/suburban populations. As with first-due units, the Department should adopt tiered ERF measures by population density.

This page was intentionally left blank

SECTION 6—SOC EVALUATION AND RECOMMENDATION

6.1 OVERALL EVALUATION

SOC ELEMENT 8 OF 8
OVERALL EVALUATION

The Department serves very diverse population densities and land use patterns, from higher-density urban uses to open rural ranchland and open spaces. In addition, the Department's non-grid road network and varying topography limit response travel times to many areas of the Department. Population drives service demand, and development brings population. The Department has historically funded high quality fire services, even during the recession, and continues to do so. Service demand within the Department is modest, reflecting the positive socioeconomics of the area.

The Department will need both a first-due firefighting unit and Effective Response Force (First Alarm) coverage available for all populated areas of the Department if the risk of fire is to be limited to the room(s) of origin, and/or wildland fires are to be stopped when small. While residential fire sprinklers are now included in the state fire codes, it will be decades before the existing housing stock will be upgraded or replaced, even as these codes are applied to all new construction.

While the volume and response times to EMS incidents consume much of the Department's attention, all communities need a "stand-by and readily available" firefighting force. For its current risks and likely desired outcomes, the Department has a sufficient quantity of fire engines (pumpers) and one aerial ladder truck spaced across the Department's most populated areas. However, serving all areas within national best practice recommendations for travel time on a non-grid road network, with hilly topography cannot be accomplished in a cost effective manner. There is not enough risk, incidents, or tax base to support more fire stations for what would be very few incidents per added fire station crew—in the existing urban/suburban population density zones.

However, the County could continue to approve developments that convert rural areas to urban/suburban population densities. Thus a population-density-driven response time policy will provide the Department a basis upon which to *add more fire stations if* the County's approvals of development add more urban/suburban population density zones. The Department should also have a "trigger point" policy for adding fire stations.

In addition to a trigger point for added fire stations, apparatus and crews, the Department must adopt and keep current new development impact fees so new development pays its fair share of capital costs per state law. Given the uncertainty of actual urban/suburban development at this writing in mid-2016, it is not practical to say exactly how many more fire stations the Department might need. Citygate reviewed the proposed new development plans the County is considering,

and IF all the proposed development were to occur, the Department will likely need to add 1-2 fire stations, plus apparatus and staffing, some of which will be dependent on the final road connections built to existing fire station service zones. For these issues Citygate will recommend the Department use its updated deployment time goals and on-going geographic modeling to show the County and development applicants what the Department's fire station requirements will be for various proposed plans.

There are many variables to adding fire stations, in addition to population, at build-out of a master planned community. These include the exact mix of development from housing to commercial/industrial risks, and the pace of development over the years. A typical recommendation of Citygate's is that when an added fire station will be required at build-out of a new area, that the station and crew shall be operational when 50% of the residential units are given occupancy final permit clearance.

At the present time, instead of adding infill fire stations to existing urban/suburban population density areas, Citygate will recommend the Department look at its staffing at Station 85 and increase it slightly to add more redundancy when Ambulance 85 is out of the Department serving the greater West Slope Ambulance JPA service area.

This regional stress on Ambulance 85 is one factor affecting the Department's ERF staffing for serious multi-unit incidents. The greater service area for Ambulance 85 also adversely impacts that unit's first-due travel time to both fire and EMS-related incidents *within* the Department. However, given the Department's paramedic staffing on its other fire units, and its ambulance mutual aid plan with Folsom, the negative ambulance *transport* capabilities impact is mitigated. But when Ambulance 85 is out of the Department, mutual aid is not timely for first-due staffing for serious fires or simultaneous incident coverage inside the Department.

6.1.1 Deployment Recommendations

Based on the technical analysis and findings contained in this Standards of Coverage study, Citygate offers the following overall deployment recommendations:

Recommendation #1: **Adopt Department Board of Directors Deployment Measures Policy:** The Department-elected officials should adopt updated, complete performance measures to direct fire crew planning and to monitor the operation of the Department. The measures of time should be designed to deliver outcomes that will save patients medically salvageable upon arrival and to keep small fires from becoming more serious. Such measures will provide the Department a basis upon which to add more fire stations if the County's approvals of development grow more urban/suburban population density goals.

Recommendation #2: **Adopt Response Time Goals Based on Population Density:**

The Department should adopt a two-tiered travel time population density driven goal:

First-due urban/suburban populations – 6 minutes travel time to 90% of the incidents.

First-due rural populations – 8 minutes travel time to 90% of the incidents.

First-Alarm units to urban/suburban populations – 9 minutes travel time to 90% of the incidents.

First-*Alarm units to rural populations* – 12 minutes travel time to 90% of the incidents.

Recommendation #3: **Specific Revised Deployment Goals**:

3.1 Distribution of Fire Stations: To treat medical patients and control small fires, the first-due unit should arrive within 9:30 minutes/seconds in urban/suburban areas, and 11:30 minutes in rural areas, 90% of the time from the receipt of a 9-1-1 call in the fire dispatch center.

This equates to a 90 second dispatch process time, a 2-minute

company turnout time, and the appropriate population density travel time of 6- or 8-minute travel time.

3.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires to or near the room of origin, to confine wildland fires to three acres or less when promptly notified, and to treat up to five medical patients simultaneously, a multiple-unit response consisting of a minimum of 3 engines, 1 ladder truck, 1 ambulance or squad, and 2 chief officers totaling 17 personnel within 12:30 minutes in urban/suburban areas and 15:30 minutes in rural areas, 90% of the time from the receipt of a 9-1-1 call in the fire dispatch center.

This equates to a 90 seconds dispatch process time, a 2-minute company turnout time, and the appropriate population density travel time of 9 or 12 minutes.

3.3 Hazardous Materials Response: Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the Department response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. It can achieve this with a travel time in urban/suburban areas for the first company capable of investigating a HazMat release at the operations level within 6 minutes travel time, 90% of the time. After size-up and scene evaluation is completed, a determination will be made whether to request a regional hazardous materials response team.

3.4 Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first company in urban/suburban areas for size-up of the rescue within 6 minutes travel time or less, 90% of the time. Assemble additional resources for technical rescue capable of initiating a rescue within a total response time of 12:30 minutes/seconds, for urban/suburban areas and 15:30 minutes/seconds in rural areas, 90% of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.

3.5 Emergency Medical Services: Provide fire unit paramedic services within 9:30 minutes/seconds urban/suburban areas and 11:30 minutes/seconds in rural areas, 90% of the time from the receipt of a 9-1-1 call in the fire dispatch center. The regional ambulance JPA will set the ambulance response time goals periodically.

Recommendation #4: **Relocation of Station 91:** As funds allow, proceed with the relocation of Station 91 to the site identified by the Department, at the best possible pace, given the poor conditions at the present station.

Recommendation #5: **Lower Dispatch Processing Time:** The Department and CAL FIRE Camino Dispatch must work on lowering fire and EMS dispatch processing times to national best practice goals. If, due to existing CAL FIRE technology and personnel costs, this cannot be achieved, the Department should explore a dispatch contract with the Sacramento Regional Fire Communications Center.

Recommendation #6: **Crew Turnout Time:** Maintain a crew turnout time maximum policy of 2 minutes.

Recommendation #7: **Increase Station 85 Staffing and Add an EMS Squad**: The Department should consider adding a fifth firefighter/paramedic per day to the Ladder 85 crew. Then provide a 2-person EMS squad unit and allow the crew to split when needed into a 3-person team (one of which is a firefighter/paramedic on the ladder and a 2-firefighter/paramedic team on the squad).

When Ambulance 85 is committed to an incident, or posted out of the Department, the EMS squad can provide additional paramedic care, or when the ambulance is available in the Department, the EMS squad can respond to low acuity medical calls that historically have not needed an ambulance transport. Doing so will increase the ambulance's capacity for serious incidents requiring transport.

If funding in the near term is not available for an additional firefighter, then the Department can consider splitting the current 4-person crew into two teams of two, one of which would staff an EMS Squad. If this were to be done initially, Citygate would caution the Department to restrict the EMS squad's service area to within 8-minutes travel time of Station 85 so that if the ladder truck were needed for a fire, the Squad could join up with the ladder truck quickly at another emergency.

Recommendation #8: The District should strive to maintain at least a 2-person staffing model at very rural stations, such as Station 91 and Rescue 83. Perhaps a 3rd position could be provided part-time from a stipend, apprentice/training program type of position.

Recommendation #9: **Adopt and Maintain Impact Fees:** The Department must adopt, and annually keep current, a new facilities and apparatus impact fee policy for new construction when the development cannot be serviced by the Department's adopted response time policies.

This page was intentionally left blank

SECTION 7—FACILITIES MASTER PLAN REVIEW

7.1 TRAINING CENTER PLAN REVIEW

Citygate Associates, LLC was asked by the El Dorado Hills Fire Department to specifically assess the Department Training Center Business Plan and analysis prepared by Interact Business Group, and to make recommendations that could be incorporated into the Facilities Master Plan.

Citygate reviewed both the December 2, 2015 Final Draft Plan of the El Dorado Hills Fire Department Training Center Business Plan, and the March 2016 updated El Dorado Hills Fire Department Training Center Business Plan. On April 13, 2016, Citygate met with Department staff and conducted an on-site review of the planned development, as well as reviewed other potential locations for a training facility at other Department stations.

7.1.1 Application of Best Practices

Overall, Citygate finds the March 2016 plan to be generally consistent with current best practices for training facilities. On page 28 (Table 3) of the plan, the National Fire Protection Association (NFPA) is mentioned as an agency that sets forth standards.

7.1.2 SVORT (Solid, Verifiable, Ongoing, and Realistic Training)

When Citygate reviews a training facility plan, in addition to reviewing the application of best practices, we evaluate whether the proposed training is solid, verifiable, ongoing, and realistic. If the training plan cannot meet those four criteria, it is likely not worth the investment. Therefore, the question becomes, "Will this training site development meet that criteria?"

Solid

The training plan presents a comprehensive list of fire service training in Table 6 – Class List by Name. This list identifies the knowledge, skills, and abilities (KSAs) normally expected of firefighters. If the KSAs are applied, a solid training foundation will be established for the personnel.

Verifiable

The shift battalion chiefs are in charge of each shift and responsible for ensuring that training is completed on their respective shifts. The Department has an established "Mandated Training Policy" and its training program generally follows the guidelines and standards issued by national, statewide, and regional recognized training certification bodies such as the NFPA, the California Office of State Fire Marshal (OSFM), and the El Dorado County Emergency Medical Services Authority (LEMSA). Some agencies, such as OSFM, audit the training to ensure that it follows the guidelines.

Ongoing

One of the training challenges for the Department has been the inability to complete some of the training due to the lack of a facility. For example, 39.1% of the training hours in the category of "desired training" are not being completed due to a lack of facilities. Also, 71% of the required annual training is not being completed.

Completion of the training facility will provide the necessary space and props so that companies and individuals can complete their required training in a safe and secure environment under the guidance of qualified trainers.

Realistic

One of the key elements of the plan is that the scope of the project is focused on the unique needs of the Department. The Training Center Business Plan contains a diagram of the planned facility and a list of the features and props that would be used if the plan were developed. Overall, these are consistent with training center planning and not out of line with the needs of the Department. Nevertheless, Citygate recommends several modifications to the plan which would make it more consistent with the fire and emergency services risk found in the Department and develop it into a "total training environment." These suggestions are discussed in more detail in this report.

7.1.3 Facility Use by Other Agencies

While the Training Center Business Plan lists a significant number of hours that the facility could or would be in use, even under the best of circumstances, the facility will be unused most of the time if solely devoted to the Department's use. The training props are primarily designed for firefighters; however, the training tower and some of the training areas could be utilized by law enforcement agencies. The classrooms could be utilized for a number of different groups: public, civic, and private. Within a 15- to 20-minute travel radius are a number of fire, law enforcement, and other agencies that would likely occasionally desire to use part of the facility. Department staff has indicated that they are considering the possibility of other agencies utilizing the facility in the future, but have not developed the policies needed for this to occur. According to staff, the policies in the plan are generic and need to be revised before the facility is opened for business, as does a fee schedule to recover usage, maintenance, and repair costs and provide for replacement of props. This is an expensive project and the Department needs to be able to recover its costs and protect itself from liability when other agencies and groups use the facility.

7.2 FACILITY LOCATION REVIEW

For a training facility of the magnitude envisioned in the Department's plan to be of any value, it must be close enough to the agency's area of responsibility that two or three companies can practice at the same time and not put the agency at risk. Large departments do this by using a

"move up and cover" strategy where fire suppression resources are temporarily reallocated to provide coverage in empty station areas. A small agency, such as the Department, with only six stations, does not have the depth of resources to provide that type of coverage. According to Table 49 on the following page, if two companies were to travel to one of the nearby facilities to practice multi-company operations, and a fire started in their coverage area, in the best of circumstances it would be almost 30 minutes before they arrived back within the Department.

One of the key issues surrounding the development of a training facility such as this revolves around the availability of other similar training facilities that could be used within a reasonable distance. Most departments are uncomfortable with a single, in-service company more than 20 to 30 minutes away while training without adjusting coverage. The three training facilities that generally are equivalent to El Dorado Hills' planned facility are 37 to 38 minutes away under ideal traffic conditions.

As stated in the plan, "The vast majority of classroom and hands-on training is completed while personnel are on duty and subject to emergency response throughout the Department. This fact dictates that personnel remain in the area, ready to respond immediately. Therefore, essential training buildings, props, and assets should be readily available to the on-duty crews within the Department." Citygate agrees with this statement as the Department must maintain response times when units train.

One company could travel outside the Department, as long as it could return in 30 minutes or less, meaning that the South Placer Fire Protection District's (SPFPD) small facility at its headquarters in Granite Bay is the only facility available. Other nearby facilities are simply too far away. As importantly, that the type of training that would need to be completed at these remote training facilities are impractical for a single engine company evolution. Meaning, at least two engines would need to travel to the remote training sites to accomplish realistic training evolutions (e.g., hose above ground, standpipe operations, etc.)

At 23 minutes travel time to SPFPD, the Department could risk one engine being out of the Department for three hours of training, plus a half hour travel time back and forth. However, a major training need for the Department is conducting multi-company evolutions. Taking two engines out of the Department for this length of time, with a return time of about 30 minutes (including picking up tools and hose), leaves the Department too vulnerable. By contrast, the proposed EDHFD facility would accommodate multi-company operations and companies could quickly cover vacant stations or respond to an incident.

Table 49—List of Nearby Training Facilities and their Distances and Travel Times[1]

Facility Agency	Location	Travel Time in Minutes	Distance in Miles
El Dorado Hills Station 87	468 Golden Foothill Parkway, El Dorado Hills	0	0
South Placer Fire Protection District	6900 Eureka Road, Granite Bay	23	15
CAL FIRE Academy	4501 CA-104, Ione	34	27
Sierra College	4975 Sierra College Blvd., Loomis *Planned training facility*	37	21
Roseville Fire Department	2030 Hilltop Circle, Roseville	38	23
Cosumnes Fire Department	10573 East Stockton Blvd., Elk Grove	38	28
Georgetown Volunteer Fire Department	6281 Main Street, Georgetown	47	31

[1] All travel times and distances were taken from Google Maps under ideal conditions and reflect travel from the El Dorado Hills Station 87.

Given the distance to the other facilities in the region, there is a great likelihood that other nearby fire agencies will want to utilize the Department's training facility. There are seven or eight fire agencies in El Dorado County, the Folsom Fire Department, and the Sacramento Metropolitan Fire District, all with stations close enough to benefit from this facility once it is developed.

One of the other issues raised in this review was the ideal location of the training facility and whether the suggested location on the property of Station 87 (4680 Golden Foothill Parkway, El Dorado Hills), or another Department-owned facility, would best meet the Department's needs. The Department staff shared with Citygate the short analysis titled *Pros/Cons of Station 86 Versus 87* for the location of the training facility.

As shown in Table 50, Citygate examined the travel time to training as a factor in determining which site is preferable.

Table 50—Distances from El Dorado Hills Fire Stations to the Training Facility[1]

Station	Address	Time in Minutes to 87	Distance in Miles to 87	Time in Minutes to 86	Distance in Miles to 86
84	2180 Francisco Drive, El Dorado Hills	12	6.5	7	3.3
85	1050 Wilson Blvd., El Dorado Hills	8	3.1	8	4.4
86	3670 Bass Lake Road, El Dorado Hills	13	6.8	0	0
87	4680 Golden Foothill Parkway, El Dorado Hills	0	0	9	5.3
91	7660 South Shingle Road, Shingle Springs	11	7.3	17	12
92	7400 Ryan Ranch Road, Shingle Springs	6	3.6	13	8.2
	Average Travel Time to Training	**10**		**11**	

[1] All travel times and distances were taken from Google Maps under ideal conditions.

The difference is minor, but as more stations are added to the south of the current Department boundary, the Station 87 site will best serve the Department. If more stations are added to the east, the Station 86 site will best serve the Department.

Finding #15: **Training Center Site:** After visiting both sites, clearly the Station 87 site is preferable. There is plenty of room to develop and expand, it is in a commercial zone as opposed to the residential zone of Station 86, and the Department already obtained a local Special Use Permit.

7.3 TOTAL TRAINING ENVIRONMENT CONCEPT

In order to maximize the value of the training facility, its development and design has to incorporate the *total training environment* concept. In the total training environment concept, every aspect of the training facility is focused on training and imparting knowledge, skills, and abilities about the culture, traditions, policies, procedures, and methods of the Department. In a total training environment, photographs on the wall and artwork are just as important as the lesson plan and instructor. The facility's development also should incorporate interactive emergency operations and firefighting "*games*," and ever-changing videos to be modern and relevant and provide multiple learning methods to reinforce critical training concepts for firefighters. If the training center is properly developed, a firefighter entering the facility for a visit of any purpose will leave with some new knowledge, skill, or ability he or she did not have before entering.

In the total training environment, every firefighter is an instructor and has an opportunity to share lessons learned on the last fire, traffic collision, rescue, or medical emergency through a variety of mediums. The culture then becomes one of learning and teaching.

Finally, in the total training environment, the facilities themselves reflect the typical and atypical hazards that are present in the community the department serves. While the frequency of fire occurrence is down considerably, primarily due to modern prevention codes and guidelines, the frequency of firefighter deaths in fires has almost doubled since the 1970s. This is due to a combination of factors: less frequent fires mean fewer opportunities to practice necessary skills; modern furnishings and finishes are more combustible because the use of synthetics; modern residences are larger than legacy (pre-1970) structures; and many of the modern construction techniques do not hold up well when exposed to fires. Solid, verifiable, ongoing, realistic training is the key to managing these risks so that firefighters go home to their families at the end of each shift.

7.3.1 Training Grounds

The site itself should be developed to replicate the real life environment of El Dorado Hills as much as practicable. Grading, landscaping, and placement of buildings and props should all be carefully considered in the overall site design.

Recommendation #10:	**Training Center Physical Design:** When grading the area for the training facility, leave as much untouched as possible. Build up a fairly steep embankment where the live fire training burn building is to be located. Utilize the entry driveway to simulate the varying grade curved roads, intersections, and divided roads found in El Dorado Hills. This will create much more realistic challenges for auto extrication and vehicle operation training. As the name implies, very little of El Dorado Hills is flat. The hands-on training ground should be sloped so that local terrain is always at the forefront of the firefighter's mind in training and on duty.

7.3.2 Two/Three-Story Commercial and Residential Burn Building

Some of the most dangerous risks to firefighters are the large homes that are found throughout the area. They have the characteristics of a small commercial building with one important difference: people live there. Flashover in a large open space such as a 2,000-3,000 square foot living room is quite different than flashover in the average single-family dwelling. It is much easier to get lost in these buildings in the dark and smoke, and since they are residences, it is unlikely the firefighters have had a chance to inspect or tour them. Many of these homes have unique features such as elevators and indoor swimming pools. The contents are often highly valuable, the security systems are unique, and there are too many other possible valuable features to describe. While it is not feasible to develop a live fire burn building the size of a mansion, the two/three-story live fire building could have a much larger footprint, three or four times larger than its current 735 square feet. With movable walls, such a facility could come much closer to imitating the kinds of challenges faced in these large structures.

While in-fill is taking hold in larger cities, suburban communities are developing their own centers and identities, and large commercial structures are being constructed in suburban communities. El Dorado Hills is no exception. Multi-story and tilt-up concrete walled commercial office and manufacturing structures are found in the flatter parts of the community. These present another set of challenges to firefighters that need to develop the knowledge, skills, and abilities to combat the rare but occasional fire that occurs.

Figure 21—New Commercial Developments

New commercial developments present big city fire problems to suburban fire agencies.

Figure 22—Tilt-up Construction

Tilt-up construction, as shown in this example, often have large expanses of open space where fires can spread, flashover is more intense, roof ventilation is required to remove smoke, and firefighters can easily lose their sense of direction in the smoke.

7.3.3 Ascending and Descending Homes

Not only are ascending and descending homes large, they are also situated on hillsides and labeled by firefighters as "ascending" or "descending."

Figure 23—Typical Ascending Home

In a typical ascending home, the top of the house is about five stories from the street level requiring the aerial ladder for access. In some cases, it is faster to use the ladder for front-door access and water supply.

As a rule, ascending homes are located above the street and require "ascending" the driveway to reach the front entrance. Ascending homes pose challenges to firefighters because fire suppression tools and supplies need to be carried up to the fire scene by hand since most driveways are not designed to accommodate a fire engine.

By contrast, descending homes are generally located below the road.

Figure 24—Typical Descending Home

In a typical descending home, the driveway is not adequate for a fire engine and all hose lines, tools, ladders, and other equipment must be carried down from the street.

Descending homes pose challenges to firefighters because entry into the home occurs above the fire, which is often the most dangerous place to be. Otherwise, hose lines need to be stretched around to the lower side of the house.

Figure 25—Descending Home with Top Story at Street Level

In a descending home with the top story at street level, if a fire occurs in any of the lower floors, firefighters will be entering the fire building above the fire, which is the most dangerous place to be.

Recommendation #11: **Live Fire Training Building Design:** The residential live fire burn structure should be developed so that it is set into a hillside to present both the ascending and descending aspects of structures in El Dorado Hills. This will be a challenge, but it is achievable. Such a live fire burn structure would be unique and costlier than the one proposed in the existing training plan; however, it would reflect the reality that firefighters face in these unique structures. It would also be a draw for firefighters from throughout the region who are faced with similar challenges. Moreover, simultaneously it could be used for the more commonly-found residential structures, as well as modern apartment buildings.

7.3.4 Four-Story Drill Tower Training Building

The four-story drill tower training building must have a large enough foot print that each side can represent a unique aspect of the common taller buildings in El Dorado Hills. Features such as window size and placement, wall type, balconies, and parapets all create challenges for firefighters.

Figure 26—Four-Story Tower

A four-story tower is needed to replicate the challenges found in a four-story building.

7.3.5 Classroom Building

Clean and practical classroom size are both listed in the plan at 35 students. The Office of State Fire Marshal (OSFM) allows as many as up to 40 students to be in a class depending on the course, and the Federal Emergency Management Agency (FEMA) allows up to 32 students, with two instructors if more than 15 students are in the class. Building a classroom large enough to accommodate 40 students creates the ability to train more people with any given curriculum.

Recommendation #12:	**Training Center Staff Spaces:** Eventually, full-time staff will need to be assigned to the training facility. While that may seem to be in the distant future, with current growth rates, it could be needed soon. Training officer and staff facilities should be built into the classroom building from the start.

7.4 REVIEW OF BEST PRACTICES

National Fire Protection Association (NFPA) 1042 *Guide to Building Fire Service Training Centers* is the current best practice for the development of a training facility such as the one the Department is considering. Citygate's review of the training plan finds it generally in compliance with NFPA 1402, although no mention is made of this best practice in the plan.

A review of the plan indicates further study should be considered on the following from NFPA 1402:

7.4.1 Cost considerations:

(5) Staffing, (7) Maintenance, and (8) Utilities – The facility will require regular maintenance. The Department cannot rely on the adjacent station personnel to perform janitorial work at the facility because the station personnel will be away on calls. Estimates are made in the plan for maintenance; however, the estimates appear low to Citygate. We suggest the Department check with other nearby training facilities to confirm the estimates or provide a more accurate estimate. No mention is made of utility costs. The Department already plans to validate the maintenance estimates.

7.4.2 General:

Citygate suggests the Department reconsider the following spaces and functions which appear to be absent from the plan:

(1) Administration and support facilities components
   - (a) Offices
   - (b) Conference rooms
   - (c) Library
   - (d) Food service facilities
   - (e) Locker facilities

(2) Indoor instructional facilities components
   - (a) Storage facilities, there never seems to be enough

(3) Outside facilities components
   - (a) Helicopter landing site

NFPA 1402 should be referenced constantly during the development of the training site. It provides guidance to the Department that will act as the basis for checklists as the site is developed, the classroom is built, and the props are erected.

Recommendation #13:	**Training Center Construction Phasing:** The construction of the training center could be split into two phases – props and classroom/office.

It is common with training centers to phase their construction based on the working capital needed to construct them. Some uses may be more attractive to contract agency users, and those could be programmed into the first phase to increase cost recovery fees. The final phasing is a cost of funds issue—cash up front, or in phases, versus use of debt financing with the resultant payments over one or two phases. Splitting the center into phases also must not be substantially costlier than doing it all at once. Professional design and cost estimation consultants can assist with this.

The Department is to be commended for investing in a professional business plan for development of its training center. Except for the few recommendations made in this document, the plan appears sound and well considered. If the Department proceeds with this plan, it will have a professional training facility.

SECTION 8—STRATEGIC PLAN REVIEW

8.1 EXECUTIVE SUMMARY

The Department engaged Citygate Associates, LLC with the task of reviewing its current strategic plan. The current plan, dated 2016-2021, originated in 2012 and was adopted in 2013. The original planning process was facilitated by the Center for Public Safety Excellence (CPSE) and followed the Center's standard planning model. Each year, on or about the anniversary date of the plan, the Department holds an update session with the Core Strategic Planning Group (Planning Group) and a Board Committee. During this session, the plan is updated by reviewing progress on each goal, and if criteria is met, that goal is closed out. Simultaneously, new goals the Planning Group deems important are added to the plan. Then the plan is submitted to the Board of Directors (BOD) for re-adoption. It is a living document that is always under revision.

To date the Department has completed three of the original six goals, and added two new goals. The plan is now under its third revision. It was recently approved in January 2016 by the BOD.

The strategic planning process Citygate uses is called Applied Strategic Planning (ASP), a planning model based on the work of J. William Pfeiffer, Timothy M. Nolan, Leonard Goodstein, and Jeanette Goodstein. This model has much in common with the CPSE model, as well as some significant differences which lead to different outcomes. In fact, the CPSE model utilizes portions of ASP. A direct comparison of the outcomes of the planning processes is impossible because the models are so different, however, ASP is routinely a very challenging, rigorous process that regularly results in effective, successful plans, and often fundamental, positive changes in organizational operations.

From Citygate's perspective, strategic planning should be a process by which the guiding members of an organization envision its future and develop necessary procedures and operations to achieve that future. In other words, the strategic plan provides a way for the organization to create its own future. This is the basis for Citygate's evaluation of the plan.

In summary, Citygate's review revealed the following strengths and weaknesses of the current plan. These strengths and weaknesses are detailed in the following sections.

8.1.1 Current Plan Strengths

Citygate compliments the Department for taking on the challenge of strategic planning. Despite the fact that Citygate identified some limitations and opportunities for improvement, the fact remains that the Department's strategic plan is a bold step in the right direction, and gives structure to the Department's continued improvement.

Some of the strengths of the Department's strategic plan include the following:

- The plan engaged the "community" as the major stakeholders in the process. Community members were given an opportunity to make suggestions and help set the agenda for the future.
- It appears that the planning is continuous, as some of the goals have been marked "completed," and two new goals have been added.
- Community expectations are listed in priority order, which could lead to some important planning issues. This list of community expectations could be strengthened further by consolidating the similar expectations and creating a shorter, but more memorable list.
- The planners identified six strategic initiatives that formed the basis for the goals and objectives developed in their detailed plan. They also identified, by name, the individuals responsible for performing the follow-up work on Goals 1, 2, and 5. This creates ownership for the completion of those goals.
- Goals 7 (Improve Patient Transport) and 8 (Volunteer Program) were added to the plan to replace goals in the plan that were completed. This was part of the ongoing planning process by the Planning Group.
- The stakeholders maintain high expectations that the Department put customer service first, which seems to compare well with the number of positive comments on customer service.

8.1.2 Current Plan Limitations

The Department's Strategic Plan is not perfect. However, *no plan is*. Once a plan is put to use, conditions change; for a plan to be viable it must be updated. These limitations are presented to help the Department as it updates its plan and for any future planning effort.

- The operating philosophy of the organization is not described in the plan. Operating philosophies provide planners with guidance and direction for the planning process. Even if the Department acquires new leadership, and/or the operating philosophies change, there is still a discernable starting point for re-planning.
- An organization often needs to make some fundamental change(s) before it can proceed with implementing a plan. This could be a simple as the way it processes some paperwork, or as complex as hiring a new chief executive. These actions are called *strategic thrusts*. The strategic thrusts are not identified as such in this plan. However, these changes were identified in the Goal/Objective section of the plan. Citygate recommends identifying the Strategic Thrusts separately from the Goals and Objectives.

- In the list of stakeholders' names, there is no clear identification of their occupations, civic standing, or other information regarding their connection with the Department.
- Listing all the community expectations and concerns is valuable background information, but consolidating similar comments and developing weighted measures of their importance could have led to more focus on the community's concerns. This is a common practice in developing consensus.
- There is no description of the briefing that community members received as part of the process.
- Table 3 of the Department's strategic plan lists similar comments in priority order, which is helpful in understanding the Community Expectations. By contrast, Tables 4, 5, and 6—Areas of Community Concern (page 11), Positive Community Feedback (page 14), and Other Thoughts and Comments from the Community (page 17)—appear to be random lists of comments from the stakeholders. Consolidating the comments in each and ranking them would have increased their value as part of the planning process.
- The Department's plan encompasses a 5-year planning horizon; Citygate believes that at this point, with pending new development before the County, a 5 to 6-year plan is sufficient.

8.1.3 Overall Evaluation

The current plan is adequate to serve the needs of the Department over the life of the plan, if the goals and objectives are thoroughly developed, regularly reviewed, and updated as conditions and opportunities arise.

The objectives of Goals 1, 2, and 5 should be detailed as completely as the other goals. It appears that some goals were more "favored" than others by the planning staff, and/or the planning staff ran out of energy to invest in the others. This is disconcerting because Goal 1, *Community Relations*, was the most frequently mentioned expectation of the community.

Both the areas of Community Concern (Table 4) and Positive Community Feedback (Table 5) may be based upon a lack of, or incorrect, information. There is a tendency of organizations to look at positive feedback as something it earned, while in fact it may be due to brand misidentification, or a positive feeling about the fire service in general. The data in these tables could be the opinions of one or two highly vocal people, or they could be widely held opinions. The data needs to be critically analyzed to understand its origin and true value.

Recommendation #14:	**Strategic Plan Life Span**: By 2019, the Department will have had six years' experience with its strategic plan. It will be time to start thinking about the process it will use to thoroughly update the strategic plan. The Department should consider updating the plan with a more rigorous approach that would actually *plan the future rather than plan for the future*. This effort would bring about the following improvements in the plan: (1) it would allow a variety of futures; (2) it would guide the members of the organization to envision the future and develop the necessary procedures and operations to achieve that future; (3) it would develop a strategic management process; and (4) it would extend the planning horizon.

8.2 STRATEGIC PLAN STRENGTHS

Strategic planning is an important step for any organization to take. It is the first step in the organization's efforts to begin to understand why it is heading a given direction, how it is getting there, and what the outcome will be. We call this the *why, how,* and *what* model. The "why, how, what" is an inspirational model, and is the way that Citygate approaches these messy challenges to attain some clarity and to intuitively understand the important issues. While unforeseen circumstances always arise, those that plan their future, follow that plan, and continually update that plan have a much higher likelihood of success. That is why simply having a plan in place is important; it can always be adjusted and updated over time.

8.2.1 What Strategic Planning Provides the Organization

Strategic planning provides organizations long-term direction. The length of the term is a decision of the Planning Group; usually it is eight to ten years. The Department chose a term length of five years; if the plan is updated annually, this planning period should suffice. Unfortunately, many organizations will develop a 5-year planning span and forget to update it regularly. Thus, at the end of the planning term, the plan has little resemblance to reality.

Six critical factors must be understood about strategic planning:

1. Strategy is a coherent, unifying, and integrative pattern of decisions.
2. Strategy is a means of establishing an organization's purpose in terms of its long-term objectives, action plans, and allocation of resources (the real test of a plan is when funds are expended to make the plan come to fruition).

3. A definition of the organization's competitive domain: what business it really is in.
4. It is a response to internal strengths and weaknesses, and external opportunities and threats.
5. It becomes a logical system for differentiating executive and managerial tasks and roles so that structure follows function.
6. A way of defining the economic contribution the organization will make to its stakeholders.

The Department's strategic plan satisfies items 1, 2, 4, and 6 of this list. This is an excellent starting point, and, for many agencies, as far as they ever go. Items 3 and 5 on the list are more nuanced and elusive, unless the planning process specifically identifies them as critical parts of the plan's outcome.

It is not surprising that the Department did not specifically identify what business it really is in. This is often difficult for fire agencies because they think that everyone already knows what business they are in. However, after serious introspection, they often come to the realization that their business is not always exactly what they thought, particularly in terms of strategies.

Once the lines of service of the organization are identified, it is an easy next step to develop an organization chart that supports those strategies with proper executive and managerial roles. Fire service organizations are generally quite good at supporting their emergency response organizations, and generally less so assisting their support functions. A good way to understand this is to look at which functions are eliminated during an economic downturn.

8.2.2 Strategic Thinking

Strategies are the big, long-term activities of the organization. For fire service organizations, these are usually lumped into three groups: core services of fire protection (e.g., prevention and response programs); additional services within the agency's capacity (e.g., EMS, technical rescue, hazardous materials response, mutual aid); and support services (e.g., training, payroll, human resources, information, legislation, legal affairs). Some agencies, particularly if they are in the ambulance transport business, will identify EMS as its own separate strategy. Usually these three or four strategies are adequate to provide long-term strategic direction to the entire organization.

"Strategic management is not a clean, step by step process. It is not linear, but a messy, iterative process that requires hard work and dedication from most people in the organization to move it toward the future. It represents a new focus for the organization; a focus on a compelling vision of the future," according to Strategic Management for Senior Leaders: A Handbook for Implementation by Denise Lindsey Wells, Director, Executive Support Division, Department of the Navy Total Quality Leadership Office.

8.2.3 Community Engagement

The plan engaged the "community" as the major stakeholders in the process. Community members were given an opportunity to make suggestions and help set the agenda for the future. It is valuable to include the community in the planning process; it is ultimately these stakeholders who receive the services and pay the bills. Its voice must be compelling.

Community expectations are listed in priority order, which could lead to some important planning issues, particularly after the similar expectations have been consolidated. Consolidating the expectations would have led to the planning priorities. For example, seven of the expectation comments related to training, while 23 of the comments related to the treatment of the community members by the Department personnel. From this, it appears that while training is important, it may be that much of that training needs to be focused on how the Department interacts with the community. Granted, Goal 1 of the Department is Community Relations. However, according to the plan, this goal was completed in February 2015.

8.2.4 Continuous Updating

Keeping a plan alive through continuous updating is one of the most critical factors in having a successful plan. If there is no follow-through, confusion arises at the operational level. This result could lead to cynicism about any improvement efforts.[25] It requires leadership commitment to ensure that a plan is updated. There are always other issues that impede progress and require management effort.

It appears that the Department planning effort is continuous, as some of the goals have been marked "completed," and has added two new goals. The Department should be pleased with its efforts to keep the plan up to date. Charging the Planning Group with that responsibility upon plan completion is an effective way to keep the plan alive. After all, the group that primarily developed the plan will likely want to see the plan be successful.

8.2.5 The Plan's Strategic Initiatives

The planners identified six strategic initiatives that formed the basis for the goals and objectives developed in its detailed plan. It also identified, by name, the individuals responsible for performing the follow-up work on Goals 1, 2, and 5. This created ownership for the completion of those goals.

[25] Op cit. Denise Lindsey Wells

While Citygate's approach would have identified the initiatives differently so as to connect them to the agency's functional organization, this is a reasonable list and approach and will provide guidance for the future.

8.3 STRATEGIC PLAN LIMITATIONS

Citygate identified limitations in the Department's strategic plan that could be remedied in a plan revision. While it might not change the plan's outcomes, making these revisions would result in a more credible plan.

8.3.1 Operating Philosophy – Guiding Principles

The philosophy of an organization that guides the behavior of its members in the planning process is the operating philosophy, or what we like to label as the organization's guiding principles. During plan development, the guiding principles help the planners by providing a framework and direction to the planning effort. As the plan is updated, the planners refer to these principles to ensure that each goal and objective is consistent with the principles. The following are three examples of guiding principles that could apply to a strategic plan.

- There is a greater need for training in basic firefighting skills due to the inexperience of today's entry-level firefighters.
- The Emergency Medical Services Authority and local medical authority is responsible for developing paramedic, emergency medical technician, and first responder Quality Assurance Standards.
- In accordance with statute, arson fires will be thoroughly investigated by the Department.

These are simply examples. Every organization has them; they are not always embodied verbally and it may take thoughtful consideration to develop them. Often they are the result of agency history, or they come from the governing body of the agency. Typically, fire service agencies will have between five and ten guiding principles.

8.3.2 Strategic Thrusts

Organizations frequently develop strategic plans, but the plans do not move the organizations in the direction the planners intended; for some reason, the plans flounder. This is usually because the organization is not ready to embrace the plan, and some basic work needs to occur first; changes in the organization need to take place. In strategic planning, these steps are labeled *strategic thrusts.* They are structural changes that an organization must undertake before it can proceed with implementing the plan. Examples include:

- Making changes or additions to the organizational structure at the leadership level.
- Complete the activation of new computer software that will allow tracking of project progress and/or completion.
- Becoming a data driven organization.
- Operating in the reality of limited resources by making a sound business case for every action.

The Department addressed these issues in the Goals/Objectives part of the plan, however, Citygate recommends identifying the Strategic Thrusts separately from the Goals and Objectives.

8.3.3 Stakeholder Identification

While their names are listed, the relationship of identified stakeholders to the Department is not. For example, whether a stakeholder is a business, or resident, etc., should be identified. The stakeholders should be a cross-section of homeowners, business people, service club members, local officials, and similar types of individuals, so that they truly represent the community. The community stakeholders in the Department's current strategic plan could be fire service family members, or they could be entirely members of the community who have no relationship to the fire service, or some mix of both. According to Department staff the stakeholders from the community were a mix of homeowners, business owners, service club members, local officials, non-profits, etc. If privacy is an issue, Citygate recommends using generic associations, such as "three local small business owners," or "one manager of a non-profit," rather than the names of the individuals. If the stakeholders are not truly a cross-section of the community, that could skew the data and resultant conclusions. Such identification adds further credibility to the plan.

If the Department had consolidated the community expectations, and was trying to meet community expectations, Goal 1 (Community Relations) should have been much more developed in the plan than Goal 3 (Training). However, the Community Relations goal is only slightly developed, and could lead readers to believe that Community Relations is not as important to the Department.

Without a thorough understanding of the fire service and its workings, it is also very difficult for community members to come in "fresh off the street" and make sensible recommendations. According to staff, the stakeholders received a very thorough briefing on the services and activities of the agency, as well as a tour of facilities. This allowed the community members the opportunity to make more sophisticated and in-depth suggestions. Citygate suggests that the briefing and its basic content be mentioned in the next edition of the plan.

Areas of community concern, positive community feedback, and other thoughts and comments from the community are not listed in any priority order, which diminishes their value as part of the planning process.

It is very common for organizations to intend to put most of their plan into effect in the first one or two years. During the planning process, enthusiasm is high and the energy level makes it easy to commit to too much. After the initial enthusiasm wears off and the organization goes back to facing its daily challenges, finding time and energy to execute the plan is difficult. It is often more successful to spread out the plan's execution.

The Department is to be commended for taking the continuous updating approach. All too often goals and objectives for years one and two get met and after that the plan finds itself shelved while other activities take priority.

Strategic plans often take 5 to 10 years to implement fully. With this in mind, do not begin all of the objectives in the first year or two. There are never enough resources to do that, and it is important not to neglect the organization's current mission-sustaining work.[26]

[26] Op cit. Denise Lindsey Wells

8.4 COMPARATIVE EVALUATION

To provide a clear distinction between planning processes, Citygate developed a side-by-side comparison of the two planning models. The Department utilized *Community-Driven Strategic Planning Process*; Citygate uses *Applied Strategic Planning.*

The Community–Driven Strategic Planning Process Outline	Applied Strategic Planning
The specific steps of each process are as follows:	
1. Define the programs provided to the Community.	**Plan to plan** – understand the planning process
2. Establish the Community's service program priorities.	**Values Scan** – values always trump strategy. Clarifying values is contentious, but essential. 1. Individual values 2. Organizational values 3. Operating philosophy – guiding principles 4. Organizational culture 5. Stakeholders
3. Establish the Community's expectations of the organization.	**Vision of the future** – stretch the organization to envision a future that really moves it forward; it should be edgy and uncomfortable.
4. Identify any concerns the Community may have about the organization.	**Mission Formulation/Clarification** – who we are, what we do, who we serve, how we serve, why we exist. Reflects the driving forces and distinctive competencies of the organization.
5. Identify the aspects of the organization that the Community views positively.	Concurrent with the planning process are two critical steps: 1. **Environmental Monitoring/inputs** – being aware of both internal and external data and forces that constantly shape the planning effort. 2. **Application considerations/outputs** – acting promptly to respond to a threat or opportunity. Throughout the life of the plan the unforeseen happens creating great opportunities to move forward or to respond to organizational threats; the plan should have flexibility built into it to accommodate.
6. Revise the Mission Statement, giving careful attention to the services and programs currently provided, and which logically can be provided in the future.	

The Community–Driven Strategic Planning Process Outline	Applied Strategic Planning
7. Revise the values of the organization's membership.	**Strategic business modeling** – how the organization can and will fulfill its intended goals; how it will fulfill its mission. 1. Identify the major lines of service (LOS) that the organization has in place or will develop to fulfill its mission; these become the strategies. 2. **Establish critical success indicators** – what does success look like in each LOS. 3. **Strategic thrusts** –certain organizational factors may prevent the organization from executing the plan. Examples are: headquarters reorganization or up-to-date software. 4. Determine what culture is necessary for the organization to achieve success. Changing the culture is extremely difficult.
8. Identify the strengths of the organization.	
9. Identify any weaknesses of the organization.	
10. Identify areas of opportunity for the organization.	
11. Identify potential threats to the organization.	
12. Identify the organization's critical issues.	**Performance Audit** – develop an understanding of the organization's capacity to move forward (bandwidth). 1. **LOS Analysis** – determine which LOS are successful or likely to be successful and which are doing poorly or likely to do poorly. 2. **SWOT Analysis** – determine internal strengths and weaknesses of the organization and external opportunities and threats to the organization. 3. **Competitor Analysis** – determine what the competitors are doing to affect the performance.
13. Identify the organization's service gaps.	
14. Determine strategic initiatives for organizational improvement.	
15. Establish realistic goals and objectives for each initiative.	
16. Identify implementation tasks for the accomplishment of each objective.	**Gap Analysis** – the ideal future should require the organization stretch. At this point priorities are also set because all gaps cannot be closed simultaneously.
17. Determine the vision of the future.	**Integrating Action Plans** – similar in concept to an incident action plan, action plans establish overall strategies, set goals to close the gaps from the gap analysis, develop objectives to reach the goals in an organized manner, assign resources and responsibility for completion, and establish a feedback loop to track progress and adjust the plan over time.

The Community–Driven Strategic Planning Process Outline	Applied Strategic Planning
18. Develop organizational and Community commitment to accomplishing the plan. Values driven strategic planning.	**Contingency Planning** – while the strategic plan is based on what is likely to happen and affect the organization, there are many events that could affect the plan; these should be listed.
	Implementation – this is the payoff for the planning effort; it is why it is so important to consider the organization's bandwidth to implement the plan and set priorities.

SECTION 9—NEXT STEPS

9.1 NEXT STEPS

The purpose of this assessment is to compare the Department's current performance against the local risks to be protected, as well as to compare against nationally recognized best practices. This analysis of performance forms the base from which to make recommendations for changes, if any, in fire station locations, equipment types, staffing, and headquarters programs.

As one step, the Department should adopt updated and best-practices-based response time goals for the differing population density areas served in the Department, and to provide accountability for the Department personnel to meet those standards. The deployment recommendations in this study are designed to meet the Department's topography and road network design on its rolling hills. Measurement and planning as the Department continues to evolve will be necessary to meet these goals.

Citygate's recommends that the Department's next steps be to work through the issues identified in this study over the short-term:

9.1.1 Short-Term Steps

- Absorb the policy recommendations of this fire services study and adopt updated Department performance measures to drive the deployment of firefighting and emergency medical resources.
- Work to reduce dispatch time to critical incidents, and keep crew turnout times to less than 2-minutes.
- Consider funding the recommended increased staffing and squad proposal for Station 85.
- Update as necessary the Department's Capital Impact Fees for new development.
- Maintain, with annual updates, the Department's Strategic Plan.
- Consider the Training Facility recommendations for tailoring the plan to El Dorado Hills' unique needs, and estimate cost to determine if the project can and should be fiscally phased over time.

This page was intentionally left blank

APPENDIX A

RISK ASSESSMENT EXHIBITS

This page was intentionally left blank

Table 51—Impact Severity Factor Evaluation Criteria – Building Fire[1]

Impact Severity Factor	Score	Scoring Guidelines
Building Construction	0	≥90% of buildings are protected non-combustible construction (Type II-A) or better
	1	≥90% of buildings are unprotected non-combustible construction (Type II-B) or better
	2	≥90% of buildings are protected combustible construction (Type III-A) or better
	3	≥75% of buildings are unprotected combustible construction (Type III-B) or better
	4	≥75% of buildings are protected wood-frame (Type V-A) or better
	5	<75% of buildings are protected wood-frame construction (Type V-B) or better
Occupancy Loading	0	≥90% of buildings have less than 10 persons average daily occupancy
	1	≥90% of buildings have less than 25 persons average daily occupancy
	2	≥75% of buildings have less than 50 persons average daily occupancy
	3	≥50% of buildings have less than 100 persons average daily occupancy
	4	≥25% of buildings have more than 250 persons average daily occupancy
	5	≥25% of buildings have more than 500 persons average daily occupancy
Built-In Fire Protection Systems	0	≥95% of buildings have monitored fire sprinkler system and monitored fire detection/alarm system
	1	≥75% of buildings have monitored fire sprinkler system and monitored fire detection/alarm system
	2	≥75% of buildings have automatic fire sprinkler system and local fire detection/alarm system
	3	≥50% of buildings have automatic fire sprinkler system and local fire detection/alarm system
	4	≥25% of buildings have automatic fire sprinkler system
	5	<25% of buildings have automatic fire sprinkler system
Water Supply	0	≥90% of buildings have Needed Fire Flow[2] (NFF) available within 300 ft.
	1	≥75% of buildings have Needed Fire Flow[2] (NFF) available within 300 ft.
	2	≥50% of buildings have Needed Fire Flow[2] (NFF) available within 300 ft.
	3	≥50% of buildings have Needed Fire Flow[2] (NFF) available within 500 ft.
	4	≥50% of buildings have Needed Fire Flow[2] (NFF) available within 1000 ft.
	5	<50% of buildings have Needed Fire Flow[2] (NFF) available within 1000 ft.
Response Capability	0	ERF[3] for all building fire risk, meeting minimum recommended annual training, available with response time ≤15:00 min. @ 90%
	1	ERF[3] for ≥90% of building fire risk, meeting minimum recommended annual training, available with response time ≤15:00 min. @ 90%
	2	ERF[3] for ≥90% building fire risk, meeting minimum recommended annual training, available with response time ≤30:00 min. @ 90%
	3	ERF[3] for ≥75% building fire risk, meeting minimum recommended annual training, available with response time ≤30:00 min. @ 90%
	4	ERF[3] for ≥50% building fire risk available with response time ≤30:00 min. @ 90%
	5	ERF[3] for ≥50% of building fire risk not available, or response time >30:00 min. @ 90%

[1] Significant building fire incident requiring multiple-alarm resources and involving multiple occupancies or a large single high-risk/value occupancy
[2] Needed Fire Flow as determined by the Insurance Services Office (ISO) criteria
[3] Effective Response Force (ERF) – number of personnel required to apply Needed Fire Flow and perform other critical tasks necessary to prevent fire from impacting other values at risk

This page was intentionally left blank

Table 52—Impact Severity Factor Evaluation Criteria – Wildland Fire[1]

Impact Severity Factor	Score	Scoring Guidelines
Vegetation	0	No flammable vegetation[2] within 1000 ft. of ≥90% of exposed values at risk[3]
	1	No flammable vegetation[2] within 500 ft. of ≥90% of exposed values at risk[3]
	2	No flammable vegetation[2] within 500 ft. of ≥75% of exposed values at risk[3]
	3	No flammable vegetation[2] within 300 ft. of ≥75% of exposed values at risk[3]
	4	No flammable vegetation[2] within 200 ft. of ≥50% of exposed values at risk[3]
	5	Flammable vegetation[2] within 100 ft. of ≥25% of exposed values at risk[3]
Weather	0	High fire weather factors[4] occur together ≤ average of 15 days per year
	1	High fire weather factors[4] occur together ≤ average of 30 days per year
	2	High fire weather factors[4] occur together ≤ average of 45 days per year
	3	Very high fire weather factors[5] occur together ≤ average of 30 days per year
	4	Very high fire weather factors[5] occur together ≤ average of 45 days per year
	5	Very high fire weather factors[5] occur together > average of 45 days per year
Topography	0	Average slope ≤5%; no topographic features[6] present within 1/4 mile of ≥90% of exposed values at risk[3]
	1	Average slope ≤5%; no topographic features[6] present within 1/8 mile of ≥90% of exposed values at risk[3]
	2	Average slope ≤5%; no topographic features[6] present within 1/8 mile of ≥75% of exposed values at risk[3]
	3	Average slope ≤10%; no topographic features[6] present within 1/4 mile of ≥90% of exposed values at risk[3]
	4	Average slope ≤10%; no topographic features[6] present within 1/4 mile of ≥75% of exposed values at risk[3]
	5	Average slope >10% and/or topographic features[6] present within 1/4 mile of >25% of exposed values at risk[3]
Water Supply	0	Public water supply ≥1,000 GPM within 500 ft. of ≥90% of exposed values at risk[3]
	1	Public water supply ≥750 GPM within 500 ft. of ≥90% of exposed values at risk[3]
	2	Public water supply ≥750 GPM within 500 ft. of ≥75% of exposed values at risk[3]
	3	Public water supply ≥500 GPM within 500 ft. of ≥75% of exposed values at risk[3]
	4	Public or private water supply ≥500 GPM within 1000 ft. of ≥75% of exposed values at risk[3]
	5	Public or private water supply <500 GPM; or >1000 ft. of >25% of exposed values at risk[3]
Response Capability	0	ERF[6] for all wildland fire risk, meeting minimum recommended annual training, available with response time ≤15:00 min. @ 90%
	1	ERF[6] for ≥90% of wildland fire risk, meeting minimum recommended annual training, available with response time ≤15:00 min. @ 90%
	2	ERF[6] for ≥90% of wildland fire risk, meeting minimum recommended annual training, available with response time ≤20:00 min. @ 90%
	3	ERF[6] for ≥75% of wildland fire risk, meeting minimum recommended annual training, available with response time ≤30:00 min. @ 90%
	4	ERF[6] for ≥50% of wildland fire risk available with response time ≤40:00 min. @ 90%
	5	ERF[6] for ≥50% of wildland fire risk not available, or available with response time >40:00 min. @ 90%

1 Significant wildland fire incident requiring multiple-alarm resources and impacting multiple values at risk
2 Includes more than 5 grouped (less than mature species height spacing) specimens of highly combustible tree and/or brush species, or more than 5,000 ft^2 of dried annual weeds/grasses more than 6" high
3 Includes occupied buildings; Critical Infrastructure and Key Resources (CIKR); vulnerable populations
4 High Fire Weather Factors: Temperature >90° F.; relative humidity <25%, wind >5 mph
5 Very High Fire Weather Factors: Temperature >95° F.; relative humidity <15%, wind >10 mph
6 Includes box canyon, chimney, ridge, saddle
7 Effective Response Force (ERF) – number of personnel required to apply appropriate fire flow and perform other critical tasks necessary to prevent fire from impacting other values at risk

This page was intentionally left blank

Table 53—Impact Severity Factor Evaluation Criteria – Medical Emergency[1]

Impact Severity Factor	Score	Scoring Guidelines
Population Density	0	Average population density ≤500/sq. mile
	1	Average population density ≤1,000/sq. mile
	2	Average population density ≤2,500/sq. mile
	3	Average population density ≤5,000/sq. mile
	4	Average population density ≤10,000/sq. mile
	5	Average population density >10,000/sq. mile
Population Demographics	0	≤5% of population: under age 10 and/or over age 65 and/or average annual household income ≤ $25,000
	1	≤10% of population: under age 10 and/or over age 65 and/or average annual household income ≤ $25,000
	2	≤20% of population: under age 10 and/or over age 65 and/or average annual household income ≤ $25,000
	3	≤30% of population: under age 10 and/or over age 65 and/or average annual household income ≤ $25,000
	4	≤40% of population: under age 10 and/or over age 65 and/or average annual household income ≤ $25,000
	5	>40% of population: under age 10 and/or over age 65 and/or average annual household income ≤ $25,000
Traffic	0	No highway traffic; no seasonal snow, ice, or dense fog; controlled intersection service level[2] A ≥ 90% of the time
	1	Single rural two-lane highway; no seasonal snow, ice, or dense fog; controlled intersection service level[2] B or better ≥ 90% of the time
	2	Multiple two-lane rural highways; no seasonal snow, ice, or dense fog; controlled intersection service level[2] C or better ≥ 90% of the time
	3	Single multiple-lane highway; seasonal snow, ice, or dense fog; controlled intersection service level[2] D or better ≥ 90% of the time
	4	Single multiple-lane freeway; seasonal snow, ice, or dense fog; controlled intersection service level[2] E or better ≥ 80% of the time
	5	Multiple 4+ lane freeways; seasonal snow, ice, or dense fog; controlled intersection service level[2] F or better ≥ 15% of the time
Pre-Hospital Emergency Care	0	ALS[3] services available ≤ 6:00 min. response time[5] @ 90%
	1	ALS[3] services available ≤ 7:00 min. response time[5] @ 90%
	2	ALS[3] services available ≤ 8:00 min. response time[5] @ 90%
	3	ALS[3] or BLS[4] services available ≤ 10:00 min. response time @ 90%
	4	ALS[3] or BLS[4] services available ≤ 15:00 min. response time @ 90%
	5	ALS[3] or BLS[4] services not available, or available > 15:00 min. response time @ 90%
Hospital Emergency Care	0	Primary emergency room ≤10 min. travel time @ 90%; secondary emergency room ≤20 min. travel time @ 90%; trauma center ≤30 min. travel time @ 90%
	1	Primary emergency room ≤15 min. travel time @ 90%; secondary emergency room ≤30 min. travel time @ 90%; trauma center ≤40 min. travel time @ 90%
	2	Primary emergency room ≤15 min. travel time @ 90%; secondary emergency room ≤30 min. travel time @ 90%; trauma center ≤45 min. travel time @ 90%
	3	Primary emergency room ≤20 min. travel time @ 90%; secondary emergency room ≤35 min. travel time @ 90%; trauma center ≤60 min. travel time @ 90%
	4	Primary emergency room ≤25 min. travel time @ 90%; secondary emergency room ≤45 min. travel time @ 90%; trauma center ≤60 min. travel time @ 90%
	5	Primary emergency room >25 min. travel time @ 90%; secondary emergency room >45 min. travel time @ 90%; trauma center >60 min. travel time @ 90%

[1] Mass-casualty incident requiring multiple-alarm resources and impacting multiple hospitals
[2] Controlled intersection Level of Service (LOS) – Levels A-F describe delay/queue times for traffic through controlled intersections (US Dept. of Transportation)
[3] Advanced Life Support (ALS)
[4] Basic Life Support (BLS)
[5] Response Time – time from receipt of 9-1-1 call to arrival of initial response resource

This page was intentionally left blank

Table 54—Impact Severity Factor Evaluation Criteria – Hazardous Material Release[1]

Impact Severity Factor	Score	Scoring Guidelines
Vulnerable Populations	0	≤5% of population under age 10 and/or over age 65
	1	≤10% of population under age 10 and/or over age 65
	2	≤20% of population under age 10 and/or over age 65
	3	≤30% of population under age 10 and/or over age 65
	4	≤40% of population under age 10 and/or over age 65
	5	>40% of population under age 10 and/or over age 65
Hazardous Material Use/Storage	0	≤1% of occupancies use/store ≤100 lbs./gals. of hazardous materials
	1	≤5% of occupancies use/store ≤500 lbs./gals. of hazardous materials
	2	≤5% of occupancies use/store ≤1,000 lbs./gals. of hazardous materials
	3	≤10% of occupancies use/store ≤2,500 lbs./gals. of hazardous materials
	4	≤10% of occupancies use/store ≤5,000 lbs./gals. of hazardous materials
	5	>10% of occupancies use/store >5,000 lbs./gals. of hazardous materials
Hazardous Material Transportation	0	≤500 lbs./gals. of hazardous material transported into/through risk zone ≤weekly
	1	≤5,000 lbs./gals. of hazardous material transported into/through risk zone ≤weekly
	2	≤10,000 lbs./gals. of hazardous material transported into/through risk zone daily
	3	≤100,000 lbs./gals. of hazardous material transported into/through risk zone daily
	4	≤250,000 lbs./gals. of hazardous material transported into/through risk zone daily
	5	>250,000 lbs./gals. of hazardous material transported into/through risk zone daily
Response Capability	0	Type-I HazMat Team available ≤ 15:00 min. @ 90%; all response personnel trained to HazMat FRO[2] level
	1	Type-I HazMat Team available ≤ 30:00 min. @ 90%; all response personnel trained to HazMat FRO[2] level
	2	Type-II HazMat Team or better available ≤ 30:00 min. @ 90%; all response personnel trained to HazMat FRO[2] level
	3	Type-II HazMat Team or better available ≤ 45:00 min. @ 90%; ≥75% of response personnel trained to HazMat FRO[2] level
	4	Type-III HazMat Team or better available ≤ 60:00 min. @ 80%; ≥50% of response personnel trained to HazMat FRO[2] level
	5	Type-III HazMat Team or better not available, or available > 60:00 min. @ 80%; <50% of response personnel trained to HazMat FRO[2] level
Evacuation Capability	0	Evacuation plan adopted and functionally exercised ≤ every 12 months; multiple EMNS[3] able to effectively notify ≥90% of residents/businesses ≤15:00 mins.; EMNS tested ≤ every 12 months
	1	Evacuation plan adopted and functionally exercised ≤ every 18 months; EMNS[3] able to effectively notify ≥75% of residents/businesses ≤15:00 mins.; EMNS tested ≤ every 18 months
	2	Evacuation plan adopted and evaluated ≤ every 18 months; EMNS[3] able to effectively notify ≥75% of residents/businesses ≤30:00 mins.; EMNS tested ≤ every 24 months
	3	Evacuation plan evaluated ≤ every 24 months; EMNS[3] able to effectively notify ≥50% of residents/businesses ≤30:00 mins.; EMNS tested ≤ every 24 months
	4	Evacuation plan not evaluated; EMNS[3] unable to effectively notify ≥50% of residents/businesses ≤30:00 mins. and/or not tested
	5	No evacuation plan and/or no EMNS available

[1] Incident requiring multiple resources and impacting multiple values at risk (e.g. freight/tank truck collision, freight train derailment, earthquake, explosion, weapon of mass destruction, etc.)
[2] First Responder Operational (FRO)
[3] Emergency Mass Notification System (EMNS)

This page was intentionally left blank

Table 55—Impact Severity Factor Evaluation Criteria – Technical Rescue

Impact Severity Factor	Score	Scoring Guidelines
Construction Activity	0	No significant construction activity other than single-family dwellings, remodels, etc.
	1	Some light new construction activity
	2	Moderate light commercial/infrastructure construction activity
	3	Some heavy commercial/industrial/infrastructure construction activity
	4	Moderate heavy commercial/industrial/infrastructure/high-rise construction activity
	5	Significant heavy commercial/industrial/infrastructure/high-rise construction activity
Industrial/Manufacturing Activity	0	No industrial/manufacturing activity
	1	Some light industrial/manufacturing activity
	2	Moderate light industrial/manufacturing activity
	3	Some heavy industrial/manufacturing activity
	4	Moderate heavy industrial/manufacturing activity
	5	Significant heavy industrial/manufacturing activity
Water Rescue	0	No water rescue risk
	1	Minimal water rescue risk; one or more small bodies of non-swift water; minimal recreation activity
	2	Minor water rescue risk; one or more small bodies of non-swift water; minor recreation activity
	3	Moderate water rescue risk; one or more bodies of non-swift water; moderate recreation activity
	4	High water rescue risk; one or more bodies of swift water; high recreation activity
	5	Very high water rescue risk; multiple swift waterways; coastal waterfront; very high recreation activity
Traffic Volume	0	No freeway or highway traffic; no high-speed arterial traffic; no seasonal snow, ice, or dense fog
	1	Single two-lane rural highway; no high-speed arterial traffic; no seasonal snow, ice, or dense fog
	2	Multiple two-lane rural highways; some high-speed arterial traffic; no seasonal snow, ice, or dense fog
	3	Single multiple-lane freeway; limited high-speed arterial traffic; minimal seasonal snow, ice, or dense fog
	4	Multiple multiple-lane freeways; moderate high-speed arterial traffic; moderate seasonal snow, ice, or dense fog
	5	Multiple multiple-lane freeways; heavy high-speed arterial traffic; heavy seasonal snow, ice, or dense fog
Service Capacity	0	USAR Type-1 (Heavy) Team / Type-1 swiftwater/flood S&R Team available within 30 min. @ 90%
	1	USAR Type-1 (Heavy) Company / Type-1 swiftwater/flood S&R Team available within 45 min. @ 90%
	2	USAR Type-2 (Medium) Company / Type-2 swiftwater/flood S&R Team available within 60 min. @ 90%
	3	USAR Type-3 (Light) Company / Type-3 swiftwater/flood S&R Team available within 75 min. @ 90%
	4	USAR Type-4 (Basic) Company / Type-4 swiftwater/flood S&R Team available within 90 min. @ 90%
	5	Technical Rescue capability / swiftwater/flood S&R capability not available within 90 min. @ 90%

This page was intentionally left blank

Table 56—Impact Severity Factor Evaluation Criteria – Transportation

Impact Severity Factor	Score	Scoring Guidelines
Population Density	0	Average population density less than 500 per square mile
	1	Average population density less than 1,000 per square mile
	2	Average population density less than 2,500 per square mile
	3	Average population density less than 5,000 per square mile
	4	Average population density less than 10,000 per square mile
	5	Average population density greater than 10,000 per square mile
Vehicle Traffic Volume	0	No freeway or highway traffic; no high-speed arterial traffic; no seasonal snow, ice, or dense fog
	1	Single two-lane rural highway; no high-speed arterial traffic; no seasonal snow, ice, or dense fog
	2	Multiple two-lane rural highways; some high-speed arterial traffic; no seasonal snow, ice, or dense fog
	3	Single multiple-lane freeway; limited high-speed arterial traffic; minimal seasonal snow, ice, or dense fog
	4	Multiple multiple-lane freeways; moderate high-speed arterial traffic; moderate seasonal snow, ice, or dense fog
	5	Multiple multiple-lane freeways; heavy high-speed arterial traffic; heavy seasonal snow, ice, or dense fog
Railway Traffic Volume	0	No railway passenger or freight services
	1	Average of less than 10 daily train movements
	2	Average of less than 25 daily train movements
	3	Average of less than 100 daily train movements
	4	Average of less than 250 daily train movements
	5	Average of more than 250 daily train movements
Aircraft Traffic Volume	0	No passenger, cargo, or military aircraft operations
	1	No commercial passenger or cargo aircraft operations; less than 5,000 general aviation flights annually
	2	Less than 500,000 passengers; less than 50,000 general aviation flights; less than 5,000 annual cargo tons
	3	Less than 1 million passengers; less than 100,000 general aviation flights; less than 10,000 annual cargo tons
	4	Less than 5 million passengers; less than 250,000 general aviation flights; less than 20,000 annual cargo tons
	5	More than 5 million passengers; more than 250,000 general aviation flights; more than 20,000 annual cargo tons
Service Capacity	0	ALS available within 6 min. @ 90%; technical rescue available within 30 min. @ 90%
	1	ALS available within 8 min. @ 90%; technical rescue available within 45 min. @ 90%
	2	ALS available within 10 min. @ 90%; technical rescue available within 45 min. @ 90%
	3	ALS or BLS available within 12 min. @ 90%; technical rescue available within 60 min. @ 90%
	4	ALS or BLS available within 15 min. @ 90%; technical rescue available within 75 min. @ 90%
	5	ALS or BLS not available within 15 min. @ 90%; technical rescue not available within 75 min. @ 90%

This page was intentionally left blank

Table 57—Impact Severity Factor Evaluation Criteria – Flood

Impact Severity Factor	Score	Scoring Guidelines
Area Affected	1	None or only very minimal area likely affected
	2	Some area likely affected
	3	Moderate area likely affected
	4	Significant area likely affected
	5	Most or all of area likely affected
Injuries / Fatalities	1	Only minor injuries likely; no fatalities
	2	Few injuries likely; no fatalities expected
	3	Some injuries and/or fatalities likely
	4	Moderate injuries and/or fatalities likely
	5	Significant injuries and/or fatalities likely
Property Damage	1	None to minimal probable property damage
	2	Some probable property damage
	3	Moderate probable property damage
	4	Significant probable property damage
	5	Major probable property damage
Critical Facilities / Key Resources	1	No impacts or only very minimal probable impacts to critical facilities / key resources
	2	Some probable impacts to critical facilities / key resources
	3	Moderate probable impacts to critical facilities / key resources
	4	Significant probable impacts to critical facilities / key resources
	5	Major probable impacts to critical facilities / key resources
Mid-Term / Long-Term Community Impacts	1	No probable mid-term and/or long-term impacts affecting community resilience
	2	Minimal probable mid-term and/or long-term impacts affecting community resilience
	3	Moderate probable mid-term and/or long-term impacts affecting community resilience
	4	Significant probable mid-term and/or long-term impacts affecting community resilience
	5	Major probable mid-term and/or long-term impacts affecting community resilience