CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

VALLEY CENTER FIRE PROTECTION DISTRICT

VOLUME 2 OF 3 - TECHNICAL REPORT

STANDARDS OF COVERAGE STUDY

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CITYGATE ASSOCIATES, LLC
WWW.CITYGATEASSOCIATES.COM
2250 EAST BIDWELL ST., STE. 100
FOLSOM, CA 95630
PHONE: (916) 458-5100
FAX: (916) 983-2090

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SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC's (Citygate) detailed work product for a Standards of Coverage (Deployment) study for the Valley Center Fire Protection District (District) is presented in this volume. 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 District.

Section 2 Standards of Response Coverage Introduction: An introduction to the Standards of Response 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 District'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 District's desired outcome, and (2) the District's existing fire station locations and future locations.

Section 5 Response Statistical Analysis: A statistical data analysis of the District'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 Next Steps: A summary of short-term next steps.

1.1.1 Goals of Report

This report will cite findings and make recommendations, if appropriate, that relate to each finding. Findings and recommendations are numbered sequentially throughout Sections 3 through 6 of this report. A complete list of all the findings and recommendations, in order, is found in the Executive Summary (Volume 1). Section 7 of this volume brings attention to the highest priority needs and recommended next steps.

This document provides technical information about how fire services are provided, legally regulated, and how the District currently operates. This information is presented in the form of recommendations and policy choices for the District leadership team 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 includes the following elements:

- Modeling the response time ability of the current fire station locations. Although this is not a study of fire departments adjacent to the District, the study does consider the impacts of the District's automatic and mutual aid agreements.
- Establishing performance goals for the District consistent with best practices and national guidelines from the National Fire Protection Association (NFPA) and the Commission on Fire Accreditation International (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 unit driving coverages from the District's fire stations.

SOC Study Questions

Our study addresses the following questions:

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

1.3 DISTRICT OVERVIEW

The District is located in northeastern San Diego County. The District encompasses approximately 85 square miles. The District is bordered by several Native American Reservations, as well as by Escondido, the Deer Springs Fire Protection District, and unincorporated San Diego County.

SECTION 2—STANDARDS OF RESPONSE 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" (SOC) 5th and 6th editions, which is a systems-based approach to fire department deployment, as published by the Commission on Fire Accreditation International (CFAI). This approach uses local risk and demographics to determine the level of protection best fitting the District's needs.

The Standards of Response Coverage method evaluates deployment as part of the self-assessment process of a fire agency. 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.

In the United States, there are no federal or state government requirements for a minimum level of fire services. Fire service levels are a local choice issue for each community to consider and fund as it deems necessary. The SOC systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination. 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 body "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.

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

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 3.2 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 department deployment, simply stated, is about the **speed** and **weight** of the attack. **Speed** calls for first-due, all-risk intervention units (engines, ladder trucks, ambulances, and/or paramedic squads) strategically located across a coverage area. These units are tasked with controlling moderate emergencies, preventing the incident from escalating to second alarm or greater, which unnecessarily depletes department resources as multiple requests for service occur. **Weight** is about multiple-unit response for serious emergencies, such as a room and contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, a sufficient quantity of firefighters must be assembled within a reasonable time frame to safely control the emergency, thereby keeping it from escalating to greater alarms.

This deployment design paradigm is reiterated in the following table.

Table 2—Fire Department Deployment Simplified

	Meaning	Purpose
***Speed* of Attack**	Travel time of first-due, all-risk intervention units strategically located across a department.	Controlling moderate emergencies without the incident escalating to second alarm or greater size.
***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, crews are drawn into a losing and more dangerous battle. The science of fire crew deployment is to spread crews out across a community 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.

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SECTION 3—DEPLOYMENT GOALS/MEASURES AND RISK ASSESSMENT

3.1 WHY DOES THE DISTRICT'S FIRE 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 Fire District Exist?

SOC ELEMENT 1 OF 8*
EXISTING DEPLOYMENT POLICIES
**Note: This is an overview of Element 1. The detail is provided on page 40.*

The Board of Directors, over the decades, has not adopted best-practice-based formal response time policies by type of risks. However, the District has a long history of striving to provide a level of service it can responsibly afford, and this effort is documented in the Fire District response time reports, the number of fire companies, and minimum daily staffing.

Many agencies today still use an average response time measure, but doing so does not meet current best practices. Best-practices-based goals include response times with a specific begin and end, and a staffing quantity. Doing so is consistent with the recommendations of the National Fire Protection Agency (NFPA) or Commission on Fire Accreditation International (CFAI). Additionally, recognized standards and best practices call for a time line with several important response time component measurements to include dispatch processing, crew turnout, and travel time.

The District also has not identified response goals for technical rescue and hazardous material responses; in addition to firefighting and EMS, response time goals for these incident types also are required to meet the Standards of Response Coverage model for the CFAI. In this Standards of Response 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.

3.1.2 Existing Outcome Expectations

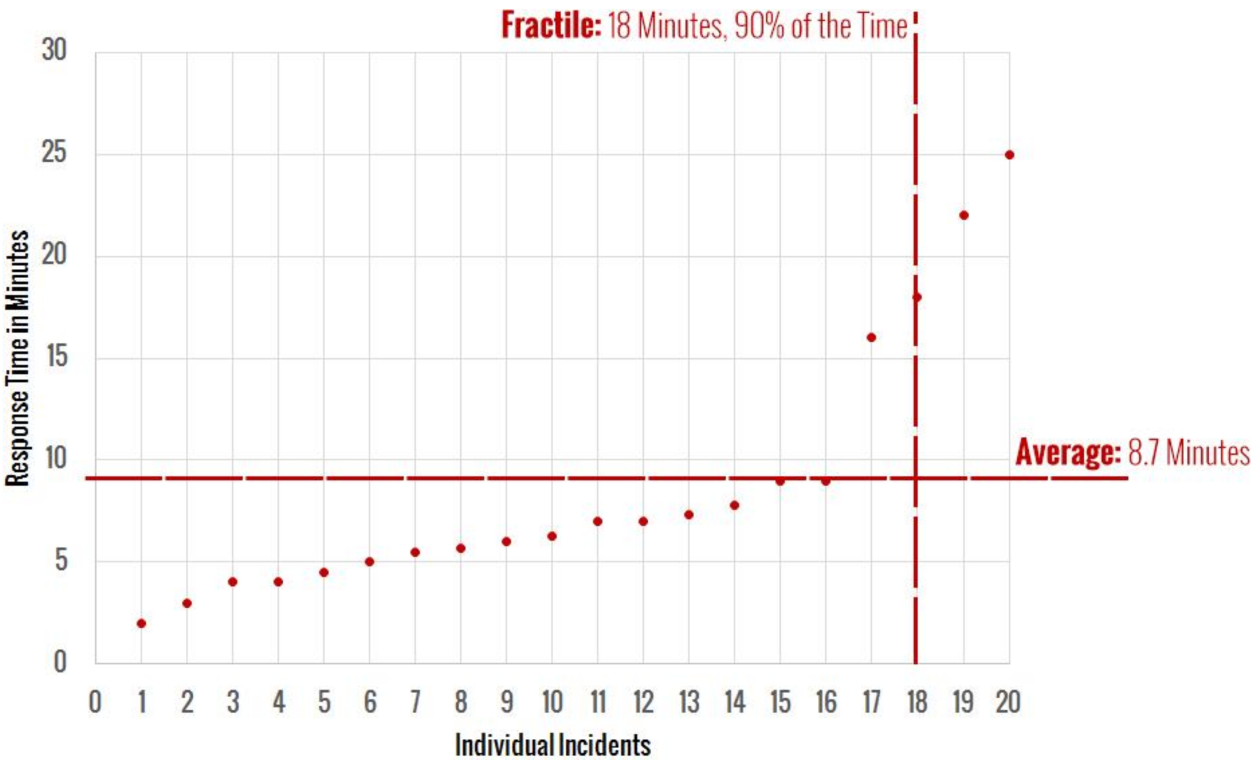
SOC ELEMENT 2 OF 8
COMMUNITY OUTCOME EXPECTATIONS

The Standards of Response Cover process begins by reviewing existing emergency services outcome expectations. This includes determining for what purpose the response system exists, and whether the governing body has adopted any response performance measures. If so, the time measures used must be understood and good data must be collected.

Current national best practice is to measure percent completion of a goal (e.g., 90 percent of responses) instead of an average measure. Mathematically this is called a "fractile" measure.[1] 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, Figure 1 shows response times for a fictitious city fire department in the United States. This city is small and receives 20 legitimate calls for service each month. Each response time for the calls for service has been plotted on the graph. The call response times have been plotted in order from shortest response time to longest response time.

Figure 1—Fractile versus Average Response Time Measurements



The figure shows that the average response time is 8.7 minutes. However, the average response time fails to properly account for four calls for service with response times far exceeding a threshold in which positive outcomes could be expected. In fact, it is evident in Figure 1 that, in this fictitious U.S. city, 20 percent of responses are far too slow, and that this city has a potential life-threatening service delivery problem. Average response time as a measurement tool for fire

[1] 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.

departments is simply not sufficient. This is a significant issue in larger cities, if hundreds or thousands of calls are answered far beyond the average point.

By using the fractile measurement with 90 percent of responses in mind, this small town has a response time of 18:00 minutes, 90 percent of the time. This fractile measurement is far more accurate at reflecting the service delivery situation in this small town.

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 concentration). Emergency medical incidents have situations with the most severe time constraints. The brain can only survive 6:00 to 8:00 minutes without oxygen. Heart attacks and 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 an 8:00- to 10:00-minute timeframe. If fire service response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, ***all*** responding crews must arrive, assess 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 7:00- to 8:00-minute total response time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point of leaving the room of origin, becoming very serious. Thus, the District needs a <u>first-due</u> response goal that is within a range 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 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, 1:00 minute. Crew notification and travel time take additional minutes. Once arrived, the crew must walk to the patient or emergency, assess the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take 2:00 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, all of which are found in parts of the District.

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. Consequently, a properly designed system will give citizens the hope of a positive outcome for their tax dollar expenditure.

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

Finding #1:	The Board of Directors has 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 the North Comm. Fire Dispatch Center receiving the 9-1-1 phone call from the County Sheriff's center, 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.

3.2 Community Risk Assessment

SOC Element 3 of 8
Community Risk Assessment

The third element of the SOC process is a community risk assessment or analysis. The broad objectives of a community risk assessment are to:

1. Identify specific hazards with potential to adversely impact the community or jurisdiction.
2. Quantify the risk for each hazard based on probability of occurrence and likely severity of resultant occurrence impacts.
3. Establish a foundation for current or future risk-reduction / hazard mitigation planning and evaluation.

Hazard is broadly defined as a situation or condition that can cause or contribute to harm or damage to people, property or the environment. Hazard examples include fire, medical emergency, vehicle collision, earthquake, flood, hazardous materials leak or spill, etc.

Risk is broadly defined as the exposure or chance of injury or loss to people, property, and the community.

3.2.1 Risk Assessment Methodology

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

1. Identification of geographic risk assessment.

2. Identification of the fire and non-fire hazards to be evaluated.
3. Identification and evaluation of relevant risk factors for each hazard by risk zone.
4. Determination of the *probability*. Probability is the likelihood that a hazard can or will create an incident. Probability is required to categorize risk and determine workload required to control and mitigate the hazard.
5. Determination of the *severity*. Severity is the magnitude of loss, such as life loss, and economic loss (e.g. taxes and employment, property value).

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

- U.S. Census Bureau population data and demographics
- Insurance Services Office (ISO) building fire flow and construction data
- District Geographical Information Systems (GIS) data
- San Diego County 2010-2035 General Plan and Zoning information
- 2015 Valley Center Local Hazard Mitigation Plan.

To provide the District with consistent hazard mitigation information, and because much of the foundational hazard research has been recently performed, significant portions of the background information in Citygate's risk assessment has been directly utilized from other sources. Such content, when utilized, has been cited and provided with a gray background.

3.2.2 Community Demographics

Table 3 summarizes key demographic data for the Valley Center community.

Table 3—Valley Center Demographics[1]

Demographic	2010	2015
Population	**9,277**	**10,261**
Under 5 years	520	409
5-19 years	1,730	2,223
20-64 years	5,036	6,128
Over 65 years	1,164	1,111
Median age	42.1	41.6
Housing Units		
Owner-Occupied	2,419	2,452
Renter-Occupied	521	542
Employment		
Labor Force[1]	4,618	5,034
Employment[1]	4,407	4,683
Income – Median	81,951	82,799
Ethnicity		
White	6,785	8,897
Hispanic/Latino	2,581	2,048
Black/African American	84	125
Asian	295	116
Education (age 25 and over)		
Population	N/A	10,261
High School Graduate	N/A	7,341
Bachelor's Degree or Higher	N/A	5,237

U.S. Census Facts 16 years and older

3.2.3 District Growth and Development

Overview[2]

Valley Center is a small, rural, unincorporated community within northeastern San Diego County, California, approximately 45 miles northeast of San Diego and 20 miles east of the

[2] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

Pacific Ocean Coast line. It is home to roughly 11,000 residents and is seen as a small, close-knit, family community. With many features that make the town unique, Valley Center offers a wide array of natural environments including hiking trails, beautiful scenic views, agricultural areas, and country style living.

District Overview and History[3]

In 1982, the citizens of Valley Center voted to create the District to provide fire services and basic medical aid, overseen by a five member, elected volunteer board. Presently, the District responds to approximately 1,300 calls per year within the 84.5 square mile District. The District is funded through property taxes and an additional benefit tax assessment that was created in 1987.

The District, for a period of time, contracted services from CAL FIRE, which brought a wide array of resources. However, in August of 2013, the District ended its contract with CAL FIRE due to an approximately 30 percent increase in annual fees. This increase created a situation that was no longer financially feasible for the District to continue in. Beginning in September of 2013, the District entered into a contract with the neighboring San Pasqual Reservation Fire Department that would provide revenue to add fire officer level staffing in conjunction with the District's reserve firefighters.

As of January 1, 2015, the contract with San Pasqual Reservation Fire Department came to an end with the District deciding to pursue a traditional format fire department with a Fire Chief, Battalion Chief, and six Captains. On November 21, 2014, the District hired on a new Fire Chief who is currently overseeing the changes that the District is experiencing. Due to the size constraints of the District, it is primarily a fire and an advanced life support medical response department. While many of the firefighters have high quality training in specific firefighting, rescue, and medical operations, the District does not have the staffing to fully, and quickly, operate at these levels. To fully provide the best service possible, the District has automatic aid agreements with neighboring departments who will come to assist when called upon. The District provides emergency medical services (EMS) at the advanced life support (ALS) level, with advanced life support (ALS) paramedics being contracted by the County of San Diego EMS Agency to Mercy Medical Transport, Inc.

Currently, the District has two stations: Station #1 located at 28234 Lilac Road, and Station #2 at 28205 North Lake Wolford Road, with both stations being staffed 24 hours per day. The District currently has an Insurance Service Office (ISO) rating of a 3/3X, which is typical for a suburban core community with outlaying rural areas in the ISO Classification system of 1 to 10, with one

[3] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

being the best. The first number is the class that applies to properties within five road miles of the responding fire station and 1,000 feet of a creditable water supply, such as a fire hydrant, suction point, or dry hydrant. The second number/letter is the class that applies to properties beyond five road miles of a fire station, but beyond 1,000 feet of a creditable water supply.

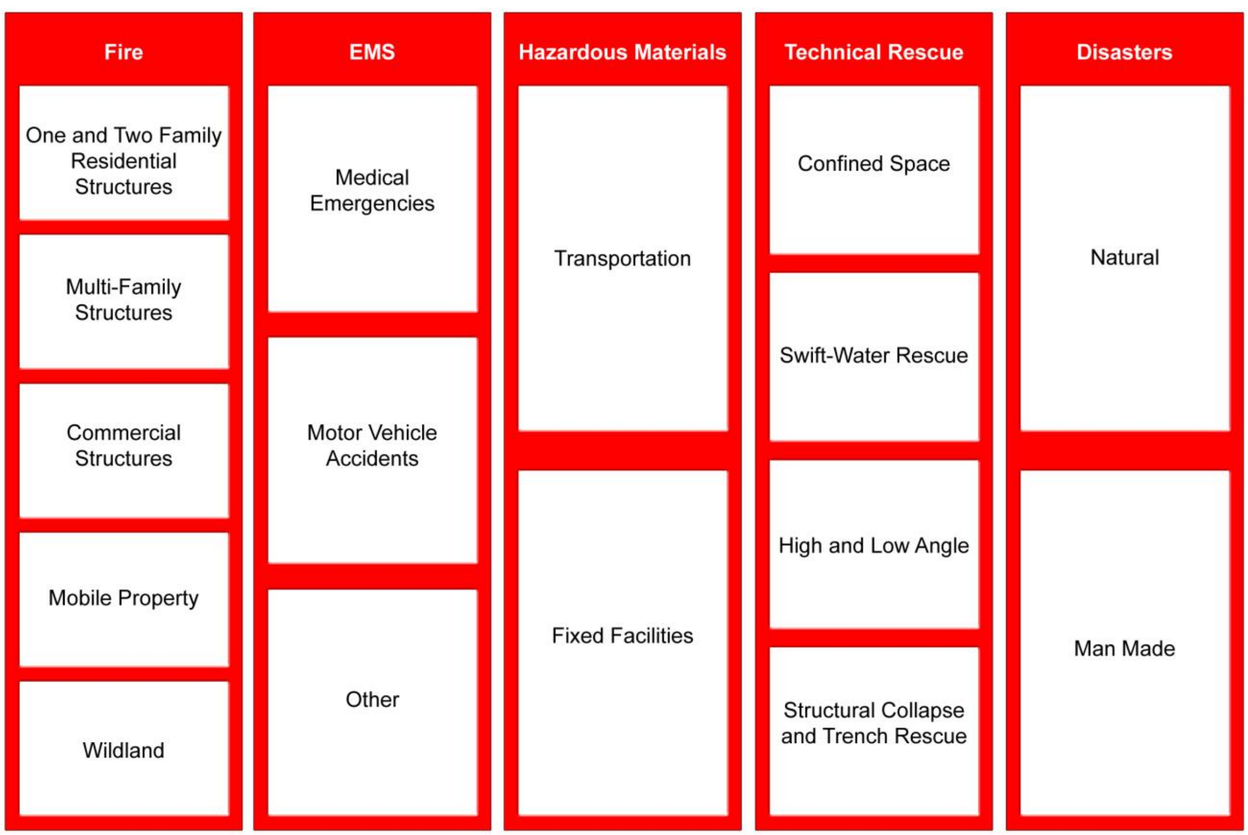
3.2.4 Hazard Identification

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 2015 Local Hazard Mitigation Plan (LHMP) for the District, as they relate to services provided by the District, include earthquake/seismic-related hazards, disruption of critical lifeline infrastructure systems, wildfire, and flooding.

Figure 2 illustrates the fire and non-fire hazards as established by CFAI. Identification and quantification of the various fire and non-fire risks are important factors in evaluating how fire resources are or can be deployed to mitigate those community risks.

Figure 2—Risk Types



Source: Commission on Fire Accreditation International (5th Edition)

The following are the risks evaluated for this study based on the hazards identified in the LHMP, and the fire and non-fire hazards as identified by CFAI, as they relate to the services provided by the District:

1. Building Fire Risk
2. Wildland Fire Risk
3. Emergency Medical Services (EMS) Risk
4. Hazardous Materials Risk
5. Technical Rescue Risk
6. Earthquake/Seismic Activity Risk
7. Flood Risk and Dam Inundation Risk
8. Drought Risk.

3.2.5 Probability of Occurrence

Probability of occurrence refers to the hazards at the location (there could be more than one) and the likelihood that the hazard(s) can or will create an incident. Without determining probability, the risks cannot be categorized to help determine workload and effective response forces for mitigation.

In evaluating probability of occurrence, there are five factors to consider:

- Define the hazard(s).
- Assess the likelihood the hazard can/will create an incident.
- Define mitigating factors.
  - *Positive factors* include fire suppression/detection systems present, building construction, and demography of the occupants.
  - *Negative factors* include poor building or system maintenance or worker or resident training to respond to that emergency.
- Know and understand the infrastructure that may influence responses.
- Remote area risks may exist, and an expectation of service delivery may drive the responses depending on the severity of those risks.

3.2.6 Impact Severity

Impact severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur. The magnitude of the loss is relative to risk and the relevance of the affected area and what level of response will be determined. There are 6 factors that help determine severity:

- Severity determination can be a relative consideration to the significance of loss based on the worst-case potential of an incident to occur.
- In many cases, the severity evaluation is a matter of establishing relative and available loss data such as employment loss, property tax revenue loss, and historical values to the community.
- A comparative analysis to other similar risk groups and levels of loss to the community.
- Mitigating factors can modify the severity:
  - *Positive factors* include fire protection and detection systems present or good evacuation training of occupants.
  - *Negative factors* unaccounted for hazardous materials on site, or incorrect or poor building construction.
- Infrastructure impact that may affect the control and termination of the incident, such as road networks and topography.
- Agency impacts should be considered. Agency impacts can be limited resources and personnel, demand on the current response system, and the ability for the agency to handle simultaneous calls for service. Does the agency have the correct response teams and personnel to mitigate the incident or is mutual/automatic aid required? Does the agency have the funding to prepare for the incident response with training, equipment and staffing?

3.2.7 Risk Factors

Elements to be evaluated in a community risk assessment include factors that influence the potential outcome severity of a hazard occurrence. Outcome severity refers to the potential negative impacts a hazard occurrence may have on a community relative to people, property, the environment, economic stability, and overall community resilience. It is important to note that while some risk factors contribute to more severe outcome impacts, other risk factors, such as response and effective mitigation measures, can also contribute to *reducing* the potential severity of outcome impacts.

In conducting a community risk assessment, Citygate examines community demographics including age, current and projected population, population density, land use, building occupancy data (fire protection systems, fire detection systems, building construction, occupant load), as well as prior risk-specific service demand data

3.2.8 Probability/Severity Risk Matrix

Probability and severity determine the overall risk determination based on the matrix in Table 4. For example, if a risk has a **low** probability of occurrence and a **low** severity, the overall risk determination is said to be **LOW/ISOLATED**. **High** probability and **high** severity result in a **MAXIMUM** risk determination.

Table 4—Probability/Severity Risk Matrix

	Low Severity	High Severity
High Probability of Occurrence	**MODERATE RISK** (***High*** Probability) (***Low*** Severity)	**MAXIMUM RISK** (***High*** Probability) (***High*** Severity)
Low Probability of Occurrence	**LOW/ISOLATED RISK** (***Low*** Probability) (***Low*** Severity)	**HIGH/SPECIAL RISK** (***Low*** Probability) (***High*** Severity)

Source: CFAI *Standards of Cover* (5th Edition)

3.2.9 Building Fire Risk

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

Building Occupancy Risk Categories

SOC methodology identifies five building occupancy 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 gallons per minute (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.

Table 5 illustrates the risk category and number of buildings in the District.

Table 5—Building Use Classification and Risk Category

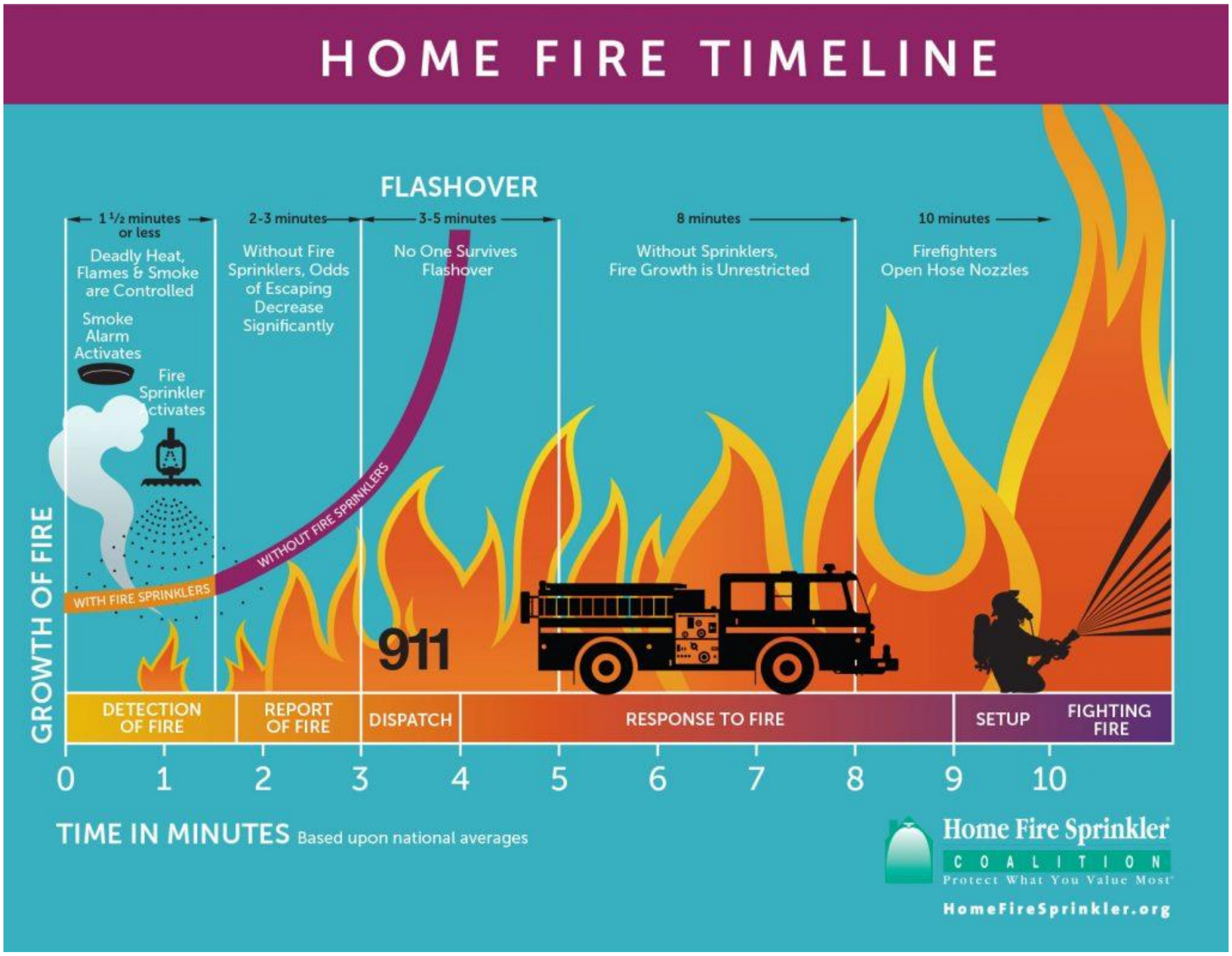
Building Occupancy Classification	Number[2]	Risk Category[1]
Assembly	24	***Maximum***
Business	138	***Moderate***
Educational	7	***High***
Factory Group	3	***High***
Hazardous	4	***High***
Institutional	2	***Special***
Mercantile	12	***Moderate***
Residential (R-1, 2, 4)	5	***High***
Storage (S-1, 2)	2	***Moderate***
Total	**207**	

[1] CFAI *Standards of Cover* (5th Edition)
[2] Source: Valley Center FPD

Figure 3 illustrates the fire progression timeline for a building fire, and the way automatic fire sprinklers impact fire progression and spread. The graphic also shows that a total response time[4] of 8:00 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 the combustible objects in that room reach their ignition temperature. Human survival in a room after flashover is extremely unlikely.

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

Figure 3—Building Fire Progression Timeline



Source: http://www.firesprinklerassoc.org

High-Rise Buildings

High-rise buildings present unique fire risks, particularly as they relate to the number of potential building occupants, the time required to evacuate those occupants in the event of an emergency, and the time required to get firefighters and fire suppression equipment to the floor(s) involved in fire. A high-rise building is defined by the California Building Code as any building having floors used for human occupancy more than 55 feet above the lowest floor having building access, except hospitals,[5] and by the California Health and Safety Code and California Fire Code as any building having floors used for human occupancy located more than 75 feet above the

[5] California Building Code Section 10-28.030 (2013 Edition)

lowest level having building access, except hospitals.[6] The District has 19 buildings four stories in height.[7]

Critical Facilities

The District's Annex to the 2010 San Diego County LHMP identifies 50 critical facilities. These facilities provide essential public or community services such as water, sewage, telecommunications, and power distribution, or are high-value cultural or historical sites. A fire occurrence with significant severity in one or more of these facilities would adversely impact essential public or community services.

Water Supply[8]

Water within Valley Center is supplied by the Valley Center Municipal Water District (VCMWD). In 1954, the VCMWD was created to gain access to imported water supplies through the San Diego County Water Authority (SDCWA) and Metropolitan Water District of Southern California (MWDSC). Prior to the creation of the VCMWD, the area relied solely upon surface water sources and underground well water, which were consumed quickly in periods of insufficient rainfall. The VCMWD is overseen by an elected five-member Board of Directors, authorized by the State Legislature under the Municipal Water District Act of 1911; each member serves a four-year term.

The VCMWD services the community of Valley Center and the surrounding area, which is approximately 100 square miles, with approximately 58 percent of the area receiving water from the VCMWD. The District's water supply is entirely imported from the SDCWA and is the fourth largest retailer of imported water and the largest purchaser of agricultural water in the SDCWA's service area. As of 2010, the district served 8,776 active water meters and 1,031 residential fire protection meters.

The VCMWD provides service to approximately 18,765 acres of agricultural lands. Agricultural service is predicted to decline in the future by as much as 75 percent by 2050. The 2035 projections for agricultural service are predicted to be approximately 13,585 acres, a decrease of 27 percent. Service to agricultural land is declining due to the increasing cost of water, reduction in active agriculture, or agricultural producers altering farming methods to reduce the amount of water that must be purchased.

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[6] California Health and Safety Code Section 13210; California Fire Code Section 202 (2013 Edition)

[7] ISO Building Inventory Database

[8] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

Due to the varying topography within the VCMWD, distribution of water is completed through the hydraulic division of the system into 18 different pressure zones, 13 of which are pressure regulated to ensure flow. The system includes:

- Approximately 291 miles of pipe (Eight inches and larger in diameter)
- 42 Reservoirs (Range 100,000 gallons to 55.9 million gallons)
- 27 Pump Stations
- 96 Pumps with a total of 19,785 Horsepower
- 7 Aqueduct Connections.

High Fire Flow Requirements

One of the factors evaluated by the Insurance Services Office (ISO) is "Needed Fire Flow" (NFF), which is the amount of water that would be required in gallons per minute (GPM) if the building were seriously involved in fire. For the District, the ISO database identifies 103 buildings, of which 33 have an NFF of 1,500-3,500 GPM.

This is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would require the complete commitment of the District's on-duty force *plus auto/mutual aid*. Using a generally accepted figure of 50 GPM per firefighter on large building fires, a fire in a building requiring 1,500 GPM would require 30 firefighters, which is more than double the District's current initial Effective Response Force (ERF or First Alarm) of 17 (nine District plus eight automatic aid) firefighters for a building fire. A significant fire in any of these buildings would likely have high consequence severity.

High Risk Buildings with Fire Sprinkler Systems

The District's adopted amendments to the California Building and Fire Codes requires automatic fire sprinkler systems in all new and existing buildings greater than 1,000 square feet in area for habitable buildings, and greater than 5,000 square feet in area for non-habitable buildings. No specific data on the number of buildings with automatic fire sprinkler systems was available.

Building Fire Service Capacity

The District's service capacity for building fire risk consists of a minimum daily on-duty response force of eleven personnel staffing two engines, one Battalion Chief, and one of two positions each on one ambulance and one rescue squad, from two fire stations. In addition, the District has automatic aid or mutual aid agreements with adjacent fire agencies. The District is also a signatory to the San Diego County Mutual Aid Agreement.

Building Fire Service Demand

Over the past three years, there were a total of 15 building fire responses comprising 0.003 percent of total service demand over the same period. Table 6 summarizes building fire risk service demand for the District by year.

Table 6—Building Fire Risk Service Demand

FY 13/14	FY 14/15	FY 15/16	Total
8	2	5	15

Source: Valley Center FPD Records Management System

Probability of Occurrence

Based on evaluation of the building fire risk factors, including the number of high-risk building occupancies, high-rise buildings, critical facilities, and high needed fire flow sites, as well as, the District's excellent firefighting water supply infrastructure, and historical building fire service demand, Citygate concludes that the District's probability of a serious building fire occurring over the next 12 months is ***High***.

Impact Severity

Severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity for building fires is deemed to be ***Low*** based on historic service demand and that the District's buildings fires are mostly residential.

Building Fire Overall Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for buildings fires is determined to be ***MODERATE***.

3.2.10 Wildland Fire Risk[9]

Wildland fire is defined as "any non-structure fire that occurs in vegetation and natural fuel."[10] These fires can often go unnoticed in the beginning, and spread rapidly, posing a great threat to life and property in the wildland urban interface (WUI). The WUI is "the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland

[9] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.
[10] National Wildfire Coordinating Group

or vegetative fuels, within or adjacent to private and public property where mitigation actions can prevent damage or loss from wildfire."[11] Wildland fires are started in four different ways: extraterrestrial impacts that cause power line failures, rock on rock friction, lightning strikes, and anthropogenic (human) related origins. Humans are the reason for over 80 percent of all wildland fires, typically through carelessness, burning of debris, or arson. Wildland fire possesses a great risk to the District due to the factors that determine the behavior of wildland fires. "Fire behavior is commonly defined as the manner in which fuel ignites, flame develops, and fire spreads and exhibits other related phenomena as determined by the interaction of fuels, weather, and topography."[12]

Wildland Urban Interface (WUI)

The California Department of Forestry and Fire Protection's (CAL FIRE) primary purpose is to provide fire protection for State Responsibility Areas (SRA). Local Responsibility Areas (LRA) are served by local fire protection resources, such as Cities. A WUI fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. The District does not contain any designated LRAs within its boundaries, and consists only of SRAs.

Fire Hazard Severity Zones

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 based on those factors for SRAs where CAL FIRE has fiscal responsibility for wildland fire protection. The District falls under SRA for fire response from CAL FIRE. CAL FIRE has determined there are three Severity zones within the District: ***Moderate, High,*** and ***Very High*** within the District. The majority is **Very High**, with **Moderate** and **High** in the remaining boundaries as shown in Figure 4.

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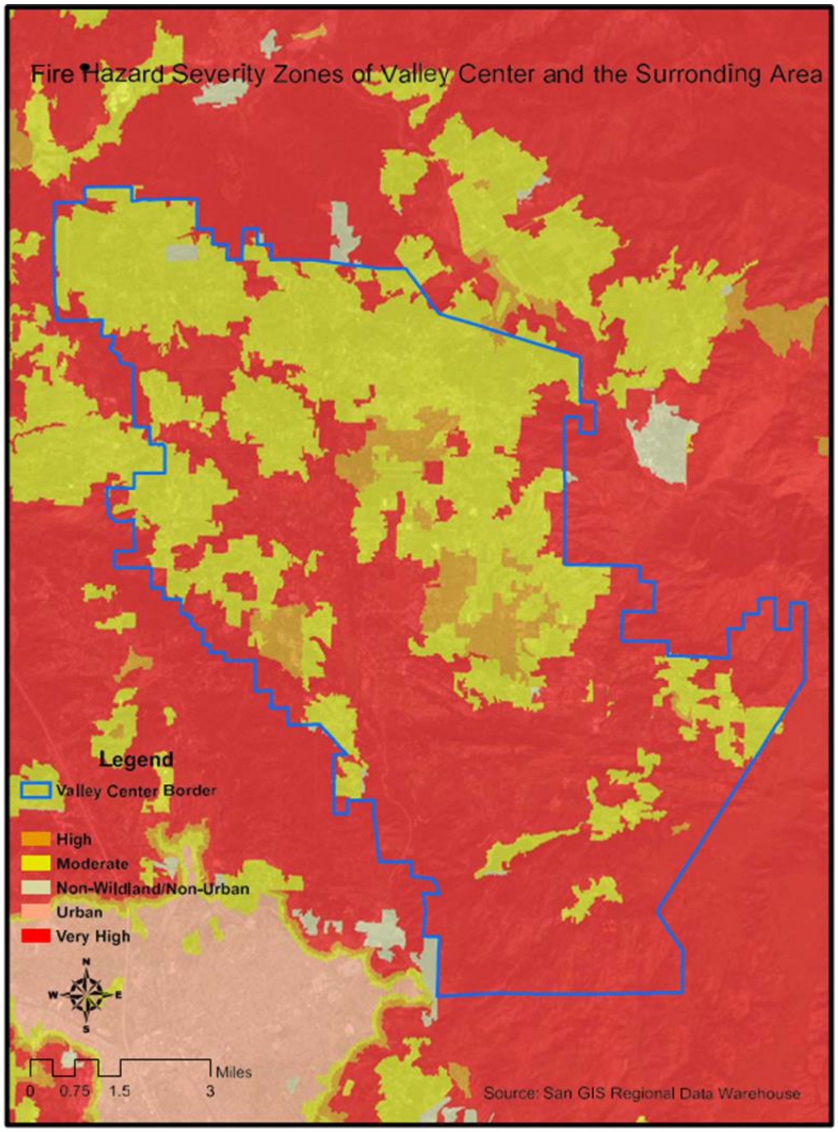
[11] National Wildfire Coordinating Group

[12] Applied Wildland Fire Behavior Research & Development

Figure 4—Valley Center Local Response Area Hazard Map



Valley Center 2015 Local Hazard Mitigation Plan (LHMP)

Wildland Fire Risk Factors

Wildland fuels, weather, and topography are the predominant factors influencing wildland fire behavior.

Wildland Fuels[13]

Fuel plays a significant role in fire behavior. While fuel does not specifically cause fire, it unquestionably determines the character of a fire by affecting ease of ignition, size, and flame intensity. Critical aspects of fuel include the continuity of fuel to allow a fire to keep spreading, the moisture within fuel that dictates how quickly fuels burn, the arrangement of fuels, and the density of vegetation (fuel load). Natural vegetation becomes increasingly susceptible to wildland fire in times of drought when moisture content of living and dead plant material decreases. Fuel is heavily influenced by its topographical location and climate. Fire preparedness and mitigation is primarily focused upon fuel management around properties since it can be modified by human actions.

Weather

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 San Diego 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, dry summers, and moderate winds through the District. Wildland fire risk during drought conditions is generally higher.

Topography

San Diego County's topography consists of a semi-arid coastal plain and rolling highlands, which, when fueled by shrub overgrowth, occasional Santa Ana winds, and high temperatures, creates an ever-present threat of wildland fire. Extreme weather conditions such as high temperature, low humidity, and/or winds of extraordinary force may cause an ordinary fire to expand into one of massive proportions.

Wildland Fire Service Capacity

The District's initial response plan for vegetation fires is one engine and a Battalion Chief. In addition to the District's other available suppression resources and nearby automatic aid and mutual aid resources, CAL FIRE has seventeen state-funded fire stations within San Diego County with extensive additional wildland suppression resources available through mutual aid to assist the District in suppressing a wildland fire.

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[13] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

Wildland Fire Risk Service Demand

Over the most recent three-year period evaluated by Citygate for this study, there were a total of 20 vegetation-related fires in the District comprising 0.005 percent of total service demand over the same time, as shown in Table 7.

Table 7—Wildland Service Demand[14]

FY 13/14	FY 14/15	FY 15/16	Total
6	8	6	**20**

Overall, the District has low wildland/vegetation fire service demand. However, the potential for a devastating fire is present in the District.

Probability of Occurrence

Based on evaluation of the wildland fire risk factors including fire hazard severity zones, low volume of receptive vegetative fuels, rolling topography, excellent firefighting water supply infrastructure, and low historic wildland fire service demand, Citygate concludes that the District probability of a serious wildland/vegetation fire occurring over the next 12 months is ***Low***.

Impact Severity

Severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity of a wildland fire is deemed to be ***High***.

Wildland Fire Overall Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for wildland fires is determined to be ***HIGH/SPECIAL***.

3.2.11 Emergency Medical Services Risk

EMS Risk Factors

Emergency medical services (EMS) risk in most communities is predominantly a function of population density, demography, violence, and vehicle traffic. Relative to population demography, 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

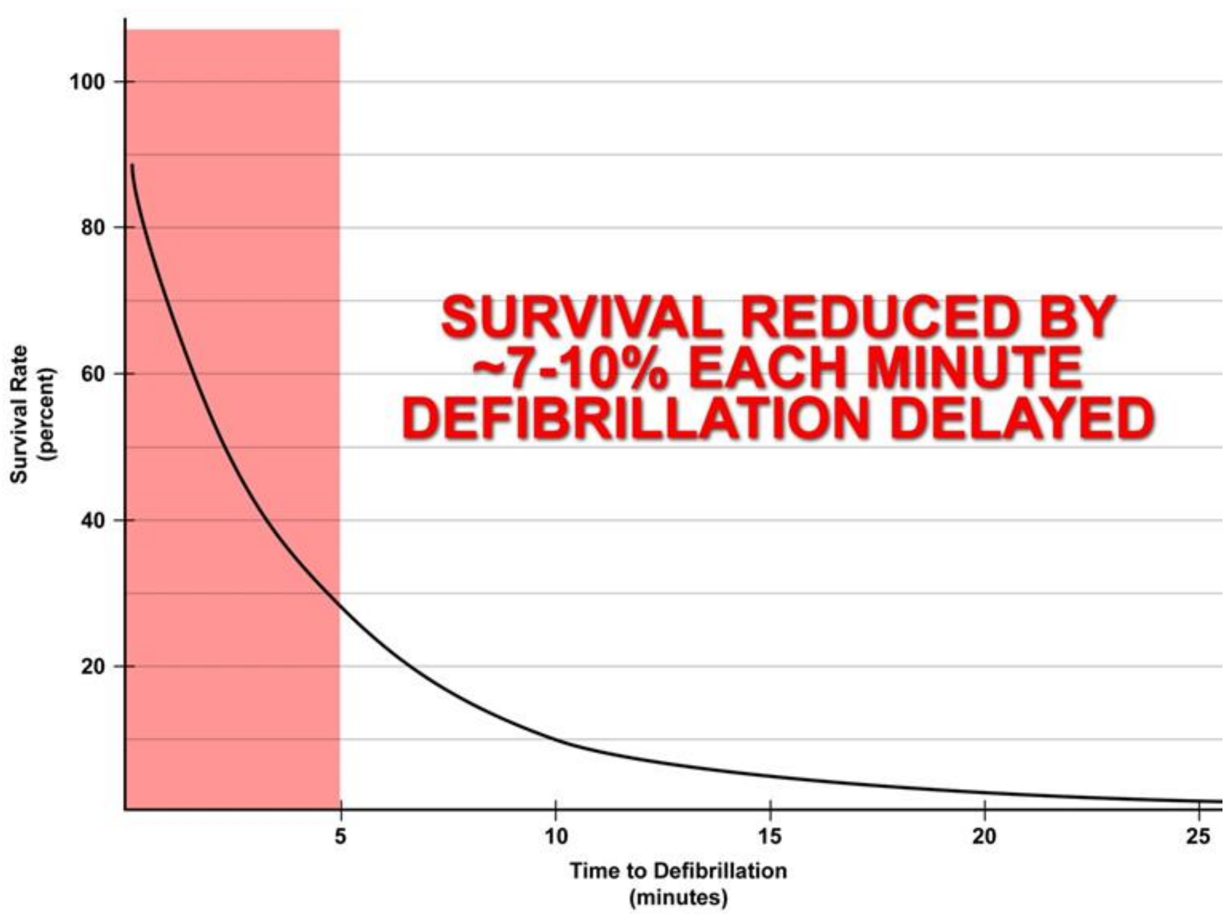
[14] Source: Valley Center FPD Records Management System

community with high daily vehicle traffic volume, particularly those areas with high traffic volume travelling at higher speeds. The District has four major highways that transect all or parts of the District including Cole Grade Road, Old Castle Road, Valley Center Road, and Lilac Road. These roads are highways that lead to local tribal gaming casinos and are heavily travelled by buses and other high occupancy vehicles (HOVs).

EMS risk can be categorized as either a medical emergency resulting from a health-related condition or event, or traumatic injury. Medical emergencies in which there is an interruption or blockage of oxygen to the brain, such as cardiac arrest, are very serious.

Figure 5 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 can influence survivability as well, such as early CPR and pre-hospital advanced life support interventions.

Figure 5—Survival Rate vs. Time of Defibrillation



Source: www.suddencardiacarrest.com

According to the 2010 U.S. Census, 10 percent of Valley Center's population is 65 and older and 9 percent is at or below poverty level.[15] The District also has multiple transportation routes contributing to its EMS risk.

EMS Service Capacity

The District's EMS service capacity consists of a daily on-duty response force of 11 personnel staffing two engines, one rescue squad, one ambulance transport unit, and one Battalion Chief from two fire stations. This on-duty force includes two reserve firefighters on the District's engines, as well as one reserve paramedic- or EMT-level firefighter on each the ambulance and rescue squad. The ambulance and paramedic rescue squad are provided by a private ambulance contractor to San Diego County, and they supply a second position on the rescue squad and ambulance. All calls for medical assistance receive the closest District unit response consisting of an engine and one ambulance. This level of response provides five personnel (at least one of whom is a paramedic) to every EMS-related call for service. All District response personnel are trained to either the 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.

EMS Service Demand

EMS service demand has been growing in the District over the three-year study period, and at present is 76 percent of total service demand over the same period.

Table 8—EMS Service Demand by Year

FY 13/14	FY 14/15	FY 15/16	Total
417	654	1,116	2,187

Source: Valley Center FPD Records Management System

EMS service demand varies widely, with the highest demand in the southern half of the District. It is also significant to note that EMS service demand is rapidly increasing by approximately 167 percent over the past three years.

Probability of Occurrence

Based on evaluation of EMS risk factors, including community demographics, high vehicle traffic volume, low violent crime activity, and historic EMS service demand, Citygate concludes that the District's probability of a serious EMS event occurring over the next 12 months is ***High***.

[15] Source: U.S. Census Bureau (2010)

Impact Severity

Severity, is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity of an EMS incident is deemed to be ***Low***.

EMS Overall Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for EMS incidents is determined to be ***MODERATE***.

3.2.12 Hazardous Materials Risk

Hazardous Materials Risk Factors

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

The District has 33 buildings/facilities classified as hazardous occupancies or requiring a state hazardous material operating permit (CUPA) as shown in Table 9.

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).

Hazardous Materials Service Capacity

All District response personnel are trained to the Hazardous Material First Responder Operational level to provide initial hazardous material incident assessment, hazard isolation, and support for the Hazardous Material Response Team. Additionally, several regional fire agencies have Hazardous Material Response Teams available through the mutual aid system.

The following hazardous material service demand table summarizes hazardous material service demand for the District over the previous three years, which is 0.79 percent of total service demand over the same period.

Table 9—Hazardous Material Risk Service Demand

FY 13/14	FY 14/15	FY 15/16	Total
1	4	2	7

Source: Valley Center FPD Records Management System

Probability of Occurrence

Based on evaluation of the hazardous materials risk factors, including 33 facilities that store, use, or produce hazardous materials, underground pipelines carrying hazardous materials, vehicle transportation of hazardous materials, at-risk populations, and low historic hazardous material service demand, Citygate concludes that the District's probability of a serious hazardous materials event occurring over the next 12 months is ***High***.

Impact Severity

Severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity from a hazardous materials incident are deemed to be ***Low***.

Hazardous Materials Overall Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for hazardous materials is determined to be ***MODERATE***.

3.2.13 Technical Rescue Risk

Technical Rescue Risk Factors

Technical rescue risk factors include active construction projects, structural collapse, confined spaces such as tanks and underground vaults, bodies of water and rivers or streams, farm and other machinery, transportation accidents, and earthquake/flood potential.

Technical Rescue Risk Service Capacity

The District has mutual aid for responses through a regional mutual aid system for technical rescue responses. Additionally, all personnel are trained to the First Responder Awareness level. Some members also have Rescue System 1 and 2 training to assist as needed.

Technical Rescue Service Demand

Over the most recent three-year period evaluated for this study, there were 17 rescue incidents in the District.

Table 10—Technical Rescue Risk Service Demand

FY 13/14	FY 14/15	FY 15/16	Total
3	6	8	17

Source: Valley Center FPD incident records

Probability of Occurrence

Based on evaluation of the technical rescue risk factors discussed, including number of active construction projects, number of confined spaces, bodies of water, serious transportation collision potential, and earthquake and flood potential, Citygate concludes that the District's probability of a significant technical rescue event occurring over the next 12 months is ***High***.

Impact Severity

Severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity from a technical rescue incident is deemed to be ***Low***.

Technical Rescue Overall Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for technical rescue is determined to be ***MODERATE***.

3.2.14 Earthquake/Seismic Activity Risk[16]

Earthquake is a term used to describe both sudden slip of a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth.[17] Shaking as a result of an earthquake can be felt both at the site of occurrence and region around the occurrence. These events cannot be predicted and thus occur with no warning. Earthquakes have a large potential for causing large-scale damage, injuries, and casualties within a matter of seconds. The resulting damage from an earthquake depends upon the energy that is released from the stress changes within the earth, the location of the epicenter (location on the earth above the slip), and the soils on which the built environment rest upon. These factors will determine the impact severity. Earthquakes are measured by magnitude and intensity.

Richter Scale

The Richter Magnitude Scale is a mathematical device designed to compare the size of earthquakes by determining the magnitude through the logarithm of the amplitude of waves recorded by seismographs. The scale includes adjustments for variations in seismographs and expresses earthquake magnitude in the form of whole numbers and decimal fractions. With the scale being logarithmic, each point increase on the scale corresponds to a 10-fold increase in power and a 32-fold increase in energy. Therefore, an earthquake with a magnitude of 8 is 100

[16] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.
[17] United States Geological Survey, 2012

times (10 x 10) greater in power and 1,024 (32 x 32) greater in energy than an earthquake with a magnitude of 6.

Modified Mercalli Intensity Scale

Intensity is the effect that an earthquake has on the earth's surface, which is measured by utilizing the Modified Mercalli Intensity Scale. While several intensity scales have been developed over the past 100 years, the Modified Mercalli Intensity Scale is the one that is currently in use today in the United States. The scale is based upon arbitrary ranking by designated roman numerals based upon observations. The lower roman numerals begin with the manner in which people feel the earthquake, with the larger roman numerals being assigned built upon structural damages observed.

History, Location, and Extent

There have been no recorded earthquakes that have caused major damages within the District. Within San Diego County, there have been several moderate earthquakes in the recent decades along the Rose Canyon Fault Zone underneath the City of San Diego registering at magnitudes of 3.9, 4.0, 3.9, and 4.7. The most recent significant earthquake activity occurred on June 15, 2004, with a magnitude of 5.3 on the San Diego Trough Fault Zone approximately fifty miles southwest of San Diego, which reported as an IV on the Modified Mercalli Intensity Scale.

Based upon San Diego GIS data, the District is near two different sections of the Elsinore Fault Zone:

- Temecula Section of the Elsinore Fault Zone (approximately 2.3 miles to the northeast)
- Julian Section of the Wildomar Fault, which is a fault within the Elsinore Fault Zone (approximately 8.2 miles to the east).

The Elsinore Fault is a strike slip fault and "one arm of a trilateral split of the San Andreas Fault." In recent documented history, this fault has been considerably quiet. In 1910, the fault produced a magnitude 6.0 earthquake to the north of San Diego County, resulting in minimal damage. The fault has the probable magnitude range of 6.5 to 7.3.

Probability of Occurrence

Based on an evaluation of earthquake risk factors including multiple known faults in combination with the potential for significant ground shaking, soft-story buildings, critical facilities, and recent local/regional earthquake activity, Citygate concludes that the District's probability of a significant earthquake event occurring over the next 12 months is ***Low***.

Severity

Severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity from an earthquake incident is deemed to be ***Low***.

Earthquake/Seismic Activity Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for earthquakes/seismic activity is determined to be ***LOW***.

3.2.16 Flood Risk and Dam Inundation Risk[18]

Flooding is the accumulation of excess water from rainfall, snowmelt, or storm surge in areas that are normally dry. Floods can also occur when water accumulates in natural water bodies such as creeks, streams, rivers, or lakes and the water overflows the banks and into an adjacent floodplain. Floodplains are low-lying lands neighboring water bodies that are subject to reoccurring flooding. Flooding is a natural event that can range from a water depth of several inches to several feet. Floods can cause substantial property damage and pose a life threat to the population through drowning and being swept away by water currents. The average rainfall within Valley Center is approximately 8.83 inches based upon 1999-2010 rainfall averages.

Flash Floods

There are several factors that determine a flood's severity and its impact upon a community, including intensity and duration of rainfall, watershed slope, vegetation, floodplain layout, and soils. When rain falls at a high intensity in a short period, the soils are not able to absorb the water causing the excessive water to runoff and accumulate in low-lying lands. This condition is known as a flash flood, which is a swift rise in water levels that flow at a high velocity and can carry a large amount of debris down current. Flash floods have a large potential for damaging both the natural and built environment. Flash floods can also be caused by dam failure or sudden spills of a large volume of water. The portions of San Diego County that are most susceptible to flash floods are terrain types of mountainous canyons and dry creek beds.

Dam Inundation

Dam inundation is the failure of a dam, levee, or artificial barrier, which causes the water body to charge out into the low-lying grounds adjacent to the water body. Dam failure may cause flash flooding and poses a threat to a small amount of agricultural acreage in the District. The

[18] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

northwest corner of the District has a small potential from dam inundation from the Lower and Upper Stehly Dam. However, this dam was recently refurbished to help preclude potential flooding. Additionally, another consequence of either riverine flooding or dam failure by either Lakes Wolford or Henshaw would be to cut off access roadways into the District, therefore isolating the District from mutual aid resources.

Localized Flooding[19]

Localized flooding is the flooding of smaller geographical areas, primarily outside of recognized flood zones, due to substantial precipitation, surface runoff, and the inundation of a storm water system. This flood type mainly occurs as a slow rising water level and has minimal water velocity. Damage is primarily minor and small in scale. With the diverse topography of the District, this flooding event is possible in small portions of the community, but would not be widespread.

Riverine Flooding

Riverine flooding is defined by the California Department of Water Resources as a flood occurring when rivers, streams, or lakes overflow their banks, including flooding in areas adjacent to local streams and creeks. This flood type can occur in both hilly regions to flat plains along water bodies. This is the primary type of flooding that can occur within the District due to the hilly regions and confined channels that are present. The steeper the topography and narrower the floodplain, the quicker the flooding comes on and is typically confined by the topography.

Probability of Occurrence

Based on an evaluation of flood risk factors including known designated flood-prone areas and multiple recent local/regional flood events, Citygate concludes that the District's probability of a significant flood event occurring over the next 12 months is ***High***.

Impact Severity

Severity is the study of the magnitude or reasonably expected loss that will be experienced by the response area, community, and the citizens should an incident occur.

The severity from a flooding event are deemed to be ***Low***.

[19] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

Flood Risk and Dam Inundation Overall Risk Determination

Based on probability of occurrence and impact severity, the overall risk determination for a flooding event is determined to be ***MODERATE***.

3.2.15 Drought Risk[20]

Nature of Hazard

Drought, or an extreme dry period, is an extended time frame where water availability falls below statistical requirements for a region. Droughts are not purely a physical phenomenon, but rather interplay between the natural water availability and human demands for water supply. While the term "drought" is primarily thought to mean a lack of rainfall, there are three different types of drought. The three types of drought are as follows:

Hydrological Drought

Hydrological drought is the deficiency in surface and subsurface water supply because of reduced or deficient precipitation.

Agricultural Drought

Agricultural drought occurs when soil moisture is insufficient to meet the demands of a particular crop at a specific point in time. This type of drought can be present even during times of average precipitation, due to soil conditions or agricultural practices.

Meteorological Drought

Meteorological drought is usually based on precipitation's departure from normal over some period of time. These definitions are usually region-specific, and presumably based on a thorough understanding of regional climatology. Normally, meteorological measurements are the first indicators of drought.

History, Location, and Extent

Drought is an extreme weather event that affects the District as well as the entirety of San Diego County. Lack of precipitation can lead to significant health, agricultural, economic, and social impacts. Drought can reduce the amount of ground and surface water available to the population and can lead to a decrease in water quality. Lower water levels reduce the amount of dilution of pollutants resulting in an increased risk of water contamination.

[20] Valley Center 2015 Local Hazard Mitigation Plan (LHMP) – Content in this risk assessment significantly utilized from other sources has been formatted with a gray background.

The United States Drought Monitor is a weekly map that is released through the joint efforts of the National Oceanic and Atmospheric Admiration (NOAA), the United States Department of Agriculture (USDA), and the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln, which monitors drought conditions across the United States. The NDMC classifies drought into five different categories, which are as follows:

- D0: Abnormally Dry
- D1: Moderate Drought
- D2: Severe Drought
- D3: Extreme Drought
- D4: Exceptional Drought.

The NDMC's latest drought map, released on February 5, 2015, shows the western portion of San Diego County as being classified as D3: Extreme Drought, with the eastern portion of San Diego Falling into the category of D2: Severe Drought. The District is within the Extreme Drought category. One year ago, in February of 2014, Valley Center was in a category D2: Severe Drought. In February of 2013, the category was D1: Abnormally dry. In February of 2012, no drought was classified. Valley Center has experienced a one-class degradation every year since 2012.

3.2.16 Risk Assessment Summary

Citygate's evaluation of the various risks likely to adversely impact the District yields the following conclusions:

1. The District has diverse urban, suburban, and rural population densities within District boundaries.
2. The District has a mix of residential, commercial, office, and industrial buildings.
3. The District has varying probabilities of occurrence and probable consequence severity relative to eight known hazards:
    a. Building Fire Risk
    b. Wildland Fire Risk
    c. Emergency Medical Services (EMS) Risk
    d. Hazardous Materials Risk
    e. Technical Rescue Risk
    f. Earthquake/Seismic Activity Risk
    g. Flood Risk and Dam Inundation Risk
    h. Drought Risk.

Table 11 indicates the summary of overall risk determination for each risk type. The determination is based on the probability of occurrence of that type of incident and the impact severity to life and property should that risk type occur. Table 4 shows the risk/severity matrix, and is repeated here. This matrix was used to determine the overall risks shown in Table 11.

Table 4—Probability/Severity Risk Matrix

	Low Severity	High Severity
High Probability of Occurrence	**Moderate Risk** (***High*** Probability) (***Low*** Severity)	**Maximum Risk** (***High*** Probability) (***High*** Severity)
Low Probability of Occurrence	**Low/Isolated Risk** (***Low*** Probability) (***Low*** Severity)	**High/Special Risk** (***Low*** Probability) (***High*** Severity)

Table 11—Risk Determination Summary

Risk Type	Risk Determination
Building Fire	MODERATE
Wildland Fire	HIGH/SPECIAL
EMS	MODERATE
Hazardous Material	MODERATE
Technical Rescue	MODERATE
Earthquake/Seismic	LOW
Flooding[21]	MODERATE
Drought	UNABLE TO QUANTIFY

[21] Flooding risks include dam inundation, and flood prone areas.

3.3 EXISTING DISTRICT DEPLOYMENT

3.3.1 Existing Deployment Situation—What the District Has in Place Currently

SOC ELEMENT 1 OF 8*
EXISTING DEPLOYMENT POLICIES
Note: Continued from page 7.

As the Board of Directors has not adopted a best-practices-based response time policy, this study will benchmark the District against the response time recommendations of NFPA #1710 for career staffed departments, and by NFPA #1720 for combination fire departments using volunteer/reserve/paid call firefighters.

NFPA #1710 for career departments in urban/suburban population density areas recommends:

- Four (4:00) minutes travel time for the first-due unit to all types of emergencies.
- Eight (8:00) minutes travel time for multiple units needed at serious emergencies (First Alarm).

NFPA #1720 for combination departments recommends:

- Urban areas of >1,000 people per square mile, 15 personnel in 9:00 minutes from crew notification, 90 percent of the time.
- Suburban areas of 500-1,000 people per square mile, 10 personnel in 10:00 minutes from crew notification, 80 percent of the time.
- Rural areas of <500 people per square mile, 6 personnel in 14:00 minutes from crew notification, 80 percent of the time.

The District's current daily staffing plan is summarized in Table 12.

Table 12—Daily Minimum Staffing per Unit for the District – 2015

Unit	Minimum Unit Staffing	Staff	Staffing Minimum
2 Engines	2	**Career Firefighters** per Day	4
	1	**Reserve Firefighter** per Day	2
1 Ambulance	1	**District Reserve Firefighter** per Day at Either Paramedic or EMT Status	1
	1	**Ambulance Company Paramedic/Firefighter** per Day	1
1 Paramedic Rescue Squad	1	**District Reserve Firefighter** per Day at Either Paramedic or EMT Status	1
	1	**Ambulance Company Paramedic/Firefighter** per Day	1
1 Chief Officer	1	**Chief Officer** per Day	1
Total District Firefighters and Chief Officer			**9**
Total Ambulance Company Medics or EMTs			**2**
Total Personnel			**11**

This daily staffing is barely adequate for the immediate response to small emerging fires in most of the built-up, urban areas of the District. However, for this staffing statement to be accurate for a building fire, the assumption is that the closest crews are available and not already operating on another emergency medical call or fire, which does occur. For example, if one engine and the ambulance are committed to an emergency medical services call, then an adjacent engine company must respond, sometimes from another fire department via the mutual aid system.

The District has an innovative partnership with its contract ambulance provider to place a reserve firefighters (a part-time employee that does not receive benefits), at either a paramedic- or EMT-level of certification, on the ambulance and rescue squad where the ambulance company provides a paramedic/firefighter on each. If the EMS units are not busy, the EMS unit staffing can assist at fires. However, if the ambulance is out of town on a transport, and the EMS squad is on another EMS incident, then the District's on-duty firefighting force falls to only six, plus mutual aid and call-back District personnel.

The District also staffs the third position on each of the two engine companies each day with a reserve firefighter. While the use of reserves is very commendable, and is less expensive, it means equipping and maintaining a reserve force larger than the minimum needed. This program can continue if the force is large enough to reliably maintain the 24/7/365 need.

One drawback to the reserve program is that it does not bring in permanent career employees whom can be trained in a succession plan program to become the next generation of Engineers and Fire Captains. This is doubly important as some of the current Fire Captains and Engineers are retired from other fire service careers. It is not known whether these individuals will be replaced by more "limited-term" employees, already once retired, or from within the ranks of an emerging, permanent District workforce that comes to deeply know the community's needs.

Services Provided

The District is an "all-risk" fire department providing the people it protects with services that include structure fire, technical rescue, emergency medical services, and first-responder hazardous materials response, as well as other services.

Given these risks, the District uses a tiered approach of dispatching different types of apparatus to each incident category. The Communications Center's system selects the closest and most appropriate resource types. Table 13 shows the resources dispatched to common risk types.

Table 13—Resources Deployed to Common Risk Types

Risk Type	District Resources Deployed	Mutual/Automatic Aid Resources Deployed	Minimum Total Firefighters Sent[1]
1-Patient EMS	1 Engine 1 Ambulance	-	2 Career FF 2 Reserve FF 1 Mercy Paramedic
Auto Fire	2 Engines	-	4 Career FF 2 Reserve FF
Building Fire	2 Engines, 1 Ambulance, 1 Rescue Squad, 1 Chief	1 Engine, 1 Ladder Truck	4 Career FF 2 Reserve FF 2 Mercy PM/FF 6 Mutual Aid FF
Hazardous Materials	2 Engines, 1 Ambulance, 1 Rescue Squad, 1 Chief	1 Engine, 1 Ladder Truck	4 Career FF 2 Reserve FF 2 Mercy PM/FF 6 Mutual Aid FF
Wildland Fire	2 Engines, 1 Rescue Squad, 1 Chief	2 Brush Units, 1 Water Tender	4 Career FF 2 Reserve FF 7 Mutual Aid FF
Technical Rescue	2 Engines, 1 Ambulance, 1 Rescue Squad, 1 Chief	2 Engines, 1 Truck	4 Career FF 2 Reserve FF 2 Mercy PM/FF 6 Mutual Aid FF

[1] The column titled "Minimum Total Firefighters Sent" does not include the reserve firefighters on the rescue squad or ambulance units as they may not be available.

Fire

The District provides structural fire protection services utilizing two engine companies, one ambulance, one paramedic rescue squad, and one Chief Officer from two fire stations, plus automatic aid units as necessary.

Technical Rescue and Hazardous Materials Responses

The District provides awareness-level responses from its resources of one engine and one Chief Officer, augmented by automatic aid and, if needed, the Countywide Hazardous Materials Type 1 Team.

3.3.2 Emergency Unit Staffing

The daily unit deployment for the District is two engine companies, one paramedic rescue squad, one ambulance unit, and one Chief Officer. The daily minimum staffing count for these units is eight District personnel, two Mercy ambulance personnel and one Chief Officer. This daily staffing depth in District is inadequate to handle several medical emergencies and one serious building fire before relying on automatic aid. Serious fires will be even more understaffed if either or both the paramedic rescue squad and ambulance are already committed to EMS incidents.

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SECTION 4—STAFFING AND GEO-MAPPING ANALYSIS

4.1 CRITICAL TASK TIME 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 task time 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.

4.1.1 Firefighting Critical Tasks

The District's Effective Response Force (ERF) to structure fires in built-up, suburban areas includes two engines, one rescue squad, one ambulance, and one Chief, for a *minimum* ERF total of **11** personnel from the District. To increase this force, each serious fire event also has dispatched, from mutual aid partners, one engine and one ladder truck with six personnel, for a total force of 17. However, the District is only immediately providing ten firefighters, including reserves, if the EMS units are available and, and only six personnel if the EMS units are not available. The District *is heavily dependent* on mutual aid over a longer distance to fully staff its effective response force.

The following table shows what a dispatched force of 17 can accomplish. The larger the force (weight of attack), the faster the tasks are completed.

Scenario: *The following is a simulated one-story residential structure fire with no rescue situation. Responding companies received dispatch information as typical for a witnessed fire. Upon arrival, they were told approximately 1,000 square feet of the home was involved in fire.*

Table 14—First Alarm Structure Fire – 17 Personnel

Company Level Tasks
1st-Due Engine
1. Lay in a hydrant supply line.
2. Stretch the 150-foot, 1¾-inch hose line to the point of access for search and rescue.
3. Operate the pump to supply water and attach hydrant supply line.
4. Assume command of initial operations.
5. Establish the Initial Rapid Intervention Crew.
2nd-Due Engine & EMS Squad
1. If necessary, lay in a hydrant supply line.
2. Stretch a second 200-foot hose line as a back-up line and for fire attack.
3. Establish treatment (EMS) sector if needed.
4. Establish 2 in 2 out.
3rd-Due Engine (Mutual Aid) and Ambulance
1. If necessary, lay in a hydrant supply line.
2. Pump first Engine's supply line if needed.
3. Stretch third 1¾-inch hose line if needed.
1st-Due Ladder (Mutual Aid)
1. Perform positive pressure and/or vertical ventilation.
2. Secure utilities.
3. Raise ladders, open concealed spaces, and force entry as needed.
4. Provide salvage and overhaul.
1st-Due Incident Commander

The duties in Table 14, grouped together, form an *Effective Response Force or First Alarm assignment*. These tasks must be performed simultaneously and effectively to achieve the desired outcome; arriving on-scene does not stop the escalation of the emergency. While firefighters accomplish the listed tasks, the incident progression clock keeps running.

Fire spread in a structure can double in size during its *free-burn* period before firefighting is started. Many studies have shown that a small fire can spread to engulf an 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. In addition, flashover presents a danger to both firefighters and any occupants of the building.

4.1.2 Emergency Medical Services Critical Tasks

The District responded to nearly 1,276 EMS incidents in FY 15/16, which is a significant increase from previous years. These incidents include car accidents, 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 three emergency medical technicians and two certified paramedics to adequately operate an emergency cardiac scene. 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 District routinely responds to EMS calls that require treatment for more than one patient. These calls include vehicle accidents, chemical exposures, construction or industrial accidents, and any other event that occurs with several people near. 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 District 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, the following critical task table reviews the tasks needed on a typical cardiac arrest.

Table 15—Cardiac Arrest – Three Firefighters plus an Ambulance

Task	Personnel Required	Type of Treatment Administered
Compressions	1-2	Compression of chest to circulate blood
Ventilate/oxygenate	1-2	Mouth-to-mouth, bag-valve-mask, apply O_2
Airway control	1-2	Manual techniques/intubation/cricothyroidotomy
Defibrillate	1-2	Electrical defibrillation of dysrhythmia
Establish I.V.	1-2	Peripheral or central intravenous access
Control hemorrhage	1-2	Direct pressure, pressure bandage, tourniquet
Splint fractures	2-3	Manual, board splint, HARE traction, spine
Interpret ECG	2	Identify type and treat dysrhythmia
Administer drugs	2	Administer appropriate pharmacological agents
Spinal immobilization	3-5	Prevent or limit paralysis to extremities
Extricate patient	3-5	Remove patient from vehicle, entrapment
Patient charting	1-2	Record vitals, treatments administered, etc.
Hosp. communication	1-2	Receive treatment orders from physician
Treat en-route	2-5	Continue to treat/monitor/transport patient
Total	**5**	**Personnel Required per Patient**

4.1.3 Critical Task Analysis and Effective Response Force Size

What does a deployment study derive from a company task analysis? The total task needs (as displayed in Table 14 and Table 15) to stop the escalation of an emergency must be compared to outcomes. It is known from nationally-published fire service "time vs. temperature" tables that after about four to five minutes of free burning, a room fire will grow to the point of flashover. At this point, the entire room is engulfed, the structure becomes threatened, and human survival near or in the fire room becomes impossible. Additionally, it is known that brain death begins to occur within four to six 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 discussed show that the residents of the District are only able to expect positive outcomes, and have a good chance of survival, in a *small emerging* fire or single patient medical emergency. This is because the District's first responding units and mutual aid units are typically arriving in 11:12 minutes or less ***travel*** time (as identified in Section 5). This travel time is significantly longer then best practices of 4:00 to 9:00 minutes in urban/suburban areas. The District is <u>not</u> staffed with enough firefighters per day to deliver <u>one</u> Effective Response Force of 17 firefighters to a building fire without the assistance from other agencies.

Mitigating an emergency event is a team effort once the units have arrived. This refers 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 a lightly-staffed force arrives, 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. If fire stations are spaced too far apart, then when one unit must cover another unit's area, or multiple units are needed, these units can be too far away and the emergency will worsen.

Previous critical task studies conducted by Citygate, the Standard of Response Cover documents reviewed from accredited fire departments, and NFPA #1710 recommendations all arrive at the need for 15+ firefighters arriving within 11:30 minutes (from the time of call) at a room and contents structure fire to be able to ***simultaneously and effectively*** perform the tasks of rescue, fire attack, and ventilation. Given that the District and mutual aid agencies sends 17 personnel (three engines, one ladder truck, one paramedic squad, one ambulance, and one Chief Officer) to an incident involving a working First Alarm building fire, the District and its leaders understand 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 force.

A question one might ask is, "If fewer firefighters arrive, *what* from the list of tasks mentioned would not be completed?" Most likely, the search team would be delayed, as would ventilation. The attack lines would only consist of two firefighters, which does not allow for rapid movement above the first-floor deployment. Rescue is conducted with only two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Effective deployment is about the **speed** *(travel time)* and the **weight** *(firefighters)* of the attack.

Seventeen initial District and mutual aid firefighters could handle a moderate-risk house fire *if they all arrived soon enough,* which the incident statistics section of this report will show *they do not*. However, even a District-based Effective Response Force of 17 will be seriously slowed if the fire is above the first floor, in a low-rise apartment building, or commercial/industrial building. This is where the capability to add alarms to the standard response becomes important.

Given the fact that the District's First Alarm (Effective Response Force) delivers 17 personnel to a moderate risk building fire, including mutual aid, it reflects the District's goal to confine serious building fires to or near the room of origin, and to prevent the spread of fire to adjoining buildings. This is a typical desired outcome in built-out areas and requires more firefighters more quickly than the typical rural outcome of keeping the fire contained to the building, not room, of origin.

Given that there is not a current District response time policy, the District's current physical response to building fires is, in effect, the District's de-facto deployment measure to built-up urban/suburban areas. Thus, this becomes the baseline policy for the deployment of firefighters.

Finding #2:	The District's minimum daily staffing of three personnel per fire engine, totaling six per day, is insufficient to begin control on serious fires and technical emergencies. The District is too dependent on outside mutual aid for anything more than minor fires and modest severity EMS events.

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 District is served today by two 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 spacing of first-due fire units to stop routine emergencies.
- **Concentration** – the clustering of fire stations close enough together so that building fires can receive sufficient resources from multiple fire 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 used a geographic mapping tool called *FireView*™ 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 District.

Given that the District has very different population density areas and staffs career and reserve firefighters, Citygate determined that the District was "between" the recommendations of NFPA #1710 for career departments and NFPA #1720 for combination departments.

Therefore, to assist the District in developing an updated and complete best practices response time policy, our GIS analysis tested three travels times for first-due units—5:00, 8:00 and 11:00 minutes. For First Alarm unit travel time, Citygate tested 8:00, 11:00 and 12:00 minutes. This helps the District visualize how different travel time goals will or will not cover the most populated areas of the District.

When up to a total of 3:30 minutes is added for dispatch processing and crew turnout times, then the maps effectively show the area covered by a single unit from 8:00 to 14:00 minutes, and by multiple units from 11:00 to 15:00 minutes.

Map #1 – General Geography and Station Locations

This map shows the existing District fire station locations with the District boundaries. This is a reference map for the other maps that follow.

Map #2a – Critical Facilities

This map shows the locations of critical facilities essential to the safe operation of the District and community.

Map #2b – High NFF Fire Flow Data

This map shows the locations of buildings with needed fire flow greater than, or equal to, 1,000GPM.

Map #2c – Hazardous Materials Use and Storage Sites

Some commercial buildings use or store a significant amount of hazardous materials. Such sites are highly regulated by the Building and Fire Codes, and enforcement of the codes is conducted by the District and San Diego County Health Department. The location of these sites is mostly in the commercial and industrial zones of the District.

Map #2d – Population Density

This map shows the population density aggregated by census block groups across the entire District.

Map #3a – First-Due Unit Distribution: 5:00, 8:00, 11:00-Minute First-Due Travel

This map shows, using green street segments, the distribution of District stations tested against three *travel* time goals. Therefore, green, yellow, and orange indicate the locations an engine could reach within the prescribed time, ***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 projections are realistic for engines with normal traffic present.

The purpose of computer response mapping is to determine and balance station locations. This geo-mapping design is then checked in the study against actual dispatch time data, which reflects actual travel data. 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 company's first-due area.

As Section 5 will detail, the Districtwide *travel* time to 90 percent of the fire and EMS incidents is currently 11:23 minutes.

Map #3b – First-Due Ambulance Travel: 10:00, 15:00, and 20:00 Minutes

The District jointly staffs, with the private ambulance provider, a squad and ambulance per day with a minimum of two personnel for first response Advanced Life Support service in conjunction with the County's operating area agreement. This map displays the coverage from the paramedic fire station locations at three travel times consistent with suburban areas in other California county EMS systems. The San Diego EMS agency agreement with the ambulance provider only requires an ambulance reach the incident location within 30:00 minutes.

Map #3c – First-Due Travel Time: 5:00, 8:00, and 11:00 Minutes Over Population Density

This map shows the three tested first-due unit travel times overlaid with the population density by census block. It is apparent that it would take at least three stations at an 8:00-minute travel time to cover the most populated sections of the District.

Finding #3:	As can be seen on Map #3c for first-due unit travel time, a 5:00- or even 8:00-minute travel time from only two stations cannot reach all the most populated areas of the District.

Map #3d – First-Due Unit Distribution: 5:00-, 8:00-, 11:00-Minute First-Due Travel PLUS a Third Fire Station

This map shows the same travel time measures as Map #3a, except, in this map, a third fire station is added at Cole Grade Road at Cole Grade Lane. Doing so adds shorter travel time coverage to the northern core of the District.

Map #3e – Three Fire Stations at 8:00 Minutes Travel

This map shows the measure of 8:00 minutes travel time from all three fire stations. There are two important factors shown here. First, most of the populated areas of the District would be within 8:00 minutes travel of a fire station. Second, the darker colors show that the more densely populated core of the District is covered by all three stations, greatly increasing both multiple-unit coverage, as well as providing redundancy for multiple calls for service.

Map #4 – ISO 1.5 Miles Travel Distance Over Population Density

This map displays the Insurance Service Office (ISO) requirement that stations cover a 1.5-mile *distance* response area over the population densities. Depending on the road network in a department, the 1.5-mile measure usually 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 the map displays, given the limited road network and topography in the District, only a few streets close to the two fire stations are reached within a 1.5-mile distance measure.

Map #5a –Effective Response Force (First Alarm) at 8:00, 11:00, and 12:00 Minutes

This concentration map looks at the District's ability to send a *minimum* of its two engines and one Chief Officer to serious building fires within 8:00 to 12:00 minutes travel time. At an urban/suburban goal in a career department at 8:00 minutes, only the streets between the two fire stations are reached.

Finding #4:	As Map #5 shows, only the core of the District receives two units in 8:00 minutes travel time. Most of the most-populated areas are reached within 11:00 minutes travel time.

Map #5b – Effective Response Force (First Alarm) at 8:00, 11:00, and 12:00 Minutes with Proposed Station

This scenario adds a third station on Cole Grade Road at Cole Grade Lane. While the time coverage colors are the same, the coverage is *increased to three units.* The time bands look similar as the third station completes a "triangle" in which the three stations cover from the center of the District outward.

Finding #5:	A third fire station on Cole Grade Road at or near the intersection of Cole Grade Lane increases both the first-unit coverage as shown in Map #3e, and raises the two-engine coverage to three engines for the most populated north-central areas of the District.

Map #6 – Two Engines Only at 8:00 Minutes Travel

This map shows the 8:00-minute coverage of only the two engine companies, whereas Map #5 also included the Battalion Chief. The coverage for two engines is the same as two engines with a Battalion Chief because the Battalion Chief comes from one of the two stations.

Map #7 – One Chief at Travel Time of 8:00 Minutes

This map displays the coverage for one Battalion Chief at 8:00 minutes travel time from Station #1. Because this is a single unit from the most centrally located station, the coverage extends to much of the most populated areas of the District.

Map #8 – One Ambulance Only: 8:00 Minutes Travel Time

This map displays the coverage for one ambulance at 8:00 minutes travel time. As with the Battalion Chief coverage, the ambulance covers the more populated areas in 8:00 minutes, which is good coverage. Across different EMS agencies in California, ambulance response times can vary from 8:00 to 12:00 minutes as long as there are paramedic first response engines in each neighborhood.

Given this coverage, the ambulance contractor does not need to operate a second ambulance within the District's boundaries.

Map #9 – All Incident Locations

Maps #9 shows, across a three-year period, the exact location for all incident types. It is apparent that there is a need for services on almost every street segment of the District.

Map #10 – All Emergency Medical Services and Rescue Incident Locations

This map further breaks out only the emergency medical and rescue call locations. With most the calls for service being emergency medical, virtually all areas of the District need emergency medical services. As can be expected, areas with the highest population density and/or the most traffic generate a larger demand for service.

Map #11 – All Fire Type Locations

This map identifies the location of all fires in the District for three years. All fires include any type of fire call, from auto to dumpster to building. There are obviously fewer fires than medical or rescue calls. Despite this, it is evident that all first-due engines in the District experience fires; the fires are more concentrated where the building density is higher due to zoning.

Map #12 – Structure Fire Locations

Displayed in this map are the structure fire locations. While the structure fire count is a smaller subset of the total fire count, there are two meaningful findings from this map. First, there are still structure fires scattered across wide areas of the District. Second, fires in the more complicated building types must be controlled quickly or the losses could be very large. Fortunately, in the commercial and industrial zones, where commercial buildings tend to have automatic fire sprinklers and fire prevention practices, there are fewer building fires in the three-year period. Overall, the rate of serious building fires in the District has been low due to the somewhat new age of the structures, and fire safety program effectiveness.

Map #13 – Emergency Medical Services and Rescue Incident Hot Spots

This map examines, by mathematical density, where clusters of EMS incident activity occurred. In this set, the darker density color plots the highest concentration of all incidents.

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. For the District, this is true in several areas, where the incident demand has been the highest.

Map #14 – All Fire Hot Spots

This map is like Map #13, but shows the hot spots of activity for all types of fires. There are three areas of the District that generate the most calls: the Valley Center and Lilac Road corridors served by Station #1; the eastern Valley Center Road areas served by Station #2; and the northern central Cole Grade Road area, beyond the quick reach of either fire station.

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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 units all in place. Examination of the actual response time data provides a picture of real response times with 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 District provided National Fire Incident Reporting System (NFIRS 5) incident and CAD apparatus response data for the period 10/1/2013-9/30/2016. As such, the data set is a statistically significant data set.

5.2 SERVICE DEMAND

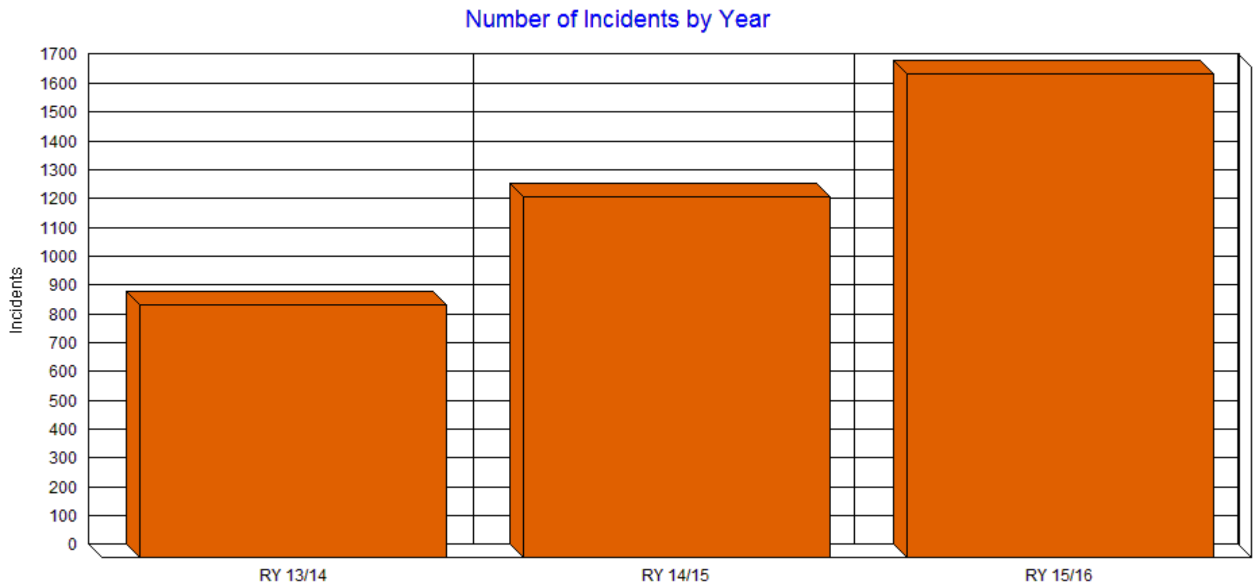
In RY 15/16, the District responded to 1,679 incidents. During this time, the District had a daily demand of 4.6 incidents, of which 2.14 percent were to fire incidents, 76 percent were to EMS incidents, and 21.86 percent were to "Other" incident types.

During this same period, there were 4,137 apparatus responses. This means there was an average of 2.46 apparatus responses, per incident, which consisted mostly of one fire engine and one ambulance.

5.2.1 Breakdown of Incident Demand Over Time

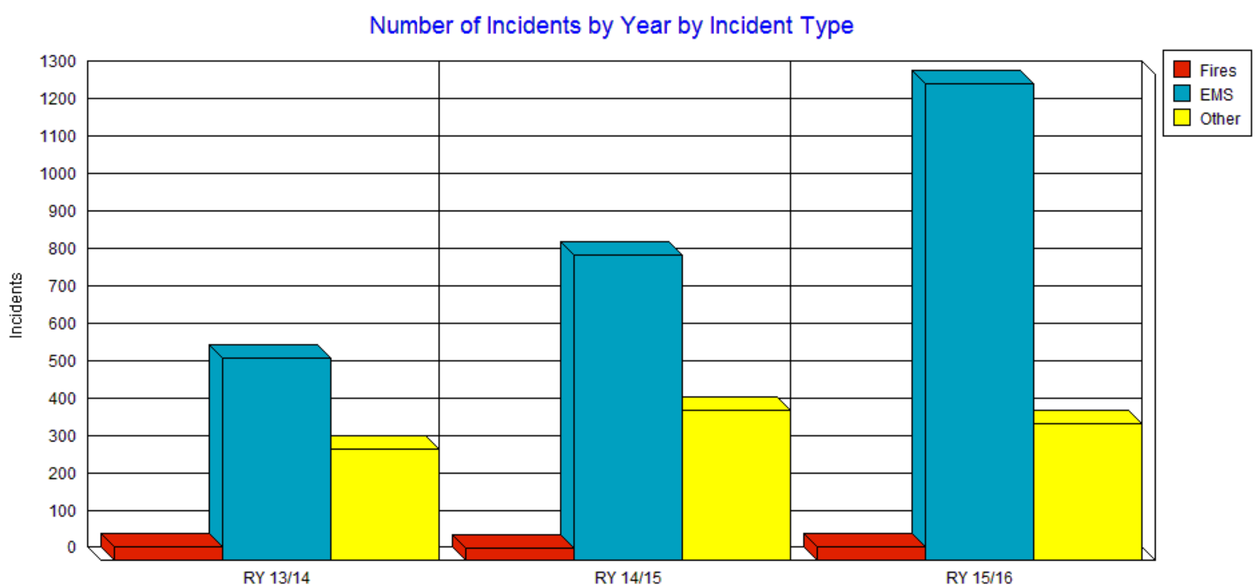
The District experienced steady growth in the number of incidents from RY 13/14 through RY 15/16. The following graph illustrates incident demand, by reporting year:

Figure 6—Number of Incidents by Year



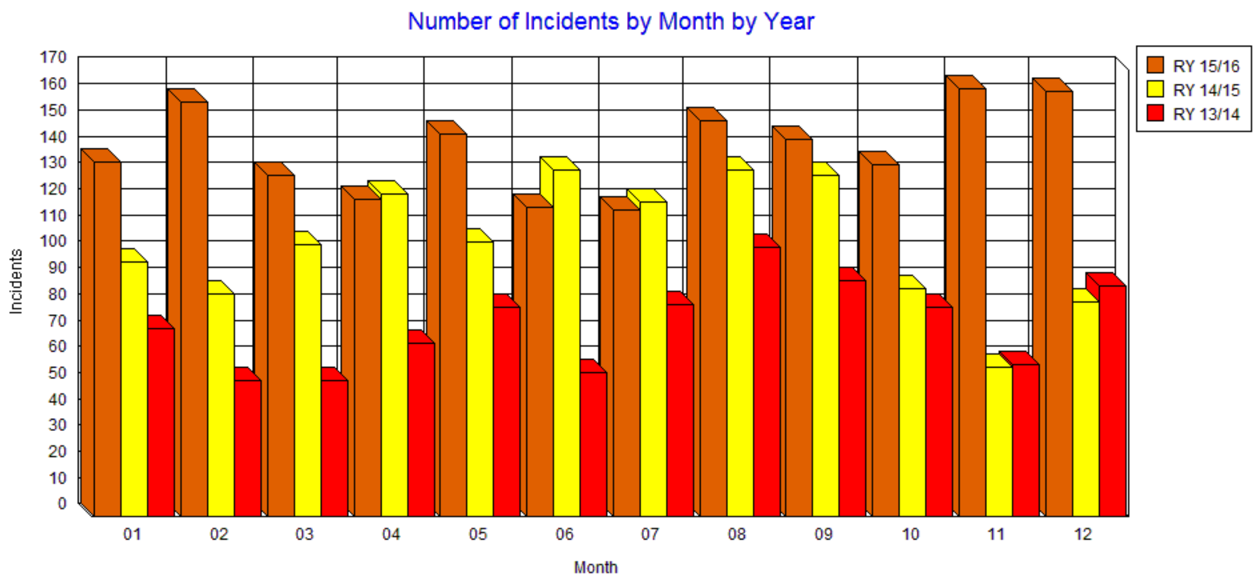
The following graph illustrates the number of incidents by incident type and reporting year. The number of EMS incidents is increasing year to year.

Figure 7—Number of Incidents by Year by Incident Type



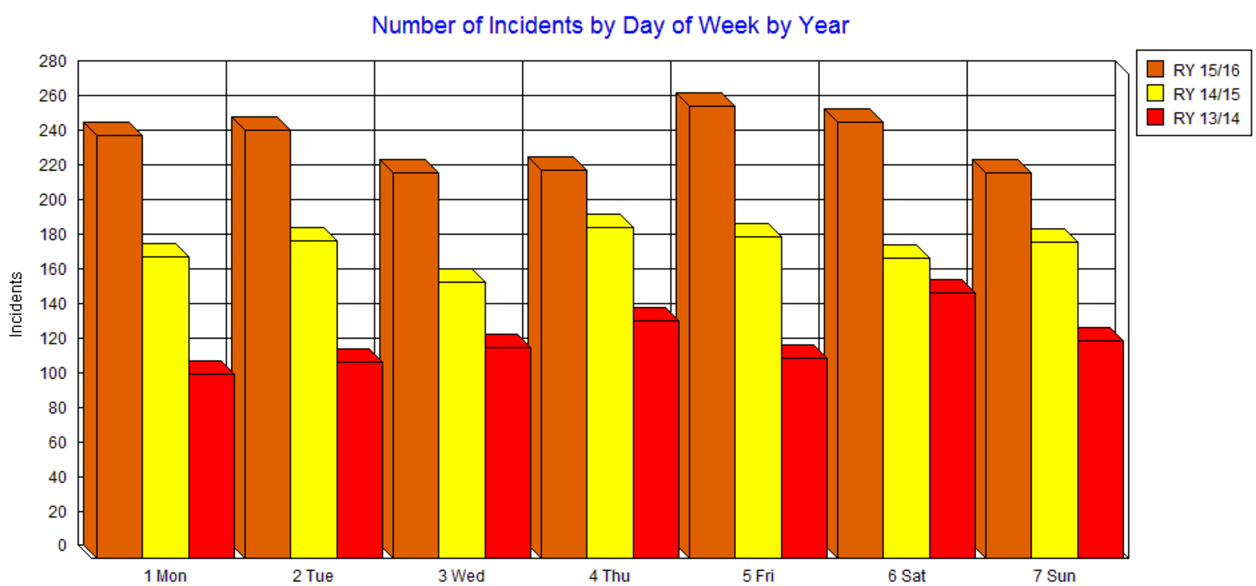
The following graph shows the number of incidents by month and year. The number of incidents per month and year is very volatile, with a general trend to greater activity in later years.

Figure 8—Number of Incidents by Month by Year



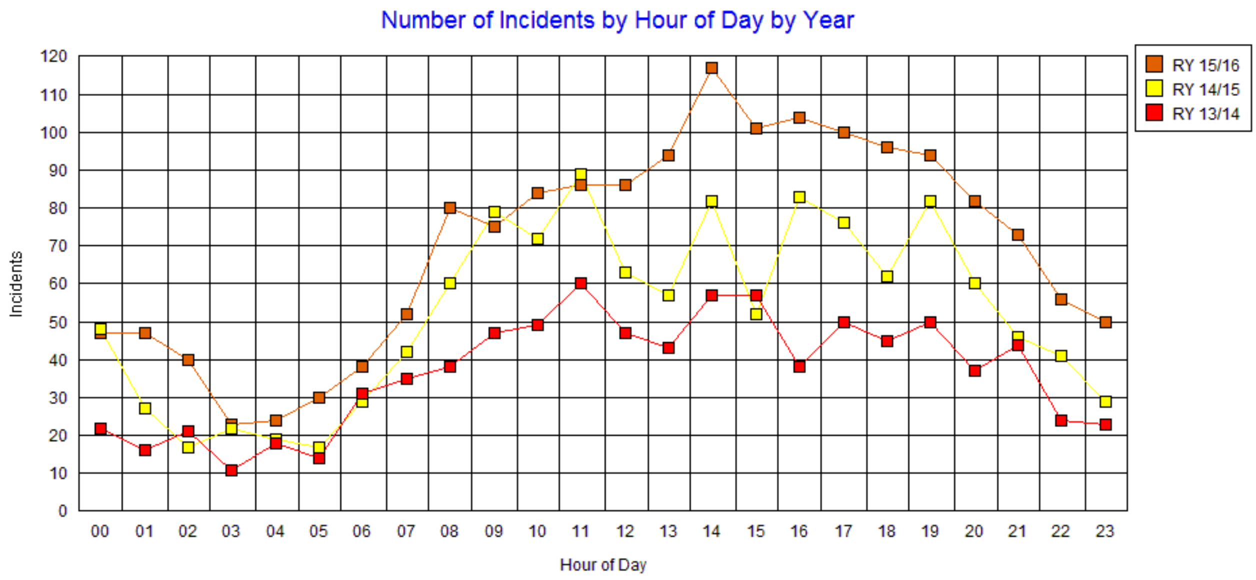
The following graph shows the number of incidents by day of week and year. Year-to-year increases in activity tend to overshadow day-to-day trends.

Figure 9—Number of Incidents by Day of Week by Year



The following graph illustrates the breakdown of incidents by hour of the day by year.

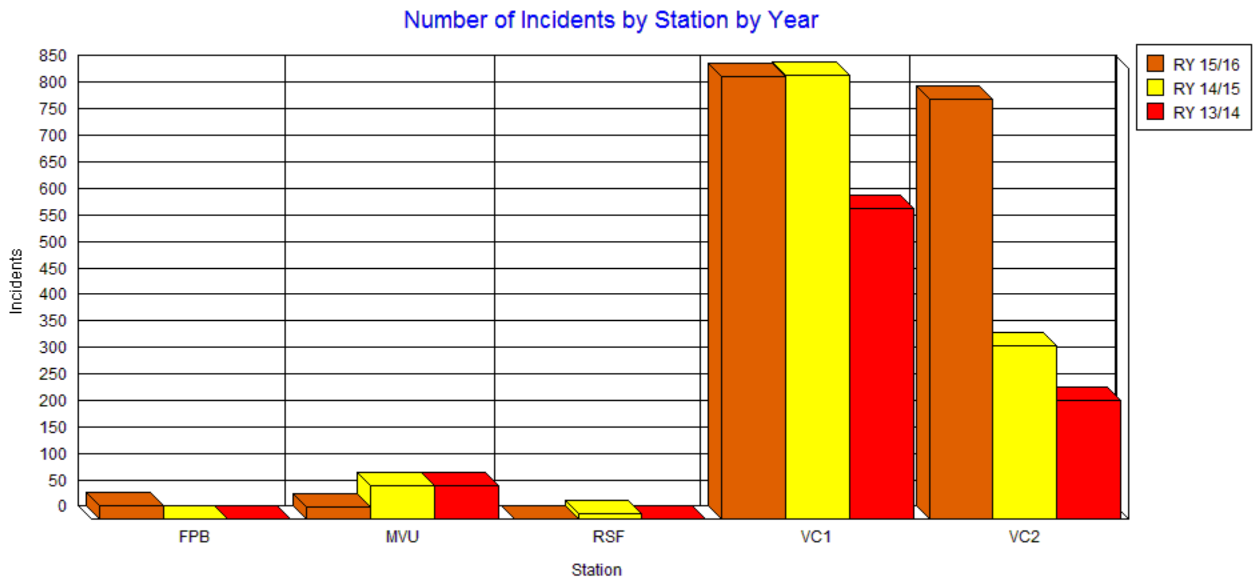
Figure 10—Number of Incidents by Hour of Day by Year



5.2.2 Breakdown of Incident Demand by Station Area

The following graph illustrates the number of incidents by station. Station VC1 had the highest volume of activity, which remained fairly steady over the past two years. Station VC2 had similar activity in the last year of the study period.

Figure 11—Number of Incidents by Station by Year



5.2.3 Breakdown of Incident Demand by Type

The following table shows the activity rankings of incidents by incident type. EMS incidents rank strongly. Cancelled en-route incidents also rank high on the list. Building fires rank in 19th place by volume.

Only the incident types equal to or greater than five occurrences in RY 15/16 are listed.

Table 16—Incident Demand by Incident Type by Year

NFIRS Code # and Description	RY 15/16
321 EMS call, excluding vehicle accident with injury	1,116
611 Dispatched & canceled en-route	108
322 Vehicle accident with injuries	75
324 Motor vehicle accident no injuries	63
541 Animal problem	37
651 Smoke scare, odor of smoke	26
622 No incident found on arrival of incident address	25
554 Assist invalid	20
561 Unauthorized burning	16
911 Citizen complaint	14
600 Good intent call, other	13
700 False alarm or false call, other	11
631 Authorized controlled burning	10
553 Public service	8
522 Water or steam leak	7
352 Extrication of victim(s) from vehicle	7
131 Passenger vehicle fire	7
311 Medical assist, assist EMS crew	6
111 Building fire	**5**

The following table shows incidents by property use where there were more than 10 occurrences in RY 15/16. The highest rankings for incidents by property use are *1 or 2 family dwellings*, followed by *Casino/gambling clubs* incidents.

Table 17—Incident Demand by Property Use by Year

Property Use	RY 15/16
419 1 or 2 family dwelling	848
144 Casino, gambling clubs	196
962 Residential street, road or residential driveway	99
963 Street or road in commercial area	81
888 Fire station	49
961 Highway or divided highway	34
960 Street, other	33
931 Open land or field	31
965 Vehicle parking area	25
215 High school/junior high school/middle school	23
400 Residential, other	22
449 Hotel/motel, commercial	19
938 Graded and cared-for plots of land	11
361 Jail, prison (not juvenile)	11

5.3 Response Time Analysis

Once the types of incidents are quantified, incident analysis shifts to the time required to respond to those incidents. Fractile breakdowns track the percentage (and count the number) of incidents meeting defined criteria, such as the first apparatus to reach the scene within progressive time segments. When calculating the response times for this section, Citygate used dispatch center data to determine accurate response times.

5.3.1 Districtwide Response Time Performance

A resident or visitor of the District measures the speed of fire department response from the time assistance is requested until the assistance arrives. This measurement is called "Call to First Apparatus Arrival" (or "Call to Arrival"). Police and sheriff's departments, under state law, act as a Public Safety Answering Point (PSAP) for 9-1-1 calls. All 9-1-1 calls for fire service in the District are received at the San Diego County Sheriff's Office Communications Center and transferred for fire dispatching to the North County Communications fire multi-agency center (North Comm.)

Based on national best-practice recommendations, *total* response time is comprised of three component parts:

Call Processing: 1:30 minutes (receive, determine need, alert crew)

Turnout: 2:00 minutes (notify, don required protective gear, unit moving)

Travel: 4:00 minutes in urban areas to 11:00+ minutes in rural areas

The following table shows the breakdown of North Comm. call received to first apparatus arrival *for fire and emergency medical* incidents (not "other" and special services).

Table 18—Call to Arrival Response Time (Minutes) – 90 Percent Performance

Station	Overall	RY 13/14	RY 14/15	RY 15/16
Districtwide	14:00	14:21	14:00	13:48

All the fire dispatch call to arrival times to 90 percent of the emergent incidents in Table 18 are past a Citygate-recommended 7:30 minutes for urban areas. They are just under a rural goal of 14:30 comprised of 11:00 minutes travel plus 3:30 minutes for dispatch and turnout. The policy issue for the District is to determine what its travel time policy should be given the suburban to rural nature of the District.

The next set of tables will present the individual segments of total response time—dispatch, crew turnout, and travel—to understand which measure(s) are responsible for the total time being longer than 7:30 minutes.

5.3.2 Dispatch Processing Time

Dispatch time: This measure is the time it takes to answer the 9-1-1 call, determine the emergency, enter information into the computer-aided-dispatch system, and alert the closet crew of the incident. Best practices suggest all calls be dispatched in 90 seconds, 90 percent of the time. The performance of North Comm. is:

Table 19—Dispatch Process Time (Minutes) – 90 Percent Performance

Station	RY 13/14	RY 14/15	RY15/16
Districtwide	02:15	01:20	01:11

Finding #6: The performance of North Comm. Center, at 1:11 minutes to 90 percent of the EMS and fire emergencies, is better than a best practices recommendation of 1:30 minutes.

5.3.3 Turnout Time

Turnout time: This measure is the time it takes for all crews to hear the dispatch message, don safety clothing, and begin moving the assigned apparatus.

Table 20—Turnout Time Performance (Minutes) – 90 Percent Performance

Station	RY 13/14	RY 14/15	RY 15/16
Districtwide	03:17	02:13	01:57

While the NFPA recommends 80 seconds for turnout time to building fires, it has long been recognized as a standard rarely met, in practical experience. Crews must not just hear the dispatch message; they must also don the OSHA-mandated personal protective clothing for the type of emergency. Citygate has long recommended that, due to this and the floor plan design of some stations, agencies can reasonably achieve a 2:00-minute crew turnout time to 90 percent of emergency incidents.

Finding #7: The District's turnout times have improved, and are now just under a Citygate-recommended 2:00-minute goal.

5.3.4 Travel Time

Travel time: The Districtwide travel time measures to all emergency incidents are shown in Table 21. Travel time is defined as the time element between when the dispatch center is notified, either verbally or electronically, that the unit is en-route to the call, and when the unit arrives at the address or location street front (not the patient's side).

Table 21—Travel Time Performance (Minutes) – 90 Percent Performance

Station	RY 13/14	RY 14/15	RY 15/16
Districtwide	10:43	11:03	11:12

NFPA Standard #1710 for career departments recommends a 4:00-minute travel time goal in urban and suburban areas. As seen in Table 21, all travel times are significantly longer than this goal. NFPA #1720 for combination departments recommends 9:00 to 14:00 minutes. The District's travel times *are better* than the NFPA #1720 recommendation of 14:00 minutes to rural areas. This is the reason that Citygate stated that the District's response time performance falls between urban and rural best-practice recommendations.

In the District, there are several reasons for slower travel times, not all of which can be cost-effectively improved. Non-grid road network areas, topography, open spaces, and limited cross access boulevards all impact travel time.

Finding #8:	The District's travel times to fire and EMS incidents are reflective of a suburban to rural area with less densely populated area.

5.3.5 First Alarm (Effective Response Force) Performance to Building Fires

The District responds to building fires with three engines, one ladder truck, one ambulance, one rescue squad, and one Chief Officer totaling 17 personnel including aid and reserves. However, only two of the engines are District-based units; the balance comes from automatic/mutual aid agreements.

This response force is large enough to provide enough units when fires are very serious – *if the force can arrive in time*. In each year, there are few building fires *in every station area* where the entire force is needed at the incident location. Therefore, the following response time sample size is very small.

The best representation for the First Alarm or Effective Response Force units is **travel** time across the District's street network. The NFPA #1710 for career departments recommends in urban areas that all units to arrive within 8:00 minutes travel time. There is not a multi-unit recommendation in NFPA #1720 for combination departments; simply enough firefighters to conduct effective operations once one or more units arrive at the incident.

As the District had moved dispatch centers from CAL FIRE to North Comm., the multi-unit travel time records were incomplete. The Fire Chief performed extensive research and determined, after record reviews for the 15 structure fires in the three-year study period, that eight responses could be studied using the dispatch data and the NFIRS report data for these working fires. Unfortunately, the data was still not complete for all responding units and times.

This study uses two measures in Table 22 for the ERF travel time study: one is for only first arriving District engines and the Chief Officer, and one for the full ERF including automatic/mutual aid units.

Table 22—Travel Time for Effective Response Force Incidents by Year (Minutes) – 90 Percent Performance

ERF Type	RY 14/15	RY 15/16	RY 16/17
First Arriving District Unit	8:49	10:33	6:53
Full ERF[22]	26:38	25:16	N/A

Finding #9:	The District's multiple-unit travel times to fire and EMS incidents are longer to both suburban and urban population density areas than national best-practice recommendations. The District's two fire engine deployment is completely dependent on mutual aid from a distance to provide an effective response force to serious fires.

5.4 SIMULTANEOUS INCIDENT ACTIVITY

Simultaneous incidents occur when other incidents are already underway at the time a new incident begins. The following table shows the percentage of simultaneous incidents broken down by number of simultaneous incidents.

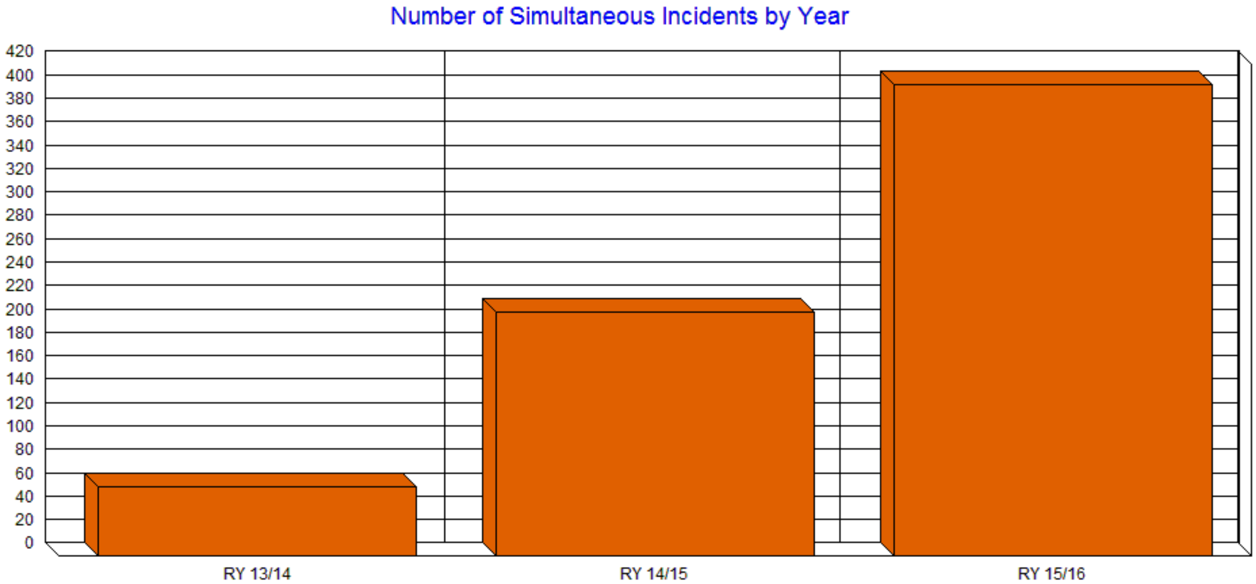
Table 23—Simultaneous Incident Activity – Three Years

# of Simultaneous Incidents	Percentage of Occurrence
1 or more	24.00%
2 or more	03.16%
3 or more	00.12%

The following graph illustrates the number of simultaneous incidents by year. RY 15/16 shows a significant increase in simultaneous calls.

[22] Travel time for all ERF units to arrive. ERF includes automatic and mutual aid units.

Figure 12—Number of Simultaneous Incidents by Station and Year



Finding #10:	The District's simultaneous incident rate of two incidents at 24 percent of the time is problematic as the District only deploys two engine companies for firefighting.

5.5 Station Demand Percentage and Unit-Hour Utilization

Due to the simultaneous incident rates measured in Table 23, this section of incident measures presents the impact on individual fire station areas and individual units as demand occurs and determines if the peak-hour demand is so high that response times suffer because units must cross the District to cover for overly busy units.

In the tables to follow, the different colors illustrate the variation in demand; the lowest rates of activity are green, progressing up to yellow, and finally red, which indicates the greatest quantity of incidents or rate of activity.

Table 24 depicts a Unit-Hour Utilization (UHU) summary for District **fire station areas** summarizing overall activity percentages for RY 15/16. The percentage listed is the percentage likelihood a station area is involved in an incident at any given hour. This number considers not only the number of incidents, but also the duration of incidents.

Table 24—Unit-Hour Utilization for Fire Station Area – RY 15/16

Hour	VC2	VC1
00:00	3.46%	3.80%
01:00	3.41%	2.26%
02:00	3.16%	2.36%
03:00	2.03%	1.04%
04:00	2.17%	1.23%
05:00	1.45%	3.04%
06:00	1.88%	2.51%
07:00	2.80%	4.51%
08:00	4.09%	5.17%
09:00	2.99%	7.16%
10:00	3.81%	5.99%
11:00	6.08%	4.63%
12:00	8.99%	5.63%
13:00	8.05%	6.38%
14:00	7.69%	9.05%
15:00	8.64%	5.86%
16:00	7.28%	7.15%
17:00	5.56%	6.06%
18:00	6.50%	4.43%
19:00	6.57%	9.12%
20:00	7.49%	3.84%
21:00	4.81%	4.79%
22:00	2.54%	4.36%
23:00	3.72%	3.51%

The next utilization percentage for apparatus is calculated by two primary factors: the number of responses and duration of responses. The following is a UHU summary for District units.

Table 25—Unit-Hour Utilization for Apparatus – RY 15/16

Hour	1691	1611	1682	1612
0:00	8.31%	3.06%	2.70%	1.50%
1:00	6.47%	2.71%	3.08%	0.98%
2:00	6.34%	2.45%	2.48%	0.87%
3:00	3.37%	1.23%	1.61%	0.79%
4:00	4.14%	1.05%	1.27%	0.72%
5:00	10.43%	4.50%	3.56%	2.38%
6:00	8.18%	2.30%	1.00%	1.84%
7:00	12.49%	3.64%	2.00%	0.76%
8:00	16.62%	5.32%	3.25%	1.46%
9:00	11.84%	4.81%	2.06%	1.52%
10:00	15.89%	4.64%	2.57%	2.45%
11:00	15.78%	4.23%	3.24%	2.20%
12:00	13.87%	4.90%	4.07%	5.46%
13:00	9.92%	3.69%	5.24%	2.42%
14:00	24.79%	7.35%	5.10%	3.44%
15:00	18.73%	6.15%	6.75%	8.17%
16:00	18.95%	6.29%	5.07%	4.19%
17:00	13.74%	5.26%	4.21%	2.17%
18:00	12.74%	4.78%	5.04%	3.59%
19:00	14.04%	7.26%	4.30%	2.24%
20:00	10.97%	4.39%	5.21%	2.45%
21:00	10.46%	4.66%	4.37%	2.37%
22:00	8.70%	4.66%	2.67%	0.57%
23:00	10.43%	3.68%	2.68%	1.49%

What should be the maximum utilization percentage on a firefighting unit? During the 9-hour daytime work period, when crews on a 24-hour shift need to also pay attention to apparatus checkout, station duties, training, public education, and paperwork, plus required physical training and meal breaks, Citygate believes the maximum commitment UHU per hour should not exceed 30 percent. Beyond that, the most important element to suffer will be training hours.

For a dedicated unit, such as an ambulance or low-acuity squad working less than a 24-hour shift, such as an 8- to 12-hour shift, then UHU can rise to 40 to 50 percent 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, to meet their annual continuing education and training hours requirements.

Finding #11:	While the busiest unit in the District achieves 25 percent Unit-Hour Utilization (UHU) and is not busier than a Citygate-recommended maximum of 30 percent UHU, with only a two-fire engine system that also has significant simultaneous incidents, the District's EMS workload means that the District may not have both of its firefighting units available at peak hours of the day, and thus is highly dependent on automatic aid.

SECTION 6—SOC EVALUATION AND RECOMMENDATION

6.1 OVERALL EVALUATION

SOC ELEMENT 8 OF 8
OVERALL EVALUATION

The Valley Center Fire Protection District serves a diverse land use pattern that, in some locations, is geographically challenged with open spaces, and limited cross access streets, which limits quick response times. Population drives service demand, and development brings population. For a community of Valley Center's size and population, the current two-fire-station plan is inadequate to provide typical expected outcomes to serious emerging building or wildland fires and life threatening medical emergencies.

For the foreseeable future, the District will need both a first-due firefighting unit and Effective Response Force (First Alarm) coverage the most densely populated sections of the District, consistent with current best practices, if the risk of fire is to be limited to only part of the inside of an affected building. While residential fire sprinklers are now included in the national model fire codes, it will be decades before the existing housing stock will be upgraded or replaced, even if these codes were to be adopted for all new construction.

While the volume and response times to EMS incidents consume much of the District's attention, all communities need a "stand-by and readily available" firefighting force for when fires break out. While the District partners in the provision of paramedic care with the ambulance provider, it would still require resources *in addition to EMS hourly demand* for an effective response to emerging fires.

If the District wants to continue in providing the three following elements, the District will need to add a third fire station:

- Provide equitable response times to all similar population density neighborhoods
- Provide for depth of response when multiple incidents occur
- Provide for a concentration of response forces for high-risk properties.

The District's diverse geography, road network, and population density differences make setting a response time policy harder than in other communities. While newer residents may see themselves in a suburban setting and expect short, urban response times, the reality is that, given the road network over the topography and the constrained overall tax base, the District cannot provide the level of services that cities like Escondido or San Marcos can provide.

In this study Citygate, contrasted the District's unit travel time performance against best-practice advice for similar areas, as well as the risks to be protected in the District. The current travel time to 90 percent of all incidents is 11:12 minutes, and the GIS map projection with a third fire station shows that most all the most populated sections of the District are within 11:00 minutes of one of these three fire stations.

Adding a third fire station and staffed engine company adds more than just a third unit; It provides three units quickly to serious fires before mutual aid can arrive. It also means that, when one engine is busy on a EMS incident, there are still two engines likely available for other events, before mutual aid is needed. Thus, adding a third fire company provides resilience to the District's response system.

Based on our measures, Citygate recommends the District adopt a response time measure of a suburban to rural area, and thus not set an urban goal that cannot be met. While severe emergencies need a first-unit arrival within 8:00 minutes or less from fire dispatch call receipt, that is difficult at the outer edges of the District. However, the greatest populations and incident densities are closer to what should be three fire stations and, as such, would receive better service. Thus, Citygate a recommending a balanced measure between urban and rural response time goals:

- First Unit – 8:00 minutes travel time, plus 3:30 minutes for dispatch and crew turnout = 11:30 minutes total response time
- Multiple-Unit Emergencies – Three fire engines, a Chief Officer, and either the EMS squad or ambulance within 11:00 minutes travel time, plus 3:30 for dispatch and crew turnout = 14:30 minutes total response time, followed up with mutual aid units within 30 minutes.

6.1.1 Deployment Recommendations

Citygate's specific deployment recommendations follow. The first deployment step for the District in the near term is to adopt updated and complete performance measures from which to set forth service expectations and, on an annual-budget basis, monitor and fund District performance.

Recommendation #1:	**Adopt Deployment Measures Policies**: The District's elected officials should adopt updated, complete performance measures to direct fire crew planning and to monitor the operation of the District. The measures of time should be designed to save patients where medically possible and to keep small but serious fires from becoming greater alarm fires. With this is mind, Citygate recommends the following measures:

1.1 Distribution of Fire Stations: To treat medical patients and control small fires, the first-due unit should arrive within **11:30** minutes, 90 percent of the time from the receipt of the 9-1-1 call in the North Comm. Fire Communications Center. This equates to a 1:30-minute dispatch time, a 2:00-minute company turnout time, and an 8:00-minute drive time in the most populated areas.

1.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires near the room of origin, to stop wildland fires to under three acres when noticed promptly, and to treat up to three medical patients at once, a multiple-unit response of a minimum of three engines, one paramedic squad or ambulance, and one Battalion Chief totaling 12 personnel should arrive within **14:30** minutes from the time of 9-1-1 call receipt in the North Comm. Fire Communications Center, 90 percent of the time. This equates to 1:30 minutes dispatch time, 2:00 minutes company turnout time, and 11:00 minutes travel time spacing for multiple units in the most populated areas.

1.3 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 District 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 for the first company capable of investigating a hazmat release at the operations level within 8:00 minutes travel time 90 percent of the time. After size-up and scene evaluation is completed, a determination can be made whether to request additional resources from the District's multi-agency hazardous materials response partnership.

1.4 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 for size-up of the rescue within 8:00 minutes travel time 90 percent of the time. Assemble additional resources for technical rescue capable of initiating a rescue within a total response time of 14:30 minutes 90 percent of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.

1.5 Emergency Medical Services: The District should continue to continue to provide first responder paramedic services to all neighborhoods to 90 percent of the higher priority medical incidents within at least **11:30** minutes total response time from North Comm. Fire Communications Center call receipt.

Recommendation #2: The staffing partnership with the ambulance provider is an excellent model and should be continued as long as economics allow.

Recommendation #3: Continue to use less expensive Reserve Firefighters as long as an adequate roster can be maintained.

Recommendation #4: The District should strive to fund a minimum daily staffing per fire engine of three career firefighters per day, and with three engines this would provide nine firefighters per day plus the two firefighters on the EMS units. When this level is reached, the Reserve Firefighters can become the fourth firefighter on the engines.

Recommendation #5: Begin a community conversation regarding a tax increase method that would provide for three firefighters per engine per day, and the staffing for a third fire station with crew, thus making the District's minimum daily career *firefighter* staffing nine per day.

SECTION 7—NEXT STEPS

7.1 NEXT STEPS

The purpose of this assessment is to compare the District'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 Board of Directors should adopt updated and best-practice-based response time goals for the District, and provide accountability for the District personnel to meet those standards. The goals identified in Recommendation #1 meet national best practices. Measurement and planning as the District continues to evolve will be necessary for the District to meet these goals. Citygate recommends that the District's next steps be to work through the issues identified in this study in the near term:

7.1.1 Near-Term Steps

- Absorb the policy recommendations of this fire services study and adopt updated District performance measures to drive the deployment of firefighting and emergency medical resources.
- Continue the innovative ambulance staffing partnership.
- Maintain a reserve firefighter force.
- Start a community conversation regarding growing revenues to add a third career position to each fire engine, and to add a third staffed fire station.