

Taming Natural Disasters

**Multi-Jurisdictional
Local Government
Hazard Mitigation Plan
for the San Francisco
Bay Area**

Adopted by ABAG Executive Board - March 17, 2005

ASSOCIATION OF BAY AREA GOVERNMENTS

BACKGROUND

The purpose of this Local Hazard Mitigation Plan document is to serve as a catalyst for a dialog on public policies needed to mitigate the natural hazards that affect the San Francisco Bay Area.

The overall strategy is to use this multi-jurisdictional effort to not only maintain and enhance the disaster resistance of our region, but also to fulfill the requirements of the Disaster Mitigation Act of 2000 for all local governments to develop and adopt this type of plan.

For purposes of this plan, local governments include not only the cities and counties of our region, but also special districts with elected boards.

For information complete information on ABAG's Local Hazard Mitigation Planning Effort, including interactive hazard mapping and risk assessment, see our Internet site at: *<http://quake.abag.ca.gov/mitigation>*

ABAG Publication Number: P05001EQK

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Annexes

Annexes for ABAG and other local governments in the Bay Area are appended to this Local Hazard Mitigation Plan.

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The writing and production of this report was funded by Grant No. PDM-03 PL04 from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) through the California Governor's Office of Emergency Services, as well as by the Association of Bay Area Governments and, through in-kind services, the local governments of the Bay Area.

Goals

Our Challenge

The San Francisco Bay Area is in a spectacular region with valleys and ridges, views and access to rivers, the ocean, and the Bay, and a mild climate. It is also home to 7 million people and has a \$400 billion economy¹.

But many of those ridges and valleys have been formed by active earthquake faults that can generate devastating shaking and ground failures. The typically mild climate is subject to occasional winter storms leading to landslides in the hills and flooding of the valleys. During the fire season, typically from May through November, the region is subject to periods of Diablo Winds bringing high temperatures, gusting winds, and low humidity. Tinder-dry trees, brush, and grasslands are subject to fires that can become catastrophic on the edges of urban development. Given an increasingly mobile population, our citizens and crops are subject to disease epidemics. Natural disasters can lead to secondary events that are disasters in themselves, including hazmat releases and dam failures. During the period from 1950 – 2000, all or part of the Bay Area was subjected to 56 disasters, or about a third of the 181 occurring in the entire State of California during that time².

These hazards are not new, and neither are the risks to lives, property, the environment, and our economy. Bay Area local governments, together with private utilities and the state, have created programs and regulations that are as creative and comprehensive as any region in the world.

Overall Goal

To maintain and enhance a disaster-resistant region by reducing the potential loss of life, property damage, and environmental degradation from natural disasters, while accelerating economic recovery from those disasters.

We need to continue to work to reduce and avoid risks from natural hazards to protect lives, property, the environment, and our economy.

This natural hazard mitigation plan is a joint effort by the cities, counties, and special districts in the Bay Area to build a more disaster-resistant region. We recognize that disasters do not respect the boundaries between our individual jurisdictions and have worked together to identify our hazards, assess our risks, and develop this goal, eight commitments, and a comprehensive list of strategies (or actions) to mitigate the identified risks.

We view this plan as a shared mental model of our overall goal, commitments, and mitigation actions. *We can no longer afford random acts of preparedness and mitigation.*

¹ Fassinger and others, 2003 – *ABAG's Projections 2003*. Economy is based on annual Gross Regional Product (GRP).

² California Governor's Office of Emergency Services database of disasters and major states of emergencies.

Commitments

The overall goal is being addressed by asking all local governments in the Bay Area to adopt formal resolutions in support of the following eight *commitments areas*. These commitments are not organized by hazard, but by the types of services supplied either directly, or indirectly, by local governments. With this organization, *each* of the Bay Area's cities and counties should find ways to address these major commitments by reducing identified risks. In addition, the Bay Area's special districts can address many of these commitments, depending on the role and responsibilities of that district. *Together, we are committed to increasing the disaster resistance of the infrastructure, health, housing, economy, government services, education, environment, and land use systems in the Bay Area.*

1. Infrastructure

Bay Area transportation and utility facilities and networks are vital lifelines during and following disasters, as well as in the functioning of our region and its economy.

2. Health

Bay Area facilities, networks, and systems providing care of sick and those with special needs need to be resilient after disasters for these systems will need to care for additional injured at the same time as those currently cared for are stressed.

3. Housing

Bay Area residents need to have safe and disaster-resistant housing that is architecturally diverse and serves a variety of household sizes and incomes.

4. Economy

Safe, disaster-resilient, and architecturally diverse downtown commercial areas, business and industrial complexes, and office buildings are essential to the overall economy of the Bay Area.

5. Government Services

Bay Area city and county governments, as well as community services agencies, provide essential services during and immediately following disasters, as well as critical functions during recovery, that need to be resistant to disasters.

6. Education

Safe and disaster-resistant school, education, and childcare-related facilities are critical to the safety of our children, as well as to the quality of life of Bay Area families.

7. Environment

Disaster resistance needs to further environmental sustainability, reduce pollution, strengthen agriculture resiliency, and avoid hazardous material releases in the Bay Area.

8. Land Use

Land use change needs to be accompanied by a respect for hazardous areas and facilities, as well as to recognize the interconnected nature of the Bay Area.

Implementation Strategies

Background on Implementation Strategy Organization

The implementation strategies, or action items, are listed under the eight major commitments identified on the previous page, rather than by hazard. As stated in the previous section, with this organization, *each* of the Bay Area's cities and counties should find ways to address these major commitments by reducing identified risks. In addition, the Bay Area's special districts can address many of these commitments, depending on the role and responsibilities of that district.

Any scheme to identify a comprehensive list of potential strategies is bound to have some overlaps. This list is no exception. Because those ideas listed under housing and economy have at their core the relationship between government and the people who live and work in their jurisdictions, there is overlap. City and counties, as well as special districts handling lifelines and schools, have buildings that are critical to their functioning, so there is duplication in the discussion of these issues.

*Most of the strategies listed are clearly within the definition of "hazard mitigation," that is, "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards."*³ The strategies address all of the hazards identified when performing the risk assessment work described in Appendix C. In addition, there are four notable areas where we have "pushed" this definition.

- ◆ The first is in the area of public education. Author Stephen Flynn notes in his 2004 book⁴ in a plea for greater public education following 9/11 that federal "security officials often act as though members of the American public are either potential recruits for an easily panicked mob or a passive part of a haystack that must constantly be sifted through to find terrorist needles." The Bay Area learned this lesson twelve years earlier in 1989 as a result of the Loma Prieta earthquake. People who live and work in our region also need to understand our hazards so that they can take appropriate mitigation measures in their homes, schools, and work places.
- ◆ Second, we have included under *Government Services* several ideas to "*Maintain and Enhance Local Government's Emergency Response and Recovery Capacity.*" These ideas have been included because we believe that many go well beyond the traditional response activities of city and county police and fire services.
- ◆ Several strategies are drafted so that they apply to natural – and security – hazards, such as the mitigation of disasters resulting from weapons of mass destruction. Hazmat releases and dam failures due to flooding, earthquakes, or terrorism have some similar impacts and therefore some similar mitigation strategies. Some methods of combating "common" crime and violence may deter major terrorist actions.
- ◆ Finally, the strategies dealing with health, both under the *Health* commitment, as well as sprinkled elsewhere in this document, have traditionally been funded by the Centers for Disease Control and Prevention (CDC), rather than FEMA. They also may involve the use of the National Disaster Medical System under U.S. Health and Human Services (including both uniformed and non-uniformed medical personnel under the U.S. Surgeon General). We view this Local Hazard Mitigation Plan, while a requirement of the Disaster Mitigation Act of 2000 being administered by FEMA, as an opportunity to build administrative bridges in the public health field. For example, local government actions to deal with managing "natural" deadly pathogens such as SARS, AIDS, West Nile, and mad cow disease in an increasingly mobile world can also assist in the response to bioterrorism.

³ Stafford Act (44 CFR 206:401)

⁴ Flynn, Stephen. 2004. *America the Vulnerable: How Our Government Is Failing to Protect Us from Terrorism*. HarperCollins Publishers, New York, page 160.

Status and Priorities

For each of the following potential mitigation strategies, local governments have been asked to choose their own priority for this strategy. The priorities in each of these local government Annexes were selected based on:

- ◆ the level of hazards identified in Appendix C,
- ◆ the Bay Area preliminary risk assessment conducted and described in Appendix C,
- ◆ supplementary hazard and risk assessment information developed by ABAG for each local government on the interactive internet site <http://quake.abag.ca.gov/mitigation>, and
- ◆ any specific studies conducted by the local government and included in that local government's Annex to this plan.

The priorities for each local government participating in this multi-jurisdictional plan are in that local government's *Annex* to this plan.

- Existing program
Responsible agency or department _____
Provide ordinance or resolution number, if applicable _____
- Very High priority – to be adopted by local government immediately
Responsible agency or department _____
- High priority – to be adopted by local government as soon as funding and resources allow
Agency responsible for seeking and administering funding _____
Sources of potential funding _____
Estimated amount of funding needed _____
- Moderate priority – will be adopted by local government as funding and resources allow
- Under study
Responsible agency or department _____
Provide estimated date of completion _____
- Not applicable, not appropriate, or not cost effective
- Not yet considered

This list is a “work in progress.” It will expand and change over time, hopefully becoming as dynamic as the restless earth whose hazards demand our attention. It is not meant to discourage local experimentation with alternative strategies. Rather, it is meant to be a list of both common and innovative practices. In addition, local governments choosing to reword specific strategies to meet their local needs, or to be more specific in their strategies, are encouraged to do so.

Some of the strategies will not be appropriate for some jurisdictions, but all jurisdictions should be able to address the general commitments with identifiable actions. Valid risk management requires a careful weighing of the advantages and disadvantages of action. ***Thus, while some strategies may be appropriate for some jurisdictions, those same strategies may not be appropriate or may not be cost effective for others.*** Over time, we are committed to developing better hazard and risk information to use in making those trade-offs. We are not trying to create

a disaster-proof region, but a disaster-resistant one. Finally, the cost of strategies varies greatly. Some of the most cost-effective relate to building and maintaining partnerships, not buildings.

Following approval of this plan by FEMA, ABAG will include the comprehensive strategies identified by all of these local governments Annexes as an interactive searchable database on that same internet site at <http://quake.abag.ca.gov/mitigation>. This interactive capability should begin to assist the California Office of Emergency Services in its efforts to monitor the effectiveness of this Local Hazard Mitigation Plan. For example, since this list of strategies has been conceived as a comprehensive list of “best practices,” strategies given relatively lower priorities by most local governments might be viewed as a multi-jurisdictional weakness, while those utilized and given a relatively high priority by most local governments might be viewed as a multi-jurisdictional strength.

Decisions on those strategies utilized and given a relatively high priority have been based on a variety of criteria, not simply on an economic cost-benefit analysis. These criteria include being technically and administratively feasible, politically acceptable, socially appropriate, legal, economically sound, and not harmful to the environment or our heritage.

Scope of Mitigation Strategies -New and Existing Development

Not only are the mitigation strategies have been designed to cover all of the hazards identified during the development of the natural hazard risk assessment for the plan as described in Appendix C, but the strategies also are designed to apply to existing development, new development, and even land use planning. For example, many of the strategies in infrastructure, housing, and economy focus on existing buildings, while many of those in land use focus on new development and general land use planning.

1. Infrastructure (INFR)

Bay Area transportation and utility facilities and networks are vital lifelines during and following disasters, as well as in the functioning of our region and its economy.

INFR-a. Multi-hazard

- 1) Assess the vulnerability of critical facilities designated by lifeline operators⁵ to damage in natural disasters or security threats, including facilities owned outside of the Bay Area that can impact service delivery within the region.
- 2) Comply with State of California and federal requirements to assess the vulnerability of dams to damage from earthquakes, seiches, landslides, liquefaction, or security threats.
- 3) Encourage the cooperation of utility system providers and cities, counties, and other special districts to develop strong and effective mitigation strategies for infrastructure systems and facilities.
- 4) Retrofit or replace critical lifeline facilities and/or their backup facilities that are shown to be vulnerable to damage in natural disasters.

⁵ Lifeline agencies, departments, and districts are those that operate transportation and utility facilities and networks.

- 5) Support and encourage efforts of *other* (lifeline) agencies as they plan for and arrange financing for seismic retrofits and other disaster mitigation strategies. (For example, a city might pass a resolution in support of a transit agency's retrofit program.)
- 6) Plan for speeding the repair and functional restoration of lifeline systems through stockpiling of shoring materials, temporary pumps, surface pipelines, portable hydrants, and other supplies, such as those available through the Water Agency Response Network (WARN).
- 7) Engage in, support, and/or encourage research by others on measures to further strengthen transportation, water, sewer, and power systems so that they are less vulnerable to damage in disasters.
- 8) Pre-position emergency power generation capacity (or have rental/lease agreements for these generators) in critical buildings of cities, counties, and special districts to maintain continuity of government and services.
- 9) Have back-up emergency power available for critical intersection traffic lights.
- 10) Develop unused or new pedestrian rights-of-way as walkways to serve as additional evacuation routes (such as fire roads in park lands).
- 11) Coordinate with PG&E and others to investigate ways of minimizing the likelihood that power interruptions will adversely impact vulnerable communities, such as the disabled and the elderly.
- 12) Encourage replacing aboveground electric and phone wires and other structures with underground facilities, and use the planning-approval process to ensure that all new phone and electrical utility lines are installed underground.
- 13) Coordinate with the State Division of Safety of Dams to ensure an adequate timeline for the maintenance and inspection of dams, as required of dam owners by State law.
- 14) Encourage communication between State OES, FEMA, and utilities related to emergencies occurring outside of the Bay Area that can affect service delivery in the region.
- 15) Ensure that transit operators, private ambulance companies, cities, and/or counties have mechanisms in place for medical transport during and after disasters that take into consideration the potential for reduced capabilities of roads following these same disasters.
- 16) Effectively utilize the Transportation Management Center (TMC), the staffing of which is provided by Caltrans, the CHP and MTC. The TMC is designed to maximize safety and efficiency throughout the highway system. It includes the Emergency Resource Center (ERC) which was created specifically for primary planning and procedural disaster management.

INFR-b. *Earthquakes*

- 1) Expedite the funding and retrofit of seismically-deficient city- and county-owned bridges and road structures by working with Caltrans and other appropriate governmental agencies.
- 2) Establish a higher priority for funding seismic retrofit of existing transportation and infrastructure systems (such as BART) than for expansion of those systems.

- 3) Include “areas subject to high ground shaking, earthquake-induced ground failure, and surface fault rupture” in the list of criteria used for determining a replacement schedule for pipelines (along with importance, age, type of construction material, size, condition, and maintenance or repair history).
- 4) Install specially-engineered pipelines in areas subject to faulting, liquefaction, earthquake-induced landsliding, or other earthquake hazard.
- 5) Replace or retrofit water-retention structures that are determined to be structurally deficient.
- 6) Install portable facilities (such as hoses, pumps, emergency generators, or other equipment) to allow pipelines to bypass failure zones such as fault rupture areas, areas of liquefaction, and other ground failure areas (using a priority scheme if funds are not available for installation at all needed locations).
- 7) Install earthquake-resistant connections when pipes enter and exit bridges.
- 8) Comply with all applicable building and fire codes, as well as other regulations (such as state requirements for fault, landslide, and liquefaction investigations in particular mapped areas) when constructing or significantly remodeling infrastructure facilities.
- 9) Clarify to workers in critical facilities and emergency personnel, as well as to elected officials and the public, the extent to which the facilities are expected to perform only at a life safety level (allowing for the safe evacuation of personnel) or are expected to remain functional following an earthquake.
- 10) Examine the feasibility of developing a water-borne transportation “system” – comprised mainly of relatively inexpensive barges – across the Bay for use in the event of major earthquakes. Implementation of such a system could prove extremely useful in the event of structural failure of either the road-bridge systems or BART and might serve as an adjunct to existing transportation system elements in the movement of large numbers of people and/or goods.

INFR-c. *Wildfire*

- 1) Ensure a reliable source of water for fire suppression (meeting acceptable standards for minimum volume and duration of flow) for existing and new development.
- 2) Develop a coordinated approach between fire jurisdictions and water supply agencies to identify needed improvements to the water distribution system, initially focusing on areas of highest wildfire hazard.
- 3) Develop a defensible space vegetation program that includes the clearing or thinning of (a) non-fire resistive vegetation within 30 feet of access and evacuation roads and routes to critical facilities, or (b) all non-native species (such as eucalyptus and pine, but not necessarily oaks) within 30 feet of access and evacuation roads and routes to critical facilities.
- 4) Ensure all dead-end segments of public roads in high hazard areas have at least a “T” intersection turn-around sufficient for typical wildland fire equipment.
- 5) Enforce minimum road width of 20 feet with an additional 10-foot clearance on each shoulder on *all* driveways and road segments greater than 50 feet in length in wildfire hazard areas.

- 6) Require that development in high fire hazard areas provide adequate access roads (with width and vertical clearance that meet the minimum standards of the *Fire Code* or relevant local ordinance), onsite fire protection systems, evacuation signage, and fire breaks.
- 7) Ensure adequate fire equipment road or fire road access to developed and open space areas.
- 8) Maintain fire roads and/or public right-of-way roads and keep them passable at all times.

INFR-d. *Flooding*

- 1) Conduct a watershed analysis of runoff and drainage systems to predict areas of insufficient capacity in the storm drain and natural creek system.
- 2) Develop procedures for performing a watershed analysis to look at the impact of development on flooding potential downstream, including communities outside of the jurisdiction of proposed projects.
- 3) Conduct a watershed analysis at least once every three years.
- 4) Assist, support, and/or encourage the U.S. Army Corp of Engineers, various Flood Control and Water Conservation Districts, and other responsible agencies to locate and maintain funding for the development of flood control projects that have high cost-benefit ratios (such as through the writing of letters of support and/or passing resolutions in support of these efforts).
- 5) Pursue funding for the design and construction of storm drainage projects to protect vulnerable properties, including property acquisitions, upstream storage such as detention basins, and channel widening with the associated right-of-way acquisitions, relocations, and environmental mitigations.
- 6) Continue to repair and make structural improvements to storm drains, pipelines, and/or channels to enable them to perform to their design capacity in handling water flows as part of regular maintenance activities.
- 7) Continue maintenance efforts to keep storm drains and creeks free of obstructions, while retaining vegetation in the channel (as appropriate), to allow for the free flow of water.
- 8) Enforce provisions under creek protection, stormwater management, and discharge control ordinances designed to keep watercourses free of obstructions and to protect drainage facilities to conform with the Regional Water Quality Control Board's Best Management Practices.
- 9) Develop an approach and locations for various watercourse bank protection strategies, including for example, (1) an assessment of banks to inventory areas that appear prone to failure, (2) bank stabilization, including installation of rip rap, (3) stream bed depth management using dredging, and (4) removal of out-of-date coffer dams in rivers and tributary streams.
- 10) Use reservoir sediment removal as one way to increase storage for both flood control and water supply.
- 11) Elevate critical bridges affected by flooding to increase stream flow and maintain critical access and egress routes.

- 12) Provide a mechanism to expedite the repair or replacement of levees that are vulnerable to collapse from earthquake-induced shaking or liquefaction, rodents, and other concerns, particularly those protecting critical infrastructure.
- 13) Ensure that utility systems in new developments are constructed in ways that reduce or eliminate flood damage.
- 14) Determine whether or not wastewater treatment plants are protected from floods, and if not, investigate the use of flood-control berms to not only protect from stream or river flooding, but also increasing plant security.
- 15) Work cooperatively with water agencies, flood control districts, Caltrans, and local transportation agencies to determine appropriate performance criteria for watershed analysis.
- 16) Work for better cooperation among the patchwork of agencies managing flood control issues.
- 17) Work cooperatively with upstream communities to monitor creek and watercourse flows to predict potential for flooding downstream.

INFR-e. *Landslides*

- 1) Include “areas subject to ground failure” in the list of criteria used for determining a replacement schedule (along with importance, age, type of construction material, size, condition, and maintenance or repair history) for pipelines.
- 2) Establish requirements in zoning ordinances to address hillside development constraints in areas of steep slopes that are likely to lead to excessive road maintenance or where roads will be difficult to maintain during winter storms due to landsliding.

INFR-f. *Building Reoccupancy*

- 1) Ensure that critical buildings owned or leased by special districts or private utility companies participate in a program similar to San Francisco’s Building Occupancy Resumption Program (BORP). The BORP program permits owners of buildings to hire qualified structural engineers⁶ to create facility-specific post-disaster inspection plans and allows these engineers to become automatically deputized as City/County inspectors for these buildings in the event of an earthquake or other disaster. This program allows rapid reoccupancy of the buildings.

INFR-g. *Public Education*

- 1) Provide materials to the public related to planning for power outages.
- 2) Provide materials to the public related to family and personal planning for delays due to traffic or road closures.
- 3) Provide materials to the public related to coping with reductions in water supply or contamination of that supply.
- 4) Provide materials to the public related to coping with disrupted storm drains, sewage lines, and wastewater treatment.

⁶ A qualified structural engineer is a California licensed structural engineer with relevant experience.

- 5) Facilitate and/or coordinate the distribution of materials that are prepared by others, such as by placing materials in city or utility newsletters, or on community access channels, as appropriate.

2. Health (HEAL)

Bay Area facilities, networks, and systems providing care of sick and those with special needs need to be resilient after disasters for these systems will need to care for additional injured at the same time as those currently cared for are stressed.

HEAL-a. *Hospitals and Other Critical Health Care Facilities*⁷

- 1) Work with critical health care facilities operators to ensure that critical facilities are structurally sound and have nonstructural systems designed to remain functional following disasters (as required for acute-care hospitals for earthquakes by State law).
- 2) Encourage hospitals to work with the California Office of Statewide Health Planning and Development (OSHPD) to formalize arrangements with structural engineers to report to the hospital, assess damage, and determine if the buildings can be reoccupied. The program should be similar to San Francisco's Building Occupancy Resumption Program (BORP) that permits owners of buildings to hire qualified structural engineers to create building-specific post-disaster inspection plans and allows these engineers to become automatically deputized as inspectors for these buildings in the event of an earthquake or other disaster. OSHPD, rather than city/county building departments, has the authority and responsibility for the structural integrity of hospital structures.
- 3) Ensure health care facilities are adequately prepared to care for victims with respiratory problems related to smoke and/or particulate matter inhalation.
- 4) Ensure these health care facilities have the capacity to shut off outside air and be self-contained.
- 5) Ensure that hospitals and other major health care facilities have auxiliary water and power sources.
- 6) Work with health care facilities to institute isolation capacity should a need for them arise following a communicable disease epidemic.
- 7) Develop printed materials, utilize existing materials (such as developed by FEMA and the American Red Cross), conduct workshops, and/or provide outreach encouraging employees of these critical health care facilities to have family disaster plans and conduct mitigation activities in their own homes.

⁷ Critical care facilities include hospitals, long-term care, primary care, or specialty clinics (such as dialysis clinics), home health agencies, or hospices.

HEAL-b. *Ancillary Health-Related Facilities*⁸

- 1) Work with State of California licensing agencies to identify these ancillary facilities in your community.
- 2) Encourage ancillary facility operators to develop disaster mitigation plans.
- 3) Encourage ancillary facility operators to create, maintain, and/or continue partnerships with local governments to develop response and recovery plans.

HEAL-c. *Environmental Health*

- 1) Create and/or participate in discussion forums for food and health personnel, including, for example, medical professionals, veterinarians, plant pathologists, and city/county environmental health officers to develop safety, security, and response strategies for food supply contamination.

HEAL-d. *Interface with National and State Health Care Initiatives*

- 1) Designate locations for the distribution of antibiotics to large numbers of people should the need arise, as required to be included in each county's Strategic National Stockpile Plan.
- 2) Train appropriate personnel to understand that the Metropolitan Medical Response System (MMRS) cities in your area. For example, Oakland and Fremont are the MMRS cities in Alameda County. MMRS cities are those cities that are provided with additional federal funds for organizing, equipping, and training groups of local fire, rescue, medical, and other emergency management personnel.
- 3) Train appropriate personnel to know if any National Disaster Medical System (NDMS) uniformed or non-uniformed personnel are within one-to-four hours of your community. These federal resources include veterinary, mortuary, and medical personnel.
- 4) Train appropriate personnel to know to utilize the State of California Department of Health Services laboratory in Richmond for confirmation of biological agents and Department of Defense laboratories in Berkeley (Lawrence Berkeley National Laboratory) or Livermore (Lawrence Livermore National Laboratory and Sandia) for confirmation of radiological agents.

3. Housing (HSNG)

Bay Area residents need to have safe and disaster-resistant housing that is architecturally diverse and serves a variety of household sizes and incomes.

HSNG-a. *Multi-Hazard*

- 1) Be aware of past problems of inadequate hazard disclosure and work with real estate agents to improve enforcement of real estate disclosure requirements for those hazards covered by this plan, for example, by making those agents and the

⁸ Ancillary health care facilities include pharmacies, private offices of health care providers (such as doctors, dentists, ophthalmologists, psychologists, and alternative medical care givers), retail sales offices for health care devices (such as optometric, auditory, or prosthetic devices), laboratories, and offices of the private non-profit agencies services clients.

disclosure firms aware of the hazard maps incorporated in this plan and available on the ABAG web site at <http://quake.abag.ca.gov/mitigation>, as well as locally developed maps.

- 2) Create incentives for owners of historic or architecturally significant buildings to undertake mitigation to levels that will minimize the likelihood that these buildings will need to be demolished after a disaster, particularly if those alterations conform to the federal Secretary of the Interior's *Guidelines for Rehabilitation*.

HSNG-b. *Single-Family Homes Vulnerable to Earthquakes*

- 1) Utilize or recommend adoption of a retrofit standard that includes standard plan sets and construction details for voluntary bolting of homes to their foundations and bracing of outside walls of crawl spaces ("cripple" walls), such as that being developed by a committee representing the East Bay-Peninsula-Monterey Chapters of the International Code Council (ICC), California Building Officials (CALBO), the Structural Engineers Association of Northern California (SEAONC), the Northern California Chapter of the Earthquake Engineering Research Institute (EERI-NC), and ABAG's Earthquake Program.
- 2) Require engineered plan sets for retrofitting of heavy two-story homes with living areas over garages, as well as for split level homes, until standard plan sets and construction details become available.
- 3) Require engineered plan sets for retrofitting of homes on steep hillsides.
- 4) Encourage local government building inspectors to take classes on a periodic basis (such as the FEMA-developed training classes offered by ABAG) on retrofitting of single-family homes.
- 5) Encourage private retrofit contractors and home inspectors doing work in your area to take retrofit classes on a periodic basis (such as the FEMA-developed training classes offered by ABAG) on retrofitting of single-family homes.
- 6) Conduct demonstration projects on common existing housing types demonstrating structural and nonstructural mitigation techniques as community models for earthquake mitigation.
- 7) Provide retrofit classes or workshops for homeowners.
- 8) Establish tool-lending libraries with common tools needed for retrofitting for use by homeowners with appropriate training.
- 9) Provide financial incentives to owners of applicable homes to retrofit.

HSNG-c. *Soft-Story⁹ Multifamily Residential Structures Vulnerable to Earthquakes*

- 1) Require engineered plan sets for voluntary or mandatory soft-story retrofits until a standard plan set and construction details become available.

⁹ A condition in which the building has far less stiffness in its lowest story than in upper stories, often due to multiple garage openings at the ground floor or large open windows for commercial space, increasing the likelihood of excessive sidesway or even collapse. Many of these buildings collapsed in the 1971 San Fernando, 1989 Loma Prieta, and 1994 Northridge earthquakes. An engineering definition is "a condition in which the stiffness of the seismic-force-resisting system in any story is less than 70 percent of the stiffness in the story above" (modified from the American Society of Civil Engineers (ASCE 31).

- 2) Adopt the 2003 International Existing Building Code, the 1997 UBC, or the latest applicable code standard for the design of voluntary or mandatory soft-story building retrofits.
- 3) Work to educate condominium and apartment owners, local government staff, engineers, and contractors on soft-story retrofit procedures and incentives using materials such as those developed by ABAG (see <http://quake.abag.ca.gov/fixit>) and the City of San Jose.
- 4) Conduct an inventory of existing or suspected soft-story residential structures.
- 5) Use the soft-story inventory to require owners to inform all existing tenants that they live in this type of building and the standard to which it may have been retrofitted, as well as require owners to inform tenants that they will live in this type of building prior to signing a lease.
- 6) Use the soft-story inventory to require owners to inform all existing tenants that they should be prepared to live elsewhere following an earthquake if the building has not been retrofitted.
- 7) Investigate and adopt appropriate financial, procedural, and land use incentives for owners of soft-story buildings to facilitate retrofit such as those developed by ABAG (see <http://quake.abag.ca.gov/fixit>).
- 8) Explore development of local ordinances or State regulations to require or encourage owners of soft-story structures to strengthen them.
- 9) Provide technical assistance in seismically strengthening soft-story structures.

HSNG-d. *Unreinforced Masonry Housing Stock*

- 1) Continue to actively implement existing State law that requires cities and counties to maintain lists of the addresses of unreinforced masonry buildings and inform property owners that they own this type of hazardous structure.
- 2) Accelerate retrofitting of unreinforced masonry structures that have not been retrofitted, for example, by (a) actively working with owners to obtain structural analyses of their buildings, (b) helping owners obtain retrofit funding, (c) adopting a mandatory versus voluntary, retrofit program, and/or (d) applying penalties to owners who show inadequate efforts to upgrade these buildings.
- 3) Require owners to inform all existing tenants that they live in this type of building and the standard to which it may have been retrofitted, as well as require owners to inform tenants that they will live in this type of building prior to signing a lease.
- 4) Require owners to inform all existing tenants that they should be prepared to live elsewhere following an earthquake even if the building has been retrofitted, for it has probably been retrofitted to a life-safety standard, not to a standard that will allow occupancy following major earthquakes.

HSNG-e. *Other Privately Owned Structural-Suspicious Residential Buildings and Earthquakes*

- 1) Identify and work toward tying down mobile homes used as year-round permanent residences using an appropriate cost-sharing basis (for example, 75% grant, 25% owner).

- 2) Inventory non-ductile concrete, tilt-up concrete, and other privately-owned structurally suspicious residential buildings.
- 3) Adopt the 2003 International Existing Building Code, the 1997 UBC, or the latest applicable code standard for the design of voluntary or mandatory retrofit of seismically vulnerable buildings.
- 4) Adopt one or more of the following strategies as incentives to encourage retrofitting of privately-owned structurally deficient residential buildings: (a) waivers or reductions of permit fees, (b) below-market loans, (c) local tax breaks, (d) grants to cover the cost of retrofitting or of a structural analysis, (e) land use and procedural incentives, or (f) technical assistance.

HSNG-f. *New Construction and Earthquakes*

- 1) Continue to require that all new housing be constructed in compliance with structural requirements of the most recently adopted version of the *California Building Code*.
- 2) Conduct appropriate employee training and support continued education to ensure enforcement of building codes and construction standards, as well as identification of typical design inadequacies of housing and recommended improvements.

HSNG-g. *Wildfire and Structural Fires*

- 1) Increase efforts to reduce hazards in existing development in high wildfire hazard areas (identified as wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat) through improving engineering design and vegetation management for mitigation, appropriate code enforcement, and public education on defensible space mitigation strategies.
- 2) Tie public education on defensible space and a comprehensive defensible space ordinance to a field program of enforcement.
- 3) Require that new homes in wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat be constructed of fire-resistant building materials (including roofing and exterior walls) and incorporate fire-resistant design features (such as minimal use of eaves, internal corners, and open first floors) to increase structural survivability and reduce ignitability¹⁰.
- 4) Develop financial incentives for homeowners to be “model” defensible space homes in neighborhoods that are wildland-urban- interface fire-threatened communities or in areas exposed to high-to-extreme fire threat.
- 5) Consider fire safety, evacuation, and emergency vehicle access when reviewing proposals to add secondary units or additional residential units in wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat.
- 6) Adopt and/or amend, as needed, updated versions of the *California Building and Fire Codes* so that optimal fire-protection standards are used in construction and renovation projects.

¹⁰ See *Structural Fire Prevention Field Guide for Mitigation of Wildfires* at <http://osfm.fire.ca.gov/structural.html>.

- 7) Create a mechanism to enforce provisions of the *California Building and Fire Codes* and local housing codes that require the installation of smoke detectors and/or fire-extinguishing systems by making installation a condition of (a) finalizing a permit for any work on existing properties valued at over a fixed amount, such as \$500 or \$1000, and/or (b) a condition for the transfer of property if these changes are determined cost-effective strategies.
- 8) Work to ensure a reliable source of water for fire suppression in rural-residential areas through the cooperative efforts of water districts, fire districts, and residents.
- 9) Expand vegetation management programs in wildland-urban- interface fire-threatened communities or in areas exposed to high-to-extreme fire threat to more effectively manage the fuel load through roadside collection and chipping, mechanical fuel reduction equipment, selected harvesting, use of goats or other organic methods of fuel reduction, and selected use of controlled burning.
- 10) Promote the installation of early warning fire alarm systems in homes wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat connected to fire department communication systems.
- 11) Establish a Fire Hazard Abatement District to fund reduction in fire risk of existing properties through vegetation management that includes reduction of fuel loads, use of defensible space, and fuel breaks.
- 12) Work with residents in rural-residential areas to ensure adequate access and evacuation in wildland-urban- interface fire-threatened communities or in areas exposed to high-to-extreme fire threat.
- 13) Require fire sprinklers in new homes located more than 1.5 miles or a 5-minute response time from a fire station or in an identified high hazard wildland-urban-interface wildfire area.
- 14) Require fire sprinklers in all new or substantially remodeled multifamily housing, regardless of distance from a fire station.
- 15) Require sprinklers in all mixed use development to protect residential uses from fires started in non-residential areas.
- 16) Compile a list of high-rise and high-occupancy buildings which are deemed, due to their age or construction materials, to be particularly susceptible to fire hazards, and determine an expeditious timeline for the fire-safety inspection of all such structures.
- 17) Conduct periodic fire-safety inspections of all multi-family buildings, as required by State law.
- 18) Ensure that fire-preventive vegetation-management techniques and practices for creek sides and high-slope areas do not contribute to the landslide and erosion hazard.
- 19) Create a mechanism to require the bracing of water heaters and flexible couplings on gas appliances, and/or (as specified under “a. Single-family homes vulnerable to earthquakes” above) the bolting of homes to their foundations and strengthening of cripple walls to reduce fire ignitions due to earthquakes.
- 20) Work with the State Fire Marshall, the California Seismic Safety, PEER, and other experts to identify and manage gas-related fire risks of soft-story residential or mixed use buildings that are prone to collapse and occupant entrapment

consistent with the natural gas safety recommendations of Seismic Safety Commission Report SSC-02-03.¹¹

HSNG-h. *Flooding*

- 1) To reduce flood risk, and thereby reduce the cost of flood insurance to property owners, work to qualify for the highest-feasible rating under the Community Rating System of the National Flood Insurance Program.
- 2) Balance the housing needs of residents against the risk from potential flood-related hazards.
- 3) Ensure that new development pays its fair share of improvements to the storm drainage system necessary to accommodate increased flows from the development.
- 4) Provide sandbags and plastic sheeting to residents in anticipation of rainstorms, and deliver those materials to the disabled and elderly upon request.
- 5) Provide public information on locations for obtaining sandbags and/or deliver those sandbags to those various locations throughout a city and/or county prior to and/or during the rainy season.
- 6) Apply floodplain management regulations for development in the floodplain and floodway.
- 7) Ensure that new subdivisions are designed to reduce or eliminate flood damage by requiring lots and rights-of-way are laid out for the provision of approved sewer and drainage facilities, providing on-site detention facilities whenever practicable.
- 8) Encourage home and apartment owners to participate in home elevation programs.
- 9) As funding opportunities become available, encourage home and apartment owners to participate in acquisition and relocation programs for areas within floodways.
- 10) Encourage owners of properties in a floodplain to consider purchasing flood insurance. For example, point out that most homeowners' insurance policies do not cover a property for flood damage.

HSNG-i. *Landslides and Erosion*

- 1) Increase efforts to reduce landslides and erosion in existing and future development by improving appropriate code enforcement and use of applicable standards, such as those appearing in the *California Building Code*, California Geological Survey *Special Report 117 – Guidelines for Evaluating and Mitigating Seismic Hazards in California*¹², American Society of Civil Engineers (ASCE) report *Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and Mitigating Landslide Hazards in California*¹³, and the California Board for Geologists and Geophysicists *Guidelines for Engineering Geologic Reports*¹⁴. Such standards should cover excavation, fill

¹¹ See http://www.seismic.ca.gov/pub/CSSC_2002-03_Natural%20Gas%20Safety.pdf. Note: any valves that are installed may need to have both excess flow and seismic triggers (“hybrid” valves).

¹² See <http://gmw.consrv.ca.gov/shmp/SHMPsp117.asp>.

¹³ See <http://www.scec.org/resources/catalog/LandslideProceduresJune02.pdf>.

¹⁴ See <http://www.geology.ca.gov/publications/engineering.pdf>.

placement, cut-fill transitions, slope stability, drainage and erosion control, slope setbacks, expansive soils, collapsible soils, environmental issues, geological and geotechnical investigations, grading plans and specifications, protection of adjacent properties, and review and permit issuance.

- 2) Increase efforts to reduce landslides and erosion in existing and future development through continuing education of design professionals on mitigation strategies.

HSNG-j. *Building Reoccupancy*

- 1) Develop and enforce an ordinance for disaster-damaged structures to ensure that residential buildings are repaired in an appropriate and timely manner and retrofitted concurrently to avoid a recurrence.

HSNG-k. *Public Education*

- 1) Provide information to residents of your community on the availability of interactive hazard maps showing your community on ABAG's web site.
- 2) Develop printed materials, utilize existing materials (such as developed by FEMA and the American Red Cross), conduct workshops, and/or provide outreach encouraging residents to have family disaster plans that include drop-cover-hold earthquake drills, fire and storm evacuation procedures, and shelter-in-place emergency guidelines.
- 3) Better inform residents of comprehensive mitigation activities, including elevation of appliances above expected flood levels, use of fire-resistant roofing and defensible space in high wildfire threat and wildfire-urban-interface areas, structural retrofitting techniques for older homes, and use of intelligent grading practices through workshops, publications, and media announcements and events.
- 4) Develop a public education campaign on the cost, risk, and benefits of earthquake, flood, and other hazard insurance.
- 5) Use disaster anniversaries, such as April (Earthquake Month and the 1906 earthquake), September (9/11), and October (Loma Prieta earthquake and Oakland Hills fire), to remind the public on safety and security mitigation activities.
- 6) Sponsor the formation and training of Community Emergency Response Teams (CERT) training. [Note – these programs go by a variety of names in various cities and areas.]
- 7) Include flood fighting technique session based on California Department of Water Resources training to the list of available public training classes offered by CERT.
- 8) Institute the neighborhood watch block captain and team programs outlined in the Citizen Corps program guide.
- 9) Assist residents in the development of defensible space through the use of, for example, "tool libraries" for weed abatement tools, roadside collection and/or chipping services (for brush, weeds, and tree branches) in wildland-urban-interface fire-threatened communities or in areas exposed to high-to-extreme fire threat.
- 10) Train homeowners to locate and shut off gas valves if they smell or hear gas leaking.

- 11) Distribute NOAA weather radios to high-risk, limited-income families living in flood hazard areas.
- 12) Develop a program to provide at-cost NOAA weather radios to residents of flood hazard areas.
- 13) Make use of the materials on the ABAG web site at <http://quake.abag.ca.gov/fixit> and other web sites to increase residential mitigation activities related to earthquakes. (ABAG plans to continue to improve the quality of those materials over time.)
- 14) Develop a “Maintain-a-Drain” campaign, similar to that of the City of Oakland, encouraging businesses and residents to keep storm drains in their neighborhood free of debris.
- 15) Encourage the formation of a community- and neighborhood-based approach to wildfire education and action through local Fire Safe Councils and the *Fire Wise Program*.
- 16) Inform shoreline-property owners of the possible long-term economic threat posed by rising sea levels.
- 17) Develop and distribute culturally appropriate materials related to disaster mitigation and preparedness, such as those on the <http://www.preparenow.org> website.

4. Economy (ECON)

Safe, disaster-resilient, and architecturally diverse downtown commercial areas, business and industrial complexes, and office buildings are essential to the overall economy of the Bay Area.

ECON-a. *Multi-Hazard*

- 1) Be aware of past problems of inadequate hazard disclosure and work with real estate agents to improve enforcement of real estate disclosure requirements for those hazards covered by this plan, for example, by making those agents and the disclosure firms aware of the hazard maps incorporated in this plan and available on the ABAG web site at <http://quake.abag.ca.gov/mitigation>, as well as locally developed maps.
- 2) Create incentives for owners of historic or architecturally significant buildings to undertake mitigation to levels that will minimize the likelihood that these buildings will need to be demolished after a disaster, particularly if those alterations conform to the federal Secretary of the Interior’s *Guidelines for Rehabilitation*.

ECON-b. *Soft-Story*¹⁵ *Commercial Buildings Vulnerable to Earthquakes*

- 1) Require engineered plan sets for voluntary or mandatory soft-story retrofits until a standard plan set and construction details become available.
- 2) Adopt the 2003 International Existing Building Code, the 1997 UBC, or the latest applicable code standard for the design of voluntary or mandatory soft-story building retrofits.
- 3) Work to educate building owners, local government staff, engineers, and contractors on soft-story retrofit procedures and incentives using materials such as those developed by ABAG (see <http://quake.abag.ca.gov/fixit>) and the City of San Jose.
- 4) Conduct an inventory of existing or suspected soft-story commercial and industrial structures.
- 5) Use the soft-story inventory to require owners to inform all existing tenants that they work in this type of building and the standard to which it may have been retrofitted, as well as require owners to inform tenants that they will work in this type of building prior to signing a lease.
- 6) Use the soft-story inventory to require owners to inform all existing tenants that they should be prepared to work elsewhere following an earthquake if the building has not been retrofitted.
- 7) Investigate and adopt appropriate financial, procedural, and land use incentives for owners of soft-story buildings to facilitate retrofit.
- 8) Explore development of local ordinances or State regulations to require or encourage owners of soft-story structures to strengthen them.
- 9) Provide technical assistance in seismically strengthening soft-story structures.

ECON-c. *Unreinforced Masonry Buildings in Older Downtown Areas*

- 1) Continue to actively implement existing State law that requires cities and counties to maintain lists of the addresses of unreinforced masonry buildings and inform property owners that they own this type of hazardous structure.
- 2) Accelerate retrofitting of unreinforced masonry structures that have not been retrofitted, for example, by (a) actively working with owners to obtain structural analyses of their buildings, (b) helping owners obtain retrofit funding, (c) adopting a mandatory versus voluntary, retrofit program, and/or (d) applying penalties to owners who show inadequate efforts to upgrade these buildings.
- 3) Require owners to inform all existing tenants that they work in this type of building and the standard to which it may have been retrofitted, as well as require owners to inform tenants that they will work in this type of building prior to signing a lease.
- 4) Require owners to inform all existing tenants that they should be prepared to work elsewhere following an earthquake even if the building has been retrofitted, for it

¹⁵ A condition in which the building has far less stiffness in its lowest story than in upper stories, often due to multiple garage openings at the ground floor or large open windows for commercial space, increasing the likelihood of excessive sidesway or even collapse. Many of these buildings collapsed in the 1971 San Fernando, 1989 Loma Prieta, and 1994 Northridge earthquakes. An engineering definition is "a condition in which the stiffness of the seismic-force-resisting system in any story is less than 70 percent of the stiffness in the story above" (modified from the American Society of Civil Engineers (ASCE 31).

has probably been retrofitted to a life-safety standard, not to a standard that will allow occupancy following major earthquakes.

ECON-d. *Other Privately-Owned Structurally Suspicious Buildings*

- 1) Inventory non-ductile concrete, tilt-up concrete, and other privately-owned structurally suspicious buildings.
- 2) Adopt the 2003 International Existing Building Code, the 1997 UBC, or the latest applicable code standard for the design of voluntary or mandatory retrofit of seismically vulnerable buildings.
- 3) Adopt one or more of the following strategies as incentives to encourage retrofitting of privately-owned structurally suspicious commercial and industrial buildings: (a) waivers or reductions of permit fees, (b) below-market loans, (c) local tax breaks, (d) grants to cover the cost of retrofitting or of a structural analysis, (e) land use and procedural incentives, or (f) technical assistance.

ECON-e. *Wildfire and Structural Fires*

- 1) Increase efforts to reduce fire in existing development through improving engineering design and vegetation management for mitigation, appropriate code enforcement, and public education on mitigation strategies.
- 2) Require that new business and office buildings in high fire hazard areas be constructed of fire-resistant building materials and incorporate fire-resistant design features (such as minimal use of eaves, internal corners, and open first floors) to increase structural survivability and reduce ignitability.
- 3) Adopt and amend as needed updated versions of the *California Building and Fire Codes* so that optimal fire-protection standards are used in construction and renovation projects.
- 4) Create a mechanism to enforce provisions of the *California Building and Fire Codes* and other local codes that require the installation of smoke detectors and fire-extinguishing systems by making installation a condition of (a) finalizing a permit for any work on existing properties valued at over a fixed amount, such as \$500 or \$1000, and/or (b) on any building over 75 feet in height, and/or (b) as a condition for the transfer of property.
- 5) Expand existing vegetation management programs in commercial and/or industrial areas.
- 6) Establish a Fire Hazard Abatement District to fund reduction in fire risk of existing properties through vegetation management that includes reduction of fuel loads, use of defensible space, and fuel breaks.
- 7) Establish a Fire Hazard Abatement District to fund fire-safety inspections of private properties, roving firefighter patrols on high fire-hazard days, and public education efforts.
- 8) Compile a list of high-rise and high-occupancy buildings that are deemed, due to their age or construction materials, to be particularly susceptible to fire hazards, and determine an expeditious timeline for the fire-safety inspection of all such structures.
- 9) Conduct periodic fire-safety inspections of all commercial and institutional buildings.

- 10) Work with the State Fire Marshall, the California Seismic Safety, PEER, and other experts to identify and manage gas-related fire risks of soft-story mixed use buildings that are prone to collapse and occupant entrapment consistent with the natural gas safety recommendations of Seismic Safety Commission Report SSC-02-03.¹⁶
- 11) Ensure that fire-preventive vegetation-management techniques and practices for creek sides and high-slope areas do not contribute to the landslide and erosion hazard.
- 12) Work with insurance companies to create a public/private partnership to give a discount on fire insurance premiums to “Forester Certified” *Fire Wise* landscaping and fire-resistant building materials.

ECON-f. *Flooding*

- 1) To reduce flood risk, thereby reducing the cost of flood insurance to property owners, work to qualify for the highest-feasible rating under the Community Rating System of the National Flood Insurance Program.
- 2) Balance the needs for commercial and industrial development against the risk from potential flood-related hazards.
- 3) Ensure that new development pays its fair share of improvements to the storm drainage system necessary to accommodate increased flows from the development, *or* does not increase runoff by draining water to pervious areas or detention facilities.
- 4) Provide sandbags and plastic sheeting to businesses in anticipation of rainstorms, and deliver those materials to the disabled and elderly upon request.
- 5) Provide public information on locations for obtaining sandbags and deliver those sandbags to those various locations throughout a city and/or county.
- 6) Apply floodplain management regulations for development in the floodplain and floodway.
- 7) Encourage business owners to participate in building elevation programs.
- 8) Encourage business owners to participate in acquisition and relocation programs for areas within floodways.
- 9) Require an annual inspection of approved flood-proofed buildings to ensure that (a) all flood-proofing components will operate properly under flood conditions and (b) all responsible personnel are aware of their duties and responsibilities as described in their building’s *Flood Emergency Operation Plan* and *Inspection & Maintenance Plan*.

ECON-g. *Landslides and Erosion*

- 1) Increase efforts to reduce landslides and erosion in existing and future development by improving appropriate code enforcement and use of applicable standards, such as those appearing in the *California Building Code*, California Geological Survey *Special Report 117 – Guidelines for Evaluating and Mitigating Seismic Hazards in California*¹⁷, American Society of Civil Engineers (ASCE)

¹⁶ See http://www.seismic.ca.gov/pub/CSSC_2002-03_Natural%20Gas%20Safety.pdf. Note: any valves that are installed may need to have both excess flow and seismic triggers (“hybrid” valves).

¹⁷ See <http://gmw.consrv.ca.gov/shmp/SHMPsp117.asp>.

report *Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and Mitigating Landslide Hazards in California*¹⁸, and the California Board for Geologists and Geophysicists *Guidelines for Engineering Geologic Reports*¹⁹. Such standards should cover excavation, fill placement, cut-fill transitions, slope stability, drainage and erosion control, slope setbacks, expansive soils, collapsible soils, environmental issues, geological and geotechnical investigations, grading plans and specifications, protection of adjacent properties, and review and permit issuance.

- 2) Increase efforts to reduce landslides and erosion in existing and future development through continuing education of design professionals on mitigation strategies.

ECON-h. Construction

- 1) Continue to require that all new commercial and industrial buildings be constructed in compliance with structural requirements of the most recently adopted version of the *California Building Code*.
- 2) Conduct appropriate employee training and support continued education to ensure enforcement of construction standards.
- 3) Recognize that many strategies that increase earthquake resistance also decrease damage in an explosion. In addition, recognize that ventilation systems can be designed to contain airborne biological agents.

ECON-i. Building Reoccupancy

- 1) Institute an aggressive program similar to San Francisco's Building Occupancy Resumption Program (BORP). This program permits owners of private buildings to hire qualified structural engineers to create building-specific post-disaster inspection plans and allows these engineers to become automatically deputized as City/County inspectors for these buildings in the event of an earthquake or other disaster.
- 2) Actively notify owners of historic or architecturally significant buildings of the availability of the local BORP-type program and encourage them to participate to ensure that appropriately qualified structural engineers are inspecting their buildings, thus reducing the likelihood that the buildings will be inappropriately evaluated following a disaster.
- 3) Actively notify owners of educational facility buildings of the availability of the local BORP-type program and encourage them to participate to ensure that appropriately qualified structural engineers are inspecting their buildings, thus reducing the likelihood that the buildings will be inappropriately evaluated following a disaster.
- 4) Allow owners to participate in a BORP-type program as described above, but not actively encourage them to do so.
- 5) Develop and enforce an ordinance for disaster-damaged structures to ensure that damaged buildings are repaired in an appropriate and timely manner.

¹⁸ See <http://www.scec.org/resources/catalog/LandslideProceduresJune02.pdf>.

¹⁹ See <http://www.geology.ca.gov/publications/engineering.pdf>.

- 6) Establish preservation-sensitive measures for the repair and reoccupancy of historically significant structures, including requirements for temporary shoring or stabilization where needed, arrangements for consulting with preservationists, and expedited permit procedures for suitable repair or rebuilding of historically or architecturally valuable structures.

ECON-j. *Public Education*

- 1) Provide information to business owners and employees on the availability of interactive hazard maps on ABAG's web site.
- 2) Develop printed materials, utilize existing materials (such as developed by FEMA and the American Red Cross), conduct workshops, and/or provide outreach encouraging businesses' employees to have family disaster plans that include drop-cover-hold earthquake drills, fire and storm evacuation procedures, and shelter-in-place emergency guidelines.
- 3) Develop printed materials, conduct workshops, and provide outreach to Bay Area businesses focusing on business continuity planning.
- 4) Better inform Bay Area business owners of mitigation activities, including elevation of appliances above expected flood levels, use of fire-resistant roofing and defensible space in wildland-urban- interface fire-threatened communities or in areas exposed to high-to-extreme fire threat, structural retrofitting techniques for older buildings, and use of intelligent grading practices through workshops, publications, and media announcements and events.
- 5) Sponsor the formation and training of Community Emergency Response Teams (CERT) training through partnerships with local businesses. [Note – these programs go by a variety of names in various cities and areas.]
- 6) Assist businesses in the development of defensible space through the use of, for example, "tool libraries" for weed abatement tools, roadside collection and/or chipping services (for brush, weeds, and tree branches) in wildland-urban- interface fire-threatened communities or in areas exposed to high-to-extreme fire threat.
- 7) Make use of the materials developed by others (such as found on ABAG's web site at <http://quake.abag.ca.gov/business>) to increase mitigation activities related to earthquakes. ABAG plans to continue to improve the quality of those materials over time.
- 8) Develop a "Maintain-a-Drain" campaign, similar to that of the City of Oakland, encouraging businesses and residents to keep storm drains in their neighborhood free of debris.
- 9) Encourage the formation of a community-based approach to wildfire education and action through local Fire Safe Councils and the *Fire Wise Program*.
- 10) Encourage businesses and laboratories handling hazardous materials or pathogens increase security to a level high enough to create a deterrent to crime and terrorism, including active implementation of "cradle-to-grave" tracking systems.
- 11) Encourage joint meetings of security and operations personnel at major employers to develop innovative ways for these personnel to work together to increase safety and security.

- 12) Inform shoreline-property owners of the possible long-term economic threat posed by rising sea levels.
- 13) Develop and distribute culturally appropriate materials related to disaster mitigation and preparedness, such as those on the <http://www.preparenow.org> website.

5. Government Services (GOVT)

Bay Area city and county governments, as well as community services agencies, provide essential services during and immediately following disasters, as well as critical functions during recovery, that need to be resistant to disasters.

GOVT-a. Focus on Critical Facilities

- 1) Assess the vulnerability of critical facilities (such as city halls, fire stations, community service centers, seaports, and airports) to damage in natural disasters and make recommendations for appropriate mitigation.
- 2) Retrofit or replace critical facilities that are shown to be vulnerable to damage in natural disasters.
- 3) Clarify to workers in critical facilities and emergency personnel, as well as to elected officials and the public, the extent to which the facilities are expected to perform only at a life safety level (allowing for the safe evacuation of personnel) or are expected to remain functional following an earthquake.
- 4) Conduct comprehensive programs to identify and mitigate problems with facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major natural disasters.
- 5) Encourage joint meetings of security and operations personnel at critical facilities to develop innovative ways for these personnel to work together to increase safety and security.
- 6) Install micro and/or surveillance cameras around critical public assets tied to web-based software, and develop a surveillance protocol to monitor these cameras.
- 7) Identify and undertake cost-effective retrofit measures on critical facilities (such as moving and redesigning air intake vents and installing blast-resistant features) when these buildings undergo major renovations.
- 8) Coordinate with the State Division of Safety of Dams to ensure that cities and counties are aware of the timeline for the maintenance and inspection of dams whose failure would impact their jurisdiction.
- 9) As a secondary focus, assess the vulnerability of *non*-critical facilities to damage in natural disasters based on occupancy and structural type, make recommendations on priorities for structural improvements or occupancy reductions, and identify potential funding mechanisms.
- 10) Ensure that government-owned facilities are subject to the same or more stringent regulations as imposed on privately-owned development.
- 11) Comply with all applicable building and fire codes, as well as other regulations (such as state requirements for fault, landslide, and liquefaction investigations in particular mapped areas) when constructing or significantly remodeling government-owned facilities.

- 12) Prior to acquisition of property to be used as a critical facility, conduct a study to ensure the absence of significant hazards.

GOVT-b. *Maintain and Enhance Local Government's Emergency Response and Recovery Capacity*

- 1) Establish a framework and process for pre-event planning for post-event recovery that specifies roles, priorities, and responsibilities of various departments within the local government organization, and that outlines a structure and process for policy-making involving elected officials and appointed advisory committees.
- 2) Prepare a basic Recovery Plan that outlines the major issues and tasks that are likely to be the key elements of community recovery, as well as integrate this planning into response planning.
- 3) Establish a goal for the resumption of local government services that may vary from function to function.
- 4) Develop a plan for short-term and intermediate-term sheltering of impacted residents.
- 5) Periodically assess the need for new or relocated fire or police stations and other emergency facilities, changes in staffing levels, and additional or updated supplies, equipment, technologies, and in-service training classes.
- 6) Ensure that fire and police department personnel have adequate radios, breathing apparatuses, protective gear, and other equipment to respond to a major disaster.
- 7) Develop and maintain a system of interoperable communications for first responders from cities, counties, special districts, state, and federal agencies.
- 8) Harden emergency response communications, including, for example, building redundant capacity into public safety alerting and/or answering points, replacing or hardening microwave and simulcast systems, adding digital encryption for programmable radios, and ensuring a plug-and-play capability for amateur radio.
- 9) Purchase command vehicles for use as mobile command/EOC vehicles if current vehicles are unsuitable or inadequate.
- 10) Maintain the local government's emergency operations center in a fully functional state of readiness.
- 11) Expand or participate in expanding traditional disaster exercises involving city and county emergency personnel to include airport and port personnel, transit and infrastructure providers, hospitals, schools, park districts, and major employers.
- 12) Maintain and update as necessary the local government's Standardized Emergency Management System Plan.
- 13) Continue to participate not only in general mutual-aid agreements, but also in agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters.
- 14) Install an alert and warning system with outdoor sirens, coordinating them, to the extent possible, with those of neighboring jurisdictions.
- 15) Conduct periodic tests of the alerting and warning system's outdoor sirens no less frequently than once per month.
- 16) Regulate and enforce the location and design of street-address numbers on buildings and minimize the naming of short streets (that are actually driveways) to single homes.

- 17) Monitor weather during times of high fire risk using, for example, weather stations tied into police and fire dispatch centers.
- 18) Establish regional protocols on how to respond to the NOAA Monterey weather forecasts, such as the identifying types of closures, limits on work that could cause ignitions, and repositioning of suppression forces. A multi-agency coordination of response also helps provide unified messages to the public about how they should respond to these periods of increased fire danger.
- 19) Increase local patrolling during periods of high fire weather.
- 20) Create and maintain an automated system of rain and flood gauges that is web enabled and publicly accessible.
- 21) Place remote sensors in strategic locations for early warning of hazmat releases or use of weapons of mass destruction.
- 22) Investigate the use of phone-based warning systems for selected geographic areas.
- 23) Review and update, as necessary, procedures pursuant to the *State Dam Safety Act* for the emergency evacuation of areas located below major water-storage facilities.
- 24) Develop procedures for the emergency evacuation of areas identified on tsunami evacuation maps as these maps become available.
- 25) Develop a business continuity plan that includes back-up storage of vital records, such as essential medical records and financial information.

GOVT-c. *Participate in National, State, Multi-Jurisdictional and Professional Society Efforts to Identify and Mitigate Hazards*

- 1) Promote information sharing among overlapping and neighboring local governments, including cities, counties, and special districts, as well as utilities.
- 2) Recognize that emergency services is more than the coordination of police and fire response, for it also includes planning activities with providers of water, food, energy, transportation, financial, information, and public health services.
- 3) Recognize that a multi-agency approach is needed to mitigate flooding by having flood control districts, cities, counties, and utilities meet at least annually to jointly discuss their a capital improvement programs for most effectively reducing the threat of storm-induced flooding.
- 4) As new flood-control projects are completed, request that FEMA revise its flood-insurance rate maps and digital geographic information system data to reflect flood risks as accurately as possible.
- 5) Participate in FEMA's National Flood Insurance Program.
- 6) Participate in multi-agency efforts to mitigate fire threat, such as the Hills Emergency Forum (in the east Bay), various *FireSafe* Council programs, and city-utility task forces.
- 7) Work with major employers and agencies that handle hazardous materials to coordinate mitigation efforts for the possible release of these materials due to a natural disaster such as an earthquake, flood, fire, or landslide.
- 8) Encourage staff to participate in efforts by professional organizations to mitigate earthquake and landslide disaster losses, such as the efforts of the Northern California Chapter of the Earthquake Engineering Research Institute, the East Bay-Peninsula Chapter of the International Code Council, the Structural

Engineers Association of Northern California, and the American Society of Grading Officials.

- 9) Conduct and/or promote attendance at local or regional hazard conferences and workshops for elected officials to educate the officials on the critical need for programs in mitigating earthquake, wildfire, flood, and landslide hazards.
- 10) Cooperate with researchers working on government-funded projects to refine information on hazards, for example, by expediting the permit and approval process for installation of seismic arrays, gravity survey instruments, borehole drilling, fault trenching, landslide mapping, flood modeling, and/or damage data collection.

6. Education (EDUC)

Safe and disaster-resistant school, education, and childcare-related facilities are critical to the safety of our children, as well as to the quality of life of Bay Area families.

EDUC-a. *Focus on Critical Facilities*

- 1) Assess the vulnerability of critical education facilities to damage in natural disasters and make recommendations for appropriate mitigation.
- 2) Retrofit or replace critical education facilities that are shown to be vulnerable to damage in natural disasters.
- 3) Conduct comprehensive programs to identify and mitigate problems with facility contents, architectural components, and equipment that will prevent critical buildings from being functional after major disasters.
- 4) As a secondary focus, assess the vulnerability of *non*-critical educational facilities to damage in natural disasters based on occupancy and structural type, make recommendations on priorities for structural improvements or occupancy reductions, and identify potential funding mechanisms.
- 5) Participate in or facilitate adoption of a program to formalize arrangements with structural engineers to report to the district, assess damage, and determine if the buildings can be reoccupied. The program should be similar to San Francisco's Building Occupancy Resumption Program (BORP) that permits owners of buildings to hire qualified structural engineers to create building-specific post-disaster inspection plans and allows these engineers to become automatically deputized as inspectors for these buildings in the event of an earthquake or other disaster. Unlike the buildings of most special districts, however, these plans should be developed with the review and guidance of the Division of the State Architect because this agency has the authority and responsibility for the structural integrity of these structures.

EDUC-b. *Use of Educational Facilities as Emergency Shelters*

- 1) Work cooperatively with the American Red Cross and others to set up memoranda of understanding for use of education facilities as emergency shelters following disasters.
- 2) Work cooperatively to ensure that school district personnel and relevant staff understand and are trained that being designated by the American Red Cross or others as a potential emergency shelter does not mean that the school has had a

hazard or structural evaluation to ensure that it can be used as a shelter following any specific disaster.

- 3) Work cooperatively to ensure that school district personnel understand and are trained that they are designated as disaster service workers and must remain at the school until released.

EDUC-c. *Use of Schools as Conduits for Information to Families About Emergencies*

- 1) Work on and/or support efforts by schools, local governments, and other agencies to utilize their unique ability to reach families through educational materials on hazards, mitigation, and preparedness, particularly after disasters and at the beginning of the school year. These efforts will not only make the entire community more disaster-resistant, but speed the return of schools from use as shelters to use as teaching facilities.
- 2) Work on and/or support joint efforts of schools and fire jurisdictions to develop plans for evacuation or sheltering in place of school children during periods of high fire danger, thereby recognizing that overloading of streets near schools by parents attempting to pick up their children during these periods can restrict access by fire personnel and equipment.
- 3) Offer the 20-hour basic CERT training to teachers and after-school personnel.
- 4) Offer the 20-hour basic CERT training to middle school and/or high school students as a part of the basic science or civics curriculum, as an after school club, or as a way to earn public service hours.
- 5) Offer the 20-hour basic CERT training course through the Adult School system and/or through the Community College system.
- 6) Develop and maintain the capacity for schools to take care of the students for the first 48 hours after a disaster, and notify parents that this capacity exists.
- 7) Develop and distribute culturally appropriate materials related to disaster mitigation and preparedness, such as those on the <http://www.preparenow.org> website.

7. Environment (ENVI)

Disaster resistance need to further environmental sustainability, reduce pollution, strengthen agriculture resiliency, and avoid hazardous material releases in the Bay Area.

ENVI-a. *Environmental Sustainability and Pollution Reduction*

- 1) Continue to enforce State-mandated requirements, such as the *California Environmental Quality Act*, to ensure that mitigation activities for hazards, such as vegetation clearance programs for fire threat and seismic retrofits, are conducted in a way that reduces environmental degradation such as air quality impacts, noise during construction, and loss of sensitive habitats and species, while respecting the community value of historic preservation.
- 2) Encourage regulatory agencies to work collaboratively with safety professionals to develop creative mitigation strategies that effectively balance environmental and safety needs, particularly to meet critical wildfire, flood, and earthquake safety levels.

- 3) Continue to enforce and/or comply with State-mandated requirements, such as the *California Environmental Quality Act* and environmental regulations to ensure that urban development is conducted in a way to minimize air pollution. For example, air pollution levels can lead to global warming, and then to drought, increased vegetation susceptibility to disease (such as pine bark beetle infestations), and associated increased fire hazard.
- 4) Develop and implement a comprehensive program for watershed maintenance, optimizing forest health with water yield to balance water supply, flooding, fire, and erosion concerns.
- 5) Balance the need for the smooth flow of storm waters versus the need to maintain wildlife habitat by developing and implementing a comprehensive Streambed Vegetation Management Plan that ensures the efficacy of flood control efforts and maintains the viability of living rivers.
- 6) Stay informed of emerging scientific information on the subject of rising sea levels, especially on additional actions that local governments can take to mitigate this hazard.
- 7) Monitor the science associated with global warming to be able to act promptly when data become available to warrant special design and engineering of government-owned facilities located in low-lying areas, such as wastewater treatment plants, ports, and airports.
- 8) Comply with applicable performance standards of any *National Pollutant Discharge Elimination System* municipal stormwater permit that seeks to manage increases in stormwater run-off flows from new development and redevelopment construction projects.
- 9) Enforce and/or comply with the grading, erosion, and sedimentation requirements by prohibiting the discharge of concentrated stormwater flows by other than approved methods that seek to minimize associated pollution.
- 10) Explore ways to require that hazardous materials stored in the flood zone be elevated or otherwise protected from flood waters.
- 11) Enforce and/or comply with the hazardous materials requirements of the State of California Certified Unified Program Agency (CUPA).
- 12) Provide information on hazardous waste disposal and/or drop off locations.
- 13) Develop and implement a program to control invasive and exotic species that contribute to fire and flooding hazards (such as eucalyptus, cattails, and cordgrass).
- 14) Enforce provisions under creek protection, stormwater management, and discharge control ordinances designed to keep watercourses free of obstructions and to protect drainage facilities to conform with the Regional Water Quality Control Board's Best Management Practices.

ENVI-b. *Agricultural and Aquaculture Resilience*

- 1) Maintain a variety of crops in rural areas of the region to increase agricultural diversity and crop resiliency.
- 2) Promote and maintain the public-private partnerships dedicated to preventing the introduction of agricultural pests into regionally-significant crops, such as the glassy-winged sharpshooter into vineyards.

- 3) Remove septic tanks and other sources of contamination adjacent to economically-significant aquacultural and agricultural resources.
- 4) Encourage livestock operators to develop an early-warning system to detect animals with communicable diseases (due to natural causes or bioterrorism).

8. Land Use (LAND)

Land use change needs to be accompanied by a respect for hazardous areas and facilities, as well as recognize the interconnected nature of the Bay Area.

LAND-a. *Earthquake Hazard Studies for New Developments*

- 1) Enforce and/or comply with the State-mandated requirement that site-specific geologic reports be prepared for development proposals within Alquist-Priolo Earthquake Fault Zones, and restrict the placement of structures for human occupancy. (This Act is intended to deal with the *specific* hazard of active faults that extend to the earth's surface, creating a surface rupture hazard.)
- 2) Require preparation of site-specific geologic or geotechnical reports for development and redevelopment proposals in areas subject to earthquake-induced landslides or liquefaction as mandated by the State Seismic Hazard Mapping Act in selected portions of the Bay Area where these maps have been completed, and condition project approval on the incorporation of necessary mitigation measures related to site remediation, structure and foundation design, and/or avoidance.
- 3) Recognizing that some faults may be a hazard for surface rupture, even though they do not meet the strict criteria imposed by the Alquist-Priolo Earthquake Fault Zoning Act, identify and require geologic reports in areas adjacent to locally-significant faults.
- 4) Recognizing that the California Geological Survey has not completed earthquake-induced landslide and liquefaction mapping for much of the Bay Area, identify and require geologic reports in areas mapped by others as having significant liquefaction or landslide hazards.
- 5) Support and/or facilitate efforts by the California Geological Survey to complete the earthquake-induced landslide and liquefaction mapping for the Bay Area.
- 6) Require that local government reviews of geologic and engineering studies are conducted by appropriately trained and credentialed personnel.

LAND-b. *Wildfire and Structural Fires*

- 1) Review development proposals to ensure that they incorporate required and appropriate fire-mitigation measures, including adequate provisions for occupant evacuation and access by emergency response personnel and equipment.
- 2) Develop a clear legislative and regulatory framework at both the state and local levels to manage the wildland-urban-interface consistent with *Fire Wise* and sustainable community principles.

LAND-c. *Flooding*

- 1) Establish and enforce requirements for new development so that site-specific designs and source-control techniques are used to manage peak stormwater runoff flows and impacts from increased runoff volumes.

- 2) Incorporate FEMA guidelines and suggested activities into local government plans and procedures for managing flood hazards.
- 3) Provide an institutional mechanism to ensure that development proposals adjacent to floodways and in floodplains are referred to flood control districts and wastewater agencies for review and comment (consistent with the NPDES program).
- 4) Establish and enforce regulations concerning new construction (and major improvements to existing structures) within flood zones in order to be in compliance with federal requirements and, thus, be a participant in the Community Rating System of the *National Flood Insurance Program*.

LAND-d. *Landslides and Erosion*

- 1) Establish and enforce provisions (under subdivision ordinances or other means) that geotechnical and soil-hazard investigations be conducted and filed to prevent grading from creating unstable slopes, and that any necessary corrective actions be taken prior to development approval.
- 2) Require that local government reviews of these investigations are conducted by appropriately trained and credentialed personnel.
- 3) Establish and enforce grading, erosion, and sedimentation ordinances by requiring, under certain conditions, grading permits and plans to control erosion and sedimentation prior to development approval.
- 4) Establish and enforce provisions under the creek protection, storm water management, and discharge control ordinances designed to control erosion and sedimentation.
- 5) Establish requirements in zoning ordinances to address hillside development constraints, especially in areas of existing landslides.

LAND-e. *Hillside – Multi-Hazard*

- 1) Establish a buffer zone between residential properties and landslide or wildfire hazard areas.
- 2) Discourage, add additional mitigation strategies, or prevent construction on slopes greater than a set percentage, such as 15%, due to landslide or wildfire hazard concerns.

LAND-f. *Smart Growth to Revitalize Urban Areas and Promote Sustainability*

- 1) Prioritize retrofit of infrastructure that serves urban areas over constructing new infrastructure to serve outlying areas.
- 2) Work to retrofit homes in older areas to provide safe housing close to job centers.
- 3) Work to retrofit older downtown areas to protect architectural diversity and promote disaster-resistance.
- 4) Protect as open space areas susceptible to extreme hazards.
- 5) Provide new buffers and preserve existing buffers between development and existing users of large amounts of hazardous materials, such as major industry, due to the potential for catastrophic releases due to an earthquake or terrorism. (Flooding might also result in release or spread of these materials, however it is unlikely.)