Omnitrans Hazard Mitigation Plan

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Emergency Planning Consultants

Recognition

Special Thanks

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List of Mitigation Plan Tables, Figures, Matrices, Maps and Photos

Note: The maps in this plan were provided by Omnitrans, County of San Bernardino, Federal Emergency Management Agency (FEMA), or were acquired from public Internet sources. Care was taken in the creation of the maps contained in this Plan, however they are provided "as is". Omnitrans cannot accept any responsibility for any errors, omissions or positional accuracy, and therefore, there are no warranties that accompany these products (the maps). Although information from land surveys may have been used in the creation of these products, in no way

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Table of Contents

Executive Summary

The Mitigation Plan was prepared in response to Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 (also known as Public Law 106-390) requires state and local governments to prepare Mitigation Plans to document their Mitigation Planning process, and identify hazards, potential losses, mitigation needs, goals, and strategies. This type of planning supplements Omnitrans's comprehensive emergency management program.

Under DMA 2000, each state and local government must have a federally approved Mitigation Plan to be eligible for hazard mitigation grant funding. To comply, Omnitrans developed its first Mitigation Plan in 2005. This Plan represents an update to that version.

The Disaster Mitigation Act of 2000 (DMA 2000) is intended to facilitate cooperation between state and local governments, prompting them to work together. Through collaboration, mitigation needs can be identified before disasters strike, resulting in faster allocation of resources and more effective risk reduction projects.

The following FEMA definitions are used throughout this plan:

Hazard Mitigation – "Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards".

Planning – "The act or process of making or carrying out plans; specifically, the establishment of goals, policies, and procedures for a social or economic unit."
(Source: FEMA, 2002, *Getting Started, Building Support for Mitigation Planning*, FEMA 386-1)

Mitigation Planning Benefits

Planning ahead helps residents, businesses, and government agencies effectively respond when disasters strike; and keeps public agencies eligible for HMGP funding. The long-term benefits of mitigation planning include:

- ✓ Greater understanding of hazards faced by a community
- ✓ Use of limited resources on hazards with the greatest effect on a community
- ✓ Financial savings through partnerships for planning and mitigation
- ✓ Reduced long-term impacts and damages to human health and structures, and lower repair costs
- ✓ More sustainable, disaster-resistant communities.

Hazard Land Use Policy in California

Planning for hazards should be an integral element of any city's land use planning program. All California cities and counties have General Plans and the implementing ordinances that are required to comply with the statewide land use planning regulations.

The continuing challenge faced by local officials and state government is to keep the network of local plans effective in responding to the changing conditions and needs of California's diverse communities, particularly in light of the very active seismic region in which we live.

Planning for hazards requires a thorough understanding of the various hazards facing Omnitrans and region as a whole. Additionally, it's important to take an inventory of the structures and contents of various Agency holdings. These inventories should include the compendium of hazards facing the city, the built environment at risk, the personal property that may be damaged by hazard events and most of all, the people who live in the shadow of these hazards.

Support for Hazard Mitigation

All mitigation is local and the primary responsibility for development and implementation of risk reduction strategies and policies lies with each local jurisdiction. Local jurisdictions, however, are not alone. Partners and resources exist at the regional, state and federal levels. Numerous California state agencies have a role in hazards and hazard mitigation.

Some of the key agencies include:

- ✓ California Emergency Management Agency (Cal EMA) is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;
- ✓ The Southern California Earthquake Center (SCEC) gathers information about earthquakes, integrates information on earthquake phenomena, and communicates this to end-users and the general public to increase earthquake awareness, reduce economic losses, and save lives.
- ✓ The California Department of Forestry and Fire Protection (CalFIRE) is responsible for all aspects of wildland fire protection on private and state properties, and administers forest practices regulations, including landslide mitigation, on non-federal lands.
- ✓ The California Division of Mines and Geology (DMG) is responsible for geologic hazard characterization, public education, and the development of partnerships aimed at reducing risk.
- ✓ The California Division of Water Resources (DWR) plans, designs, constructs, operates, and maintains the State Water Project; regulates dams; provides flood protection and assists in emergency management. It also educates the public, serves local water needs by providing technical assistance
- ✓ Federal Emergency Management Agency (FEMA) provides hazard mitigation guidance, resource materials, and educational materials to support implementation of the capitalized DMA 2000.
- ✓ United States Census Bureau (USCB) provides demographic data on the populations affected by natural disasters.
- ✓ The United States Department of Agriculture (USDA) provides data on matters pertaining to land management.

A Hazard Mitigation Planning Team (Planning Team) consisting of Omnitrans staff from various departments used the following approach to update the mitigation plan:

- ✓ Develop a Planning Team
- ✓ Identify hazards posing a significant threat
- ✓ Profile these hazards

- ✓ Estimate inventory at risk and potential losses associated with these hazards
- ✓ Develop mitigation strategies and goals that address these hazards
- ✓ Develop plan maintenance procedures for implementation after the Cal EMA and the FEMA approve the mitigation plan.

Although the requirements of DMA 2000 only apply to natural hazards, which are the primary focus of this plan, the Planning Team felt it was important to also identify, profile, assess, and mitigate technological and human-caused hazards.

As required by DMA 2000, Omnitrans informed the public about the planning process and provided opportunities for public input. In addition, key agencies and stakeholders shared their expertise during the planning process. This Mitigation Plan documents the process, outcome, and future of Omnitrans mitigation planning efforts.

How is the Plan Organized?

The structure of the plan enables people to use a section of interest to them and allows Omnitrans to review and update sections when new data is available. The ease of incorporating new data into the plan will result in a Mitigation Plan that remains current and relevant to Omnitrans.

Part I of the Mitigation Plan consists of three sections, including the Executive Summary, Introduction, and Community Profile.

Part II of the Mitigation Plan consists of Mitigation Strategies, Planning Process, Plan Maintenance, and Risk Assessment.

Part III of the Mitigation Plan consists of a Earthquake and Flood hazard-specific analysis.

Part IV is an Appendix supporting the plan.

Following is a description of each of the sections of the plan:

Part I: Background

Executive Summary

The executive summary provides an overview of the planning process.

Section 1: Introduction

The Introduction describes the background and purpose of developing the Mitigation Plan for Omnitrans.

Section 2: Community Profile

The section presents the history, geography, demographics, and socioeconomics of Omnitrans. It provides valuable information on the demographics and history of the region.

Part II: Mitigation Planning

Section 3: Mitigation Strategies

This section highlights 1) Mitigation Actions Matrix 2) planning approach 3) how the action items are organized 4) goals and objectives.

Section 4: Planning Process

This section describes the mitigation planning process including 1) Planning Team involvement 2) public and other stakeholder involvement; and 3) integration of existing data and plans.

Section 5: Plan Maintenance

This section provides information on plan implementation, monitoring and evaluation.

Section 6: Risk Assessment

This section provides information on hazard identification, vulnerability and risk associated with hazards in Omnitrans.

Part III: Hazard Analysis

Hazard-Specific Analysis on the one chronic hazard is addressed in this plan. Chronic hazards occur with some regularity and may be predicted through historic evidence and scientific methods. The chronic hazard addressed in the plan is:

Section 7: Earthquake
Section 8: Flooding

Part IV: Appendix

The plan appendix is designed to provide users of the Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and potential resources to assist them with implementation.

Appendix A: Resource Directory: The resource directory includes City, local, regional, state, and national resources and programs that may be of technical and/or financial assistance to Omnitrans during plan implementation.

Mitigation Measure Categories

Following is FEMA's list of mitigation categories. The activities identified by the Planning Team are consistent with the six broad categories of mitigation actions outlined in FEMA publication 386-3 *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies*.

- ✓ **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

- ✓ **Property Protection:** Actions that involve modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- ✓ **Public Education and Awareness:** Actions to inform and educate citizens, property owners, and elected officials about hazards and potential ways to mitigate them.

  Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- ✓ **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses preserve or restore the functions of natural systems. Examples include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- ✓ **Emergency Services:** Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- ✓ **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, retaining walls, and safe rooms.

Plan Mission

The mission of the Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This is achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide Omnitrans in creating a more sustainable community.

Mitigation Planning Process

The process for updating the 2005 Mitigation Plan started with identifying members for the Planning Team. Each team member represented different Agency department and specific divisions within those departments with a role in mitigation efforts. The Planning Team met over a period of 7months, and identified characteristics and consequences of natural hazards with significant potential to affect Omnitrans.

Hazard mitigation strategy and goals were developed by understanding the risk posed by the identified hazards. The group also determined hazard mitigation activities and priorities to include scenarios for both present and future conditions. The final Mitigation Plan will be implemented through various projects, changes in day-to-day Agency operations, and through continued hazard mitigation development.

Public Input

The Plan will be available to the public through different venues and will engage the public, involve them in ongoing planning and evaluation, and facilitate communication. The Planning Team recognizes that community involvement increases the likelihood that hazard mitigation will become a standard consideration in Omnitrans evolution.

The Planning Team posted a public notice on their website. The resources and information cited in the Mitigation Plan provide a strong local perspective and help identify strategies and activities to make Omnitrans more disaster resistant.

Participating Organizations

For mitigation planning to be successful; like all community planning; it requires collaboration with, and support from, federal, state, local, and regional governments; citizens; the private sector; universities; and non-profit organizations. The Planning Team consulted a variety of sources to ensure that the planning process results in practicable actions tailored to local needs and circumstances.

Planning Approach

The four-step planning approach outlined in the FEMA publication, *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies* (FEMA 386-3) was used to develop this plan:

- ✓ **Develop mitigation goals and objectives -** The risk assessment (hazard characteristics, inventory, and findings), along with municipal policy documents, were utilized to develop mitigation goals and objectives.
- ✓ **Identify and prioritize mitigation actions -** Based on the risk assessment, goals and objectives, existing literature/resources, and input from participating entities, mitigation activities were identified for each hazard. Activities were 1) qualitatively evaluated against the goals and objectives, and other criteria; 2) identified as high, medium, or low priority; and 3) presented in a series of hazard-specific tables.
- ✓ **Prepare implementation strategy -** Generally, high priority activities are recommended for implementation first.

  However, based on community needs and goals, project costs, and available funding, some medium or low priority activities may be implemented before some high priority items.
- ✓ **Document mitigation planning process -** The mitigation planning process is documented throughout this plan.

Mitigation Planning

As the cost of damage from disasters continues to increase nationwide, Omnitrans recognizes the importance of identifying effective ways to reduce vulnerability to disasters. Mitigation Plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout Omnitrans.

The plan provides a set of action items to reduce risk from hazards such as education and outreach programs and the development of partnerships. The plan also provides for the implementation of preventative activities, including programs that restrict and control development in areas subject to damage from hazards.

The Mitigation Plan is integrated with other plans including the System Security Emergency Response Preparedness Plan (SSERPP), as well as department specific standard operating procedures.

Scope

The Mitigation Plan addresses the needs of Omnitrans-owned facilities within the Omnitrans boundaries.

Risk Assessment

Risk assessment is the identification of risks posed by a hazard and the corresponding impacts to the community. This process involves five steps: identify hazards, profile hazards, inventory critical assets, assess risks, and assess vulnerability of future development. The potential impact of hazards associated with the Omnitrans location and varying terrain make the environment and population vulnerable to a spectrum of natural disaster situations. Any disaster scenario can only be assessed through careful planning and collaboration between public agencies, private sector organizations, and Omnitrans users, to make it possible to minimize loss.

Mitigation Strategy Goals

The Planning Team confirmed the four mitigation goals from the 2005 plan:

- ✓ Transit System Life Safety
- ✓ Avoid Damage to Property
- ✓ Protect the Environment
- ✓ Promote Hazard Mitigation

These goals guided the development and implementation of specific mitigation activities. Many of the mitigation objectives and action items come from current programs. Emphasis was placed on the effectiveness of the activities with respect to their estimated cost.

Plan Adoption

The Mitigation Plan was reviewed and adopted by the Board of Directors after approval by Cal EMA and FEMA. A copy of the Board Resolution appears in Section 3: Planning Process.

Plan Maintenance

Mitigation Planning is an ongoing process involving changes as new hazards occur, as the area develops, and as more is learned about hazards and their impacts. The Planning Team will monitor changing conditions, help implement mitigation activities, annually review the plan to determine if Agency goals are being met, and provide an update to Cal EMA and FEMA every five years. In addition, the Planning Team will review After-Action Reports generated after any disaster that impacts Omnitrans, and revise the mitigation plan if needed.

Section 1: Introduction

Why Develop a Mitigation Plan?

As the costs of damage from disasters continue to increase, Omnitrans realizes the importance of identifying effective ways to reduce vulnerability to disasters. Mitigation plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout Omnitrans.

The plan provides a set of action items to reduce risks from hazards through education and outreach programs and to foster the development of partnerships, and implementation of preventative activities such as land use programs that restrict and control development in areas subject to damage from hazards.

The resources and information within the Mitigation Plan:

- ✓ Establish a basis for coordination and collaboration among agencies and the public of Omnitrans;
- ✓ Identify and prioritize future mitigation projects; and
- ✓ Assist in meeting the requirements of federal assistance programs.

The plan works in conjunction with other Agency plans, including the SSERPP.

A thorough review of existing documents revealed that Omnitrans has previously experienced or could be vulnerable to the following natural hazards: earthquake, flood, wildfire, landslide, dam failure, windstorm, terrorism, drought. The planning team utilized FEMA recommended Calculated Priority Risk Index to identify the most significant threats facing Omnitrans – Earthquake and Flooding.

It is impossible to predict exactly when a disaster will occur, or the extent to which they will affect Omnitrans. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from these natural disasters. As the population of the region continues to increase, the exposure to hazards creates an even higher risk than previously experienced.

"Floods and hurricanes happen. The hazard itself is not the disaster – it's our habits, it's how we build and live in those areas…that's the disaster."

Craig Fugate, FEMA Administrator

Hazard Mitigation Legislation

Relevant hazard mitigation legislation and grants are highlighted below.

Hazard Mitigation Grant Program

In 1974, Congress enacted the Robert T. Stafford Disaster Relief and Emergency Act, commonly referred to as the Stafford Act. In 1988, Congress established the Hazard Mitigation Grant Program (HMGP) via Section 404 of the Stafford Act. Regulations regarding

HMGP implementation based on the DMA 2000 were initially changed by an Interim Final Rule (44 CFR Part 206, Subpart N) published in the Federal Register on February 26, 2002. A second Interim Final Rule was issued on October 1, 2002.

The HMGP helps states and local governments implement long-term hazard mitigation measures for natural hazards by providing federal funding following a federal disaster declaration. Eligible applicants include state and local agencies, Indian tribes or other tribal organizations, and certain nonprofit organizations.

In California, the HMGP is administered by Cal EMA. Examples of typical HMGP projects include:

- ✓ Property acquisition and relocation projects
- ✓ Structural retrofitting to minimize damages from earthquake, flood, high wind, wildfire, or other natural hazards
- ✓ Elevation of flood-prone structures
- ✓ Vegetative management programs, such as:
- ✓ Brush control and maintenance
- ✓ Fuel break lines in shrubbery
- ✓ Fire-resistant vegetation in potential wildland fire areas

Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation Program (PDM) was authorized by §203 of the Stafford Act, 42 United States Code (USC), as amended by §102 of the DMA 2000. Funding is provided through the National Pre-Disaster Mitigation Fund to help state and local governments (including Indian tribal governments) implement cost-effective hazard mitigation activities that complement a comprehensive mitigation program.

In Fiscal Year 2009, two types of grants (planning and competitive) were offered under the PDM Program. Planning grants allocate funds to each state for Mitigation Plan development. Competitive grants distribute funds to states, local governments, and federally recognized Indian tribal governments via a competitive application process. FEMA reviews and ranks the submittals based on pre-determined criteria. The minimum eligibility requirements for competitive grants include participation in good standing in the National Flood Insurance Program (NFIP) and a FEMA-approved Mitigation Plan. (Source: http://www.fema.gov/fima/pdm.shtm)

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) Program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101). Financial support is provided through the National Flood Insurance Fund to help states and communities implement measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP.

Three types of grants are available under FMA: planning, project, and technical assistance. Planning grants are available to states and communities to prepare Flood Mitigation Plans.

NFIP-participating communities with approved Flood Mitigation Plans can apply for project grants to implement measures to reduce flood losses. Technical assistance grants in the amount of 10 percent of the project grant are available to the state for program administration. Communities that receive planning and/or project grants must participate in the NFIP. Examples of eligible projects include elevation, acquisition, and relocation of NFIP-insured structures. (Source: http://www.fema.gov/fima/fma.shtm)

Disaster Mitigation Act of 2000

DMA 2000 (DMA 2000) was signed by President Clinton on October 30, 2000 (Public Law 106-390). Section 322 primarily deals with the development of Mitigation Plans. The Interim Final Rule for planning provisions (44 CFR Part 201) was published in the Federal Register twice: February 26, 2002 and October 1, 2002. The Mitigation Planning requirements are implemented via 44 CFR Part 201.6.

Under DMA 2000 state and local government (each city, county, and special Authority), and tribal government must develop a Mitigation Plan to be eligible to receive HMGP funds. Every mitigation plan, which must be reviewed by the state and approved by FEMA, should address the following items:

DMA 2000 was designed to establish a national program for pre-disaster mitigation, streamline disaster relief at the federal and state levels, and control federal disaster assistance costs. Congress believed these requirements would produce the following benefits:

- ✓ Reduce loss of life and property, human suffering, economic disruption, and disaster costs.
- ✓ Prioritize hazard mitigation at the local level with increased emphasis on planning and public involvement, assessing risks, implementing loss reduction measures, and ensuring critical facilities/services survive a disaster.
- ✓ Promote education and economic incentives to form community-based partnerships and leverage non-federal resources to commit to and implement long-term hazard mitigation activities.

State and Federal Support

While local jurisdictions have primary responsibility for developing and implementing hazard mitigation strategies, they are not alone. Various state and federal partners and resources can help local agencies with mitigation planning.

Cal EMA is the lead agency for mitigation planning support to local governments. In addition, FEMA offers grants, tools, and training.

The Mitigation Plan was prepared in accordance with the following regulations and guidance:

- ✓ DMA 2000 (Public Law 106-390, October 10, 2000)
- ✓ 44 CFR Parts 201 and 206, Mitigation Planning and Hazard Mitigation Grant Program, Interim Final Rule, October 1, 2002
- ✓ 44 CFR Parts 201 and 206, Mitigation Planning and Hazard Mitigation Grant Program, Interim Final Rule, February 26, 2002

- ✓ How-To Guide for Using HAZUS-MH for Risk Assessment, (FEMA 433), February 2004
- ✓ Mitigation Planning "How-to" Series (FEMA 386-1 through 9 available at: http://www.fema.gov/fima/planhowto.shtm)
- ✓ Getting Started: Building Support For Mitigation Planning (FEMA 386-1)
- ✓ Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)
- ✓ Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies (FEMA 386-3)
- ✓ Bringing the Plan to Life: Implementing the Mitigation Plan (FEMA 386-4)
- ✓ Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5)
- ✓ Integrating Historic Property and Cultural Resource Considerations into Mitigation Planning (FEMA 386-6)
- ✓ Integrating Manmade Hazards Into Mitigation Planning (FEMA 386-7)
- ✓ Multi-Jurisdictional Mitigation Planning (FEMA 386-8)
- ✓ Using the Mitigation Plan to Prepare Successful Mitigation Projects (FEMA 386-9)
- ✓ State and Local Plan Interim Criteria Under the DMA 2000, July 11, 2002, FEMA
- ✓ Mitigation Planning Workshop For Local Governments-Instructor Guide, July 2002, FEMA
- ✓ Report on Costs and Benefits of Natural Hazard Mitigation, Document #294, FEMA
- ✓ LHMP Development Guide – Appendix A - Resource, Document, and Tool List for Local Mitigation Planning, December 2, 2003, Cal EMA

HAZUS-MH uses Geographic Information System technology to produce detailed maps and analytical reports on physical damage to building stock, critical facilities, transportation systems, and utilities.

Hazards U.S. – Multi-Hazard

In 1997, FEMA developed a standardized model for estimating losses caused by an earthquake. Hazards U.S. (HAZUS) addressed the need for more effective national, state, and local planning and the need to identify areas that face the highest risk and potential for loss.

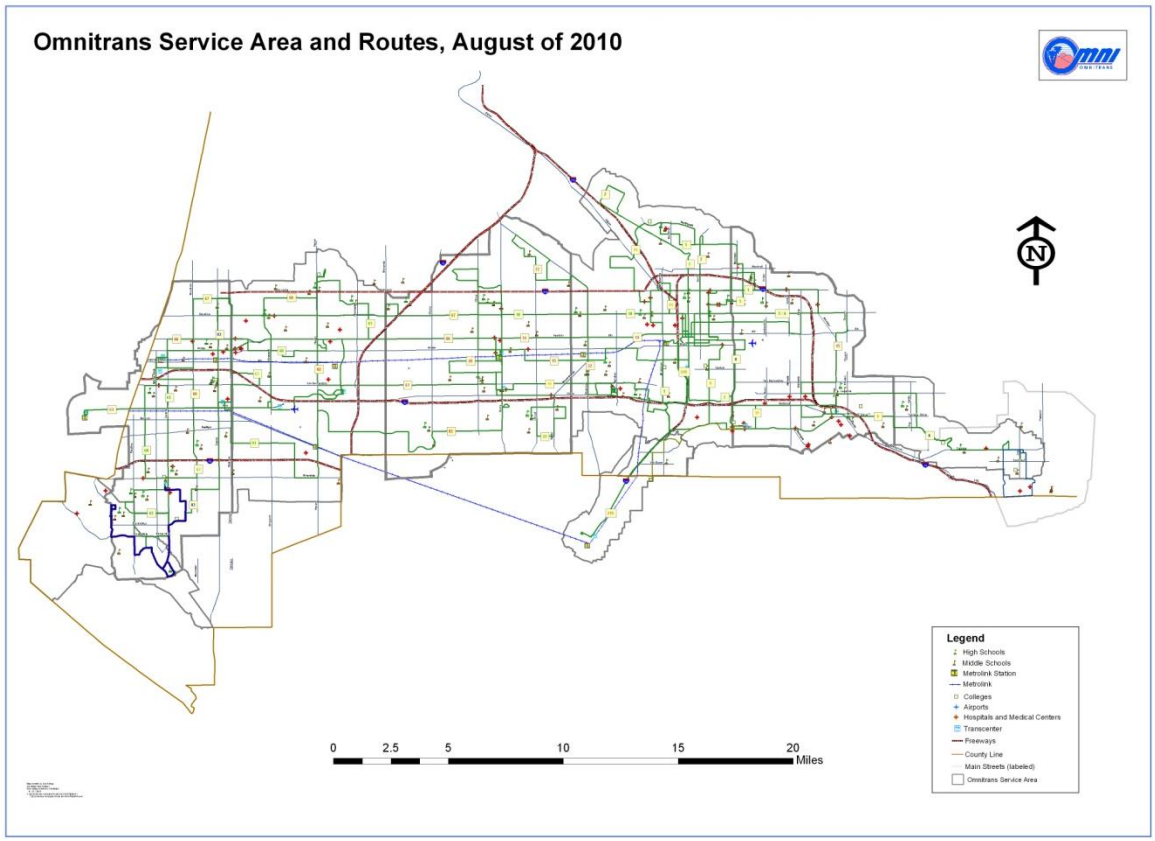
Hazards U.S. Multi-Hazard (HAZUS-MH) provides models to estimate potential losses from floods (coastal and riverine) and winds (hail, hurricane, tornado, tropical cyclone, and thunderstorm). HAZUS-MH applies engineering and scientific risk calculations developed by hazard and information technology experts to provide defensible damage and loss estimates. This methodology provides a consistent framework for assessing risk across a variety of hazards.

HAZUS-MH uses Geographic Information System technology to produce detailed maps and analytical reports on physical damage to building stock, critical facilities, transportation systems, and utilities. The damage reports cover induced damage (debris, fire, hazardous material, and inundation) and direct economic and social losses (casualties, shelter requirements, and economic impacts), promoting standardization.

Who Does the Mitigation Plan Affect?

The Mitigation Plan affects the areas within Omnitrans boundaries and Agency-owned facilities. Map 1-1: Omnitrans Service Area and Routes shows the regional proximity of Omnitrans and nearby communities.

Map 1-1: Omnitrans Service Area and Routes
(Source: Omnitrans)



Section 2: Community Profile

Overview

Omnitrans is the public transit agency serving the San Bernardino Valley. Founded in 1976 through a joint powers agreement, Omnitrans carries over 15 million passengers each year throughout its 480-square mile service area.

Topography

More than 85 percent of San Bernardino County is desert that contains low mountains, valleys, and dry lake bed. The remainder of the area consists of the San Bernardino Mountains and the San Bernardino Valley in the southwest corner of the county. Elevations in the county vary from 11,500 feet on the San Gorgonio Peak in the San Bernardino Mountains to the sea level at the southern end of Death Valley.

Climate

Climatic conditions in the county vary substantially with the topography and region. In general, the climate of the San Bernardino Valley is similar to coastal southern California, except that it is warmer in summer and is not as foggy. This area is well suited for growing citrus and other semitropical fruits. The monthly average daily extreme temperatures range from 37 to 96 degrees Fahrenheit in July. Temperatures at residential and resort elevations in the San Bernardino Mountains are from 15 to 20 degrees Fahrenheit colder than in the valley. The annual rainfall, most of which falls in the winter months, averages 16 inches in the valley area and from 20 to 30 inches in the mountains. The average annual rainfall in the desert area ranges from 2 to 5 inches.

Major River/Watersheds

The majority of larger watercourses traversing developed areas in San Bernardino County have been improved to control flooding. Two major flood control dams, San Antonio Dam and the Mojave River Falls Dam, and earthfill dams designed to control floods of greater magnitude than the 100-year flood. A number of other dams, debris basins, retarding basins, and water-spreading basins provide a significant flood control function. The principal flood problem in the desert area is sheet flow flooding.

Population/Demographics

The population of San Bernardino County is approximately 1.6 million. Of this total, 66 percent live in San Bernardino Valley; 82 percent live in the 23 incorporated cities and towns; and 285,000 live in the unincorporated (county) areas. City of San Bernardino, the county's largest city and county seat, has a population exceeding 185,000.

Economy

San Bernardino has long been a transportation crossroad and gateway from Southern California to the rest of the United States. San Bernardino County contains Ontario International Airport, the second largest airport in the greater Los Angeles area that includes Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. It is

served by the Union Pacific, Burlington Northern Santa Fe and Southern Pacific railroads, whose classification yards in Colton and are among the largest in the world. The transportation and warehousing infrastructure has enabled the county to become a center fir interstate trucking. There are over ten major trucking terminals for freight consolidation and transfer located in the county.

Industry

The transportation and warehousing infrastructure supports an expanding export service sector. This sector primarily brings money to the county from outside the area. These funds in turn circulate through local shopping and commerce centers supporting a secondary tier of business growth and employment. Because of low land costs and access to all of Southern California, a number of large light manufacturing firms are relocating from other parts of the Los Angeles Basin to San Bernardino County.

PART II: MITIGATION PLANNING

Section 3: Mitigation Strategies

Goals

The Planning Team developed mitigation goals and objectives to avoid or reduce long-term vulnerabilities to hazards. These general principles clarify desired outcomes.

The goals and objectives are based on the risk assessment and Planning Team input, and represent a long-term vision for hazard reduction or enhanced mitigation capabilities. They are compatible with organizational needs and goals expressed in other planning documents prepared by Omnitrans.

FEMA defines **Goals** as general guidelines that explain what you want to achieve. They are usually broad policy-type statements, long-term, and represent global visions.

FEMA defines **Mitigation Activities** as specific actions that help you achieve your goals and objectives.

Each goal is supported by objectives and mitigation action items. The Planning Team developed these action items through its knowledge of the local area, risk assessment, review of past efforts, identification of mitigation activities, and qualitative analysis.

The five mitigation goals and descriptions are listed below.

Transit System Life Safety

Description:

Omnitrans operates in a 480 square mile region of San Bernardino County know as the San Bernardino Valley. The Valley has a population of over 1.2 million with one of the highest transit dependent customer bases in Southern California. Over 60% of the Transit Agency's riders are transit dependent. The sheer number of people located in the Valley can make emergency management activities a challenge. The challenge is further complicated by the traffic congestion, and the wildland urban interface areas of the Valley located along the San Bernardino and San Gabriel Mountain Ranges to the north. The San Bernardino Valley is bordered by Riverside, Los Angeles, and Orange Counties on the East, South, and West. As the population in the region continues to grow, more development is moving into areas know for seasonal wildfire exposure, and devastating fires. Flooding has historically been more prevalent in and along the foothills of the Valley, where increasing urban development contributes to a high amount of stormwater runoff. In addition, several major earthquake faults run through the Valley and quake activity has been growing in and around the region. Protecting the safety of passengers and employees within the Transit System is one of the Agency's primary responsibilities. Protecting lives is also the basis for emergency planning, response, and mitigation activities. Consistent with one of the main responsibilities of local government, the mission of the Omnitrans Safety & Security Office is the protection of passengers, employees, and the transit system.

Objective #1 Continually improve the understanding of the location and potential impacts of natural hazards, the vulnerability of transit system facilities, and the measures needed to protect life safety within the transit system.
Objective #2 Continually provide state and local agencies with updated information about hazards, vulnerabilities, and mitigation measures associated with the transit system.
Objective #3 Ensure that all Federal, local, state codes and standards are enforced with regard to protection of life.
Objective #4 Ensure that all facility structures in the transit system meet minimum standards for life safety.
Objective #5 Ensure that all facilities and transit system infrastructure in high risk areas is protected by mitigation measures that provide for life safety.
Objective #6 Identify and mitigate all imminent threats within the transit system to life safety.

Avoid Damage to Property

Description:

Omnitrans will ensure that mitigation efforts are integrated into all Agency Emergency Operating Plans. Earthquakes, floods, and other natural and human-caused hazards can disrupt critical infrastructure of the transit system. The transit system is an essential part of the community's lifeline service for the people of the San Bernardino Valley. The protection of transit system property also includes the preservation of valuable operational data, historical information, and other non-structural assets of the transit agency. Omnitrans has incorporated mitigation activities in Continuity of Business and Continuity of Government plans for the transit system.

Objective #1 Ensure transit system property protection measures are utilized.

Objective #2 Reduce or eliminate all repetitive property losses due to flood, fire, and earthquake within the transit system.

Objective #3 Research, develop, and adopt cost-effective codes and standards to protect the transit system infrastructure beyond the minimum of protecting life safety.

Objective #4 Establish a partnership among all levels of government and the business community to improve and implement methods to protect the transit system infrastructure.

Protect the Environment

Description:

Natural disasters not only destroy the man-made environment, but they can also adversely affect the physical environment. Flooding can adversely affect water quality in the rivers and streams that support fisheries and can damage other critical habitats. Geologic hazards can result in landslides that can block streams and prevent fish migration. Debris from natural disasters can pollute the water, foul the land, and diminish air quality if not dispose of properly.

Objective #1 Ensure that all mitigation projects associated with the transit system are reviewed for compliance with all applicable environmental laws.

Objective #2 Encourage hazard mitigation measures that result in the least adverse effect on the natural environment and that use natural processes.

Objective #3 Ensure that all transit system hazard mitigation planning reflect the goal of protecting the environment.

Promote Hazard Mitigation

Description:

Omnitrans will develop a procedure to ensure that comprehensive hazard mitigation planning, integration, awareness, and education are increased within the transit agency. Support local and state efforts to broaden the understanding of the importance of mitigation. Encourage Omnitrans participation in such activities as the Disaster Resistant California (DRC) conference as a source of specialized mitigation training for Agency staff.

Objective #1 Ensure that Omnitrans is covered by the San Bernardino County Operational Area Multi-Jurisdictional Hazard Mitigation Plan.

Objective #2 Update the Agency's Hazard Mitigation Plan annually as part of the Operational Area's Multi-Jurisdictional Hazard Mitigation Plan.

Objective #3 Increase understanding of the importance of hazard mitigation among the Transit System staff, stressing the benefits of reduced losses to life and property, the reduced cost of disaster recovery, and the increased benefit of the continuity of operations of the transit system and local government.

Objective #4 Strengthen the message of hazard mitigation in disaster preparedness programs within Omnitrans.

How are the Mitigation Action Items Organized?

The action items are a listing of activities in which Agency, staff can be engaged to reduce risk. Each action item includes an estimate of the timeline for implementation.

The action items are organized within the following Mitigation Actions Matrix, which lists all of the multi-hazard (actions that reduce risks for more than one specific hazard) and hazard-specific action items included in the mitigation plan. Data collection and research and the public participation process resulted in the development of these action items (Section 3: Planning Process). The Matrix includes the following information for each action item:

Funding Source

The action items can be funded through a variety of sources, possibly including: operating budget/general fund, development fees, Facilities Management Plan, Community Development Block Grant (CDBG), Hazard Mitigation Grant Program (HMGP), other Grants, private funding, and other funding opportunities.

Coordinating Organization

The Mitigation Actions Matrix (Table 3-1) assigns primary responsibility for each of the action items. The hierarchies of the assignments vary – some are positions, others departments, and other committees. The primary responsibility for implementing the action items falls to the entity shown as the “Coordinating Organization”. The coordinating organization is the agency with regulatory responsibility to address hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation.

Coordinating organizations may include local, county, or regional agencies that are capable of or responsible for implementing activities and programs.

Plan Goals Addressed

The plan goals addressed by each action item are included as a way to monitor and evaluate how well the mitigation plan is achieving its goals once implementation begins.

Comments

Department representatives provided status updates on each of the mitigation action items identified in the 2005 plan. The status as of 2010 is indicated in the comments column using the following categories: New, Revised, Completed, Deleted, and Deferred.

Prioritizing Mitigation Action Items

Following is the tool used by the Planning Team to rank the various mitigation action items.

Prioritizing Mitigation Action Items

Mitigation Action Item Number _____

Instructions: If the answer is “yes”, check the box.

Does the Action:
- ☐ solve the problem?
- ☐ address Vulnerability Assessment?
- ☐ reduce the exposure or vulnerability to the highest priority hazard?
- ☐ address multiple hazards?
- ☐ benefits equal or exceed costs?
- ☐ implement a goal, policy, or project identified in the General Plan or Capital Improvement Plan?

Can the Action:
- ☐ be implemented with existing funds?
- ☐ be implemented by existing state or federal grant programs?
- ☐ be completed within the 5-year life cycle of the LHMP?
- ☐ be implemented with currently available technologies?

Will the Action:
- ☐ be accepted by the community?
- ☐ be supported by community leaders?
- ☐ adversely impact segments of the population or neighborhoods?
- ☐ require a change in local ordinances or zoning laws?
- ☐ positive or neutral impact on the environment?
- ☐ comply with all local, state and federal environmental laws and regulations?

Is there:
- ☐ sufficient staffing to undertake the project?
- ☐ existing authority to undertake the project?

Now tally the total number of “checks”.

Number of checks: _____

Now using the following scale determine the priority level:
- 1-6 = Low priority
- 7-12 = Medium priority
- 13-18 = High priority

Priority: _____ (Low, Medium, High)

Following is Table 3-1: Mitigation Actions Matrix which identifies the existing and future mitigation activities developed by the Planning Team.

Mitigation Actions Matrix										
Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed				Funding Source (*=not yet identified)	Ranking future actions (L=Low, M=Med, H=High, n/a=not applicable)	Comments (New, Completed, Deleted, Revised, Deferred)
				Transit System Life Safety	Avoid Damage to Property	Protect the Environment	Promote Hazard Mitigation			
MH-1	Form a planning team to develop the Mitigation Plan outlining potential hazards and mitigation factors.	Safety & Security Office	Every 5 years (Ongoing)	X	X	X	X	Federal and Local	H	
~~MH-2~~	~~Perimeter fencing and gate control enhancements are to be supplemented with intrusion alarm systems linked to existing surveillance video.~~	~~Omnitrans~~	~~Ongoing~~	~~X~~				Federal and Local	~~M~~	Deleted – Not mitigation
MH-3	Ensure that all new buildings, major remodels, and/or building additions conform to California Buildings Codes, City Building Codes, Uniform Building Codes, National Fire Protection Association, State Fire Marshal, and other local fire and other regulatory agencies. This will assist in mitigating effects from earthquakes, fires, and other natural disasters.	Maintenance Department – Facilities Management	1-5 years	X	X	X	X	Federal and Local	H	New
MH-4	Examine existing flood zones, major earthquake faults, and fire prone	Planning Department	1-5 years	X	X		X	Federal and	H	New

Mitigation Actions Matrix										
Action Item Identifier	Action Item	Coordinating Organization	Timeline	Plan Goals Addressed				Funding Source (*=not yet identified)	Ranking future actions (L=Low, M=Med, H=High, n/a=not applicable)	Comments (New, Completed, Deleted, Revised, Deferred)
				Transit System Life Safety	Avoid Damage to Property	Protect the Environment	Promote Hazard Mitigation			
	areas when developing Omnitrans' Emergency Services Plan. This allows the Agency to mitigate placing agency resources in harm's way during these types of disasters.							Local		

Section 4: Planning Process

Plan Methodology

DMA 2000 emphasizes the importance of participatory planning in the development of Mitigation Plans. This Mitigation Plan was written using the best available information from a wide variety of sources.

Throughout the planning process, Omnitrans made a concerted effort to gather information from Omnitrans, city and county departments, as well as state and federal agencies, the local business community, and other stakeholders.

Disaster Mitigation Act of 2000

Requirement §201.6(c) (1)

[The plan shall include…:] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

The Planning Team solicited information from agencies and people with specific knowledge of natural hazards and past historical events, as well as planning and zoning codes, ordinances, and recent planning decisions. The hazard mitigation strategies contained in this plan were developed through an extensive planning process involving local businesses and residents.

The rest of this section describes the mitigation planning process including 1) Planning Team involvement, 2) extended Planning Team support, 3) public and other stakeholder involvement; and 4) integration of existing data and plans.

Planning Team Involvement

The Executive Summary included a detailed chronological list of planning process tasks. Following is an accounting of specific participation. (Sign in sheets are attached to this section).

Table 4-1: Planning Team Timeline

	June 2010	July	August	September	October	November	December	January 2011	February	March
Planning Team meeting with Consultant	X		X							
Consultant prepared the draft plan update						X				
Planning Team reviewed draft plan						X				
Submit draft plan to San Bernardino County Operational Area						X				
Revise plan based on input from the County						X	X			
Submittal of the Final plan to San Bernardino County Operational Area							X			

	June 2010	July	August	September	October	November	December	January 2011	February	March
County submits Multi-Jurisdictional Hazard Mitigation Plan to Cal EMA and FEMA for approval							X			
Cal EMA and FEMA review and revisions as necessary							X	X	X	
Submit approved plan to Board of Director for adoption										X

Table 4-2: Planning Team Level of Participation

	Mark Crosby	Steve Okamura	Karl Baker	Carolyn Harshman
Planning Team meeting with Consultant (June 2010)	X	X	X	X
Planning Team meeting with Consultant (August 2010)	X	X		X
Consultant prepared the draft plan update				X
Planning Team reviewed draft plan	X	X	X	
Submit draft plan to San Bernardino County Operational Area	X			
Revise plan based on input from the county				X
Submittal of the Final plan to San Bernardino County Operational Area	X			
Revise plan as necessary based on FEMA review				X
Submit approved plan to Board of Directors for adoption	X			

The Planning Team was responsible for the following tasks:

- ✓ Establish plan development goals
- ✓ Prepare timetable for plan completion
- ✓ Ensure plan meets DMA 2000 requirements, and federal and state guidelines
- ✓ Organize and oversee public involvement
- ✓ Solicit participation of government agencies, businesses, residents, and other stakeholders
- ✓ Gather information (such as existing data and reports)
- ✓ Develop, revise, adopt, and maintain plan

The Planning Team, with support from other staff and local organizations, identified and profiled hazards; determined hazard rankings; estimated potential exposure or losses; evaluated development trends and specific risks; and developed mitigation goals, objectives, and activities.

During its meetings the Planning Team gathered and shared information, assessed risks, identified critical facilities, developed mitigation strategies, and provided continuity throughout plan development to ensure the plan addresses jurisdiction-specific hazard vulnerabilities and mitigation strategies. Members communicated regularly by phone and email between group meetings.

The Planning Team will meet annually after the plan is adopted. Members will provide project direction and oversight, assist with plan evaluation, and convene supplementary meetings as-needed.

Outside Agency Involvement

A variety of agencies and individuals provided data and expertise during plan development. The agencies were informed of the availability of the draft mitigation plan. Any comments received have been incorporated into the final document. A list of external reviewers is included at the end of this section. Following is a summary of input gathered from the review process.

Table 4-3: Existing Processes and Programs

Process	Action	*Implementation of Plan*
Administrative	Departmental or organizational work plans, policies, and procedural changes	✓ Safety & Security Office ✓ Other departments as appropriate
Administrative	Other plans	✓ Reference plan in Emergency Operations Plan ✓ Address plan findings and incorporate mitigation activities in Facilities Maintenance Plan
Budgetary	Capital and operational budgets	✓ Include line item mitigation measures in budget as appropriate

Process	Action	*Implementation of Plan*
Regulatory	Executive orders, ordinances, and other directives	✓ Building Code ✓ Facilities Maintenance Plan (Require hazard mitigation in design of new construction) ✓ Comprehensive Planning (Institutionalize hazard mitigation in land use and new construction) ✓ National Flood Insurance Program ✓ Storm Water Management Plan
Funding	Traditional and nontraditional sources	✓ Once plan is approved, seek authority to use bonds, fees, loans, and taxes to finance projects ✓ Seek assistance from federal and state government, foundation, nonprofit, and private sources, such as Hazard Mitigation Grant Program ✓ Research grant opportunities through U.S. Department of Housing and Urban Development, Community Development Block Grant
Partnerships	Creative funding and initiatives	✓ Community volunteers ✓ In-kind resources ✓ Public-private partnerships ✓ State support
Partnerships	Advisory bodies and committees	✓ Emergency Management Ad Hoc Committee ✓ Inter-Agency Coordination Group ✓ Safety Committee

Use of Existing Documents

The Planning Team gathered and reviewed existing data and plans during plan development:

- ✓ Omnitrans Hazard Mitigation Plan (2005)
- ✓ County of San Bernardino Multi-Jurisdictional Mitigation Plan (2010)
- ✓ HAZUS reports
- ✓ Historic GIS maps and local inventory data
- ✓ Census data
- ✓ FEMA “How To” Mitigation Series (386-1 to 386-9)
- ✓ National Oceanic and Atmospheric Administration statistics

Plan Adoption

Adoption of the plan by our governing body demonstrates the Agency’s commitment to meeting mitigation goals and objectives. Governing body approval legitimizes the plan and authorizes responsible agencies to execute their responsibilities.

The Board of Directors must adopt the Mitigation Plan following review by Cal EMA and approval by FEMA. The resolution of adoption by the Board of Directors is in Section 3: Planning Process.

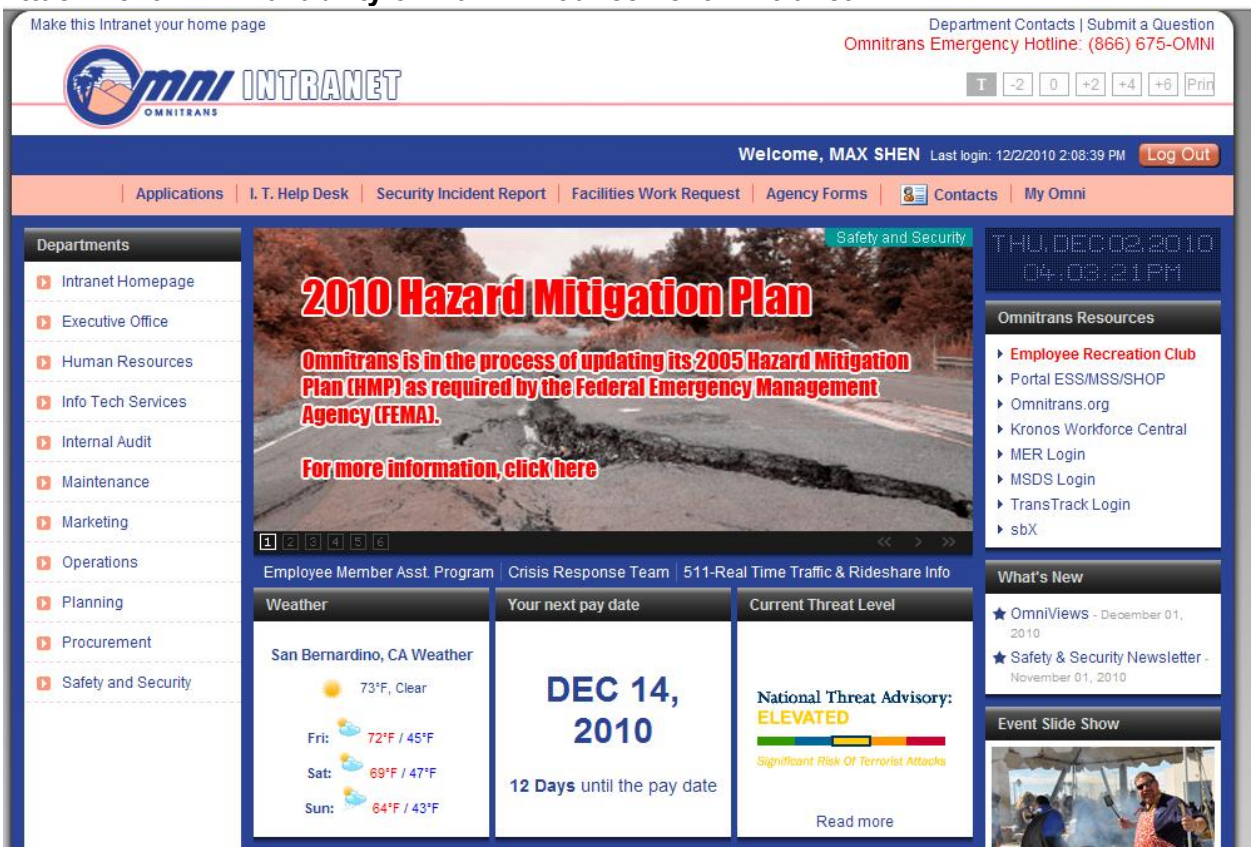
Board of Directors Public Meeting

The Mitigation Plan was posted on Omnitrans website for the public to review. The Board of Directors meeting agenda was posted at the East Valley facility on January 24, 2012 and at www.omnitrans.org on January 25, 2012. The Board of Directors heard the item on February 1, 2012.

The Board of Directors voted _____ (results) for the adoption of the update to the Mitigation Plan.

Attachment 4-1: Board of Directors Resolution

Attachment 4-2: Availability of Plan Announcement – Intranet



Attachment 4-3: Availability of Plan – Internet Safety

Attachment 4-4: Safety Newsletter

California Disaster History & Hazard Mitigation At Your Fingertips!

Avalanche
Drought
Freezes
Dam Failure
Pollution
Hazardous Materials Spills
Terrorism
Volcanoes
Insect Pests
Civil Disturbances
OH MY!

How do I find out if my home is in a wildfire hazard zone?
To determine whether or not you are in a wildfire hazard zone, contact you local fire department or your local emergency management organization

Learn About Natural Hazards In Your Neighborhood

Natural hazards are part of living in California. Having a preparedness kit will help you weather the days after a disaster, but did you know there are steps you can take that may actually reduce the risks of injuries to you and your neighbors and lessen the damage to your home?

Learn more at Maria Schriver's web site "We Prepare" and the California Emergency Management Agency web site "Emergency Preparedness for Home and Business."

Below are links to resources that can help you be prepared!

10 Ways YOU Can Be Prepared
Video: How To Assemble A Disaster Preparedness Kit
Food and Water In An Emergency
Preparing For Disaster For People With Disabilities And Other Special Needs

Use this website to discover the hazards that exist in your area and learn how to reduce YOUR risk! Remember, the best way to recover from disasters is by reducing the risks before a disaster strikes.

Please note: This web site is for general purpose use only. Real estate disclosure information can be obtained from your local city or county government. See our disclaimer below for more information regarding the limitations of this web service.

How To Use This Web Site

To find out what natural hazards exist in your area, do one of the following:

- Enter in the search above a street address and a city or town name or zip code
- Enter a city or town name, or zip code
- Enter a landmark like "The California Academy of Sciences"
- Then press the enter key or click on the "Map Search" button.

You can also search by pointing at the map using these 4 steps:

1. Click the bull's eye button above the map
2. Click once on the map to choose a location.
3. Use the magnifying glass with the plus sign (+) to zoom in, and the minus sign (-) to zoom out.
4. Use the hand button to drag the map from side to side and up and down.

Cal EMA
CALIFORNIA EMERGENCY MANAGEMENT AGENCY

Year	Date	Disaster Types
2010	05/07	Earthquake
2010	03/08	Severe Winter Storms, Flooding, and Debris and Mud Flows
2008	11/18	Wildfires
2007	10/24	Wildfires
2007	03/13	Severe Freeze
2006	06/05	Severe Storms, Flooding, Landslides, and Mudslides
2006	02/03	Severe Storms, Flooding, Mudslides, and Landslides
2005	04/14	Severe Storms, Flooding, Landslides, and Mud and Debris Flows
2005	02/04	Severe Storms, Flooding, Debris Flows, and Mudslides

What is a landslide hazard map?

A landslide hazard map indicates the possibility of landslides occurring throughout a given area. A hazard map may be as simple as a map that uses the locations of old landslides to indicate potential instability, or as complex as a quantitative map incorporating probabilities based on variables such as rainfall thresholds, slope angle, soil type, and levels of earthquake shaking. An ideal landslide hazard map shows not only the chances that a landslide may form at a particular place, but also the chance that it may travel down-slope a given distance.

(From http://www.usgs.gov/faq/list_faq_by_category/get_answer.asp?id=315)

How do I find out if my home is in a flood zone?

There are several ways to access flood zone information:

1. Go to the "What's Your Flood Risk?" section of FEMA's FLOODSMART.GOV website (http://www.floodsmart.gov/floodsmart/pages/your_flood_risk/your_flood_risk.jsp) and enter your property address,

2. View or purchase a copy of your local Flood Insurance Rate Map (FIRM) at FEMA's Map Service Center: http://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1,

3. Contact your local government and ask to be directed to the department in charge of the Community Map Repository to view the hard copy FIRM. A listing of some community contact numbers can be found at this link http://www.fema.gov/fema/csb.shtm

Section 5: Plan Maintenance

The Plan Maintenance section of this document details the formal process that will ensure that the Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how Omnitrans will integrate public participation throughout the plan maintenance process.

Convener

The Board of Directors will adopt the Mitigation Plan and the CEO/General Manager will take responsibility for plan maintenance and implementation. The Planning Team Chair (Security & Loss Prevention Supervisor) will serve as a Convener to facilitate the Planning Team meetings, and will assign tasks such as updating and presenting the Plan to the members of the Planning Team. Plan implementation and evaluation will be a shared responsibility among all of the Planning Team members.

Planning Team

The Planning Team will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The convener will assign representatives from Agency departments, including, but not limited to, the current Planning Team.

In order to make the Planning Team as broad and useful as possible, The CEO/General Manager may choose to involve other relevant organizations and agencies in hazard mitigation. These additional appointments could include:

- ✓ A representative from the American Red Cross
- ✓ A representative from a county government emergency response agency
- ✓ An emergency management representative from one of the cities we serve

The Planning Team will meet at least once a year. Meeting dates will be scheduled once the final Planning Team has been established. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan.

Implementation through Existing Programs

Omnitrans will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Omnitrans Maintenance Department is responsible for adhering to the State of California's Building and Safety Codes. In addition, the Planning Team will work through the Maintenance Department with other agencies at the state level to review, develop and ensure Building and Safety Codes are adequate to mitigate or present damage by hazards. This is to ensure that life-safety criteria are met for new construction.

Within a year of formal adoption of the Mitigation Plan, the recommendations listed above will be incorporated into the process of existing planning mechanisms at Omnitrans level. The

meetings of the Planning Team will provide an opportunity for Planning Team members to report back on the progress made on the integration of mitigation planning elements into Omnitrans planning documents and procedures.

Economic Analysis of Mitigation Projects

FEMA's approach to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis.

Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later.

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Planning Team will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Planning Team will use other approaches to understand the costs and benefits of each action item and develop a prioritized list.

Evaluating and Updating the Plan

Formal Review Process

The Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the agencies and organizations participating in plan evaluation. The Convener or designee will be responsible for contacting the Planning Team members and organizing the annual meeting. Planning Team members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The Planning Team will review the goals and action items to determine their relevance to changing situations in Omnitrans, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Planning Team will also review Section 3: Risk Assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

The Convener will assign the duty of updating the Plan to one or more of the Planning Team members. The designated Planning Team members will make appropriate changes to the Plan before submitting it to the Planning Team members. The Planning Team will also notify all holders of Omnitrans plan when changes have been made. Every five years the updated plan will be submitted to the State Hazard Mitigation Officer at the California Emergency Management Agency and the Federal Emergency Management Agency for review. The

CEO/General Manager is authorized to approve future updates and amendments to the Mitigation Plan.

Continued Public Involvement

Omnitrans is dedicated to involving the public directly in the continual review and updates to the Mitigation Plan. Copies of the plan will be available at Omnitrans headquarters in San Bernardino and on the internet. Each year, after the Planning Team evaluates the mitigation activities, a notice regarding the location of copies of the plan will be publicized via the website. This site will also contain an email address and phone number where people can direct their comments and concerns.

The Convener will be responsible for using Agency resources to maintain public involvement through the web page.

Section 6: Risk Assessment

What is a Risk Assessment?

Conducting a risk assessment can provide information regarding: the location of hazards; the value of existing land and property in hazard locations; and an analysis of risk to life, property, and the environment that may result from natural hazard events. Specifically, the five levels of a risk assessment are as follows:

1. *Hazard Identification*
2. *Profiling Hazard Events*
3. *Vulnerability Assessment/Inventory of Existing Assets*
4. *Risk Analysis*
5. *Assessing Vulnerability/Analyzing Development Trends*

1) Hazard Identification

This section is the description of the geographic extent, potential intensity, and the probability of occurrence of a given hazard. Maps are used in this plan to display hazard identification data. Omnitrans identified one major hazard that affects its critical facilities. Although the region as a whole and the Omnitrans service area is vulnerable to several different hazards, this mitigation plan deals specifically with impacts on the critical facilities. As a result of extensive research of existing documents and input from the Planning Team, earthquakes and flooding were identified as the hazard posing the greatest threat to Omnitrans critical facilities. The geographic extent of each of the hazard was identified by Omnitrans utilizing the maps and data contained in the County's General Plan and Multi-Jurisdictional Hazard Mitigation Plan. Utilizing FEMA's Calculated Priority Risk Index (CPRI), the Planning Team concluded that the identified hazard posed a significant threat against Omnitrans. The hazard ranking system is described in Table 6-1: Calculated Priority Risk Index, while the actual ranking is shown in Table 6-2: Calculated Priority Risk Index Ranking.

Table 6-1: Calculated Priority Risk Index
(Source: Federal Emergency Management Agency)

CPRI Category	Degree of Risk Chart			Assigned Weight Factor
	Level ID	Description	Index Value	
Probability	Unlikely	• Extremely rare with no documented history of occurrences or events • Annual probability of less than 1 in 1,000 years.	1	45%
	Possible	• Extremely rare with no documented history of occurrences or events. • Annual probability of between 1 in 100 years and 1 in 1,000 years.	2	
	Likely	• Occasional occurrence with at least two or more documented historic events. • Annual probability of between 1 in 10 years and 1 in 100 years.	3	

	Highly Likely	• Frequent events with a well documented history of occurrence. • Annual probability of greater than 1 every year.	4	
Magnitude / Severity	Negligible	• Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). • Injuries or illnesses are treatable with first aid and there are not deaths. • Negligible quality of life lost. • Shut down of critical facilities for less than 24 hours.	1	30%
	Limited	• Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructures) • Injuries and illnesses do not result in permanent disability and there are no deaths. • Moderate quality of life lost. • Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	• Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructures) • Injuries or illnesses result in permanent disability and at least one death. • Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	• Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). • Injuries or illnesses result in permanent disability and multiple deaths. • Shut down of critical facilities for more than 1 month.	4	
Warning Time	More than 24 hours	• Population will receive greater than 24 hours of warning.	1	15%
	12 to 24 hours	• Population will receive between 12-24 hours of warning.	2	
	6 to 12 hours	• Population will receive between 6-12 hours of warning.	3	
	Less than 6 hours	• Population will receive less than 6 hours of warning.	4	
Duration	Less than 6 hours	• Disaster event will last less than 6 hours.	1	10%
	Less than 24 hours	• Disaster event will last between 6-24 hours.	2	
	Less than one week	• Disaster event will last between 24 hours and 1 week.	3	
	More than one week	• Disaster event will last more than 1 week.	4	

Table 6-2: Calculated Priority Risk Index Ranking for Omnitrans

Hazard	Probability	Weighted 45%	Magnitude Severity	Weighted 30%	Warning Time	Weighted 15%	Duration	Weighted 10%	CPRI Ranking
Earthquake - South San Andreas Fault	3	1.35	4	1.2	4	0.6	3	0.3	3.45

2) Profiling Hazard Events

This process describes the causes and characteristics of each hazard and how the Omnitrans facilities, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each identified hazard discussed in this plan is provided in the Risk Assessment. Table 6-3 indicates a generalized perspective of the community's vulnerability of the various hazards according to extent (or degree), location, and probability.

Table 6-3: Vulnerability: Location, Extent, and Probability for Omnitrans

Hazard	Location (Where)	Extent (How Big an Event)	Probability (Unlikely, Possible, Likely, Highly Likely)
Earthquake	Entire Project Area	The Southern California Earthquake Center (SCEC) in 2007 concluded that there is a 99.7 % probability that an earthquake of M6.7 or greater will hit California within 30 years.[1]	Moderate
Flood	Throughout Project Area	Urban Flooding from Severe Weather (500-year floodplain)	Low

[1] Uniform California Earthquake Rupture Forecast

3) Vulnerability Assessment/Inventory of Existing Assets

This is a combination of hazard identification with an inventory of the existing (or planned) property development(s) and population(s) exposed to a hazard. Critical facilities are of particular concern because these locations provide essential equipment or provide services to the general public that are necessary to preserve important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified and are illustrated in Table 6-5: Omnitrans Critical Facilities Vulnerable to Hazards.

4) Risk Analysis

Estimating potential losses involves assessing the damage, injuries, and financial costs likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. For each hazard where data was available, quantitative estimates for potential losses have been included in the hazard assessment. Data was not available to make vulnerability determinations in terms of dollar losses for all of the identified hazards. The Mitigation Actions Matrix (Section 3: Mitigation Strategies) includes an action item to conduct such an assessment in the future.

5) Assessing Vulnerability/ Analyzing Development Trends

This step provides a general description of Agency facilities and contents in relation to the identified hazards so that mitigation options can be considered in land use planning and future land use decisions. This Mitigation Plan provides comprehensive description of the character of Omnitrans in Section 2: Community Profile. This description includes the geography and

environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components of Omnitrans can help in identifying potential problem areas and can serve as a guide for incorporating the goals and ideas contained in this mitigation plan into other community development plans.

Critical and Essential Facilities

Facilities critical to government response activities (i.e., life safety and property and environmental protection) include: local government 9-1-1 dispatch centers, local government emergency operations centers, local police and fire stations, local public works facilities, local communications centers, schools (shelters), and hospitals. Also, facilities that, if damaged, could cause serious secondary impacts are also considered "critical". A hazardous materials facility is one example of this type of critical facility.

Essential facilities are those facilities that are vital to the continued delivery of key Omnitrans services or that may significantly impact the Agency's ability to recover from the disaster.

Table 6-4: Omnitrans Critical Facilities Vulnerable to Hazards illustrates the critical facilities and the vulnerability of those facilities to the identified hazards.

Table 6-4: Omnitrans Critical Facilities Vulnerable to Hazards

Omnitrans Facilities	Address	Earthquake	Flooding
Omnitrans Offices	1700 W Fifth St San Bernardino, CA 92411	X	X
Omnitrans West Valley Facility	4748 Arrow Hwy, Montclair, CA 91763	X	
Omnitrans I Street Facility	234 South I Street, San Bernardino, CA 92410	X	
Omnitrans Feron Facility	9421 Feron Blvd. #101, Rancho Cucamonga, CA 91730	X	

Summary

Hazard mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Hazard mitigation for industries and employers may include developing relationships with emergency management services and their employees before disaster strikes, and establishing mitigation strategies together. Collaboration among the public and private sector to create mitigation plans and actions can reduce the impacts of hazards.

Section 7: Earthquake Hazards

Why Are Earthquakes a Threat to Omnitrans?

Omnitrans has not been severely impacted by a recent earthquake event.

Local Conditions

Earthquakes are considered a major threat to Omnitrans due to the proximity of several fault zones, notably including the Southern San Andreas Fault. A recent Southern California Earthquake Center (SCEC) report (SCEC, 1995) indicated that the probability of an earthquake of Magnitude 7 or larger in southern California before the year 2024 is 80 to 90%. A significant earthquake along one of the major faults could cause substantial casualties, extensive damage to buildings, roads and bridges, fires, and other threats to life and property. The effects could be aggravated by aftershocks and by secondary effects such as fire, landslides and dam failure. A major earthquake could be catastrophic in its effect on the population, and could exceed the response capability of the local communities and even the State.

Impact of Earthquakes in Omnitrans

Based on the risk assessment, it is evident that earthquakes will continue to have potentially devastating economic impacts to certain areas of Omnitrans. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Injury and loss of life;
- ✓ Commercial and residential structural damage;
- ✓ Disruption of and damage to public infrastructure;
- ✓ Secondary health hazards e.g. mold and mildew;
- ✓ Damage to roads/bridges resulting in loss of mobility;
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community;
- ✓ Negative impact on commercial and residential property values; and
- ✓ Significant disruption to students and teachers as temporary facilities and relocations would likely be needed

Historic Events in the Region

Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in the Region, most with a magnitude below three. No community in the Region is beyond the reach of a damaging earthquake. Table 4-1: Earthquake Events in the Region describes the historical earthquake events that have affected the Region.

Table 7-1: Earthquake Events in the Southern California Region Magnitude (5.0 or Greater)
(Source: http://www.usgs.gov/)

1933	Long Beach	1999	Hector Mine

1941	Carpenteria	2005 Southern California
1954	West of Wheeler Ridge	2005 Off the coast of Northern California
1971	San Fernando	2007 Offshore Northern California
1973	Point Mugu	2007 San Francisco Bay Area
1986	Coastal San Diego	2008 Willow Creek
1986	North Palm Springs	2008 Chino Hills
1987	Whittier Narrows	2009 Calexico/Mexicali
1992	Landers	2010 Mexicali/Calexico
1992	Big Bear	2010 Ocotillo
1994	Northridge	

Regulatory Background

The State regulates development within California to reduce or mitigate potential hazards from earthquakes or other geologic hazards. Development in potentially seismically active areas is also governed by the Alquist-Priolo Earthquake Fault Zoning Act and the Seismic Hazards Mapping Act.

Chapter 16A, Division IV of the California Building Code (CBC), titled "Earthquake Design." states that "The purpose of the earthquake provisions herein is primarily to safeguard against major structural failures or loss of life." The CBC and the Uniform Building Code (UBC) regulate the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The procedures and limitations for the design of structures are based on site characteristics, occupancy type, configuration, structural system, height, and seismic zonation. Seismic zones are mapped areas (Figure 16A-2 of the CBC and Figure 16-2 of the UBC) that are based on proximity to known active faults and the potential for future earthquakes and intensity of seismic shaking. Seismic zones range from 0 to 4, with areas mapped as Zone 4 being potentially subject to the highest accelerations due to seismic shaking and the shortest recurrence intervals.

The 1933 Long Beach Earthquake resulted in the Field Act, affecting school construction. The 1971 Sylmar Earthquake brought another set of increased structural standards. Similar re-evaluations occurred after the 1989 Loma Prieta Earthquake and 1994 Northridge Earthquake. These code changes have resulted in stronger and more earthquake resistant structures.

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act of 1972 (renamed in 1994) is "to regulate development near active faults so as to mitigate the hazard of surface fault rupture." The State Geologist (chief of the Division of Mines and Geology) is required to delineate Earthquake Fault Zones (formerly known as "Special Studies Zones") along known active faults. As defined by the California Division of Mines and Geology (DMG), an active fault is one which has had surface displacement within Holocene time (roughly the last 11,000 years) and/or has an instrumental record of seismic activity. Potentially active faults are those which show evidence of surface displacement during Quaternary time (roughly the last 2 million years), but for which evidence of Holocene movement has not been established. The DMG evaluates faults on an individual basis to determine if a fault will be classified as an Alquist-Prioto

Earthquake Fault Zone. In general, faults must meet certain DMG criteria, including seismic activity, historic rupture, and geologic evidence to be zoned as an Earthquake Fault Zone. Cities and counties affected by the zones must regulate certain development within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting. Typically, structures for human occupancy are not allowed within 50 feet of the trace of an active fault.

The Seismic Hazard Mapping Act was adopted in 1990 for the purpose of protecting public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure caused by earthquakes. The Seismic Hazard Mapping Act requires that the State Geologist delineate the various seismic hazard zones. Cities, counties, or other permitting authorities are required to regulate certain development projects within the zones. They must withhold development permits for a site within a zone until the geologic conditions are investigated and appropriate mitigation measures, if any, are incorporated into the development plans. In addition, sellers (and their agents) of real property within a mapped hazard zone must disclose that the property lies within such a zone at the time of sale.

Earthquake Characteristics

Measuring and Describing Earthquakes

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter.

When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter.

Soft soils can further amplify ground motions. The severity of these effects is dependent on the amount of energy released from the fault or epicenter. One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. The acceleration due to gravity is often called "g". A ground motion with a peak ground acceleration of 100%g is very severe. Peak Ground Acceleration (PGA) is a measure of the strength of ground motion. PGA is used to project the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (10%, 5%, or 2%) of being exceeded in 50 years. These ground motion values are used for reference in construction design for earthquake resistance. The ground motion values can also be used to assess relative hazard between sites, when making economic and safety decisions.

Another tool used to describe earthquake intensity is the Magnitude Scale. The Magnitude Scale is sometimes referred to as the Richter Scale. The two are similar but not exactly the same. The Magnitude Scale was devised as a means of rating earthquake strength and is an

indirect measure of seismic energy released. The Scale is logarithmic with each one-point increase corresponding to a 10-fold increase in the amplitude of the seismic shock waves generated by the earthquake. In terms of actual energy released, however, each one-point increase on the Richter scale corresponds to about a 32-fold increase in energy released. Therefore, a Magnitude 7 (M7) earthquake is 100 times (10 X 10) more powerful than a M5 earthquake and releases 1,024 times (32 X 32) the energy.

An earthquake generates different types of seismic shock waves that travel outward from the focus or point of rupture on a fault. Seismic waves that travel through the earth's crust are called body waves and are divided into primary (P) and secondary (S) waves. Because P waves move faster (1.7 times) than S waves, they arrive at the seismograph first. By measuring the time delay between arrival of the P and S waves and knowing the distance to the epicenter, seismologists can compute the magnitude for the earthquake.

The Modified Mercalli Scale (MMI) is another means for rating earthquakes, but one that attempts to quantify intensity of ground shaking. Intensity under this scale is a function of distance from the epicenter (the closer to the epicenter the greater the intensity), ground acceleration, duration of ground shaking, and degree of structural damage. This rates the level of severity of an earthquake by the amount of damage and perceived shaking (Table 4-3: Modified Mercalli Intensity Scale).

Table 7-2: Modified Mercalli Intensity Scale

MMI Value	Description of Shaking Severity	Summary Damage Description Used on 1995 Maps	Full Description
I			Not Felt
II			Felt by persons at rest, on upper floors, or favorably placed.
III			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV			Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motorcars rock. Windows, dishes, doors rattle. In the upper range of IV, wooden walls and frame creak.
V	Light	Pictures Move	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clock stop, start, change rate.
VI	Moderate	Objects Fall	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked.
VII	Strong	Nonstructural	Difficult to stand. Noticed by drivers of motorcars. Hanging objects quiver. Furniture broken. Damage to masonry, including cracks.

Table 7-2: Modified Mercalli Intensity Scale

MMI Value	Description of Shaking Severity	Summary Damage Description Used on 1995 Maps	Full Description
		Damage	Weak chimneys broken at roofline. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Small slides and caving in along sand or gravel banks. Concrete irrigation ditches damaged.
VIII	Very Strong	Moderate Damage	Steering of motorcars affected. Damage to masonry C, partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, and elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Cracks in wet ground and on steep slopes.
IX	Very Violent	Extreme Damage	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land.
X			Rails bent greatly. Underground pipelines completely out of services.
XII			Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

Severity

A major earthquake occurring in or near Omnitrans could cause many deaths and injuries, extensive property damage, fires, hazardous material spills, and other dangers. Aftershocks and the secondary effects of fire, hazardous material/chemical accidents, and possible failure of dams and waterways could aggravate the situation.

The time of day and season of the year would have a profound impact on the number of dead and injured and the amount of property damage. Such an earthquake could exceed the response capabilities of the individual cities, San Bernardino County Operational Area, and the State of California Emergency Management Agency. Support of damage control and disaster relief could be required from other local governments and private organizations, as well as the state and federal governments.

Extensive search and rescue operations could be required to assist trapped persons. Mass evacuation could be essential to save lives, particularly in areas downwind from hazardous material releases. Emergency medical care, food, and temporary shelter could be required by injured or displaced persons.

Many families could be separated, particularly if the earthquake occurs during working hours. A personal inquiry or locator system could be essential to maintain morale. Emergency

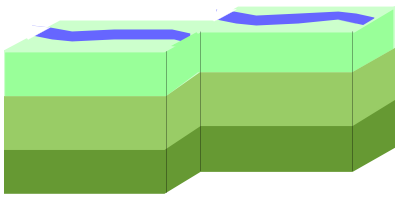
operations could be seriously hampered by a loss of communications, damage to transportation routes, and/or disruption of public utilities and services.

The economic impact on Omnitrans could be considerable in terms of lost employment and lost tax base. A major earthquake could disrupt, damage, or destroy computer facilities, which could curtail the operations of banks, insurance companies, and other elements of the financial community for several days or weeks. This could affect the ability of local government, business, and residents to make payments and purchases. (Source: California Division of Mines and Geology, Special Publication 60, *Earthquake Planning Scenario for a Magnitude 8.3 Earthquake on the San Andreas Fault in Southern California,* 1982)

Causes of Earthquakes in the Region

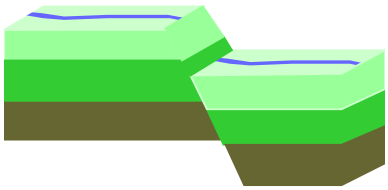
Earthquake Faults

A fault is a fracture along between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.



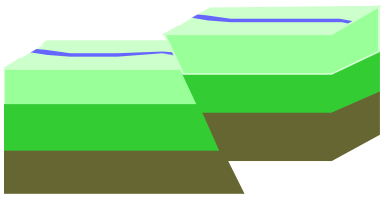
Strike-slip Faults

Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.



Dip-slip Faults

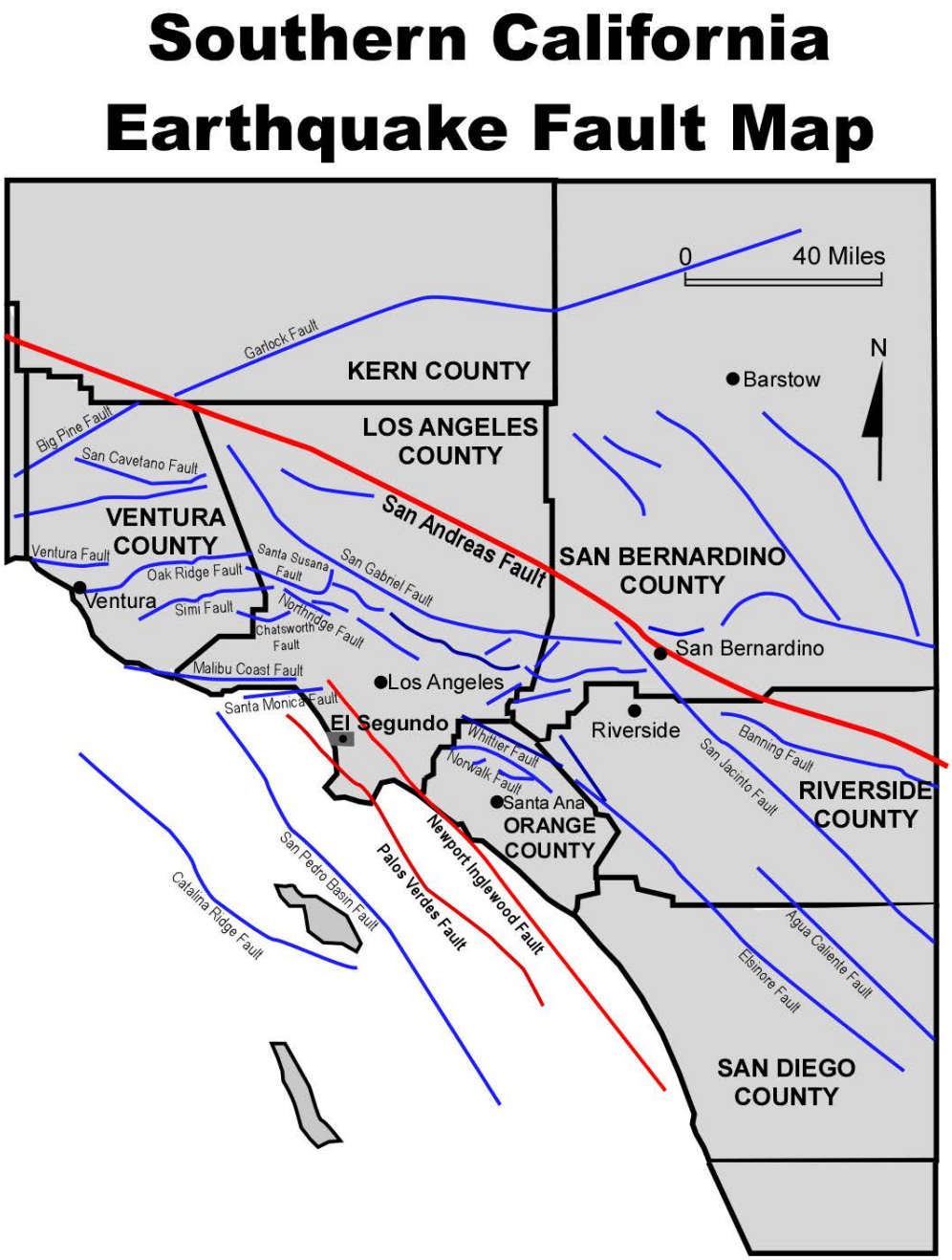
Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault.



Thrust Faults

Thrust faults have a reverse fault with a dip of 45 ° or less.

Map 7-1: Regional Fault Location Map



Earthquake Related Hazards

Ground shaking, landslides, liquefaction, and amplification are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

Seismic activity along nearby or more distant fault zones are likely to cause ground shaking within Omnitrans service area. Based on a Probabilistic Seismic Hazard Assessment for the Western United States, issued by the United States Geological Survey (1999), the horizontal peak ground acceleration having a 10 percent probability of being exceeded in 50 years ranges from approximately (0.35g to 0.56g within Omnitrans service area).

Soil liquefaction is a seismically induced form of ground failure, which has been a major cause of earthquake damage in southern California.

Fault Rupture

The potential for ground rupture due to fault movement is related to the seismic activity of known fault zones. Recognized active fault zones are generally located outside Omnitrans. Faults such as the El Modeno Fault or the Peralta Hills Fault could conceivably cause ground rupture within the City. Compared with the more active recognized fault zones, the potential for ground rupture due to seismic activity in Omnitrans is considered low.

Earthquake-Induced Landslides

Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

Liquefaction

Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these structures. Liquefaction generally occurs during significant earthquake activity, and structures located on soils such as silt or sand may experience significant damage during an earthquake due to the instability of structural foundations and the moving earth. Many communities in Southern California are built on ancient river bottoms and have sandy soil. In some cases this ground may be subject to liquefaction, depending on the depth of the water table.

Soil liquefaction is a seismically-induced form of ground failure, which has been a major cause of earthquake damage in southern California. During the 1971 San Fernando and 1994

Northridge earthquakes, significant damage to roads, utility pipelines, buildings, and other structures in the Los Angeles area were caused by liquefaction. Research and historical data indicate that loose, granular materials situated at depths of less than 50 feet with fines (silt and clay) contents of less than 30 percent, which are saturated by a relatively shallow groundwater table are most susceptible to liquefaction. These geological and groundwater conditions exist in parts of southern California and Omnitrans, typically in valley regions and alluviated floodplains.

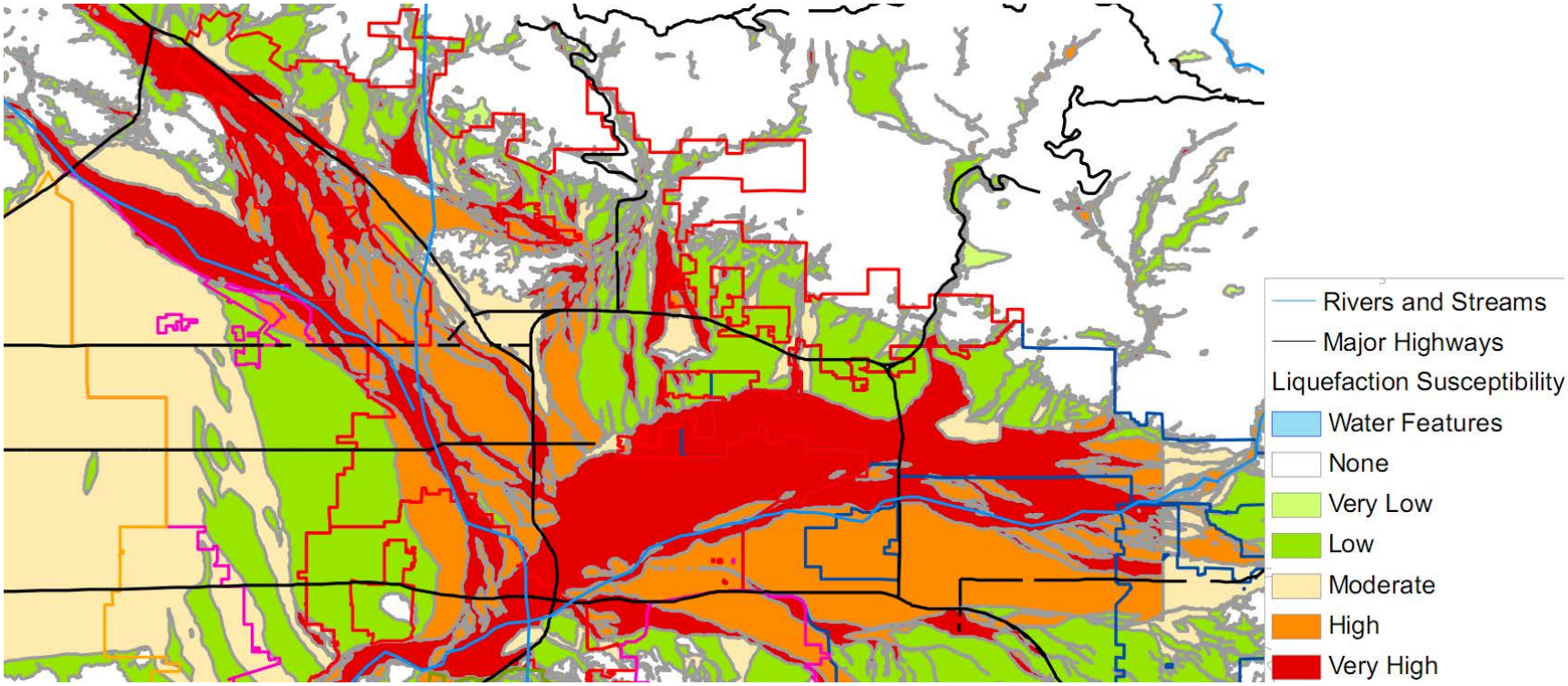
For liquefaction to occur, three general conditions must be met. The first condition – strong ground shaking of relatively long duration – can be expected to occur in Omnitrans area as a result of an earthquake on any of the several active faults in the region. The second condition – loose, or unconsolidated, recently deposited sediments consisting primarily of silt and sand – occurs in a large portion of the valley floors, and in the larger canyon bottoms prevalent throughout San Bernardino County. The third condition is water saturated sediments within about 50 feet of the surface.

The California Geological Survey has identified areas most vulnerable to liquefaction. Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Liquefaction and Earthquake Landslide-Induced Areas in Omnitrans identified areas in the vicinity that are subject to liquefaction and landslides associated with earthquake activities.

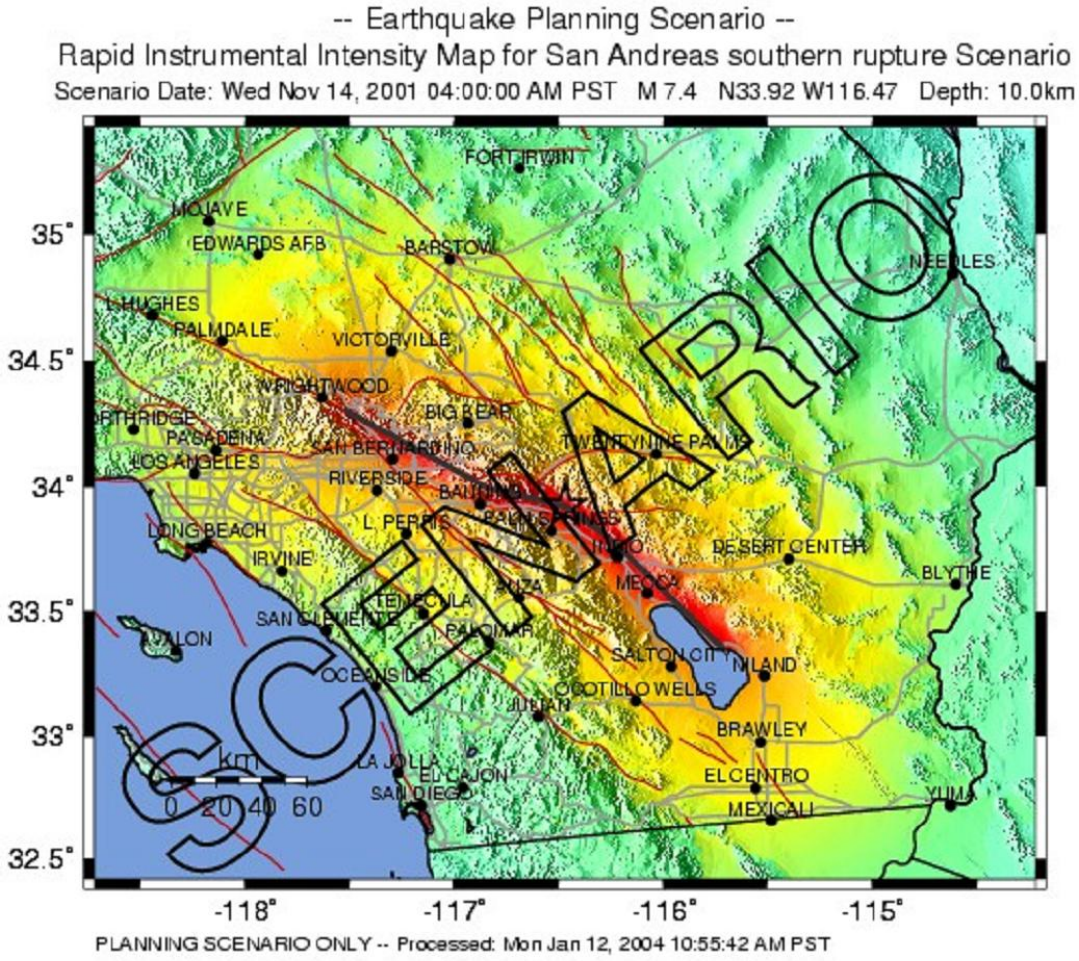
Amplification

Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

Map 7-2: Liquefaction and Earthquake Landslide-Induced Areas (San Bernardino)
(Source: 2010 San Bernardino County Operational Area Multi-Jurisdictional Hazard Mitigation Plan)



Map 7-3: Seismic Shaking Intensities for the Southern San Andreas Fault
(Source: State of California Department of Conservation, http://www.consrv.ca.gov/cgs/rghm/loss/index.htm)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

S15 San Andreas Fault - Southern Scenario M 7.4

Section 8: Flood Hazards

Why are Floods a Threat to Omnitrans?

According to historical records, Omnitrans facilities have not been impacted by flooding.

Urban flooding could pose a threat to life and safety, and possibly can cause damage to public and private property. There is potential for localized flooding in natural depressions within the Agency service area, however none of the Agency-owned facilities are located within an identified 100-year floodplain.

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Local Conditions

The size and frequency of a flood in a particular area, depends on a complex combination of conditions, including the amount, intensity, and distribution of rainfall previous moisture condition and drainage patterns.

The magnitude of a flood is measured in terms of its peak discharge, which is the maximum volume of water passing a point along a channel in a given amount of time, usually expressed in cubic feet per second (cfs). Floods are usually referred to in terms of their chance of occurrence. For example, a 100-year flood has a 1% chance of occurring in any given year.

The Federal Emergency Management Agency (FEMA) establishes base flood heights and inundation areas for 100-year and 500-year flood zones. The 100-year flood zone is defined as the area that could be inundated by the flood which has a one percent probability of occurring in any given year. The 500-year flood is defined as the flood which has a 0.2 percent probability of occurring in any given year.

The City of San Bernardino and City of Yucaipa both participate in the National Flood Insurance Program (NFIP). Created by Congress in 1968, the NFIP makes flood insurance available in communities that enact minimum floodplain management rules consistent with the Code of Federal Regulations §60.3.

The Omnitrans Administrative Offices are located in a 500-year floodplain.

Local Mapping

FEMA flood maps are not entirely accurate. These studies and maps represent flood risk at the point in time when FEMA completed the studies, and does not incorporate planning for floodplain changes in the future due to new development. Although FEMA is considering changing that policy, it is optional for local communities. The FEMA FIRM maps for the Agency were last updated 8/28/2008.

Repetitive Loss Properties

According to FEMA records there are no repetitive loss properties located within the boundaries of the Agency.

Impact of Flooding in the Omnitrans Service Area

Floods and their impacts vary by location and severity of any given flood event, and likely only affect certain areas of the county during specific times. Based on the risk assessment, it is evident that floods will continue to have devastating economic impact to certain areas of the city.

Impact that is not quantified, but anticipated in future events includes:

- ✓ Injury and loss of life;
- ✓ Commercial and residential structural damage;
- ✓ Disruption of and damage to public infrastructure;
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values and
- ✓ Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Historic Flooding in the Region

Historic flooding in San Bernardino County records show that the County's rivers have flooded numerous times. Following are storm summaries with damages greater than $2 million since 1990. The records are gathered from NOAA's National Climatic Data Center .

Flash Flood – Forest Falls 1997

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC

Search Field: Search NCDC

ncdc | xml_no_dtd | ncdc

ncdc

Event Record Details

Event: **Flash Flood**
Begin Date: **04 Sep 1997, 05:30:00 PM PST**
Begin Location: **Forest Falls**
End Date: **04 Sep 1997, 06:00:00 PM PST**
End Location: **Forest Falls**
Magnitude: **0**
Fatalities: **0**
Injuries: **2**
Property Damage: **$ 3.5M**
Crop Damage: **$ 0.0**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
A severe thunderstorm packing torrential rains and golf ball size hail pummelled the Mill Creek Basin and the Yucaipa Ridge, in the San Bernardino Mountains, sending flood waters rushing down Mill and Little San Gorgonio Creeks. A spotter in Forest Falls reported 2.5 inches of rain in just 45 minutes. The result was a 15 foot high, 150 foot wide, wall of mud and water rushing through the Mill Creek Canyon, and into the town of Forest Falls. On the south facing slope of the Yucaipa Ridge, a 6 to 10 foot high flow of water and debris cascaded down Little San Gorgonio Creek, flooding portions of Oak Glen as well. The Forest Falls area bore the brunt of the damage as tons of mud, boulders, and debris buried roads, mangled automobiles, battered scores of homes, dislodged propane tanks, and stranded residents. Two homes were completely destroyed and 77 others suffered damage, 16 seriously. In Oak Glen, a nursery suffered extensive losses, otherwise the major damage was to roads and drainage facilities. Clearing mud, rock, and debris flows was costly. Two minor injuries were reported. Total estimated damage and debris clean-up was $3.2 million in Forest Falls alone, and another $250,000 in Oak Glen.

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http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flash Flood – San Bernardino County 1997

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC

Search Field: Search NCDC

ncdc | xml_no_dtd | ncdc | ncdc

Event Record Details

Event: **Flash Flood**
Begin Date: **07 Oct 1997, 03:30:00 AM PST**
Begin Location: **San Bernardino**
End Date: **07 Oct 1997, 07:30:00 AM PST**
End Location: **San Bernardino**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 2.5M**
Crop Damage: **$ 0.0**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
Localized heavy rain developed over the San Bernardino Mountains in association with a fast-moving cold front and sharp, low pressure trough aloft. Between 1.5 and 2.0 inches of rain fell on a recently burned area southwest of Running Springs. Most of the rain fell in less than one hour, loosening debris and soil on Holcomb Hill, which flowed into, and blocked drainage through box culverts. The result was a six-foot wall of mud, debris and water flowing over cars, roads, and homes . In all, 27 homes , an apartment complex, Acquinas High School, and 14 automobiles were damaged. Also, trees up to two feet in diameter, along with boulders and other debris, blocked and damaged drainage channels and roads. The flood stranded four runaway teenagers, who had to be rescued by helicopter. They were treated for minor bruises and hypothermia. Total estimated losses exceeded $2.5 million.

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http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flash Flood – Southwest San Bernardino County 1998

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC

Search Field: Search NCDC

ncdc | xml_no_dtd | ncdc

ncdc

Event Record Details

Event: **Flood**
Begin Date: **23 Feb 1998, 06:00:00 PM PST**
Begin Location: **Southwest Portion**
End Date: **24 Feb 1998, 06:00:00 AM PST**
End Location: **Southwest Portion**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 35.9M**
Crop Damage: **$ 14.1M**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
A powerful Pacific storm fed by warmer than normal El Nino conditions in the eastern Pacific, slammed into southern California with strong winds, thunderstorms, and very heavy rain. This was the final in a series of heavy storms which pummelled the region this month. In many areas the ground was nearly saturated and some reservoirs were nearing or exceeding their capacity. The two, to locally five inches of rain which ensued, caused widespread flooding and property damage, prompting the President to declare all four counties Federal Disaster Areas. Strong winds gusting over 40 mph at times felled trees, whose support was weakened in the water-logged soils, which snapped utility lines, resulting in sporadic power outages. Snow levels dropped as low as 1400 feet in the high deserts of San Bernardino County and wind gusts to 60 mph knocked out power to thousands. In the mountains, 1 to 2 feet of heavy, wet snow above 6000 feet, snapped tree branches and power lines. Above 7000 feet, 3 to 4 feet of snow fell. In Laguna Beach, two hillsides gave way, sending a river of mud and water through homes and cars. Two men were killed and at least two others injured, and three hundred homes were damaged, 18 of them seriously. In Apple Valley and Hesperia, flooding caused major damage to scores of homes, while hundreds of homes and businesses in other communities suffered minor damage. In Apple Valley alone, two dozen families were evacuated, and damage to public and private property reached $10 million.

Parts of 74 roads had to be closed throughout the Victor Valley. Many roads, rail lines, and bridges were damaged or had to be closed for a time, including I-15 through the Cajon Pass. Dangerous swift-water rescues occurred in Colton, Pedley, Canyon Lake, Redlands, Sun City and San Jacinto. In San Diego County, 200 people were evacuated from three mobile home parks in Oceanside, and portions of Camp Pendleton were flooded, due to the raging Loma Alta Creek. Numerous sink holes developed. One near the I-15 and Balboa Avenue in San Diego, measured 550 feet long, 35 feet wide, and 65 feet deep. The San Diego River at Fashion Valley peaked at 15.1 feet at 4:00 am on the twenty-fourth, which is 3.8 feet above flood stage. For the third time this month, low lying roads, golf courses, and parking facilities were inundated. The persistent wet weather damaged the strawberry crop, assorted winter vegetables, citrus and avocado groves, and hurt the flower industry in San Diego County, but losses to dairymen in San Bernardino and Riverside Counties was staggering. Thousands of cows succumbed to the weather. Some drowned, others died of exhaustion and fatigue from struggling through 3 to 4 feet of mud, and many lost calves. Damage estimates to residences, businesses, property, infrastructure, agriculture, and the cost of emergency services, and for clean-up for all four counties exceeded $100 million. While a large percentage of this figure is attributable to this storm, some portion was the result of previous storms this month. The environment that these storms created, helped facilitate the runoff and subsequent flooding which ensued during this final storm of the month. Toward the end of the storm, a small tornado touched down in Huntington Beach at the Villa Huntington Mobile Estates. A carport and children's playroom was ripped up. Flying debris hit a transformer, knocking out power to 200 homes and a portion of a roof settled atop a tree one quarter mile away. Later that morning a waterspout was sighted off of Mission Beach.

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Flash Flood – Forest Falls 1999

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

DOC >NOAA >NESDIS >NCDC

Search Field:

Search NCDC

	ncdc
xml_no_dtd	ncdc
	ncdc

Event Record Details

Event: **Flash Flood**
Begin Date: **11 Jul 1999, 03:18:00 PM PST**
Begin Location: **4 Miles North East of Forest Falls**
End Date: **11 Jul 1999, 05:00:00 PM PST**
End Location: **2 Miles West North West of Forest Falls**
Magnitude: **0**
Fatalities: **1**
Injuries: **5**
Property Damage: **$ 6.0M**
Crop Damage: **$ 0.0**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
F36PH Thunderstorms redeveloped during the afternoon and moved slowly west southwest down the valley. Rainfall rates were high with over an inch of rain falling in less than a half hour. Radar rainfall estimates were near three inches. As a result creeks and streams feeding into Mill Creek rapidly filled and created a 25 foot high wall of water, rocks, and mud. Seven homes were destroyed, 11 sustained moderate to severe damage, and 35 others had minor damage. Roads were covered with 10 feet of rocks, mud, and debris. Flash flood waters continued to move down Mill Creek and into the Santa Ana River, causing road flooding in Redlands .

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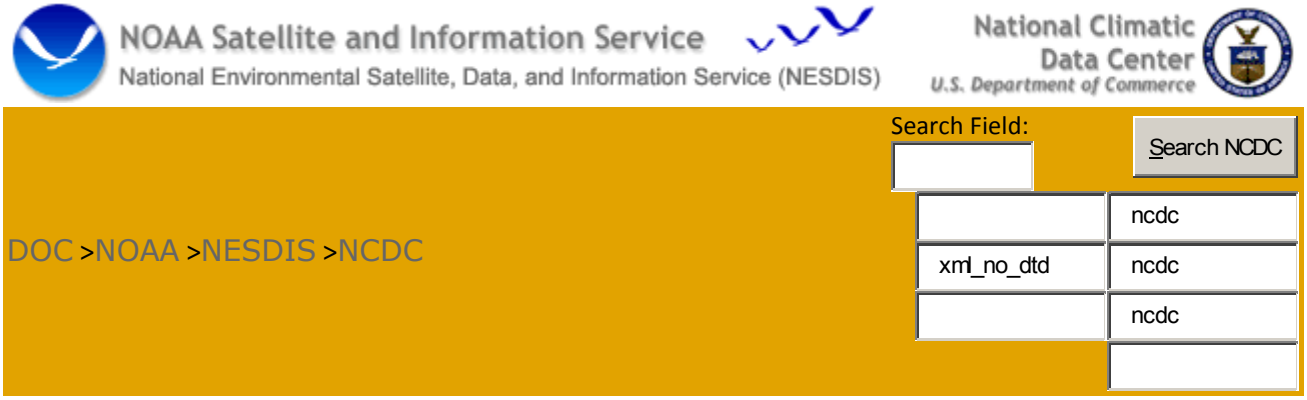
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flash Flood – Forest Falls 1999



Event Record Details

Event: **Flash Flood**
Begin Date: **13 Jul 1999, 03:05:00 PM PST**
Begin Location: **Forest Falls**
End Date: **13 Jul 1999, 04:45:00 PM PST**
End Location: **Forest Falls**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 2.1M**
Crop Damage: **$ 0.0**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
Thunderstorms moved over the same area that had experienced flash flooding the previous two days. Four creeks overflowed as the area received 1.8 inches of rain in 25 minutes. A 10 foot wall of mud and debris washed across roads. Four homes were destroyed, 10 sustained major damage, and 16 sustained minor damage. Hail, 0.75 inch diameter, was reported as the heavy rain ended.

http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flash Flood – Victorville 2004

Event Record Details

Event: **Flash Flood**
Begin Date: **14 Aug 2004, 12:17:00 PM PST**
Begin Location: **3 Miles South of Victorville**
End Date: **14 Aug 2004, 01:20:00 PM PST**
End Location: **3 Miles North of Hesperia**
Magnitude: **0**
Fatalities: **0**
Injuries: **1**
Property Damage: **$ 5.0M**
Crop Damage: **$ 0.0**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
Flash flooding in eastern Victorville and in the Spring Valley Lake vicinity trapped many vehicles in rapidly rising water which in some places was "neck deep." Spring Valley Lake was especially hard hit with

damage to many homes along Autumn Leaves Ave. The lakes $100,000 white sand beach was also washed away by the flood waters. Many businesses along Hesperia Rd. near Bear Valley Rd. were inundated with water and there was significant damage done to business computers and furniture. Flood waters eight feet deep covered the BNSF railroad tracks and forced a hault to train traffic. The result was a 60 train backup that extended well into the Cajon Pass.

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Flood – San Bernardino County and Riverside County 2005

Event Record Details

Event: **Flood**
Begin Date: **09 Jan 2005, 11:00:00 AM PST**
Begin Location: **Not Known**
End Date: **11 Jan 2005, 11:00:00 AM PST**
End Location: **Not Known**
Magnitude: **0**
Fatalities: **0**
Injuries: **1**
Property Damage: **$ 3.0M**
Crop Damage: **$ 0.0**

State: **California**
Map of Counties

Zones affected: **San Bernardino And Riverside C**

Description:
Flooding along the Santa Ana River destroyed a barn, tractors, livestock, a house, bridges, 3 golf courses, and a sewer line. An estimated 2 to 3 million gallons of untreated sewage spilled into the river. One man had to be rescued after he fell in the river. The man was hospitalized for hypothermia and pelvic injuries.

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Flash Flood – Wrightwood 2005

Event Record Details

Event: **Flash Flood**
Begin Date: **11 Jan 2005, 06:30:00 AM PST**
Begin Location: **Wrightwood**
Begin LAT/LON: **34°21'N / 117°38'W**
End Date: **11 Jan 2005, 10:30:00 AM PST**
End Location: **Forest Falls**
End LAT/LON: **34°05'N / 116°55'W**

State: **California**
Map of Counties
County: **San Bernardino**

Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 16.0M**
Crop Damage: **$ 0.0**

Description:
Rock and mudslides closed Highways 18, 330, 138, and 173. Huge sinkholes opened up on Highway 330. Flash Flooding undermined portions of Highway 18. Flooding made Highway 138 impassible. Huge boulders littered many stretches of all major mountain highways. Some roads remained closed for month so that the damage could be repaired and the debris cleaned up. The heavy rains and flash floods resulted in 16 major storm related construction projects on San Bernardino County mountain roads.

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Flood – San Bernardino County and Riverside County 2005

Event Record Details

Event: **Flood**
Begin Date: **14 Jan 2005, 01:30:00 AM PST**
Begin Location: **Not Known**
End Date: **16 Jan 2005, 12:00:00 PM PST**
End Location: **Not Known**

State: **California**
Map of Counties

Zones affected: **San Bernardino And Riverside C**

Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 10.0M**
Crop Damage: **$ 0.0**

Description:
Officials at Prado Dam were forced to release water at 10,000 cfs into the Santa Ana River after a coffer dam began to spill water into an area of an earthen dam that was under construction. Hundreds of residents downstream were forced to evacuate. Corona Municipal Airport was completely flooded, and airplanes and hangars were damaged. Many of the planes were moved onto nearby streets before the river had a chance to completely inundate the airport. The Santa Ana River spilled onto the Green River Golf Club's two courses, closed the River Road bridge for 3 weeks, damaged a bike path, and forced the evacuation of 130 horses from an equestrian center.

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http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flash Flood – Hesperia Airport 2010

Event Record Details

Event: **Flash Flood**
Begin Date: **21 Jan 2010, 12:30:00 PM PST**
Begin Location: **4 Miles West North West of Hesperia Arpt**
Begin LAT/LON: **34°23'N / 117°22'W**
End Date: **21 Jan 2010, 21:45:00 PM PST**
End Location: **5 Miles East South East of Hesperia**
End LAT/LON: **34°24'N / 117°13'W**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 16.0M**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
EVENT NARRATIVE: Heavy rain in the High Desert produced widespread flash flooding in the cities of Adelanto, Victorville, Hesperia, and Apple Valley. This area, on average, receives about 5 to 6 inches of rain per year. Most of these areas saw that amount of rain in just a few days. Runoff from the San Bernardino Mountains and a rapidly rising Mojave River may have contributed to some of the flooding. Numerous homes, schools, parks, and roads sustained minor to major damage. Some reports claimed as many as 124 homes in San Bernardino County were damaged. On January 28, the Governor of California declared a State of Emergency which included San Bernardino County. EPISODE NARRATIVE: The fourth, and strongest, in a series of winter storms pounded the region on the 21st and 22nd, bringing another round of gusty winds, heavy rain, thunderstorms, several feet of snow in the mountains, and flooding throughout the CWA. Many roads in the region were closed due to flooding and mud on the roadway, as well as fallen trees. In Horsethief Canyon Ranch in Temescal Valley dozens of large trees were uprooted due to the heavy rain and winds, though no other damage was reported. The storm was marked by record-breaking low pressure. Lindbergh Field recorded a sea level pressure of 987.1 mb, shattering the old record of 994.6 mb set on March 3 1983.

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Flash Flood – Mt. Baldy 2010

Event Record Details

Event: **Flood**
Begin Date: **19 Dec 2010, 06:00:00 AM PST**
Begin Location: **4 Miles West of Mt Baldy**
Begin LAT/LON: **34°13'N / 117°41'W**
End Date: **22 Dec 2010, 17:00:00 PM PST**
End Location: **4 Miles South West of Adelanto Hlndale Arp**
End LAT/LON: **34°41'N / 117°30'W**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 97.0M**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
EVENT NARRATIVE: San Bernardino County was the hardest hit county in California in terms of amount of damage due to the heavy rain at the end of December. County officials put the total damage amount (including public and private property of all types and labor to repair damage) at approximately $97 million. Both state and federal money will be available to help those affected. Highway 395 at Highway 18 completely flooded with several stalled vehicles. Eastbound Highway 138 just west of LA County line has mud, debris and water across all lanes. Highway 18, west of Sheep Creek road is closed, as well as Koala Road between Rancho and El Mirage, due to flooding. EPISODE NARRATIVE: A large Pacific plume of moisture ahead of an advancing trough of low pressure brought heavy rain and periods of serious flooding for nearly a week. The plume of moisture responsible was a form of an Atmospheric River. The mountain areas, particularly the San Bernardino range, experienced record large rainfall totals and many areas of flash flooding, debris flows and mud slides. Most rivers in the county warning area reached flood stage. Other effects include numerous traffic collisions, roadway flooding and closures, swift water rescues, beach closures and millions of dollars in damage to homes, businesses and infrastructure. Along with numerous city and governor-declared States of Emergency, President Obama proclaimed a Federal disaster declaration for 10 counties in California, including all four counties comprising the SGX CWA.

http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flood – Hodge 2010

Event Record Details

Event: **Flood**
Begin Date: **21 Dec 2010, 14:30:00 PM PST**
Begin Location: **3 Miles South West of Hodge**
Begin LAT/LON: **34°48'N / 117°13'W**
End Date: **24 Dec 2010, 09:00:00 AM PST**
End Location: **2 Miles North East of Barstow**
End LAT/LON: **34°54'N / 117°00'W**
Magnitude: **0**
Fatalities: **0**
Injuries: **0**
Property Damage: **$ 5.0M**
Crop Damage: **$ 0.0K**

State: **California**
Map of Counties
County: **San Bernardino**

Description:
EVENT NARRATIVE: The Mojave River overflowed its banks due to a combination of heavy rain and emergency release of water from Cedar Spring Dam near Arrowhead. Numerous roads were covered with mud and closed, one bridge was washed out, a broken levee flooded a neighborhood, and three swift water rescues were performed. EPISODE NARRATIVE: A series of storms fueled by a tropical moisture tap pounded the Mojave Desert and southern Great Basin for several days. Extremely heavy snow and widespread flooding resulted.

http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~storms

Flood Risk Factors

El Niño

El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific having important consequences. Among these consequences is increased rainfall across the southern tier of the US and in Peru, which has caused destructive flooding, and drought in the West Pacific, sometimes associated with devastating brush fires in Australia. Observations of conditions in the tropical Pacific are considered essential for the prediction of short term (a few months to 1 year) climate variations.

El Niño (Spanish name for the male child), initially referred to a weak, warm current appearing annually around Christmas time along the coast of Ecuador and Peru, and lasting only a few weeks, to a month or more. Every three to seven years, an El Niño event can last for many months, having significant economic and atmospheric consequences worldwide. During the past forty years, ten of these major El Niño events have been recorded, the worst of which occurred in 1997-1998. Previous to this, the El Niño event in 1982-1983 was the strongest. Some of the El Niño events have persisted more than one year.

Table 8-1: El Niño Storm Event Years

El Nino Years			
1902-1903	1925-1926	1953-1954	1982-1983
1905-1906	1930-1931	1957-1958	1986-1987
1911-1912	1932-1933	1965-1966	1991-1992
1914-1915	1939-1940	1969-1970	1997-1998
1918-1919	1941-1942	1972-1973	
1923-1924	1951-1952	1976-1977	

Severity

Floods threaten life and property. People and animals can drown; structures and their contents destroyed; roads, bridges, and railroad tracks can be washed out; and crops ruined. Floods can create health hazards due to the discharge of raw sewage from damaged septic tank leach fields, sewer lines, and sewage treatment plants; or due to hazardous materials carried off by raging waters. Vital public services are disrupted.

Geography and Geology

The region is the product of rainstorms and erosion occurring over millennia. Most of the mountains surrounding the valleys and coastal plain are deeply fractured faults. As the mountains grew taller, their brittle slopes eroded. Rivers and streams carried boulders, rocks,

gravel, sand, and silt down these slopes to the valleys and coastal plain. Today, much of the coastal plain rests on the ancient rock debris and sediment washed down from the mountains.

This sediment can act like a sponge, absorbing vast quantities of rain in years when heavy rains follow a dry period. Like a sponge near saturation, the same soil fills up rapidly when heavy rain follows a period of relatively wet weather. Even so, in some years of heavy rain, flooding is minimal because the ground is relatively dry, yet the same amount of rain following a wet period causes extensive flooding.

The built out portions of the communities within the Agency's service area leave little open land to absorb rainfall. The lack of open land forces water to remain on the surface rapidly accumulating. If it were not for the massive flood control system with its concrete lined river and streambeds, flooding would occur more frequently.

The 100-year flooding event is the flood having a 1% chance of being equaled or exceeded in magnitude in any given year. **Contrary to popular belief, it is not a flood occurring once every 100 years.**

Another potential source of flooding is "asphalt creep". The street space between the curbs of a street is a part of the flood control system. When water leaves property and accumulates in the street, it is directed toward the underground portion of the flood control system. The carrying capacity of the street is determined by the width of the street and the height of the curbs along the street. Often, when resurfacing streets, a one to two inch layer of asphalt is laid over the existing asphalt. This added layer of asphalt subtracts from the rated capacity of the street to carry water. Thus, the original engineered capacity of the entire storm drain system is marginally reduced over time. Subsequent re-paving of the street will further reduce the engineered capacity even more.

Flood Terminology

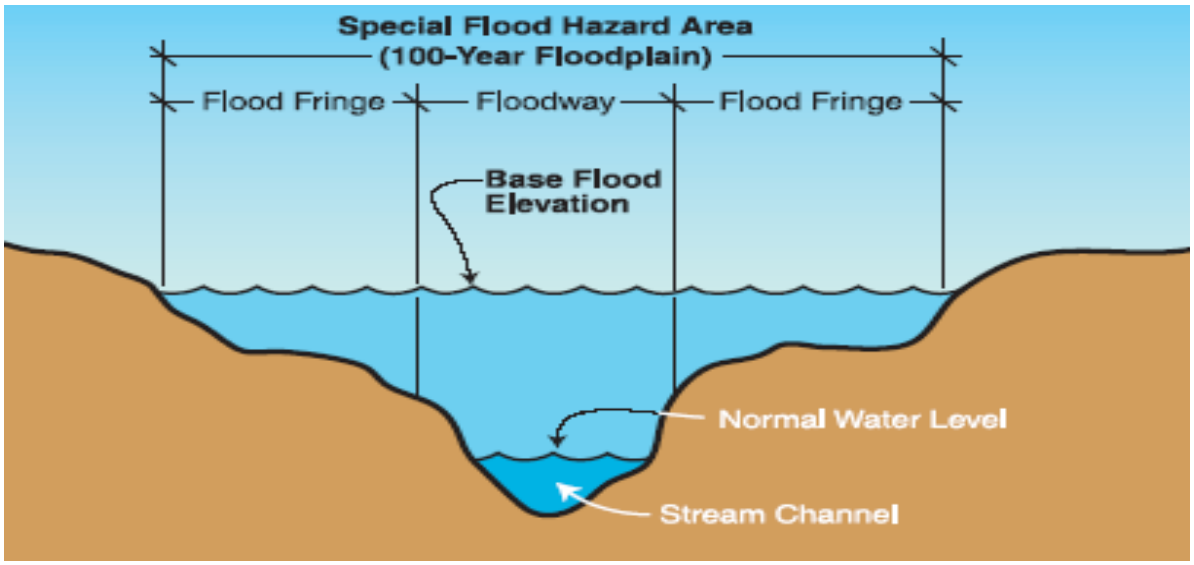
Floodplain

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess flood water. The floodplain is made up of two sections: the floodway and the flood fringe.

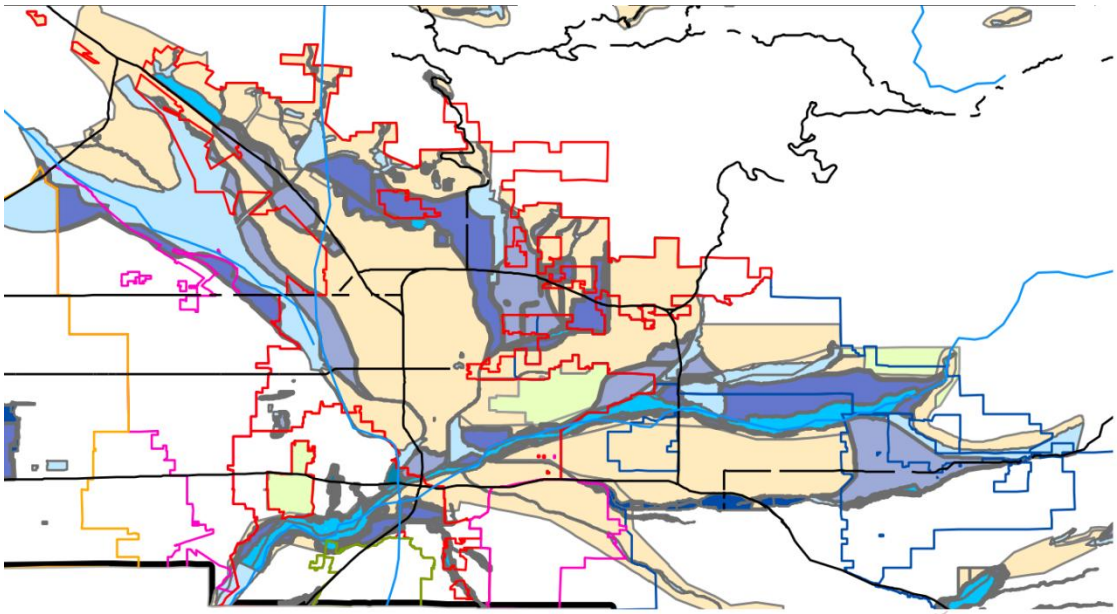
100-Year Flood

The 100-year flooding event is the flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood. Schematic 5-1: Floodplain and Floodway shows the relationship of the floodplain and the floodway.

Schematic 8-1: Floodplain and Floodway
(Source: FEMA How-To-Guide Assessing Hazards)



Map 8-1: Flood Hazard Areas (San Bernardino)
(Source: 2010 San Bernardino Operational Area Multi-Jurisdictional Hazard Mitigation Plan)



Rivers and Streams

Major Highways

Special Flood Hazard Areas

Subject to Inundation by the 1% Annual Chance Flood

Zone A (No Base Flood Elevations Determined)

Zone AE (Base Flood Elevations Determined)

Zone AH (Flood Depths of 1 to 3 feet, usually areas of ponding; Base Flood Elevations Determined)

Zone AO (Flood Depths of 1 to 3 feet, usually sheet flow on sloping terrain; Average depths determined)

Other Flood Areas

Zone X (Shaded) - 0.2% Annual chance (500yr) Flood

Zone X Protected by Levee - areas protected from the 1% annual chance flood

Other Areas

Zone D - areas in which flood hazards are undetermined, but possible

Zone X (unshaded) - areas determined to be outside the 0.2% annual chance (500-year) floodplain

Floodway

The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. For NFIP purposes, floodways are defined as the channel of a river or stream, and the overbank areas adjacent to the channel. The floodway carries the bulk of the flood water downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures that would obstruct or divert flood flows onto other properties.

The Omnitrans facilities are impacted by regulations prohibiting all development in the floodway. The NFIP floodway definition is "the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Floodways are not mapped for all rivers and streams but are generally mapped in developed areas.

Base Flood Elevation (BFE)

The term "Base Flood Elevation" refers to the elevation (normally measured in feet above sea level) that the base flood is expected to reach. Base flood elevations can be set at levels other than the 100-year flood. Some communities use higher frequency flood events as their base flood elevation for certain activities, while using lower frequency events for others. For example, for the purpose of storm water management, a 25-year flood event might serve as the base flood elevation; while the 500-year flood event serves as base flood elevation for the tie down of mobile homes. The regulations of the NFIP focus on development in the 100-year floodplain.

Types of Flooding

Urban Flooding

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in flood waters that rise very rapidly and peak with violent force.

The Omnitrans service area has a high concentration of impermeable surfaces that either collect water, or concentrate the flow of water in unnatural channels. During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with vegetative debris causing additional, localized flooding.

Riverine Flooding

Riverine flooding is the overbank flooding of rivers and streams. The natural processes of riverine flooding add sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers.

Shallow area flooding is a special type of riverine flooding. FEMA defines shallow flood hazards as areas that are inundated by the 100-year flood with flood depths of only one to three feet. These areas are generally flooded by low velocity sheet flows of water.

Dam Failure Flooding

Loss of life and damage to structures, roads, and utilities may result from a dam failure. Economic losses can also result from a lowered tax base and lack of utility profits. These effects would certainly accompany the failure of one of the major dams in the Omnitrans service area. Because dam failure can have severe consequences, FEMA requires that all dam owners develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions. Although there may be coordination with county officials in the development of the EAP, the responsibility for developing potential flood inundation maps and facilitation of emergency response is the responsibility of the dam owner.

Dam failure results from a number of natural or human causes, including earthquakes, erosion of the face or foundation, rapidly rising flood waters, improper sitting, and structural/design flaws. The Planning Team categorized dam failure as a natural hazard for purposes of this plan. Should a dam failure occur, it will likely be the result of natural causes – an earthquake.

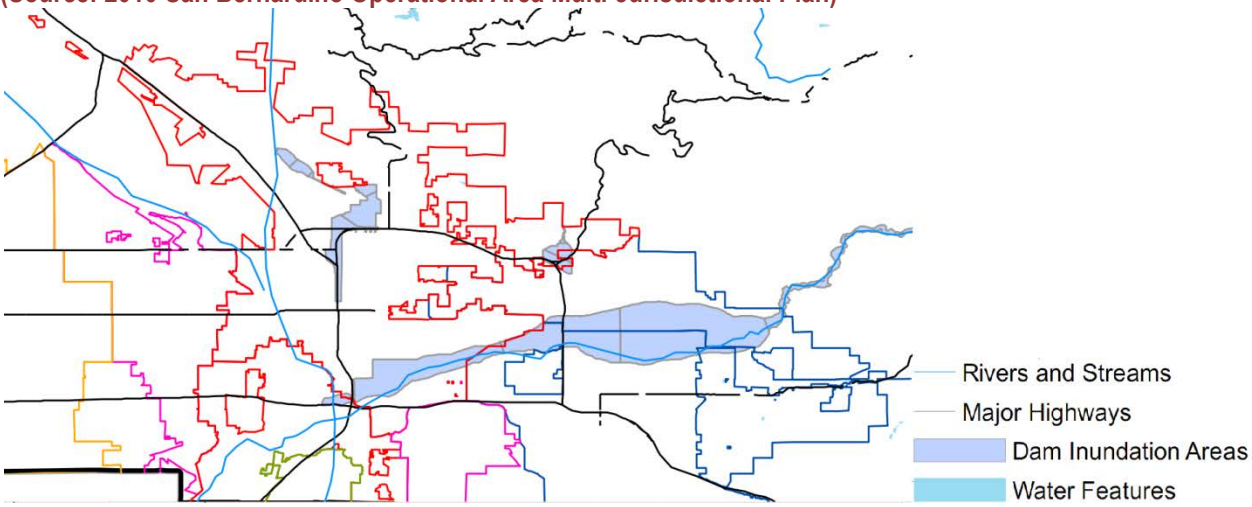
Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS) Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements.

Since 1929, the State of California is responsible for overseeing dams to safeguard life and property (California Department of Resources, 1995). This legislation was prompted by the 1928 failure of St. Francis Dam. In 1965, the law was amended to include off stream storage reservoirs due to the 1963 failure of Baldwin Hill Reservoir. In 1973, Senate Bill 896 was enacted to require dam owners, under the direction of Cal EMA, to show the possible inundation path in the event of a dam failure.

Governmental assistance could be required and continued for an extended period. These efforts are required to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and welfare for the affected population including, as required, temporary housing for displaced persons.

The dams in San Bernardino County hold billions of gallons of water in reservoirs. Releases of water from the major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures, and the resultant flooding could cause catastrophic flooding. Following the 1971 Sylmar Earthquake the Lower Van Norman Dam showed signs of structural compromise, and tens of thousands of persons had to be evacuated until the dam could be drained. The dam has never been refilled.

Map 8-3: Dam Inundation Map (San Bernardino)
(Source: 2010 San Bernardino Operational Area Multi-Jurisdictional Plan)



What is the Effect of Development on Floods?

When structures or fill are placed in the floodway or floodplain, water is displaced. Development raises the river levels by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. When structures or materials are added to the floodway or floodplain and no fill is removed to compensate, serious problems can arise. Flood waters may be forced away from historic floodplain areas. As a result, other existing floodplain areas may experience flood waters that rise above historic levels. Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses, and other facilities. Careful attention should be given to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events. In highly urbanized areas, increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. Care should be taken in the development and implementation of storm water management systems to ensure that these runoff waters are dealt with effectively.

How are Flood-Prone Areas Identified?

Flood maps and Flood Insurance Studies (FIS) are often used to identify flood-prone areas. The NFIP was established in 1968 as a means of providing low-cost flood insurance to the nation's flood-prone communities. The City of San Bernardino (location of Omnitrans Offices) was originally mapped by NFIP in 1974 and the map was most recently updated in August of 2008. The NFIP also reduces flood losses through regulations that focus on building codes and sound floodplain management. NFIP regulations (44 Code of Federal Regulations Chapter 1, Section 60, 3) require that all new construction in floodplains must be elevated at or above base flood level.

FIRM and FIS Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A FIRM is the official map produced by FEMA which delineates Special Flood Hazard Area (SFHA) in communities where NFIP regulations apply. FIRMs are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.

Water surface elevations are combined with topographic data to develop FIRMs. FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. In some cases, they also include BFEs and areas located within the 500-year floodplain.

Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. However, it is important to note that not all 100-year or 500-year floodplains have been mapped by FEMA.

PART IV: APPENDIX

Appendix A: Resource Directory

The Resource Directory provides contact information for local, regional, state, and federal programs that are currently involved in hazard mitigation activities. The Planning Team may look to the organizations on the following pages for resources and technical assistance. The Resource Directory provides a foundation for potential partners in action item implementation.

The Planning Team will continue to add contact information for organizations currently engaged in hazard mitigation activities. This section may also be used by Omnitrans interested in hazard mitigation information and projects.

American Public Works Association (APWA)		
Level: National	Hazard: Multi	http://www.apwa.net
2345 Grand Boulevard, Suite 500 Kansas City, MO 64108-2641		
Notes: The American Public Works Association is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services.		
Association of State Floodplain Managers (ASFM)		
Level: Federal	Hazard: Flood	www.floods.org
2809 Fish Hatchery Road Madison, WI 53713		
Notes: The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery		
Building Seismic Safety Council (BSSC)		
Level: National	Hazard: Earthquake	www.bssconline.org
1090 Vermont Ave., NW, Suite 700 Washington, DC 20005		
Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.		
California Department of Conservation: Southern California Regional Office		
Level: State	Hazard: Multi	www.consrv.ca.gov
655 S. Hope Street, #700 Los Angeles, CA 90017-2321		
Notes: The Department of Conservation provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our state's natural resources.		
California Department of Forestry and Fire Protection (CalFIRE)		

Level: State	Hazard: Multi	http://www.fire.ca.gov/php/index.php
210 W. San Jacinto Perris, CA 92570		
Notes: The California Department of Forestry and Fire Protection (CalFIRE) protects over 31 million acres of California's privately-owned wildlands. CalFIRE emphasizes the management and protection of California's natural resources.		
California Department of Transportation (CalTrans)		
Level: State	Hazard: Multi	http://www.dot.ca.gov/
120 S. Spring Street Los Angeles, CA 90012		
Notes: CalTrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, CalTrans is also involved in the support of interOmnitranspassenger rail service in California.		
California Department of Water Resources (DWR)		
Level: State	Hazard: Flood	www.dwr.water.ca.gov
1416 9th Street Sacramento, CA 95814		
Notes: The Department of Water Resources manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.		
California Division of Mines and Geology (DMG)		
Level: State	Hazard: Multi	www.consrv.ca.gov/cgs/index.htm
801 K Street, MS 12-30 Sacramento, CA 95814		
Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources.		
California Emergency Management Agency (Cal EMA)		
Level: State	Hazard: Multi	www.calema.ca.gov
3650 Schriever Ave Mather, CA 95655		
Notes: California Emergency Management Agency coordinates overall state agency response to major disasters in support of local government. The office is responsible for assuring the state's readiness to respond to and recover from natural, manmade, and war-caused emergencies, and for assisting local governments in their emergency preparedness, response and recovery efforts.		
California Environmental Resources Evaluation System (CERES)		
Level: State	Hazard: Multi	http://ceres.ca.gov/
900 N St., Suite 250 Sacramento, CA 95814		
Notes: CERES is an excellent website for access to environmental information and websites.		

California Planning Information Network		
Level: State	Hazard: Multi	www.calpin.ca.gov
Notes: The Governor's Office of Planning and Research (OPR) publishes basic information on local planning agencies, known as the California Planners' Book of Lists. This local planning information is available on-line with new search capabilities and up-to-the- minute updates.		
California Resources Agency		
Level: State	Hazard: Multi	http://resources.ca.gov/
1416 Ninth Street, Suite 1311 Sacramento, CA 95814		
Notes: The California Resources Agency restores, protects and manages the state's natural, historical and cultural resources for current and future generations using solutions based on science, collaboration and respect for all the communities and interests involved.		
Community Rating System (CRS)		
Level: Federal	Hazard: Flood	www.fema.gov/nfip/crs.shtm
500 C Street, S.W. Washington, D.C. 20472		
Notes: The Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners within the County would receive reduced NFIP flood insurance premiums if the County implements floodplain management practices that qualify it for a CRS rating. For further information on the CRS, visit FEMA's website.		
Environmental Protection Agency (EPA), Region 9		
Level: Regional	Hazard: Multi	http://www.epa.gov/region9/
75 Hawthorne Street San Francisco, CA 94105		
Notes: The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship.		
Federal Emergency Management Agency (FEMA), Region IX		
Level: Federal	Hazard: Multi	www.fema.gov
1111 Broadway, Suite 1200 Oakland, CA 94607		
Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.		
Federal Emergency Management Agency (FEMA), Mitigation Division		
Level: Federal	Hazard: Multi	www.fema.gov/fima/planhowto.shtm
500 C Street, S.W. Washington, D.C. 20472		

Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.		
Floodplain Management Association		
Level: Federal	Hazard: Flood	www.floodplain.org
P.O. Box 50891 Sparks, NV 89435-0891		
Notes: The Floodplain Management Association is a nonprofit educational association. It was established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives of federal, state and local government agencies as well as private firms.		
Landslide Hazards Program, USGS		
Level: Federal	Hazard: Landslide	http://landslides.usgs.gov/index.html
12201 Sunrise Valley Drive, MS 906 Reston, VA 20192		
Notes: The NLIC website provides good information on the programs and resources regarding landslides. The page includes information on the National Landslide Hazards Program Information Center, a bibliography, publications, and current projects. USGS scientists are working to reduce long-term losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure both nationally and worldwide.		
National Fire Protection Association (NFPA)		
Level: National	Hazard: Wildfire	www.nfpa.org/catalog/home/index.asp
1 Batterymarch Park Quincy, MA 02169-7471		
Notes: The mission of the international nonprofit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life. It does this by providing and advocating scientifically-based consensus codes and standards, research, training, and education.		
National Floodplain Insurance Program (NFIP)		
Level: Federal	Hazard: Flood	www.fema.gov/nfip/
500 C Street, S.W. Washington, D.C. 20472		
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.		
National Oceanic and Atmospheric Administration (NOAA)		
Level: Federal	Hazard: Multi	www.noaa.gov
14th Street and Constitution Ave NW, Rm 6013 Washington, DC 20230		

Notes: NOAA's historic role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.		
National Resources Conservation Service (NRCS)		
Level: Federal	Hazard: Multi	www.nrcs.usda.gov/
14th and Independence Ave., SW, Room 5105-A Washington, DC 20250		
Notes: NRCS assists owners of America's private land with conserving their soil, water, and other natural resources, by delivering technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases.		
National Weather Service (NWS)		
Level: Federal	Hazard: Multi	www.nws.noaa.gov/
520 North Elevar Street Oxnard, CA 93030		
Notes: The National Weather Service is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather and with issuing forecasts and warnings of weather and floods in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1. protection of life, 2. protection of property, and 3. promotion of the nation's welfare and economy.		
National Weather Service, Office of Hydrologic Development (OHD)		
Level: Federal	Hazard: Flood	http://www.nws.noaa.gov/
1325 East West Highway, SSMC2 Silver Spring, MD 20910		
Notes: The Office of Hydrologic Development (OHD) enhances National Weather Service products by infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field office, providing advanced hydrologic products to meet needs identified by NWS customers.		
Southern California Association of Governments (SCAG)		
Level: Regional	Hazard: Multi	www.scag.ca.gov
818 W. Seventh Street,12th Floor Los Angeles, CA 90017		
Notes: The Southern California Association of Governments functions as the Metropolitan Planning Organization for six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. As the designated Metropolitan Planning Organization, the Association of Governments is mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.		
Southern California Earthquake Center (SCEC)		
Level: Regional	Hazard: Earthquake	www.scec.org
3651 Trousdale Parkway, Suite 169 Los Angeles, CA 90089-0742		

Notes: The Southern California Earthquake Center (SCEC) gathers new information about earthquakes in Southern California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives.		
State Fire Marshal (SFM)		
Level: State	Hazard: Wildfire	http://osfm.fire.ca.gov
1131 "S" Street Sacramento, CA 95814		
Notes: The Office of the State Fire Marshal (SFM) supports the mission of the California Department of Forestry and Fire Protection (CalFIRE) by focusing on fire prevention. SFM regulates buildings in which people live, controls substances which may, cause injuries, death and destruction by fire; provides statewide direction for fire prevention within wildland areas; regulates hazardous liquid pipelines; reviews regulations and building standards; and trains and educates in fire protection methods and responsibilities.		
US Army Corps of Engineers (USACE)		
Level: Federal	Hazard: Multi	www.usace.army.mil
P.O. Box 532711 Los Angeles CA 90053-2325		
Notes: The United States Army Corps of Engineers work in engineering and environmental matters. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provide engineering services to the nation including planning, designing, building, and operating water resources and other civil works projects.		
US Geological Survey (USGS)		
Level: Federal	Hazard: Multi	www.usgs.gov
345 Middlefield Road Menlo Park, CA 94025		
Notes: The USGS provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.		
US Geological Survey (USGS), Water Resources		
Level: Federal	Hazard: Multi	http://water.usgs.gov
6000 J Street, Placer Hall Sacramento, CA 95819-6129		
Notes: The USGS Water Resources mission is to provide water information that benefits the Nation's citizens: publications, data, maps, and applications software.		
Western States Seismic Policy Council (WSSPC)		
Level: Regional	Hazard: Earthquake	www.wsspc.org/home.html
125 California Avenue, Suite D201, #1 Palo Alto, CA 94306		

Notes: WSSPC is a regional earthquake consortium funded mainly by FEMA. Its website is a great resource, with information clearly categorized – from policy to engineering to education.		
Westside Economic Collaborative c/o Pacific Western Bank		
Level: Regional	Hazard: Multi	www.westside-la.or
120 Wilshire Boulevard Santa Monica, CA 90401		
Notes: The Westside Economic Development Collaborative is the first Westside regional economic development corporation. The Westside EDC functions as an information gatherer and resource center, as well as a forum, through bringing business, government, and residents together to address issues affecting the region: economic diversity, transportation, housing, workforce training and retraining, lifelong learning, tourism, and embracing diversity.		