

## Preface

In 2002 Fremont Fire Department recommended significant building renovations and seismic improvements of all City of Fremont fire stations to the City Council. Three of the 11 stations were in such poor repair or needed seismic improvements so extensive that new construction was indicated as the most financially practical solution. As a result, Fire Department Staff conducted an analytical and objective evaluation of our resource deployment system based upon the characteristics of the community. The *Standards of Response Coverage* report was completed in December 2003 with the assistance of a Department Task Force made up of Department and City employees with support from Citygate Consulting Associates.

The vision of the Standards of Coverage project was “to identify local hazards and high value community occupancies, to objectively evaluate existing resource deployment (including fire station locations) and to recommend improvements as required. To also conduct regular appraisals of system performance.” The goals for the project were as follows.

- To develop appropriate and measurable response expectations
- Identify and evaluate critical tasks for each major call type
- Evaluate historical response performance and problem areas
- Research and analyze potential improvement alternatives
- Identify and/or implement actions within the scope of authority of FD
- To make responsible recommendations to the City Council as appropriate

The process began by mapping the inventory of buildings (with the assistance of the GIS Division) including their location within the City, densities, hazardous processes and other information of interest. The inventory was categorized using a system developed by the California State Fire Marshal's Office known as “Risk Hazardous and Value Evaluation (Rhve) which classified the City of Fremont as a community predominantly made up of buildings of moderate hazard. Staff also identified concentrations of hazardous materials occupancies, Staff top sales tax generators, and high fire risk buildings as identified by Insurance Services Office (ISO) rating criteria.

A review of the City's fire, emergency and rescue experience over the past three years was then recorded and mapped. During this process, staff utilized performance standards, benchmarks and other recognized objective resources to help evaluate system performance, current fire station locations and to consider proposed sites to improve performance if necessary. These tools and measuring instruments were also utilized to assist staff in developing goals, objectives, measurements and outcomes to conduct an annual performance review of the Department's deployment system as well as to ensure continuous improvement.

The Fremont Fire Department has responded to an average of 13,000 emergency incidents annually over the past three years. The Department recorded 12,867 incidents (1,072/month) in calendar year 2002, 59 percent of which were medical aid incidents and 377 were fire incidents of all types (i.e., structure, vehicle, trash, fence, grass, etc.). This data is consistent with previous years experience and the expectation is for similar and gradually increasing levels of activity in the coming years. While fire responses amounted for only three percent of the year's activity, fires consumed nearly 14 percent of the Department's staff hours (number of responding personnel multiplied by the amount of time required to abate an incident) and resources during this time period. Also of note is that over the past three years, approximately 50 percent of the emergency incidents were concentrated in the City's three core fire districts; District 1 (Central), 3 (Irvington) and 6 (Centerville). The highest incidence of fire events and medical emergencies were also concentrated in these districts as well. Additionally, District 1 (generally bound by Eggers, Stevenson, Civic Center and Interstate 880) is the area that nearly 25 percent of the emergency requests originate from annually.

Fire stations are located throughout a community in order to place resources within an acceptable response distance to the areas that the assigned resources are expected to serve. Response time is the most important measurement of fire department performance. Fire station location is the major factor in a department's ability to meet its response objectives. The Department has identified response criteria primarily based upon two occurrences; flashover in the case of structure fires and irreversible brain damage in emergency medical incidents. Flashover is the point in the development of a fire when ordinary combustibles within the room simultaneously reach their ignition temperature. Rapid burning occurs without direct flame contact and temperature exceed 1000 degrees Fahrenheit. The concern here is that once flashover is reached, occupants cannot survive, property damage increases exponentially and firefighter safety is compromised. Additionally, our ability to confine a fire to the room of origin (a stated Department goal) after flashover has been reached is virtually impossible. **Note:** It should be pointed out that flashover will not occur in structures with properly designed and installed automatic fire sprinkler systems. This fact points out the obligation of the Fire Department to continue to recommend and require aggressive preventative measures through the adoption of fire codes and ordinances to reduce the incidence and impacts of hostile fires.

In terms of medical aid incidents, one of the most respected indicators of performance for emergency medical services (EMS) systems is resuscitation survival rate. According to the American Heart Association, irreversible brain damage occurs within four to six minutes of a patient becoming pulseless and non-breathing with cardiac defibrillation being most effective when delivered prior to six minutes. After that point, the potential for a successful resuscitation falls off dramatically. The City of Fremont has enjoyed one of the highest

resuscitation rates in the country and it is our goal to continue to keep our resources positioned to maintain this high level of service.

Staff has recommended a response time standard that the Fire Department will respond to reported emergencies such that after the receipt of the alarm from the Communications Center, the dispatched fire company will arrive at the scene of an emergency within five (5) minutes: thirty (30) seconds, (1 minute: 30 seconds turnout time, 4 minute travel time), 90 percent of the time. In reviewing the Fremont Fire Department performance over the past three years, it should be noted that the response experience currently is that we meet this standard approximately 79 percent of the time. Staff is taking steps to improve upon this experience including proposing station relocations and presenting additional recommendations for City Council consideration.

Critical tasks can be defined as the activities that need to be completed during the successful abatement of an emergency incident. Through the Standards of Coverage process, critical tasks have been identified for each of the types of incidents that the Fire Department typically responds to. Out of this process, the Department has determined that 14 firefighters as a minimum are required for a structure fire in a single-family dwelling (the type of structure fire the Department most often responds to) and three firefighters for paramedic level emergency medical incidents. The Department has also proposed additional performance standards including the following.

- Confine structure fires to the room of origin 90 percent of the time
- Maintain a resuscitation rate that is a minimum of 10 percent above the nationally recorded average
- Extricate trapped victims in a vehicle within 30 minutes 90 percent of the time
- Perform a Level A Hazardous Materials entry within one hour 90 percent of the time

A final performance measurement was considered during the evaluation of the deployment system and experience of the Department. The measurement is known as "reliability" or the percentage of time that the assigned (first-due) company is available to respond to an incident within its district. Reliability is directly related to the call volume of an in-service resource. The higher the call volume of a company, the less reliable or available that company will be to respond. The less available a company is to respond to incidents within its district, the more likely a second or third due company will have to respond. This results in a longer response time and a lower potential for a positive outcome of the emergency incident. Engine 1 is the least available company in the City as would be expected by its high call volume. In 2002, Engine 1 was unavailable to respond to nearly 25 percent of the incidents that occurred within District 1.

The outcomes of the Fremont Fire Department Standards of Coverage report are clearly defined within this document however, some will be presented here. The most notable is that the Fremont Fire Department currently operates at a very high level of performance in terms of the outcomes of incidents. This is evident in output measurements (i.e., response performance, time to extrication, resources assigned to incidents, etc.) as well as our outcome experience (confinement success rate, resuscitation rate, trauma outcomes, etc.). Station re-locations are advised for two of the three fire stations identified for complete reconstruction and the Department should consider the re-assignment of some of our emergency resources during the implementation of the FD Building Program. District 11 impacts must also be monitored with a decision to reopen the station being based upon development and emergency response activity in the area.

Several deficiencies have been uncovered through this process, which can be addressed by the Department without City Council approval. One of those, adding a fifth fire company to structure fire assignments to ensure the appropriate amount of firefighters are available at the scene, has already been accomplished. The impact of this action will be closely monitored both in terms of its effectiveness in improving outcomes in combating structure fires **and equally** important, its anticipated negative impacts on the Department's ability to provide emergency services to the community during extended operations. The Department has also already undertaken a comprehensive review of response assignments and the revising/development of standard operating procedures. An additional and significant deficiency is poor truck service into three northern City districts, which can be addressed through City Council consideration of resource recommendations and the completion of the Department's Building Program.

The Fire Department, through the adoption of the Standards of Coverage analysis, will recommend several proposals and operational changes to the City Council. The most significant of these is the consideration of modifying the City's General Plan with respect to Fire Department response performance, providing funding for an additional, centrally located three person Rescue Company, the implementation of a traffic pre-emption program and an automatic vehicle locator system. Staff also proposes to closely monitor the activity levels within Fire District 11 and to recommend that Station 11 be constructed and staffed based upon supporting data.

The completion of this analysis and document has been very useful not only in identifying our performance and deficiencies, but in providing staff with the tools and experience to routinely assess the operational performance of the Department and to make the appropriate corrections when and where needed. Staff will annually review the performance of our Emergency Response Resources and provide a report to the City Council of the outcomes.

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# INTRODUCTION

## A. OVERVIEW

For the past decade, the fire service has struggled to define the right number of personnel and the best combination of equipment to adequately protect a particular fire service jurisdiction. There have been many attempts to create a standard methodology for determining how many firefighters and what tools a community needs to assure adequate protection and to address most emergencies. The unique characteristics of each community have defied efforts to create a “one size fits all” solution. The fire service has taken the position that one community’s fire problems cannot be compared to another, so any standard solutions or methodologies cannot be overlaid onto another community.

Identifying a need for a tailored assessment process for a fire agency’s resources led to a joint effort between the International Association of City Managers and the International Association of Fire Chiefs. The two groups created an organization called the Commission on Fire Accreditation International (CFAI). This organization has resulted in the creation of a formal and extensive self-assessment and accreditation process that recognizes the fire departments use of appropriate industry practices. One of the first steps in the Self-Assessment process is for each fire agency to complete a Standard of Cover study that identifies two essential areas of performance:

- ◆ Determine appropriate response time and number of personnel needed to mitigate the effects of a variety of emergencies (structure fire, medical emergency, hazardous material, rescue, flood, etc.)
- ◆ Conduct a survey of the fire risk for all structures in the City.

This assessment is a systems approach to addressing deployment issues, as opposed to a linear perspective. Many factors will be measured to create a comprehensive systems approach to analyzing deployment in order to thoroughly assess if a department pursuing accreditation is properly deployed to meet their community’s risks and expectations.

The process of working with multiple components in a deployment analysis is admittedly more work than a linear perspective formula. For example, if we just took an analysis of travel time, we would ignore data on multiple calls, but the analysis would miss important data reflecting overworked fire companies. If we don’t use a variety of risk assessment tools and instead just deploy resources based on getting resources to yield an effective outcome, we could under deploy critical incidents.

Often when a public official, elected or appointed, discusses their community's fire service capability they assume that their fire department has the resources to handle any emergency incident it may be called upon to manage. Using this systems approach to deployment results in an informed public policy debate where the City Council can "purchase" a configuration of the best fire and EMS protection the community needs and can afford.

The standards of response coverage (SOC) is an actual process that defines the distribution and concentration of fixed and mobile resources. The SOC Plan should encompass everything a fire department needs to determine resource deployment. Through a comprehensive approach, each fire service agency should be able to match local needs (risk and expectations) with the costs of various levels of service. An emergency event will continue to escalate if resources arrive late or are insufficient and the incident is understaffed and under equipped. An incident that is allowed to escalate through insufficient resources will draw down the community's available resources and possibly any other jurisdiction's resources that are called on for mutual aid.

To contain a fire to its area of involvement (i.e. one room and its contents), the arrival of the first fire engine company and subsequent fire personnel and equipment must be on scene prior to a fire reaching the "flashover point" (this term is further defined in the next section). The success of preventing flashover is based on geographic distribution of resources and the concentration of resources to meet the potential risk. The distribution and concentration of resources is not entirely a fire related issue, but can also involve an array of medical associated incidents.

For example, most medical emergencies primarily require the expeditious response of a single fire engine or truck company and a paramedic transport unit, while a multiple vehicle accident requires a response of multiple fire engines and multiple paramedic transport units. The response to an area with a high life potential, a high economic value or a high fire flow requires the timely arrival of fire companies to control and extinguish a fire. These companies are required for rescue and an assortment of tasks needed to control a fire or mitigate an emergency.

The creation of a SOC Plan looks at the Fremont Fire Department's particular distribution and concentration of field resources and then determines the associated risks and current fire resources based on historical needs. In developing our SOC Plan, complementary documents were developed or used to support our findings.

These documents were developed by tools which included the Risk Hazard Value Assessment (RHAVE) software program, a travel time modeling tool called Fire View, and the City of Fremont's extensive Geographical Information System (GIS) which provides detailed information about historical emergency response information, buildings, utilities, fault lines, etc., and further defines the wildland

fire risk for Fremont. In addition the Fire Department's Computer Aided Dispatch (CAD) system, Records Management System (RMS) and Patient Care Tracking System (PCTS) were used in concert with the above tools to graphically display the historical fire department business and emergency response and data.

## **B. THE STANDARD OF COVER PROCESS AND ITS DEFINITIONS**

The SOC process has nine components. They included:

1. Existing Deployment
2. Community Outcome Expectations
3. Community Risk Assessment
4. Setting Service Level Objectives
5. Distribution Study
6. Concentration Study
7. Historical or Performance Reliability
8. Historical Response Effectiveness Studies
9. Overall Evaluation

The following is a definition for each of the SOC sections and components:

**Existing Deployment:** Each agency has something in place today, so the SOC study starts with understanding the current system, how it came to be and the expectations placed on it.

**Community Outcome Expectations:** The next factor to consider is what the community has set as a performance standard for the Fire Department as adopted by policy.

**Community Risk Assessment:** This is a critical step in the SOC process. The fire department responds to a variety of risks. Different risks have different outcome needs. Some risks require additional deployment to achieve an acceptable outcome. The SOC process analyzes deployment *backwards* from risk assessment. That is, how many people must arrive in what time frame, properly trained and equipped, to achieve the desired outcome? The SOC process uses a method called *critical task analysis* to determine this objective; for example, containing a fire to the room of origin and assigning resources necessary to accomplish the objective.

**Setting Service Level Objectives:** After understanding the current community risk and the expectations for dealing with it, the fire department must construct specific performance objectives for each risk type. This is the process called *critical task analysis*, which matches staffing deployment over a certain period of time to achieve certain objectives.

**Distribution Study:** This evaluation establishes the locations of the first due engine or truck company and initial attack resources (typically engines). The station locations are needed to assure rapid deployment to minimize and terminate routine emergencies. Distribution is measured by the percent of the community covered by a first-due engine.

**Concentration Study:** This is the spacing of multiple resources arranged (close enough together) so that the initial “effective response force” can be assembled on-scene with enough time to most likely stop the escalation of the emergency for a given risk type. Concentration is also measured by what percent of the community is covered by the effective response force (first alarm assignment).

**Historical or Performance Reliability:** An SOC study needs to look at the multiple call frequency issues known as call stacking. This occurs when more than one emergency call occurs in the same time period for the same fire company.

**Historical Response Effectiveness Studies:** This section looks at the percent of compliance the existing system delivers? It also evaluates how well the Department’s objective of responding within its stated response goal for requests for service in all areas is served.

**Overall Evaluation:** After all parts of the SOC are gathered and evaluated together to form a whole, any changes in deployment will be proposed to the governing body, complete with a cost benefit analysis for those changes. After any change or at least annually thereafter, the fire department will re-benchmark itself against its performance goals to maintain an accurate picture of its deployment system.

In summary, each agency that undergoes the SOC process defines its own Standards of Cover after careful evaluation of all the factors to deployment in their area. Agencies may need to identify alternative methods such as central alarm stations, fire sprinklers, mutual or automatic aid, and road improvements that improve response times. An additional fire station is not always the only or best answer to improving response times or increasing deployment of resources. An outcome may very well recommend the relocation of existing units to a different station location to enhance a department’s overall effectiveness.

### **C. EXISTING DEPLOYMENT OF RESOURCES**

This section provides an understanding of the existing deployment practices (both documented and undocumented) of how the current system came to be and the expectations the community has placed on the fire department.

## PURPOSE

The performance study of the Fremont Fire Department covers many areas and address many questions. They are:

- How should future fire station locations be determined?
- What type of emergency response apparatus, with what staffing levels, should be stationed in what locations, at which hours of the day?
- What is the expected workload of each company (Resource Utilization Ratio)?
- What does the demand for service in each area look like, and what are projected demands?
- What levels of service should the Department provide within each emergency discipline?

The purpose of the "Standards of Coverage for Emergency Response" document is to provide the following:

- A baseline tool for defining emergency response performance standards and goals.
- A summary of community risk (life safety and economic).
- An analysis of critical emergency scene tasks, which should assume maximum utilization of all personnel under a "worst-case" scenario. These analyses should be consistent with the Department's risk analysis, staffing levels, and goals.
- A basis for continually measuring performance over time.
- A guideline for the Department's Quality Improvement programs.
- A guideline for policy decisions dealing with resource procurement and allocation as the Department plans for the next 5-10 year period.

This document serves as the Department's Standards of Response Coverage, a critical element of the accreditation process of the Commission on Fire Accreditation International (CFAI). "Standards of Response Coverage" are those written procedures that determine the distribution and concentration of the fixed and mobile resources of a fire and EMS organization. These standards include twelve key points. This document includes a section for each point, and additional sections for quality improvement and goals. Descriptions of the topic, current practices, facts, and proposed changes are presented in each section.

The Standards of Coverage are developed through the evaluation of the Fremont Fire Department's present practices and historical response data. The results of these analyses are then used to make formal statements concerning the level of service the Fire Department could be expected to deliver.

# **SECTION I**

## **DESCRIPTION OF THE CITY OF FREMONT**

### **A. HISTORY OF THE ORGANIZATION**

Prior to 1956, the area that would later become the City of Fremont was comprised of five large unincorporated communities. Each of these communities, Irvington, Mission San Jose, Centerville, Niles, and Warm Springs had its own volunteer fire department and elected chief officers. The first volunteer fire department to form was Irvington in 1880 followed by Mission San Jose in 1886, Centerville in 1890, Niles in 1909 and finally, Warm Springs in 1945. Each of these volunteer fire departments operated from their own fire station.

The City of Fremont was incorporated as a general law city in 1956 and served a population of 22,493. The City of Fremont is an elected Council, City Manager form of government. The City's first task was to immediately set about implementing a Public Safety Department. Members of this newly formed department not only fought fires, but they also wrote tickets and performed other police functions.

In 1958, the public safety department concept was abandoned in favor of separate police and fire departments and it was at that point that the Fremont Fire Department was formed. The Fire Department was a volunteer organization with the Warm Springs fire station being the only station staffed between the hours of 8:00 a.m. and 5:00 p.m. Slowly, throughout the 1960's, all fire stations began staffing 24-hours a day and in 1969, volunteer firefighters became full-time paid firefighters staffing a total of seven stations.

Today, The City of Fremont encompasses an area of approximately 92 square miles and has a population of 208,000 making it the fourth most populous city in the Bay Area and California's fifth largest city in area. The Fire Department has 157 employees, of which 134 are safety personnel assigned to field operations, and ten fire stations. The Department currently enjoys a Class 2 rating (on a scale of 1-10) from the Insurance Service Organization (ISO).

Emergency services are delivered from ten engine companies and two truck companies, staffed with three personnel each, as well as two shift command officers. All engine and truck companies are Advance Life Support (ALS) capable with a minimum of one paramedic on each company. In addition, the Fire Department cross-staffs five specialized wildland fire vehicles. The Department also provides emergency communications through its centralized Fire Communications Center, which is staffed with a total of eleven dispatchers. Due to budgetary constraints, this service will be contracted to the Lawrence

Livermore National Laboratory Fire Department Regional Dispatch Center in February of fiscal year 2003-2004.

The Fire Department also provides Hazardous Materials response throughout the City via its Hazmat Team, which is comprised of eighteen personnel who are distributed equally across all three shifts. In addition, the Department is rated as a "Heavy" with the California Office of Emergency Services in the discipline of rescue. The Fremont Fire Department is under contract with the Department of Health and Human Services (DHHS) to develop a Metropolitan Medical Response System (MMRS). This is a regional program designed to provide emergency planning, training, equipment and pharmaceuticals to care for its citizens in the event of a Weapons of Mass Destruction (WMD) attack. The Department is also a participating agency on California Area Task Force Four-Oakland (CATF-4). The Department provides trained rescue specialists to the team as well as two trained search and rescue canines and handlers. The Fire Department is an active participant in the both the State and Alameda County Mutual Aid systems. It also has out-of-county mutual aid response areas with the California Department of Forestry, East Bay Regional Parks District, Milpitas Fire Department and Menlo Park Fire Protection District.

## **B. THE EVOLUTION OF FIRE STATION LOCATIONS AND RESOURCES**

***The City of Fremont General Plan, adopted on May 7, 1991, defines the response performance standard for the department by stating "that an engine shall arrive to the scene within 5 minutes 95% of the time for all calls for emergency service."***

Based upon this general performance requirement the City of Fremont has historically provided emergency response services from eleven primary fire districts with one fire station in each of them. These eleven primary districts are further subdivided into 117 sub-districts.

*(Please see the Map Atlas, M-1;"11 Primary Fire Districts" and M-2; "117 Sub-Fire Districts").*

Currently, the Fremont Fire Department has ten (10) fire stations in service that now cover the eleven primary fire districts. A discussion and description of these 10 fire stations, inclusive of recent response history, follows.



*Central Station  
Fire Station #1*

**Fire Station 1**, located at 4200 Mowry Avenue, is a three-bay station and was constructed in 1963 serving primarily the central business district. The facility houses one 3-person Engine Company, one 3-person Truck Company, one Battalion Commander, one reserve fire engine and the Fire Communication Center. The response area for Station 1 includes a high number of single-family dwellings, apartment complexes, a hotel, the Hub shopping center, Washington and Kaiser Hospitals, several convalescent hospitals, a psychiatric hospital and multiple retirement communities, City Hall, one high school, the BART station and a portion of Interstate 880.

Engine 1 responded to a total of 2392 incidents last year representing 18.9% of all calls for service in 2002. Of those incidents, 1682 were for medical aid, which is the highest for any company in the Department. Engine 1's second-due districts include all or portions of districts 2, 3, 6 & 9. Truck 1 responded to a total of 564 incidents representing 4.4% of all calls for service and provides first-in truck service to all or portions of districts 1, 2, 3, 6, 8, 9 & 10.





*Niles Station, Fire Station #2*

Station 2 (Niles) will be reconstructed as a new facility on this site as a part of the Building Program

**Fire Station 2** is located at 37645 2<sup>nd</sup> Street. It was constructed in 1952 and is a two-bay facility. The station has virtually remained unchanged since it opened and currently houses one 3-person Engine Company that cross-staffs a Type III wildland engine. Truck service is received from Truck 1. The district services a large number of single-family dwellings, the historic downtown Niles business district, is bordered by the Alameda County Flood Channel, several railroad lines as well as portions of the BART line and Highway 84 through Niles Canyon. Niles Canyon is often the site of several swift water rescues on an annual basis as the water flow through the canyon to the flood control channel can rise very rapidly and unexpectedly with heavy rains during the winter months.

Engine 2 responded to a total of 614 incidents last year representing 4.8% of all calls for service. Engine 2 provides second-due response coverage to all or portions of districts 1, 6, 8 & 9. Engine 2 is a primary provider of mutual aid to both the city of Union City and to the California Department of Forestry fire station located in Sunol.



**Fire Station 3** is located at 40700 Chapel Way. The facility was first located in 1939 on Washington Boulevard. In 1979, a new 2-bay fire station was constructed on the current site. The station houses one 3-person Engine Company and a reserve fire engine. Station 3 is also the location of the station supply program for all fire stations within the department. District 3 has a large number of apartment complexes, single-family residences, a large assisted living facility, portions of Central Park including the Swim Lagoon and provides response to a portion of Interstate 680.

Engine 3 handled 1304 incidents last year representing 10.3% of the total calls for service in 2002. In addition to their first-in response area, Engine 3 provides second-due coverage to all or portions of districts 1, 4, 7, & 9 and receives truck service primarily from Truck 7 and in some areas Truck 1.



**Fire Station 4**, located at 1000 Pine Street, was built in 1990. The original fire station 4 was constructed in 1954 and located on Anza Way. The station houses one 3-person Engine Company that cross-staffs one Type III wildland engine as well as one Battalion Commander. The primary response area for Engine 4 is composed of primarily single-family dwellings. The district is also home to Mission San Jose as well as two convents. Engine 4 also serves Ohlone College, one high school, an Alameda County Water District Treatment facility, a large portion of our wildland interface including the Mission Peak Reserve and a large portion of Interstate 680. The facility also houses our Emergency Medical Supply program as well as offices for the department's two Nurses who assist the department's Paramedic and EMT programs. Engine 4 responded to 710 incidents in 2002 representing 5.6% of all calls for service and provides second-due coverage to all or portions of districts 3, 5, 7 & 9. Truck service is received from Truck 7.

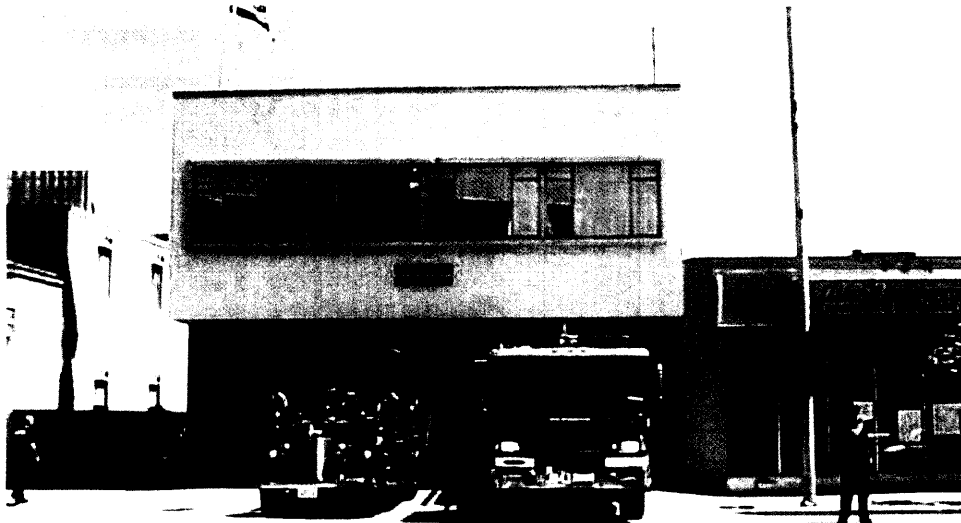


### *Warm Springs, Fire Station #5*

**Fire Station 5** is located at 55 Hackamore Lane and was constructed in 1992. The original station 5 was constructed in 1946 and was located on the exact parcel of land that now houses the new facility. The new facility was actually built around the original facility. When completed, the old facility was torn down to make way for the parking area around the new station.

Fire station 5 houses one 3-person Engine Company. Additionally, the crews at station 5 cross-staff one Type III wildland engine as well as the Hazmat Unit. Nine of the eighteen members of the department's Hazmat Team are quartered out of station 5. Station 5 also has one of the two compressed air systems for the department's fleet of Self Contained Breathing Apparatus. Engine 5 provides second-due engine service to districts 4, 7, and 11. Truck service to district 5 is provided by Truck 7.

District 5 has a significant number of single-family dwellings, a large portion of our wildland interface area inclusive of portions of the Mission Peak Reserve, a small number of apartment complexes, a large industrial area, a railroad transfer yard, portions of Interstates 880 and 680 and borders the City of Milpitas with whom we have a reciprocal mutual aid agreement. Engine 5 responded to 861 incidents in 2002 representing 6.8% of all calls for service.



### *Centerville, Fire Station #6*

Station 6 (Centerville) will be replaced with a new building that will be relocated to a nearby site that will improve its support of the Department's resource deployment system and response time criteria.

**Fire Station 6** is located at 37412 Fremont Boulevard and was built in 1954. Station 6 became the Fire Department's first headquarters when the City formed in 1956, and housed the dispatch center until 1963. It is the only 2-story station in the City of Fremont and currently houses one 3-person Engine Company and a reserve engine. However, only one of the three types of Type I engines within the department's fleet will fit into the apparatus room.

District 6 has within its response area a high number of large apartment and condominium complexes, a large amount of single-family dwellings, the current corporation yard for the City of Fremont, the Centerville Train Depot servicing Amtrak and the Altamont Commuter Express (A.C.E.) train, a portion of the BART tracks, portions of Highway 84 and Interstate 880, and has one High School.

In 2002, Engine 6 responded to 1537 incidents representing 12.1% of all calls for service. Engine 6 provides second-due service to districts 1, 2 & 8 and receives truck service from Truck 1.



**Fire Station 7** is located at 43600 Grimmer Boulevard and was constructed in 1956. The facility is a three bay station and houses one 3-person engine company, one 3-person truck company, a technical rescue vehicle (TRV) and a reserve truck. The site also contains the department's training facility which consists of an 18 student classroom, training trailer housing three staff captains, 5-story tower, drafting and pump test pit as well as room for limited elements of rescue training.

District 7 has a large number of single-family homes, two large apartment complexes, a large mobile home park, one high school and a very large industrial area. In addition, the City's new Corporation Yard is located in District 7, the Fremont Unified School District Offices, the Alameda County Water District Offices, several rail lines and transfer stations, portions of San Francisco bay and portions of Interstate 880 and 680. In 2002, Engine 7 ran 1226 incidents representing 9.7% of all calls for service while Truck 7 responded to 187 incidents, which represents 1.4% of all incidents. Engine 7 provides second-due service to districts 3, 4, 5 and 11 and receives Truck service from Truck 7.

*Northgate, Fire Station #8*



Station 8 (North Fremont) will be replaced with a new building that will be relocated to a nearby site that will improve its support of the Department's resource deployment system and response time criteria.

**Fire Station 8** is currently located at 3723 Darwin Drive and is temporary facility operating out of a remodeled single-family dwelling. While the living quarters remain unchanged, the residential garage was remodeled to accommodate a fire engine. However, only one of the three types of Type I engines in the department's fleet will fit into the apparatus room. The building was built in 1971 and was occupied by the Fire Department in 1978. The site was temporary awaiting the development of the North Plain as well as the re-routing and construction of Highway 84. One 3-person Engine Company operates out this single bay station.

District 8 has a large number of single-family dwellings, several large apartment complexes, one High School, a portion of the Alameda County Flood Control Channel, the newly opened Quarry Lakes Park operated by the East Bay Regional Parks District, portions of Interstate 880 and portions of Highway 84. District 8 shares a border with the City of Newark and the City of Union City and consequently, is a primary provider of mutual aid to these two cities when requested. Engine 8 provides second-due service to districts 2, 6 and 10 and responded to 1108 incidents last year representing a total of 8.7% of all calls for service in 2001. District 8 receives truck service from Truck 1.

*Stevenson Place, Fire Station #9*



**Fire Station 9** was constructed in 1992 and is a two bay station housing one 3-person Engine Company. The facility, located at 39609 Stevenson Place also houses the department's Air/Light Unit as well as an Emergency Medical Services Golf Cart utilized to provide medical responses to the adjacent golf course. There are no paved roads within the golf course making the golf cart the only vehicle in the department able to access the golf course. The crew at Fire Station 9 also cross-staffs a Type III wildland engine. The facility also houses and supplies all of the department's Personal Protective Equipment.

In addition to the city's only golf course, district 9 also has the California School for the Deaf and the Blind, a large number of single-family dwellings, several large apartment and condominium complexes, the City's first high-density apartment over commercial business building, a large area of wildland interface, most of Central Park, the police building and jail facility and the old City Government Building. Engine 9 provides second-due coverage for districts 1, 2, 3 and 4 and receives truck service from Truck 1. Engine 9 responded to 852 incidents last year representing 6.7% of all calls for service in 2002.



*Ardenwood, Fire Station #10*



**Fire Station 10** is a two bay station located at 5001 Deep Creek Road and houses one 3-person Engine Company who cross-staff a Type IV wildland engine. Station 10 also houses several reserve apparatus as well as the two search and rescue canines and handlers. The ladder program is also operated out of station 10 as well as the small tools and equipment program and apparatus outfitting. One of the two compressed air systems for the department's fleet of Self Contained Breathing Apparatus is located at Fire Station 10. The Department's hose program was moved to this facility with the closure of Fire Station 11.

District 10 has Coyote Hills which is operated by the East Bay Regional Park District, portions of the Alameda County Flood Channel, portions of Interstate 880 and Highway 84, including the Dumbarton Bridge, portions of the San Francisco Bay, the Don Edwards Wildlife Refuge, one large apartment complex, several condominium complexes, a large mobile home park and a large amount of single-family dwellings. Engine 10 receives truck service from Truck 1 and provides second-due coverage to district 8. District 10 also borders the Cities of Newark and Union City and provides mutual aid to them both as well as to the Menlo Park Fire Protection District on the Dumbarton Bridge. Engine 10 responded to 834 incidents in 2002 representing 6.6% of all calls for service.

**Station 11** was located in a temporary facility in a parking lot behind a commercial business at 46375 Landing Parkway. This facility has been placed out-of-service due to budgetary constraints and low call volume. The facility was a 60' x 24' doublewide trailer with an adjacent tent structure housing the one fire engine staffed with three firefighters. A new two-bay facility has been designed and is scheduled to begin construction in the future. The new facility will be located at 47200 Lakeview Boulevard.

District 11 is composed of primarily commercial industry. It also covers a portion of Interstate 880, has several mid and low-rise hotels including the 11-story Marriott Hotel and New United Motors Incorporated (NUMMI) which is the largest employer in the City. Engine 11 provided second-due coverage to districts 5 and 7 and received truck service from Truck 7. Engine 11 responded to 435 incidents in 2002 representing 3.4% of all calls for service.

### **C. FREMONT FIRE COMMUNICATIONS**

The Fremont Fire Department has maintained a dedicated communications center for over 40 years. It is currently staffed by a minimum of three Fire Alarm Operators. The Fire Department Communications Center functions will be transferred to a regional center operated by the Lawrence Livermore National Laboratory Fire Department and managed by the Alameda County Regional Emergency Communications Consortium. The transition is scheduled to occur in February 2004.

Fremont's deployment practices require move up companies to cover in at various stations, either by uncommitted companies or by mutual aid resources. The move up or "flexing" of cover-in resources is required when there is a gap of three or more uncovered districts. District five in Warm Springs is the exception. Our policy requires the district be covered due to the long response times resulting from traffic patterns experienced in the area, proximity to other Fire Stations and whenever there is the potential for extended on-scene times. In many instances, the communications center is required to exercise the South Zone Mutual aid plan in order to provide adequate coverage.

The Fremont Fire Department has mutual aid agreements within Alameda County. Mutual Aid into Fremont will usually be provided by Newark, Union City, Hayward, and Alameda County Fire Departments, which make up the "South Zone". In addition, mutual aid is used on freeway responses with CDF, Union City, Milpitas, and Menlo Park. In the event of a large incident, the communications center will try to maintain at least five available companies within the city. The fire station locations identified as needing to be occupied by Fremont or mutual aid companies during a large incident are Fire Stations 1, 5, 7, 8, and 9.

## **D. PHYSICAL GEOGRAPHY**

The City of Fremont is the southern most city in Alameda County. To the south of Fremont is the City of Milpitas in Santa Clara County. To the north of Fremont

is Union City. The City of Fremont completely surrounds the City of Newark, which is geographically located to the west of central Fremont. The boundaries of Fremont encompass approximately 92 square miles. Approximately 60 square miles are developed with the remaining 30 consisting of mostly undeveloped marshlands near the bay and grassy hills to the east. Mission Peak is the predominant landmark in Fremont. It is part of the vast East Bay Regional Parks system and the gateway to the Ohlone Wilderness. The air traffic space directly above Mission Peak is also one of the busiest corridors in the United States for commercial airliners. Aircraft converge in this region as they make their final approach to San Jose, Moffitt, Oakland and San Francisco Airports.

In addition to the former townships of Niles, Centerville, Irvington, Mission San Jose, and Warm Springs, three other identifiable districts have been formed in Fremont. These include Ardenwood, Northgate, and the Central Business District.

Looking at Fremont on the map, it could be described as a long narrow city. Lengthwise the city stretches from north to south for over ten miles. The city stretches from the Bay all the way to the top of the East Bay Hills. The majority of the population of Fremont resides in the flatland communities. Fremont was built along the Highway 880 corridor with the city limits being on both the east and west side of the freeway. The 880 freeway runs north to south through Fremont. The majority of the population of Fremont resides on the east side of the Highway 880. The northwestern part of Fremont is inaccessible from the southwestern part unless travel is made through the City of Newark or using the Highway 880.

Highway 680 enters Fremont from the east then turns south, running parallel to Highway 880. Both Highways 680 and 880 are very congested routes to and from the South Bay. State Highway 84 enters Fremont in Niles Canyon and travels westward to the Dumbarton Bridge. This stretch of the highway can be difficult to access during commute times or after a traffic accident. State Highway 238 runs north to south through Fremont on Mission Boulevard. This is also a major traffic artery through Fremont. Fremont has two railroad lines. One goes east to west through the Centerville district and the other goes north to south through several different districts. Bay Area Rapid Transit has a line coming from the north and ending in the Central Business District. Within this decade, construction will begin to extend that line southward, adding a station in the Warm Springs District.

With its moderate climate and its proximity to major universities, shopping areas, recreational and cultural activities, employment centers, major airports, and the

Bay Area Rapid Transit system, Fremont captures metropolitan living at its best. Within its response boundaries, Fremont Fire Department provides fire, EMS, and special response services to a community that experiences a significant daytime population increases, fed by some of Fremont's largest employers including New United Motors Incorporated (NUMMI), Avant Corporation, DiscoverX, Lam Research, Marriott Hotel, Office Depot, Regional Auto Dealerships, Sysco Food Services, Viamed, Therma Wave, Costco, Washington Hospital, Kaiser Hospital, Home Depot, Target, and many more biotech and Silicon Valley type businesses. The City's real property assessed valuation is estimated at \$21 billion.

In respect to fire service delivery, several districts in Fremont have accessibility problems for fire companies from outside the district. Geographical features and traffic can make access from outside these districts difficult. The fire districts in the greater central Fremont area have outside companies coming into respective districts from all directions. Many other districts have outside companies coming only from one direction. The Ardenwood district in the northern part of Fremont has outside responding companies coming only from the south. The Warm Springs district has outside companies coming from the north and east. The company responding from the east into Warm Springs often has delays due to traffic. When extended on-scene times are expected in the Warm Springs area, a move-up company is utilized to protect that district. The Niles district has two access points from outside the district. One is from the north end of Fremont, which requires a long response traveling along the Union City/Fremont border. The other access to Niles requires the fire company to come from the south into Niles across a narrow and often congested bridge. The Mission San Jose district is accessible from many different routes for "outside the district" companies but the distance to be traveled is lengthy. Fremont is in an earthquake prone area with the San Andreas Fault running through the City. Several districts have the potential to be isolated if freeway over/underpasses collapse.

The central portion of Fremont is mostly residential with light commercial areas. Most of the commercial areas are of the strip mall varieties. In the southern and northwestern part of Fremont are the majority of large commercial and industrial type occupancies. Parts of the Niles, Mission San Jose, and Warm Springs districts are in the hills and have a large urban interface with the potential for large vegetation fires.

## **E. DEMOGRAPHICS**

The 2000 Census confirmed that Fremont is the fourth largest city in the Bay Area with a population of 208,600 residents, an increase of 17% since 1990. The demographics of the community has also changed significantly since its incorporation in 1956 from a predominately white farming community to a middle-class industrial community in the 1970s and 1980s, to the present, in which Fremont has a high-tech economic focus and is home to an array of international

ethnicities. Three demographic trends that have the potential to present significant challenges for the future are ethnicity, age and income.

<b>Fremont's Rank in the Bay Area</b>		
<b>Rank</b>	<b>City</b>	<b>January 1, 2002</b>
1	San Jose	918,800
2	San Francisco	793,200
3	Oakland	409,300
4	Fremont	208,600
5	Hayward	140,030
6	Sunnyvale	132,900
7	Concord	123,900
8	Berkeley	104,600
9	Santa Clara	104,300
10	Richmond	101,100

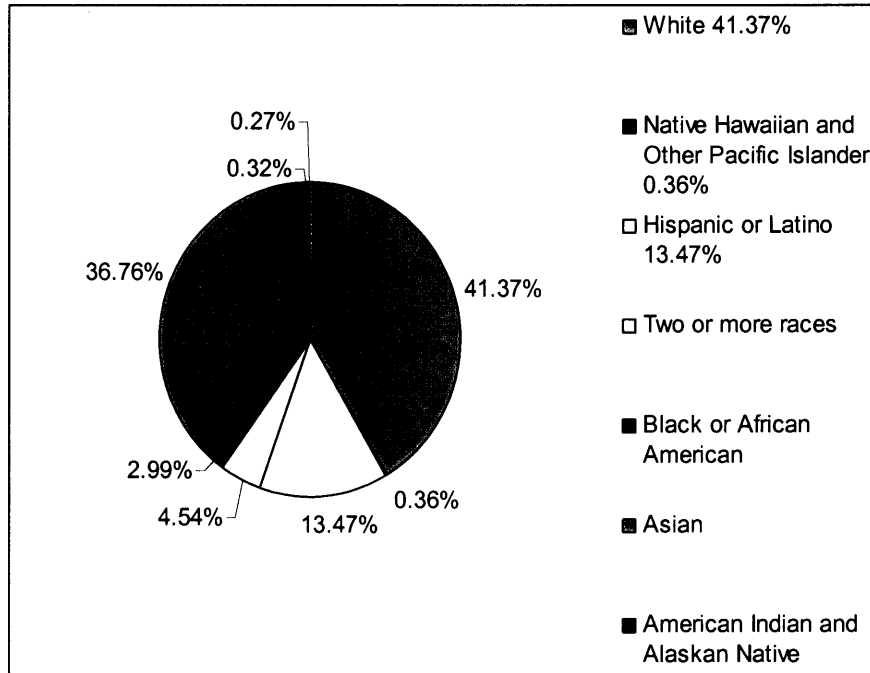
Source: California State Department of Finance

**2000 Census – Ethnic Breakdown for Fremont**

<b>Ethnicity</b>	<b>Population</b>	<b>%</b>
<b>White</b>	84,149	41.37%
<b>Asian</b>	74,773	36.76%
<b>Hispanic or Latino</b>	27,409	13.47%
<b>Black or African American</b>	6,084	2.99%
<b>Two or more races</b>	9,053	4.54%
<b>Native Hawaiian and Other Pacific Islander</b>	736	0.36%
<b>American Indian and Alaskan Native</b>	656	0.32%
<b>Some Other Race</b>	553	0.27%

Source: US Census

Fremont is now a “minority majority” community in terms of the make-up of our population meaning that no single ethnic or cultural group comprises a majority. While in 1990, our population was predominantly white, 64%, the 2000 Census reported that Fremont’s white population has decreased to 42% of residents and our Asian population has grown to 37%. The emerging diversity presents future challenges for the Department most importantly in becoming educated and skilled around cultural norms and overcoming language barriers that may adversely impact our ability to provide excellent services that will effectively reach all segments of the community. Additionally, the City’s growing diversity could increase the potential for conflict between racial and ethnic groups that, if not consciously addressed, may create additional response impacts.

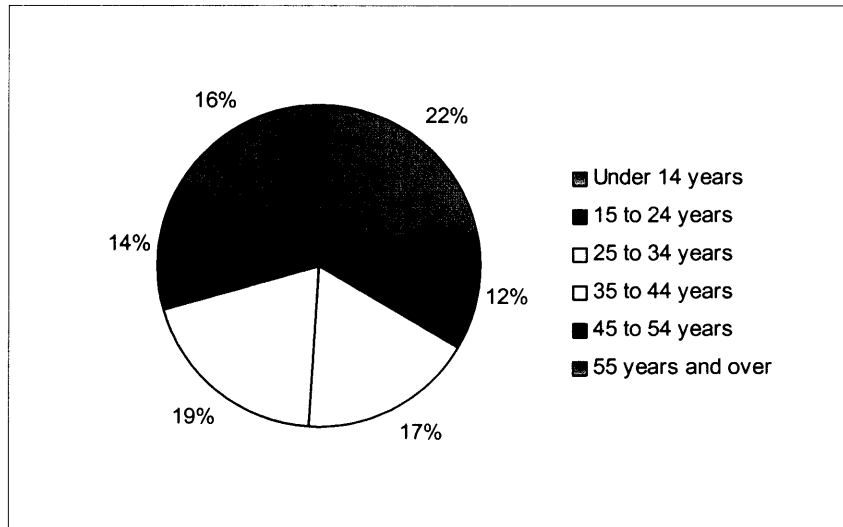


The projected aging population may also impact service delivery. Since incorporation, the City has experienced a relatively stable population of seniors however as the Baby Boomer generation approaches senior citizenry, the senior population is forecast to move from approximately 15% in the southern areas of Alameda County to nearly 30% by the year 2020. Conversely, Fremont is known for strong representation of young families with young children. This is evidenced by the 2000 Census, which reports that 44,400 Fremont residents (21.83%) are under the age of 14 years.

### 2000 Census – Age Breakdown for Fremont

Age Range	Population	%
Under 14 years	44,413	21.83%
15 to 24 years	23,736	11.67%
25 to 34 years	35,274	17.34%
35 to 44 years	39,578	19.46%
45 to 54 years	27,859	13.70%
55 years and over	32,553	16.00%

## 2000 Census – Age Breakdown for Fremont



The community by comparison consists of a well educated population, 20% of the population with at least a bachelor’s degree, and households with average incomes (\$103,100) that are substantially higher than either the Alameda County average (\$82,500) or the SF Bay Area household average (\$93,800). The City also reports a crime index of 28.78 crimes per 1,000 population making it among the safest cities in the Bay Area for population of more than 100,000. Typically, this combination of factors tends to reduce the use of emergency services below the average.

### Fremont Education Levels

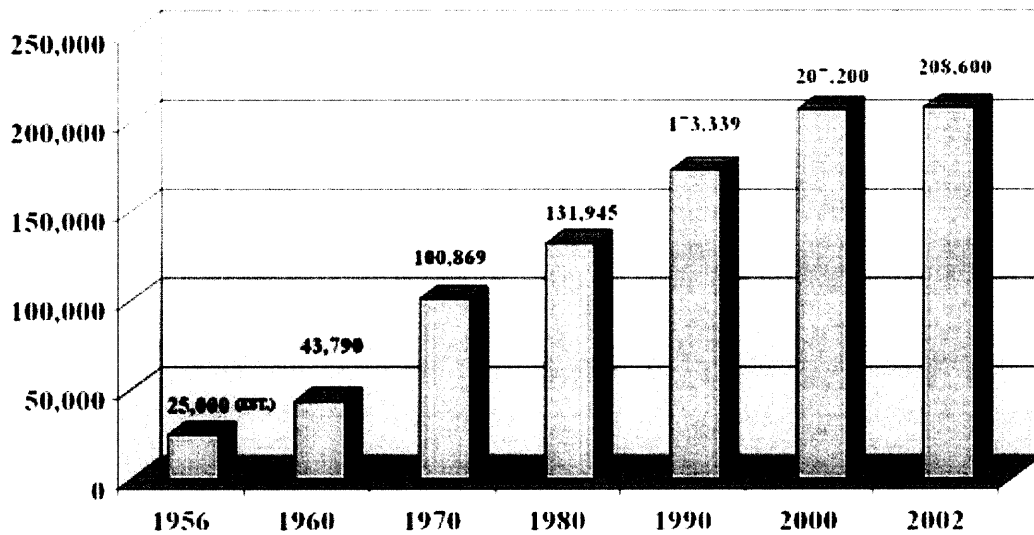
Education Level	Percentage
Elementary School	4%
Some High School	9%
High School Graduate	23%
Some College	34%
Bachelors Degree	20%
Graduate Degree	10%

Our response experience over the past 5 years has demonstrated some trends that should they continue, will need to be considered and addressed through resource deployment modifications. Since 1995, our incidents have primarily been medical aid requests (58% of the call volume in 2001). The volume of incidents has increased in total over the past five years, however, individual categories have seen mixed experiences. Medical aid requests have increased in each of the years since 1995 and that trend is expected to continue particularly

in light of our population growth and average age projections. Fire incidents (structure, vehicle, brush, explosions and miscellaneous), however, have remained relatively constant during the same period of time, as have the occurrence of hazardous materials releases. The incidence of citizen assists and false alarm responses have fluctuated within a range over these years.

Our charge will be to obtain data from our Development Services Center (DSC) to determine the types, numbers, locations and timing of new occupancies that are projected for the community over the next five to ten years and the hazards that they represent. From that information we can then make projections about currently unidentified deployment impacts potentially resulting from population increases, changes in densities, concentration of hazards and traffic congestion.

**Fremont Population Growth Trend**



Source: California State Department of Finance

At this time, there is significant opportunity for investment in redevelopment within the City of Fremont. Three of our original districts (Centerville, Niles and Irvington) have large designated redevelopment areas that are funded and have been approved. There is also a 3,000 acre Industrial Redevelopment area that was formed in 1983 in the southwest region of Fremont bounded by Interstate 880 on the east and Stewart Avenue on the north. Additionally, the City Council has communicated the interest to increase the density around the existing City Hall campus with mid and high-rise buildings to establish a true “Downtown Fremont Business and Civic Center” and, although such a project is in the distant horizon, any information relative to timing or impact area should be considered.



It is anticipated that over the next few years, BART will begin the construction of a Warm Springs station. This is expected to revitalize and encourage the growth of business within this service area suggesting the potential for an increased demand for emergency services. The potential service demand impact will become more apparent through the environmental impact process. The Fire Department has an existing response standard in the Safety Element of the General Plan. The Standards of Cover study will produce a change to the existing standard

## **Summary**

The City of Fremont was incorporated in 1956 and has an elected Council, City Manager form of government. It encompasses an area of approximately 92 square miles with a population of 208,000 and growing, making it the fourth most populous city in the Bay area.

The Fremont Fire Department is currently composed of eleven districts. Total calls for service for the year 2002 was 12,867. The operations division of the Department, under direction of the Division Chief of Operations, provides direct delivery of fire protection, emergency medical services, rescue, and hazardous material response by deploying 38 personnel located in 10 fire stations. These personnel are divided into 3-person companies and assigned to 10 engines, 2 trucks and are supervised by 2 Battalion Commanders. All engine and truck companies are Advanced Life Support (ALS) capable with a minimum of one paramedic assigned to each company.

In FY 2002-2003, the City of Fremont Fire Department closed Fire Station 11. In FY 2003-2004, the department will be contracting out the emergency communications center to the Lawrence Livermore National Laboratory and closing an additional Fire Company.

## SECTION II

### RISK, HAZARD AND VALUE ASSESSMENT

#### A. KEY ELEMENTS

A risk assessment traditionally consists of an analysis of the seven key elements described below. In addition to the traditional elements, establishment of response performance standards must include consideration of the topography and the transportation network over which emergency responders must travel in order to meet the demands for service, the nature of emergency response activity, and patterns of future property development and population growth. Quantification of risk can be either *subjective* or *objective*. Objective risk is identified by evidence-based research, data analysis, statistical information, and other material. Subjective risk is essentially interpretation of unclear data, non-expert perception, or anecdotal evidence.

Through a methodical analysis of the risk dynamics present in a given community, a risk assessment makes it possible to develop rational resource deployment strategies. The goal of the risk assessment process is to determine the probability of an event occurring, as well as the potential consequences (hazard assessment) of that event. From this analysis, the agency defines their level of response to these events.

The resources that are available to respond, and the safe deployment of those resources, are described in Section Five under “Critical Tasking” and “Establishment of an Effective Response Force”. This section is a critical component of Fremont Fire Department’s Standard of Coverage for Emergency Response. Different communities may adopt dissimilar resource deployment plans for the same type of emergency events. These decisions are typically based on distribution of community resources, personnel, funding, existing infrastructure, geographic considerations, and a host of other factors.

#### B. TERMINOLOGY

**Fire Flow** – The amount of water required to control a fire based on building structure and contents.

**Probability** – An estimate of the likelihood that a particular event will occur within a given period of time.

**Consequence** – The risk to human life and the economic impact of an event (including fire, medical, and other events).

**Occupancy Risk** – An assessment of the relative risk to life and property resulting from a fire inherent in a specific occupancy or in a generic occupancy class.

**Demand Zones** – Areas utilized to analyze risk situations. FFD, because of its size and complexity, utilizes a variety of zones for different purposes:

**Response Districts (RDs)** - Irregularly shaped zones utilized for dispatch determinations. The computer aided dispatch system (CAD) utilizes RDs to recommend apparatus to respond to events occurring within the RD. They are developed based on neighborhood configuration, traffic flow patterns, closest fire stations, and a variety of other considerations. RD boundaries change frequently based on changes in street networks, station locations, etc.

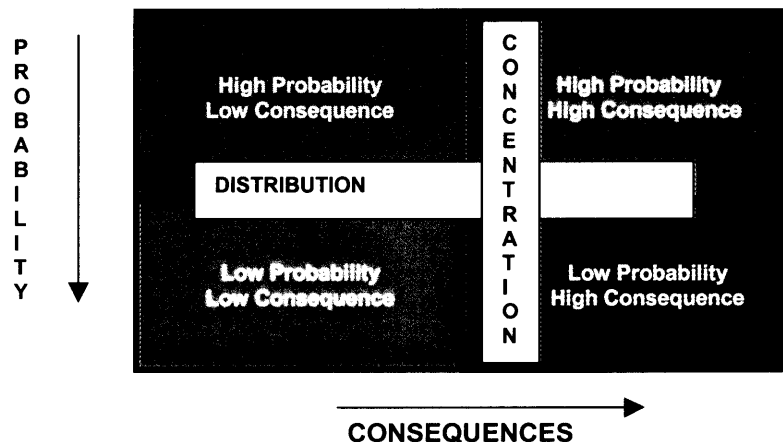
**Community Profile** – An analysis of the attributes of the community based on the unique mixture of demographics, socioeconomic factors, occupancy risk, demand zones, and levels of service currently provided. The Department often will use existing demographic data, such as Census Tract compilations or Quality Improvement markers for these analyses.

Through a methodical analysis of the risk dynamics present in a given community, a risk assessment makes it possible to develop rational resource deployment strategies. The goal of the risk assessment process is to determine the probability of an event occurring, as well as the potential consequences of that event.

### C. RISK ASSESSMENT COMPONENTS

The Risk Based Response Chart below provides guidance on a rational strategy for company deployment by comparing consequence and probability of emergency events. This results in four quadrants.

Figure 2.1



Each quadrant shows the probability of occurrence and the consequences of occurrence for each event included in the risk assessment. The quadrants also help to define the relationship between community requirements of distribution and concentration of responding fire forces and the need for the commitment of emergency resources.

A community risk assessment may include defining the differences between a single-family dwelling, a multiple family dwelling, a large industrial or commercial campus, and a high-rise residential or commercial structure, and assigning each to a different quadrant of the Risk Based Response Polygon. Fire stations and apparatus may be distributed uniformly throughout the community to provide prompt initial response to all types of incidents, or resources may need to be concentrated in high consequence areas to enable a large-scale response to an unlikely but highly consequential event.

#### **D. FACTORS UNIQUE TO THE FREMONT FIRE DEPARTMENT**

The challenge of fire station placement becomes more complex in a City such as Fremont. A traditional city fire department places companies in close proximity to its urban core, with lesser concentration of resources as the neighborhoods become more suburban. Response areas are relatively simple to define – a downtown “business core”, perhaps an industrial zone, and well-established residential neighborhoods. In those cities, particularly older urban cities of the mid-west and northeast, incident demands and the likelihood of simultaneously occurring fires and medical emergencies require that stations and apparatus be sited based on predictions of fire incident response (while apparatus utilization is primarily impacted by EMS incident response).

Fremont Fire Department serves a diverse community that includes several small business districts and urban city cores (with only moderate density), vast expanses of mixed suburban and commercial development. In excess of 75% of the structures within the City were built after 1970 utilizing modern, fire resistive construction methods and building codes. In addition, the Department’s Fire Prevention Bureau conducts a proactive fire prevention program. Thus, because the incidence of actual fires is quite low, historical coverage determinations with respect to fire have been based mainly on geographic response time factors.

The City of Fremont was built around five rural districts back in 1956. The original fire stations were deployed to meet the needs of those communities during that time period. Since then several fire stations have been relocated to meet the response time standards identified in the 1991 City of Fremont General Plan. When these stations were built, the placement was based on convenience and cost of property first and, to a lesser extent, response data. Additionally, they were often placed with regard to the fixed emergency infrastructure in surrounding communities. More recent station placement decisions have

attempted to fill in the gaps between communities, and to place new fire stations in locations that can be justified based on historical and predicted response data.

The preponderance of EMS calls in Fremont's response mix (57%), combined with the utilization of dual-role apparatus and personnel, further confounds efforts to establish Standards of Coverage. It is difficult to assign values to programs such as injury prevention, citizen CPR, public access defibrillation or various self-help programs which correspond to the values that can be associated with "engineered" fire detection and control systems (alarms, sprinklers, etc.).

In addition, historical response data indicates that approximately 75% of the department's responses occur between the hours of 8:00 a.m. and 9:00 p.m. Thus, while stations and fire suppression apparatus form a foundation of coverage based on the protection of territory and real property, the variations in EMS call distribution creates a second tier of responses that impacts deployment at varying hours of the day and in various locations in response to anticipated demand.

## **E. GEOSPATIAL CHARACTERISTICS OF FREMONT FIRE DEPARTMENT**

In order to reasonably break the Fremont Fire Department's response area into logical demand zones, we looked to available boundaries established by other governmental entities for guidance.

*(Please see Map Atlas, M-3; "11 Fire Districts with Fire Station Locations")*

## **F. TOPOGRAPHY**

The City of Fremont is comprised of a diverse topography. In the core area of the City, the terrain is essentially flat, with San Francisco Bay on the western border and rolling hills on the east. The eastern portion of the city contains approximately 14.4 square miles of very high fire hazard zones as described in the Bates Bill.

*(Please see Map Atlas, M-4; "Topography Map")*

## **G. TRANSPORTATION NETWORKS**

Perhaps the greatest challenge to Fremont Fire Department's response performance lies with the transportation network throughout the City. Within the core area of the City, the transportation network consists of the Alameda County Transit system, Bay Area Rapid Transit (BART) system and taxi cab service providers. AMTRAK and the Altamont Express Trains have expanded service during the past two years. In addition, commercial railroad lines (two north-

south), one east-west are heavily used by the Union Pacific Railroad. There are very few over-crossings or under-crossings throughout the City. These rail lines cross major thoroughfares, which frequently causes significant traffic delays during commute hours when the rail system is in use by any of the carriers. Although these transportation systems are well established, the majority of our citizens use private transportation as their primary mode of travel.

With an increasing population density, City roads are increasingly burdened by heavy traffic. Periods of "rush hour" congestion are steadily increasing in length, and in some areas, particularly Interstates 680 and 880, Highways 84, the Dumbarton Bridge and 238, traffic is extremely heavy throughout the daytime hours. Fremont is geographically located in the eastern portion of the Silicon Valley. Commuters to the South Bay and Peninsula use these major thoroughfares as their primary route of travel. State projects to expand these local highways are near completion, which will expand road capacity and highway speeds significantly. Efforts to expand local streets to improve traffic flow are limited by constraints on government finances, political pressures from the citizenry and topography (hills).

While the Department openly encourages "connectivity" and provides regular testimony supporting projects that will enhance emergency response, several factors that slow or obstruct emergency vehicle response are beyond the Department's complete control and can only be addressed through regular participation in legislative and community dialogue. For example, the Department engaged in a lengthy campaign against "traffic calming devices" such as "roundabouts" and "speed bumps" which were attempts by planners and homeowners to slow down traffic in residential neighborhoods, and provide a safer environment for pedestrians. All of these devices have proven to incrementally slow the response of large fire apparatus.

Extensive field-testing has shown these devices slow response times by adding an additional 9.5 seconds for Engines and 13.75 seconds for Aerial Ladder Trucks for every speed bump encountered. For example, there are five (5) speed bumps on Logan Drive between Mowry Avenue and Central Avenue. An Engine traveling down Logan from Mowry to Central will take an additional 47.5 seconds and a Truck 1 minute 8 seconds as a result of having to slow down for speed bumps. Maintaining a balance between safe neighborhood streets and adequate response times is difficult given these circumstances.

The Department produced an educational video that was used to educate policymakers. Typical fire apparatus (engine and truck companies) were filmed trying to negotiate the existing streets with these devices in place. The Fire Department Staff worked collaboratively with other City staff to design traffic calming devices that allow large vehicles to travel through grooves placed in the middle of the calming device, enabling the vehicle to proceed at normal speeds.

The extreme traffic pressure and subsequent delays that are currently experienced on the City's major "east-west" arterials would be substantially reduced through the addition of the Highway 84 extension and southern Highway 880 to Mission Boulevard expressway, near Auto Mall Parkway. However, inadequate funding, has postponed these projects.

The City of Fremont has a Traffic Pre-Emption Program. This system is designed to reduce response times by changing traffic signal lights at intersections to 'green' in the direction of travel of responding emergency vehicles via a pulsating light from an emitter located on the emergency vehicle. Currently, there are six (6) intersections in the center of the city with pre-emption receivers. No additional funds are currently available to expand this project.

Ultimately in the next several years, BART will be extended to the Warm Springs District, and subsequently to San Jose and the Santa Clara County Light Rail system. This will improve highway traffic, and will also increase the number of commuters coming into the City of Fremont. This enhanced transportation system will open the door for additional commercial/industrial development in the Warm Springs District.

The BART extension will also create a response challenge for the department as a result of the tunnel that is proposed for underneath Lake Elizabeth. The impact of this project on the department and emergency response is not yet fully understood and will require future study.

## **H. DEVELOPMENT AND POPULATION GROWTH**

The Bay Area is one of the fastest growing areas of the United States. Fremont, being strategically close to the hub of the Silicon Valley, and still having an abundance of commercial real estate available, is expected to develop further over the years. Although predictions of population growth are tenuous at best and subject to the vagaries of the national economy, the Association of Bay Area Governments projects Fremont's population to increase to 214,600 by 2005; 220,500 in 2010; and 228,300 by 2020. The current population is approximately 208,000. Because of Fremont's strong land use planning laws, this growth is expected to occur in two fashions.

Residential development - Of particular significance relative to residential development activity is the realignment of State Route 84. With the resolution of the alignment proposed primarily along Decoto Road, the City will have approximately 40 acres of centrally located surplus land. Development use is yet to be decided, but it is likely that residential units will be built. CalTrans owns a similar sized parcel along the former SR 84 route, however, no information is available.

in terms of timing or availability. A 2000+ unit residential development, Ardenwood 2000, may be proposed in the future in the Ardenwood area west of Interstate 880, which will include a commercial center. This project is approximately 1 – 2 years from construction. An approved two-story shopping center at Interstate 680 and Durham Road, Sabercat Center, is currently on hold but if approved and built, could cause an increase in residential units in the immediate vicinity. One area to watch is the 3,700 acre parcel under the “Niles” sign on the east side of Mission Boulevard which was recently purchased by a single developer. The parcel has been considered to be undesirable for development to this point. Other residential development will likely be infill in underutilized sites within existing fire service areas.

Commercial – There will be little, if any, development activity over the next five years (2003 – 2008). Most activity will occur in occupying existing office and R&D space vacated during the economic downturn of Silicon Valley related companies. Some warehouse growth west of I-880 is expected in the Baylands Business District, however, not for two to three years. The growth is expected in and around the Pacific Commons development.

Retail - Significant activity is anticipated at Pacific Commons along Auto Mall Parkway west of I-880 in the development of approximately 80 acres, yielding 700,000 square feet. The time frame for this activity is within six months (fall 2003) to two years (2005 - 2006). There is also a potential of developing the former Home Depot site off of Stevenson Boulevard west of I-880 within one to two years. The 28 acres has a potential of approximately 325,000 square feet. Longer term sites (2006 – 2008) include the parcel south of the NUMMI plant near I-880 and Mission Boulevard. The parcel is approximately 30 acres.

Of special note is the priority the City Council has placed on establishing a Downtown district. At the present, the Economic Development Department is actively marketing the area roughly bounded by Fremont Boulevard, Paseo Padre, Stevenson and Mowry Avenue. A request for qualifications process is set to begin soon with the Economic Development staff currently pre-qualifying strong potential developers.

Other retail growth anticipated is mostly infill at the Hub (Fremont Boulevard and Mowry), Mowry East Mowry and Farwell) and the historic districts of Niles, Centerville, Irvington and Mission San Jose. Notable developments may occur in Centerville where the Redevelopment Agency has a six-acre site near Fremont Boulevard south of Thornton and in the Mission San Jose District where Ohlone College is considering a development.

### **Zoning Information**

The City of Fremont is planned to be a balanced City with mixtures of industry, commerce, a variety of housing types, parks and open space. The original five



towns that composed Fremont are still evident in the organization of the City. Each of the five communities, now often referred to as “districts,” still contain a central commercial area, four of which have significant historic elements: Niles, Irvington, Centerville and Mission San Jose. A newer commercial area has replaced the historic commercial center in Warm Springs.

Industrial development has occurred in the southwestern area of the City, on land set aside for industrial use when the City was first incorporated. Industrial and business park development has also occurred on the northwestern side of the City in an area more recently designated for industrial use west of Interstate 880 and north of State Route 84. Most of the businesses are light to medium industrial facilities, which include some medium to large hazardous materials installations.

The City’s eastern hills rise above Mission Boulevard and Interstate 680 to form an open space backdrop. The eastern foothills have been designated as a hazardous fire hazard area. This designation requires annual maintenance of vegetation and intensified building standards in the Fremont Building Code.

The Fire Department has just completed an Area Plan as is required by the California Office of the State Fire Marshal. In this plan, consideration is given to facilities that present off-site consequences, underground pipelines and interagency coordination agreements. This plan also takes into account the High/Special Risk facilities from a hazardous materials perspective and is regularly updated and revised every ten years.

Fremont’s environmental factors including topographical, geological and climatic conditions contribute to the likelihood of major fire, rescue and toxic containment operations as well as contribute to emergency response delays. In order to combat these effects, Fremont has imposed mitigation systems to aid in the confinement, extinguishment and notification of occupants to allow for evacuation that will assist in the further reduction of injury and fatalities to life and the loss of property.

The modifications proposed to the California Fire Code are designed to mitigate the response time delays, increase survivability, and mitigate the impact of hazardous materials incidents caused by the topographic, geologic and climatic conditions present in the City of Fremont. For all of the reasons listed below, these regulations are needed to reduce human and property losses due to fire and hazardous materials in the City of Fremont.

## **Climate**

The local climatic conditions in Fremont affect the acceleration, intensity, and size of fires in the community. Times of little or no rainfall, combined with low humidity and high temperatures and winds, create extremely hazardous

conditions, particularly as they relate to wood shake and shingle roof fires and conflagrations. The winds experienced in this area can have a tremendous impact upon the initiation and spread of wild land fires, wood shake and shingle roof fires, and fires involving the interiors of buildings. In building fires, winds can literally force fires back into the building and can create a blowtorch effect, in addition to preventing "natural" ventilation and cross-ventilation efforts.

In developed areas of the City, fires can occur in buildings, rubbish, autos, and grass fires on vacant lots. In undeveloped and hillside areas of the City, there is a risk of large grass fires. If a fire occurs, local dry conditions combined with high winds create the risk of potential firestorms. In addition, reduced visibility and traffic accidents due to dense fog can increase demand on emergency services and increase emergency response time.

### **Geology and Topography**

The local geological and topographical conditions in Fremont affect fire frequency, magnitude, exposure and accessibility problems and have a negative impact upon the response capability of the Fire Department. Seismic hazards in combination within soils conditions have the potential to produce substantial structure damage or structural failure, multiple major fires and additional fire dangers, as well as place great strain on firefighting and rescue resources.

A seismic event could also trigger widespread damage to hazardous material storage vessels and cause substantial hazardous material releases into the environment. A major seismic event would disrupt transportation systems that already limit emergency response due to congestion, steep terrain, landslide vulnerability, firestorm vulnerability, reduced visibility and indirect routing resulting in a slower response and increased burden on Fire Department resources.

For additional information on land use distribution refer to the City of Fremont's zoning map.

### **Insurance Services Office (ISO) Rating**

The Insurance Services Office (ISO) is an organization that prepares reports on local fire defenses. The insurance industry evaluates a community's risks when setting their rates. Once ISO has completed their assessment and accompanied report, they sell the information to insurance underwriters for use in rate setting. The system they use has ten different public fire protection classifications, which define the various levels of public fire protection. Property insurance premiums are sometimes based on the insurance classification rate and the type of occupancy asking for the insurance. Notably, life safety issues are not considered in this evaluation system, and the fire department section of the

evaluation does not include a review of public education activities or fire prevention.

The ISO report rates a city by ten class categorizations. A Class One rating is considered to be the best rating. The ISO publishes a document titled "Fire Protection Rating Schedule" that provides a list of those features that have a significant influence on minimizing damage once a fire has started. There are three components evaluated in the ISO's grading, they are: (1) Fire Department, (2) Water Supply, and (3) Communications. The components are analyzed individually and collectively. Each component is rated on its own merit and then in comparison to the other two. Large disparities between components can result in "divergent point" penalties. This occurs, for example, when the fire department and water supply sections ratings differ by a large number of points. It is of little benefit to have a fire department that is extremely capable of fighting fire when there is no water supply to apply on the fire, or vice versa.

Commonly, a city will have a different grading than the fire department because the overall score is only determined after evaluating all three components. The public fire protection class given to the city is based on the percentage of credits that the city earns in the evaluation process as follows:

**Table 2.2**

<b>Class</b>	<b>Percent</b>
1	90% or more
2	80% to 89.99%
3	70% to 79.99%
4	60% to 69.99%
5	50% to 59.99
6	40% to 49.99%
7	30% to 39.99%
8	20% to 29.99%
9	10% to 19.99%
10	0% to 9.99%

The Fremont Fire Department received its last insurance evaluation in September of 1991. At that time, the City's population was recorded at approximately 173,800. The "Receiving and Handling of Alarms" criteria received 8.62 points out of 10, rating the fire alarm as a Class 2. The "Water System" criteria received 37.09 points out of a possible 40 for a Class 1 rating. The Fire Department received 37.92 points out of 50 for a Class 3 rating. The City was assessed a total of (3.38) points for this divergence. The total points assessed against the City were 80.25. The City was given an overall Class 2 rating.

## **I. RISK EVALUATION - GENERAL**

Many fire departments classify risks according to a graded system, which uses defined terms such as “maximum risk”, “high risk”, “moderate risk”, etc., to classify portions of the areas they protect, and to base response programming on those classifications. Fremont, because of its history, multi-community nature, rapid rate of growth and change, and the manner in which industrial, commercial, and residential occupancies are interspersed throughout the City, does not make use of such a classification scheme.

## **J. RISK ANALYSIS**

The City of Fremont Fire Department is organized into 11 fire districts that are further divided into 117 sub-districts or boxes. A comprehensive analysis was conducted using the **Risk, Hazard and Value Evaluation (RHAVE) grading system**. This system is supported by the United States Fire Administration and has been widely accepted in evaluating a communities risk level.

The RHAVE program is an occupancy vulnerability assessment profile. It is a collection of data elements designed to provide quantitative recommendations by using commonly accepted definitions of measurements. These measurements are identified in the Uniform Fire Code and the Uniform Building Code as well as National Fire Protection Agency recognized standards (NFPA). The grading system takes into account seven elements: The premise (occupancy type), building construction, life safety, risk (frequency/likelihood and consequence) water demand, property value and a summary. The summary is where the data elements are tallied and a score is given. There are four categories: maximum, significant, moderate and low. Scores range 60+, 40-59, 15-39 and 15 or less respectively.

The evaluation process considered the probability of an event occurring as well as the consequences of the event. There are four general categories considered. Those four categories are High/Special Risk, Maximum Risk, Moderate Risk and Low, Isolated Risk. The analysis determined that in general, 90% of the 11 districts and 117 sub-districts in Fremont fell into the moderate risk category. Within those areas, some High/Special Risk facilities are located in both the northern and southern industrial parks. These sites require special target hazard planning and preparation by the Fire Department.

*(Please see Map Atlas, M-5; Rhave Map with Sub-Districts)*

## **K. RISK CLASSIFICATION - SPECIFIC**

A Risk, Hazard, and Value Evaluation (RHAVE) process is typically utilized to stratify risk into more definitive categories and determine the values exposed to loss, the probability of an event occurring, and the consequences that such an

event may have on the community. Fremont Fire Department believes primary risk falls into four general categories in order of severity: life risk, community economic risk, environmental or historical risk and pure dollar loss. Since life risk and community economic risks are of primary importance, nearly all property associated with those risk categories is included in Fremont Fire Department's response zones. Examples of these are described below:

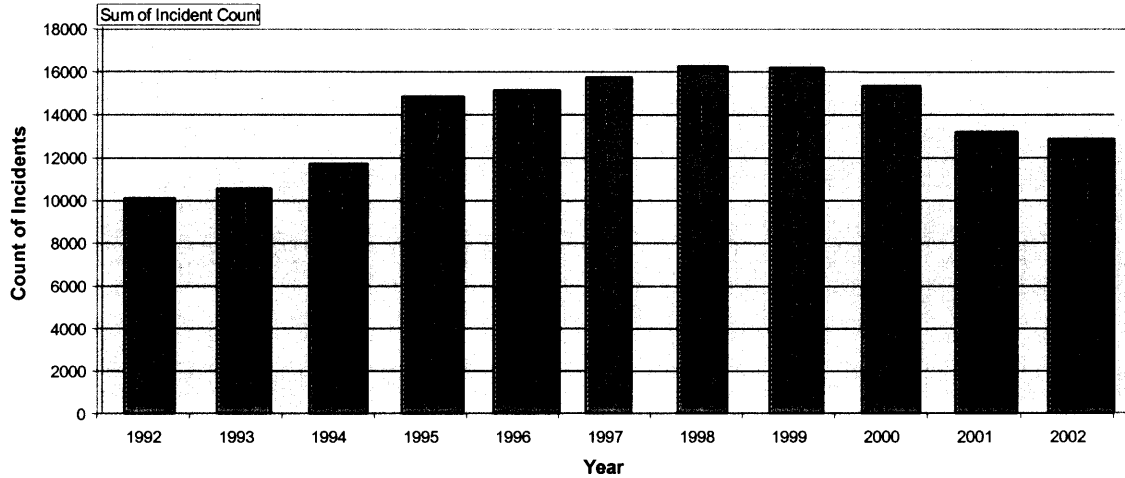
1. **Life Risk:** Any location that presents a high risk of life loss, such as high-density housing (particularly unsprinklered and older structures), foster care \*homes, skilled nursing facilities, hospitals, housing within close proximity to hazardous manufacturing or storage, day-care centers, and schools.
2. **Community Economic Risk:** Those facilities that have a high dollar value, and if destroyed or damaged by fire could close or relocate, permanently or temporarily placing a severe economic burden on the community through the loss of jobs and/or tax revenue. This category also includes critical infrastructure of primary importance to the economic health and safety of the community, such as utilities, roads, and bridges.
3. **Environmental or Historical Risk:** Any area where a high risk of severe or permanent environmental damage would likely occur in the event of a fire loss or hazardous material spill, or any structure of significant historical significance to the community.
4. **Pure Dollar Loss:** Structures that have a high value, but pose a low risk of life loss or community economic impact and are typically fully insured against loss. Examples would be large rural residential and farm structures, and some commercial buildings housing primarily inventory.

## **Probability**

Fremont Fire Department's call volume has increased steadily with the growth in size and population of the City. Table 2.3 illustrates total call volume over the last 10 years. (Note: The chart includes response totals that are combined with incidents occurring in Union City from 1994 – 2000).

**Table 2.3**

**FREMONT FIRE DEPARTMENT INCIDENT HISTORY - LAST 10 YEARS**



For the year 1994 through 2000 inclusive, the Cities of Fremont and Union City operated a combined fire department. The data above includes incidents that occurred within the City of Union City for that time period.

**Impact of Automatic Fire Sprinklers on Local Experience**

Automatic fire sprinklers provide buildings with added protection from fire. The National Institute of Science and Technology reports a potential 82% reduction in fire deaths should fire sprinklers be installed in all residential occupancies. The City of Fremont has required Fire Sprinklers in all new construction since 1998. There are also standards in place that require retro-fit of buildings to provide for fire sprinklers when additional square feet is added to existing buildings or other major renovations. There are additional requirements for retrofit sprinkler applications when a property owner intends certain change-in-use applications to their property or when the building sustains significant damage during a fire or disaster.

Contrary to the concerns of many, building occupants are at greatest risk at home, where most feel the safest, as opposed to when they are in hotels or other public places. Hotels, in fact, are among the places that are safest from fire, and that is due in large part to the fire protection technology required for them. That technology typically includes early warning systems and automatic fire sprinklers.

Fire sprinklers have been around for more than a century, protecting commercial and industrial properties as well as public buildings such as hotels, hospitals and high-rises. Additionally, the same lifesaving technology that protects these types of buildings is also available for homes, where 80 percent of all fire deaths occur.

## Sprinkler Operation

In a home fire sprinkler system, a network of piping filled with water under pressure is installed behind the walls and ceilings, and individual sprinklers are placed along the piping to protect the areas beneath them. Because the water is always in the piping, the fire sprinkler system is always "on call". If fire breaks out, the air temperature above the fire rises and the sprinkler activates when the air temperature gets high enough. The sprinkler(s) nearest the fire spray water forcefully over the flames, extinguishing them completely in most cases, or at least controlling the heat and limiting the development of toxic smoke until the fire department arrives. Smoke will not activate fire sprinklers.

Sprinklers are effective because they reduce the risk of death or injury from a fire by reducing the heat, flames and smoke produced. Home fire sprinkler systems release approximately 10-25 gallons of water per minute and can potentially contain and even extinguish a home fire.

## Types of Calls to Which Fremont Fire Department Responds

Using the call classification scheme developed by the National Fire Incident Reporting System (NFIRS), during calendar years 2001 and 2002 the Fremont Fire Department responded to 13,197 and 12,867 respectively.

An analysis of call types and frequencies was conducted to assess the probability of a particular event occurring. All calls for service over the two years (January 1, 2001 through December 31, 2002) were included.<sup>1</sup> The results are shown below in Table 2.4

**Table 2.4**

<b>NFIRS CALL TYPE</b>	<b>CALLS FOR SERVICE 1/1/01 to 12/31/01</b>	<b>%</b>	<b>CALLS FOR SERVICE 1/1/02 to 12/31/02</b>	<b>%</b>
FIRE	424	3.2%	377	2.9%
Explosion, Overpressure	50	0.4%	39	0.3%
EMS, Rescue	7,585	57.5%	7,591	59.0%
Hazardous Condition	872	6.6%	870	6.8%
Service Call	1,678	12.7%	1,530	11.9%
Good Intent Call	793	6.0%	816	6.3%
False Call	1,592	12.1%	1,464	11.4%
Natural Disaster	3	0.0%	2	0.0%
Other	200	1.5%	178	1.4%
<b>TOTAL</b>	<b>13,197</b>	<b>100%</b>	<b>12,867</b>	<b>100%</b>

<sup>1</sup> Data obtained from CFIR reports generated by company officers through the Tiburon records management system.

*(Please see Map Atlas M-6, "All Calls"; M-7, "All Call Hot Spots"; M-8, "All Fire Calls"; M-9, "All Fire Call Hot Spots")*

This distribution illustrates the first of several challenges faced in providing service to Fremont. A pure fire suppression agency's demand for service is primarily driven by the characteristics of fixed real property, land and buildings. However, the Fremont Fire Department's demand is primarily driven by people, whose distribution does not necessarily correspond to the distribution of real property. Moreover, human beings are highly mobile; thus demand for service in a particular area can change depending upon the time of day, as well as over longer periods.

Four groups of calls were examined: fires (NFPA classifications 1), EMS calls (NFPA classification 3), Hazardous Materials events (NFPA classification 4), and all other calls (NFPA classifications 2, 5, 6, 7, 8 and 9). In addition, because of its extensive automatic aid and mutual aid relationships, Fremont Fire Department does not utilize the NFPA classification for "mutual aid" calls. These calls can be segregated using a separate classification scheme available in the Department's emergency response records management system. We have also included a temporal analysis of aggregated data to demonstrate the peak load demands for response services at various times of the day.

## **Fires**

Fires occur throughout the entire Fremont Fire Department service area. More than 60% of these fires are brush, rubbish, and automobile fires. Table 2.5 shows the frequency of fires throughout Fremont Fire Department.

**Table 2.5**

### **FREQUENCY OF FIRES**

<b>NATURE</b>	<b>1/1/01 - 12/31/01</b>	<b>1/1/02 - 12/31/02</b>
Structure	115	116
Automobile	132	105
Brush	88	75
Trash	53	42
Misc.	42	39
<b>Totals</b>	<b>430</b>	<b>377</b>
Per Day	1.17	1.03

The data indicates the department experiences a fire of some type each day and a structure fire approximately every three days.



While the Department has attempted in the past to define a "working" structure fire for the purposes of trying to determine resource commitments, our present data collection methods do not accurately document when a fire is under control, and additional resources are not needed. A future goal will be to define and stratify the severity of structure fires, so the Department can determine how many were mitigated early by first arriving companies versus how many required a greater commitment of resources to extinguish. This may be accomplished through a combination of CAD data, fire loss statistics and incident report narrative collected through the Quality Improvement process.

**EMS**

The largest proportion of emergency response activity within Fremont Fire Department is the response to requests for emergency medical services. The proportion of EMS calls to other calls has remained relatively constant over the last three years. Currently, Fremont Fire Department responds to approximately 20.67 EMS calls per day. Table 2.6 displays this data.

**Table 2.6**

**FREQUENCY OF EMS CALLS**

<b>Risk Category</b>	<b>1/1/01 – 12/31/01</b>	<b>1/1/02 – 12/31/02</b>
EMS calls	7,544	7,545
Daily average	20.67	20.67

**Hazardous Materials**

Fremont Fire Department protects one of the most extensive collections of hazardous materials in the Bay Area, both in volume and in chemical complexity. These materials are found not only along the City’s transportation corridors, but also within the numerous hazardous materials facilities spread throughout the City. Much of this HazMat load is attributable to the “Silicon Valley” of microprocessor production and biotechnology facilities found in the area.

Hazardous materials incidents are relatively infrequent considering the diverse industrial base scattered throughout the City, as well as its complex transportation network. Presently, Fremont Fire Department responds to 143 HazMat calls per year, or about .39 HazMat incidents per day. Table 2.7 shows the number of HazMat calls over the reporting period. In late 2001, incidents increased as units were sent to investigate suspicious compounds called in by citizens on high alert for terrorist activity. The data does not reflect most of these incidents due to the method by company officers to file these reports.

Table 2.7

### FREQUENCY OF HAZMAT CALLS

<b>Risk Category</b>	<b>1/1/01 – 12/31/01</b>	<b>1/1/02 – 12/31/02</b>
HazMat Calls	166	143
Daily Average	.45	.39

### All Calls for Service

The Fremont Fire Department responded to 13,197 calls for service in 2001 and 12,867 in 2002. Please refer to Table 2.3 for this data breakdown.

### Mutual Aid

Within Alameda County, mutual aid is provided through written agreements between each city. In addition, several neighboring fire service organizations provide mutual response on jurisdictional borders. It is not unusual to find personnel from two different agencies operating effectively at an emergency scene, under the supervision of a command officer from a third agency.

Accordingly, the characterization of calls as “mutual aid” is not utilized except in special, infrequently occurring situations. Currently, the Department does not capture accurate mutual aid response data to report in this document. Table 2.6 identifies the jurisdictions the City of Fremont provides, or receives mutual aid from:

Table 2.8

<b>Jurisdiction</b>
Newark
Union City
Milpitas
CDF
Alameda County
Hayward
Menlo Park

### Miscellaneous Calls

Like most community based fire service organizations, Fremont Fire Department serves its communities as a multifunctional service provider, often becoming “the social service of last resort.” Citizen and public assistance calls of almost infinite variety make up a significant minority of service requests. Table 2.9 reflects the frequency of miscellaneous service requests over the reporting period.

Table 2.9

### FREQUENCY OF MISCELLANEOUS SERVICE CALLS

<b>Risk Category</b>	<b>1/1/01 – 12/31/01</b>	<b>1/1/02 – 12/31/02</b>
Service Calls	1,678	1,530
Daily Average	4.60	4.19

### False Alarms

The Fremont Fire Department responds to a number of sprinkler and fire alarm system false calls annually as indicated in Table 2.10. The average over the last two-year period is four false alarm responses per day. In most cases, a company is dispatched, arrives at the location and searches the building to ensure that a fire has not gone undetected by occupants. The responding company then resets the system so that it will function as intended. The exception to this is when a responsible party is contacted at the incident scene and indicated a false trip of the system.

Table 2.10

### FREQUENCY OF FALSE ALARM CALLS

<b>Risk Category</b>	<b>1/1/01 – 12/31/01</b>	<b>1/1/02 – 12/31/02</b>
False Alarms	1,592	1,464
Daily Average	4.36	4.01

### Total Calls

Table 2.11 demonstrates total call volume and frequency of all responses for calendar years 2001 and 2002.

Table 2.11

### FREQUENCY OF ALL CALLS FOR SERVICE

<b>Risk Category</b>	<b>1/1/01 – 12/31/01</b>	<b>1/1/02 – 12/31/02</b>
Total Calls	13,197	12,867
Daily Average	36	35

It should be noted that this categorization scheme dramatically understates the activity of line response companies for three significant reasons. First, it is believed that the general assumption relative to company activity level can be accurately determined through incident volume alone. This understanding suggests that all incidents require a similar amount of time, resources or companies to abate. Table 2.12 identifies the call volume for the year 2002 and includes the required resources (staff hours) needed to abate the emergency, a more accurate representation of company activity level.

**Table 2.12**

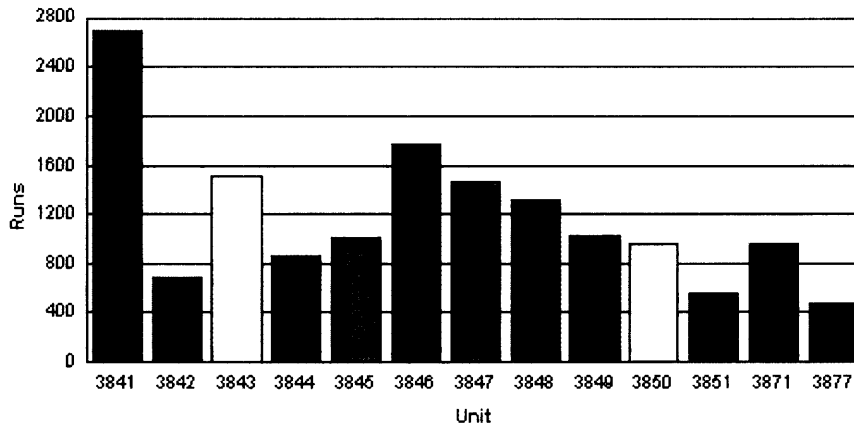
**Incident Category Breakdown for 2002**

Category	Count	Staff Hours	Percent of Total
Fires	377	2,161	13.53%
Explosion, Overpressure	39	58	0.36%
EMS, Rescue	7,591	9,366	58.64%
Hazardous Condition	870	1,337	8.37%
Service Call	1,530	1,808	11.32%
Good Intent Call	816	398	2.49%
False Call	1,464	718	4.49%
Others	180	125	0.78%
<b>Grand Total</b>	<b>12,867</b>	<b>15,971</b>	<b>100%</b>

Secondly, incident call volume tracks only first-in incidents companies respond to within their first-in districts. Company Runs add to this number the number of responses a particular company responds to as a part of multi-company response out of their first-in districts. Table 2.13 depicts this activity for 2002.

**Table 2.13**

**2002 Company Runs**



The total number of Company Runs for 2002 was 15,288 compared to the total number of calls, which was 12,867 for the same time period.

Third, consideration should be given to activities spent in preparation for responding to emergency requests for assistance (operational readiness) and non-emergency assignments in support of lowering our community fire experience. The impact of both the intense training requirements of a multi-role fire and EMS provider and Fremont Fire Department’s “community fire stations” model, with a focus on prevention and education activities, means that a response-based activity inventory fails to account for activities that occur on many “runs”, and does not account for non-emergency activity. For example, an engine company responding to an “invalid assist” request may in addition to

assisting the citizen, perform a smoke detector check, “fall proof” the house, and distribute other educational materials.

All significant activity is captured on a daily basis in the Fire Department's records management system (RMS). The computer aided dispatch (CAD) response data is automatically entered for all incidents fire companies are dispatched on, and those activities associated with training, prevention, and community education, are entered by the company officer.

### Temporal Analysis

Temporal Analysis is the analysis of events with respect to time. Previous analyses have established that these patterns have not changed significantly over reporting periods. Accordingly, data from all three time groups have been aggregated, in the interests of simplicity. The charts below display the temporal distribution of calls for the year 2002 using the same classification scheme utilized for the frequency analysis. From a review of these graphs, the times of day at which events are likely to occur can be ascertained.

**Table 2.14**

### TEMPORAL DISTRIBUTION OF FIRE CALLS By Hour of Day

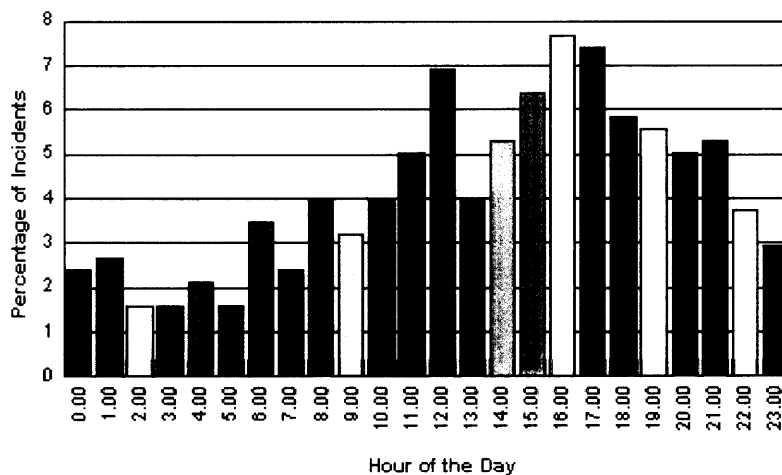


Table 2.15

### TEMPORAL DISTRIBUTION OF EMS CALLS By Hour of Day

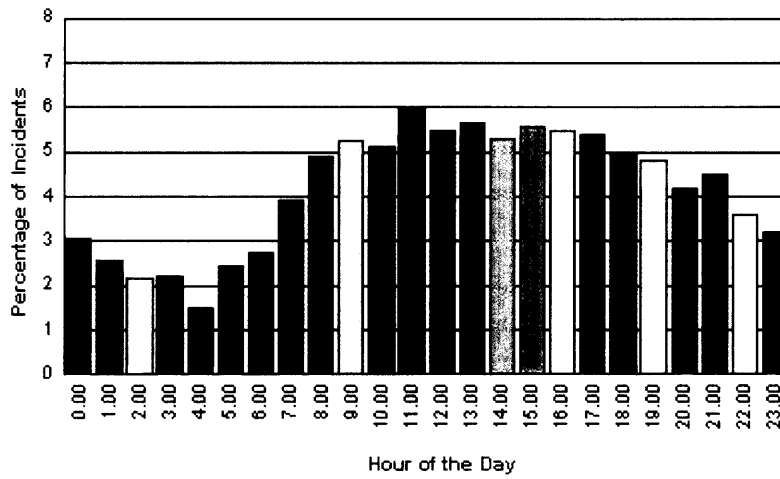


Table 2.16

### TEMPORAL DISTRIBUTION OF HAZARDOUS MATERIALS CALLS By Hour of Day

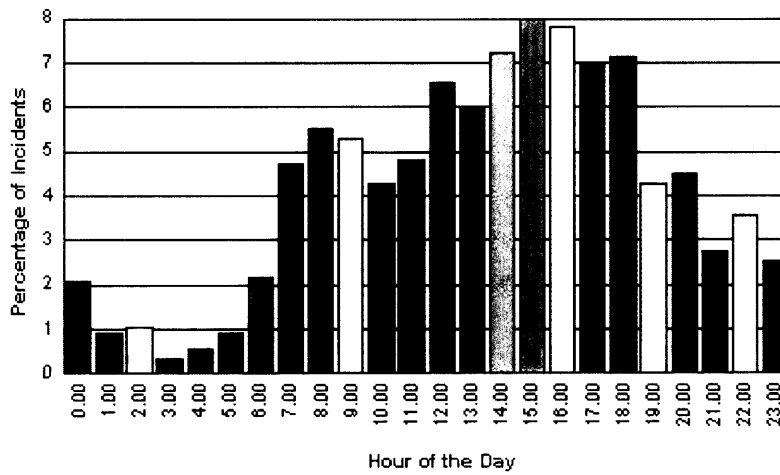
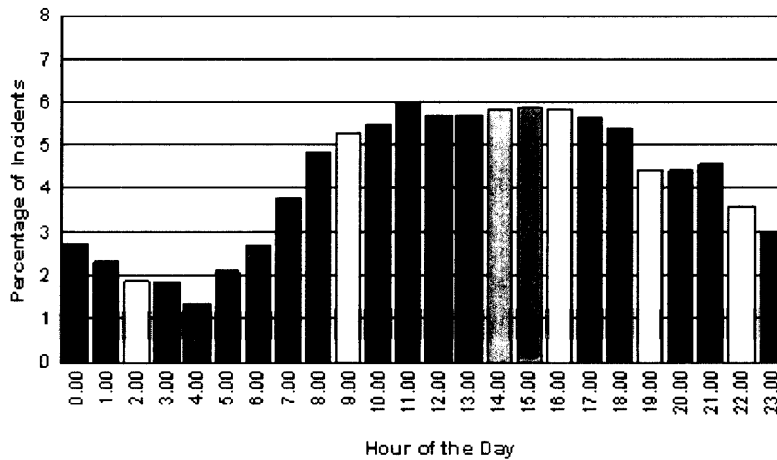


Table 2.17

### TEMPORAL DISTRIBUTION OF ALL CALLS By Hour of Day



### Buildings

The City of Fremont is a growing community, with room for residential, commercial, and industrial development. With the Pacific Commons project under development, a wide variety of large-scale structures will be built over the next few years. In addition, large residential structures, though small in number, will continue to be built in the eastern hills of the City.

Currently, the City of Fremont is home to approximately 59,400 structures. Over 81 percent of these are single-family homes with the next largest category being office uses. Developments are anticipated in several areas of the City including downtown (area bounded by Capitol Avenue, Walnut, Fremont Boulevard and Mowry Avenue), around the Warm Spring BART Station, and the high density but yet to be determined parcels around the State Route 84 re-alignment. Table 2.18 identifies an inventory of the number and type of buildings protected by the Fire Department and is based upon data maintained by the City GIS Division.

**Table 2.18**

<b>CLASSIFICATION</b>	<b># OF BUILDINGS</b>
Single Family Residential	48,484
Multi-Family Residential	936 (190 apartment buildings, 746 residential condominiums)
Places of Assembly	396
Offices	8,083
Educational Facilities	115
Fabrication & Manufacturing	553
Hazardous Materials	305
Health Care Facilities	18
Mercantile	173
Storage	275 (includes 24 storage/warehousing businesses)
Special Residences (AFH)	71 (includes 31 adult residential facilities, 9 group homes and 31 residential care facilities for seniors)
Total Buildings	59,409

### **Summary**

Fremont's environmental factors including topographical, geological and climatic conditions can contribute to operational difficulties as well as emergency response delays. Fremont Fire Department's response companies must be adequately distributed to handle the high frequency, moderate-to-low risk events, while at the same time concentrated adequately to support the requirements of maximum risk occupancies.



## SECTION III

### GOALS, OBJECTIVES AND PERFORMANCE STANDARDS

Historically, neither Fremont Fire Department nor its antecedent fire departments utilized a “standards of response coverage” document or statements to guide their operations. The department does have a single performance standard as stated in the City of Fremont General Plan as discussed in section I. Fremont Fire Department has operated under a modified strategic planning process, which included mission statement, goals and objectives, and annual performance statements. These annual performance statements have been reviewed by the City Manager and approved by the City Council as an element of the annual budget approval process.

As identified in the FY 2003/2004 budget document, the General Plan statement has been revised to now state, “Arriving at the scene of an emergency within six (6) minutes 90% of the time...” This modification has not changed the travel time but has now recognized the turnout time and alarm processing time as part of the overall response time goal.

Furthermore, our service objectives have been expanded to include, “Rescue and extricate trapped individuals in thirty (30) minutes or less from the time of arrival at scene of emergency, 90% of the time...”

The ICMA benchmark consortium has indicated that 90% achievement is the baseline for suburban/urban fire departments.

#### A. MISSION STATEMENT

The mission statement of Fremont Fire Department is:

*The Mission of the Fremont Fire Department is to deliver the services necessary to minimize the loss of life and property threatened by the hazards of fire, medical and rescue emergencies, hazardous materials incidents, and disaster situations in our community.*

## **B. ORGANIZATIONAL GOALS**

Fremont Fire Department's organizational goals and objectives are set forth in the Department's annual budget document. A Strategic Plan for the Fire Department is currently under development which will be consistent with the City's Strategic Plan 2020. The following goals and objectives are incorporated herein by reference. Specific elements relative to emergency response services are restated below because of their relevance to the development of the Standards of Coverage for Emergency Response.

GOAL #1: Reduce the number and severity of emergency incidents.

Specific Objectives:

- ◆ Improve response programs through modifications in station locations, deployment, notification, dispatch, traffic pre-emption, district boundary redrawing, vehicle routing, and information availability, training and preplanning.
- ◆ Employ prevention and education programs that will minimize the need for emergency response services.
- ◆ Improve the capacity of the Department to provide emergency response and related services to residents whose primary language is not English.

GOAL #2: Maximize utilization of existing resources.

Specific Objectives:

- ◆ Conduct ongoing resource deployment analysis and develop plans to improve resource allocation.
- ◆ Develop, maintain, and evaluate quantifiable and measurable performance standards for all Divisions.
- ◆ Maintain the Department's apparatus, facilities, and equipment to ensure they continue to meet or exceed all recognized standards.
- ◆ Maintain a modern and efficient apparatus fleet.

GOAL #3: Promote craftsmanship, quality and proficiency throughout the organization.

Specific Objectives:

- ◆ Encourage quality and craftsmanship through continuous learning.
- ◆ Instill pride and professionalism through the sharing of good examples, promotion of success, and the fair, objective analysis of error.
- ◆ Support a positive environment through empowerment and encouragement of risk-taking.
- ◆ Recognize quality performance.

Historically, the mission statement and the City of Fremont General Plan have served as guidelines by which Department staff has driven decisions about distribution, concentration, and staffing of line companies. Population, certain special hazards, and other factors were also considered.

Because of its extraordinarily dynamic past, Fremont Fire Department is the product of numerous individual and group decisions and processes. Based upon the previous chapters of Community Description and Risk Assessment, the Fremont Fire Department proposes the following:

The Fremont Fire Department has established five service level goals for a Moderate Risk fire in Fremont. These goals are aimed at protecting the lives and property of our citizens and to provide a high degree of safety for Fire Department personnel. The Department's goals for fire companies are:

1. Arrive on scene before flashover
2. Confine the spread of fire to the room of origin
3. Account for all occupants
4. Remove all victims from inside involved and exposed structures
5. Provide a high degree of safety for Fire Department personnel

The Fremont Fire Department has established five service level goals for a typical EMS/ALS call in Fremont. These goals are aimed at protecting the lives and property of our citizens and to provide a high degree of safety for Fire Department personnel. The Department's goals for fire companies are:

1. Arrive on scene prior to clinical death as recognized by American Heart Association
2. Stabilize the scene of the incident
3. Assess the patient(s)
4. Stabilize the patient using ALS/BLS care
5. Provide for transportation based on Alameda County EMS standards

The Fremont Fire Department has a service level goal for an extrication. This goal is aimed at protecting the lives of our citizens and to provide a high degree of safety for Fire Department personnel. The Department's goal for fire companies is:

1. Rescue and extricate trapped individuals in thirty (30) minutes or less from the time of arrival at scene of emergency, 90% of the time

## Performance Standards for Emergency Response

Based upon the previous goals and objectives, the department currently has two adopted response goals. They are:

1. Distribution of first due engine companies for moderate risk occupancies is to arrive at the scene of emergency calls for service within 4 minutes travel time 90% of the time.
2. Concentration of a total effective response force for moderate risk occupancies is to arrive at the scene of emergency calls for service within 8 minutes 90% of the time. (The description of an effective response force will be covered in chapter V.)

PERFORMANCE ELEMENT		TIME STANDARD		FRACTILE	
Primary Answer		10 seconds		90%	
Call Screening		30 seconds		90%	
Secondary Answer		10 seconds		90%	
Call Processing		60 seconds		90%	
Turnout Time		90 seconds		90%	
Travel Time		4 min	8 min	90%	90%
Distribution	Concentration	7 min 20 sec	11 min 20 sec	90%	90%

### Event Definitions:

- Primary Answer:** The time it takes for the 9-1-1 call to be answered in the Public Safety Answering Point (PSAP) dispatch center
- Call Screening:** The time interval for the 9-1-1 call to be answered at the PSAP.
- Transferring:** Transfer is when the 9-1-1 call is transferred to secondary PSAP from primary PSAP.
- Secondary Answer:** The time interval to answer the 9-1-1 call at the secondary PSAP.
- Call Processing:** The time interval for "caller" interrogation at the secondary PSAP.
- Turnout Time:** The time interval between a Fire Company receiving a call and exiting the station
- Travel Time:** The time interval between a Fire Company exiting the station and arriving to the scene of the call.
- Distribution:** The total time associated with the arrival of the first-due company.
- Concentration:** The total time associated with the arrival of the entire first alarm assignment.

## **Summary**

For the purposes of measurement and quantification of data, anything listed in this document as a "Fremont Fire Department Response Goal" shall be considered achievable. Anything that affects Department resource deployment, (ie., funding, staffing, or resource depletion) that has an adverse or negative effect on deployment standards, will require an analysis in order to make appropriate adjustments to the Standards of Coverage.

# SECTION IV

## PHYSICS AND PHYSIOLOGY OF EMERGENCY SERVICE

### TIME AND ON-SCENE PERFORMANCE EXPECTATIONS

Rapid and effective performance of assigned tasks is the hallmark of an effective response force. An effective response force must arrive on scene in a timely fashion if they are to perform their job functions effectively. The target indicators established for Fremont Fire Department operational elements, both individuals and response companies, focus on response time and on-scene performance expectations. Minimum task performance standards within required times have been established by the Department and should be evaluated annually through company evaluations.

### RESPONSE PERFORMANCE STANDARDS

#### The Response Time Continuum

The International Association of City Managers (ICMA) describe a response time performance continuum in the book entitled “Managing Fire and Rescue Services” of the Municipal Management Series. The response time performance continuum is a process map composed of measurable time points and intervals. The elements of the emergency response system are described below:

Incident Mitigation Time									
System Notification Time		System Response Time				System Impact Time			
		Incident Processing time		Unit response time		Unit impact time			
Detection Time	Notify Time	Call-Handling Time	Dispatch Time	Turn-out Time	Travel Time	Deploy Time	Control Time	Wrap-up Time	
A	B	C	D	E	F	G	H	I	J
Incident Occurs	Incident detected	911 begins ringing at PSAP	Call transferred to dispatcher	Call dispatched	Unit(s) respond	Unit(s) arrive	Unit(s) begin work	Incident under control	Incident ends

### TIME POINTS AND TIME INTERVALS – THE CASCADE OF EVENTS

The CFAI has defined response time elements as a cascade of events. This cascade is similar to that used by the medical community to describe the events leading up to the initiation, mitigation, and ultimate outcome of a cardiac arrest. Throughout this discussion, it is imperative to keep in mind that there are some intervals described (i.e., reflex, travel, etc.) that can be directly influenced by the fire service. Others such as discovery and notification intervals can be influenced indirectly through public education and technology initiatives. Defining and requiring standards for the dispatch center can influence other events, such as the call-processing interval.

## MEASURES

Careful definition of terminology is essential to any conversation about response performance standards. It becomes even more critical when an organization attempts to benchmark its performance against other providers. The following definitions are standardized for discussion of response performance parameters:

**Event Initiation** – The point at which factors occur that may ultimately result in an activation of the emergency response system. Precipitating factors can occur seconds, minutes, hours, or even days before a point of awareness is reached. An example is the patient who ignores chest discomfort for days until it reaches a critical point at which time, he/she makes the decision to seek assistance (point of awareness). It is rarely possible to quantify the point at which event initiation occurs.

**Discovery Interval** – The time interval between the event initiation point and the emergency event awareness point.

**Emergency Event Awareness** – The point at which a human being or technologic “sentinel” (e.g., smoke detector, infrared heat detector, etc.) becomes aware that conditions exist requiring an activation of the emergency response system.

**Alarm** – The point at which Awareness triggers an effort to notify the emergency response system. An example of this time point is the transmittal of a local or central alarm to a public safety answering point (PSAP). This time period is typically not captured in a method where it can be measured with any accuracy.

**Alarm Transmission Interval** – The time interval between the awareness point and the alarm point. This interval can be significant, e.g. the alarm is transmitted to a distant commercial alarm monitoring organization, which then retransmits the alarm to the local 9-1-1 and dispatch facility.

**Notification** – The point at which an alarm is received by the public safety answering point (PSAP). This transmittal may take the form of electronic or mechanical notification received and answered by the PSAP.

**Call Processing Interval** – The interval between the first ring at the primary public safety answering point and the dispatch of the appropriate resources as defined below.

1. **Ring Time** - first ring in the primary PSAP to 9-1-1 answer.
2. **Interrogation time**- from answer to transfer to secondary PSAP.
3. **Ring Time** - time from first ring in the secondary PSAP to 9-1-1 answer.
4. **Interrogation time** – From 9-1-1 answer to activation of station or company alerting devices.

The Fremont Fire Department standard for ring time is 10 seconds or less 90% of the time. The call-processing standard for non-medical calls is 60 seconds or less 90% of the time. Medical call compliance is content based in compliance with the standards established by the National Academy of Medical Dispatch.

This can, if necessary, be broken down in to two additional parameters: "*call taker interval*" (the interval from the first ring of the 911 telephone until the call taker transfers the call to the dispatcher) and "*dispatcher interval*" (the interval from the time when the call taker transfers the call to the dispatcher until the dispatcher, or CAD operator activates station and/or company alerting devices). Fremont Fire Department's primary PSAP, the Fremont Police Department Communications Center has established a performance standard of 1.50 minutes for total call processing time (including dispatch time).

**Reflex or Turnout Interval** - The interval between the activation of station and/or company alerting devices and when the responding crew activates the "responding" button in the fire station or notifies Fire Alarm by voice that the company is responding. During the reflex interval, crews cease other activities, don appropriate protective clothing, determine the location of the call, and board and start the fire apparatus. It is expected (without any guarantee) that the "responding" signal will be given when personnel are aboard the apparatus and the apparatus is beginning to roll toward the call.

**En-Route Time** - The point at which the responding apparatus signals the dispatch center that they are responding to the alarm.

**Travel Interval** - Begins at the termination of the reflex interval, and ends when the responding unit notifies the dispatcher unit that it has arrived on scene (again, via voice or MCT notification)

**On-Scene Time** – The point at which the responding unit arrives on scene. Arrival is determined by actual physical arrival on scene or at the address of the emergency as displayed by CAD

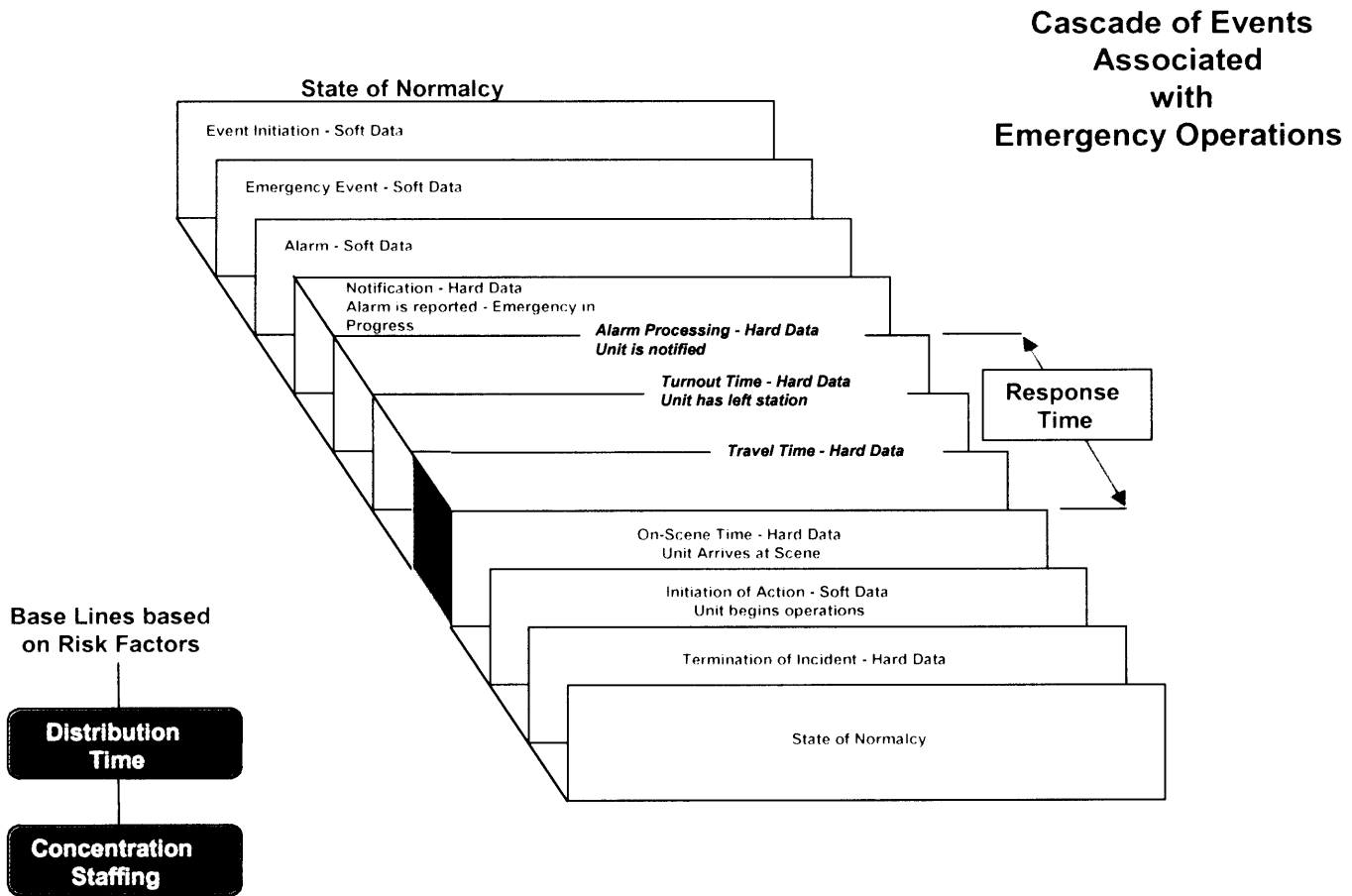
**Initiation of Action or "At Patient" Time** – The point at which actions to mitigate the event begin. This may include size-up, resource deployment, patient evaluation, etc. This may be variable, considering access problems associated with high-rise buildings, malls, and incidents where terrain must be traversed in order to reach the patient.

**Termination of Incident** – The point at which unit(s) have completed the assignment and are available to respond to another request for service.



Figure 4.1 is the graphical representation of the Cascade of Events:

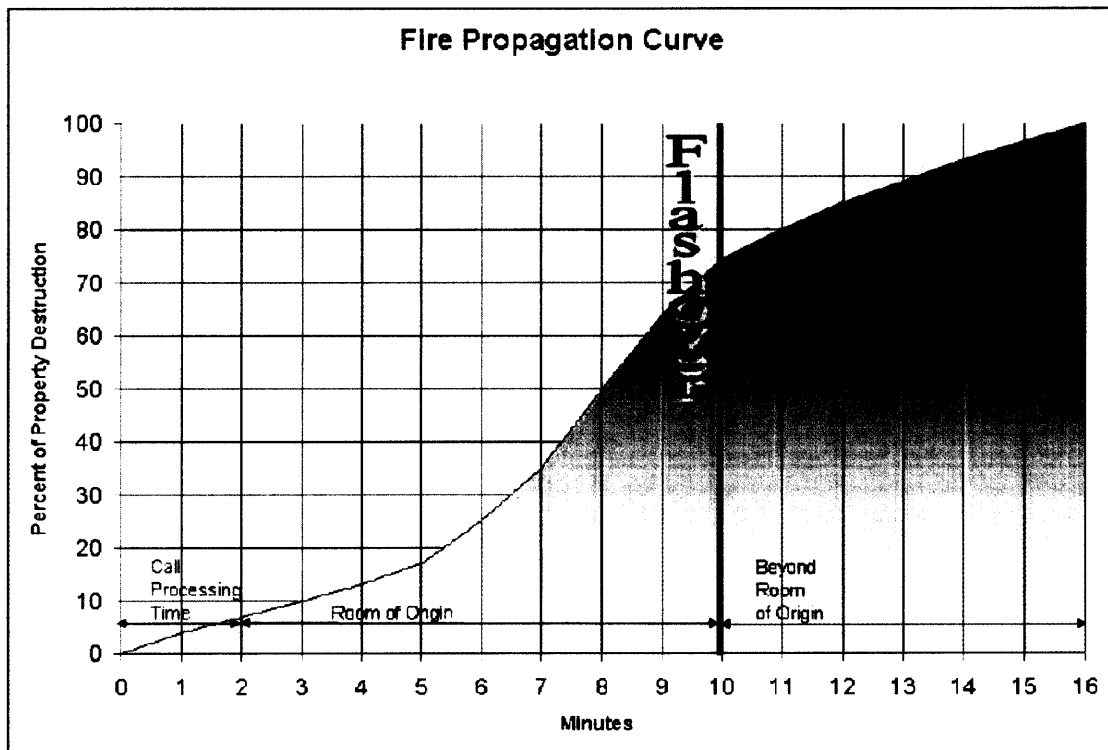
Figure 4.1



## TIME – TEMPERATURE CURVE

The “time-temperature curve” standard is based on data from Fire Research professionals who have established that a typical point source of ignition in a residential house will “flash over” at some time between 5 and 30 minutes after ignition. Flashover is the point at which all combustibles in a room or space reach their ignition temperature simultaneously. Flashover causes a typical “room and contents” fire to become a structural fire of some magnitude. The time range for flashover is determined by fire load and spatial geometry. Small spaces/rooms with high fire loads reach flashover faster than the larger spaces/rooms with lower fire loads.

Figure 4.2



The utility of the time-temperature curve for fire station placement is limited by a number of factors.

1. It does not account for the time required for the existence of a fire to be “discovered” and reported to the fire department via the 9-1-1 system.
2. The time from ignition to flashover varies widely (5-30 minutes depending on building characteristics); thus it cannot provide a valid basis for the allocation of resources.
3. The curve is constantly shifting, given the numerous changes in building construction, built-in suppression systems, and the increased use of fire-resistive materials for furniture and other items typically found in the interior of occupied buildings.
4. Fires of this type (involving flashover or potential flashover) involve less than 2% percent of most Fire Department’s total responses.
5. It applies only when are either not present in the building and/or fail.