SEISMIC SAFETY
AND SAFETY SUB-ELEMENT
OF THE
COMMUNITY DEVELOPMENT ELEMENT

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PREFACE

In 1971, the California Legislature added Government Code Section 65302, requiring all city and county agencies to develop Seismic Safety and Safety Elements as part of their General Plan. The Seismic Safety and Safety Element is the primary means for the community to identify hazards that must be considered in planning the location, type and density of development. The Element must address all relevant seismic and geologic hazards, as well as structural hazards and earthquake induced flooding and fires. Plans and programs for emergency management and response must also be included in every agency's sub-element. Planning must also be included for structure fires, flooding and hazardous materials incidents.

Sunnyvale adopted its Seismic Safety and Safety Elements in 1972. In 1984, due to the considerable overlap in the required content of each document, the Seismic Safety and Safety Elements were combined into a single Sub-element. The updated and revised version was adopted by the City Council. The Seismic Safety and Safety Sub-element was updated in 1993. This current version of 2008 Seismic Safety and Safety Sub-element incorporates the changes that have occurred in Sunnyvale since this document was last reviewed.

The Seismic Safety and Safety Sub-element is part of the Community Development Element of the City's General Plan. The overall purpose of this Sub-element is to provide information and policy direction for the City of Sunnyvale related to safety and seismic safety and as a guideline for determining the City's role and responsibility related to disaster and emergency management.

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Executive Summary
INTRODUCTION

The relatively young geological processes that have created the San Francisco Bay Area are still active today. Seismically, the City sits between two active earthquake fault systems, the San Andreas to the west, and the Hayward/Calaveras to the east. There are other potentially active faults in the San Francisco Bay Area as well. The USGS estimates the probability that the San Francisco Bay Area will experience a strong (magnitude of 6.7 or better) earthquake by the year 2037 at approximately 63 percent.

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Lying beneath Sunnyvale are thick layers of sand, gravel and clay, known as alluvium, which amplify the effects of earthquakes. Based on the damage caused in Santa Clara Valley by the 1906 earthquake and the poor performance of alluvial deposit land areas during earthquakes, this area could be subject to severe damage from an earthquake with an epicenter nearby. Buildings of un-reinforced masonry construction and older commercial buildings will likely suffer the most damage**.** The good news is that the continual modernization of the City has greatly reduced the number of both of these types of structures.

Fires resulting from earthquake-severed gas and electrical lines pose a serious danger that may cause more damage than the earthquake itself. Major fires in San Francisco after the Loma Prieta Earthquake in 1989 and those after the 1994 Northridge Earthquake are recent examples of after quake fire damage that can devastate a city.

Fires resulting from earthquake severed gas and electrical lines pose a serious danger that may cause more damage than the earthquake itself.

Land subsidence which occurs when natural water resources are depleted below ground, has compounded the geologic and hydrodynamic problems of the area. Subsidence is caused by excessive ground water extraction primarily from human means. The human-caused subsidence has been halted over the last four decades by an extensive water recharge and water importation program. Natural subsidence is still continuing at a much slower rate but can be dramatically intensified by earthquakes due to the process known as liquefaction.

Santa Clara Valley is classified as an active flood plain that has been severely altered by human activity. The Valley is still

subject to periodic flooding from excessive rain as experienced in 1995, 1997 and the *El Nino* flooding of 1998. Each of these events was a locally declared disaster as a result of the damage caused by severe rain. Tidal flooding could also occur without the protective barriers constructed along the margins of the Bay. The City maintains an extensive storm drain system and the Santa Clara Valley Water District maintains the creek and flood control channels in the City.

The City's industry has greatly reduced the dependence on hazardous materials used in manufacturing since this Sub-element was last revised in 1993. Although the potentials still exist for both humans and the environment, potential exposures have been both reduced by decreased use of hazardous materials and by continuously improving the handling, controls and emergency response**.**

The City's industry has greatly reduced the dependence on hazardous materials used in manufacturing since the last time this Sub-element was revised in 1993.

High winds and tornados have also caused damage in the past, but pose a minimal risk to the community simply based on the low probability of occurrence. The last tornado occurred on the southwest portion of Sunnyvale in 1998 with relatively few structures affected. The "minor" damage was estimated at $3.8 million. Only one other tornado has been recorded in the City's history. That tornado occurred in 1951.

The City lies in the landing pattern of Moffett Federal Airfield and when winds come from the south, planes take off over heavily developed areas. In 1973, two planes collided over the Sunnyvale Municipal Golf Course, killing all persons aboard both aircraft. The risk of aircraft accidents still exists even though the Navy's use of Moffett Field as a Naval Air Station ended in 1994. The current use levels are greatly reduced over the peak usage in 1990, 80,000 completed takeoffs/landings (sorties). The Environmental Impact Report (EIR) adopted in 1994 allows for a maximum of 25,000 takeoffs and landings annually. In 2007; NASA reported 9,100. In April 2008, NASA advised the Sunnyvale City Council of their intention to allow the operation and storage of a Zeppelin MT07 Aircraft at NASA beginning in 2009. This Aircraft would be operated by Airship Ventures, Inc. It is unknown how many annual flights this Zeppelin would make. The numbers will most likely be influenced by interest generated within the region.

The level of risk that the community is willing to accept can be expressed in a variety of ways. However it is expressed, the

assessment of hazards should be designed to accommodate new information and assist in establishing a realistic balance among the community's need for safety and economic and social requirements.

Not all disasters are preventable but knowledge of the hazards and proper planning are significant measures that can mitigate their effect.

PURPOSE

The purpose of this sub-element is to examine seismic safety and other safety issues in Sunnyvale, and to establish a planning document to guide land use decisions. This can help establish a balance between the community's need for safety with other needs such as housing, employment and transportation. Incorporating knowledge of existing safety hazards into the planning and development review process is essential. This sub-element contains an integrated set of mission statements, policies and key initiatives to guide the community decision making process.

The sub-element is one of several General Plan documents that establish overall City policies. In addition, the actions taken by the City affect and are affected by the actions of other government agencies at federal, state, regional, and county levels. Decisions by other agencies may preempt or influence local decision-making by imposing requirements for funds, program criteria, and regulations. This document seeks to create an atmosphere of cooperation among public and private entities by setting and explaining the mission statements and policies of the City of Sunnyvale.

The Seismic Safety-Safety Sub-Element seeks to create an atmosphere of cooperation among public and private entities by setting and explaining the mission statements and policies of the City of Sunnyvale.

Other sub-elements which directly address community safety are: the Water Resources Sub-element, Surface Runoff Sub-element, Air Quality Sub-element, Noise Sub-element, Fire Services Sub-element, and the Law Enforcement Sub-element. Other documents indirectly related to the Seismic Safety and Safety Sub-element are the Land Use and Transportation Element and the Sunnyvale Community Vision. Many of these documents were developed or revised since 1993 when the Seismic Safety and Safety Sub-element was last revised.

SUMMARY OF ACCOMPLISHMENTS SINCE 1993

The Seismic Safety and Safety Sub-element was first written in 1984; and revised in 1993**.** Since that time, significant progress has been made in many of the areas addressed in that document. In these last 14 years, the City has consistently focused on Seismic Safety and Safety when considering land use and development issues.

Several accomplishments that have been achieved since 1993 are in the areas of community development and building construction. To improve the seismic safety of buildings in the less stable soil areas of the City, geotechnical reports are now required for all developments in the City. In 1993 they were only required for new construction north of Highway 237. The City actively participates in the State of California Seismic Hazards Mapping Program. All geotechnical reports received by the City are forwarded to the State of California for additional review.

DOWNTOWN MURPHY STREET

Un-reinforced masonry (URM) building construction poses a serious seismic hazard in every community. URM buildings are defined as construction using brick or hollow masonry (no grouting or steel reinforcement) as the major construction component. Buildings which are fully or partially grouted or reinforced are not considered URM. In compliance with URM legislation enacted 1986, Sunnyvale is continuing to identify and perform hazard mitigation on these URM buildings. The Community Development Department has identified the 10 remaining URM buildings left in Sunnyvale, which are all in the 100 block of South Murphy Avenue. This is a historical area which is exempt from the State URM legislation.

Building codes are normally changed and adopted every three years. Major changes related to seismic safety occurred in 1973 and 1986 codes. The City can only require the retrofitting of existing buildings if a major addition or major use change occurs. There are many types of building construction in Sunnyvale, such as concrete “tilt-up”, that are exempt from retrofitting requirements. The sole exception to retrofitting was URM’s as listed above.

The seismic safety of City buildings has also received considerable attention. Many City buildings have been designated as “Essential Services Buildings.” The Public Safety building completed in 1985 was the first City building constructed to seismic tolerances, which at that time was 50 percent higher than existing code standards. Seismic retrofitting of the Community Center, City Hall Annex, Library, Corporation Yard (stores section) were also completed. The seismic retrofitting of all six fire stations was completed as of 1995. The Sunnyvale Senior Center, completed in 2003, is a model of not only seismic standards (built to the then requirement of 25 percent over code), but is designed to operate independent of electrical service and can be alternately provided power through solar, an oversized generator, or combination of the two.

In 2001 the California Environmental Protection Agency (EPA) certified the City as a “Unified Program”, allowing for the local enforcement of State codes governing above ground and under ground hazardous materials storage, storage treatment, and disposal of hazardous wastes and emergency planning for releases at high hazard facilities. Department of Public Safety staff now implements a comprehensive environmental regulatory program which includes permitting, inspection, enforcement, and educational elements. As a result, preventable hazardous materials releases, having a potential to negatively affect the public and environment, have declined by more than 75 percent since 1993.

The City has also completed many infrastructure improvements. For example, the City has completed the installation of two new domestic/emergency water transmission lines South of El Camino Real. These new transmission lines complete the water delivery system, interconnecting Sunnyvale's four water supply sources. The Public Works Department also identified two roadway over-crossings in need of seismic improvements and completed those improvements in 1994.

The City’s Flood Zone Ordinance was updated in 2001 to meet current Federal Emergency Management Agency (FEMA) standards. Public Works identified and repaired several levee sections at the Water Pollution Control Plant. Since this Sub-element was last rewritten, the Santa Clara Valley Water District (SCVWD) made a significant number of

improvements to the creeks and channels in Sunnyvale to improve water flow and reduce the risk of flooding. In the next few years, the SCVWD has planned additional improvements to ensure these creeks will be able to contain the runoff from a 100 year flood.

Recognition of the need to implement the goals and policies and accomplish the actions stated in the 1984 sub-element could not have been accomplished without additional resources. The Public Safety Department was directed to implement many of the emergency management goals and, in 1987, was authorized to hire additional staff for the Emergency Preparedness Unit. Staff increased from two to seven full time employees to do emergency management planning and training. These staff increases were funded primarily through federal grants that were available at that time, and allowed the City to develop neighborhood and business preparedness programs and to develop a cadre of volunteer amateur radio operators to assist with communication during an emergency. Sunnyvale Neighborhoods Actively Prepare (SNAP) is a self-help neighborhood emergency preparedness volunteer group coordinated by Public Safety. Sunnyvale Emergency Preparedness Organization (SEPO) was an organization similar to SNAP in the business community. Sunnyvale Amateur Radio Emergency Services (SARES), is a volunteer amateur radio network of more than 100 community volunteers who assist DPS at special events and in emergencies

Since 1993, federal funding for the additional staffing at the DPS was eliminated. Staffing was reduced back to the levels of 1984 with the addition of a part-time Staff Office Assistant. One of the programs that had to be eliminated was SEPO. Consequently, many of the larger corporations and companies established their own Emergency Response Teams (ERT's) which City staff regularly supports. Today, the Sunnyvale Neighborhoods Actively Prepare program attracts participants from every area of the City. These community volunteers are trained to care for themselves and their neighborhoods. Additionally, the City maintains a core of more than 300 pre-designated community volunteers as disaster service worker to help augment staff after a disaster.

Damaging earthquakes are infrequent, however, they pose the most significant threat in relation to the destruction they may cause to the City

The Sunnyvale Emergency Plan was revised in March 2005 along with completion of the Local Hazard Mitigation Plan (LHMP) Annex. In 2006 OES developed the Heat Emergency Response Plan Annex, and trained every City employee on

Disaster Service Worker laws, rules and regulations. The training also included personal preparedness for City workers, responsibility of reporting to work in the event of a disaster and training in the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS). The Public Works Department also has made significant improvements to its training program for the Water Pollution Control Plant operators to focus on response and recovery during and after disasters. Finally, in 2007, OES in cooperation with representatives from all City departments reorganized the Sunnyvale's Emergency Management Organization (EMO) structure.

The purpose of the EMO structure is to allow the City to properly utilize the Incident Command System (ICS), a standardized on-scene emergency management system specifically designed to allow the user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents without being hindered by jurisdictional boundaries. This management tool also enables the EMO staff to support the field units, facilitate priority setting, interagency cooperation and manages the efficient flow of information and resources. ICS addresses both the organization and the process.

The accomplishments noted here are only a high level summary of the significant changes that have occurred since the 1993 Seismic Safety and Safety Sub-element. Details of these and other accomplishments are provided throughout the text of this document.

SUMMARY OF COMMUNITY CONDITIONS

The following summary is derived from the information presented in the Community Conditions section of this Sub-element. These findings form the basis of the Mission Statements, Policies and Key Initiatives that follow.

SEISMIC HAZARDS

Damaging earthquakes are infrequent; however, they pose the most significant threat in relation to the destruction they may cause to the City.

Sunnyvale is located between two active earthquake faults. Scientists have identified four fault segments on which they believe large earthquakes are most likely to occur. The USGS estimated that there is a 63 percent chance for at least one earthquake of magnitude 6.7 or larger to strike in the San Francisco Bay Area before the year 2037. An earthquake of this size could strike at any time.

A local major earthquake could cause the failure of parts of the levee system and such a failure could lead to flooding in the northern parts of the City that are below sea level.

Fire in the aftermath of an earthquake could pose serious problems in Sunnyvale. Major variables that could intensify the situation include water system damage, multiple fires and isolation of some areas due to roadway over crossing failures.

FLOOD HAZARDS

There are five sources of flooding that can threaten Sunnyvale:

1. Excessive precipitation - surface runoff
2. Tidal – levee breaks
3. Dam failure – Stevens Creek Dam
4. Tsunamis – tidal waves from earthquakes in the Ocean
5. Combination of the above hazards

The Santa Clara Valley Water District maintains Calabazas Creek, Stevens Creek, and the Sunnyvale East and West flood control channels. These channels coupled with the City's storm drains take the majority of surface run-off to the Bay. Tidal flooding could occur if the system of dikes and levees failed or their banks overflowed.

Severe Weather Hazards

Severe winter storms accompanied by high winds have caused considerable property damage in the past. Power loss due to high winds and winter storms can affect a significant portion of the City if the storms last for more than a few hours. Pacific Gas and Electric Company (PG&E) has the responsibility for maintaining utilities within the City limits, however electric power is supplied by high voltage lines originating outside the City. PG&E responds to service calls on a priority basis and has limited staff available to answer community needs. Experience has shown that PG&E is often overwhelmed and may not be able to return power to neighborhoods or geographic areas for several days.

Sunnyvale Public Safety Officers responding to a local

Fire Hazards

Sunnyvale has a relatively low risk factor for fire loss and past fire experience has demonstrated Sunnyvale to be a relatively fire-safe community. However, as in any City, the potential for serious fire events is ever present. A trained and well-equipped fire service must be ready to respond to fires and other incidents. While the potential for extraordinary disaster always exists, and while the aging process of the City and its buildings will have some adverse impact on fire loss, the overall environment is comparatively fire-safe.

No community is free from all risks but land use choices can be made that mitigate risks to community members while at the same time provide for the economic and social needs of the

Because Sunnyvale is a relatively new community, and because the City has a strong facilities inspection and fire education program the incidence of fire is low. Each year, inspections are completed at all commercial facilities, apartments, hotels, and schools with and emphasis on prevention. Additionally, fire station based education programs target school children, while the Crime Prevention Unit provides more advanced public education programs to businesses and neighborhoods.

The majority of fires experienced in Sunnyvale are kitchen fires caused by inattention while cooking. Future public education will focus on residential kitchen fires to raise awareness and provide the community with information that will help to reduce the incidence of these types of fires. For more specific information and risk factors, the Fire Services Sub-element should be referenced.

Hazardous Materials

A decline in manufacturing facilities in Sunnyvale and changes in the manufacturing processes has resulted in a lower overall volume of hazardous materials stored and used within the City. The highest hazard facilities, those with larger quantities of hazardous materials or materials having greater toxicity, are located in the industrial area in the northern part of the City.

The primary risks to the community are spills and releases of hazardous materials from an onsite accident, a transportation accident, an act of terrorism, or a seismic event. Regulatory controls are in place to minimize the probability of releases occurring as a result of these incidences.

Aviation Hazards

Sunnyvale lies in the landing pattern of Moffett Federal Airfield and, during south winds, planes take off over heavily-developed areas. Risk of future accidents exists even though the Navy's usage of Moffett Field as a Naval Air Station ended in 1994. Other than the potential for aircraft accidents, noise is the most significant concern of residents. Allowable land uses around Moffett Field are determined by accident potential and noise level.

Infrastructure Inventory

The local community, in relation to hazards and risk, can be broken into five key categories:

1. Current Land Use
2. Higher Risk Structures
3. Non-Structural Elements of Buildings
4. Essential Services Buildings
5. Lifelines

Land development and use, from zoning for specific types of uses, to standards used to build structures, to the manner in which the community is maintained plays a major role in the overall assessment of risk. No community is free from all risks but land use choices can be made that mitigate risks to community members while at the same time provide for the economic and social needs of the community. Structures may be considered in the higher risk category because of the type of occupancy. Apartment complexes, schools, major employment centers, shopping centers and other places of assembly are examples. Structures may also be

Responsibility for preparing for emergencies lies both with the City and the members of the community.

in this category because of the age or type of construction. Examples include buildings constructed prior to the adoption of modern earthquake building standards and un-reinforced masonry buildings. The contents of buildings (the non-structural elements) can cause injuries and damage and must be properly secured. Medical facilities, police and fire stations are some of the critical facilities in a community. The continued functioning of these facilities is very important to a community's ability to respond to and recover from a disaster. A community's lifelines include essential services such as water, sewer, gas, electricity, telecommunications, streets and highways.

Isolation After a Disaster

Neighborhood and/or community isolation after a disaster such as a major earthquake is likely as some normal transportation routes and communication lines will be damaged during such an event. Internal isolation occurs when the City's ability to receive reports of emergencies, relay emergency information and respond to citizen's requests for help is limited by destroyed or damaged lifelines. External isolation occurs when the City's ability to communicate emergency conditions and the ability to request or receive outside emergency resources is lost due to destroyed or damaged lifelines.

The City has established an Emergency Management Organization to provide oversight for the effective delivery of services in an emergency or disaster.

Emergency Planning and Coordination

Responsibility for preparing for emergencies lies both with the City and the members of the community. No government agency has all the resources needed to respond to all the needs of its community members in or after a disaster. The City has established an emergency management program for which the Department of Public Safety is responsible for coordinating. The program's goals include helping neighborhoods, schools, and businesses to plan and prepare for disasters. There are two full-time planners (one Public Safety Lieutenant and one Public Safety Community Service Officer) and one part time Staff Office Assistant that are responsible for supporting all emergency preparedness programs citywide assigned to the Department of Public Safety, Office of Emergency Services.

The City maintains a state of readiness by providing on-going training and exercises for its EMO staff throughout the year.

The City has established an Emergency Management Organization (EMO) to provide oversight for the effective delivery of services in an emergency or disaster. During disasters, such as a major earthquake, the City will only be

able to respond to a limited number of high-priority calls for service. When City resources are exhausted, and a local emergency has been declared, outside assistance can be requested through an established network of local, operational area, regional, state and federal mutual aid.

The EMO staff is provided with ongoing training both on their individual positions, and the overall EMO function. Additionally, all EMO staff participate in an annual functional exercise to enhance their response to various simulated disasters.

Community members are also a resource; many of these volunteers have received emergency response training that has been delivered under the Sunnyvale Neighborhoods Actively Prepare (SNAP) Program

All City employees are Disaster Service Workers (DSW). Training and awareness of the DSW status and the need for the individual City employee to be self and family-prepared was held for all employees during 2006 and 2007. This training also included the responsibility for all City employees to remain at, or report back to work in the event of a disaster. These efforts continue and all new City employees are provided similar training. Many City employees are pre-assigned emergency tasks and others will be deployed where needed in case of an emergency. All City employees have pre-designated check-in points to respond to in the event of an emergency.

Community Resources

In cooperation with the American Red Cross and local school districts the City has established a disaster shelter program called Project ARK. The program involves stocking large containers with emergency supplies for up to 300 people for three days. Currently, there are 11 ARKS at eight school sites throughout the City. The current locations of the ARKs are Columbia Middle School, Cupertino Middle School, Bishop Elementary, Peterson Middle School (2), Ponderosa Elementary, Fremont High School (2), Lakewood Elementary School (2), and Sunnyvale Middle School.

Amateur radio operators in the community have organized as an active emergency response group called Sunnyvale Amateur Radio Emergency Services (SARES). The City is very fortunate to have these dedicated and well-trained volunteers who have repeatedly proven to be a critical communications asset in disaster response; SARES is robust, geographically distributed, and rapidly deployed. During emergencies, SARES members are available to support radio communications in the EOC; shadow City

employees when communications are disrupted; provide communications link to the City for the Volunteer Emergency Response Team (VERT) Center (see page 82 for VERT); act as observers during an emergency and communicate their observations to staff; and provide mutual aid to other cities within Santa Clara County upon request.

To maintain and enhance their skills and provide public service communications to the City during non-emergencies; SARES meets on a quarterly basis, participates in City and Countywide drills and exercises, parades, walkathons, and races. Time and time again, SARES has proven that are community resource that the City can rely upon.

The VERT is designed to support the City in the event of an emergency by organizing the efforts of volunteers.

Many people typically show up at government facilities during a major emergency. Most are not pre-trained; they are “walk-in” spontaneous unaffiliated volunteers who just want to help. This well-intentioned phenomenon can cause a significant burden on the affected area if there is no plan.

The City recognizes these individuals as a valuable community resource and has put together a comprehensive Emergency Volunteer Plan, through the Office of the City Manager, to coordinate an effective response. The plan delineates the roles and responsibilities of designated and pre-trained City staff members who will manage and coordinate the Emergency Volunteer Center. The Plan provides for and staff are trained on the organizational system to register, screen, assign, train, place and care for emergency volunteers. The goal is to capitalize on this known resource and direct the volunteer talent and energy to the disaster response and relief efforts.

POST DISASTER RECOVERY

The recovery from a disaster needs to be at least as well planned as the initial emergency response. Sunnyvale is taking a very proactive approach to this type of planning. Significant work has been done to develop standard operating procedures for disaster assistance centers, damage assessment, and financial recovery.

In 2005, Sunnyvale completed a local annex to the ABAG Hazard Mitigation Plan and it has been approved by the

Federal Emergency Management Agency (FEMA). The plan is part of an overall strategy to reduce or eliminate long-term risk to life and property from a natural hazard event. Adoption of the annex as part of the overall plan better prepares Sunnyvale for future emergencies and allows the City to apply for FEMA grant funds to mitigate existing risks. The last time Sunnyvale received funding was in 1995 for a declared disaster in the City of Sunnyvale. Grant funds from FEMA were received for two separate flooding incidents in the amounts of $127,380 and $65,820.

The Finance Department plays an essential role in the recovery phases of an emergency and is responsible for acquiring funds through the Public Assistance Program and managing disaster-related costs. The direction and actions by Finance are based on the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1974 (PL93-288). In previous years, Finance has been successful in obtaining reimbursement of disaster related costs from the State and Federal government.

The Sunnyvale Emergency Plan, revised in 2005, deals primarily with the actions and responsibilities for individuals working in the EOC. After the EMO is demobilized, continuing recovery work becomes the responsibility of various departments. Some of the work can be assigned intuitively. As an example sheltering displaced person is one of the responsibilities of Parks and Recreation. It could be assumed, and was in fact discussed during our EMO positional training last year; that Parks and Recreation will have a major role in the post-disaster recovery. Since the need to shelter displaced persons occurs frequently in most disasters, the Parks and Recreation Department has put together a training plan for their staff.

Some assignments are less intuitive. For instance debris removal may not be a major factor after a California storm. However following an earthquake, debris may directly affect an emergency rescue. DPW would logically be assigned the post-disaster recovery of removing debris from public areas, and if debris poses a health and safety threat it will be removed from private property as well. DPW Solid Waste is currently working on a Debris Removal Plan.

Within the Community Development Department (CDD), two building inspectors are certified under the State’s Safety

Assessment Program (SAP). SAP is a program in which building inspectors attend a series of classes to learn how to conduct building safety assessments to determine if buildings are safe to occupy after disasters. There is a continuing effort by CDD to train more SAP certified inspectors as several have recently retired.

The City, in the recovery phase, will work in concert with the State and Federal government to manage what is called large and small term projects. These projects may involve DPS/OES, Finance, DPW, CDD and Parks and Recreation staff. Recovery activities are those necessary to restore services and systems to a state of normalcy. Recovery actions include damage assessment and those necessary to return health and safety systems (e.g., water) and services to minimum operating standards.

DEBRIS REMOVAL

All contingency planning for debris removal is under the purview of the Department of Public Works (DPW). DPW in conjunction with designated support agencies such as: utility companies, waste management firms, and trucking companies will facilitate the debris clearance, collection, reduction and disposal needs following a disaster.

The quantity and type of debris generated, its location, and the size of the area over which it is dispersed directly impacts the type of collection and disposal methods used to address the debris problem, associated costs incurred, and the speed with which the problem can be addressed. Often debris removal exceeds the capabilities of the affected areas and because of the limited quantity of resources and service commitments, it is anticipated that the City will rely heavily on private contractors to remove, collect, and manage debris for reuse, resource recovery, reduction, and disposal.

To ensure that our citizens' health and safety are protected and emergency vehicles access is clear to bring resources into the City, DPW will also manage debris removal from the public right-of-way. Debris will be removed from private property only when pre-approved and deemed to be in the best interest of the public. Debris removal, regardless of source, becomes a high priority following a disaster as it is a visible sign that a sense of normalcy is returning to the City.

The DPW has pre-identified areas that may be used as

temporary collection and processing sites. These sites are still to be finalized, and a plan is needed for conducting an environmental assessment. When finalized, detailed information pertaining to each of these sites will be maintained by DPW. This information will include the exact debris storage locations, size, available ingress and egress routes, and results of an environmental assessment. The list of these sites will be reviewed and updated as necessary.

DPW has developed and will also maintain a list of approved contractors who have the capability to provide debris removal, collection, recycling and disposal in a cost effective, expeditious, and environmentally sound manner.

A list of this Sub-element's Community Condition Indicators is provided on page 88.

Summary of Mission Statements and Policies

Mission Statement A:	ENSURE THAT NATURAL AND HUMAN-CAUSED HAZARDS ARE RECOGNIZED AND CONSIDERED IN DECISIONS AFFECTING THE COMMUNITY, AND THAT LAND USES REFLECT ACCEPTABLE LEVELS OF RISK BASED ON IDENTIFIED HAZARDS AND OCCUPANCY.
Policy A1	**Land Use** Evaluate and consider existing and potential hazards in developing land use policies. Make land use decisions based on an awareness of the hazards and potential hazards for the specific parcel of land.
Policy A2	**Flood Hazards** Take measures to protect life and property from the effects of a 1 percent (100 year) flood.
Policy A3	**Hazardous Materials** Promote a living and working environment safe from exposure to hazardous materials.
Policy A4	**Aviation Hazards** Make planning decisions that establish and/or maintain a safe balance of aviation and land use for the areas affected by NASA AMES and Moffett Federal Airfield.
Policy A5	**Essential Services** Maintain lifelines in good operating condition to lessen damage and increase survivability after a major disaster.*

*Lifelines are essential services necessary for the continued normal functioning of the community, e.g. water, gas, electricity, transportation and communication lines.

Mission Statement B:	ENSURE THAT THE CITY, ITS COMMUNITY MEMBERS, BUSINESS AND INDUSTRY ARE PREPARED TO EFFECTIVELY RESPOND TO MAJOR EMERGENCIES.
Policy B1	**Essential Building Services** Construct or maintain City facilities utilized for emergency response so that they remain operable after a major seismic event.
Policy B2	**Emergency Management Organization** Provide for the emergency management of the City in order to respond effectively and to assure life and property safety in the event of a disaster.
Policy B3	**Emergency Planning & Coordination** Provide an integrated approach to planning and preparedness for emergencies and disasters.
Policy B4	**Schools** Provide information to public/private schools and day care centers to assist in their planning and preparedness for emergencies and disasters.
Policy B5	**Business and Industry** Provide information and assistance to business and industry to encourage their own planning and preparedness for emergencies and disasters.
Policy B6	**Community** Provide the community members of Sunnyvale with information, encouragement and assistance with emergency planning and preparedness.
Policy B7	**Communications** Provide emergency radio or other communication devices for coordination of emergency response and the capability to communicate with outside agencies and community members.
Policy B8	**Grant Funding** Actively seek and apply for grant funding from available governmental and private sources that would enhance emergency preparedness

Mission Statement C:	ENSURE THAT THE CITY, ITS COMMUNITY MEMBERS, BUSINESS AND INDUSTRY ARE PREPARED TO RECOVER FROM DISASTERS.
Policy C1	**City Government** Provide for the continuation of City government and services following a major disaster as quickly as feasible.
Policy C2	**Community Members and Business/Industry** Encourage community members and business/industry to plan for recovery from disasters as quickly as feasible.

COMMUNITY CONDITIONS
GEOLOGIC SETTING

Sunnyvale lies at the southern end of San Francisco Bay and is built atop the alluvial deposits (different mixtures of silt, clay and sand) that surround the margins of the Bay. The areas closest to the Bay are overlain by unconsolidated fine silty clay, known as "Bay mud," which varies in thickness from a few feet to as much as 30 feet. Generally, the older more stable alluvium is south of the Caltrain tracks and the younger less stable material is to the north. Bedrock generally lies beneath the area at depths of 300 feet or more. During periods of heavy rain the easily-eroded rock and soils of the uplands cause streams to carry heavy loads of sediment. When streams overflow their banks they spread sediment-laden waters over the low plains and basins. Normally, the finer sediment will be carried by the stream all the way to the Bay and deposited as fine estuarine mud. This depositional process, coupled with an active tectonic (land movement) setting, is an important geologic process that must be considered in land use planning and structural design.

A geotechnical reports is now required for all new construction and the addition of a basement throughout the City.

Sunnyvale's soil is largely composed of expansive clays. Expansive clays are a poor foundation material because they swell when wet and shrink when dry, producing extensive cracks. The effects of these clays have been partially mitigated by soils engineering studies federally required by the Subdivision Map Act. The City requires soils reports (geotechnical reports) as part of the permitting process to determine if the proper calculations for design of foundation and structural components have been met. As an improvement since the last Sub-element in 1993, a geotechnical report is now required for all new construction and the addition of a basement throughout the City. This requirement has been expanded from the previous requirement of only these developments North of Highway 237.

Sunnyvale's topography is essentially flat, dropping from an elevation of 300 feet to sea level. The slope across the City is in a northeasterly direction from the high point in the southwest corner to the Bay. The average slope is approximately 0.9% and that slope is fairly consistent from Homestead Road to the bay. The City is bordered on the east by Calabazas

Creek and on the west by Stevens Creek. These streams, assisted by three flood control channels (Sunnyvale East, West and El Camino flood control channels), play a major role in the control of surface run-off during rain storms. They are described in more detail in the Flood Hazard section of this sub-element and the Surface Runoff Sub-element.

SEISMIC HAZARDS

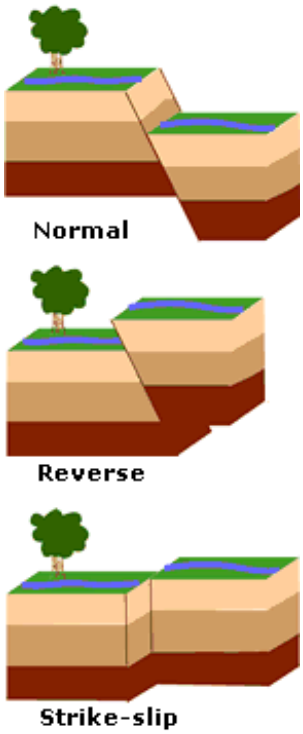
Earthquakes can be disastrous, and we can't always predict how the ground will react. The major geologic effects of earthquakes include surface faulting (ground rupture), ground shaking, ground failure, and flooding from tsunamis (seismic sea waves) and seiches (earthquake-generated standing waves). These hazards may act as constraints on development. For instance, buildings constructed in areas subject to severe ground shaking need to be engineered to withstand that effect. The following is a discussion of individual seismic hazards:

EARTHQUAKE FAULTS

The characteristics of earthquake faults are important in planning and preparing for the future. The way a fault moves, the magnitude and intensity in a given event, how often it may move and how far it moves are essential pieces of information needed to determine an earthquake's potential effect on the City's population and infrastructure.

Faults are fractures in the earth's surface which occur along opposite sides that have moved relative to one another in response to an accumulation of stress. The Bay Area is crisscrossed by numerous faults that are generally associated with the San Andreas Fault system. The San Andreas Fault system is a network of faults that are responsible for most of the movement between the North American and Pacific plates.

Seven miles south of the Civic Center lies the San Andreas Fault. Ten miles northeast are the Hayward fault zones. These are considered to be active fault zones. Active faults are defined by the state as those that have moved within the last several thousand years. Most of the faults have a "right-lateral strike slip" type of movement, tectonic plate passing to the right laterally of one another plate. The area is splintered with lesser known but potentially active faults, which generally run parallel to the Peninsula Segment of the San Andreas Fault. Among these splinter faults, in the Cupertino planning area, are the Sargent-Berrocal and the Monte Vista faults. These faults have a "dip-slip" type of movement, tectonic plates sliding under one another.



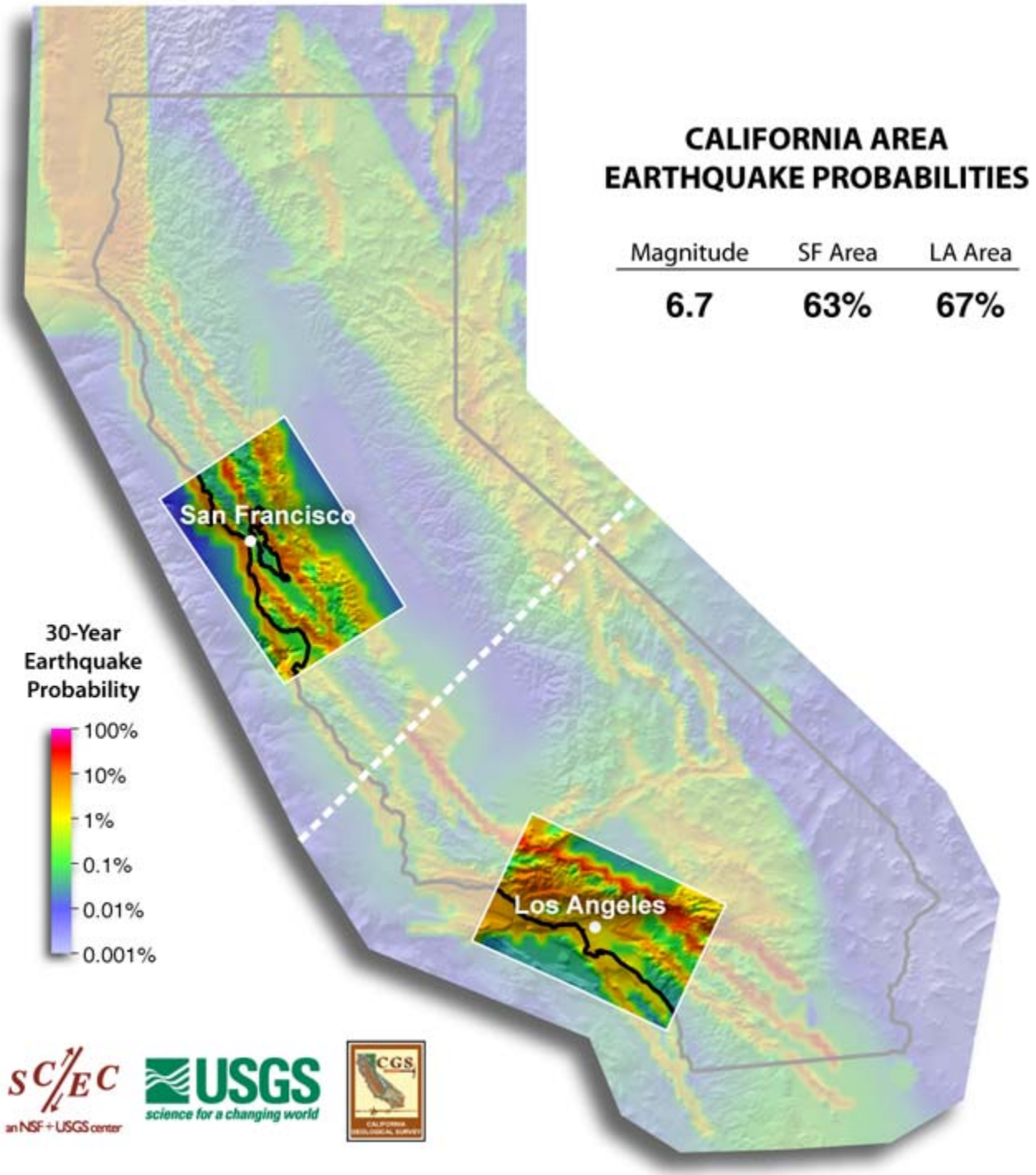
Normal faults form when the hanging wall drops down.

Reverse faults form when the hanging wall moves up.

Together, normal and reverse faults are called dip-slip faults, because the movement on them occurs along the dip direction.

Strike-slip have walls that move sideways, not up or down. That is, the slip

San Andreas Fault Zone



EARTHQUAKE MAGNITUDE AND INTENSITY

The severity of an earthquake is normally expressed in two ways - magnitude and intensity. The Richter scale expresses magnitude (M) - the amount of energy released by an earthquake. The Modified Mercalli Scale is a subjective measurement of earthquake intensity. It is designed to describe the effects on people, to structures and the earth's surface.

An earthquake of large magnitude does not necessarily cause the most intense surface effects. The effect in a given region depends to a large degree on local surface and subsurface geologic conditions. An area like Sunnyvale, underlain by unconsolidated alluvial materials, is likely to experience much more noticeable effects than an area equally distant from the earthquake epicenter but underlain by hard materials such as granite.

An earthquake's destructiveness to a particular area depends on many factors. These include the magnitude, intensity, focal depth, distance from the epicenter, local geologic conditions and the age and design of buildings and other man-made structures. The extent of damage also depends on the population density in the affected area.

GROUND SHAKING AND THE 1989 LOMA PRIETA EARTHQUAKE

Ground shaking is the most widespread effect of an earthquake. The location of the epicenter and the magnitude will determine the extent of damage from one area to another. The sudden release of energy in an earthquake causes waves to travel through the earth. These waves not only shake structures, but can trigger secondary effects such as landslides or other types of ground failures. Shaking generally increases in severity with the increase of an earthquake's magnitude. It is also dependent upon a number of variables such as the distance from the fault and the local geologic and soil conditions. Waves radiating from the earthquake's epicenter may cause the ground to shake more severely in less stable soils such as Bay mud. Studies of many earthquakes indicate that property damage from ground shaking is generally greatest in areas of water saturated soils.

The United States Geological Survey (USGS) is responsible for the making quick and accurate assessments of exact locations and intensity of all earthquakes that occur. Computer

generated “Shake Maps” are generated automatically to plot the intensity of ground shaking and are generally available within minutes following an earthquake. This quick, accurate and important information can aid in making the most effective use of emergency response resources. USGS is continually attempting to increase the number of monitoring stations they have and their efforts to “predict” earthquakes. To date the best USGS can do is to give 10-20 seconds of warning to areas remote form the epicenter. This does not make for an efficient warning system, as the time needed to transmit this warning is longer than the amount of time the information is relevant. USGS continues to explore improvement of current methods and looks toward new ways to predict in the future.

Large earthquakes hardly ever occur alone. When one earthquake happens, we usually see another at a nearby location. To talk about this phenomenon, seismologists coined three terms: foreshock, main shock, and aftershock. In any cluster of earthquakes, the one with the largest magnitude is called the main shock; anything before it is called a foreshock and anything after it is called an aftershock. We rarely see aftershocks more than a few miles from the main fault. Bigger earthquakes have more and larger aftershocks. As the magnitude of the main shock increases, the magnitude of the largest aftershock, on average, increases as well. In general, an earthquake large enough to cause damage will produce several aftershocks within the first hour. The rate of aftershocks dies off quickly with time so even the second day will have many less aftershocks than the first.

Magnitude/Intensity Comparison United States Geological Survey Earthquake Hazards Program	
Magnitude- Richter designated as M	**Modified Mercalli Intensity**
1-.0 – 3.0	I
3.0 – 3.9	II - III
4.0 – 4.9	IV - V
5.0 – 5.9	VI - VII
6.0 – 6.9	VII - IX
7.0 and higher	VIII or higher

I.	Not felt except by a very few under especially favorable conditions
II.	Felt only by a few persons at rest, especially on upper floors of buildings
III.	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV.	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V.	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI.	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII.	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly build or badly designed structures; some chimneys broken.
VIII.	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX.	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X.	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI.	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII.	Damage total. Lines of sight and level are distorted. Objects thrown in the air.

Damage from ground shaking can be lessened prior to development by requiring seismic and geologic site investigations, before approving development proposals and enforcing building design and construction standards. Buildings constructed on adequately prepared foundations and built conforming to modern building codes (1973 and after) provide the best insurance against the damage caused by the violent shaking in a major earthquake. Potential damage can also be mitigated when existing older buildings (built to comply with less stringent seismic standards) are remodeled by requiring the owners to improve the building's seismic stability as part of the remodeling process. Presently, the City requires a soils report for all new developments or redevelopments and strict compliance with all building codes. Geologic site investigations and reports are now required for all developments in the City. The geotechnical report is a detailed assessment of the soil upon which the building will be constructed and specific building design requirements that will help mitigate the effects of an earthquake in this area.

1989 Loma Prieta Earthquake, surface cracks destroys driveway

Our most recent significant earthquake was the magnitude 6.9 Loma Prieta earthquake which occurred on October 17, 1989. Loma Prieta was not the "big one," but rather a moderate earthquake. It certainly was destructive to some parts of the Bay Area, but nowhere near the magnitude or intensity of the great San Francisco earthquake of 1906. The inevitability of an earthquake causing widespread damage throughout the Bay Area still is a very real probability that still confronts everybody living in this area.

Sunnyvale sustained relatively minor damage from the Loma Prieta earthquake. Of the 110 City and commercial buildings inspected, only two facilities suffered major structural damage. The Westinghouse facility on Hendy Avenue was forced to demolish a water tower on their property and the Arboretum building at the Sunnyvale Community Center required renovation. The City received $164,633 from the state for reimbursement of expenses due to the earthquake.

Drawing on new data and new methodologies, the United States Geological Survey (USGS) Working Group on California Earthquake Probabilities (WGCEP07) was commissioned to develop and update, statewide forecast, the latest result of which is the Uniform California

Earthquake Rupture Forecast Version 2 or UCERF. The UCERF Report concluded that there is a 63 percent probability of a 6.7 magnitude earthquake striking the greater San Francisco Bay Region (SFBR) over the next 30 years. If the epicenter of the next earthquake strikes closer to an urban area it will cause significantly greater damage than was experienced in 1989 Loma Prieta earthquake.

EARTHQUAKE PREDICTION

The USGS, the California Office of Emergency Services, the California Geological Survey, and the Association of Bay Area Governments jointly conducted a Loss Estimation Study in 2002 focused on the 10 most likely damaging earthquakes forecast for the Bay Region by the working group. These earthquakes occur on six of the seven major fault systems in the Bay Area and range in size from a magnitude 6.7 event on a blind thrust underlying Mt. Diablo to a magnitude 7.9 repeat of the 1906 rupture on the San Andreas fault in northern California. Their 30-year probabilities range from a high of 15.2 percent for a magnitude 7.0 rupture of the Rodger's Creek fault to 3.5 percent for a magnitude 7.4 combined rupture of the Peninsula and Santa Cruz Mountains segment of the San Andreas Fault.

The ten most likely earthquakes and their 30-year probabilities

Ten most likely damaging Earthquake scenarios	30-year probability	Magnitude
Rodgers Creek	15.2%	7.0
Northern Calaveras	12.4%	6.8
Southern Hayward (possible repeat of 1868 earthquake)	11.3%	6.7
Northern and Southern Hayward	8.5%	6.9
Mt. Diablo	7.5%	6.7
Green Valley-Concord	6.0%	6.7
San Andreas: Entire Northern California segment (possible repeat of 1906 earthquake)	4.7%	7.9
San Andreas: Peninsula segment (possible repeat of 1838 earthquake)	4.4%	7.2
Northern San Gregorio segment	3.9%	7.2
San Andreas: Peninsula and Santa Cruz segment	3.5%	7.4

Because the 10 most likely future earthquakes in the Bay Area occur on faults throughout the region, the impact and

potential losses reported here reveal significant risk for the entire 10 county region.

The USGS Study found that all 10 of the most likely forecast earthquakes would cause social and economic disruption equal to or greater than the 1989 magnitude 6.9 Loma Prieta earthquake when current building replacement and repair costs in the San Francisco Bay Area are utilized. The magnitude 6.9 Loma Prieta earthquake resulted in at least $6 billion in damage to buildings and infrastructure. This amount does not include the resulting economic losses related to this damage.

The 1998 USGS Study estimates were determined using the Federal Emergency Management Agency's nationally recognized and publicly available earthquake loss estimation model, Hazards United States (HAZUS). The study used ground-shaking inputs for the scenario events developed using the same methodology employed by the USGS in producing automated, near real-time, Web-based ShakeMap, that depict the degree and distribution of strong shaking following significant quakes in the San Francisco and Los Angeles regions. In a post-earthquake setting, FEMA and California (Office of Emergency Services) OES will use ShakeMap input into HAZUS for rapid post-event loss estimation and to help guide emergency response. Ground motion inputs in a HAZUS-ready (Geographic Information Systems) GIS format are available on the www.fema.gov website for these ten most likely scenario earthquakes as well as for all potential Bay Area earthquakes characterized by the Working Group.

A repeat of the 1906 magnitude 7.9 earthquake, the worst case scenario for the Bay Area, is estimated to result in about 5800 fatalities if it strikes during working hours. This estimate is comparable to the approximately 6000 deaths caused by the 1995 magnitude 6.9 Kobe earthquake that occurred in the afternoon directly beneath an urban area with a population of 1.52 million people. Most scenarios, however, have maximum projected fatalities on the order of several hundred, reflecting the success of earthquake-resistant design and construction practices in California, particularly in residences.

The loss of life is predicted to be highest if an earthquake

occurs in the early afternoon when people are working in office/commercial buildings with varying vulnerability to earthquakes. These predicted mid-afternoon fatalities are generally about five times higher than values predicted at 2:00 a.m. when the population is assumed to be in wood frame residential units.

Because all 10 of the scenario earthquakes in the loss estimation study strike much closer to the urban core of the Bay Area than the magnitude 6.9 1989 Loma Prieta earthquake, the projected number of uninhabitable residences for all 10 scenarios will probably exceed the 16,000 made uninhabitable by the Loma Prieta event. For example, the Association of Bay Area Governments has estimated that more than 150,000 uninhabitable residences will occur in a M7.9 repeat of the 1906 earthquake or a M6.9 rupture of the entire Hayward fault.

These loss estimates are believed to be minimums, in part because of a lack of detailed and representative building inventory in the Bay region, as well as the fact that damage to specific facilities or lifelines, such as the Hetch-Hetchy aqueduct system, Bay Area ports, and transportation systems, is not included. For example, a recent Bay Area economic forum study on the seismic vulnerability of the Hetch-Hetchy system estimated potential for tens of billions of dollars of losses related to failure of that system alone in a major earthquake.

The liquefaction process involves the transformation of loose water-saturated silt or sandy soil into a fluid condition

Ground Failure

Most ground failure from earthquake shaking results in displacement in the surface due to loss of strength of underlying materials. The various types of ground failures include landslide, liquefaction, lateral spreading, lurching and differential settlement. These effects usually occur in soft, fine-grained, water-saturated alluvium generally found locally in areas near San Francisco Bay and areas built on landfill.

The liquefaction process involves the transformation of loose water-saturated silt or sandy soil into a fluid condition resulting in ground failure. The ground fails when the liquefied material is not confined and flows out toward a free face such as creek beds. Conditions for potential liquefaction exist throughout the City but the potential is generally greatest north of U.S. 101. The liquefaction potential

increases during the rainy season when the water table rises closer to the surface.

Lateral spreading is movement, or "spreading out", of land that occurs most commonly on gentle to nearly horizontal slopes composed of moist, sandy soil underlain by loose to moderately dense granular deposits or layers. Cracks, fissures and differential settlement usually accompany this effect, which has proven to be very damaging to structures and utilities. In 1906, the effects of liquefaction, lateral spreading, differential settlement and subsidence were observed locally, especially along what is today Highway 237.

SEISMICALLY INDUCED FLOODING

Earthquakes may generate flooding from a tsunami (sea wave or "tidal wave" caused by an earthquake), seiche (wave generated in an enclosed body of water such as a lake or swimming pool) or dam failure. Coastal regions bordering oceans are the most susceptible to tsunamis. A tsunami off the San Francisco coast could cause Bay water to top local levees, especially if it arrived at high tide. If at the same time Bay water elevation and/or large runoff from local storms were increased by northerly wind waves, the chance for topping would be increased.

A local earthquake could cause the failure of parts of the levee system and such a failure could lead to the flooding of large areas of the City. Salt water flooding would likely occur in the northernmost portion of the City. This flooding could be increased by fresh water flooding from an excessive amount of surface and storm drain runoff, or by levee failure along Calabazas Creek and/or the flood control channels in the event of an earthquake occurring during a winter storm. If all of the postulated events occur we can expect moderate to severe flooding in many areas of the City. Dikes and flooding are discussed in more detail in the Flood Hazards section.

Seismic *seiches* are earthquake generated waves within enclosed or restricted bodies of water - like sloshing water out of a glass. The risk of seismic seiches in the southern reaches of San Francisco Bay is not known. Water sloshing within structures such as elevated tanks or ground-level storage tanks could cause collapse or severe distortion of the

container.

Failure of the Stevens Creek Reservoir dam caused by an earthquake could also affect the City. Most significantly affected would be the southwest part of the City south of Remington and west of Sunnyvale-Saratoga Road. This estimated flood inundation area is based upon the maximum 3,700 acre-feet storage capacity of the reservoir. Depending upon the quantity of water released the depth of flooding could vary from several inches to several feet. For any large release of water Interstate-280 would act as a barrier to keep some water out of Sunnyvale.

Safety improvements to the reservoir and the dam have recently been made. The reservoir and dam are now engineered to withstand an earthquake on the San Andreas Fault of a magnitude 8.25 on the Richter Scale. Upstream and downstream berms were built and the dam was raised 10 feet. The contour of the gentle slopes surrounding the dam, plus the compacted earth along the sides and the face of the dam, were designed to encourage run-off and the collection of water and to discourage landslides. A hydro gauge was installed to alert the SCVWD of any sudden, unplanned release of water. The spillway was also upgraded to be capable of withstanding a flow of 15,600 cubic feet per second. For comparison, if the spillway was not there and it was just a river bed passageway for water, it would only allow a flow of 6,000 cubic feet per second. As an added precaution, safety inspections are done after all earthquakes of 5.0 or greater magnitude.

No landslides on any of the county's dams have occurred in the past decade, even in the 1995, 1997, and 1998 "El Nino" storms or after the 1989 earthquake.

No landslides on any of the county's dams have occurred in the past decade, even in the 1995, 1997 and 1998 storms or after the 1989 earthquake.

SEISMIC HAZARD AREAS

Maps predicting the severity of earthquake ground shaking usually depict intensity. Great advances have been made and continue to be made in this area. Three factors affect the intensity experienced at a location:

1. The size of the earthquake, or magnitude
2. The distance to the earthquake fault; and
3. The geologic materials underlying the site.

Larger magnitude earthquakes generally cause the ground to shake harder and longer, and they affect larger areas. This relationship is generally well understood. On the other hand, many commonly believe that most damage will occur at the epicenter of the earthquake. (The epicenter is the point on the surface above the location where the fault begins to slip.) The earthquake epicenter is not the point at which most damage occurs. The fault slippage can be tens of miles long and waves are generated along the entire length of the fault that ruptures. Thus, predictions of ground shaking intensity are based not on distances from hypothetical epicenters, but on distances from known faults.

The final factor affecting intensity at a site is the geologic material underneath that site. Thick, loose soils tend to amplify and prolong the shaking. The worst such soils in the Bay Area are the loose clays bordering the Bay, commonly referred to as "Bay mud". The rock that is least susceptible to shaking is granite. The remaining materials fall between these two extremes, with the thicker soils in the valleys being more susceptible to shaking and the rocks in the hills being less susceptible.

EARTHQUAKE RELATED FIRE

Fire in the aftermath of an earthquake has the potential of causing greater loss of life and property damage than the earthquake itself. As a result of the 1906 earthquake, at least 80 percent of all property loss in San Francisco was attributed to fire. The spread of the fire was due to an inadequate water supply and the predominately wood building construction. Today, even though buildings are built to stricter fire codes, fires resulting from an earthquake still pose a serious danger to every community. Severed gas mains and electrical lines are common ways these fires start. Major fires in San Francisco after the Loma Prieta Earthquake on October 17, 1989 are recent examples. In Sunnyvale the most serious problems will center in areas that are older and have structures of questionable earthquake resistance (e.g. un-reinforced masonry and older commercial "tilt-up" construction).

Sunnyvale should also expect numerous other fires throughout the City following a major earthquake. A number of variables may tend to intensify the situation:

- The extent of damage to the water system
- The extent of isolation due to bridge and/or freeway overpass collapse
- The extent of roadway damage and/or amount of debris blocking the roadways
- Time of year (e.g. seasonal hot, high winds)
- Time of day will influence the amount of traffic on roadways and could intensify the risk to life during normal business hours
- The availability of timely Mutual Aid resources, since most other surrounding jurisdictions would be experiencing their own problems
- The declaration of a local disaster will have the effect of creating a notice of need for additional resources

FLOOD HAZARDS

Sunnyvale occupies an area of relatively young and active geological processes. Before human activities disrupted the soil depositional process, Sunnyvale's land area was located between two flooding sources: the alluvial fan deposits of the intermittent streams from the mountains and, the periodic flooding from the San Francisco Bay. Historically, Sunnyvale has been subject to substantial floods, although these are not thought to be the largest floods that can occur.

There are five sources of flooding that can threaten Sunnyvale:

1. Excessive precipitation - surface runoff
2. Tidal – levee breaks
3. Dam failure – Stevens Creek Dam
4. Tsunamis – tidal waves from earthquakes in the Ocean
5. Combination of the above hazards

The areas in Sunnyvale that will flood as a result of heavy rains and the resulting surface runoff border Calabazas Creek and the East and West flood control

Dam failure and tsunamis were addressed in an earlier section entitled "Seismically Induced Flooding."

EXCESSIVE PRECIPITATION AND SURFACE RUNOFF

The areas in Sunnyvale that will flood as a result of heavy rains and the resulting surface runoff border Calabazas Creek and the East and West flood control channels. Specific street flooding will also occur from clogged storm drains and low places in some roadways.

Three significant flooding events have been occurred in Sunnyvale since the 1993 writing of this Sub-element. These occurred in 1995, 1997 and the *El Nino* Flooding of 1998. These were all declared disasters throughout Santa Clara County. Because of the effort in this area over the past fourteen years, the damage was considerably less than during previous flooding.

The City has constructed an extensive 150 mile storm drain system, and continues to improve upon it. The low lying northern areas of the City are assisted by two pumping stations to pump storm drain runoff into the Bay. Pump Station Number 1 is located north of Caribbean Drive. Storm water runoff from Moffett Industrial Park drains through low level

channels and pipes into a small lagoon where it is pumped into the Guadalupe Slough. Pump Station Number 2 lifts the storm water runoff from the low-lying area in northeast Sunnyvale and discharges it directly into Calabazas Creek.

Standards set by the FEMA and the Army Corp of Engineers for flood plain management call for a minimum three foot freeboard (clearance) for the 1percent flood incident. A 1 percent flood, also known as a 100 year flood, has a 1 percent probability to being equaled or exceeded in any given year. In the years following these storms the SCVWD has made many improvements to the flood control channels that have increased their capacity. The District completed a project to construct wing walls along Calabazas Creek several feet higher than they were. In southern Sunnyvale, additional channel openings, called "boxes", were installed under Homestead, Vireo and Lochinvar expanding the creek size under these streets. For further information please see the Surface Runoff Sub-element.

TIDAL FLOODING

Without the present system of dikes and levees, a part of Sunnyvale normally would be subjected to flooding by tides. It is assumed that this would still be the case if these dikes were to be topped, breached or failed.

The dike system originally was designed to contain holding ponds that ultimately served as salt evaporators for commercial production rather than a barrier to prevent flooding a populated area. The dikes are constructed of weak, locally derived Bay materials that are constantly undergoing settlement, erosion by the elements and damage by burrowing animals. They have a high potential for liquefaction during a major earthquake.

The problem of dike vulnerability has been compounded by the general lowering of the ground surface in this part of Santa Clara County - six to eight feet from 1916 to 1966 in the northern areas of the City. During the same time frame the ground subsided three - four feet in the areas along El Camino Real. Until ground water recharge methods were initiated in the late 1960's the amount of freeboard on the dikes was constantly being diminished by an accelerated subsidence rate caused by groundwater withdrawal. Although human-caused subsidence has been minimal since 1967, a certain amount of

subsidence is happening naturally due to regional tectonic movements, peat decay and a three inch rise in the sea level during the last 50 years.

A Capital Improvement Project was completed by the Department of Public Works in 2006 to repair and strengthen the levees surrounding the ponds, reducing the chance that the levees would fail in the event of a major earthquake. If the levee fails, salt water from the Bay would intrude into the ponds at high tide (the pond is lower in elevation than the slough) and partially-treated sewage from the pond would mix with Bay water.

FLOOD MANAGEMENT

FEMA investigated the existence and severity of flood hazards in Sunnyvale. Calabazas Creek, Stevens Creek, Sunnyvale East and West Channels and the San Francisco Bay were all studied in detail. Areas of flood hazards, flood-related erosion hazards, mudslide hazards, flood protection measures and flood insurance zones were identified in the report. Their report is titled "Flood Insurance Study, City of Sunnyvale, California." The latest revision was published on December 19, 1997 and included a "Flood Insurance Rate Map" that shows areas in Sunnyvale susceptible to flooding. Figure 7, page 35 shows flood-prone areas in Sunnyvale during a 100-year flood event.

A Capital Improvement Project was completed by the Department of Public Works in 2006 to repair and strengthen the levees surrounding the ponds, reducing the chance that the levees would fail in the event of a major earthquake.

A 1 percent flood is considered to be a severe flood, but one with a reasonable chance of occurrence for purposes of land planning, property protection and human safety. Flood management is usually based on the 100-year flood, which is synonymous with 1 percent flood. Flood of a magnitude with an expected recurrence of once in 100 years. In Sunnyvale, a 100-year flood event has never occurred.

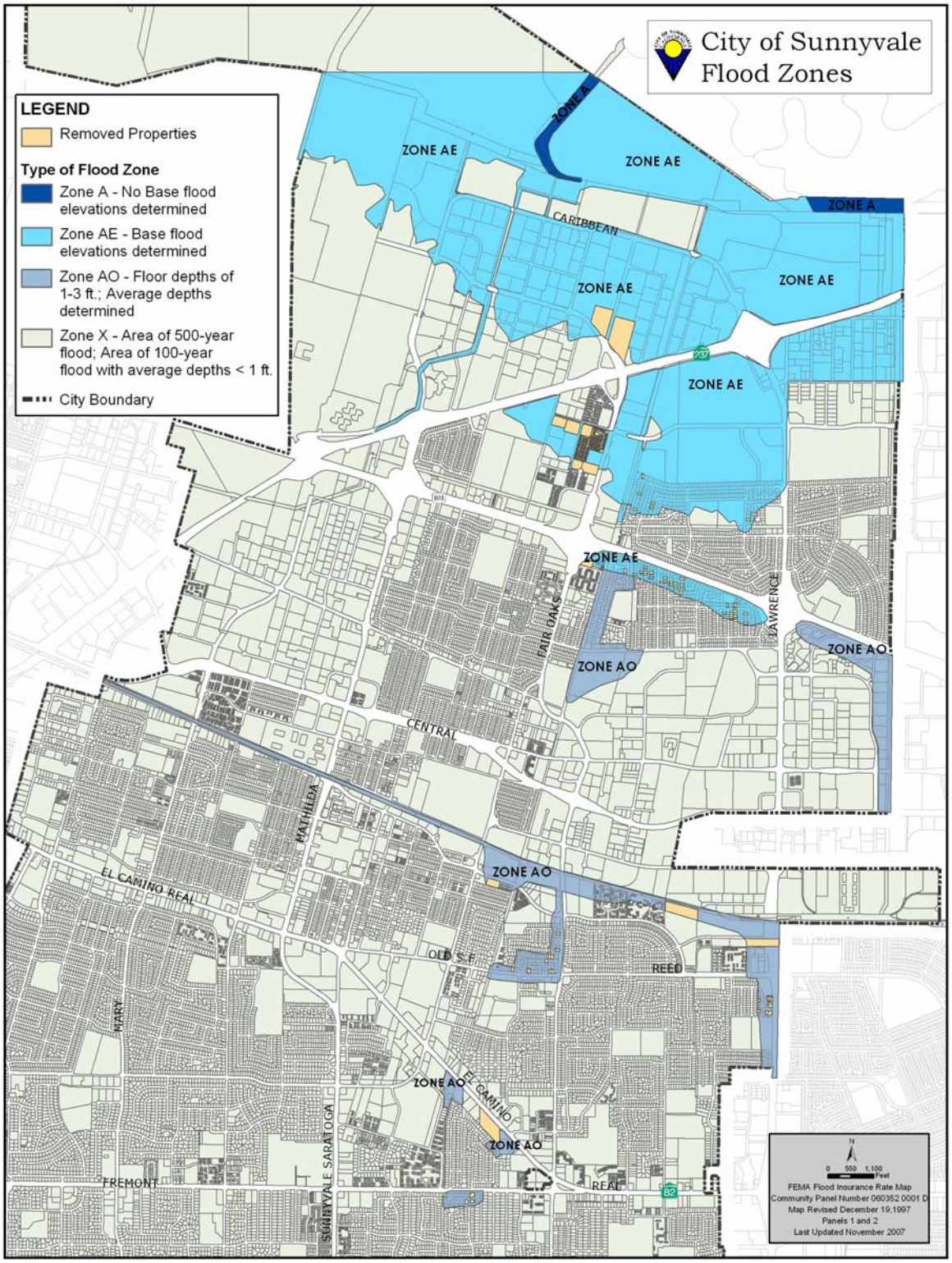
Sunnyvale has enforced specific building code requirements in the flood prone areas to minimize potential property damage from flooding. Specific requirements for development in these areas to reduce flood hazards include minimum foundation pad heights above the projected flood depth as specified on the Flood Insurance Rate Map (F.I.R.M.). For detailed information refer to Chapter 16.62 of the Municipal Code and the F.I.R.M. on file in the Public Works Department.

The City of Sunnyvale participates in the National Flood

Since 1988, the City has participated in the National Flood Insurance Community Rating System. As a result of the City's good standing (ratings 7 and 8)

Insurance Program (NFIP) Community Rating System (CRS). The City was granted a Class 7 rating by FEMA, effective May 1, 2003. This rating enables Sunnyvale community members and businesses to obtain a 15 percent discount on their flood insurance premiums. For the past five years, the City has maintained a Class 8 CRS rating, which has provided 10 percent discounts on flood insurance policies. The City has participated in FEMA's CRS Program since 1998.

More than 850 flood insurance policies are active in the City of Sunnyvale. The City's participation in the CRS program is expected to save property owners approximately $75,000 per year in premium reduction.


City of Sunnyvale
Flood Zones
LEGEND
Removed Properties
Type of Flood Zone
Zone A - No Base flood elevations determined
Zone AE - Base flood elevations determined
Zone AO - Floor depths of 1-3 ft.; Average depths determined
Zone X - Area of 500-year flood; Area of 100-year flood with average depths < 1 ft.
City Boundary
ZONE A
ZONE AE
ZONE AO
CARIBBEAN
CENTRAL
EL CAMINO REAL
OLD S.F.
REED
MATILDA
MARY
SUNNYVALE SARATOGA
FREMONT
FAIR OAKS
LAWRENCE
EL CAMINO REAL
237
101
82
N
0 550 1,100 Feet
FEMA Flood Insurance Rate Map
Community Panel Number 060352 0001 D
Map Revised December 19,1997
Panels 1 and 2
Last Updated November 2007

SEVERE WEATHER HAZARDS

The first of two recorded tornados ever to strike Sunnyvale was in 1951. It destroyed the Southern Pacific Railroad Station, and sheared off a large number of roofs in its path across the City. Severe winter storms are more common and when accompanied by high winds, can cause extensive damage to City and private property and endanger life. Trees torn or up-rooted by winds are hazardous to surrounding objects, structures and could block transportation routes. Compliance with the Uniform Building Code usually insures that buildings will not be knocked down nor the roofs blown off by excessive winds - except those of tornado force.

The second recorded tornado struck Sunnyvale in 1998. This tornado was again in conjunction with the severe winter storm of *El Nino* which was a county-wide declared disaster. The primary area of damage was to property in the Bernardo and Remington area. This county-wide “declaration” allowed this Tornado to come under its umbrella and helped with the recovery of $3.8 million in tornado-related damages.

May 4, 1998, Sunnyvale was struck by a tornado, causing $3.8 million in damage.

Broken power lines or major black-outs caused by any reason are life hazards that must be answered immediately and attended to until the power can be shut off or restored. Power black outs for long periods of time can cause extensive economic losses to all segments of the community from loss of spoiled food by individual families to the loss of production time by business and industry. Black-outs that affect traffic control devices severely limit the ability to move traffic and require a large commitment of City resources. Restoring lost electrical power is dependent upon the Pacific Gas and Electric Company's ability to respond to the outage. PG&E has provided timely responses to past problems but their ability to quickly respond is dependent upon the number and priority of requests for service. In the event of a major storm it is probable there will be power outages in "pockets" of Sunnyvale lasting up to 48 hours.

The under grounding of power lines reduces the number of power outages resulting from severe weather. Sunnyvale has funded underground projects in the past, most recently along Fremont Avenue between Wolfe Road and Belleville. The City

will continue to be served by a mixture of underground and overhead power lines throughout the City. PG&E does not currently have any plans to underground utilities other than what is required for new construction or redevelopment site upgrades.

FIRE HAZARDS

A major responsibility of the City is one of providing an environment protected from the ravages of fire that can threaten the lives and property of the community's community members and businesses. A variety of factors determine the number and type of fire service demands.

Chief among the factors are the age, size and general condition of the community and its infrastructure, type of construction and building uses, nature of major industries, extent of local regulations and policies concerning fire and life safety measures and the ability and willingness of City government to meet community expectations and mandated requirements concerning levels of service.

Since creating the 1993 sub-element Sunnyvale, has made several significant changes in local ordinances to mitigate Fire hazards. The goals of these ordinances are to reduce the number of deaths and injuries and provide a higher level of protection against property damage from fires. Sunnyvale Municipal Code (SMC) requires automatic sprinkler systems to be installed in all new residential construction. For many years automatic sprinkler systems have proved their value in commercial and apartment buildings but have not been required for residential structures. Sprinkler systems for residential dwellings are also required when adding on or remodeling more than 50 percent of the building. In November of 2007 Council adopted the amendments to the 2007 California Fire Code, is a modified requirement for new construction, or significant tenant improvements regarding fire sprinklers. Presently, new construction or significant improvements in buildings 5000 square feet or more require sprinklers. The adoption of the new codes moves that level to 3600 square feet or more. Smoke detectors are required for all newly constructed and remodeled residential dwellings. Smoke detectors have been credited with saving many lives by warning residents to escape during the early stages of a fire.

Burning embers blown by the wind onto wood roofs of adjacent dwellings is one of the quickest ways for a fire to spread to other structures. To combat this common problem the City adopted an upgraded fire-resistant roof ordinance in 2003. In the past, requirements for roofs for new residential construction

to be of "fire retardant" materials, as defined by the Uniform Fire Code and rated as class C. Generally, replacement roofs for residential living units must be "fire resistive" when more than 25 percent of the existing roof is replaced. The 2003 ordinance adopted by Council increased this rating for new and replacement of roofing materials to the higher class B rating. It is impossible to know how many lives are saved or how many fewer dollars in property damage are done because of these laws, but the evidence from fire cause investigations overwhelming proves that they will help meet these two goals.

When viewed as a whole, the balance of factors in Sunnyvale is favorable and past fire experience has demonstrated Sunnyvale to be a relatively fire-safe community. Master Planning has emphasized fire prevention through a comprehensive review of building plans and ongoing periodic inspections of occupied businesses, engineered fire protection systems and fire safety education as methods to maintain a relatively low loss of life and property due to fires.

However, as in any City, the potential for serious fire events is ever present. A trained and well-equipped fire service must be ready to respond not only to fires, but to medical aid calls, hazardous materials incidents and other situations requiring particular expertise. While the potential for extraordinary disaster always exists, and while the aging process of the City and its buildings will have some adverse impact on fire loss, the overall environment is comparatively fire safe.

For more detailed information refer to the Fire Services Sub-element which is part of the Public Safety Element of the General Plan. The Goals, Policies and Key Initiatives related to fire hazards are listed in the Fire Services Sub-element.

HAZARDOUS MATERIALS

The boom of high-technology development and production in Sunnyvale, which began in the 1960's, went relatively unnoticed by fire safety and environmental professionals until the early 1980's. Contaminated drinking water in San Jose, a result of leaking underground chemical storage tanks, brought the hazards of high tech chemicals into focus. Many of the processes utilized in these industries were dependent on highly toxic substances, particularly toxic compressed gases. Between 1983 and 1990 locally-used chemicals were identified and evaluated. Companies using these substances were cataloged by chemical usage. Engineering controls were investigated and implemented to reduce the overall risk to the community.

Hazardous waste generation, storage, treatment, and disposal are monitored by Sunnyvale Hazardous Waste Inspectors.

Two categories of risk can be broadly defined as "high hazard" sites and "moderate hazard" sites. The high hazard sites are those that store and use hazardous materials in large volumes or that have the potential of significantly affecting the surrounding community if spills or accidents occur, releasing toxic substances. The greatest threat to community safety is an accidental discharge of toxic gas into the outside air. Moderate hazards sites pose less of an immediate threat because they either use smaller quantities of hazardous materials, the storage is underground or the substance is less acutely toxic. However, leaks from moderate hazard sites may result in long-term environmental damage. Local gas stations are examples of moderate hazard sites. All high hazard and approximately 75 percent of all moderate hazard sites are located north the of the Caltrain right of way, north of Evelyn Avenue.

There are many ways the community may be impacted by hazardous materials. Leaking underground storage tank systems have contributed to contaminated soil and groundwater. Although Sunnyvale has been spared, contamination has negatively impacted groundwater aquifers that supply drinking water in other communities. As of August 2007, there are 72 open cases of soil and/or groundwater contamination under investigation or cleanup in Sunnyvale. The San Francisco Bay Regional Water Quality

Control Board has the responsibility to insure these sites are made safe by requiring and overseeing cleanups. There have been 135 contaminated site cases closed by the Board in Sunnyvale since 1993. Because of our local interest, Public Safety's Special Operations Bureau monitors the progress of cleanups and assists the Board as needed.

Another example is the risk of hazardous materials spills during major seismic events. Containers falling to the ground may break and release hazardous substances. Tanks containing hazardous liquids could rupture or liquids splash over the top. There is also a risk of pipes rupturing and releasing hazardous liquids and compressed gases.

REGULATIONS AND CONTROLS

Faced with increasing use of toxic chemicals by industry and a lack or regulatory controls, Sunnyvale passed ordinances regulating the use and storage of hazardous materials in 1983 and 1990. A significant number of hazardous materials responses to releases and the discovery of groundwater contamination from leaking underground tanks made it clear that these ordinances were necessary to protect the community and the environment from chemical exposure.

The City was instrumental in the development of the model Hazardous Materials Storage Ordinance proposed by the Santa Clara County Fire Chiefs Association. Enacted in 1983 as Title 20 of the Sunnyvale Municipal Code, it regulates aboveground and underground storage of hazardous materials and waste. Requirements were established for secondary containment of materials and monitoring of storage sites. An efficient permit and inspection program was established to insure safe facilities operations while not burdening industry with unnecessary constraints. In addition, businesses storing hazardous materials were mandated to disclose their chemical inventories to responders and the as well as to the community at large.

To reduce the potential hazards from the use of toxic gases the City passed the model Toxic Gas Ordinance in 1990 (Municipal Code 16.53). The ordinance requires engineering controls to reduce the likelihood of the off-site release of toxic gases. A seismic detector that shuts off the gas flow in the event of a major earthquake is one of the controls

required. The ordinance also provides for the treatment of toxic gases in normal operations as well as during emergencies.

In 2001, DPS was certified by the California Environmental Protection Agency as a Unified Program Agency. This certification allows the City to implement several important state environmental programs locally. Hazardous waste generation, storage, treatment and disposal at businesses are monitored by Hazardous Materials Inspectors. As the oversight is now at a local level, inspections are conducted much more frequently and the likelihood of illegal hazardous waste dumping or toxic releases from improperly treated wastes has significantly decreased.

Sunnyvale businesses that store large quantities of specified hazardous materials are required by state law to develop risk management plans. As a Unified Program Agency, DPS is now charged to review and certify these plans which outline administrative and engineering controls in place to prevent accidental releases of hazardous materials.

Today, Sunnyvale has 889 facilities currently permitted for hazardous materials activities. There are 24 locations permitted specifically for toxic gas storage. The types and quantities of hazardous materials stored and used at Sunnyvale businesses varies from gasoline in underground tanks at the corner service station to highly toxic compressed gases utilized by semiconductor manufacturing facilities. All of these facilities are inspected annually by specially trained Hazardous Materials Inspectors to ensure compliance with State and Municipal Code Regulations.

RESPONSE TO HAZARDOUS MATERIALS INCIDENTS

The use of hazardous materials in Sunnyvale has substantially decreased since the last update of this sub-element in 1993. Due to the decreased use of hazardous materials by Industry, Sunnyvale has decreased the volume of its risks in this area. As a continuing effort to reduce this risk even further, Sunnyvale has continued to improve its planning, enforcement and incident response efforts to effectively deal with these remaining hazards. The 1982 implementation of the Public Safety Department's Hazardous Materials Response Team was the first of its kind in Santa

Clara County. It included the purchase of a multi-purpose fire apparatus and the additional staffing of two Public Safety Officers for hazardous materials and other firefighting responses.

Since the initial addition of the two officers, the Department of Public Safety has extended the training of personnel involved in the program to the point that 3 Public Safety Officers and 1 Public Safety Supervisor are generally available for response both within the City and for Mutual Aid purposes. This continued commitment to providing the highest level of response has taken on an "all hazards" approach. This has expanded the training of the Hazardous Response Team to not only improve their skills in Hazardous Materials Response, but expand that role to training in the areas of complex rescues above and below ground, auto extrication and other areas related to protection of the public. The City's commitment to "all hazard" response has also resulted in improvements in "all hazard" equipment. The City placed a "state of the art" fire apparatus into service in 2007 which is designed to supply the tools and equipment to the scene of even the most complex emergency event.

Sunnyvale has also been at the forefront of a new "all hazards" approach with the integration of the Hazardous Materials Response Team and the Special Weapons and Tactical Team (SWAT).

Sunnyvale has also been at the forefront of a new "all hazards" approach with the integration of the Hazardous Materials Response Team and the Special Weapons and Tactical Team (SWAT). The concept revolves around potential terrorist attacks and the effective response utilizing members of both teams. A new vehicle, the "Bearcat," has been added to the City fleet with this approach in mind. It is equipped to deliver specially trained department members to biological or chemical incident that may include a component of violence, with increased security and safety. The vehicle is equipped with a wide array of hazardous material detection devices. The vehicle also is "armored" to withstand weapons or explosive device attack. The vehicle is also equipped with personal protective equipment for both hazardous materials and physical attack. This concept is still evolving with increased personnel training in this area.

This "all hazards" approach continues to expand. Recent terrorist events such as the attacks of September 11, 2001, exemplify the need to expand and more completely explore many of the concepts and approaches taken to combat

terrorism. A complete review needs to be undertaken in the future with the updating of the Police Sub-element and the Fire Sub-element which are more directly related to this issue.

COMMUNITY AND STAFF NOTIFICATION SYSTEMS

In 2004 Sunnyvale activated a notification system which is referred to as the “Communicator” This system utilizes two different methods of rapid notification in the event of emergencies. The first method, and most often utilized, is the rapid, automatic notification of specific groups of staff members identified as having certain needed skills sets. Instances of some of these groups are members of the EMO organization, SWAT, Hazardous Materials, and Accident Investigation teams and DPS administration. This system uses 24 dedicated phone lines to dial the work and personal numbers of the needed staff.

As a part of this system, the GeoCast portion can be utilized to contact specific areas within the city to do notifications of hazardous events that have occurred. This system allows the notification of all residential and business, published and non-published telephone numbers in a specific area. It allows the transmission of verbal instructions for the residents and/or businesses on what actions they need to take to stay safe. Examples are “self evacuate to the North,” “Shelter in place,” or virtually any type of instruction that can be spoken over the telephone. This system has typically been used to broadcast releases of hazardous materials and SWAT incidents.

Sunnyvale’s current system utilizes our own self contained server and 24 dedicated phone lines to produce the notifications. There is an existing contract with AT&T to update monthly the listed and non-listed telephone numbers that the server has access to. Notifications can be made using an existing group of people or mapping a specific area.

The next generation of notification systems is currently being investigated by the Sunnyvale. This type of system is totally web based and allows for any user to enter their phone

number, usually cell number, and e-mail address. Individual community members must maintain their own file and specify which type of notifications they wish to receive. Santa Clara County is currently exploring the implementation of a system which includes this web based “reverse 911” type system. The system would cover the whole of Santa Clara County and all of its residents. Sunnyvale is working closely with the County to assure the completion of the project and it’s viability for the residents of Sunnyvale. The Project is scheduled for completion 2009.

Note: *There are twelve non-functioning siren based warning towers in Sunnyvale that were once part of a Civil Defense Attack Warning System. The City has an unfunded Capital Project to remove the towers, however, the County has asked the City to leave the towers in place until a regional warning system can be designed and there is certainty that the towers will not be needed in the future.*

AVIATION HAZARDS

In 1994, the transfer of Moffett Field NAS to NASA/Ames Research Center was completed. An Environmental Impact Report (EIR) was also completed at that time. Moffett Federal Airfield will continue to support the operations of NASA, support certain segments of the Military, and continue its efforts with its partners for corporate collaborations.

Compatible land uses for and around NASA Ames/Moffett Field have been the subject of intense debate for many years. Other than the potential of aircraft accidents, noise is the most significant concern of area residents. The noise levels at Moffett Federal Airfield have dropped significantly since the Navy was operating the field. Stage III aircraft are now required for aircraft landing at Moffett. This is the lowest level for both noise and emission levels. Both the level of activity and noise levels are more closely examined in the Noise Sub-element.

NASA adopted the 1994 Federal Aviation Authority (FAA) regulation (14 CFR 77) that increased the "clear zone" from 750 feet to 1000 feet to each side of the runway. This increase is still within the NASA Ames/Moffett Federal Airfield borders.

NASA/Ames follows FAR part 77 which covers objects, such as buildings, affecting navigable airspace. This regulation covers more than the “clear zone” of 1000 feet. As an example, Moffett Towers is currently under construction in Sunnyvale. Nasa/Ames needed to confirm that the height of these buildings did not penetrate their imaginary airspace. This air space consists of a slope of 7:1 from the end of the runway to infinity. This imaginary line raises 1 foot of height for every 7 feet of ground distance.

Since the announcement of the departure of the Navy there has been an increase in proposals by other jurisdictions and private partners requesting the Federal Government to allow commercial aviation at Moffett Federal airfield, in addition to the current aviation users. Increase in use by Federal tenants and/or civil aviation would increase the risk of aircraft accidents.

The height of the usage of Moffett Field was in 1990 with the

peak of 80,000 take offs and landings (sorties). The 1994 adopted EIR, mentioned in paragraph above allows for a maximum of 25,000 take offs and landings annually. In 2007; NASA reported 9,100. sorties.

NASA/Ames has recently explored and initiated the leasing of airfield usage to large private companies as part of corporate collaborations. Close monitoring of increased usage and potential growth of Moffett Field is warranted. NASA has been responsive to the cities of Sunnyvale and Mountain View regarding noise/traffic levels. Sunnyvale has no direct authority over NASA/Ames. It is suggested that continued cooperation is necessary.

In April 2008, NASA advised the Sunnyvale City Council of their intention to allow the operation and storage of a Zeppelin MT07 Aircraft at NASA beginning in 2009. This Aircraft would be operated on a “for profit” enterprise by Airship Ventures, Inc. Airship Ventures has already set up their corporate headquarters at the NASA Research Park at Moffett Field. They are still seeking approval for the housing of their Zeppelin in hanger #2. It is unknown how many annual flights this Aircraft would make. The numbers will most likely be influenced by interest generated within the region.

Through the Council Policy Manual, the Sunnyvale City Council has established specific Goals, Policies and Action Statements that deal with NASA/Ames Moffett Field. The specific policies related to Moffett Field are covered in Policies 3.6B2, 3.6B3, and 3.6B5. These are specifically related to noise produced by the aircraft using Moffett Field. Based upon the Council direction of limiting the usage of the field to what is currently occurring, or a reduction of that use, policy indirectly reduces the risk of accidents based upon limiting occurrences. Sunnyvale also seeks through this policy to continue the use of Moffett as a federal facility, and oppose efforts to expand the facilities use to civil or commercial purposes.

Based upon the Council direction of limiting the usage of the field to what is currently occurring, or a reduction of that use, policy indirectly reduces the risk of accidents based upon limiting occurrences.

INFRASTRUCTURE INVENTORY

The local community, in relation to hazards and risk, can be broken into 5 key categories:

1. Current Land Use
2. Higher Risk Structures
3. Non-Structural Elements of Buildings
4. Critical Facilities
5. Lifelines

CURRENT LAND USE

Land development and use, from zoning for specific types of uses, to standards used to build structures, to the manner in which the community is maintained plays a major role in the overall assessment of risk. Since there is no such thing as a risk free environment, communities establish minimum safety standards in the form of laws and regulations which include building codes, fire prevention codes and zoning ordinances. These regulations have been established over a long period of time and are usually improved based on experience and increased technical knowledge.

CONSTRUCTION STANDARDS HAVE BEEN DEVELOPED THROUGH VARIOUS INTERNATIONAL ORGANIZATIONS WHICH UPDATE THE CODES AND

CODES AND REGULATIONS

Construction standards have been developed through various international organizations which update the codes and print new editions every three years. Codes, such as, the Uniform Building Code, Uniform Fire Code, Uniform Plumbing Code, Uniform Mechanical Code and the National Electric Code typically adopted by the Sunnyvale City Council every three years. The purpose of the codes is to provide standards to safeguard life, health, property and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures within Sunnyvale. Modern criteria for seismic design and construction have been included in the Uniform Building Code since 1973. Seismic upgrades have continued to improve since 1993. These codes are enforced by the Departments of Public Safety and Community Development.

Since the early part of the last century, three nonprofit organizations developed the three separate sets of model building codes used throughout the United States. The western United States (including California) used the codes published by the International Conference of Building Officials. The southern portion of the country used code published by the Southern Building Code Congress

International, Inc. and the northeast used Building Officials and Code Administrators International, Inc. codes.

Although regional code development was effective and responsive to our country's needs, the time came for a single set of codes. The nation's three model code groups responded by creating the International Code Council (ICC) and developing codes that provide a set of standard and consistent regulations without regional limitations. ICC was established in 1994 as a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes.

Sunnyvale City Council has adopted the International California Building Codes in November of 2007.

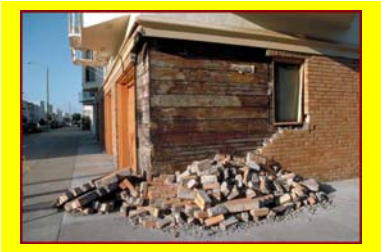
In California, the Building Standards Commission is charged with the authority to adopt the building codes used throughout the state. Local jurisdictions are mandated to enforce the codes adopted by the state. In January 2007, the state adopted the 2007 California building codes and published the documents on July 1, 2007. The Sunnyvale City Council has adopted the International/California Building Codes in November of 2007.

Planning and Development

The majority of industrial-zoned land lies in the northern portion of the City, which is considered to be more vulnerable to damage resulting from an earthquake. As the land at or below sea level, a system of dikes and levees is necessary to maintain its status. This takes on particular importance when recovery after a disaster is considered. When businesses are not properly prepared for a disaster such as an earthquake, their buildings and contents will likely suffer greater damage and slow their recovery. This affects employment, the general economy and the ability of the entire community to recover. Recovery problems can continue for years after an earthquake, or other disaster, as we have witnessed in the Santa Cruz after the 1989 Loma Prieta earthquake, the 1991 Oakland/Berkeley Hills Fire, and the 2005 Hurricane Katrina.

The regulation of new development offers the most practical opportunity for preventing losses from seismic and geologic processes. Although the City is approximately 98 percent developed, Sunnyvale's practice of requiring a geotechnical report to define and delineate any seismic hazard, prior to the approval of a project, is an important practice that will help mitigate the effects of the next major earthquake in Sunnyvale.

Policies on the use and development of land need to take seismic, geologic and other hazards into consideration in order to avoid creating new hazards or increasing the level of risk from existing hazards, and whenever possible, reduce the levels of risk posed by existing land uses. Sunnyvale's long range Goals and Policies are established with risk reduction in mind while at the same time providing for the community's social and economic needs. Achieving safety in both existing and future development can be guided by asking the questions "Does our planning provide reasonable safety?" and "Is the cost of achieving acceptable risk commensurate with the benefits gained?"



Damage to un-reinforced masonry building, 1989 Loma Prieta Earthquake.

Higher Risk Structures

Structures that have high or involuntary occupancies are particularly important in evaluating risk. High occupancy structures include large apartment complexes, major employment centers, auditoriums, shopping centers and other places of assembly. Structures that have involuntary occupancies are those that usually house a segment of the community dependent upon others for their safety. These occupancies include schools, day care centers, hospitals, convalescent homes and jails.

Structures may also be in the higher risk category because of age or type of construction. These structures may include: 1) those constructed prior to the adoption and enforcement of local codes requiring earthquake-resistant building design; 2) those constructed of un-reinforced masonry (URM); 3) those which exhibit any of the following characteristics: exterior parapets or ornamentation that may fall off; exterior walls that are not anchored to the floors, roof or foundation; sheeting on roofs or floors incapable of withstanding lateral loads; non-ductile frame construction. Of particular concern was the need to identify URM buildings. URM buildings are extremely vulnerable to seismic shaking and have performed very poorly in past earthquakes. In 1986 the state legislature passed a law that required all jurisdictions to identify hazardous URM buildings by January 1990. It further requires jurisdictions to establish a mitigation program and notify building owners that their structures are potentially hazardous in earthquakes. Cities must also submit information on potentially hazardous buildings and hazard mitigation programs to the Seismic Safety Commission. The City of Sunnyvale has compiled with the state mandated URM law by setting up a voluntary mitigation program.

Today, with the exception of 10 historical buildings on South Murphy Avenue, no URM buildings exist in Sunnyvale.

Through this program 86 buildings suspected as being of URM construction were identified as of the 1993 sub-element. When the Community Development Department reviewed the existing building plans or inspected these buildings it was found that none of them were URM construction. However, some of these buildings did need seismic retrofitting and through this process were upgraded to required standards. There are 48 URM buildings in the 100 block of South Murphy Avenue that are historical buildings and exempt from the 1986 law. Most of these buildings have been voluntarily upgraded to current earthquake standards when they were being remodeled for a new occupancy. Today, based upon studies by the Building and Planning departments, with the exception of 10 historical buildings on South Murphy Avenue, no other URM buildings exist in Sunnyvale.

Residential structures which are usually wood-framed have performed well in earthquakes. Where damage has occurred in residential structures, it has usually been traceable to the lack of even minimum bracing or anchorage to the foundation or the lack of adequate bracing for chimneys. Generally, pre-1933 structures were not designed to resist earthquakes and, if improvements to resist lateral forces have not been made, the buildings pose an extreme hazard to the occupants.

SOFT-FIRST STORY MULTI-FAMILY DWELLINGS

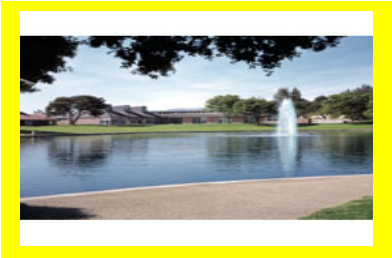
Soft-first story multi-family apartment buildings are of particular concern for potential for loss of life and property damage in an earthquake. This was shown to be particularly true in the Northridge earthquake. Identifying and reinforcing buildings that lack adequate seismic resistance can reduce the risk to the community. Wood framed apartment buildings, particularly those with first-story tuck-under parking, have proven to be vulnerable to earthquake damage. In June of 2003 a survey was completed by The Collaborative for Disaster Mitigation (CDM) at San Jose State University. This survey focused on Structures that were built before 1990. Those structures built after that date could not be considered soft-first story buildings, as the seismic standards changed.

Sunnyvale was identified in this CDM study as having 993 multi-family buildings. Of these, 415 were considered to be soft-first story structures which represents 42% of the multi-family buildings. Of the 27,109 total Apartment units in Sunnyvale, 7,439 (27%) were part of a building that was considered soft-first story. Currently, no legislation requires the

retrofitting or abatement of soft-first story buildings. The consistent modernization of the City will have some effect on reducing both the number of buildings and units.

Non-Structural Elements of Buildings

Non-structural elements of buildings are an extremely important factor in seismic safety considerations. All buildings contain many parts which are not related to the load-carrying members: partitions, stairs, ceilings, windows, veneers, and the like. These are subject to the same inertial forces as the rest of the structure, and they must adjust to the deflections of the building. Every significant earthquake produces damage to these non-structural elements. Falling parapets, appendages, and exterior veneers constitute the most serious hazards in most buildings. In the design of new buildings and the correction of hazards in old buildings, the attachment, anchorage and stabilization of non-structural parts are as important as the strength and rigidity of the skeleton itself. Items such as bookshelves and filing cabinets must be sufficiently secured to reduce the hazard to people inside of buildings.



Sunnyvale Community Center

In 1991, a survey of City buildings was done to determine the non-structural items needing to be secured or sufficiently braced to withstand a major earthquake. As a result of the survey, the Facilities Services Division of the Parks & Recreation Department requested funds to make the needed changes. Funds were budgeted and approved and the non-structural upgrades were completed in the mid 1990's. All new non-structural additions continue to be evaluated using the latest codes and are included in the annual safety inspections of City facilities.

Sunnyvale Public Safety

Essential Services Buildings

An "Essential Services Building" is a state designation which used to be called "Critical Facilities." Both terms are appropriate and are defined as those facilities and parts of a community's infrastructure that must remain operational after an earthquake for a community to respond effectively. Examples include hospitals, fire stations, police and emergency services facilities, utility facilities and communications facilities. The evaluation of the vulnerability of these community facilities should include site hazards, structural design, facility function and their importance to emergency response. Other facilities such as schools, churches and park buildings which could be used as aid centers or shelters should be included in this category.

Because of the possibility that a large seismic event could cause isolation of parts of or all of the community or parts of it, local critical facilities should not be centered in one area of the City. These facilities should have enough basic supplies to be able to sustain operations for 72 hours.

The seismic safety of City buildings has also received considerable attention. Many City buildings have been designated as “Essential Services Buildings.” The Public Safety building completed in 1985 was the first, of all City buildings constructed to seismic tolerances 50 percent higher than code standards. Seismic retrofitting and, or evaluation of need for the Community Center, City Hall Annex, Library and Corporation Yard (stores section) were also completed. The seismic capabilities of the Water Pollution Control Plant are covered in the "Lifelines" section below.

The seismic retrofitting of all six fire stations was completed in the mid-1990’s. The Sunnyvale Senior Center, completed in 2003, is a model in not only seismic standards (built to the then requirement of 25 percent over code), but is designed to operate independent of electrical service and can be alternately provided power by solar or an oversized generator or combination of the two.

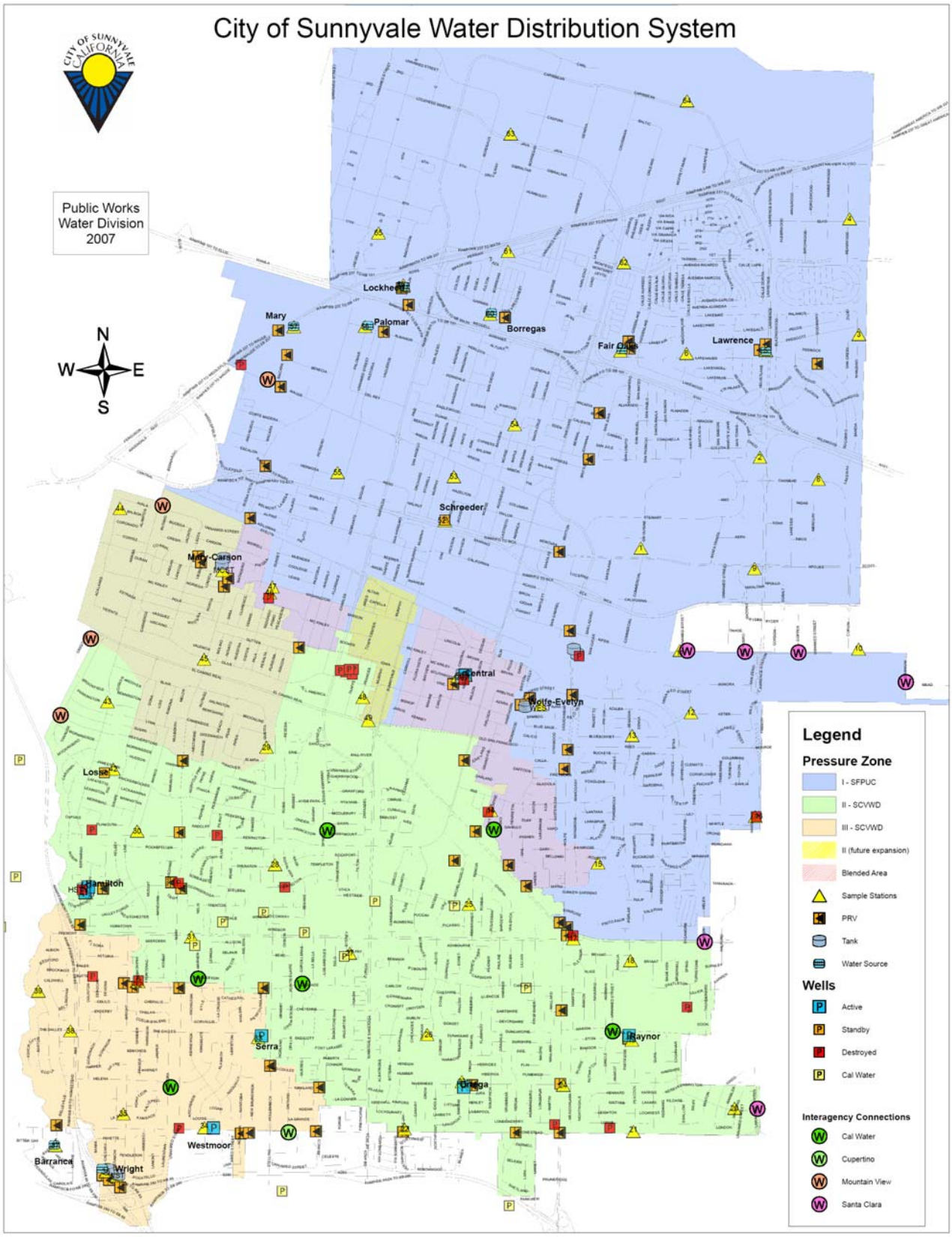
In the event the normal PG&E power supply to City facilities is lost, backup generators have been installed for certain facilities. The Public Safety building has two backup generators to support its operations. The Corporation Yard building, Water Pollution Control Plant, Community Center, Library, City Hall, City Hall Annex, Senior Center and each of the six fire stations all have generators to supply emergency power.

LIFELINES

Lifelines are essential services that are necessary for the continued functioning of the community following a disaster. They include utilities (gas, electricity, water, sewer, and communications), City streets, major highways, bridges and railway lines. Information on age, service, condition and location help planners assess the likelihood of failure during a seismic event.

ELECTRIC POWER

PG&E provides the natural gas and electrical power for


City of Sunnyvale Water Distribution System
Public Works
Water Division
2007
N
W
E
S
Lockheed
Mary
Palomar
Borregas
Fair Oaks
Lawrence
Schreeder
Mary-Carson
Central
Wolfe-Evelyn
Lossa
Hamilton
Serra
Raynor
Ortega
Westmoor
Barranca
Wright
Legend
Pressure Zone
I - SFPUC
II - SCVWD
III - SCVWD
II (future expansion)
Blended Area
Sample Stations
PRV
Tank
Water Source
Wells
Active
Standby
Destroyed
Cal Water
Interagency Connections
Cal Water
Cupertino
Mountain View
Santa Clara

Sunnyvale. The severity of damage to these utilities resulting from an earthquake and what effects it will have is very difficult to forecast. PG&E has three electrical sub-stations in the Sunnyvale area - the Lawrence Sub-station (off Fair Oaks Avenue east of Weddell Court), the Britton Sub-station (off of Kifer Road near Kifer Court) and the Wolfe Sub-station (at the Homestead & Blaney PG&E facility).

PG&E's backup power supply network is comprised of an electrical grid of multiple transmission lines. If power is interrupted from a particular supply, service from other sources can be obtained. Areas within the City that experience a sustained interruption may, dependent upon loading, are switched to different circuits. PG&E has installed automatic switches at the three Sunnyvale sub-stations. This installation of the automatic switches helps minimize power interruptions and restore power quicker when outages do occur.

WATER SERVICE

Sunnyvale has four sources of water in the City. California Water Service Company serves several pockets of former unincorporated areas annexed into the City in 1979. This private company continues to provide service to these areas. The rest of the City is served by the City of Sunnyvale's water system that is supplied by San Francisco's Hetch Hetchy system, the Santa Clara Valley Water District (SCVWD) and 10 City wells. Water from Hetch Hetchy comes to the City via seven connections in northern Sunnyvale and the SCVWD supply via two connections near Homestead and Wright. The wells are located throughout the City. This system supplies both domestic and emergency water for the City. Projects were completed in the 1990’s that provide the grid connections in Sunnyvale's water delivery system that will allow water from any supply source to be distributed to any area of the City. It will also provide an additional backup supply source in all areas served by the City's system in the event one of the sources fails due to an earthquake or other disaster.

SANITARY SEWER

The Water Pollution Control Plant (WPCP) is a large facility that processes all of the City's sewage. The plant keeps four one ton cylinders of chlorine on site, but only one is used at any one time. Sulfur dioxide is also used by WPCP Operators in the treatment process. There are four to six one ton cylinders of sulfur dioxide kept at the plant. Since 1986 all

WPCP Operators have participated in a thorough training program in plant operations and emergency incidents. Training includes drills for chlorine/sulfur dioxide spills, leaks and containment procedures; working in confined spaces; plant evacuation and handling of chemicals. Written Standard Operating Procedures have been developed for evacuation of the plant and the chlorine and sulfur private company continues dioxide system. The City uses two ponds in the sewage treatment process. They are adjacent to the plant and separated from the Bay by levees.

The WPCP has two separate generators normally used every day that supply approximately 90 percent of the electrical needs of the plant. The generators are powered by a blend of methane gas from the landfill and WPCP digesters, and are supplemented with natural gas from PG&E. The influent pump engines are powered by digester gas and can run the entire primary sewage treatment process in the event of a PG&E power loss.

ROADWAYS AND OVER CROSSINGS

Sunnyvale has 46 major roadway over-crossings and bridges on its City streets and freeways within the City limits. There are many smaller roadway bridges over creeks and flood control channels, primarily in residential areas. The main concern of planners is the ability of the City's primary over-crossings and bridges to withstand a major earthquake. After experiencing the damage to the elevated freeways in San Francisco and Oakland during the 1989 Loma Prieta earthquake significant concerns were voiced about the seismic safety of California's numerous roadway bridges and over-crossings. Responding to these concerns, the California Legislature passed Senate Bill 36X in late 1989. Seismic retrofitting has been completed for all over-crossings in the City of Sunnyvale.

The Mathilda over crossing at Evelyn is scheduled by the Department of Public Works for modernization and widening with design to be completed in 2008 and construction to be started in early 2009 and completed by the end of 2010. This design and building will incorporate the most recent seismic safety standards on perhaps the most critical roadway in Sunnyvale.

ISOLATION AFTER A DISASTER

After a disaster such as a major earthquake it is likely that some normal transportation routes will be blocked and communications lines will be down or overloaded. The result will be the partial isolation of some neighborhoods and possibly the community. Although less probable, isolation is a possibility during any event where major transportation and/or communication facilities are damaged. When these effects delay or prevent the delivery of emergency services into affected areas it increases the level of risk to persons and property.

Isolation has two levels that could occur simultaneously:

INTERNAL ISOLATION - when the City's ability to receive reports of emergencies, relay emergency information and respond to requests for help is limited by destroyed or damaged lifelines.

EXTERNAL ISOLATION - when the City's ability to communicate emergency conditions and request or receive outside emergency resources is lost due to destroyed or damaged lifelines.

TRANSPORTATION

In 1989, the Loma Prieta earthquake closed 142 roads in the San Francisco Bay Area, several of which remained closed for more than six months. Five years later, the 1994 Northridge earthquake produced approximately the same number of closures of 140. More than a dozen roads remained closed for months.

The Association of Bay Area Governments (ABAG) completed a study of transportation issues in 1999. This study received support from Caltrans, the USGS, and a committee of transportation providers, utility representatives, and emergency response professionals. The goal was to assess the vulnerability of the region's roadways to earthquakes, and to develop an estimate of the number and location of road and highway closures in major quakes.

After the Loma Prieta earthquake, San Francisco International Airport was shut down overnight. The closure posed a major inconvenience to airline passengers, but it

also cut off a critical conduit to supplies and services. Ironically, the airport itself sustained minimal damage, freeways and roads around the airport remained open to traffic. The principal reason the airport shut down was a shortage of air traffic controllers. Road closures elsewhere in the Bay Area prevented them from getting to their jobs.

In the short-term, road closures can impede emergency crews, police, firefighters, and paramedics from responding to life-threatening situations. In the long term, closures that stretch on for months and-sometimes years-can sap the region's economic vitality.

To develop the road closure projections, ABAG analyzed data culled from the Loma Prieta and Northridge earthquakes on damage sustained by the region’s freeways, highways, thoroughfares and local City streets.

From conclusions drawn by ABAG, Sunnyvale appears to be in a good position to recover relatively quickly from internal isolation in regards to roadways. The effects of an earthquake to the region are quite different. External isolation due to road closures in the region still appear to be quite possible and would serve to slow Sunnyvale recovery based upon regional transportation.

Since the Loma Prieta earthquake, a significant and ever-increasing number of the region’s roadways, supporting structures, and bridges have been retrofitted or reviewed by Caltrans. The current seismic retrofit program at Caltrans focuses on minimizing the likelihood of structure collapse and the prevention of fatalities and injuries. However, Caltrans emphasizes that following a major earthquake, bridges are still likely to be closed temporarily for inspection, and could be closed for extended periods to repair any damage.

ABAG also recommends that transportation providers and planning agencies hold corridor-level and scenario-specific workshops to develop comprehensive strategies to reduce the impact of anticipated transportation disruptions. One key step will be to identify critical transportation facilities that need to be useable, or returned to service, immediately following an earthquake.

ABAG’s report “Riding Out Future Quakes,” last updated in 2003, may be referenced regarding transportation issues.

This report includes potential scenarios regarding earthquakes and the number and location of associated road closures.

COMMUNICATIONS

Isolation could also occur, or be complicated by, the loss of normal communication links. The ability to communicate to others the condition of and the community's emergency needs is a critical function.

The City does not currently have either mobile dispatch capability, or a back-up dispatch center. Santa Clara County Communications has the ability to instantly divert all incoming 911 calls to their center, in the event Sunnyvale's equipment becomes disabled.

In 2006, a system called EMSystem was installed in the Sunnyvale Emergency Communications Center that can alert our dispatchers as to the state of our County's Medical System, including the load on emergency rooms. The system has protocols for delivering instructions for suspension of Emergency Medical Dispatching during a major event.

Police and fire operations each have a primary radio channel and back-up radio channel for their voice communications. Sunnyvale Dispatchers use a Computer Aided Dispatch (CAD) system to create events for service and then route the events to the officers' Mobile Data Computers

Santa Clara County agencies have a variety of interoperable radio channels for communication between agencies:

Northern Santa Clara County agencies (Palo Alto, Mountain View, Los Altos and Sunnyvale) all share the same range of radio frequencies. This allows Sunnyvale to program the other frequencies into Police and Fire radios. During an emergency Sunnyvale can transmit on the other radio channels listed to coordinate all Cities efforts during a major incident.

The LAWNET (police) and REDNET (fire) frequencies are used by all Santa Clara County agencies on a routine basis for notifying other dispatch centers of mutual aid needs and requesting assistance. There are also "Hot" telephone lines that exist between dispatch centers and other key

stakeholders to expedite requests for assistance and information.

The Silicon Valley Regional Interoperability Project (SVRIP) began in 1998 when Police Chiefs, Fire Chiefs, and City Managers recognized the need for an integrated communications system to allow first responders to talk to each other, and to share information during emergencies. The project began by using a small capital investment by each city in Santa Clara County to create a common radio channel that would allow law enforcement to converse during emergencies. The immediate program goal was quickly achieved with the development of the Bay Area Mutual Aid Communications System (BAYMACS), however SVRIP committee members soon realized that one common radio frequency would be overwhelmed during an emergency of any significance. Additionally, the BAYMACS project did not allow for the integration of Fire Departments into the system.

After the events of September 11, 2001, the Federal Government realized the need for Police, Fire, and Emergency Medical Services personnel to easily communicate during a disaster and began funding efforts focused on voice and data sharing through interoperability. The SVRIP Committee received several grants that funded projects within Santa Clara County. Among the first of the projects was ECOMM, a microwave-network that will connect all Public Safety Dispatch Centers wirelessly, and will allow for the sharing of Voice, Computer Automated Dispatch and Records data when the project is complete. This microwave-network will provide a high capacity digital connection that will allow for the equivalent of 672 simultaneous conversations.

Another project of note is the SVRIP Committee's *Voice over Internet Protocol* (VoIP Project). This project is focused on sharing voice data wirelessly, which will expand voice communication capabilities using internet based connections over existing radio systems.

Finally, the SVRIP Committee has undertaken a Data Interoperability Project which will create automated links between disparate Computer Automated Dispatch (CAD) systems. This project will result in improved command and

control of resources and information between 900 Dispatch Centers and field personnel.

Several potential upgrades to the Sunnyvale Communications systems should be examined: Upgrade of Sunnyvale's Radio System Infrastructure. Upgrade our current analog radios to digital (become P25 compliant and meet upcoming FCC requirements for narrow banding). Upgrade our current system in order to participate in a countywide interoperable radio system (potentially a hybrid 800 MHz, 700 MHz, 480 MHz, 150 MHz ranges). Santa Clara County is taking the lead on establishing a county-wide blended 700 MHz infrastructure. The City of San Jose is also moving towards upgrading their police radio system to 700 MHz.

To Sunnyvale's credit, Sunnyvale Amateur Radio Emergency Services (SARES) can be used for backup communications for the Public Safety Dispatch Center. See the Community Resources section for further information on SARES.

EMERGENCY PLANNING AND COORDINATION

There is a difference between the day-to-day response to emergencies and the response needed to meet the demands of a disaster. City Departments are prepared to handle the routine emergencies of the community. However, disasters pose a different set of demands that the normal resources, and established levels of service cannot meet. In general terms, a disaster is defined as an emergency event which exceeds the capacity of the City to handle it in the same manner as it handles the day to day emergencies that occur. Effective emergency management requires the City to use all of its resources to meet emergency needs. The basic strategy is to recognize and cease some non-emergency activities and concentrate all available resources on the demands generated by the disaster.

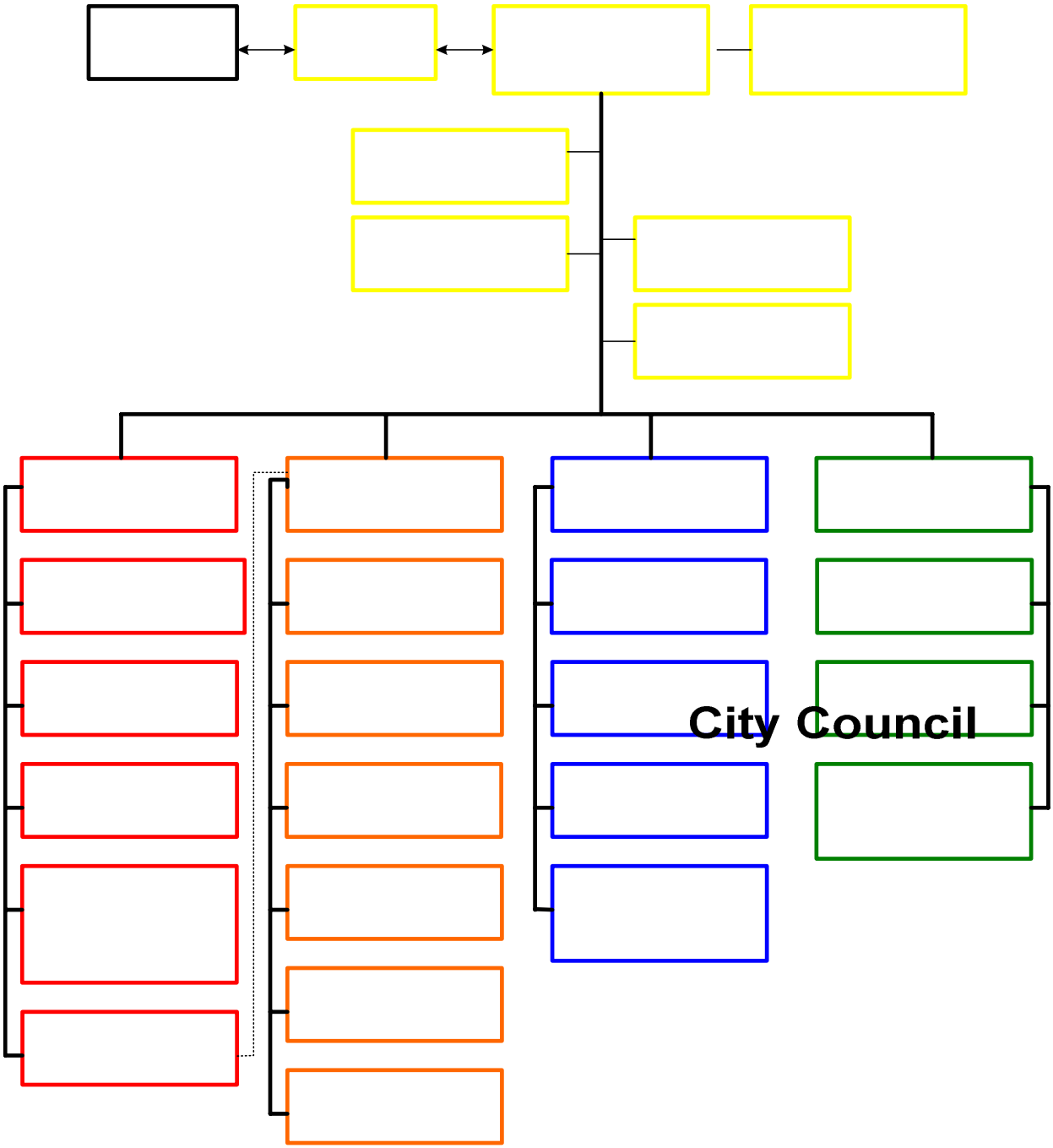
The overall strategy of emergency management is to provide for an integrated approach to preventing, planning, responding, preparing and mitigating disasters. Emergency management planning and training is assigned to the Department of Public Safety. Since 1981, the activities have been coordinated through the Public Safety of Office Emergency Services. During non-emergency periods it is necessary to assess the City's hazards and vulnerabilities and to work together with the private sector, community-based organizations, faith-based organizations, and other non-governmental organizations to identify resources so that there is an integrated effort to prepare for, and respond to disasters. As governed by Standardized Emergency Management System and National Incident Management System, it is also imperative that the City plan and coordinate with neighboring jurisdictions, the county, state and federal emergency entities.

The overall strategy of emergency management is to provide for an integrated approach to planning, responding, preparing and mitigating disasters.

CITY OF SUNNYVALE'S EMERGENCY PLAN

Section 8568 of the California Government Code and Chapter 2.16 of the Municipal Code requires that the City

Emergency Management Organization



develop an emergency operations plan. The City of Sunnyvale's Emergency Plan is a living document, subject to revisions based on agency reorganization, new laws, experience with exercises, and actual disasters. In September, 1975, the City Council adopted the first Emergency Plan. The Plan was revised by Council action in 1988. Since then, there have been numerous revisions to the plan as a result of lessons learned from the 1989 Loma Prieta earthquake; the implementation of SEMS into California's overall emergency response organization and NIMS as required under Homeland Security Presidential Directive (HSPD)-5. SEMS and NIMS provides the framework for the plan and dictates to organizations how to work together to prevent, prepare for, protect against, respond to, and recover from the entire spectrum of "all-hazard" events. These, and other state and federal changes, created the need for revisions to the City's Emergency Plan which was adopted by the City Council in 2005.

To maximize efficiency of resources within the City's emergency organizational structure, staff is assigned to fulfill pre-designated functions. These individuals make up the Emergency Management Organization (EMO) and work within the Emergency Operations Center (EOC). The City relies upon Incident Command System, a component of SEMS/NIMS which incorporates five basic management functions: Command/Management, Operations, Planning and Intelligence, Logistics and Finance.

The City Manager or designee is the Director of Emergency Services. When an event, or a combination of events, begin to reach the point that a potential exists for exceeding the ability to handle the event in a routine manner, the City Manager, as Director of Emergency Services, may direct a partial or complete mobilization of the EMO. The City staff not pre-assigned to the EOC is available as an emergency work force and deployed where needed. Training for those who support the EOC is provided annually.

If events evolve to the point that City resources are insufficient to respond effectively, outside resources can be requested under the local or state mutual aid agreements. Mutual aid agreements are based on the premise that no government organization can afford to employ the personnel

or purchase all the equipment necessary to respond to all disasters. Sunnyvale, along with all other city and county governments in the state, has signed mutual aid agreements to assist communities that have been struck by major disasters. This agreement is known as the California Master Mutual Aid Agreement. Additionally, in California there are local Police, Fire and Emergency Manager's mutual aid agreements in place.

The responsibility of responding to and recovery from any disaster lies with local government. Emergency planning, response, mitigation and recovery rests with all levels of government. Local governments are supported by emergency organizations at the county, state and federal levels. The state-wide emergency organization is defined by the Emergency Services Act of 1970, the California Disaster Assistance Act, Standardized Emergency Management System and the California Master Mutual Aid Agreement.

California's SEMS continues to provide the structured framework for responding to and managing emergencies and disasters of all kinds. The enhancements to SEMS through integration of NIMS improve the ability of California to reduce the impacts of disasters and continue to lead the nation in emergency management.

Henry R. Renteria
State OES Director

SEMS unifies all elements of California's emergency management organization into a single integrated system. Its use is required for State response agencies. Local government agencies must use SEMS to be eligible for State funding of certain response related personnel costs resulting from a disaster. In 2005 the Governor signed the Emergency Management Assistance Compact (EMAC) with other states, which provides for mutual assistance among the states entering into this compact in managing any emergency or disaster that declared by the governor of the affected state, whether arising from natural disaster, technological hazard, manmade disaster, civil emergency aspects of resource shortages, community disorders, insurgency, or enemy attack.

The California emergency organization is tiered into five distinct levels of response. The first is field (on-scene responders), followed by local (jurisdictional), then the county, which is called the "Operational Area." In a major emergency/disaster or mutual aid situation, the Operational Area coordinates emergency services within the county's geographical boundaries and provides the link to the next tier, the region. Requests for assistance are made to the region when the local jurisdiction and Operational Area resources are inadequate or unavailable. Santa Clara County is located in the Coastal Region, which

encompasses all Bay Area and coastal counties from Del Norte County in the north to Monterey County to the south. The fifth level is the state. An event such as a major earthquake in the Bay Area, the entire region may be overwhelmed and resources exhausted. The state coordinates the resources from other regions and, if needed, request additional aid from the federal government

PUBLIC WARNING

Sunnyvale relies on Public Safety personnel and the City's Communications Officer (Public Information Officer) to warn the community of imminent emergencies. Emergency and disaster alerting resources include:

- ***The Internet***
  Massive changes have occurred in the utilization and the amount of information available over the Internet. This is nowhere more apparent than in the area of disaster preparedness. Regional events attain immediate attention from various public and private internet information providers.

  For earthquakes of magnitude 3.5 and higher, the California Integrated Seismic Network (CISN) produces maps depicting the intensity of ground shaking. These maps are based on shaking parameters from stations in the combined seismographic networks, supplemented with predicted ground motions in areas where limited data are available, and are distributed electronically within minutes of the occurrence of the earthquake. Maps are updated as additional data becomes available. This information is available to the public. CISN is a joint effort including California Geological Survey, United States Geological Survey, California Office of Emergency Services, Caltech and UC Berkeley.

- ***Television and Radio***
  Current commercial television and radio are under increasing demands from the public for instant information. Their role in a disaster has increased tremendously in the past fourteen

years. It is imperative that the City work with getting the proper message out, as soon as possible, to these sources. By the nature of their business they tend to aggressively seek out the most “newsworthy” information. Public information properly routed in the direction of these sources will improve our ability to communicate the appropriate message to the community members and business.

- ***Emergency Notification Center***
  The Sunnyvale “Communicator Alerting System” was placed into service in 2004, and utilizes several different features to communicate with specific groups. It is used on a routine basis to communicate with varying groups within the Department of Public Safety for both notification of significant events, and the call back of personnel to duty for a specific event, i.e. large fire, SWAT team call out, etc. from pre-designated groups in the system.

  The Geocast, an additional component of the City’s alert and warning system, can also be used to notify a specific geographic area of a hazard. Since 2004, the Geocast has been used to notify the community of emergency incidents by automatically dialing both listed and unlisted telephone numbers to leave a pre-recorded message. An example of this was a 2006 hazardous materials release in which local residents were asked to “shelter-in-place.” The Geocast was able to complete notifications in a very short time. Without the Geocast notifications would drain the already overwhelmed resources.

- ***KSUN-Channel 15***
  The City of Sunnyvale Government Access Cable Television Channel (KSUN-15) is a community source of information serving Sunnyvale. KSUN-15 programming will carry emergency information as a preemptive and immediate priority to assist the public in matters of public safety and public health. The

City has the ability to override all Comcast channels instantly with an emergency audio message conducted by Communications Officer/OCM in conjunction with OES. In addition to using KSUN as a communication tool in an emergency, Public Safety frequently uses the channel to provide preparedness and presentation information to the public as a means of community education.

- ***Emergency Alert System (EAS)***
  The Emergency Alert System (EAS) was established nationwide on January 1, 1997. EAS is a warning system. It is used to provide the public with immediate messages affecting life and property. The most common reasons to activate the EAS include: 9-1-1 system failures, severe weather warnings, hazardous material incidents, tsunami warnings, evacuation orders, and other threats. The system also may be used by state and local authorities to deliver AMBER alerts and weather information targeted to a specific area.

- ***Community Radio***
  The community radio station was placed into service in 2007. This low-powered AM radio station is designed to disseminate information to the public of an informational nature. The long term goal is for the City PIO and other City staff to utilize the station as an informational resource to enhance the quality of life on a routine basis and to promote health and safety during a non-emergency phase. In the event of a disaster, it is designed to be an informational source for Sunnyvale specific instructions that enhance safety and health. The community radio station is still being tested and refined, to provide better coverage citywide. Staff expects full implementation to occur in 2008

War Preparedness

Civil preparedness for war is regulated by Congress under the Civil Defense Act. Congress has directed FEMA to develop civil defense system to protect life and property from both peacetime and war disasters. FEMA is working with state and local governments to develop guidelines that will provide emergency planning, warning systems, and provision for direction and control of operations by key local and state officials during war.

Under the integrated emergency management concept, plans address multiple-hazards, likely to endanger a specific community. Consequently, evacuation plans are developed to address such threats as hurricanes, release or threatened release of a hazardous material and international crisis'

COMMUNITY RESOURCES

Sunnyvale Neighborhoods Actively Prepare (SNAP)

SNAP is a program implemented in 1987 to establish neighborhood self-reliance in the event of a major disaster. SNAP provides the structure, the materials and the training necessary for residents to be self-sufficient for the first 72 hours following a major earthquake or other disaster.

Over the years, SNAP has undergone major revisions to the program. This was necessary in order to keep SNAP current and vibrant. The modifications to the program resulted from internal training, lessons learned from actual disasters, the expansion and adoption of Community Emergency Response Team (CERT) materials by the Emergency Management Institute and National Fire Association, and to align our SNAP model with the surrounding cities' programs.

Program goals are still the same, using the "all-hazards" approach to educate and train our residents to take care of themselves in the aftermath of a major disaster. The training, follows the FEMA curriculum, Sunnyvale residents learn that emergency response services are not staffed for catastrophic events, and damage to the infrastructure may restrict the City's operations. As trained SNAP members operating in their neighborhoods, residents can extend the capabilities of our City's response organizations to minimize damage to life and property. SNAP members are trained to fulfill their obligations to themselves, their families and neighborhoods. Once their obligations are completed, the City will call upon its residents to augment in the recovery by sharing their skills and services. As auxiliary emergency responders, trained SNAP members will be able to collect information about the disaster, perform triage, treat the injured, conduct simple search and rescue and perform modest tasks as assigned by staff. Through training the City has empowered SNAP members to assist others in their community and workplace.

SNAP provides the structure, the materials and the training necessary for residents to be self-sufficient for the first 72 hours following a major disaster

Further, SNAP has grown beyond the original concept of involving community members in earthquake response operations only, to a program which includes education on

all disasters that may occur in Northern California. It is anticipated that 100% of the SNAP members will take actions during the course of an emergency. They will first take care of their family and their neighborhood, then they will be available for assistance to other parts of the City, For example if a disaster occurred that primarily affected the southern portion of Sunnyvale, it might be expected that those who live in the northern portion of the City might quickly assess that no assistance is needed in their neighborhood. They would respond to their affected neighbors on the southern portion of town. Those living in the southern portion of town may very well be committed to staying in their area to assist with the localized damage.

PROJECT ARK

Project ARK is Sunnyvale's disaster shelter program, which is a cooperative effort among the City, the American Red Cross, Santa Clara Valley Chapter and the four school districts in Sunnyvale (Sunnyvale Unified, Santa Clara Unified, Cupertino Unified, and Fremont Union High School District). Currently, the program involves 11 emergency containers called "ARKS" placed at eight school sites around the City. Each container is stocked with emergency supplies to support up to 300 people for three days. ARKS have been placed at Bishop Elementary, Lakewood Elementary, Ponderosa Elementary, Columbia Middle School, Cupertino Middle School, Peterson Middle School, Sunnyvale Middle School and Fremont High School.

In the event of a disaster or other local emergency, the supplies in each ARK would be used to set up an American Red Cross mass care facility (public shelter).

SUNNYVALE AMATEUR RADIO EMERGENCY SERVICES (SARES)

More than 100 amateur radio operators in the community have organized as an active emergency response group called Sunnyvale Amateur Radio Emergency Services (SARES). The SARES members are FCC-licensed amateur radio operators who have registered their capabilities and equipment for public service. They serve without compensation. Locally, SARES is directed by the Emergency Coordinator, who is appointed by the American Radio Relay League (ARRL) Section Emergency Coordinator. This Emergency Coordinator reports directly to OES to provide direct contact and status update to radio

FCC LICENSED HAM RADIO OPERATORS WHO ASSIST STAFF WHEN THE CITY'S COMMUNICATION SYSTEMS ARE DISRUPTED.

operators in the field, without burdening City staff with requests for information.

SARES provides assistance to the City at both routine special events, when additional radio communications are needed, and during emergencies/disasters. In preparation for an emergency event radio equipment and antennas have been installed at 30 locations throughout the City. Some of the locations include the Dispatch Operations Center at Public Safety Department, all fire stations, the Community Center, Corporation Yard, Water Pollution Control Plant, Sunnyvale Medical Clinic, two mobile home parks and many schools. In the event of an emergency or disaster SARES members report to pre-designated locations and activate their network. The SARES network will provide a critical communication link when the City services are disrupted.

Volunteer Emergency Response Team (VERT)

When a disaster – natural or man-made - strikes a community, spontaneous, unaffiliated volunteers – our neighbors and residents – often arrive on-site at a disaster ready to help. The events of September 11 dramatically illustrated the need for better planning in this arena, and the issues of unaffiliated volunteers began receiving increased attention. In 2002, the Points of Light Foundation and Volunteer Center National Network and FEMA convened a National Leadership forum on Disaster Volunteerism. In 2003, the National Voluntary Organizations Active in Disaster (NVOAD) coalition established a Volunteer Management Committee to continue the work in addressing the challenges of managing spontaneous volunteers.

The City of Sunnyvale's VERT program is designed to plan for the integration of citizen involvement in an emergency management setting, to help prepare for, respond to, recover from, and mitigate the effects of disasters in our community. The VERT program is managed by Volunteer Resources Program Coordinator, with the Community Resources Division in the Office of the City Manager.

VERT is responsible for organizing emergency volunteers. History tells us that local government is often the first point of contact for volunteers who want to help after an emergency. Past experience has demonstrated that individuals will congregate at city halls, fire stations, community centers, the

incident site and other places where they believe there may be opportunities to volunteer. While well intentioned, these volunteers can often hinder the efforts of first responders. For this reason, the City has partnered with the County in the creation of local and regional plans to address this issue. As a result of these plans, processes are in place to manage affiliated and unaffiliated volunteers.

> *Affiliated volunt*eers are attached to a recognized voluntary organization and are trained for specific disaster response activities. Their relationship with the organization precedes the immediate disaster, and they are invited by that organization to become involved in a particular aspect of emergency management. An example of affiliated volunteers is SARES.
>
> *Unaffiliated volunteers* are not part of a recognized voluntary agency and often have no formal training in emergency response. They are not officially invited to become involved but are motivated by a sudden desire to help others in times of trouble. They come with a variety of skills. They may come from within the affected area or from outside the area. (Also known as: "convergent, emergent," walk-in or "spontaneous.")

The Emergency Volunteer Plan is an organizational guide for registering, screening, assigning, training, and caring for emergency volunteers.

The purpose of the Emergency Volunteer Plan is to provide an organizational system to register, screen and place volunteers immediately following a major disaster. These actions shall be accomplished by employing, at a minimum, the following activities:

- Identify by skill and organization those persons who may volunteer their time and/or talent following a declared disaster adversely affecting the citizens of the City of Sunnyvale.

- Provide an orderly process for receiving and assigning both pre-registered and spontaneous emergency

volunteers to meaningful tasks during and after a disaster.

- Supplement existing City personnel with volunteers in responding to and recovering from the effects of a major disaster.

- Establish methods for receiving and responding to requests for assistance from the City's Emergency Operations Center and the public, then match the available volunteer with the request for assistance.

- Monitor the activities of volunteers to ensure that their welfare is protected.

Regional Role in Volunteer Management in a Disaster or Emergency

In our ongoing effort to provide dynamic and cost-effective ways to engage volunteers in disaster or emergency situations, the Office of the City Manager's Volunteer Resources Office and Sunnyvale's Office of Emergency Services are jointly participating in a countywide workgroup sponsored by the Volunteer Center of Silicon Valley and the Emergency Manager's Association. The Volunteer Center has a strong history of working in the disaster response arena and has received funding to plan for the coordination and utilization of volunteers during a major disaster or emergency. The objectives of the project include:

- Leveraging resources through collaboration in the jurisdictions of Santa Clara County

- Establishing a system to better meet the regional needs of volunteers in their local communities

- Providing a framework and developing a contact list for mutual aid for staffing disaster volunteer management operations

- Identifying best practices and standardization of materials and training for the management of spontaneous volunteers

The desired result in putting together plans for managing affiliated and unaffiliated volunteers is to help to identify

disaster-related tasks such as: office, manual and people skills that may be needed during and after an emergency or disaster. As seen in previous disasters (i.e., Loma Prieta Earthquake, September 11 tragedy, Hurricane Katrina, etc.) affiliated and unaffiliated volunteers willingly, and in unprecedented numbers, will do anything to provide assistance in recovery efforts including office work, treating the injured, looking for the missing, making signs, removing debris from collapsed structures, and interviewing other volunteers. In Santa Clara County, specifically in Sunnyvale, the City is providing the means beforehand to identify and train affiliated volunteers and have in place an Emergency Volunteer Plan to address the needs of unaffiliated volunteers.

City Employee Volunteer Efforts

Hurricane Katrina and other natural disasters that occurred during 2004 and 2005 devastated many cities and hundreds of thousands of people suffered the loss of their homes and communities. These events prompted the Council to consider the need to be prepared to respond to a large scale disaster and look into how the City might support staff that is interested in participating in relief and recovery efforts.

Report to Council 06-131 was prepared by staff in an effort to present issues associated with City Employee Volunteers. Currently, the City of Sunnyvale provides disaster relief and assistance through participation in the California Master Mutual Aid Plan (State) and the Emergency Management Assistance Compact (Federal) and allows employees to volunteer to assist relief agencies during non-work hours. Employees may also request the use of accrued leave time or leave without pay as allowed by City policy and with supervisor and/or City Manager approval.

Council approved on 4/25/06 the continuing participation in formal Mutual Aid Agreements and clarified existing City policies to allow employees to use accrued leave time with supervisory approval, or leave without pay with City Manager approval, to volunteer for disaster relief efforts during normal work hours. Approval must be obtained in writing.

POST DISASTER RECOVERY

The recovery from a disaster needs to be as well planned as the initial emergency response. When a community has been devastated by a disaster, pressure from displaced businesses and families to rebuild as quickly as possible can be overwhelming for the local Planning Commission and City Council. If this happens little thought will be given to correcting past mistakes, evaluating changes in land usage and their long-range effects on a community. A community can effectively plan to recover from a disaster and with thoughtful planning, those strategies will provide a framework for the recovery.

In 2005, ABAG received grant funds to assist local agencies to comply with the Disaster Mitigation Act of 2000 requirements. ABAG invited local agencies to participate and complete the detailed planning necessary to create a pre-disaster mitigation plan. ABAG completed a regional plan for the 9 Bay Area counties which was adopted by ABAG on March 17, 2005 after being approved by FEMA. Local agencies were given the opportunity to partner with ABAG to reduce the staff time required to complete a plan. Sunnyvale staff participated with ABAG and completed a FEMA approved Local Annex to the approved ABAG Plan in 2005. The plan is part of an overall strategy to reduce or eliminate long term risk to life and property from a natural hazard event. Adoption of the “Local Annex” as a part of the overall plan better prepares Sunnyvale for future emergencies and allows the City to apply for FEMA grant funds to mitigate existing risks.

Sunnyvale’s 2005 Local Hazard Mitigation Plan (LHMP) Annex with its focus on the 9 likely hazards to occur in the Bay Area (The nine hazards are five earthquake related hazards – faulting, shaking, landslides, liquefaction, and tsunamis; and four weather related hazards – flooding, landslides, wildfires, and drought.) continues to be examined and analyzed for future

needed changes that may develop in the area of recovery. This plan, as required will be updated in 2010.

COMMUNITY CONDITION INDICATORS

FISCAL YEAR:		03/04	04/05	05/06	06/07
1. Percentage of housing stock over 20 years of age		85%	86%	88%	88%
2. Number of facilities requiring hazardous materials storage permits		854	898	886	892
3. Number of hazardous materials release investigations		6	7	7	7
4. Number of active SNAP participants (trained within the last 18 months)		307	318	296	301
5. Number of total SNAP training classes		25	25	25	25
6. Number of active SARES amateur radio operators		93	91	87	90
7. Number of ARKS located at Sunnyvale Schools		12	12	11	11

INTERRELATIONSHIP WITH OTHER SUB-ELEMENTS

The General Plan of the City of Sunnyvale is composed of seven elements in addition to the Community Vision: Land Use and Transportation, Community Development, Environmental Management, Public Safety, Socio-economics, Cultural, and Planning and Management. The Seismic Safety and Safety Sub-element is part of the Community Development Element. This element included 3 other sub-elements: Open Space and Recreation, Housing and Community Revitalization, and Community Design.

The interrelationship of the Seismic Safety and Safety Sub-element with other sub-elements is summarized below.

Law Enforcement Sub-element	
GOAL 4.1A:	Provide a safe and secure environment for people and property
Policy 4.1.A.1:	Provide rapid and timely response to all emergencies.
Action Statements	
4.1.A.1c	Assist in the implementation and evaluation of the Emergency Preparedness Plan.
4.1.A.1d	Maintain, train and equip special response teams for extraordinary or extremely hazardous emergency incidents.
GOAL 4.1D:	Conduct planning and administration that incorporates interaction with other City Departments as well as other agencies both public and private, when mutual concerns exist which could have impact on law enforcement services.
Policy 4.1.D.2:	Provide effective and efficient management of Public Safety resources.
Action Statements	
4.1.D.2b	Develop proposals and apply for appropriate governmental grants.
Fire Services Sub-element	
Policy 4.2A.4	Conduct field operations and emergency scene management in a safe, effective, and efficient manner.
Action Statements	
4.2A.4c	Maintain liaison with the Department of Public Works to assure an adequate and well-maintained water supply system for fire suppression purposes.
4.2A.4d	Identify and adopt methods and policies which provide safety,

	improve communications, and enhance command and control of emergency incidents.
4.2A.4e	Maintain policies and agreements with other agencies that provide for mutual emergency assistance when required.
Policy 4.2B.2	Operate a response system that will provide effective control and investigation of hazardous materials and emergencies.
Action Statements	
4.2B.2a	Provide a specially trained and equipped response team capable of mitigating emergencies resulting from hazardous material leaks, spills and discharges and conduct related inspections and permit activities.
Policy 4.2C.1	Provide controls based on fire and life safety codes, ordinances, permits and field inspections. Promote compliance through enforcement efforts.
Action Statements	
4.2C.1a	Revise and adopt appropriate codes, ordinances, and policies significant to fire and life safety issues.
4.2C.1d	Conduct building and permit inspections for safety at a frequency sufficient to promote compliance with appropriate codes and ordinances.
Policy 4.2C.2	Coordinate a comprehensive program designed to control and mitigate harmful effects resulting from the storage, use and transport of hazardous materials.
Action Statements	
4.2C.2a	Conduct inspection and permit activities consistent with laws and requirements governing the use and storage of hazardous substances.
4.2C.2b	Participate in cooperative efforts directed toward remedying problems associated with hazardous materials.
Policy 4.2C.3	Heighten public consciousness of fire and life safety in ways community members can not only prevent fires from starting but react properly to emergencies when they occur.
Action Statements	
4.2C.3g	Coordinate appropriate activities through the Special Operations Bureau.
Surface Runoff Sub-element	
GOAL C:	Ensure that flood hazards are recognized.
Policy C.2:	Prevent flooding to protect life and property.
Action Statements	
C.2.a	Encourage the SCVWD to periodically reevaluate the capacity of creeks and channels.
C.2.b	Encourage the SCVWD to maintain creeks and channels to remove flow-inhibiting vegetation, debris and silt.

C.2.c	Encourage the SCVWD to maintain dikes and levees at least 3 feet above the 1 percent flood level and to inspect and repair damage caused by burrowing animals.
C.2.d	Continue to maintain the flood plain management practices outlined by the FEMA and the Army Corps of Engineers.
Land Use and Transportation Element	
Goal C.3	Maintain a transportation system that is safe, pleasant, and convenient.
Policy C.3.2	Integrate the use of land and transportation systems.
Action Statement	
C.3.2.4	Continue to evaluate transportation impacts from land use proposals at a neighborhood and City-wide level.
Housing and Community Revitalization Sub-element	
Policy C.2	Continue to encourage and assist property owners to maintain existing developments in a manner that is aesthetically pleasing, free from nuisances and safe from hazards.
Policy C.2.a	The City should continue to offer technical assistance to homeowners to aid them in maintaining, upgrading and improving their property.
Action Statement	
	The Community Development Department offers a manual on residential construction standards and brochures regarding home maintenance and neighborhood improvement. These publications are available at the One-stop Permit center.
Policy C.3	Improve and continue to implement a citizen-orientated, proactive education program regarding Neighborhood Preservation.
Action Statement	
C.3.a	Continue to implement the Neighborhood Preservation Program.
	The Neighborhood Preservation Program consists of three key elements (1) Public education, (2) Proactive staff action, and (3) Neighborhood specific programs. The City periodically reviews existing codes, ordinances and use permit conditions to determine their current applicability to neighborhood and community preservation issues. The Neighborhood Preservation program is coordinated with other programs to avoid duplication of activity and maximize efficiency.

Mission Statements, Policies, and Key Initiatives

INTRODUCTION

The Seismic Safety and Safety Sub-element establishes a set of mission statements, policies and key initiatives designed to promote a safe community. It is Sunnyvale's commitment to incorporate these concerns when determining City actions and programs. This sub-element provides information and specific recommendations to guide decisions relevant to seismic safety and safety concerns.

The mission statements and policies of this document affect and can be affected by other sub-elements and are intended to be integrated with them.

Emergency management requires both short and long-term planning and implementation. It is also a continuing educational process. Implementation of this sub-element must also be recognized as ongoing and long term. The completion of certain key initiatives may require years to accomplish due to operational and/or financial constraints.

The mission statements, policies and key initiatives in this sub-element are based on the following principles:

1. The community members of Sunnyvale desire a living environment reasonably safe from natural or human-caused disasters.

2. The community members wish to maintain the basic character of the City.

3. The probability that the City will experience a major earthquake by 2037 is approximately 63 percent.

4. The City has not yet experienced the 1 percent or 100 year flood.

5. Hazard analysis and risk assessment are local responsibilities with regional implications. This responsibility requires strong local control and coordination with other local and regional agencies.

6. Effective emergency management requires coordination of all levels of government and public and private community resources.

7. Effective emergency preparedness by the community can mitigate the effects of disasters. A poorly prepared community will suffer the full effects of the disaster.

8. The City will be on its own for days or weeks following a major disaster because of probable isolation and the extremely high disaster related demands for services from state and federal resources. Other communities will experience the same disaster related effects.

Mission Statements, Policies, and Key Initiatives

Mission Statement A:	ENSURE THAT NATURAL AND HUMAN-CAUSED HAZARDS ARE RECOGNIZED AND CONSIDERED IN DECISIONS AFFECTING THE COMMUNITY, AND THAT LAND USES REFLECT ACCEPTABLE LEVELS OF RISK BASED ON IDENTIFIED HAZARDS AND OCCUPANCY.
Policy A1	**Land Use** Evaluate and consider existing and potential hazards in developing land use policies. Make land use decisions based on an awareness of the hazards and potential hazards for the specific parcel of land.
Key Initiatives:	
A.1.1	Encourage coordination of planning decisions, concerns and information sharing among the neighboring cities, affected agencies and interested citizen groups.
A.1.2	Retain existing residential sprinkler and fire resistive roofing requirements.
A.1.3	Encourage and cooperate with seismic and geologic investigations in the Sunnyvale planning area by agencies such as the United States Geological Survey, the California Division of Mines and Geology, and Association of Bay Area Governments.
A.1.4	Require geotechnical reports for new developments and redevelopments in the City.
A.1.5	Continue to adopt and enforce the latest State building and fire codes, and ensure staff receives adequate training to apply the latest codes.
Policy A2	**Flood Hazards** Take measures to protect life and property from the effects of a 1% (100 year) flood.
Key Initiatives:	
A.2.1	Encourage the Santa Clara Valley Water District to reevaluate the capacity of Stevens Creek, Calabazas Creek, Sunnyvale East, West and El Camino Flood Control Channels in relation to a 1% (100 year) flood.
A.2.2	Encourage and monitor the work of the Santa Clara Valley Water District (SCVWD) in maintaining all creeks and channels in Sunnyvale free of flow inhibiting vegetation, debris and silt.
A.2.3	Encourage SCVWD to maintain their dikes and levees at least 3 feet above the 1% flood level and to provide continued inspection and repair from damage caused by burrowing animals.
A.2.4	Maintain the flood plain management practices as outlined by the Federal Emergency Management Agency and the Army Corps of Engineers.
A.2.5	Participate in the National Flood Insurance Program.
Policy A3	**Hazardous Materials** Promote a living and working environment safe from exposure to

	hazardous materials.
Key Initiatives	
A.3.1	Maintain current information on the hazardous materials used in Sunnyvale businesses and their potential hazards to the community.
A.3.2	Participate in future development of proposed state and local code changes in storage and handling methods for hazardous materials.
A.3.3	Maintain the City's status as a Unified Program Agency as certified by the Environmental Protection Agency
Policy A4	**Aviation Hazards** Make planning decisions that establish and/or maintain a safe mix of aviation and land use for the areas affected by NASA/Ames Moffett Field.
Key Initiatives:	
A.4.1	Oppose any effort to promote Moffett Field for civil/general aviation.
Policy A5	**Essential Services** Maintain lifelines in good operating condition to lessen damage and increase survivability after a major disaster.
Key Initiatives:	
A.5.1	Encourage the state and county to maintain and/or improve their over crossings to increase their ability to survive a major seismic event.
A.5.2	Encourage Pacific, Gas and Electric and AT&T to assess maintain and, if necessary, improve their facilities to increase their ability to survive a major seismic event.
A.5.3	Study, evaluate and fund the improvements needed to the levee system at the Water Pollution Control Plant to increase its ability to survive a major earthquake.
A.5.4	Actively pursue funding for the under groundling of utilities in accordance with the principals and guidelines of Public Utilities Commission and PG&E Tariff Rule 20 -A.

*Lifelines are essential services necessary for the continued normal functioning of the community, e.g. water, gas, electricity, transportation and communication lines.

Mission Statement B:	ENSURE THAT THE CITY, ITS COMMUNITY MEMBERS, BUSINESS, INDUSTRY, FAITH-BASED ORGANIZATIONS, COMMUNITY ORGANIZATIONS, AND SPECIAL NEEDS POPULATIONS ARE PREPARED TO EFFECTIVELY RESPOND TO MAJOR EMERGENCIES.
Policy B1	**Emergency Response Facilities** Construct or maintain City facilities utilized for emergency response to Essential Services Buildings, so that they remain operable after a major seismic event.
Key Initiatives:	
B.1.1	Inspect City owned facilities to ensure compliance with seismic safety/safety standards as needed. Fund capital projects when necessary to bring critical facilities up to seismic standards.
B.1.2	Construct new City facilities as Essential Services Buildings to meet or exceed seismic safety/safety standards so that they will remain operable after a major earthquake or disaster.
Policy B2	**Emergency Management Organization** Provide for the emergency management of the City in order to respond effectively and to assure life and property safety in the event of a disaster.
Key Initiatives:	
B.2.1	Provide annual and just-in-time training for those persons assigned to the Emergency Management Organization.
B.2.2	Frequently review the EMO chart, responsibilities and tasks so that it reflects sound emergency management principles.
B.2.3	Maintain an Emergency Operations Center for direction and control of disaster response and recovery.
B.2.4	Develop an alternate EOC site, in the event of loss of the primary site.
Policy B3	**Emergency Planning & Coordination** Provide an integrated approach to planning and management for emergencies and disasters.
Key Initiatives:	
B.3.1	Identify, assess and maintain data on hazards to the community.
B.3.2	Maintain an Emergency Plan and update it as necessary.
B.3.3	Identify and maintain communications and coordination with community resources that will provide assistance during emergencies.
B.3.4	Coordinate planning and training with other agencies and jurisdictions to provide an effective and coordinated response to any emergency/disaster.
B.3.5	Train employees and operational units in emergency preparedness and disaster response procedures appropriate to their job function.
B.3.6	Maintain communication with and provide training exercises to

	improve coordination between City staff and private support organizations.
B.3.7	Evaluate City resources and make recommendations for improving City self-reliance during emergencies.
B.3.8	Provide assistance to residents and businesses in emergency preparedness.
B.3.9	Identify and evaluate the role of faith-based and other community-based organizations, and determine their role in an emergency
B.3.10	Integrate the needs of special needs populations into the planning, prevention, response, mitigation and recovery phases of emergency management.
B.3.11	Evaluate and improve interoperability of communications systems to facilitate the effective use of radio and data information exchange during emergencies and disasters
Policy B4	**Schools** Provide information to public/private schools and day care centers to assist in their planning and preparedness for emergencies and disasters.
Key Initiatives:	
B.4.1	Assist schools and day care centers in emergency preparedness.
B.4.2	Encourage private schools and day care centers not constructed under the Field Act to evaluate and improve their buildings for seismic safety.
B.4.3	Assist in the development of emergency preparedness curriculum and training materials for schools and day care centers.
Policy B5	**Business and Industry** Provide information and assistance to business and industry to encourage their own planning and preparedness for emergencies and disasters.
Key Initiatives:	
B.5.1	Provide available emergency preparedness information to businesses and industries that request assistance.
B.5.2	Encourage business and industry to plan for recovery from catastrophic events.
Policy B6	**Community** Provide the community members of Sunnyvale information, encouragement and assistance with emergency planning and preparedness.
Key Initiatives:	
B.6.1	Provide community members with information on self-help before, during and after a disaster.
B.6.2	Provide speakers for emergency preparedness talks to interested community members and community groups.
B.6.3	Identify and coordinate community volunteers that wish to

	participate in planning, prevention, preparedness, response and recovery activities.
Policy B7	**Communications** Provide emergency radio or other communication devices for coordination of emergency response and the capability to communicate with outside agencies and community members.
Key Initiatives:	
B.7.1	Periodically review emergency radio capabilities to enhance survivability during a major disaster.
B.7.2	Assist and encourage volunteer amateur radio operators to participate actively during a disaster or emergency as part of SARES.
Policy B8	**Grant Funding** Actively seek and apply for grant funding from available governmental and private sources that would enhance emergency preparedness
Key Initiatives:	
B.8.1	Periodically participate in a needs assessment of emerging concepts involving emergency preparedness that could be met with grant funding
B.8.2	Enhance and upgrade existing emergency preparedness equipment and practices utilizing grant funding.

Mission Statement C:	ENSURE THAT THE CITY, ITS COMMUNITY MEMBERS, BUSINESS AND INDUSTRY ARE PREPARED TO RECOVER FROM DISASTERS.
Policy C1	**City Government** Provide for the continuation of City government and services following a major disaster as quickly as feasible.
Key Initiatives:	
C.1.1	Maintain a thorough and current Emergency Plan that provides information for the continuation of City government immediately following a disaster.
C.1.2	Plan for the recovery and resumption of all City operations after a disaster.
Policy C2	**Community Members and Business/Industry** Encourage community members and business/industry to plan for recovery from disasters as quickly as feasible.
Key Initiatives:	
C.2.1	Provide assistance to local businesses in planning for recovery and resumption of business after a disaster.
C.2.2	Provide guidance to community members on disaster recovery through brochures, talks and other outreach methods.
C.2.3	Encourage community members/businesses to purchase

	earthquake or other catastrophic insurance coverage.

UPDATING THE SEISMIC SAFETY AND SAFETY SUB-ELEMENT

Periodic updating can provide current information and measure success achieved toward meeting the stated goals. Annual updates should be made for data which lends itself to yearly review. Ten year updates should also include data from the Community Development and Public Works Departments, the United States Geological Survey and the California Division of Mines and Geology and Association of Bay Area Governments.

Annual:

- Review hazards and land use.
- Review public and private sectors preparedness planning.

Ten Year:

- Reevaluate all mission statements, policies and key initiatives for success and appropriateness
- Identify new trends related to emergency preparedness.
- Evaluate data from other agencies used in the Sub-element.
- Anticipate future conditions

APPENDIX A - GLOSSARY OF TERMS

Active faults — Active faults are faults which show evidence of any or all of the following:

- Topographic or physiographic expressions suggestive of geologically young fault movements
- Fault creep.
- Records of surface rupture within or adjacent to the study area in historic time

Alluvial fans — Alluvial fans are built by rivers flowing from mountains onto lowlands. They are low cone-shaped heaps, steepest near the mouth of the valley, and sloping gently outward with ever decreasing slope.

Alluvium — A general term for the sediments laid down in river beds, flood plains, lakes, fans at the foot of the mountain slopes, and estuaries during relatively recent geologic times.

Amplification — The increase in earthquake ground motion that may occur to the principal components of seismic waves as they enter and pass through different earth materials.

Annex — An addition to the emergency plan and/or general plan.

Anomaly — A deviation or inconsistency of a specific land feature from uniformity with the larger area.

Aquifer — A permeable layer of rock that contains enough group water to yield significant quantities of water to wells and springs.

Displacement — The dislocation of one side of a fault relative to the other side resulting from fault movement.

Earthquake — Perceptible trembling to violent shaking of the ground produced by sudden displacement of rocks below and at the earth's surface.

Epicenter — The geographical location of the point on the surface of the earth that is vertically above the earthquake focus.

Focal depth — Depth of an earthquake focus below the ground surface.

Focus — The point within the earth which marks the origin of the elastic waves of an earthquake.

Free face — A sloping surface exposed to air or water such that there is little or no resistance to lateral movement of earth materials.

Geology	The science which treats of the earth, the rocks of which it is composed, and the changes which it has undergone or is undergoing.
Ground failure	A situation in which the ground does not hold together such as in a landslide, mud flow or liquefaction.
Ground lurching	Undulating waves in soft saturated ground that may or may not remain after the earthquake.
Ground strength	The limiting stress that ground can withstand without failing by rupture or continuous flow.
Habitable land	Land that is zoned for commercial, industrial, office, public or residential development.
Infrastructure	The substructure or underlying foundation of the City; especially the basic installations and facilities on which the continuance and growth of the City depends. This includes schools, roads, communications systems, utilities, etc. (See Lifelines)
Intensity	A nonlinear measure of earthquake size at a particular place as determined by its effect on persons, structures, and earth materials. The principal scale used in the United States today is the Modified Mercalli, 1956 version. Intensity is a measure of effects as contrasted with magnitude which is a measure of energy. They are not the same.
Inundation	Flooding caused by water topping a dam or water released by dam, reservoir, levee or other break.
Lifelines	Lifelines are the utility services and communication and transportation lines necessary for the continued functioning of the community. (See Infrastructure)
Liquefaction	A process by which water saturated sand loses coherence when shaken. Involved is the collapse of sand grains into intergranular voids which induces an increase in pore pressure and loss of strength. This loss of strength leads to a quicksand condition in which objects can either sink or float depending on their density.
Magnitude	The rating of a given earthquake is defined as the logarithm of the maximum amplitude on a seismogram written by an instrument of specified standard type at a distance of 62 miles from the epicenter. It is a measure of the energy released in an earthquake. The zero of the scale is fixed arbitrarily to fit the smallest recorded earthquakes. The scale is open ended but the largest known earthquake magnitudes are near 8.75. Because the scale is logarithmic, every step of one magnitude unit means a 32 fold increase in energy release. A magnitude

7 earthquake releases 32 times as much energy as a magnitude 6 earthquake. Magnitude is not the same as intensity.

Plate tectonics An Earth model in which a small number (10-25) of large, broad, thick plates of the Earth's surface believed to "float" on an under layer and move more or less independently, grinding against each other like ice floes in a river. The plates are propelled from the rear by sea-floor spreading. The continents form part of the plates and move with them like blocks of wood in an ice floe.

Sediment Solid material settled from suspension in a liquid.

Seismic Pertaining to an earthquake or earth vibration, including those that are artificially induced.

Seiches A wave generated in an enclosed body of water.

Seismic Velocity The rate of propagation of an elastic wave. The speed at which an earthquake moves through the ground. It is affected by the properties of the earth through which it is moving.

Seismograph An instrument that measures continuously a record of earth vibrations.

Seismology The science of earthquakes and related phenomena.

Soil profile A vertical section of a soil that shows all its layers and the material from which it was derived.

Subsidence A shrinking of a large area of land, usually observed as shrinkage.

Tectonics A study of the origin, relations, and evolution of structural features of the Earth's crust, such as folding and faulting of the rocks.

Topography The physical features of the land, especially its relief and contour.

Tsunami The literal translation means great harbor waves in Japanese. A Tsunami is not a single wave but a series of waves caused by the sudden shift or subsidence of the sea floor which accompanies some earthquakes. Tsunamis are characterized by great speed and may cause considerable damage along on an exposed coast thousand of miles from the source.

Water tables The upper surface of a zone where ground water is saturated in the earth below that point.

APPENDIX B – ACRONYMS

ABAG	Association of Bay Area Governments
BAYMACS	Bay Area Mutual Aid Communications System
CAD	Computer Aided Dispatch
CDD	Community Development Department
CDM	Collaborative for Disaster Mitigation
CRS	Community Rating System
DPS	Department of Public Safety
DPW	Department of Public Works
DSW	Disaster Service Worker
EAS	Emergency Alert System
EIR	Environmental Impact Report
EMAC	Emergency Management Assistance Compact
EMO	Emergency Management Organization
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERT	Emergency Response Team
FAA	Federal Aviation Authority
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map

GIS	Geographic Information Systems
HAZUS	Hazards U.S. Multi-hazard
HSPD	Homeland Security Presidential Directive
ICC	International Code Council
ICS	Incident Command System
LHMP	Local Hazard Mitigation Plan
NASA	National Aeronautics and Space Administration
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NVOAD	National Voluntary Organizations Active in Disaster
OCM	Office of the City Manager
OES	Office of Emergency Services
PG&E	Pacific Gas and Electric Company
PIO	Public Information Officer
SAP	Safety Assessment Program
SARES	Sunnyvale Amateur Radio Emergency Services
SCVWD	Santa Clara Valley Water District
SEMS	Standardized Emergency Management System
SEPO	Sunnyvale Emergency Preparedness Organization
SFBR	San Francisco Bay Region
SMC	Sunnyvale Municipal Code
SNAP	Sunnyvale Neighborhoods Actively Prepare
SVRIP	Silicon Valley Regional Interoperability Project

SWAT	Special Weapons and Tactical Team
UCERF	Uniform California Earthquake Rupture Forecast
URM	Un-reinforced Masonry
USGS	United States Geological Survey
VERT	Volunteer Emergency Response Team
VoIP Project	Voice Over Internet Protocol
WPCP	Water Pollution Control Plant

APPENDIX C - CITY COUNCIL RESOLUTION

RESOLUTION NO. 327-08

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SUNNYVALE AMENDING THE GENERAL PLAN BY REVISING THE SEISMIC SAFETY AND SAFETY SUB-ELEMENT OF THE COMMUNITY DEVELOPMENT ELEMENT

WHEREAS, the Department of Community Development has proposed an amendment to the 1972 General Plan of the City of Sunnyvale, as amended, by revising the Seismic Safety and Safety Sub-Element of the Community Development Element, which proposed Sub-Element is set forth in Report to Council No. 08-178 dated June 10, 2008; and

WHEREAS, no new development or change in policy that would affect the physical environment is proposed through the Community Development Element and therefore, pursuant to Title 14 of the California Code of Regulations, Section 15061(b)(3), no additional environmental review is required. The vision for the community and the related goals will be implemented through the adoption of the functional elements of the General Plan and appropriate environmental review and documentation will be conducted at that time; and

WHEREAS, CEQA - EXEMPTION. The City Council finds, pursuant to Title 14 of the California Code of Regulations, Section 15061(b)(3), that this ordinance is exempt from the requirements of the California Environmental Quality Act (CEQA) in that it is not a Project which has the potential for causing a significant effect on the environment.

WHEREAS, the Planning Commission held a noticed public hearing on the proposed amendments on May 12, 2008, after which the Planning Commission recommended that the City Council adopt the amendment; and

WHEREAS, the City Council held a noticed public hearing to consider adoption of the amendment on June 10, 2008, at which time certain amendments to the Sub-Element were approved;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SUNNYVALE THAT:

1. The City Council finds and determines that the proposed amendment to the Seismic Safety and Safety Sub-Element of the Community Development Element conforms with the requirements provided for in the Sunnyvale Municipal Code, that it is a suitable and logical change of the General Plan for the development of the City of Sunnyvale, and that it is in the public interest.

2. The revised Seismic Safety and Safety Sub-Element of the Community Development Element, as adopted, a copy of which is on file in the Office of the City Clerk of the City of Sunnyvale, is hereby incorporated into the 1972 General Plan of the City of Sunnyvale.

3. The Mayor and City Clerk are directed to endorse the amendment to the 1972 General Plan of the City of Sunnyvale and to show that the same has been adopted by the City Council.

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4. The City Clerk is directed to file a certified copy of the amendment to the 1972 General Plan of the City of Sunnyvale with the Board of Supervisors and the Planning Commission of the County of Santa Clara and the planning agency of each city within the County of Santa Clara. The City Clerk is further directed to file a certified copy of the amendment with the legislative body of each city, the land of which may be included in said plan.

Adopted by the City Council at a regular meeting held on June 10, 2008, by the following vote:

AYES: SPITALERI, HAMILTON, HOWE, LEE, SWEGLES, MOYLAN, WHITTUM
NOES: NONE
ABSTAIN: NONE
ABSENT: NONE

ATTEST: APPROVED:

City Clerk Mayor
(SEAL)

APPROVED AS TO FORM AND LEGALITY:

David E. Kahn, City Attorney