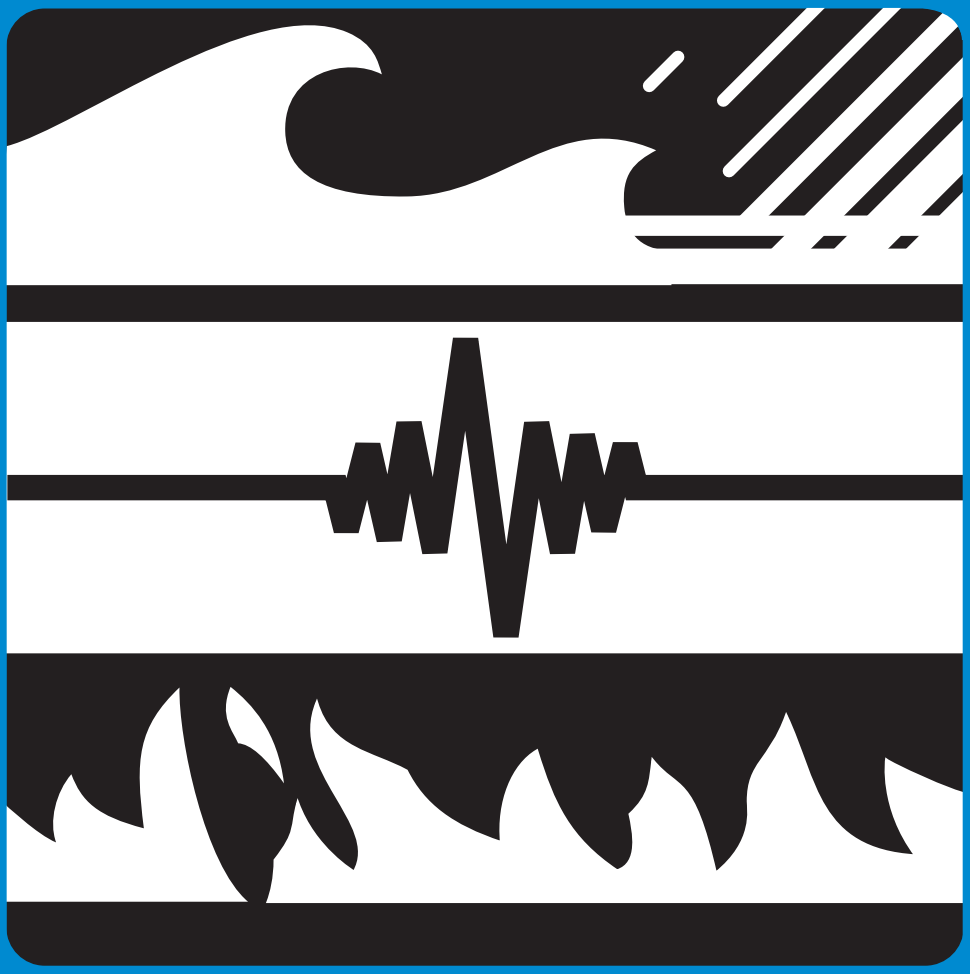
SAFETY ELEMENT



DEPARTMENT OF CITY PLANNING LOS ANGELES, CALIFORNIA

City Plan Case No. 95-0371
Council File No. 86-0662

SAFETY ELEMENT
OF THE LOS ANGELES CITY GENERAL PLAN

Relates to Natural Hazards, Not Police Matters

Replaces the 1975 Safety, 1974 Seismic Safety and 1979 Fire Protection & Prevention Elements

Approved by
the City Planning Commission
August 8, 1996

Adopted by
the City Council
November 26, 1996

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INTRODUCTION

State law since 1975 has required city general plans to include a safety element which addresses the issue of protection of its people from unreasonable risks associated with natural disasters, *e.g.*, fires, floods, earthquakes. It did not intend that a safety element address police matters, except in the context of natural disasters. In 1984, the State deleted the seismic safety element from its list of mandated general plan elements and incorporated the seismic provisions under the safety element provisions. The subject Safety Element provides a contextual framework for understanding the relationship between hazard mitigation, response to a natural disaster and initial recovery from a natural disaster. It replaces three previously adopted elements of the City's General Plan: the Safety Element, Fire Protection and Prevention Element, and Seismic Safety Element.[1] All three have been revised and combined into the subject Element. Drainage, water and fire facilities will be addressed in greater detail by facilities or infrastructure elements of the General Plan.

An important premise of the Safety Element is that Los Angeles is a built city that is integrally connected to its neighbors geographically and by natural disasters which recognize no boundaries. Therefore, the Element outlines the historic evolution in Los Angeles of local, state and federal roles, particularly relative to mitigation of and response to natural disasters. The last section of the Element contains goals, objectives, policies and broadly stated programs. The programs outlined are programs of the City Emergency Operations Organization (EOO). The EOO is the City agency (program) which implements the Safety Element.

Following the 1994 Northridge and 1995 Kobe, Japan earthquakes a variety of studies and cooperative information exchange ventures were initiated to expand knowledge concerning earthquakes so that people could be better protected in the event of future significant seismic events. Kobe, Northridge and other seismic event information is being used in formulating methodologies for strengthening buildings and structures to more successfully withstand severe damage and to better protect occupants and equipment during various types and degrees of seismic events.

The California State Geologist's Seismic Hazards Mapping Program is preparing the State's official seismic hazard maps. The maps will identify amplified shaking, liquefaction and landslide hazard zones. Once the maps become available they will be used in revising the City's building, zoning and other codes, plans, standards, procedures and/or development permit requirements.

Chapters I and III of this Safety Element outline the scope of the EOO's on-going efforts to use experiences and new information to improve the City's hazard program. Chapter II outlines the City's historic commitment to improving its prevention of controllable disasters, mitigation of impacts associated with disasters and response to disaster events.

[1] *Adopted by the City Council on September 19, 1975, January 16, 1979 and September 10, 1974, respectively.*

CHAPTER I - BACKGROUND

PLANNING AREA

The Safety Element relates to the entire City of Los Angeles. Within the City's boundaries are approximately 465 square miles of land area, including approximately 214 square miles of hills and mountains. The San Gabriel and Santa Susana Mountains bound the City on the north, the Santa Monica Mountains extend across the middle of the City. The Palos Verdes Hills and Pacific Ocean are on the south and west. Because flood, fire and seismic events, geologic features and potential hazards relate to each other and transcend the City's boundaries, this Element takes into account other jurisdictions and governmental entities.

DEMOGRAPHICS

The 1990 Federal census estimated that the City's population was 3,485,399 individuals. The 1995 General Plan "Framework" element estimated that the population of Los Angeles City would be increased by approximately 820,000 people to 4,306,564[2] and that employment would be increased by an estimated 390,000 jobs by the year 2010.

EMERGENCY OPERATIONS ORGANIZATION AND OTHER INTERAGENCY COORDINATION

Emergency Operations Organization (EOO). The EOO is the City agency that implements the Safety Element. Therefore, it is the only "program" identified by the Element. The EOO is a unique City department, as indicated in the following.

EOO background and history. After every significant emergency, City personnel evaluate the effectiveness of response, ways to improve response and how to reduce potential loss of life, injury and property damage in future similar events. Natural disasters within the City, as well as disasters in other parts of the world, have added to existing knowledge about disaster preparedness. Historically most jurisdictions rely on emergency personnel (police, fire, gas and water) to respond to and handle emergencies. In many jurisdictions, emergency agencies work independently of one another; situation which can lead to command and effectuation conflicts and inefficiencies.

In the late 1970s it was recognized that Los Angeles enjoyed a significant number of public and private resources which could be mobilized to respond to emergencies and provide assistance to victims. However, most of the services operated independently of each other. To evaluate how to make better use of government and private resources, Mayor Tom Bradley convened a task force to study the situation and recommend a plan of action. The task force recommended establishment of a unified, streamlined chain of command to maximize the limited City resources which were available for response to emergency situations. To accomplish this goal the City, in 1980, adopted the Emergency Operations Ordinance (Ordinance No. 153,772) which established a multi-agency Emergency Operations Organization (EOO) under the direction of the Mayor and administration of an Emergency Operations Board (EOB). At the time, it was the only city organization of its kind in the United States.

EOO description. The EOO is an operational department of the City pursuant to City Administrative Code Division 8, Chapter 3. It is a "department without walls" which is comprised of all agencies of the City's government. However, unlike traditional departments, the EOO is not located physically in any one place. It is a chain of command and protocols which integrate the City's emergency operations into a single operation. It centralizes command and information coordination so as to enable the chain of command to operate efficiently and effectively in deploying resources.

The Emergency Operations Board (EOB) supervises the EOO (*i.e.*, City) emergency preparedness, response and recovery. It is comprised of the heads of the City's critical emergency operations agencies, *e.g.*, Board Public Works, Fire and Police departments, *etc.* The Chief of Police is chair of the EOB, the City Administrative Officer is the vice chair responsible for coordinating non-emergency EOO activities and the City Attorney is the legal advisor

[2] *The figure is consistant with the estimate used by the Southern California Association of Governments.*

to the EOB. The Mayor, in time of emergency, directs the 13 operational divisions of the EOO. Each division is responsible for carrying out specific tasks for coordinating emergency actions which are essential in abating the impacts and limiting the scope of a catastrophe; responding to life threatening situations and safety needs of the population; maintaining and reestablishing essential services, transportation and communication networks; aiding dislocated people; and planning for recovery. Various City agencies are responsible for coordinating the activities of their assigned divisions. For example, the EOO ordinance specifies that the Transportation Division is under the responsibility of the general manager of the City Department of Transportation and is responsible for developing plans

> "for the maintenance of traffic control devices, emergency travel routes to be used in the event of an emergency, placement of barricades as necessary or as directed by the chiefs of the Police and Fire Suppression and Rescue Divisions, direction and control of traffic and coordination with all other agencies supplying common carrier services."

An Emergency Management Committee (EMC) provides staff to support the EOB. Over two dozen City agencies, other governmental agencies and private organizations participate in activities of the EMC. The EMC develops plans and programs and conducts training exercises to promote integrated disaster planning, response and mitigation efforts.

An Emergency Operations Center (EOC) of the EOO provides a centralized coordination facility for emergency response activities. The EOC is located four floors underground and is equipped with vital communications and backup power, food and other supplies necessary to provide for the needs of the EOO emergency response coordinating team for approximately two weeks. A mobile EOC unit is available in the event the primary center is inaccessible or to provide additional disaster response coordination capability. It is comprised of a fleet of vehicles which contain portable offices, communications, self-sustaining power, rest rooms and other resources to enable the mobile EOC unit to operate at any location to which it is sent.

To enhance communications and provide additional communications back-up, the City, as a member of the Operational Area Satellite Information System (OASIS), through the EOO is linked to the Governor's Office of Emergency Services (OES) by satellite. At the time this Element was prepared, Los Angeles was the only city participating in OASIS. OASIS interconnects all of the counties within the State to the OES which in turn is linked to national communications systems.

In the event of a disaster or emergency, the Mayor assumes emergency powers, as defined by law. City agencies follow procedures contained in their emergency plans, under the direction of the Mayor and Chief of Police, pursuant to EOO protocols set forth in the EOO ordinance and plans.

The EOO Master Plan and individual agency "Emergency Response Plans" set forth procedures for City personnel to follow in the event of an emergency. "Annexes" to the Master Plan include hazard-specific plans (*e.g.*, flood), situational contingency plans for known or anticipated events (*e.g.*, annual L.A. Marathon) and pre- and post-event plans (*e.g.*, "Recovery and Reconstruction Plan").

Other interagency coordination. Individual jurisdictions long have cooperated with one another in responding to emergency incidents. At one time emergency response personnel had to remain at their own boundaries, unable to respond to fires or other emergencies across their borders due to territorial requirements. Such territorial limitations were recognized as unacceptable for maintaining public health and safety and resulted in informal and formal aid arrangements between agencies and jurisdictions. These typically enabled the closest available unit to respond to an emergency incident. The agreements usually provided for compensation of the responding jurisdiction for services rendered. Interjurisdictional assistance to assure public safety, protection and other assistance services today generally are in the form of "mutual aid" agreements.

Mutual aid and other agreements provide for voluntary cooperative efforts and for provision or receipt of services and aid to or from other agencies or jurisdictions when local capabilities are exceeded by an emergency event. Through mutual aid agreements, the EOO and individual City agencies coordinate emergency response planning with adjacent cities, the County of Los Angeles, the State, federal agencies and other public and private

organizations, such as the Los Angeles Unified School District and the American Red Cross. In addition they share information so as to improve hazard mitigation efforts and coordinate resources for disaster response and recovery. For example, in the event of a disaster, Los Angeles County is required by State law to provide the City with coroner, health, mental health, prosecutorial, court and children's services. The OES is designated by law to provide coordination and State resources to regions or local areas which are declared disaster areas by the Governor. The Federal Emergency Management Agency (FEMA) is designated by federal law to coordinate and provide Federal resources to state and local government relative to disasters declared by the President. To facilitate rapid response to wild fires in brush and forest areas, the U.S. Forest Service has agreements with the County and City fire services for simultaneous dispatch of personnel and equipment to fight fires in designated geographic areas ("Initial Action Zone"). The Public Works Mutual Aid Agreement, conceived by Los Angeles County in the late 1980s, provides for sharing of personnel and public works equipment between signatory cities and counties within the State during times of emergency. In addition, sometimes the City provides a specific service by contract to another jurisdiction. For example, for a set fee, the City provides fire and emergency medical services to the City of San Fernando which is geographically surrounded by Los Angeles.

Following the disastrous Oakland-East Bay Hills fire of 1991 the State legislature directed the OES, in coordination with other State agencies and interested local emergency management agencies, to establish by regulation the Standardized Emergency Management System (SEMS). The SEMS became effective September 1994 (Government Code Section 8607). It is a command management system which is based upon the Incident Command System (ICS).[3] Like ICS, the SEMS is not a physical agency, it is a procedure for integrating emergency response functions. It sets forth a system and framework within which response agencies which utilize the SEMS can function in an integrated fashion, in effect becoming a single response entity. The SEMS outlines a chain of authority (command) for organization of all public emergency response functions within the State. As its name implies, the SEMS provides guidelines for standardization of procedures and approaches to emergency response; facilitation of the flow of information and resources between organizational levels (field, local government, operation area, regional and state); coordination between responding agencies; and rapid mobilization, deployment, use and tracking of resources. Cities and counties are encouraged to utilize the SEMS in order to qualify for State funds for emergency response activities. At the time this Safety Element was under preparation the EOO was reorganizing so as to implement the SEMS for the City of Los Angeles.

In addition to agreements between government entities, private organizations play a key role in disaster planning and response. In particular, the American Red Cross, Salvation Army, churches and other non-profit organizations provide food, shelter, clothing, health care, volunteer labor and other emergency services to disaster victims, in coordination with the governmental agencies. A variety of private sector organizations have been formed to coordinate community emergency preparedness efforts, to heighten public awareness and understanding of the need for disaster preparedness and to encourage private disaster preparedness activities. Los Angeles Unified School District and City park facilities are the designated assembly and coordination locations for emergency sheltering and assistance efforts coordinated by the Red Cross, the State and/or FEMA. In addition, the Red Cross provides interagency emergency response planning and training support.

CALIFORNIA STATE SAFETY ELEMENT REQUIREMENTS

General mandates and guidelines. City and county general plans are required to contain a safety element which addresses natural disaster hazards. This Safety Element fulfills this State requirement. It should be noted that the term "safety" does not mean "police." Safety, in the context of the General Plan law and the subject Safety Element, addresses natural hazards associated with fire, flood, earthquake, landslides and other hazards generally asso-

[3] *For more about the Incident Command System, see Chapter II: Fire and Rescue.*

ciated with or compounded by natural events. State law also indicates that hazardous materials should be addressed by a safety element. In this Element, hazardous materials are addressed primarily in relation to natural disaster hazards, *e.g.*, release of stored chemicals as a result of fire or earthquake. Other elements of the General Plan address other hazardous materials issues.

Local officials have the authority to declare a local emergency and to invoke emergency regulations to facilitate response to the emergency. Planning and preparedness are critical in mitigating the extent of the impacts of a disaster, through pre-disaster abatement, pre-disaster response preparation and post-disaster recovery plans. The State identifies local safety elements as key tools for assisting local jurisdictions in organizing their hazard mitigation, disaster response and recovery efforts.

In 1975, the State mandated that general plans contain safety elements. The general plan law was amended in 1984 to remove seismic elements from the list of required elements and to incorporate seismic provisions within the safety element provisions. The amended law (California Government Code Section 65302.g) requires that a city's general plan contain a

> "safety element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mud slides and landslides; subsidence and other geologic hazards known to the legislative body; flooding; and wild land and urban fires."

These components need not be contained within the same general plan document. Other components may be added, as deemed appropriate by a local jurisdiction. A city within a county may adopt by reference all or part of the county's safety element, providing that the county element is sufficiently detailed to apply to the City.

The intent of the State in requiring mandatory planning was to reduce deaths, injuries, property damage and economic and social dislocation resulting from "natural hazards." A safety element is intended to be the primary vehicle for relating local safety planning to land use planning and decisions.

Jurisdictional infrastructures, such as roads and emergency services, have become increasingly interrelated. Therefore, local jurisdictions are encouraged by the State to coordinate their general plans with neighboring jurisdictions. The Los Angeles County Safety Element includes all of the cities and unincorporated areas within the County and interrelates the critical service systems, evacuation routes, *etc.* for the entire county. The subject Element and its associated graphic exhibits utilize and are consistent with the County Safety Element.

State required mapping and content. Relative to fire and geologic hazards, a safety element is to take into account maps of known seismic and other geologic hazards and to address peak load water supply requirements, minimum road widths (for evacuation purposes) and clearances around structures (for emergency access). For information about seismic and landslide hazards mapping, see Chapter II, "Seismic Events."

Dam failure inundation diagrams are encouraged by the Governor's Office of Planning and Research to be incorporated into a safety element. The diagrams are to show the areas of potential flooding in the event of dam failure. In addition, pursuant to the State Emergency Services Act (Government Code Section 8550), the City Department of Water and Power provides dam failure inundation maps to the State Office of Emergency Services via the County of Los Angeles. These maps are the basis of the County inundation maps which were a resource for preparation of the inundation exhibit which is a part of this Element (Exhibit G).

Landslide hazard identification maps are encouraged by the State Office of Planning and Research to be considered in a safety element. A landslide exhibit is included in the attached exhibits (Exhibit C).

State required consultation. Pursuant to Government Code Section 65302g, staff on January 6, 1994, prior to proceeding with the preparation of the subject element, contacted the State Division of Mines and Geology and the State Office of Emergency Services to advise them that preparation of the City Safety Element was about to commence and to solicit advice concerning plan preparation. Staff was advised by these offices that the County of Los Angeles Safety Element provided research data

in its technical appendices, including geologic, seismic, wildfire, critical facilities (*e.g.*, evacuation route) and other exhibits, which adequately covered the City of Los Angeles. They advised that the County reports provided an adequate technical basis and could be utilized by reference for the City's element.

Technical references. The City Planning Department reviewed the County Safety Element and decided that it did not contain sufficient City-oriented information to be adopted as the City's safety element. The background data and information concerning the character of natural hazards and history of natural disasters and events relative to the County and its immediate environs provided excellent technical information. However, it did not provide adequate specific information about the history of disaster mitigation in the City. Further, the goals, objectives, policies and programs contained in the County element generally did not apply to the City. Therefore, the City decided to prepare its own safety element and to use the "Technical Appendix to the Safety Element of the Los Angeles County General Plan: Hazard Reduction in Los Angeles County" as a technical resource and its exhibits as a basis for some of the exhibits contained in the City's element. The County Technical Appendix was prepared by Leighton and Associates, Incorporated in cooperation with Sedway Cooke Associates and William Spangle and Associates, December 1990.

The principal data source for the City Safety Element was the Los Angeles City General Plan Framework 1994 Draft Environmental Impact Report (DEIR). In addition to the County Technical Appendix and Framework DEIR, additional information was secured from City historic records, a variety of informational sources and oral interviews with technical staff of various City and other agencies. The exhibits which accompany the Element were based primarily on the County Technical Appendix exhibits and Framework DEIR exhibits, for which the County Technical Appendix was a resource. The City's Safety Element exhibits include information required by the State. They are comparable to and consistent with the County Safety Element exhibits which were deemed by the State to be in compliance with its requirements.

State required format, implementation and monitoring. In addition to State law, the Governor's Office of Planning and Research issues "General Plan Guidelines." The document provides guidance for preparation of local general plans. The 1990 Guide, under which this Safety Element was prepared, advises that a general plan contain goals, objectives, policies, programs and implementation monitoring. The goals are to be general and abstract, suggesting specific actions for achievement. Objectives are to express intermediate steps for achieving goals. Policies are to guide decision making. Each policy is to have at least one corresponding implementation measure.

Los Angeles was the first city in the State to establish an "Emergency Operations Organization" (EOO). The City, through its EOO has developed integrated operational, contingency and long range plans to address all aspects of potential emergency and disaster situations. Therefore, Los Angeles already goes far beyond the intent of the State general plan law and Governor's guidelines relative to a comprehensive City safety element. In keeping with the national, State and City efforts to streamline emergency operations, including planning, the Safety Element complies with the State's general plan laws without creating a new bureaucratic layer or causing duplication of government work. To this end it identifies only one implementation program, the EOO.

The three Safety Element goals parallel three of the primary phases of disaster planning: hazard mitigation (pre-disaster), emergency response (disaster event) and recovery (post-disaster). For the purposes of this Element, planning and training are incorporated under each of these phases. The three categories identify the three steps needed for urban safety relative to potential natural disasters: (1) pre-disaster mitigation of potential hazards which could cause loss of life and property damage during a disaster, procedures for mitigating disruption, provisions for back-up systems necessary for keeping essential City services and systems operational in the event of a disaster; (2) protection of life and property and provision of temporary assistance to disaster victims during and immediately following a disaster; and (3) post-disaster elimination of disaster-created hazards, re-establishment of private and public services and systems and general recovery.

The policies to achieve Element objectives are administrative. They generally provide broad guidelines for program formulation. Given the complexity of Los Angeles City government, often more than one EOO program emanates from a policy or more than one policy guides program formulation. Every policy contained herein is implemented by at least one EOO program or protocol, *i.e.*, a program which is administered by the EOO or one or more of its member City agencies. The broadly stated programs of this element describe the type of EOO programs which implement each policy of the Safety Element.

The Element complies with State law by providing a contextual framework and overview of the City's natural hazards, hazard mitigation and emergency response operations. It is not as comprehensive as the EOO establishing ordinance, Master Plan, Master Plan Annexes and associated plans insofar as the Element is informational rather than operational document and generally does not address social and police issues (*e.g.*, crowd control and riots). The EOO Master Plan and its related documents provide comprehensive (including police) operational protocols and plans. They are reviewed and approved not only by the EOO Board but by the Mayor and City Council and, therefore, are City policy. More importantly, they are operational documents, not just planning documents, and they are updated continuously.

The Safety Element is listed as a program of the EOO "Recovery and Reconstruction Plan" (aka "annex"). Therefore, the EOO's periodic monitoring of that annex will include a review of the Safety Element for purposes of recommending revisions. The Safety Element format, programs and monitoring are in compliance with State law and state general plan guidelines.

ELEMENT SCOPE

Prior General Plan elements. The Safety Element is less complex than the former safety, seismic and fire elements of the General Plan which were prepared in the 1970s. It simplifies goals and policies and identifies program categories. It generally does not contain standards and technical guidelines because these already are contained in City codes and administrative procedures which implement the EOO plans.

Jurisdiction. Element implementation involves only those programs which are within the authority and responsibility of the City of Los Angeles.

Police. The Element addresses only natural hazard issues. Therefore it does not address police matters, except in relation to natural disasters, *e.g.*, traffic safety during or following a disaster.

Wind. No wind hazard section is contained in the Element. Generally the most severe wind conditions come in the autumn when the dry Santa Ana or "devil" winds contribute to wild land (brush fire) conditions or cause localized minor damage. These winds rarely reach a velocity of more than 75 miles per hour. Wind hazards, such as tornadoes, are rare and in recent history have resulted in relatively minor, localized impact. The most damaging tornado recorded in Los Angeles occurred in 1983. It traveled several miles, moving north from South Central Los Angeles and the vicinity of the Convention Center in the Central City. Vehicles were turned over and many homes and other structures, including the Convention Center, were damaged. There is no record of a hurricane having struck the City in modern times. The City does not have large areas of flat agricultural or vacant lands which necessitate wind barrier protection. The anchoring of structures pursuant to seismic safety requirements assumes anchoring needed for wind considerations.

Assumptions. The City's EOO programs, including the subject Element, emphasize mitigation of potential hazard impacts, rather than avoidance through land use prohibitions, except as required by State flood and seismic regulations. This is because, by and large, the City is a built city and damage due to disasters such as fire, seismic event or hazardous materials release could occur anywhere in the city regardless of distance from identified major earthquake fault rupture zones, forested areas or concentrations of hazardous materials. The assumption is that hazard mitigation strategies, such as building design, and pre-event training and planning can reduce damage, disruption, injury and costs resulting from natural disasters and will facilitate more rapid short and long term recovery following a disaster.

CHAPTER II - EXISTING CONDITIONS, HAZARD ISSUES AND MITIGATION HISTORY

Much of the City of Los Angeles is built within old flood plains and mountains or adjacent to the Pacific Ocean. The population is concentrated within urban centers which are interspersed by low density residential neighborhoods. Most of the flat lands of the City have been developed with some land use. Remaining open space tends to be concentrated within flood plains or along steep hillside and drainage water courses which typically have been designated as public park land, recreational, flood control or low intensity uses, consistent with State law. Vulnerability to fire and flood has increased as development has encroached into remaining open space areas. Concentration of development and infrastructure has increased the vulnerability of greater numbers of people, businesses and facilities to seismic, fire and flood events while at the same time providing greater resources for responding to such events.

When a catastrophic natural disaster strikes, it may trigger secondary events. An earthquake may trigger a landslide or cause rupture of gas mains or hazardous materials enclosures. Disruption of gas mains could contribute to or cause fires. If winds are present, fires could become wild fires. Fires can denude hillsides and, thereby, exacerbate potential flood hazard and inundation conditions. For purposes of evaluating natural hazards addressed by this Safety Element, the following sections provide a brief history of the measures taken to mitigate individual natural hazards in Los Angeles.

FIRE AND RESCUE[4]

Fire was the first "natural" hazard to be addressed by El Pueblo de Los Angeles which was founded in 1781. The hot, arid climate, especially during the summer and fall, dried out vegetation. Dry brush was prone to fires caused by lightning strikes and spontaneous combustion. Nature adjusted to this phenomenon by making some of the native chaparral (vegetation) dependent on fires for regeneration. Their seed cases opening only when heated by fire. New sources of fire came with the advent of human habitation. By the early 1800s Los Angeles was an agricultural community with a small population. Buildings generally were constructed of adobe and tile. Individual properties experienced fires such as hay mounds igniting spontaneously, roofs being set afire by sparks from cooking stoves or fires due to carelessness. The primary fire hazard was storage of large quantities of hay. No fire bells or alarms existed. Instead someone would shoot a gun in the air repeatedly to attract assistance and volunteers formed leather bucket brigades to douse fires. As the City grew and buildings were established in close proximity to each other, entire blocks could burn in a matter of hours due to the lack of adequate water storage and delivery systems. Given these potentially catastrophic hazards it is not surprising that some of the earliest City building regulations addressed fire hazards.

Fire Department established. In 1869, officials and interested men met at Billy Buffum's Saloon and formed the City's first informal volunteer fire department. They convinced the City Council to levy fines on alleged arsonists so as to raise money for equipment. Because the levies also were used to drive unwanted elements, such as prostitutes and immigrants, from the City, not much money was raised. After the disastrous Chicago fire of 1871, the Volunteer Fire Department was recognized formally and the City Council allocated money for construction of a fire house. Water delivery was a major problem in the early years due to feuds with the local water company, lack of water supplies and lack of an integrated water system. The volunteers pleaded for pumping and other equipment but the City Council was reluctant to expend money because fires were deemed an inconsequential problem. To secure equipment, the volunteers solicited donations. In 1872 they purchased the City's first piece of modern fire fighting equipment, an Amoskeag steam pump. The City's first paid fire fighting employee was an engineer hired by the City Council at $100 a month to operate the pump and

[4] *A primary source used in in the preparation of this Element relative to Fire Department history, especially early history, was Paul C. Ditzel's* L.A.F.D. Centennial Edition*, Jostens Printing and Publishing Co., Visalia, California, 1986.*

help manage the firehouse. The heavy pump had to be pulled by the volunteers to fires because the Council refused to allocate funds to purchase horses. Sometimes the pump became bogged down in sand and never made it to a fire site. In 1874 the volunteers became so upset over the Council's failure to buy horses that they threatened to quit. This prompted another meeting at Buffum's. After the meeting, town leaders convinced the City Council to turn over the new fire station to the volunteers and to provide horses for the pumper. But it was not until 1875 that funds were appropriated for two horses. In that year, the volunteers began using chemicals (carbon dioxide) to help extinguish fires. By 1881 demand for fire fighting still was small. Of the 33 fire calls, 15 were false alarms and only $950 was sustained in fire damage. Sometimes months went by when no fire calls were received. Major fires were rare but the potential for major disaster soon became apparent.

In September 1883 the Los Angeles area experienced the worst brush fire it had known to that date. It was centered in the Coldwater Canyon area, eight miles west of the city limits. It burned for three days, destroying acres of watershed as well as cottages, barns, farmhouses, entire ranches, a bee farm, haystacks and crops. Although County personnel fought the fire, the City Council realized the City was vulnerable to a similar catastrophe. Subsequently, it took steps to improve the fire protection system, including a review of ways to improve the fire alarm system which still was comprised of people shooting guns in the air and ringing church and other bells. The old firehouse was replaced in 1884 by a new Plaza Firehouse, which still stands in the El Pueblo de Los Angeles State Historic Park near the civic center. In 1885, instead of constructing an alarm bell system, the Council voted to establish a City Fire Department with paid fire fighters.

The Department was established on February 1, 1886. Walter S. Moore, who had served three nonconsecutive terms as volunteer fire chief and as president of the City Council for a term, was hired at $125 per month as the first salaried Chief Engineer. Thirty fire fighters, most of them former volunteers, were hired to man four leased firehouses. In addition, volunteer units were retained in the less populated areas outside the central city, including the San Fernando Valley. In 1898 a $150,000 bond issue was approved for purchase of the first city-owned fire station sites, construction of 12 stations and establishment of a more efficient alarm system using new telephone and telegraph technology. Engine Company No. 1, the first City-owned station, became operational in 1887 at the site of what today is the Fire Department's supply and maintenance facility. A unique feature of the station was a hanging harness developed by one of the firemen. Horses were trained to walk under the harness upon hearing the fire bell so the harness could be quickly lowered and strapped onto them. This time saving innovation was adopted by stations across the nation.

From the beginning the Department was an innovative, progressive agency which sought to secure the latest equipment, utilize the latest techniques and to develop better methods for fire fighting and prevention. The 1920s was a period in which the Fire Department grew and developed into a premier fire fighting force. It explored and experimented with new techniques and received considerable public support for purchase of modern equipment and expansion of its stations and personnel. By 1921 the Department had become fully motorized. Recognizing that costly property loses were occurring due to smoke, falling debris and water damage, the Department experimented with salvage techniques. In 1923 it became the first major fire department in the nation to operate its own fleet of salvage rigs. Salvage teams were assigned throughout the City. At fire sites they covered furniture and valuables with tarpaulins while the fire fighters fought the fires. This tactic significantly reduced property damage and improved insurance ratings for the City. A Demolition Corps of personnel who were trained in handling explosives was established for such duties as dynamiting fire or flood damaged structures, preparing fire breaks and combating gas fires. Around 1924 the Department became the first major fire agency in the nation to equip all of its vehicles with two-way radios.

Fire Department expansion almost halted during the period of the Great Depression due to a lack of monetary resources. During the early 1940s, training and procedural changes reflected war concerns, including response to possible air raid attacks. A special Mountain Patrol was established to monitor potential targets of anticipated incendiary bombs.

After World War II the Department expanded dramatically in response to a commercial, industrial and population boom. Passage of a $4.5 million bond issue in 1947 enabled the construction or upgrading of 35 stations and purchase of new, modern apparatus. Upgrading of its services earned the Department its first national Board of Fire Underwriters "Class I" rating (1947).

Fire prevention. Fire prevention long has been recognized as the best method for reducing fire incidence and devastation. As the Fire Department became more organized and better accepted, the City adopted fire regulations and authorized fire fighters, police and other officials to enforce them. Increasingly comprehensive ordinances were passed to regulate building design, materials and occupancies so as to better contain fires and reduce fire hazards.

The first regulations applied to Fire Districts which were established in 1869 in the most densely developed sections of the City. By 1874 the amount of hay, gun powder and kerosene which could be stored in buildings was regulated, outside walls and roofs were required to be made of noncombustible material and stoves to be surrounded by masonry. In the 1880s concern regarding spread of fire and loss of life resulted in requirements for separate exits for large assembly halls, fire walls between adjoining buildings, exit aisles and swinging doors. In some districts, such as what is now the Central City, wooden structures were prohibited and masonry structures were required. Wood remained the most common construction material for buildings outside of the downtown fire districts. In 1907 water connections were mandated for new and existing homes. With the advent of electrical wiring, fire hazards increased, leading to the establishment of electrical safety codes.

Around the turn of the century, insurance companies played a significant role in the improvement of fire standards throughout the nation. Facing high costs from poorly managed fire systems, the fire underwriters joined together in an association which established fire rating systems to assess efficiency and effectiveness of local fire hazard mitigation and fire fighting agencies. Insurance rates were established accordingly. Cities could lower their fire insurance rates if they improved their hazard mitigation and fire fighting systems. This economic incentive spurred nationwide interest in fire prevention and suppression and continues to do so to this day.

In 1916 a Fire Prevention Bureau was established to carry the message of prevention to the general public, encourage voluntary hazard prevention measures, enforce hazard mitigation ordinances and improve prevention regulations and methods. The Bureau quickly inaugurated its first public information program. It was aimed at the general public and especially at children because fires set by children playing with matches was one of the major causes of fires. Public education was recognized as an important fire prevention tool. Programs, like firemen's musters (skills demonstrations) were designed to interest the public in fire prevention and to recruit young men into the volunteer fire service. Firemen visited schools to demonstrate their equipment and techniques and to present a fire prevention message. By 1929 Los Angeles boasted an average $1.05 per capita loss due to fire incidents, compared to the $2.10 national average. This was due in large part to the Department's aggressive efforts to improve its own resources, techniques, equipment and response as well to the upgrading of fire prevention and suppression regulations, strengthening of enforcement and improving the public's fire prevention awareness.

In 1942 a Junior Fire Department was established in conjunction with the city schools. Not only did it inculcate good fire prevention awareness but it provided a sort of Little League for fire service by providing a career development program. School and community fire prevention programs to this day are an important means of encouraging the public to exercise fire prevention in their daily lives.

Fire prevention measures often were adopted following fires which resulted in loss of life or significant property loss so as to prevent similar occurrences in the future. Sometimes it took more than one tragic event to trigger public support for changes. This was due to conflicts between life safety issues and costs to property owners who would be required to implement safety features. For example, as early as 1912, a fire in the St. George Hotel in the downtown raised the issue of the danger of open stairwells in spreading fires. However, no action was taken. In 1928 open stairwells contributed to a fire in the Ponet Square Hotel in the Central City area.

In 1952 seven people were killed in a second St. George Hotel fire. Following this fire, *The Los Angeles Daily News* ran an exposé which revealed that 248 hotels and apartment buildings (10,000 units) had fire violations and open stairwells which made them firetraps. Nevertheless, a proposed stair enclosure ordinance was not adopted. It took the tragic second Ponet Square Hotel fire of 1970, in which 19 residents lost their lives, to provide the impetus for passage of an ordinance. The Ponet Square Ordinance included requirements for stair shaft enclosures, self-closing doors and one-hour fire doors. It applied retroactively to pre-1943 structures of three or more stories in height. A four-year grace period was allowed for compliance. Over 1,200 of the 1,487 buildings affected by the retrofitting provisions were located in the older Central City area.

A major multi-casualty fire occurred in the Stratford Apartments (Westlake community) in 1973. It took the lives of 25 of the 120 tenants, including nine children. The Stratford was a pre-1943 building which had not been retrofitted. Following the fire, the Ponet Square Ordinance compliance grace period was rescinded. The 1983 Dorothy Mae Apartments fire resulted in the loss of 25 civilian lives in a building which had been retrofitted to comply with the Ponet Square ordinance. Most victims lost their lives in the hallways at stairwell exits due to flash over situations. To prevent similar tragedies, a retroactive ordinance was adopted for pre-1943 apartment and hotel buildings of three or more stories. It required automatic sprinklers in common areas and inside entry doors to each residential unit and mandated installation of fire alarm systems.

The Department has not waited for fires to happen. It has been aggressive in researching and evaluating fires. Operation School Burning was instituted by the Department in 1958 following the Chicago Our Lady of the Angeles parochial school fire which killed 95 children and teachers. The program utilized a vacated school facility to monitor scientifically the propagation and spread of fires and methodologies for preventing, suppressing and containing fires and saving people. From this program came supervised school fire drills to train students and teachers to respond appropriately and without panic to a fire situation. In addition, new regulations were developed to make schools safer.

A similar program was utilized in 1977-78 to evaluate house fires and to develop and field test prevention and suppression measures. It demonstrated the effectiveness of early warning, sprinkler systems and smoke detectors in homes and dramatically changed available information about the time/temperature curve for fire development. Findings were utilized by private industry in product development.

Fire prevention and enforcement measures account for a continuing reduction in deaths and injuries associated with fires related to structures. For example in 1983-4 the Fire Department responded to 5,620 structural fires. In 1992-3 it responded to 4,010 structural fires even though the City's population had increased by 17% (500,000 people), new construction had increased substantially and a greater intensity of development had taken place, *e.g.*, multi-story and high rise buildings had replaced low density structures.

Training. Unlike fire agencies in many other jurisdictions, all Fire Department emergency personnel, including fire fighters, inspectors and an increasing number of emergency medical personnel, are trained fire fighters and all are given emergency medical training. This enables an efficient mobilization in event of major emergencies and has resulted in a department in which fire fighters are multi-skilled. Fire fighters receive on-going skills training to familiarize them with new techniques and equipment and to refresh their skills.

The Department long has been known for its innovative leadership in the field of fire fighting techniques and strategies. In the early days, firemen responded in an ad hoc fashion to fire incidents. They used their muscle, agility and quick wits to assess and respond to a situation, often operating independently of each other. The ad hoc approach to fire fighting was inefficient and sometimes resulted in injury to firemen. To improve efficiency, safety and effectiveness the Department established a unique Fire College. The program included classroom training as well as exercises under simulated emergency and fire conditions. It was the first such educational program in the nation. Instructors were required to have at least seven years of fire fighting experience and a teaching credential from the University of California at Los Angeles. The first class graduated in 1925. The Fire College transformed

the Department into one of the most professional in the nation and was credited with a significant reduction in property losses and loss of life due to fire. It was so successful that in 1931 the Federal Board of Vocational Education incorporated the College's curriculum into a standard curriculum for fire personnel. Fire College instructors were hired by the International Association of Fire Chiefs and National Board of Fire Underwriters to help other departments establish similar training programs.

In 1957 the Emergency Operational Procedures Manual was developed to provide coordinated ground and air procedures for fighting brush fires. The manual was the precursor of the Incident Command System which provides coordinated procedures for multi-unit response to emergency events. Exercises were conducted to assure that personnel were familiar with the procedures, thereby increasing efficiency and effectiveness.

Coordination/mutual assistance. Because the City surrounds other cities, *e.g.*, Beverly Hills and West Hollywood, and adjoins other cities as well as county, state and federally controlled lands, it has joined in a variety of agreements with other jurisdictions for cooperative response and management of fires and other emergency incidents. Containment and suppression of a fire within an adjoining jurisdiction protects the City from encroachment and damage from the fire, thereby protecting the population as a whole. Most of the agreements are voluntary. Services are accepted and rendered at the discretion of the respective jurisdictions, depending upon factors such as availability of personnel and equipment. Under such agreements, usually the nearest fire units, regardless of jurisdictional boundaries, respond to fire or emergency medical calls. For example, since 1952 the Department has participated in a memorandum of understanding with the U.S. Forestry Service to render "all reasonable assistance" in suppressing fires along or near the National Forest boundary. It participates in automatic response agreements with the County and adjoining cities of Beverly Hills, Burbank, El Segundo and Santa Monica for fires within specific geographic areas of each jurisdiction and in contract agreements to provide services to the City of San Fernando and the community of Bell Canyon (in Ventura County). Under mutual aid agreements, personnel and equipment sometimes are loaned to jurisdictions experiencing major incidents which exceed their resources. For example, when an area experiences major brush fires, crews and equipment sometimes are sent from not only other California jurisdictions but other states as well, through agreements coordinated by the Governor's Office of Emergency Services or the Federal Emergency Management Agency. In recent years, City fire fighters have assisted in suppression of brush fires in the immediate region and as far away as Mammoth Lakes in the High Sierras and Mt. Palomar in San Diego County.

When a major disaster strikes, local, state, federal and private agencies respond under mutual aid agreements and federal, state and local disaster response procedures. The City's Emergency Operations Organization is the primary City organization under which City agencies join together in emergency preparation, response and recovery planning. In addition, the fire and police departments and other emergency response personnel participate with like agencies in other jurisdictions in training exercises and network coordination. Following the Watts civil disturbance in 1965 the Fire Department developed a task force procedure for more efficient deployment of personnel and equipment in response to emergencies. Civil disturbances and increased violence have resulted in cooperative procedures between state and local law enforcement agencies and the Fire Department to protect fire fighting and rescue personnel.

Coordination sometimes has been hampered by a lack of compatible communications systems, utilization of different terms for agency functions and a confusing variety of local agency organizational structures. These factors hampered communications and sharing of resources to fight a series of devastating fires in the Southern California region during 1970. The experience resulted in establishment by the U.S. Forestry Service of a partnership of local, state and federal fire agencies to develop improved coordination for fire suppression management and emergency response. The partnership evolved into the Fire Resources of Southern California Organized for Potential Emergencies (FIRESCOPE) program. FIRESCOPE[5] developed the Incident Command

[5] *When FIRESCOPE became state wide, the word 'Southern' subsequently was dropped but the acronym 'FIRESCOPE' was retained.*

System (ICS) and Multi-Agency Coordination System (MACS) which were designed to improve multi-agency response to multi-hazard events, including earthquakes, floods and fires. The Los Angeles City Fire Department was a leader in developing these programs and one of the first to make them operational. The programs established plans and procedures for improved interagency coordination, including common terminology, organizational structures (chain of command) and response procedures and for compatible communications (*e.g.*, radio frequencies) and equipment systems (*e.g.*, hose connections). The goal was to make agency personnel and equipment readily interchangeable within and between jurisdictions and command levels so as to facilitate effective deployment and efficient utilization of limited resources between federal, state, regional, district and local agencies and operational levels. When incidents exceed or are anticipated to exceed the resources at a particular response level, assistance is requested from the next level which in turn evaluates the needs and assembles and allocates personnel and other resources. The ICS and MACS procedures were incorporated into the City's fire fighting program where they were tested in mock and real situations. The State's Standardized Emergency Management System (SEMS) regulations of 1994 was patterned in part after the ICS and MACS programs in response to the Oakland-Eastbay fire in northern California. The SEMS encourages compatibility between all emergency agencies operating within the State. The agreements described above are but a few of the cooperative agreements in which the Fire Department is a party.

Brush fires. Brush fires continue to be a major threat to life and property throughout the region due to unique fuel, terrain and climatic conditions. The hazard is especially great when the dry "Santa Ana" winds arrive, usually in the fall and winter seasons. The desert blown Santa Anas turn vegetation to tinder and spread localized fires quickly. A brush clearance program was instituted in 1920 using paid civilians to clear vacant lots of debris and rubbish. The program significantly reduced brush fires. In 1924 a civilian Mountain Fire Patrol was established to improve fire safety in hillside areas. The Patrol counseled private property owners in fire prevention and encouraged them to maintain burlap bags and other fire fighting material to protect their homes which often were distant from fire stations or were not served by adequate roads. Boxes of fire fighting tools were placed at strategic locations along Mulholland Drive and fire breaks, fire trails and fire roads were maintained to slow movement of fires and provide access for fire fighters. However, the fire breaks proved ineffective with major fires. Wind conditions, including those generated by a fire, could carry burning embers and materials far beyond fire breaks. In 1958 the City banned incinerator and open burning to reduce fire hazards and improve air quality. The ban resulted in the lowest incidence of fires in 14 years.

To date, the 1961 Bel Air fire storm in the Santa Monica Mountains is ranked as the City's most costly brush fire. The 50 mile an hour Santa Ana winds, combined with fire-generated winds, carried burning debris and set new fires far from the main front. Within the first six hours, before defensive procedures became effective, 484 homes and other structures were destroyed. The fire lasted two days, destroyed over 500 structures and burned 6,090 acres of watershed within a 19-mile perimeter. Even with this loss, 78% of all the homes within the perimeter were saved. A direct result of the fire was the phasing out of the Mountain Fire Patrol, rebuilding the two existing fire stations and constructing two new stations along Mulholland Drive, the road which runs along the ridge of the Santa Monica Mountains. In addition, the Mountain Fire District and Buffer Zone boundaries were expanded to include a greater area and a Department Brush Clearance Unit was established to enforce brush clearance regulations in the Districts and Zones. The Public Works Department's Bureau of Street Maintenance took over the responsibility of enforcing brush clearance on vacant lots within other areas of the City.

Devastating brush fires have resulted in establishment of more fire stations and facilities in hillside areas and in more stringent requirements for fire hydrant installation, hillside brush clearance, fire access road systems, home sprinklers, fire resistant construction and landscaping materials, and development of improved fire fighting strategies and equipment. In 1962 the Department acquired its first helicopter with water dropping capability. Subsequently, air craft became important equipment for fighting brush fires. They were used for dropping

water and chemicals on targeted fire areas. Flammable roofs long had been identified by fire agencies as major contributors to property damage and the spreading of fire storms in developed areas near brush lands. In 1970, following the Chatsworth fire in which 113 homes were damaged or destroyed, the City required that new homes in Mountain Fire Districts treat combustible roof materials so as to make them more resistant to fire. Following the devastating December 1989 Sesnon (Granada Hills) fire which destroyed or damaged 30 dwellings, combustible roofing material was banned from use in construction of new homes in Mountain Fire Districts.

Between October 25 and November 10, 1993 an unprecedented series of 22 devastating wild fires occurred in the six county Southern California region (from Ventura to San Diego County). The fires were caused by arson (12 fires), arcing power lines (6), campfires (2) and undetermined sources and were fanned by Santa Ana winds and fueled by a combination of dead undergrowth resulting from a seven-year drought and heavy new growth caused by recent rains. The fires burned 197,277 acres, destroyed over 1,170 structures and killed three people. They were battled by a force of 9,476 fire fighting personnel from 458 agencies from around the nation. The last and largest of the fires was in the Topanga-Malibu area (November 2-7). The fire burned 18,000 acres, destroyed 384 structures and killed three civilians. Fire fighters were shifted by the FIRESCOPE center in Riverside County from other fire sites to Malibu-Topanga and placed under the command of the Los Angeles County Fire Department. The largest commitment of fire personnel in fire fighting history, 7,136 fire fighters, were involved in battling the Topanga portion of the fire and a total of over 9,000 personnel battled both segments. The fire was an extremely dangerous, rapidly changing, fast moving fire. Fire fighting was hampered by steep hillside terrain, narrow mountain roads, falling debris dislodged by the fire and shifting winds which sent flames up to 200 feet in the air and carried burning embers which ignited new fires. Resources were deployed to protect structures and to contain and eventually suppress the fire. Fixed wing and helicopter aircraft were used to battle fires.

The 22 fires, especially the Topanga-Malibu fire, successfully tested FIRESCOPE. Different agencies interacted and combined into a single force under a unified command system as planned by the FIRESCOPE protocols. The fires also tested the processes and procedures of individual agencies to combat and manage major fires and proved the effectiveness of the City's hillside brush clearance law. Clearance of brush within 100 feet of structures in Mountain Fire Districts not only protected the structures but enabled fire fighters to battle fires without having to stand in fuel (brush). Following the fires, the Governor's Office of Emergency Services convened a survey team to review all of the fires and recommend additional procedures and measures to improve response and coordination. A direct result of the Topanga-Malibu fire was the signing of a cooperative agreement for use of planes ("Super Scoopers") which could scoop water from the ocean and drop it on brush fires. The Super Scooper agreement marked the first time that federal, state, county and a city had joined in a cooperative agreement with another nation (Canada) and a private manufacturer to test new equipment in the field as a means of exploring new fire fighting tools. Another direct result of the fire was the Department's decision to secure syphon ejectors, pumps and other equipment to enable utilization of water from private swimming pools for fire fighting.

High rise and complex structural fires. Improved building construction engineering, materials and mechanisms made possible construction of increasingly taller buildings. Lighter materials, such as asbestos was used instead of brick for fire proofing. The first four-story wood frame building was constructed in Los Angeles in 1882. By 1888 seven story buildings with brick bearing walls were permitted and fire escapes were required for buildings four stories or more in height. With the advent of elevators and minimal masonry reinforcement, the City in 1903 allowed the construction of its first 13-story office building. In 1905 the fire escape ordinance was made retroactive and enforcement was delegated to the Building Department. Subsequently, water connections were required in new multi-story buildings to facilitate fire fighting. In 1910 the height limit was set at 150 feet (13 stories) for steel frame office buildings, the maximum possible under then available engineering techniques, and five stories for residential buildings, including hotels. After building technological advances enabled construction of

taller buildings, the height limit was retained to assure that the proposed City Hall would be the City's tallest building. City Hall was dedicated in 1928 and at 452 feet in height (over 28 stories) it remained the tallest building until the 1957 floor area ratio ordinance replaced the height ordinance. The 1957 ordinance allowed unlimited height with a maximum floor area in order to encourage provision of open space and more imaginative building design. In 1962 the 32-story Occidental Tower (later TransAmerica Building) was constructed in the Central City community. It became the first building to exceed the height of City Hall. Hundreds of high rise buildings have since been constructed in the City. This has necessitated entirely new techniques for fire mitigation, suppression and rescue.

In 1964 Operation High Rise was instituted. It used empty buildings to study the propagation, effects and spread of fires and to develop systematic response and suppression procedures for high rise fires. Procedures developed by this unique program and subsequent programs have been used by emergency response agencies throughout the world. The first significant local test of Operation High Rise was in 1968 for a fire in the 9-story U.S. Borax and Chemical Corporation building in the Westlake area. Heat activated elevator buttons caused elevators to be called to and to remain at the fire involved floor, resulting in the death of one fire fighter. Emergency alarm systems failed to work and hand held walkie talkies proved ineffective inside the building. Out of this tragedy came new building construction requirements and fire fighting procedures, including banning of heat activated elevator buttons by Los Angeles and establishment of a new Department procedure requiring fire fighters to use stairs instead of elevators to gain access to a fire involved floor. The first major high rise fire in the nation, the One New York Plaza fire of 1970, triggered a national review of hazards associated with high rise buildings. The California State Legislature in 1974 adopted high rise fire safety regulations which included requirements for automatic sprinkler systems in any new buildings which were 75 or more feet in height.

Revised procedures were successfully used in the 1971 Westwood Center Building (Glendon Avenue, Westwood community) fire. The Department quickly contained the fire and suppressed it within half an hour. In 1976 the new Incident Command System (ICS) was instituted. It was designed to improve operations and coordinate fire suppression resources. Its first major test was the 1976 fire on the 20th floor of the Occidental Tower building. The success of ICS resulted in adoption of the ICS methodology by other emergency response agencies around the world.

The 1979 fire on the 11th floor of the Bunker Hill West Tower (Hope and Third Streets, Central City) was the City's first major fire in a residential high rise building. Residents were phoned and urged to remain in their rooms so that opening of doors would not spread the fire and so that residents would not become victims of smoke inhalation. One couple died when they were literally blown off a balcony ledge when the fire burned from the open room across the hall, through the door to their unit, causing a blast of heated air. Following this tragedy, rescue procedures were improved and, in 1980, smoke detectors were required in all new residential high rise buildings and any high rise buildings which were issued remodeling permits.

In 1984 the Department's improved ICS procedures were successfully used in responding to the 12-story Fickett Towers (Van Nuys community) senior citizen building fire. The fire was knocked down in 71 minutes and all 230 of the elderly and infirm tenants were successfully evacuated.

The most materially damaging high rise fire in City history occurred in 1988 in the 62-story First Interstate Bank Building fire (Wilshire Boulevard at Hope Street, Central City) which claimed the life of one civilian. The fire began on the 12th floor and moved upwards to the 16th floor before it was contained and suppressed. Following the Interstate fire, the City Council required fire sprinklers in the 363 existing commercial and office buildings constructed before the State sprinkler regulations became effective. The fire also underscored to private industry the need for private back-up systems and facilities to enable continuance of business operations following a fire.

One of the most complex and difficult fires ever fought by the Department was the 1986 Central Library fire (5th Street at Grand Avenue, Central City). The open book stacks, narrow corridors, circuitous stairways, interference of the thick walls with

the walkie-talkies, lack of windows and ventilation, dense smoke, intense heat (estimated as high as 2500 degrees in some areas), limited access and fire fighter exhaustion due to heat and exertion made the fire difficult to attack. Extensive pre-planning for a potential fire in the historic structure resulted in an orderly evacuation of library staff and patrons and invaluable familiarity of the fire commanders with the building and its unique fire suppression demands. Salvage units quickly instituted procedures to protect the 1.2 million books and documents from smoke and water damage. Ingenious methods were devised to direct smoke from the building and relay fire fighters in and out of the fire areas. After seven hours and thirty-eight minutes the fire was brought under control. It took another five days to mop up the hot spots and for the building to cool down. The 350 fire fighters saved over a million books. Only 350,000 books were fire or water damaged and only 4% of the $500 million value of the structure was lost.

Harbor and airport emergencies. With the annexation of San Pedro and Wilmington in 1909, including property which would become the future Port of Los Angeles, the Department began to develop capabilities for fighting dock and other harbor fires. Two private tugs for ocean vessel and pier fire fighting were replaced in 1916 by a motor launch fire boat and two steam pumpers on a barge. In 1919 the City's first fire fighting vessel was commissioned. A subsequent 1924 bond issue enabled the construction of one of the world's most powerful fireboats. Its "guns" could deliver 10,200 gallons of water per minute to douse waterfront and harbor fires and it had a unique stationary tower which could be extended to 44 feet above the water line. Three more fire boats were added in 1928. In the 1960s, self-contained underwater breathing apparatus equipment enabled more effective response to underwater fires, spills and other emergency incidents in the Port. To facilitate response, the Department has entered into cooperative arrangements with federal, state, county and the adjoining Port of Long Beach for response to fires, hazardous materials spills and other emergencies in the harbor area.

Airport expansion resulted in the establishment of fire stations at the Los Angeles International (LAX) and Van Nuys airports in 1956. As with the harbor operations, special equipment, tactics and training were instituted to prevent, suppress and contain fires and to rescue potential victims. The first major air crash took place in 1978 when a Continental Airlines DC-10 crashed on take-off at LAX. LAX Fire personnel quickly suppressed the blaze and saved the lives of all but three of the 198 passengers and crew. Due to the quick response, the emergency was over in less than six minutes. Today both the port and airports have on-site fire fighting operations and special equipment designed for the unique needs of those facilities.

Arson fires. Arson is a major cause of fire, averaging 10 incidents per day in 1994-95 with an estimated $23 million property loss (18% of the total loss due to all fires). Arson first was recognized as a major issue in 1887 when a spate of arson fires associated with anti-Chinese civil unrest in Los Angeles caused San Francisco insurance companies to cancel policies for properties in the old Chinatown area (roughly from what is now Union Station to the El Pueblo de Los Angeles Plaza). In 1918 the Arson Bureau was established to investigate suspicious fires. The squad was so effective in identifying and bringing arsonists to conviction during the Prohibition era (1920-35) that during the Depression (1927-37) Los Angeles was not plagued by the rash of set fires which was experienced by many other jurisdictions. Arson investigations also led to a better understanding of the causes and propagation of fires and, thereby, assisted and continues to assist in the development of better prevention measures. By 1978 arson had become the fastest growing crime in the United States. To combat the crime, federal agencies joined with local agencies to establish task forces. In Los Angeles the Arson Suppression Task Force consists of representatives from federal agencies, the Fire Department and the Police Department. Arson Section investigations have resulted in a high rate of arrests and convictions, including convictions of the Dorothy Mae and Ponet Square arsonists. Of 148 arson related cases involving adults which were sent to the County District Attorney in 1991-92, 109 cases resulted in commitment of arsonists to imprisonment or mental health facilities or placement under supervised probation.

Hazardous materials mitigation and response. See Hazardous Materials section.

Rescue/medical. Rescue and provision of medical care to victims of fires always has been an impor-

tant function of the Department. A Rescue Squad began operating in 1922 to provide breathing apparatus and to attend to fire fighters at fire scenes. In 1930 a fleet of six ambulances was purchased to transport injured firemen to hospitals. The service soon was expanded to serve civilian fire victims. By 1957 the fleet included Department ambulances and ambulances operated by private companies. The first paramedic ambulance service was established in 1970. In that year, other City operated ambulances and their crews were transferred to the Fire Department by executive order of Mayor Sam Yorty. The Department reorganized the service and reassigned ambulances and crews to all areas of the City so as to facilitate efficient response. By 1973 all contract services with private ambulance companies had been phased out and the Department had assumed authority over all first care (response) medical service within the City. The operation was upgraded and became the Bureau of Emergency Medical Services. All of the Department's fire fighting personnel are trained in emergency medical skills so as to enable any fire fighting team to respond to an emergency medical call. By the 1990s more calls were received for medical services than for fire fighting services, *e.g.*, approximately 77 percent of the all calls received in 1993-94 were for medical services.

Following the collapse in 1963 of the Baldwin Hills Dam, the Department's new helicopter was used to rescue stranded and endangered victims. The success of the helicopter operation resulted in purchase of a fleet of helicopters. Following the 1992 drowning of a teenage boy in the Los Angeles River channel, the Los Angeles River Rescue Task Force program was established in cooperation with the Army Corps of Engineers and the County of Los Angeles to develop strategies for rescuing people who might become trapped in the over 400 miles of the flood control channels which exist within the City.

The Department has been called upon to respond to several major earthquake related emergencies beginning with the 1933 Long Beach quake. Following the 1971 San Fernando (aka Sylmar) earthquake the Department developed an Earthquake Response Plan which was utilized during the 1994 Northridge quake. The Department and other emergency professionals also evaluate response of other jurisdictions to major emergencies in other cities, states and nations so as to assess how to better prepare for local emergencies. Following the 1985 Mexico City and 1987 Whittier earthquakes, the City recognized that its personnel alone were insufficient to provide all assistance needed during and following a major disaster. To address this issue a Disaster Preparedness Division was established within the Fire Department to train City and private sector personnel in disaster response techniques and procedures. One of the programs is the Community Emergency Response Program (CERT) which trains volunteer community, business and City employee representatives in earthquake awareness, disaster fire suppression techniques, light search and rescue operations and team organization and management. The goal of CERT is to create a well-trained civilian emergency work force as an adjunct to professional forces. CERT trains people to establish neighborhood self-sufficiency during extended emergencies (such as earthquakes) and in situations where the numbers and scope of events overwhelms government emergency forces. The volunteers are trained to perform independently, to train other neighborhood or work area volunteers, to operate teams within their work areas or communities and to work with professional forces in other disaster areas to which they might be assigned. As of 1994 the CERT Program had trained over 12,000 people and its techniques had been adopted by other agencies, including FEMA, to train volunteers throughout the nation.

Following the 8.1 magnitude 1985 Mexico City earthquake, the Department recognized the need for equipment to facilitate rescue of victims trapped in structures and to stabilize hazardous structures. With the support of the City's Emergency Operations Organization, the Department purchased better equipment, including diamond blade power saws and air lifting bags. The equipment proved invaluable in rescuing victims following the 1993 Northridge earthquake.

In 1990, FEMA sponsored a conference in Seattle, Washington for the purpose of developing a national Urban Search and Rescue (US&R) response plan. This led to the formation of 25 Federal Emergency Management Agency (FEMA) US&R Task Forces which are located throughout the nation. Each of the 25 fully equipped, 62-person US&R teams can operate self-sufficiently for 72 hours. They are trained to a high level of expertise in rescue, medi-

cal and technical skills and are equipped with specialized equipment capable of dealing with difficult types of building and structural collapses in which people are trapped. The teams rotate the initial on-call responsibility. However, more than one team may be called to assist in a disaster situation. In a major disaster all might be called. The Los Angeles Fire Department is one of the 25 participants in this program. Its FEMA US&R team is maintained in addition to the US&R operations which are part of the Department's on-going US&R program.

Urban development in proximity to brush and hillside terrain makes containment of wild fires difficult. The density and variety of urban development from low rise to high rise structures, traditional commercial and industrial to harbor and airport facilities poses unique fire response and suppression challenges for the City's emergency forces. The broad scope of potential hazards is depicted on Exhibit D, "Selected Wildfire Fire Hazard Areas." The City's fire safety program addresses the broad scope of fire prevention and suppression and emergency response operations.

STORM WATER, INUNDATION AND OTHER WATER ACTION

The water-related hazard programs associated with the Safety Element relate only to those matters which are within the authority and responsibility of the City. However, it is important to understand the context within which the City operates. Water action hazards include major and localized flooding, erosion and landslides as well as potential inundation from water storage facility failure, seiches, mud and debris flows, tsunamis and other ocean wave related hazards. These hazards generally are depicted on Exhibits C (landslide), F (flood plains) and G (inundation and tsunami). Mitigation of water action hazards is a cooperative, multi-jurisdictional effort. It also is related to geologic conditions, seismic, fire and hazardous materials mitigation. To merely set forth the City's specific mitigation responsibilities would leave gaps and raise questions about how related hazards are addressed. Therefore, to provide a comprehensive overview, this section provides a summary of the historic evolution of the roles of various levels of government and how Los Angeles City fits into the overall hazard mitigation efforts.

In general, flood control authority can be summarized as follows: (1) the United States Army Corps of Engineers oversees construction of projects associated with navigable bodies of water, including the Los Angeles River-related flood control systems and ocean harbors; (2) the Los Angeles County Department of Public Works oversees construction of ancillary Los Angeles County Flood Control District facilities and designs and/or maintains the flood control drainage facilities, including the Los Angeles River system (under the guidance of the Army Corps) to mitigate 100- and 500-year storms; and (3) the City Bureau of Engineering oversees construction and maintenance of the City's storm drainage system which is designed to mitigate 50-year magnitude storms. Various City agencies implement development permit, slope stability and watershed protection regulations.

The flood control and storm drainage systems are comprised of the following principal features: (1) debris basins at the mouths of canyons to slow the flow of water and trap boulders, rocks and debris and to prevent clogging of the flow channels; (2) flood control basins (dams) at the upstream portions of the rivers to contain water and regulate downstream flow; (3) containment of over 400 miles of river and tributary systems within mostly open concrete flood control channels; (4) streets, gutters and catch basins to collect and route surface flows to storm drains which carry urban run-off to larger tributary systems and, ultimately, to the flood control channels and ocean; (5) spreading grounds in the San Fernando Valley to impound storm water and allow it to percolate into the ground where it replenishes the underground water system; and (6) associated bridges, reservoirs and water storage facilities. The purpose of the flood control system is to carry storm waters as quickly as possible to the Santa Monica and San Pedro (harbor area) bays to prevent flooding.

Before the flood control system was built, the Los Angeles River and its tributaries flowed freely from the Santa Susana, Santa Monica and San Gabriel Mountains to the sea, flooding large portions of the basins south of the mountains. The Los Angeles basin between the Santa Monica Mountains and Wilmington-San Pedro (future site of the harbor) was dotted with swamp lands and marshes fed by the rivers and streams. Local Spanish names derive

from this marshy landscape including "arroyo" (water course), "cienega" (marsh), "zanja" (ditch) and "redondo" (willow). A swamp existed in what is now the Central City. Figueroa Street was called Grasshopper Street and the area became known as "Grasshopper Gulch" due to the insects which lived in the swamp and plagued that part of the community. Today ground water still is very close to the surface in the Wilshire District, feeding the La Brea tar pits, which once entrapped pre-historic animals, and requiring special building design considerations to protect against flooding of subsurface structures. "Brea" is Spanish for "tar."

Capital floods. Major storms which cause a high magnitude of water flow can be devastating to a wide geographic area. They are the most dramatic and potentially the most hazardous water activity confronting the City. The Los Angeles region is a semi-arid region with rainfall which averages 15 inches per year but can vary from 8 to 30 inches per year. Rains tend to occur in heavy, short duration storms between November and April. In a 100-year storm (Exhibit F), 10 to 24 inches of rain may fall within 24-hours or as much as one inch of rain a minute for a brief duration. Severe storms are periodic and may not occur for several years. Paving of the City with structures and impermeable surfaces has eliminated natural ponding areas which allowed water to percolate into the soil. This has facilitated water runoff and velocity of runoff thereby increasing the potential for flooding. Water rushes from streets and other impermeable surfaces along the path of least resistance to the ocean.

Between 1815 and 1938 seventeen major floods were recorded. The 1815 flood cut across what is now the Central City, diverting the Los Angeles River to the Pacific Ocean via Ballona Creek. The flood of 1825 diverted the river from Ballona Creek to its present course. After the 1825 flood, the City was reestablished in the 1815 flood plain without thought of potential future flooding. The floods of 1867-8 destroyed the City's new water system, including a reservoir and a dam intended to divert water for domestic and irrigation needs, changed the course of the San Gabriel River and convinced the City Council to hire the first City Engineer. The 1865-71 droughts devastated farms and the cattle ranches which had characterized the region for a century. To recover losses, ranches, orchards and farms were subdivided and sold. The smaller plots began to be developed with homes, businesses and urban infrastructure. Railroads were extended into the region in 1865, spurring a development boom and accelerating in-migration from the eastern United States. Prior to 1914 there was little interest in providing protection from flooding because the City was rural in character, development was dispersed and major permanent infrastructures had not been constructed. Flooding tended to be localized or occurred in areas not yet inhabited or utilized. As Los Angeles became more urbanized, permanent structures were installed, the population became more concentrated, impermeable surfaces caused more and swifter runoff and flooding increased the threat to life and property.

The first public program in the area to address flooding was the Los Angeles harbor construction project of 1898 which included flood water and silt diversion to protect the harbor. On December 31, 1898 the Army Corps of Engineers, which was charged with the responsibility of improving navigable waterways of the United States, established a 19 man team to plan and build a deep water harbor for the City.

Flood control initially was not within the authority of the Corps, except as it pertained to harbor improvement. The harbor project was completed in 1914. In 1914 over 19 inches of rain fell in four days causing streams and rivers to overflow, turning sections of the Los Angeles basin into islands, severing communications and causing $10 million in property damage, including damage to the harbor. In response, the State, in 1915, created the Los Angeles County Flood Control District to prepare and carry out a flood control plan. Major flooding in 1916 resulted in passage of a County bond issue for the Army Corps to construct the first phase of the flood control system. The project, the Dominguez Narrows by-pass, was completed in 1921. It diverted Los Angeles River flood waters and eliminated harbor silting by emptying flood waters into what is now the Long Beach harbor. Between 1917 and 1939, dams, reservoirs and debris basins were constructed in local mountains, along with some river channel enclosures, but the construction did not keep pace with the explosion in urban growth and was not sufficient to protect the populace. A series of devastating floods between 1921 and 1938 dem-

onstrated the need to establish and carry out a comprehensive flood control plan and resulted in a series of federal acts which gradually expanded the role of the Army Corps and provided funds to construct local drainage systems. The most devastating flood ever experienced by Los Angeles occurred on March 2, 1938. Two days of flooding caused over $40 million in damage and the deaths of 113 people, disrupted the City and again severed communications systems. The disaster resulted in establishment of the first local emergency plan (to aid victims and control looters and sightseers) and adoption of the Drainage Act of 1938 which mandated the Army Corps to prepare a flood control plan for the entire Los Angeles County Drainage Area. The plan was adopted by Congress in 1941 and construction of the system was authorized.

Between 1935 and 1970 the Army Corps oversaw the construction of a system of drainage projects designed to contain the Los Angeles, San Gabriel, Rio Hondo and Santa Ana Rivers as well as Ballona Creek, the Dominguez Channel and other waterways so as to prevent future flooding in the Los Angeles basin from 100-year and 500-year magnitude storms. Two three-day storms in 1943 led to enactment of the National Flood Control Act of 1948 which permitted construction of small flood control projects and performance of emergency work without authorization of Congress. As each phase of the flood control system was completed, except for the dams and dam basins, it was placed under the authority of the Los Angeles County Flood Control District which was charged with maintaining the system (including 58 miles of the Los Angeles River which runs through 13 cities from Calabasas to Long Beach). The principal function of this massive system was to prevent flooding by channeling storm waters so they would be carried as quickly as possible to the sea.

Fire-flood cycles in recent years have increased flood hazards. Rains regenerate growth of vegetation on hillside slopes. The hot summer climate dries out vegetation, creating fuel for fires which destroy the vegetation. Lacking vegetation to slow water flow and enhance water absorption, rain water rushes unimpeded down the fire denuded slopes causing erosion and flooding. Such cycles in 1968-69, 1977-78, 1979-80, 1982-83 and 1994-95 resulted in flooded and washed out streets, destruction of bridges, loss of life, landslides which destroyed hillside and coastal properties, localized but destructive flooding and mud and debris flow inundation of properties below denuded areas.

Since 1940, the City and County have become increasingly urbanized, adding more impermeable surfaces which have increased storm water runoff which in turn has taxed the capacity of the current system during major storms. In 1980 a levee of the Los Angeles River flood control channel near the City of Long Beach was threatened with overtopping by flood waters. This raised concerns about the adequacy of the capacity of the southern sections of the channel to protect adjacent cities. Destructiveness of recent floods and the issue of system capacity have contributed to a re-evaluation of the flood control system by the Army Corps and County Department of Public Works (which in 1985 took over the Flood Control District). They currently are preparing plans to increase the capacity of the Los Angeles River channel in order to meet Federal Emergency Management Agency (FEMA) guidelines for protecting downstream cities from flooding.

Drainage. Within the broad context of regional flood control the City's role is relatively small but critical. It is responsible for construction and maintenance of a storm drainage system within the City's boundaries. The first drainage system was constructed by settlers after the City was established in 1784. Zanjas (ditches) were dug to trap and guide water for drinking, irrigation and drainage. During the 19th Century, wooden (typically redwood) and pottery pipes were added. The first large publicly constructed drainage system may have been the system installed by the Army Corps during the Civil War to drain ponds and wet lands and supply water to the Army's Drum Barracks at Wilmington.

Los Angeles City committed itself to construction of a drainage system after the devastating floods of 1867-68. Contrary to common practice of the time, the storm drainage system was separated from the sewer (i.e., waste water) system and remains separate today, except for treated waste water which is discharged into the flood control system or directly into the ocean. The separation was established following an 1870 report by Frank Lecouvreur, the City's first Engineer, that separation would prevent

overwhelming of the sewer system by flood waters associated with periodic major storms. By 1879 a sewer system to take waste water from what is now the civic center to the ocean was under construction. In addition, Lecouvreur designed an east-west street system to assist the flow of rain waters via a street gutter system. The gutters carried storm and daily run off water via the zanjas to ponds and other natural collection areas or to rivers.

The City Bureau of Engineering is charged with overseeing construction of the City's storm drainage system. In addition, the Bureau, under contract to the County, sometimes designs and constructs sections of the County Flood Control system. The City's storm drainage system is integrated with the County Flood Control system and drainage systems of neighboring jurisdictions. The City system consists of streets (including gutters), approximately 1,500 miles of storm drains beneath the streets, approximately 50,000 catch basins which collect runoff from the streets, several large spreading grounds and several pumping facilities. It is designed to accommodate 50-year magnitude storms. During dry weather the combined County and City storm drainage systems carry tens of millions of gallons of runoff (*e.g.*, treated waste water, lawn irrigation, *etc.*) daily. During storms it carries billions of gallons of storm runoff per day. Runoff is carried via open flood control channels directly to the ocean or to collection systems, as envisioned by Lecouvreur in 1870.

Until recent times, the drainage system primarily was financed with public funds or by bond programs. The State Subdivision Map Act of 1907 provided for dedication of land for public purposes. In 1911 the State Improvement Act empowered local governments to use easements, eminent domain, assessment districts and subdivision procedures to secure streets, sewers, drainage and other infrastructure systems. The Subdivision Map Act was amended in 1921 to allow cities to require easements for drainage purposes but legal challenges prevented them from exacting land from property owners. Therefore, dedication of land for public purposes generally continued to be voluntary or was secured through purchase following costly and often lengthy condemnation proceedings. With limited funding available for purchase of easements and construction, development of the system was slow until the Great Depression when federal and state public works programs for the unemployed provided millions of dollars for system construction.

A City's right to withhold building permits for noncompliance with public dedication requirements was upheld by the California Supreme Court in 1966 *(Southern Pacific Railroad versus the City of Los Angeles).* This decision strengthened the City's ability to secure drainage facilities in conjunction with new development. Local authority was further strengthened by the California Environmental Quality Act of 1971 which required development projects to mitigate potential environmental impacts of proposed projects. Under the State Subdivision Map Act (California Government Code Sections 66410ff), environmental mitigation and City regulations, the City in recent times has required owners of proposed development projects to construct drainage systems to accommodate runoff associated with a project and/or to protect a project and adjacent properties from storm water related hazards associated with the project. This has resulted in a systematic construction of drainage facilities in association with new development projects.

Drainage facilities are built to design specifications determined by the City's Bureau of Engineering. The Bureau in the 1920s established a hydrologic testing laboratory, later called the Hydraulic Research Laboratory. Using mathematical models and dynamic physical models, the lab developed and refined drainage system design and design standards. For specific projects its models were designed to take into account particular site specific factors such as degree of slope, susceptibility to flooding, anticipated velocity of water. The lab also designed associated equipment, including an efficient grate configuration for catch basin grates so grates would not be hazardous to bicyclists, and developed engineering aids such as hydraulic tables, charts and graphs. In the 1980s and 1990s the lab focused on designing wastewater related hydraulic structures. The laboratory incorporated computer technology to assist in hydraulic analysis. However, despite tremendous advances, computer modeling technology is not yet able to achieve the detail and accuracy provided by the lab's physical models. The lab's design innovations and standards have been used not only in development of the Los Angeles storm water and waste water systems and by the City's engineers

but have been used by other jurisdictions and private engineers.

Land use planning. Land use planning is important in protecting the public from storm water related hazards. The State Subdivision Map Act allows local jurisdictions to disapprove permits for construction of structures in flood hazard or inundation areas if the hazards cannot be mitigated adequately. The Flood Control Act of 1960 authorized the Army Corps to provide flood maps and information to local jurisdictions to assist them in land use planning. Subsequent federal and state (Cobey-Alquist Flood Plain Management Act, Water Code Section 8401c) legislation encouraged local land use planning, regulations and enforcement in flood prone areas by linking insurance rates and flood management funding to the adequacy of local regulations.

Flood hazard areas, or flood plains which are subject to 100-year floods (Exhibit F), comprise approximately 30 square miles of the City. These areas were mapped by the Federal Emergency Management Agency (FEMA), which deemed that approximately 15 square miles of the hazard areas were buildable. FEMA estimated that over 48,000 structures were located in the hazard areas. To comply with the Flood Disaster Protection Act of 1973, which increased the insurance rates set forth in the National Flood Insurance Act of 1968 and required local floodplain regulations to have enforcement provisions, the City of Los Angeles adopted the 1980 Flood Hazard Management Specific Plan (amended in 1988 by Ordinance 163,913). The ordinance establishes annexation procedures and permit review and mitigation procedures for issuance of development permits in areas prone to flooding, mud flow or coastal inundation. It also specifies the responsibilities of City agencies which process the permits. Mitigation measures include relocation of structures within a property, increased base elevation, additional structural reinforcement, anchoring, and installation of protective barriers. A permit can be denied if mitigation is deemed insufficient to protect human life. Compliance with the National Flood Insurance Act makes the City eligible for FEMA funds and reduced federal flood insurance rates. In addition, the General Plan community plan elements establish land use designations (zoning categories) for all properties within the City, in compliance with State land use requirements. Flood inundation areas generally are classified in the lowest density zoning categories.

Mud and debris slides and localized flooding. Watershed protection is a primary concern of the City, especially in hillside areas (Exhibit C). Permeable soil soaks up rain and irrigation water, proper grading and drainage systems channel and collect water to protect slopes from saturation and slippage, catch basins divert surface water to street gutters which divert the water to storm drains and flood control channels so as to reduce erosion and flooding. The Bureau of Engineering, Building and Safety Department, Planning Department and Fire Department coordinate development permit review and issuance to assure proper grading, drainage, irrigation and landscaping so as to preserve slope stability, provide erosion control and reduce potential for flooding and fire hazard.

Following major brush fires, federal or state agencies typically seed denuded areas with wild plant seeds which rapidly germinate thereby encouraging regeneration of vegetation which will hold the soil and protect the watershed from erosion. Remedial measures, such as sandbagging and erection of temporary erosion control measures, are instituted in anticipation of storms so as to protect road systems and property from potential landslides, flooding and mud and debris flows. To reduce fire hazards and protect slopes, the City requires vegetation clearance and encourages hillside property owners to plant appropriate vegetation and to implement proper irrigation and slope maintenance measures.

Beach erosion. Beach erosion mitigation is under the auspices of the Army Corps. Taming of flood waters of the Los Angeles River and draining of marshes, dredging, construction of breakwaters and creation of new land masses for development of the harbors changed ocean wave action and reduced the flow of natural sediments (sand) to the sea. Change in wave action and lack of sand to replenish beaches resulted in erosion of the coastline, undermining of cliffs and reducing or eliminating beaches. Undermining of cliffs sometimes resulted in landslides and loss of homes and property. Initially local jurisdictions were responsible for beach protection. In the 1930s the Bureau of Engineering Hydraulic Research Laboratory evaluated sand migration to

identify causes of erosion and means of mitigating erosion and protecting roadways and properties. It became clear the that primary cause of beach erosion was due to the breakwaters and other Army Corps constructed modifications of wave action along the coast. Mitigation generally was beyond the expertise and resources of local jurisdictions. In 1956 damage had become so serious that Congress expanded the role of the Corps to include responsibility for beach erosion management, *e.g.*, beach protection and replenishment.

Tsunamis and large ocean waves. Tsunamis are large ocean waves which are generated by major seismic events. Storms at sea also can generate heavy waves. Both have the potential of causing flooding of low lying coastal areas. Exhibit G depicts potential tsunami hazard areas. Hazardous tsunamis are rare along the Los Angeles coast. However, storm generated waves have caused considerable damage to property and beaches along the ocean perimeter. The City Flood Hazard Specific Plan sets forth design criteria for development in coastal zones, including increased base building elevations. The Army Corps is responsible for constructing and maintaining the breakwaters which are designed to mitigate damaging wave action, particularly in the harbor area. The Harbor Department works cooperatively with the Army Corps relative to maintenance and protection of the breakwater facilities. Along with the fire and police departments, it participates in the federal tsunami alert program to warn potentially affected properties and harbor tenants of tsunami threats and to advise them concerning protective response actions.

Seiches and inundation (water storage facilities). A seiche is a surface wave created when a body of water is shaken. Seiches are of concern relative to water storage facilities because inundation from a seiche can occur if the wave overflows a containment wall, such as the wall of a reservoir, water storage tank, dam or other artificial body of water. Mitigation of potential seiche action has been implemented by the Department of Water and Power through regulation of the level of water in its storage facilities and providing walls of extra height to contain seiches and prevent overflow. Dams and reservoirs are monitored during storms and measures are instituted in the event of potential overflow. These measures apply to facilities within the City's borders and facilities owned and operated by the City within other jurisdictions.

Inundation due to water storage facility failure also is a potential hazard. The Baldwin Hills dam failure of December 14, 1963 and near collapse of the Van Norman Dam during the 1971 San Fernando earthquake resulted in strengthening of the federal, state and local design standards and retrofitting of existing facilities. Thirteen dams in the greater Los Angeles area moved or cracked during the 1994 Northridge earthquake. The most seriously damaged was the Pacoima Dam which was located approximately eight miles from the epicenter. However, none were severely damaged. This low damage level was due in part to completion of the retrofitting of dams and reservoirs pursuant to the 1972 State Dam Safety Act following the San Fernando quake. The Act also required the preparation of inundation maps. Significant potential inundation hazard areas are depicted on Exhibit G.

Ecological systems. Environmental considerations are an important part of flood control systems. As the Los Angeles flood control system neared completion and public demand for water supplies, recreation and beautification increased, Congress provided for multiple use of facilities. By the 1960s watershed protection, electrical power, recreation, agriculture and water storage were integral secondary uses of flood control systems and considerations in flood control systems planning. Paving of the Los Angeles River bottom, and City in general, reduced ground water recharge. To compensate for the loss, water spreading grounds were established to replenish underground aquifers. Three sections of the Los Angeles River have unpaved bottoms partially due to the existence of natural springs. These sections and dam basins provide natural habitats for wild animals and birds. The dam basins also provide land for recreation and agricultural uses. Sand bars, trees and heavy marsh growth provide protected habitats for water birds. Fish live in the river channel. Until 1984, the Los Angeles River channel, except for the unpaved sections, virtually was dry except during the rainy season. Upon completion of the San Fernando Valley Donald C. Tillman Wastewater Reclamation Plant (1984) a continuous flow of reclaimed water was sent down the channel creating a year round stream which has regenerated plant and animal life along the entire channel. Some

hiking, equine and bicycle trails exist and are planned for expansion along the edges of some flood control channels.

Water quality. Water quality relative to drainage was an early consideration of the City. Public funds began to be expended in the late 1880s for construction of public works, including streets with gutters and associated drains. The sewage and water drainage systems were separated so as to keep storm and drainage water from entering the sewage system and to enable large quantities of rain water to be carried rapidly to the ocean without necessity of treatment. In the 1920s sewer maintenance hole covers near gutters were sealed to keep out storm water and an inspection unit was established to identify and cite property owners for illegal connections from roofs, yards, wash racks and the like into the sewer system. In recent years pollution of drainage water has become an increasing concern.

Prior to 1958 the primary concern relative to water pollution related to pollution of ocean and beaches due to oil tanker spills. Such spills were regulated by federal agencies. Beginning with the Water Pollution Control Act of 1956, the federal government began to address the problem of pollution discharge into navigable waters, such as the Pacific Ocean. Initially, this resulted in regulations of discharge of waste water (sewage). More recently, federal regulations have focused on storm water, urban runoff and dumping of pollutants into storm drainage systems. Daily runoff in dry or wet periods washes residues from the land, including deposits from vehicles, pet waste, pesticides and street litter. Illegal dumping of waste into the storm drainage system adds to the run-off stream. The first rains of the season wash accumulated pollutants from streets, vegetation and roof tops into the drainage system. Even natural seepage, such as from the La Brea tar pit area or other oil and gas deposits which underlay large sections of the City, or from microorganisms in the soil, contribute pollutants. Pollutants also are washed from the air onto the land and into the run-off stream. Air quality aspects of pollution are addressed in the General Plan Air Quality Element.

Storms result in inflow and infiltration into sewage systems and have caused release into the ocean of partially treated sewage. Sometimes discharge washed into the ocean during storms has resulted in temporary beach closure due to potential health hazards associated with harmful bacteria from human and animal waste and decomposed plant material which is washed from land surfaces into the ocean by storms or which results from leak incidents. There also is concern that storm related residues may contribute damage to the ecology of the local bays, estuaries and natural water supported habitats.

To address potential hazards of discharge and run-off, the Federal Clean Water Act (*i.e.*, Water Pollution Control Act) was amended in 1972 making it unlawful to discharge water borne pollutants into navigable waters of the United States from any point source, except as allowed by a National Pollutant Discharge Elimination System (NPDES) permit. A "point source" being an identifiable source of discharge such as from a ship, pipe, fissure, or container, as opposed to non-point sources, such as water borne run-off containing pollutants from sources which are not readily identifiable. In 1973 the Federal Environmental Protection Agency (EPA) issued regulations to implement the Act and specifically exempted urban runoff that was not contaminated by industrial or commercial sources. The State Water Resources Control Board and its regional boards were charged with enforcing the regulations and issuing the permits. In Los Angeles, the regulations were interpreted to apply to City sewage and industrial waste water discharges into the Pacific Ocean and not to storm water or urban runoff.

To more clearly address the issue of storm water and urban runoff, the Clean Water Act was amended in 1987 to require NPDES permits for any discharge into navigable waters of the United States. The intent of the amendment was to address non-point sources and general urban and storm water runoff, especially residues from routine industrial and commercial activity. Such residues are washed by storm water from surfaces and the land and are carried via the drainage systems to the ocean. There was recognition in broadening the regulations that it was difficult to assess non-point source pollution and that further data and evaluation of run-off was needed.

In 1988-90 the EPA issued storm water discharge regulations to implement the 1987 amendments. The City joined with Los Angeles County and other

municipalities within the County in ubmitting a joint NPDES permit which was approved by the Los Angeles Regional Water Quality Control Board in June 1990. The permit was applicable for five years. The involved jurisdictions were in the process of renewing the permit at the time this Safety Element was being prepared. Water pollution issues and programs are addressed more comprehensively by other elements of the General Plan.

SLOPE FAILURE AND SUBSIDENCE

Los Angeles is a part of the Pacific Coastal Region, a huge geologic region which stretches from Alaska to the tip of South America. The region consists of young geologic areas in which the mountains still are in the process of growing and shaping the California land form. Los Angeles is one of the few major cities in the world with a mountain range (the Santa Monica Mountains) bisecting its land area. In addition, it is bounded by the Santa Susana and Verdugo Mountains and the Palos Verdes Hills. The Beverly Hills and Baldwin Hills bound or cross other sections of the City. The Pacific Ocean interacts with the coastal boundaries of these ranges to create seaside cliffs and beaches. Under natural conditions, slopes often give way, resulting in landslides. Exhibit C generally depicts some of the significant potential landslide hazard areas. As City development spread from the flat lands of what is now the Central City and the San Fernando Valley into the hillsides and along the bases of slopes, unstable soil and erosion sometimes contributed to landslides and mud and debris flows which impacted development, especially following rain storms. Landslides can be triggered by natural causes such as earthquakes, ocean wave action or saturation by storm, or can be induced by the undercutting of slopes during construction, improper artificial compaction or saturation from sprinkler systems or broken pipes.

The principal tool for mitigation of geologic hazards is the City Grading Code. In 1929 the Building and Safety Department began to compile and correlate data on soil conditions for distribution to realtors, builders and prospective property buyers. In 1952 hillside grading provisions were added to the Building Code. Los Angeles was the first city in the nation to have such provisions. Storms of 1957-58 caused extensive damage in hillside areas and led to adoption of the 1963 Grading Code. It was the first such legislation in the nation and served as a model for other jurisdictions. A unique feature of the Code was a requirement that professional geologists supervise hillside grading. Under the Code the Department of Building and Safety has the authority to withhold building permit issuance if a project cannot mitigate potential hazards to the project or which are associated with the project. A property owner may be required to install pilings to anchor a structure to bedrock, to construct retaining walls, build drainage systems or implement other mitigation measures. If, after a project is constructed, potential slope stability hazards are identified, the City can require implementation of stabilization measures. The Grading Code periodically is revised to reflect new technology and improve standards and requirements. Pursuant to the State Hazard Mapping Act, the State Geologist is preparing maps which identify potential landslide hazard areas. A description of this program is contained in the "Seismic Events" section of this Element.

To regulate subsurface extraction activities, the City established Oil Drilling District procedures in 1948 and Rock and Gravel District procedures in 1951. The latter was superseded in 1976 by the Surface Mining District ordinance which brought the City into compliance with the California Surface Mining and Reclamation Act of 1975. The former has been amended several times to improve protective and procedural measures and, in 1971, to include offshore oil drilling. Both contain provisions for monitoring and imposing mitigation measures to prevent significant subsidence relative to oil and gas extraction and mining activities. The districts (Exhibit E) are established as overlay zones and are administered by the City Planning Department with the assistance of other City agencies. The City Oil Administrator of the Office of the City Administrative Officer is responsible for monitoring oil extraction activities and has the authority to recommend additional mitigation measures to the Planning Commission after an Oil Drilling District is established. The Planning Department Office of Zoning Administration issues and administers oil drilling permits and may impose additional mitigation measures, as deemed necessary, after a permit has been granted, such as measures to address subsidence.

SEISMIC EVENTS

The programs associated with this Safety Element emphasize seismic safety issues because seismic events present the most widespread threat of devastation to life and property. With an earthquake, there is no containment of potential damage, as is possible with a fire or flood. Unlike a fire or flood whose path often can be generally measured and predicted, quake damage and related hazard events may be widespread and, at present, are unpredictable. Related hazard events could occur anywhere in the quake area including inundations from damaged reservoirs or release of hazardous materials, such as gas, which in turn could lead to fires or form toxic clouds.

Since 1800 there have been approximately 60 damaging seismic events, or "earthquakes," in the Los Angeles region. After a brief hiatus between major events (circa 1940-1972), the greater Los Angeles area has experienced a number of moderate events which have resulted in considerable disruption of the infrastructure, impact on social and economic life, loss of lives and extensive property damage within the City, the greater metropolitan area and the adjacent region. The most recent of these was the 6.7 magnitude 1994 Northridge earthquake which was centered in the northwest part of the City, in the general vicinity of the 1971 San Fernando (aka Sylmar) quake.

The U.S. Geological Survey has estimated the probability of a ten to thirty percent potential for a 7.5 or more magnitude quake along the southern portion of the San Andreas fault within the next five to thirty years. The Alquist-Priolo Act requires the State Geologist to map active earthquake fault zones. Those faults in the Los Angeles area typically are visible, above ground faults, *e.g.*, the San Andreas fault. The fault zones located within the City are depicted on Exhibit A. However, it is the quakes along the unmapped faults, such as the blind thrust fault associated with the Northridge earthquake, that increasingly are becoming the focus of study and concern. The concept of blind thrust faults has been recognized only recently by seismologists. The effect of such faults may dominate the geology of the Los Angeles basin in a way not previously known.

Seismic mitigation is relatively new, compared to flood and fire mitigation. Every major seismic event in the United States and abroad has provided valuable data for evaluating existing standards and techniques and improving hazard mitigation. The 6.3 magnitude Long Beach earthquake of 1933 killed 115 people and caused approximately $48 million in property damage. It demonstrated the vulnerability of unreinforced masonry structures and the hazards of parapets and unanchored facade decorations. In response, the State legislature adopted the Field Act of 1934 which set seismic building standards. Locally the reinforcement and parapet standards were adopted for new construction. The nature of damage to Seattle, Washington, due to the 1949 earthquake, persuaded Los Angeles to require removal of parapets and decorative appendages so as to prevent unreinforced masonry and concrete from falling onto streets and sidewalks during a quake. The ordinance was applicable to some 30,000 pre-1933 buildings which were located predominantly in the Central City area. The 1985 Mexico City earthquake prompted the City to upgrade and expand its urban search and rescue program (see Fire Section).Following the 1971 San Fernando quake, the City required improved anchoring of new tilt-up (concrete walls poured and tilted-up on the site) structures and retroactive reinforcement of unreinforced masonry structures. A seismic retrofit tilt-up ordinance was developed and made retroactive two weeks after the 1994 Northridge earthquake. Subsequently, the City adopted a series of ordinances which required retrofitting of certain existing structures (*e.g.*, foundation anchoring of hillside dwellings) and for new construction, as well as an ordinance which required evaluation of structures by a structural engineer during the construction process. The Northridge quake underscored the need for thorough, on-going building inspections to assure construction of buildings according to Code.

Although the Northridge earthquake was listed by seismologists as a moderate quake, it was the most costly seismic event in the United States since the 1906 San Francisco earthquake. Within the City and surrounding region, approximately 72 people died as a result of the quake (including by heart attack associated with the quake experience), thousands were physically injured, and the direct and indirect psychological toll was incalculable. Property damage was in the billions of dollars. An estimated

93,000 (as of June 1996) buildings were damaged in the City, some requiring demolition. Approximately 5,800 buildings had to be partially or totally vacated, including approximately 25,640 mostly multiple-residential dwelling units. By the autumn following the quake, some 27,000 units were deemed in danger of being lost because owners had difficulty financing repair costs.

In addition, the infrastructure (Exhibit H) of the metropolitan area was severely disrupted. Freeways collapsed, the power systems for the City and linked communities as far away as Oregon were temporarily "blacked out" and communications were disrupted. Due to abatement measures, planning, training and inter-agency and inter-jurisdictional coordination, response was much more efficient than in 1971 following the San Fernando quake. Stronger building codes and required retrofitting following the San Fernando quake contributed to a reduction in damage to structures and buildings and resulted in better containment of hazardous materials. Coordinated response resulted in more rapid identification of damage sites, extinguishing of fires, addressing of fire hazards, administering, often from battle-field like temporary facilities, to the injured and displaced and initiation of work to restore the disrupted cities and region. Closure of businesses, disruption of services and dislocation of people had a significant domino effect on the economy of the region, state and nation. The economic impact would have been greater had the quake been more severe or had disruption of the infrastructure continued for a longer period of time.

The fact that the Northridge event occurred at 4:31 a.m. January 17, 1994 on the Martin Luther King Jr. national holiday may have been the primary reason for so little loss of life and human injury. A low number of commuters were traveling on the freeways and streets and few people were in offices, industrial, commercial buildings, public garages and shopping centers, many of which suffered severe structural and non-structural damage. Many emergency and seismic experts believe that had the quake occurred at midday, instead of during the predawn, the loss of life and injury figures would have been substantially higher. Nevertheless, emergency forces were severely challenged by the event.

The Northridge quake was one of the most measured earthquakes in history due to extensive seismic instrumentation in buildings and on the ground throughout the region. Information from seismological instruments, damage reports and other data provided a wealth of information for experts to analyze. Traditional theories about land use siting and existing building code provisions were called into question. It is known that the complex Los Angeles fault system interacts with the alluvial soils and other geologic conditions in the hills and basins. This interaction appears to pose a potential seismic threat for every part of the City, regardless of the underlying geologic and soils conditions. Structural damage does not occur due to any one factor. The duration and intensity of the shaking, distance from the epicenter, composition of the soil and type of construction, all are factors in determining the extent of damage which may occur. Alluvial and artificially uncompacted soils tend to amplify the shaking. Shallow ground water, combined with uncompacted soils can result in liquefaction (quicksand effect) during a strong quake. Therefore, it is difficult to escape the impacts of a quake. During the Northridge quake, damage appeared to have a more direct relationship to building construction than did proximity to the epicenter. Largely as a result of the Northridge earthquake, the national Uniform Building Code was amended in 1994 to require that new development projects provide geotechnical reports which assess potential consequences of liquefaction and soil strength loss and propose appropriate mitigation measures, *e.g.*, walls supported by continuous footings, steel reinforcement of floor slabs, *etc.* These provisions were incorporated into the Los Angeles City Building Code, effective January 1996. Exhibit B identifies, in a general manner, areas susceptible to liquefaction. It was prepared for the General Plan Framework Element environmental impact report and is based on the County of Los Angeles 1990 Safety Element liquefaction exhibit. It identifies areas deemed to be liquefaction or potential liquefaction areas, based on occurrences of shallow ground water together with recent alluvial deposits.

One of the surprising findings following the Northridge quake was that many steel frame buildings, believed before the quake to be the safest structures, suffered unexpected welding joint damage. Such damage resulted in the evacuation of an 11-story building in West Los Angeles several months

after the quake when it was determined that the damage to building joints had dangerously weakened the building structure. The building was located miles from Northridge, in the basin on the other side (south) of the Santa Monica Mountains. At the time this Safety Element was under preparation experts had not determined an acceptable method for retrofitting such buildings.

These are important findings for Los Angeles because Los Angeles is a built city. Few large tracts of land remain which have not already been developed with some use. Many key facilities, such as freeways, already follow fault lines through mountain passes. Buildings already are built on uncompacted and alluvial soils. Part of the downtown center, including its many high rise buildings, is built near the Elysian Park blind thrust fault which many seismologists believe could be the source of a major seismic event in the not so distant future. Physical expansion and change in the City will occur primarily through rehabilitation of existing structures and redevelopment of existing neighborhoods. The City's biggest challenge is how to protect an existing city and its inhabitants from future damage. Many believe this should be accomplished through improved building design instead of prohibition of construction. At the time this Element was under preparation, the City was retrofitting City Hall and some Port of Los Angeles facilities with base isolators to make the structures less prone to failure during strong ground shaking. This type of retrofitting is a step in addressing the strengthening of built structures.

Pre-seismic event land use planning with a view to reconfiguring the devastated areas though post-event changes in land use, intensity of development, *etc.* generally are not included as programs of this Safety Element. It has been the City's experience that the unpredictability of seismic events, both as to location and damage, renders such planning impractical. Devastation, while widespread, generally does not completely destroy entire blocks, neighborhoods or large geographic areas. Therefore, rebuilding tends to be more of an infill activity than an urban clearance and reconstruction enterprise. However, traditional redevelopment programs are included in the optional tools available for reconstruction of severely damaged areas and are being used to rebuild neighborhoods devastated by the Northridge quake.

Hazard assessment. The State Public Resources Code Section 2699 requires that a safety element "take into account" available seismic hazard maps prepared by the State Geologist pursuant to the Alquist-Priolo Earthquake Fault Zoning Act of 1972, subsequently amended (Public Resources Code Sections 2621-2630, originally known as the Alquist-Priolo Special Studies Zones Act) and the Seismic Hazard Mapping Act of 1990, subsequently amended (Public Resources Code Sections 2690-2699.6 and 3720-3725). The Alquist-Priolo Act was established as a direct result of the 1971 San Fernando earthquake. It requires that the State Geologist map active faults throughout the State. Those maps which are applicable to the City of Los Angeles are incorporated into Exhibit A of this Safety Element.

The Hazard Mapping Act requires the State Geologist to map areas subject to amplified ground shaking (or conditions which have potential for amplified ground shaking), liquefaction and landslide hazard areas. Following the 1994 Northridge earthquake, the hazard mapping program was revised and accelerated. The maps were under preparation concurrently with the preparation of this Safety Element. The first liquefaction and landslide hazard maps are scheduled to be released in 1996. Ground shaking maps are scheduled for release beginning in 1997. The entire mapping program is expected to be completed around 1999. Local jurisdictions are required by the Mapping Act to require additional studies and appropriate mitigation measures for development projects in areas identified as potential hazard areas by the maps. As maps are released for Los Angeles they will be utilized by the Building and Safety Department in helping to identify areas where additional soils and geology studies are needed for evaluation of hazards and imposition of appropriate mitigation measures prior to issuance of building permits. Once the entire set of maps for Los Angeles is complete it will be used to revise the soils and geology exhibits of this Safety Element. The maps, along with information being developed by private technical organizations, such as the Southern California Earthquake Center and California Institute of Technology, will assist the City in evaluating how to strengthen its land use and development codes and development permit procedures so as to better protect life and property from seismic

hazards. The Building Code already has been revised utilizing data secured relative to the Northridge and other recent significant seismic events. The subject Safety Element fulfills current requirements, based upon available official maps and reliable data, relative to fault zones (Exhibit A), liquefaction areas (Exhibit B) and slope failure (Exhibit C). These exhibits will be revised following receipt of the reliable new information. In addition to the hazard mapping provisions, the State requires that property sellers or agents disclose to potential property buyers geotechnical reports and their contents.

HAZARDOUS MATERIALS

Hazardous materials have been a concern since 1900 when the City experienced its first major oil industry fire. Extraction of oil and gas deposits began in 1896 when Edward Doheny discovered oil at Second Street and Glendale Boulevard (Westlake community). By 1900 he had erected over 600 wooden oil rigs and installed hundreds of storage tanks and related facilities. In that year a family bonfire ignited the oil field at Bixel Street. An estimated 10,000 gallons of blazing oil spilled down the hills but was diverted and suppressed before it reached the densely built Central City. The saving of the downtown from a potential disaster prompted the City to purchase more fire suppression equipment and to expand the number of fire stations and personnel. Subsequent oil field fires in the Doheny and other fields throughout the City resulted in regulations to assure containment of oil fires in oil fields, refineries and oil and gas storage facilities.

Much of the area south of the Santa Monica Mountains is underlain by gas and oil deposits. Such deposits exist under other areas of the City as well (Exhibit E). Natural gas, crude oil and hydrogen sulfide can work their way to the surface or infiltrate structures, causing potential fire and health hazards. In addition, landfills are sources of methane gas. The existence of underground gas and hazardous materials deposits requires monitoring of excavations and known seepage areas. A major incident occurred in 1971 during the tunneling for the Feather River Project when a methane explosion killed 18 workers. Incidents relating to the gas seepage caused temporary safety shutdowns of the Metro Rail subway tunneling in 1993-95.

In the 1920s the use of chemicals and hazardous materials in the City's expanding manufacturing and commercial sectors increased the hazards for both workers and the general populace. A series of movie studio back lot fires and film processing laboratory fires occurred in the late 1920s. These incidents led to the enactment of City regulations to protect workers and the public from fires and fumes associated with highly flammable film and chemicals used in film processing as well as from hazards associated with flammable movie sets.

Today hazardous materials are used in commercial, industrial, institutional and agricultural enterprises as well as households throughout the City. Los Angeles operates both a major international airport and a major harbor within its boundaries and operates other airport facilities within and outside its boundaries. Hazardous and highly flammable materials are shipped through, stored and used (especially fuels) at these facilities. They also are transported along freeways and highways and are stored in facilities throughout the City. Many hazardous materials, if released by accident or catastrophic event, could cause severe damage to human life and health and to the facilities and could disrupt activities within a radius of several miles around the release site.

During the 1994 Northridge earthquake, over 100 incidents of quake related release of hazardous materials were reported. Of these, 23 involved release of natural gas, 10 involved release of gases and liquid chemicals at educational institutions and 8 involved release of hazardous materials at medical facilities. Gas leaks or chemical reactions triggered fires which destroyed or damaged nine university science laboratories. Rupture of a high pressure natural gas line under Balboa Boulevard in Granada Hills resulted in a fire which damaged utility lines and adjacent homes. Petroleum pipeline leaks released 4,000 barrels of crude oil into the Santa Clara River north of Los Angeles and caused fires in the Mission Hills section of the City.

Fires can damage labeling and warning signs which are posted on chemical and fuel containers and on structures to identify presence of hazardous materials. Identification of hazardous materials, storage and handling sites and information about containment facilities and/or procedures are important to protect emergency personnel as well as employees and

the adjacent community during a spill incident and incident clean-up.

Hazardous materials management is regulated by federal and state codes. Within the City, the Fire Department is designated as the enforcement agency for the City, state and federal hazardous materials regulations. City regulations include spill mitigation and containment and securing of hazardous materials containers to prevent spills. In addition, the State Fire Marshall enforces oil and gas pipeline safety regulations and the federal government enforces hazardous materials transport pursuant to its interstate commerce regulation authority. At the time this Safety Element was under preparation cooperative interjurisdictional efforts were underway to evaluate the Northridge, Kobe and other seismic experiences and to develop methods for reducing potential hazardous materials spills and related damage associated with seismic events.

In 1976 the bulk oil tanker S.S. Sansinena exploded in the Port of Los Angeles killing nine people, injuring 46 and causing an estimated $21.6 million in damage. The tanker was empty. Poor maintenance and operating procedures on board the ship were identified as the cause of the explosion. In response to this incident, the City Council adopted a unique ordinance which required the Fire Department to inspect all tanker ships in the Port prior to loading and unloading so as to assure compliance with City fire prevention and safety measures and regulations. Los Angeles is the only City in the nation which has established such a program.

The Fire Department works cooperatively with the United States Coast Guard, the State and Los Angeles County in responding to off-shore emergency incidents including responding to, containing and cleaning-up off-shore oil spills. The City's authority is to protect the shoreline (on-shore). In accordance with a mutual aid agreement with the U.S. Coast Guard, the Fire Department provides the initial response to any spill in the harbor or off-shore. Its responsibility is to contain the initial spill and keep the situation from getting worse. The County is responsible for coordinating clean-up efforts. At the time this Safety Element was being prepared, the State was preparing a statewide Coastal Oil Spill Contingency Plan to establish administrative procedures (*e.g.*,chain of command) for responding to spills and providing clean-up, including training and utilization of volunteers in clean-up operations. The Fire Department's spill contingency plan will be incorporated into the State plan.

As noted above, this Safety Element primarily addresses hazardous materials relative to other potential natural hazards. Landfill monitoring is addressed by another element of the General Plan and by the City's Integrated Solid Waste Management Plan.

CHAPTER III - GOALS, OBJECTIVES AND POLICIES

The Safety Element goals, objectives, policies and programs are broadly stated to reflect the comprehensive scope of the Emergency Operations Organization (EOO). The EOO is the only program that implements the Element. The Element's policies outline administrative considerations which are addressed by EOO procedures, including its Master Plan, or which are observed in the carrying out of the Plan. All City agencies are part of the EOO. All City emergency preparedness, response and recovery programs are integrated into EOO operations and are reviewed and revised continuously.

Because City codes and regulations contain standards for water, streets, *etc.*, the Safety Element programs generally do not contain specific standards. An exception is the Fire Code policy which contains standards which, at the time this Element was under preparation, were contained only in the 1979 Fire Protection and Prevention Element of the General Plan. Until the standards are incorporated into the Fire Code or other regulations or plans, this is the only place where they are located. They are needed to guide City development actions. Other standards which were listed in the 1979 Fire Protection and Prevention Element have been incorporated into City Codes or superseded by other regulations or procedures.

HAZARD MITIGATION

GOAL 1

A city where potential injury, loss of life, property damage and disruption of the social and economic life of the City due to fire, water related hazard, seismic event, geologic conditions or release of hazardous materials disasters is minimized.

Objective 1.1

Implement comprehensive hazard mitigation plans and programs that are integrated with each other and with the City's comprehensive emergency response and recovery plans and programs.

Policies

1.1.1 Coordination. Coordinate information gathering, program formulation and program implemen tation between City agencies, other jurisdictions and appropriate public and private entities to achieve the maximum mutual benefit with the greatest efficiency of funds and staff. [All EOO hazard mitigation programs involving cooperative efforts between entities implement this policy.]

1.1.2 Disruption reduction. Reduce, to the greatest extent feasible and within the resources available, potential critical facility, governmental functions, infrastructure and information resource disruption due to natural disaster. [All EOO programs involving mitigation of disruption of essential infrastructure, services and governmental operations systems and prepare personnel for quickly reestablishing damaged systems implement this policy.]

1.1.3 Facility/systems maintenance. Provide redundancy (back-up) systems and strategies for continuation of adequate critical infrastructure systems and services so as to assure adequate circulation, communications, power, transportation, water and other services for emergency response in the event of disaster related systems disruptions. [All EOO programs that involve provision of back up systems and procedures for reestablishment of essential infrastructure, services and governmental operations which are disrupted implement this policy.]

1.1.4 Health/environmental protection. Protect the public and workers from the release of hazardous materials and protect City water supplies and resources from contamination resulting from accidental release or intrusion resulting from a disaster event, including protection of the environment and public from potential health and safety hazards associated with program implementation. [All EOO hazardous materials hazard and water pollution mitigation programs implement this policy.]

1.1.5 Risk reduction. Reduce potential risk hazards due to natural disaster to the greatest extent feasible within the resources available, including provision of information and training. [All programs that incorporate current data, knowledge and technology in revising and implementing plans (including this Safety Element), codes, standards and procedures that are designed to reduce potential hazards and risk from hazards potentially associated with natural disasters implement this policy.]

1.1.6 State and federal regulations. Assure compliance with applicable state and federal planning and development regulations, *e.g.*, Alquist-Priolo Earthquake Fault Zoning Act, State Mapping Act and Cobey-Alquist Flood Plain Management Act. [All EOO natural hazard enforcement and implementation programs relative to non-City regulations implement this policy.]

EMERGENCY RESPONSE (Multi-Hazard)

GOAL 2

A city that responds with the maximum feasible speed and efficiency to disaster events so as to minimize injury, loss of life, property damage and disruption of the social and economic life of the City and its immediate environs.

Objective 2.1

Develop and implement comprehensive emergency response plans and programs that are integrated with each other and with the City's comprehensive hazard mitigation and recovery plans and programs.

Policies

2.1.1 Coordination. Coordinate program formulation and implementation between City agencies, adjacent jurisdictions and appropriate private and public entities so as to achieve, to the greatest extent feasible and within the resources available, the maximum mutual benefit with the greatest efficiency of funds and staff. [All EOO response programs involving cooperative efforts between entities implement this policy.]

2.1.2 Health and environmental protection. Develop and implement procedures to protect the environment and public, including animal control and care, to the greatest extent feasible within the resources available, from potential health and safety hazards associated with hazard mitigation and disaster recovery efforts. [All EOO emergency response and recovery programs that mitigate environmental impacts or provide care and control of animals injured or released by an emergency situation implement this policy.]

2.1.3 Information. develop and implement, within the resources available, training programs and informational materials designed to assist the general public in handling disaster situations in lieu of or until emergency personnel can provide assistance. [All EOO response programs involving training, collection and dissemination of warning, guidance and assistance information to the public implement this policy.]

2.1.4 Interim procedures. Develop and implement pre-disaster plans for interim evacuation, sheltering and public aid for disaster victims displaced from homes and for disrupted businesses, within the resources available. Plans should include provisions to assist businesses which provide significant services to the public and plans for reestablishment of the financial viability of the City. [All EOO response and recovery programs involving evacuation and provision of temporary services to victims of an emergency event and any planning and training related thereto implement this policy.]

2.1.5 Response. Develop, implement and continue to improve the City's ability to respond to emergency events. [All EOO emergency response programs and all hazard mitigation and disaster recovery programs related to protecting and reestablishing communications and other infrastructure, service and governmental operations systems implement this policy.]

2.1.6 Standards/fire. Continue to maintain, enforce and upgrade requirements, procedures and standards to facilitate more effective fire suppression. [All peak load water and other standards, code requirements (including minimum road widths, access, clearances around structures) and other requirements or procedures related to fire suppression implement this policy.]

The Fire Department and/or appropriate City agencies shall revise regulations or procedures to include the establishment of minimum standards for location and expansion of fire facilities, based upon fire flow requirements, intensity and type of land use, life hazard, occupancy and degree of hazard so as to provide adequate fire and emergency medical event response. At a minimum, site selection criteria should include the following standards which were contained in the 1979 General Plan Fire Protection and Prevention Plan:[6]

• Fire stations should be located along improved major or secondary highways. If, in a given service areas, the only available site is on a local street, the site must be on a street which leads directly to an improved major or secondary highway.

• Fire station properties should be situated so as to provide drive-thru capability for heavy fire apparatus.

• If a fire station site is on the side of a street or highway where the flow of traffic is toward a signalized intersection, the site should be at least 200 feet from that intersection in order to avoid blockage during ingress and egress.

• The total number of companies which would be available for dispatch to first alarms would vary with the required fire flow and distance as follows: (a) less than 2,000 g.p.m. would require not less than 2 engine companies and 1 truck company; (b) 2,000 but less than 4,500 g.p.m., not less than 2 or 3 engine companies and 1 or 2 truck companies; and (c) 4,500 or more g.p.m., not less than 3 engine companies and 2 truck companies.

[These provisions, in full or in part, shall be deemed deleted from the Safety Element upon incorporation of these or substitute provisions into the Fire Code, Fire Chief Regulations, other appropriate regulations or procedures or another General Plan element.]

2.1.7 Volunteers. Develop and implement, within the resources available, strategies for involving volunteers and civic organizations in emergency response activities. [All EOO response programs involving volunteers implement this policy.]

[6] *These provisions of the 1979 Plan were modified by the Fire Department for purposes of clarification .*

DISASTER RECOVERY (Multi-Hazard)

GOAL 3

A city where private and public systems, services, activities, physical condition and environment are reestablished as quickly as feasible to a level equal to or better than that which existed prior to the disaster.

Objective 3.1

Develop and implement comprehensive disaster recovery plans which are integrated with each other and with the City's comprehensive hazard mitigation and emergency response plans and programs.

Policies

3.1.1 Coordination. Coordinate with each other, with other jurisdictions and with appropriate private and public entities prior to a disaster and to the greatest extent feasible within the resources available, to plan and establish disaster recovery programs and procedures which will enable cooperative ventures, reduce potential conflicts, minimize duplication and maximize the available funds and resources to the greatest mutual benefit following a disaster. [All EOO recovery programs involving cooperative efforts between entities implement this policy.]

3.1.2 Health/safety/environment. Develop and establish procedures for identification and abatement of physical and health hazards which may result from a disaster. Provisions shall include measures for protecting workers, the public and the environment from contamination or other health and safety hazards associated with abatement, repair and reconstruction programs. [All EOO hazard mitigation, response, recovery programs involving identification and mitigation of release of hazardous materials and protection of the public and emergency personnel from hazardous materials implement this policy.]

3.1.3 Historic/cultural. Develop procedures which will encourage the protection and preservation of City-designated historic and cultural resources to the greatest extent feasible within the resources available during disaster recovery. [All EOO recovery programs that encourage protection and preservation of historic and cultural resources implement this policy.]

3.1.4 Interim services/systems. Develop and establish procedures prior to a disaster for immediate reestablishment and maintenance of damaged or interrupted essential infrastructure systems and services so as to provide communications, circulation, power, transportation, water and other necessities for movement of goods, provision of services and restoration of the economic and social life of the City and its environs pending permanent restoration of the damaged systems. [All EOO response, recovery programs involving restoration of the City's infrastructure and essential services and service systems implement this policy.]

3.1.5 Restoration. Develop and establish prior to a disaster short- and long-term procedures for securing financial and other assistance, expediting assistance and permit processing and coordinating inspection and permitting activities so as to facilitate the rapid demolition of hazards and the repair, restoration and rebuilding, to a comparable or a better condition, those parts of the private and public sectors which were damaged or disrupted as a result of the disaster. [All EOO recovery programs involving financial planning, permit expediting and legislative and administrative actions to facilitate post-disaster recovery implement this policy.]

CHAPTER IV - IMPLEMENTATION

An Implementation program is an action, procedure, program or technique that carries out general plan policy. The Emergency Operations Organization (EOO) is the program that implements the Safety Element. The EOO is a City department comprised of all City agencies, pursuant to City Administrative Code, Division 8, Chapter 3. The Administrative Code, EOO Master Plan and associated EOO plans establish the chain of command, protocols and programs for integrating all of the City's emergency operations into one unified operation. Each City agency in turn has operational protocols, as well as plans and programs, to implement EOO protocols and programs. A particular emergency or mitigation triggers a particular set of protocols which are addressed by implementing plans and programs. The City's emergency operations program encompasses all of these protocols, plans and programs. Therefore, its programs are not contained in one comprehensive document. The Safety Element goals, objectives and policies are broadly stated to reflect the comprehensive scope of the EOO.

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability, and upon request, will provide reasonable accomodation to ensure equal access to its programs, services and activities.

EXHIBITS

SAFETY ELEMENT EXHIBIT **A**

Alquist-Priolo Special Study Zones & Fault Rupture Study Areas

In the City of Los Angeles

Alquist- Priolo Special Study Zone Areas

Fault Rupture Study Areas

NOTES

The Safety Element seismic and landslide exhibits, along with any official geologic or seismic hazard maps prepared by the State Geologist and any other potential hazard areas identified by the City Building Safety Department are used in determining if additional soils and geology reports should be prepared to help assess potential hazards and mitigations, as a part of the development permit process.

Sources: California Environmental Impact Report, Framework Element, Los Angeles City General Plan, May 1995; California Environmental Quality Act of 1970 (CEQA), Public Resources Code 21000 *et. seq.* as amended 1992, Alquist-Priolo Special Study Zone Act, Public Resources Code 2621-2630 and 2690-2699.6 as amended 1993, State of California Special Studies Zone maps for the following USGS quadrangles: Oat Mountain (1-1-76) San Fernando (1-1-79), Sunland (1-1-79), Burbank (1-1-79), Beverly Hills (6-1-86), Hollywood (6-1-86), Los Angeles (1-1-77), Inglewood (6-1-86), Torrance (6-1-86), Long Beach (6-1-86), as prepared by the State Geologist pursuant to the Alquist-Priolo Special Study Zones Act, City of Los Angeles Seismic Safety Plan Element of the General Plan Council file 74-3401, September 10, 1975.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • March 1994 • Council File No. 89-2104

N

1 1/2 0 1 2 3 4 5 KILOMETERS

1 1/2 1/4 0 1 2 3 4 MILES

SAFETY ELEMENT EXHIBIT B

Areas Susceptible to Liquefaction

In the City of Los Angeles

Liquefiable Areas (recent alluvial deposits; ground water less than 30 feet deep)

Potentially Liquefiable Areas (recent alluvial deposits; ground water 30-50 feet deep)

NOTES

The Safety Element seismic and landslide exhibits, along with any official geologic or seismic hazard maps prepared by the State Geologist and any other potential hazard areas identified by the City Building Safety Department are used in determining if additional soils and geology reports should be prepared to help assess potential hazards and mitigations, as a part of the development permit process.

Sources: Environmental Impact report, Framework Element, Los Angeles City General Plan, May 1995; County of Los Angeles, General Plan Safety Element Technical Appendix Vol. 2 plate 4 "Liquefaction Susceptibility", January 1990.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • October, 1993 • Council File No. 89-2104

SAFETY ELEMENT EXHIBIT C

Landslide Inventory & Hillside Areas

In the City of Los Angeles

- 5 - 100 Acre Bedrock Landslide Site
- 5 - 100 Acre Probable Bedrock Landslide Site
- Bedrock Landslide Area Greater Than 100 Acres
- Probable Bedrock Landslide Area Greater Than 100 Acres
- Undifferentiated Shallow Surfacal Landslide
- Cluster of Small Shallow Surfacal Landslides
- Approximate Location of Hillside Areas

NOTES

The Safety Element seismic and landslide exhibits, along with any official geologic or seismic hazard maps prepared by the State Geologist and any other potential hazard areas identified by the City Building Safety Department are used in determining if additional soils and geology reports should be prepared to help assess potential hazards and mitigations, as a part of the development permit process.

Sources: Environmental Impact Report, Framework Element, Los Angeles City General Plan, May 1995; County of Los Angeles, General Plan *Safety Element Technical Appendix Vol. 2 Plate 5* "Landslide inventory", January 1990; County of Los Angeles, *General Plan Safety Element Technical Appendix (Vol.1)*, "Hazard Reduction in Los Angeles County," December 1990 California Environmental Quality Act of 1970 (CEQA) with guideline, Public Resources Code Section 21000 *et. seq.*, as amended 1992; California Government Code Section 6530(g), as amended; City of Los Angeles, Planning and Zoning Code Section 17.05(c), as revised 10-13-93.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • June, 1994 • Council File No. 89-2104

1 1/2 0 1 2 3 4 5 KILOMETERS

N

1 1/2 1/4 0 1 2 3 4 MILES

SAFETY ELEMENT EXHIBIT **D**

Selected Wildfire Hazard Areas In the City of Los Angeles

Selected Wildland Fire Hazards

- Mountain Fire District
- Fire Buffer Zone
- Electrical Transmission Lines

Selected Urban Fire and Secondary Hazards

- Industrialized Areas
- Petrochemical Complexes (Including Oil Fields)
- Natural Gas Transmission Lines
- Natural Gas Distribution Lines
- Underground Natural Gas Storage Facilities
- Areas of known shallow Methane accumulation
- Selected concentration of Post-1946 High Rise Buildings (Greater than 8 stories)

NOTES

1. Mountain Fire Districts and Buffer Zones (Los Angeles City Fire Code Section 57.25) have been substituted for the "Fire Zone 4" and "Additional Areas of High Fire Hazard" designations shown on the County Safety Element Appendix exhibit.
2. Industrial zones are used to represent industrialized areas. Industrialized areas can be correlated with greater risk of public exposure to atmospheric releases of hazardous materials and flammable or explosive materials.
3. This plate does not show all fire hazards, nor does it intend to designate their relative risk. It should be used for general planning purpose only.

Source: LA County Safety Element Technical Appendix, Plate 7, December 1990. , City of Los Angeles Fire Department (See note No. 1) and Exhibit H

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • April, 1996 • Council File No. 89-2104

1 1/2 0 1 2 3 4 5 KILOMETERS

N

1 1/2 1/4 0 1 2 3 4 MILES

SAFETY ELEMENT EXHIBIT E

Oil Field & Oil Drilling Areas

In the City of Los Angeles

Major Oil Drilling Areas

Boundaries of State-Designated Oil Fields

1. Aliso Cyn Oil Field
2. Beverly Hills Oil Field
3. Boyle Heights Oil Field*
4. Cascade Oil Field
5. Cheviot Hill Oil Field
6. Horse Meadows Oil Field*
7. Hyperion Oil Field
8. Inglewood Oil Field
9. Las Cienegas Oil Field
10. L A City Oil Field
11. L A Downtown Oil Field
12. Mission Oil Field*
13. Pacoima Oil Field
14. Playa Del Rey Oil Field
15. Rosecrans Oil Field
16. Salt Lake Oil Field
17. San Vicente Oil Field
18. Sawtelle Oil Field
19. South Salt Lake Oil Field
20. Torrance Oil Field
21. Union Station Oil Field
22. Venice Beach Oil Field
23. Wilmington Oil Field

*Abandoned

NOTES

This map shows all oil fields know by the state geologist to have shown at least 6 months of economically viable production of oil. State wildcat maps show that exploratory wells have been drilled throughout the city.

Sources: Environmental Impact Report, Framework Element, Los Angeles City General Plan, May 1995; California Department of Conservation Division of Oil and Gas (DOG), Publication No. TR31, Land Use Planning in Urban Oil Producing Areas, 1988: DOG, Publication No. PRC 04, California Code of Regulations, Title 14 "Natural Resources" Section 1681 *et. seq.*, as amended February 1993; DOG, Publication No. PRC01, California Public Resources Code, Division 3"Oil and Gas", Sec. 3000 *et. seq.*, as amended July 1993; Division of Oil and Gas and Geothermal Resources, Construction project site review and well abandonment procedure (Brochure), as amended February 1994; City of Los Angeles Planning Department, interviews with DOG Long Beach office staff Engineers, 1994; California Environmental Quality Act of 1970 (CEQA) including guidelines, PRC SEC. 21000 *et. seq.*, as amended 1992.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • May, 1994 • Council File No. 89-2104

SAFETY ELEMENT EXHIBIT **F**

100-Year & 500-Year Flood Plains

In the City of Los Angeles

100-Year Flood Plain Areas

500-Year Flood Plain Areas

NOTES

1. A 500-Year flood will also flood 100-Year flood plains.
2. A 100-Year flood is a flood which results from a severe rainstorm with a probability of occuring approximately once every 100 years.
3. A 500-Year flood is a flood which results from a severe rainstorm with a probability of occuring once every 500 years.
4. Flood plains shown on the map reflect Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) currently in effect and Preliminary FIRM maps showing increases in expected flooding along the Los Angeles River and Dominguez Channel. Flood plains are now larger due to increased urbanization of the Los Angeles River Basin.

Sources: Environmental Impact Report, Framework Element, Los Angeles City General Plan, May 1995; Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps; FEMA Preliminary Flood Insurance Rate Maps; California Evironmental Quality Act of 1970 (CEQA), Public Resources Code Section 21000 et. seq., as amended 1992; California Government Code Section 65302 as amended 1993.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • March, 1994 • Council File No. 89-2104

SAFETY ELEMENT EXHIBIT G

Inundation & Tsunami Hazard Areas

In the City of Los Angeles

Flood Control Basin

Potential Inundation Areas

Areas Potentially Impacted by a Tsunami

Boundaries of Inundation Areas from Specific Flood Control Basins

Sources: Environmental Impact Report, Framework Element, Los Angeles City General Plan, May 1995; Technical Appendix to the Safety Element of the Los Angeles County General Plan Hazard Reduction in Los Angeles County, Volume 2, Plate 6, "Flood and Inundation Hazards" January 1990; California Environmental Quality Act of 1970 (CEQA), Public Resources Code Section 21000 *et. seq.* with guidelines as amended, 1992; California Government Code Title 7 chapter 3, article 5 section 65302(g), as amended 1993.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • March, 1994 • Council File No. 89-2104

1 1/2 0 1 2 3 4 5 KILOMETERS

1 1/2 1/4 0 1 2 3 4 MILES

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SAFETY ELEMENT EXHIBIT H

Critical Facilities & Lifeline Systems

In the City of Los Angeles

Selected Transportation Routes

- Selected Disaster Route
- State Highway
- Interstate Highway
- Federal Highway
- Caltrans Freeway Interchange
  High priority for Caltrans retrofit program
  (May include railroad crossing)
- Caltrans Pedestrian Crossing

Selected Emergency Facilities

- Major Communication Center
- LA County Maintenance Warehouse
- LA City Maintenance Warehouse

Selected Dependent Care Facilities

- Major Acute Care Hospital (Capacity greater than 500)
- Other Major Hospital
- LA County Community Care Facility (Capacity greater than 200)
- Major Jail Facility

Selected Lifeline Facilities

- Gas Compressor Station
- Electrical Power Plant
- Water Treatment Plant
- Waste Water Treatment Plant
- Major Transmission Substation
- High Voltage Transmission Line (Aerial Power Line)
- Underground Electrical Transmission Line
- Major Aqueduct

NOTES

1. This map is intended to present the general distribution of community elements vulnerable to damages from a variety of hazards. In order to preserve map clarity, all important critical facilities and lifelines are not shown.
2. Disaster routes function as primary thoroughfares for movement of emergency response traffic and access to critical facilities. Immediate emergency debris clearance and road/bridge repairs for short-term emergency operations will be emphasized along these routes.
3. The selected disaster routes also provide a plan for interjurisdictional road reconstruction and rebuilding following a major disaster.
4. The compilation of selected lifeline facilities relied heavily upon California Division of Mines and Geology, Earthquake Scenario Reports, Special Publications 60 and 99.
5. This map is intended for general land use and disaster planning purposes only.

Source: LA County Safety Element Technical Appendix, Plate 8, December 1990 & General Plan Framework EIR.

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