Huntington Beach/Fountain Valley Hazard Mitigation Plan

A Partnership to Provide a Safer Community!

Partners include:

City of Huntington Beach
City of Fountain Valley
Huntington Beach City School District
Huntington Beach Union High School District
Ocean View School District
Fountain Valley School District

Prepared by the
Huntington Beach/Fountain Valley Hazard Mitigation Committee

For more information, please contact:

Huntington Beach Fire Department Emergency Services Office
2000 Main Street
Huntington Beach, CA 92648
714-536-5980
or
Fountain Valley Fire Department Emergency Preparedness Office
10200 Slater Avenue
Fountain Valley, CA 92708
714-593-4424

Acknowledgements

Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee

Oversight Committee

Cathy Green, City of Huntington Beach, Mayor
Guy Carrozzo, City of Fountain Valley, Mayor
Duane Olson, City of Huntington Beach, Fire Chief
Mark Haskell, City of Fountain Valley, Fire Chief

Agency Leads

Glorria Morrison, Cities of Huntington Beach/Fountain Valley Emergency Services Coordinator and Committee Chair
Steve Nagel, City of Fountain Valley, Fire Marshal
Dick Masters, Huntington Beach City School District
Scott Atkinson, Huntington Beach Union High School District
Carolyn Stocker, Ocean View School District
Carl Dane, Fountain Valley School District

Technical Sub-Committee

Steve Krieger, City of Huntington Beach, Public Works Civil Engineering Assistant
Ricky Ramos, City of Huntington Beach, Associate Planner
Steve Nagel, City of Fountain Valley, Fire Marshal
Robert Franklin, City of Fountain Valley, City Planner
Bill Ault, City of Fountain Valley, Public Works Director

Community, Business, and Environmental Participants

Cecil Wright, City of Huntington Beach CERT, Community Member
Peter Green, City of Huntington Beach, Environmental Representative
Luanne Scorza, Boeing Security & Fire Protection, Business Representative
Jim McLain, City of Fountain Valley, Community Representative

Plan Writers

Glorria Morrison, Cities of Huntington Beach/Fountain Valley Emergency Services Coordinator
Katie Freeman, City of Huntington Beach Assistant Emergency Services Coordinator
Jacob Green, City of Fountain Valley Assistant to the Emergency Services Coordinator
Cecil Wright, City of Huntington Beach CERT, Community Member

The Huntington Beach/Fountain Hazard Mitigation Planning Committee appreciates the assistance of the following organizations: *State Office of Emergency Services, Federal Emergency Management Agency (FEMA), Disaster Management Area Coordinators of Los Angeles County, and Clackamas County Oregon* for producing documents utilized by this Committee to develop this Plan. The generosity of these groups and the professionalism of their emergency management personnel is typical of the spirit of cooperation that pervades the emergency management profession.

The Cities of Huntington Beach and Fountain Valley cannot accept any responsibility for any errors, omissions or positional accuracy; and, therefore, there are no warranties that accompany these maps or research. Although information from Land Surveys may have been used in the creation of these products, in no way does this product represent or constitute a Land Survey. Users are cautioned to field verify information before making any decisions based on this information.

Huntington Beach/Fountain Valley Hazard Mitigation Plan Table of Contents

Part I: Introduction

A. Overview
1. Plan Contents
2. Participating Agencies
3. Plan Mission
4. Plan Goals
5. Hazard Specific Goals and Objectives
6. Organization of Strategies

B. Purpose
1. Purpose of Developing a Hazard Mitigation Plan
2. Planning Area Affected
3. Support for the Plan
4. Plan Methodology
5. Input from the Hazard Mitigation Committee
6. Stakeholder Interviews
7. State and Federal Guidelines for Mitigation Plans
8. Plan Layout
9. Environmental Issues Overview

C. Planning Process
1. HB/FV Hazard Mitigation Planning Committee
2. Review of Existing Documents
3. Capability Assessment
4. Hazard Mitigation Community Forums
5. Multi-Jurisdictional Participation
6. Hazard Mitigation Meetings and Events
7. Plan Distribution List
8. City Council/School Board Resolutions

Part II: Community Profiles

A. City of Huntington Beach
B. City of Fountain Valley
C. Huntington Beach City School District
D. Huntington Beach Union High School District
E. Ocean View School District
F. Fountain Valley School District

Part III: Risk Assessment

A. Identifying/Profiling Hazards
B. Assessing Vulnerability
C. Multi-Jurisdictional Risks
D. Summary

Part IV: Hazards and Strategies

A. Windstorm
B. Tsunami
C. Subsidence
D. Dam Failure
E. Flood
F. Earthquake
G. Multi-Hazard Strategies
H. Strategy Prioritization

Part V: Plan Maintenance

A. Review of the Plan
   1. Coordinating Body
   2. Convener
   3. Bi-Annual Meetings
B. Plan Follow up
   1. Monitoring, Evaluating, and Updating the Plan
   2. Plan Rewrite
   3. Plan Adoption
   4. Incorporating into Existing Planning Mechanisms
   5. Incorporating into New Buildings and Infrastructure
   6. Local Mitigation Funding Sources
   7. Continued Public Involvement
   8. Plan Maintenance Matrix

Part VI: Appendices

Appendix A: Committee Bylaws
Appendix B: Public Participation Plan
Appendix C: Strategy Voting Forms
Appendix D: List of Exhibits
Appendix E: Plan Resources Directory
Appendix F: List of Acronyms
Appendix G: Glossary

Part I

Introduction
Table of Contents

A. OVERVIEW 1
1. PLAN CONTENTS 2
2. PARTICIPATING AGENCIES 2
3. PLAN MISSION 2
4. PLAN GOALS 2
   (a) Protect Life and Property 3
   (b) Public Awareness 3
   (c) Natural Systems 3
   (d) Partnerships and Implementation 3
   (e) Emergency Services 3
5. HAZARD SPECIFIC GOALS AND OBJECTIVES 4
   (a) Windstorm 4
   (b) Tsunami And Dam Failure 4
   (c) Subsidence 4
   (d) Flood 5
   (e) Earthquake 5
6. ORGANIZATION OF STRATEGIES 5
   (a) Coordinating Organization 6
   (b) Time Line 6
   (c) Ideas for Implementation 6
   (d) Plan Goals Addressed 6
   (e) Partner Organizations 7
   (f) Constraints 7

B. PURPOSE 9
1. PURPOSE OF DEVELOPING A HAZARD MITIGATION PLAN 10
2. PLANNING AREA AFFECTED 11
3. SUPPORT FOR THE PLAN 11
4. PLAN METHODOLOGY 12
5. INPUT FROM THE HAZARD MITIGATION PLANNING COMMITTEE 12
6. STAKEHOLDER INTERVIEWS 13
7. STATE AND FEDERAL GUIDELINES FOR MITIGATION PLANS 13
8. PLAN LAYOUT 15
9. ENVIRONMENTAL ISSUES 17

C. THE PLANNING PROCESS OVERVIEW 19
1. HB/FV HAZARD MITIGATION PLANNING COMMITTEE 23
   (a) Formation of the Committee 23
   (b) Committee Members 23
   (c) Bylaws 24
   Exhibit I-C-1: City Council and School Board Resolutions 25

(d) Public Meetings 25
(d) Public Meetings 26
(d) Public Meetings 27
2. REVIEW OF EXISTING CITY DOCUMENTS 27
3. CAPABILITY ASSESSMENT PROCESS 28
Exhibit I-C-2: Capability Assessment 28
(a) Human Resources 29
(b) Technical Resources 32
(c) Financial Resources 32
4. HAZARD MITIGATION COMMUNITY FORUMS 33
5. MULTI-JURISDICTIONAL PARTICIPATION 37
(a) OCEMO 37
(b) State Office of Emergency Services (OES) 38
(c) Federal Emergency Management Agency (FEMA) 38
(d) Tour of Prado Dam and Seven Oaks Dam 39
6. HAZARD MITIGATION MEETINGS AND EVENTS 40
7. PLAN DISTRIBUTION LIST 42
8. CITY COUNCIL/SCHOOL BOARD RESOLUTIONS 42

Part I-A
Overview

A. Overview

A multi-jurisdictional committee consisting of six public agencies and community members was formed to jointly develop this plan. The public agencies are:

- City of Huntington Beach
- City of Fountain Valley
- Huntington Beach City School District
- Huntington Beach Union High School District
- Ocean View School District
- Fountain Valley School District

The geographic area studied for this plan is the area within Huntington Beach and Fountain Valley city boundaries. Huntington Beach is 28 square miles and located 35 miles south of Los Angeles on the Pacific Ocean. It has 8.5 miles of coastline. Fountain Valley is 9.87 square miles and is just inland and contiguous to Huntington Beach.

All six agencies that participated in this study are located within this study area. The four School Districts are spread throughout the two Cities and three of the School Districts have schools within both Cities. The Cities work closely with the School Districts on emergency preparedness.

The two contiguous Cities share similar topographic characteristics and associated threats: Newport-Inglewood Earthquake Fault; low-lying and below sea level prone to flooding from the Santa Ana River; and alluvial soils prone to liquefaction and subsidence. In addition, Huntington Beach is a coastal city making it vulnerable to severe storms and tsunamis.

The Huntington Beach and the Fountain Valley Fire Departments work together daily sharing a dispatch center, training center, crossing boundaries for response, and have similar policies and procedures. When budgets became tight in 2003, they also agreed to share an Emergency Services Coordinator. The Cities' Emergency Management Programs and Emergency Operations Plans have been aligned. They share administrative and operational goals and structure.

Due to the close working relationship of the six public entities, related topography, and similar Emergency Management Programs, the six public organizations agreed to form a multi-agency committee to complete one Hazard Mitigation Plan. However, each of the six agencies has been analyzed separately and has their own mitigation strategies.

1. Plan Contents

The Huntington Beach/Fountain Valley Hazard Mitigation Plan includes resources and information to assist residents, public and private sector organizations, and others interested in participating in mitigation planning for natural hazards. The mitigation plan provides a list of activities to help the Cities of Huntington Beach and Fountain Valley and the four School Districts (Huntington Beach City, Huntington Beach Union High, Ocean View, and Fountain Valley) reduce risks and prevent losses from future natural hazard events. The strategies address natural multi-hazard issues, as well as activities for mitigating the effects from *earthquake and liquefaction, flooding, subsidence, dam failure, tsunami, and windstorm.*

2. Participating Agencies

The Huntington Beach/Fountain Valley Hazard Mitigation Plan is the result of a collaborative effort between the City of Huntington Beach, City of Fountain Valley, Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District and Fountain Valley School District employees, community volunteers, other public agencies, non-profit organizations, the private sector, the public and regional, state and federal organizations. Public participation played a key role in development of goals and strategies. Interviews were conducted with stakeholders across the City, and two public workshops were held to include City of Huntington Beach and City of Fountain Valley residents in the plan development. The Huntington Beach/Fountain Valley Hazard Mitigation Committee guided the process of plan development.

For a complete list of committee members, see the Planning Process Part I-C.

3. Plan Mission

The mission of the Huntington Beach/Fountain Valley Hazard Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the Cities and School Districts towards building a safer, more sustainable community.

4. Plan Goals

The plan goals describe the overall direction that agencies, organizations, and citizens can take to work toward mitigating risks from natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the strategies.

(a) Protect Life and Property
Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.

Reduce losses and repetitive damages from chronic hazard events while promoting insurance coverage for catastrophic hazards. Improve hazard assessment information to make recommendations for discouraging new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

(b) Public Awareness
Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards. Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

(c) Natural Systems
Balance natural resource management and land use planning with natural hazard mitigation to protect life, property, and the environment. Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

(d) Partnerships and Implementation
Strengthen communication and coordinate participation among and within public agencies, citizens, nonprofit organizations, business, and industry to gain a vested interest in implementation. Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

(e) Emergency Services
Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure. Strengthen emergency operations by increasing collaboration and coordination among public agencies, nonprofit organizations, business, and industry. Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

5. Hazard Specific Goals and Objectives

(a) Windstorm

Goals

- Determine who the stakeholders are in windstorm damage
- Determine how communications between stakeholders can be established to coordinate windstorm prevention
- Decide how the public can participate in windstorm prevention

Objectives

- Provide a forum for communication between stakeholders
- Work together with stakeholders to educate the public on proper tree pruning to reduce windstorm related power outages
- Establish a list of critical facilities within the two-city area to determine if they have backup power to be able to continue operations should a commercial power failure occur

(b) Tsunami And Dam Failure

Goals

- Identify tsunami and dam failure prone areas within the communities
- Enhance warning systems to provide quick and effective notifications of an impending tsunami or dam failure
- Ensure tsunami and dam failure preparedness education remains a priority

Objectives

- Review all warning systems to ensure that adequate coverage exists for the coastal community
- Upgrade warning systems to add/improve coverage in the Edwards Fire Station area

(c) Subsidence

Goals

- Identify subsidence prone areas
- Identify public structures that have been impacted by subsidence
- Educate the public on subsidence and its impact

Objectives

- Work with State and Federal resources to determine subsidence impact areas
- List and prioritize public facilities impacted by subsidence
- Include subsidence in all disaster preparedness education

(d) Flood

Goals

- Eliminate to the greatest degree possible, the risk from flood hazards to life, property, public investment, and social order
- Provide a flood control system which is able to support the permitted land uses while preserving the public safety
- Upgrade existing deficient flood control systems
- Pursue funding sources to reduce the costs of flood control
- Minimize losses to critical facilities from flooding
- Minimize losses to existing and future structures within the flood zone
- Minimize economic loss to the six public agencies, the public, and recovery costs to FEMA and State OES from floods

Objectives

- Upgrade pump stations
- Upgrade storm drains
- Educate City personnel, School District personnel, and residents on emergency flood protection measures
- Work closely with other levels of government to ensure flood control systems are being upgraded

(e) Earthquake

Goals

- Identify at-risk structures and promote seismic retrofitting of any pre-1933 buildings
- Minimize losses to critical facilities from earthquakes by seismically retrofitting unstable structures
- Promote non-structural hazard mitigation throughout the community
- Ensure earthquake preparedness education remains a priority

Objectives

- Provide public educational materials on seismic retrofitting to the public
- Provide education on non-structural hazard mitigation to the community
- Continue to educate employees and the public through programs like the Community Emergency Response Team (CERT) program on earthquake preparedness

6. Organization of Strategies

The strategies listed in this plan are activities in which Cities, School Districts, and citizens can be engaged to reduce risk. Each strategy includes an estimate of the time line for implementation. Some strategies are activities that Cities and School Districts may implement with existing resources and authorities within one

to two years. Other strategies may require new or additional resources, and may take up to 20 years to completely implement.

The strategies are listed in the Hazards and Strategies Section (Part IV) by hazard. Additional strategies are listed in the Hazards and Strategies Section under Multi-Hazard Strategies. A strategy matrix in the Plan Maintenance Section lists all of the strategies in the plan. Data collection, research, and the public participation process resulted in the development of these strategies. Each strategy listed in this plan includes the following information:

(a) Coordinating Organization
The coordinating organization is the public agency with regulatory responsibility to address natural 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.

(b) Time Line
Each strategy includes an estimate of the time line for implementation. Some strategies are activities which agencies are capable of implementing with existing resources and authorities within one to two years. Other strategies may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

(c) Ideas for Implementation
Each strategy includes ideas for implementation and potential resources, which may include grant programs or human resources. The Plan Maintenance Matrix includes the section within the mitigation plan where this information can be found.

(d) Plan Goals Addressed
The plan goals addressed by each strategy are included as a way to monitor and evaluate how well the Mitigation Plan is achieving plan goals once implementation begins. The plan goals are organized into the following five areas:

- Protect Life and Property
- Public Awareness
- Natural Systems
- Partnerships and Implementation
- Emergency Services

(e) Partner Organizations

Partner organizations are agencies or public/private sector businesses that may be able to assist in the implementation of strategies by providing relevant resources to the coordinating organization. The partner organizations listed in the Resource Directory of the Huntington Beach/Fountain Valley Hazard Mitigation Plan are potential partners recommended by the Committee, but were not necessarily contacted during the development of the Mitigation Plan.

(f) Constraints

Constraints may apply to some of the strategies. These constraints may be a lack of City staff, lack of funds, or vested property rights, which might expose the City to legal action as a result of adverse impacts on private property.

(This page intentionally left blank.)

Part I-B
Purpose

B. Purpose

Throughout history, the residents of Huntington Beach and Fountain Valley have dealt with various natural hazards affecting the area. Photos, journal entries, and newspapers from the 1800s and 1900s show that the residents of the area dealt with earthquakes, liquefaction, subsidence, flooding, severe coastal storms, windstorms, tornados, and minor tsunamis.

Although there were fewer people in the area, the natural hazards adversely affected the lives of those who depended on the land and climate conditions for food and welfare. As the population of the Cities continues to increase, the exposure to natural hazards creates an even higher risk than previously experienced. As the number of working class individuals increase in an area, the expectations on government following a disaster become greater.

Huntington Beach is the third most populous City in Orange County while Fountain Valley is the 19th. Orange County California is the second most populous County in the State of California, the most populated State in the United States. Orange County has 2,978,816 people. It offers the benefits of living in a Mediterranean type of climate with an extremely low crime environment. Orange County is characterized by the unique and attractive landscape coupled with world-famous tourist beaches. However, the potential impacts of natural hazards associated with the terrain and large numbers of tourists make the environment and population vulnerable to natural disaster situations.

It is impossible to predict exactly when natural disasters will occur, or the extent to which they will affect the Cities and School Districts. However, with careful planning and collaboration among public agencies, private sector organizations, and community members, it is possible to minimize the losses that can result from these natural disasters. The Hazard Mitigation Plan is a major part of this process.

Orange County experienced destructive flooding, winter storms and tornados six times in the 1990s (1991, 1992, 1993, 1995, 1997 and 1998). In the 1995 winter storm, Huntington Beach alone had $2.9 million in damage. The County sought and received Presidential Disaster Declarations to obtain federal assistance for recovery efforts in 1992, 1993, 1995, and 1998 for winter storms. In 1997 only a State Proclamation was received.

1. Purpose of Developing a Hazard Mitigation Plan

As the costs of damage from natural disasters continue to increase, the community realizes the importance of identifying effective ways to reduce vulnerability to disasters. A hazard mitigation plan will assist our communities in reducing risk by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the six agencies participating in this plan.

The Plan provides a set of strategies intended to do the following: reduce risk from natural hazards through education and outreach programs, foster the development of partnerships, and implement preventative activities.

The resources and information within the Mitigation Plan:

(1) establish a basis for coordination and collaboration among participating agencies and public entities
(2) identify and prioritize future mitigation projects; and
(3) assist in meeting the requirements of federal assistance programs.

The hazard mitigation plan works in conjunction with other City and School District plans, including the City General Plans and Emergency Operations Plans.

Natural hazards impact citizens, property, the environment, and the economy of the Huntington Beach and Fountain Valley area. Earthquakes, flooding, tsunamis, subsidence, dam failure, and windstorms have exposed Huntington Beach and Fountain Valley residents and businesses to the financial and emotional costs of recovering after natural disasters. The risk associated with natural hazards increases as more people move to areas affected by natural hazards.

Even in our communities, which are essentially “built-out” (i.e., have little or no vacant land remaining for development), population density continues to increase when low-density housing is replaced with medium and high-density development projects.

The inevitability of natural hazards, and the growing population and activity within the study area create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future natural hazard events. Identifying the risks posed by natural hazards, and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities.

2. Planning Area Affected

The City of Huntington Beach Hazard Mitigation Plan affects two Cities and four School Districts within the boundaries of the two Cities. This plan provides a framework for planning for natural hazards. The resources and background information in the plan are applicable to the two Cities and four School Districts and the goals and recommendations lay groundwork for local mitigation plans and partnerships.

Natural Hazard Land Use Policy In California

Planning for natural hazards is an integral element of every city's land use planning program within the State of California. All California cities and counties have General Plans and implement ordinances that comply with Statewide 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 and fast increasing population.

This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards. Both Huntington Beach and Fountain Valley are almost entirely built out and most of the future decisions will be on rebuilding, not new developments.

Planning for natural hazards required our Hazard Mitigation Planning Committee to list assets of the six agencies, review policies and ordinances to guide development in hazard areas, research hazards and their impacts, and determine strategies to mitigate the natural hazards. This research includes the compendium of hazards facing the community, the built environment at risk, the public and personal property that may be damaged by hazard events, and most of all, the people who live in the shadow of these hazards.

3. Support for the Plan

Each Local jurisdiction is responsible for the development and implementation of risk reduction strategies and policies. 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 natural hazards and natural hazard mitigation. Some of the key agencies include:

- The Governor's Office of Emergency Services (OES) 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 this 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 Division of Mines and Geology (DMG) is responsible for geologic hazard characterization, public education, the development of partnerships aimed at reducing risk, and exceptions (based on science-based refinement of tsunami inundation zone delineation) to state-mandated tsunami zone restrictions;

- 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, and serves local water needs by providing technical assistance.

4. Plan Methodology

Information in this hazard mitigation plan is based on research from a variety of sources. Staff from the City of Huntington Beach, City of Fountain Valley, Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District, and Fountain Valley School District conducted data research and analysis, facilitated planning committee meetings and public workshops, and developed the final mitigation plan. The research methods and various contributions utilized in preparing the Plan are briefly described in the following:

5. Input from the Hazard Mitigation Planning Committee

The Hazard Mitigation Planning Committee convened monthly and held three special meetings/forums for a total of 12 meetings to guide the development of the plan. The committee played an integral role in developing the mission, goals, and strategies for the mitigation plan. The committee consisted of representatives of public and private agencies and organizations within the Cities of Huntington Beach and Fountain Valley, the Huntington Beach Union High, Huntington Beach City, Ocean View and Fountain Valley School Districts, including:

- City of Huntington Beach Elected Official, Fire Department, Planning Department, Public Works Department, Public Information Office, Emergency Services Office, and Information Services
- City of Fountain Valley Elected Official, Fire Department, Planning Department, Public Works Department, and the Emergency Preparedness Office
- Huntington Beach City School District

- Huntington Beach Union High School District
- Ocean View School District
- Fountain Valley School District
- Huntington Beach Community Emergency Response Team (CERT)
- Fountain Valley Community Member/former National Guard
- Huntington Beach Boeing Company Security and Emergency Preparedness
- Golden West College/Science Department (retired)

6. Stakeholder Interviews

City staff conducted over 60 interviews with individuals and specialists from organizations interested in natural hazards planning. The interviews identified common concerns related to natural hazards and identified key activities to reduce risk from natural hazards. Stakeholders interviewed for the plan included representatives from:

- Southern California Edison
- The Gas Company
- Verizon Telephone
- Verizon Wireless
- Nextel
- Orange County Sanitation District
- Huntington Beach, Fountain Valley, Orange County, and Southern California Municipal Water Districts
- Huntington Beach City, Huntington Beach Union High, Ocean View, and
- Fountain Valley School Districts
- Orange County Agencies: Emergency Management, Health Care Agency and Resource & Development Management Department
- The Boeing Company
- Hospitals: Huntington Beach Medical Center, Fountain Valley Regional Hospital and Medical Center, and Orange Coast Memorial Hospital
- State Office of Emergency Services
- Orange County Cities Emergency Management Organization (OCEMO)
- Cities of Irvine and Long Beach
- Los Angeles County, Area G Representative
- United States Geological Survey (USGS)
- University of California, Irvine
- Federal Emergency Management Agency (FEMA)

7. State and Federal Guidelines for Mitigation Plans

Following are the Federal requirements for approval of a Natural Hazard Mitigation Plan:

- Open public involvement, with public meetings that introduce the process and project requirements

- The public must be afforded opportunities for involvement in: identifying and assessing risk, drafting a plan, and public involvement in approval stages of the plan.
- Community cooperation, with opportunity for other local government agencies, the business community, educational institutions, and nonprofits to participate in the process
- Incorporation of local documents, including the local General Plan, the Zoning Ordinance, the Building Codes, and other pertinent documents

The following components must be part of the planning process:

- Complete documentation of the planning process
- A detailed risk assessment on hazard exposures in the community
- A comprehensive mitigation strategy, which describes the goals & objectives, including proposed strategies, programs & actions to avoid long-term vulnerabilities
- A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the plan and integration of the hazard mitigation plan into other planning mechanisms.
- Formal adoption by the City Councils and School Boards for the six participating agencies
- Plan Review by both State OES and FEMA

These requirements are spelled out in greater detail in the following plan sections and supporting documentation.

Two public forums were held to meet the requirement for public participation, in addition to the inclusion of representatives from outside organizations on the planning committee itself. The timing and scheduling of the forums may vary from one community to another depending on how each City's committee organizes its work and the particular needs of the community.

City of Huntington Beach and Fountain Valley staff examined existing mitigation plans from around the country, current FEMA hazard mitigation planning standards (386 series) and the State of California Natural Hazards Mitigation Plan Guidance and Crosswalks.

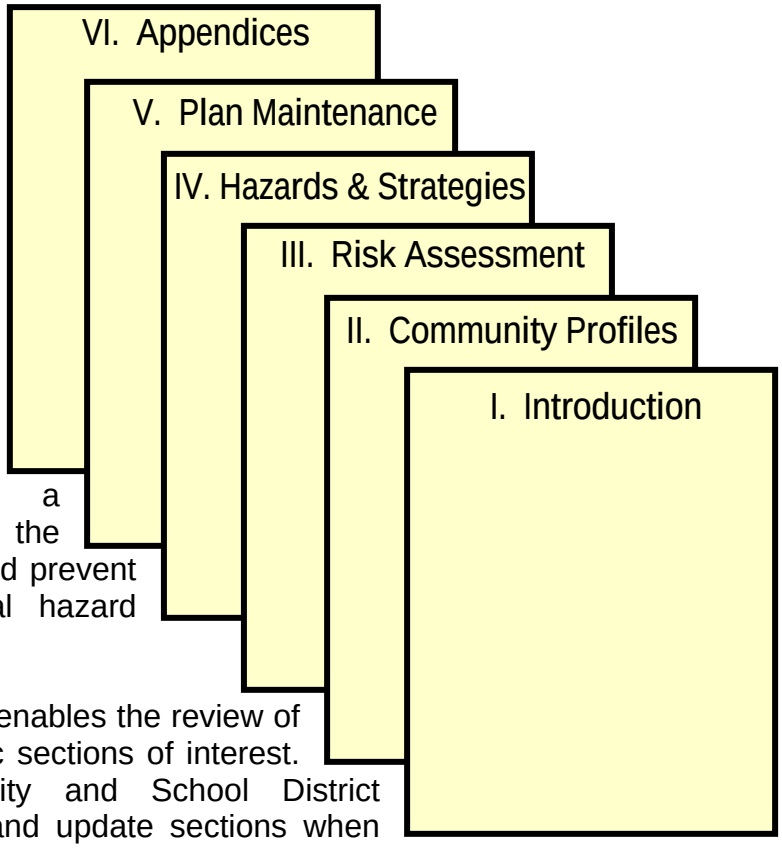
Other reference materials consisted of county and city mitigation plans, including:

- Clackamas County (Oregon) Natural Hazards Mitigation Plan
- Los Angeles Area G Template

Hazard specific research: The City of Huntington Beach and City of Fountain Valley staff collected data and compiled research on six hazards: earthquakes and liquefaction, flooding and storms, tsunamis, windstorms (Santa Ana Winds and tornados), subsidence, and dam failure. Research materials came from

State agencies including OES. The City of Huntington Beach and City of Fountain Valley staff conducted research by referencing historical local newspapers, interviewing long time residents, long time City of Huntington Beach, City of Fountain Valley, Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District, and Fountain Valley School District employees and locating information in historical documents. The Cities and School District's staff identified current mitigation activities, resources and programs, and potential strategies from research materials and stakeholder interviews.

8. Plan Layout



Each section of the mitigation plan provides information and resources to assist people in understanding the City and the hazard-related issues facing citizens, businesses, and the environment. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent loss from future natural hazard events.

The structure of the plan enables the review of the entire plan or specific sections of interest. It also allows the City and School District governments to review and update sections when new data becomes available. The ability to update individual sections of the mitigation plan places less of a financial burden on the City. Decision-makers can allocate funding and staff resources to selected pieces in need of review, thereby avoiding a full update, which can be costly and time-consuming. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to the City of Huntington Beach, the City of Fountain Valley, the Huntington Beach City School District, the Huntington Beach Union High School District, the Ocean View School District, and the Fountain Valley School District.

Part I: Introduction

The ***Plan Introduction*** includes: an overview of the plan, organization of the plan, participating agencies, plan mission, plan goals, plan objectives, acknowledgements, distribution list, and plan adoption resolutions.

The ***Plan Purpose*** includes: Why develop this plan, whom does the mitigation plan affect, plan methodology, input from the planning committee, stakeholder interviews, state and federal guidelines, and plan usage.

The ***Planning Process*** includes: formation of the planning committee, committee members, by-laws, public committee meetings, review of existing documents, capability assessment, community forums, multi-jurisdictional participation, and hazard mitigation meetings/events.

Part II: Community Profiles

An in-depth profile of each of the six agencies participating in this plan is included to assist with hazard impact analysis.

City profiles for Huntington Beach and Fountain Valley include: population and demographics, geography and the environment, climate, land and development, parks and libraries, housing and community development, employment and industry, transportation, major facilities, historical disaster events, essential service facilities, non-city government facilities, utilities, social, cultural and environmental assets, and development trends.

School District profiles for Huntington Beach City, Huntington Beach Union High, Ocean View, and Fountain Valley School Districts include: an overview, disaster history, population and demographics, special populations/special needs, transportation statistics, school site information, and School District information.

Part III: Risk Assessment

Risk Assessment includes sections on: identifying and profiling hazards, assessing vulnerability, agency asset lists, estimating potential losses, multi-jurisdictional risks and a summary.

Part IV: Hazards and Strategies

The six natural hazards studied for this plan are: windstorm, tsunami, subsidence, dam failure, flood, and earthquake. Included is a comprehensive study of each hazard and how it impacts the area of Huntington Beach and Fountain Valley and its impact on the six participating agencies.

Part V: Plan Maintenance

A plan for maintaining the plan has been developed. It includes monitoring the plan, evaluating the plan, updating the plan, and plan follow-up. This part shows how the six participating agencies will deal with the subject of hazard mitigation in the future.

Part VI: Appendices

The appendices include: committee by-laws, public participation plan, strategy voting forms, list of exhibits, plan resource directory, list of acronyms, and a glossary.

9. Environmental Issues

The adoption of the Hazard Mitigation Plan is categorically exempt pursuant to Class 6, Section 15306 of the California Environmental Quality Act which states that basic data collection and research which do not result in a serious or major disturbance to an environmental resource is exempt from further review. Additionally, the Hazard Mitigation Plan is only a study that identifies, among other things, mitigation strategies that the local jurisdiction has not yet approved, adopted, or funded.

(This page intentionally left blank.)

Part I-C
The Planning Process Overview

C. The Planning Process Overview

In January 2003, the Emergency Services Coordinator of Huntington Beach became aware of the need for local agencies to develop a Hazard Mitigation Plan. The Emergency Services Coordinator began researching the law but little information was available at that time. The Coordinator informed her City and the members of the Orange County Emergency Management Organization (OCEMO) about the planning requirement.

Beginning in January 2003, the 23 Orange County Cities met twice monthly to develop their Emergency Operations Plans (EOPs). For the first six months, the Hazard Analysis Section was developed. The group came to a consensus on the hazards facing Orange County and each City was assigned research on a hazard. The hazards were presented and discussed in depth. Experts were invited to speak on the topics. Hazards were profiled and ranked. The Hazard Analysis completed by the OCEMO members was the basis for the study on the hazards included in this plan.

Throughout 2003 the OCEMO Plan Writing Subcommittee discussed taking the EOP process (meeting twice monthly and sharing assignment responsibilities) and continuing it into 2004 to complete Hazard Mitigation Plans. The Huntington Beach Emergency Services Coordinator requested 23 copies of each of the FEMA 386 series booklets and handed them out at the meeting so participants could become familiar with mitigation planning protocol.

As stated earlier in the plan, due to budget cuts, in May 2003 the City of Huntington Beach signed a contract with the City of Fountain Valley to share 25% of the Huntington Beach Emergency Services Coordinator. Because of these similarities, the two Cities agreed to a joint Hazard Mitigation Plan.

In August and again in September, the Huntington Beach/Fountain Valley Emergency Services Coordinator attended the OES Workshop 1 on Disaster Mitigation Act 2000 (DMA2000). The Emergency Services Coordinator shared the information with the two Cities to help make an informed decision on whether to dedicate personnel and resources to Hazard Mitigation Plan development.

In August, the Coordinator got approval from the City of Huntington Beach to invite the City of Fountain Valley and the four School Districts: Huntington Beach City, Huntington Beach Union High, Ocean View and Fountain Valley School Districts to participate in the planning process. It was determined that the School Districts did not have full time emergency managers nor the technical resources available to complete this project. The two Cities had personnel and technical resources but were limited in financial

resources to develop the plan. Therefore, it was practical for the six agencies to join together and share planning resources in development of one comprehensive plan. One of the major catalysts was the FEMA Hazard Mitigation grants received over the past 10 years. Jurisdiction that have received the following grant money:

■ City of Huntington Beach	$3,747.000
■ City of Fountain Valley	0
■ Huntington Beach Union High School District	1,871,000
■ Huntington Beach City School District	167,000
■ Ocean View School District	0
■ Fountain Valley School District	0
	$5,785,000

A meeting was held on August 19, 2003 with the two Cities and four School Districts. This was the first step in for formalizing the hazard mitigation planning process. Commitment Forms were signed dedicating human, technical, and financial resources from each jurisdiction to the project.

In August, the Huntington Beach/Fountain Valley Emergency Services Coordinator wrote a FEMA grant for $135,000 to reimburse City personnel salaries. Staff from the two Emergency Service Offices were assigned as primary Plan Writers.

In December 2003, the Huntington Beach/Fountain Valley Emergency Services Coordinator arranged for a private contractor to put on a class for OCEMO members and any interested Orange County City personnel on DMA 2000. Jan Rogala of Dimensions Unlimited, Inc. presented the law, why a jurisdiction should develop a plan, and her experience in developing Hazard Mitigation Plans.

By February of 2004, the County and many cities within Orange County decided not to participate on the Orange County Hazard Mitigation Planning Committee and the County committee was disbanded.

On January 21, 2004, the Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee had their first Hazard Mitigation kickoff meeting. The Huntington Beach/Fountain Valley Emergency Services Coordinator was assigned as Chair of the Committee and conducted the meetings using Roberts Rules of Order. The Chair briefed the committee on DMA 2000 and presented a time line for completing the plan. The committee was asked to identify additional persons or groups that should be added to the committee. A local community member and a Federal Government agency representative were invited to participate.

The committee agreed to meet monthly, the second Thursday from 3-4:30 PM, at the City of Huntington Beach Emergency Operation Center (EOC). The plan writers were

directed to develop a "Hazard Mitigation Public Information Plan" on how the public would be incorporated into the planning process.

The City of Fountain Valley hired a 20 hour a week employee to develop their Plan. The plan writers are the Huntington Beach/Fountain Valley Emergency Services Coordinator (40 hours a week), the Huntington Beach Assistant Emergency Services Coordinator (40 hours a week) and the Fountain Valley Assistant to the Emergency Services Coordinator (20 hours a week).

In February, the plan writers presented the committee with Bylaws that were discussed and approved. (See Appendix A.) Each of the six agencies went to their respective governing bodies and received endorsement of the Committee Bylaws. This made their agency an official member of the committee. (See resolutions in Exhibit I-1.) Also in February the hazards were discussed and ranked. After much discussion, six natural hazards were selected for study: Windstorms, Tsunami, Subsidence, Dam Failure, Flood, and Earthquake.

The Cities discussed the need for GIS mapping. It was determined that the City of Fountain Valley does not have access to GIS mapping. The plan writers developed a list of maps and requested the Huntington Beach GIS Department begin map construction. Also utilized were Orange County maps developed by the State of California Office of Emergency Services (OES), United States Geological Survey (USGS), the Army Corps of Engineers and numerous Internet mapping sites.

The Public Information Plan was presented and approved. (See Appendix B.)

In March 2004, the hazard *Windstorms: Santa Ana Wind and Tornado* was presented. The Fountain Valley Assistant to the Emergency Services Coordinator conducted the hazards study and presented ideas on recommended strategies. The hazard was discussed in detail. The Committee was asked to provide additional mitigation strategies by the next meeting. The committee agreed on the percent of impact area in each City.

(A comprehensive hazard study and PowerPoint presentation were prepared on each hazard.)

Participants were given Excel spreadsheets to complete for the next meeting. Each of the six participating agencies were to identify all of their facility assets, their value, and the value of the contents.

The Committee agreed to hold two Community Forums. The sites were booked, flyers were developed, and the Committee approved all related actions.

In April 2004, the hazard Tsunami was presented. The Huntington Beach Assistant Emergency Services Coordinator conducted and presented the study. The same process was followed as in March 2004.

School Districts and Cities turned in their asset lists. The Cities were then asked to complete city-wide lists of structures, values, and contents. This work would take months to develop.

May 2004, the Committee was taken on a tour of the Prado and Seven Oaks Dams in preparation for the study on dam failures. The Huntington Beach Assistant Coordinator completed the Dam Failure study. At the monthly meeting the Dam Failure study was presented and the hazard mitigation process followed.

The Huntington Beach and Fountain Valley Community Profiles were developed and presented. They include the following categories: population and demographics, geography and the environment, climate, land and development, parks and libraries, housing and community development, employment an industry, transportation, major facilities, historical disaster events, essential service facilities, government facilities (non-city), utilities, social, cultural and environmental assets and development trends.

In June 2004, the hazard was Flood. A volunteer with the Huntington Beach Fire Department's Community Emergency Response Team (CERT) is the community member representing the City. He is a retired engineer and is a past member of the City's Flood Management Planning Committee. This individual took his experience and expertise and volunteered to conduct the study on Flood: Severe Weather and Storms. This volunteer developed a professional analysis of the flood impact to the area. The study was presented, strategies were discussed, and percentages agreed upon.

In July, the Planning Process was presented. The School Districts presented their District Profiles. The Community Forum agendas were approved.

On July 22, 2004, the Huntington Beach Community Forum was held in the Huntington Beach City Council Chambers. Forty-two persons attended including both City Mayors, Council Members, a Congressional Representative, Planning Commissioners, Fire Chief and Fire Department personnel, Planning Department staff, CERT volunteers, neighboring City personnel, and the general public. The six hazards were presented along with the mitigation strategies recommended. Each strategy was numbered and a comment form was handed out with corresponding numbers to make it easy for the community to provide input on the plan. Dozens of comments were made and each is listed in the Hazard Mitigation Community Forums Attendee Comments section (Part 1-C-4).

On August 5, 2004, the Fountain Valley Community Forum was held in the Fountain Valley Council Chambers. Thirty-one people attended the forum including the Fountain

Valley Mayor, Fire Chief, Planning Department, Public Works Department, RACES volunteers, and residents. The six hazards were presented with the recommended mitigation strategies. Comments made by Fountain Valley citizens at the forum are listed in the Hazard Mitigation Community Forum Attendee Comments Section (Part 1-C-4).

At the August meeting, community input was consolidated and then shared with the Committee. The mitigation strategies were prioritized and the earthquake study also presented. September activities included presentation Introduction, Risk Assessment and Maintenance parts of the plan. We discussed governing body approval and submission of the Plan to the State and Federal government agencies.

The plan will be approved by all six governing bodies prior to November 1, 2004.

1. HB/FV Hazard Mitigation Planning Committee

(a) Formation of the Committee

The Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee is the result of a collaborative effort between the City of Huntington Beach, City of Fountain Valley, Huntington Beach City School District, Huntington Beach High School District, Ocean View School District, and Fountain Valley School District. The Committee played an integral role in developing the mission, goals, and action items for the mitigation plan. The Committee representatives are:

(b) Committee Members

Name	Agency	Committee Responsibility
CITY OF HUNTINGTON BEACH REPRESENTATIVES		
Cathy Green Mayor	City of Huntington Beach City Council	***Oversight Committee***
Duane Olson Fire Chief	City of Huntington Beach Fire Department	***Oversight Committee***
Glorria Morrison HB/FV Emergency Services Coordinator	City of Huntington Beach Fire Department	***Committee Chair, Lead Agency Representative and Plan Writer***
Katie Freeman, Assistant Emergency Services Coord.	City of Huntington Beach Fire Department	***Plan Writer***
Ricky Ramos Associate Planner	City of Huntington Beach Planning Department	***Technical Committee***
Steve Krieger Civil Engineering Assistant	City of Huntington Beach Public Works Department	***Technical Committee***
Peter Green Retired Mayor	City of Huntington Beach Retired College Professor	***Community Member***
Cecil Wright Past President/CERT	City of Huntington Beach CERT Volunteer	***Community Member***

Name	Agency	Committee Responsibility
CITY OF FOUNTAIN VALLEY REPRESENTATIVES		
Guy Carrozzo Mayor	City of Fountain Valley City Council	***Oversight Committee***
Mark Haskell Fire Chief	City of Fountain Valley Fire Department	***Oversight Committee***
Jacob Green Assistant to the Emergency Services Coordinator	City of Fountain Valley Fire Department	***Plan Writer***
Steve Nagel Fire Marshal	City of Fountain Valley Fire Department	***Lead Agency Representative Technical Committee***
Bill Ault Public Works Director	City of Fountain Valley Public Works Department	***Technical Committee***
Robert Franklin City Planner	City of Fountain Valley Planning Department	***Technical Committee***
Jim McLain	City of Fountain Valley Volunteer	***Community Member***
HUNTINGTON BEACH CITY SCHOOL DISTRICT REPRESENTATIVES		
Dick Masters	HB City School District	***Lead Agency Representative***
Dana Sauer	HB City School District	***Representative***
HUNTINGTON BEACH UNION HIGH SCHOOL DISTRICT		
Scott Atkinson	HB Union High School District	***Lead Agency Representative***
OCEAN VIEW SCHOOL DISTRICT		
Carolyn Stocker	Ocean View School District	***Lead Agency Representative***
Mary Lou Beckman	Ocean View School District	***Representative***
FOUNTAIN VALLEY SCHOOL DISTRICT		
Carl Dane	Fountain Valley School District	***Lead Agency Representative***

The Hazard Mitigation Planning Committee convened once a month from January 2004 to October to guide development of the Mitigation Plan. *See Hazard Mitigation Meetings and Events for dates.*

(c) Bylaws

The Bylaws were created by the Hazard Mitigation Committee to facilitate a process based on cooperation and consensus. The bylaws dictate committee and subcommittee member descriptions, meeting schedule, voting rights, and participant responsibilities (See Appendix A for complete bylaws). Each Jurisdiction's City Council or School Board adopted the bylaws, officially recognizing the Committee.

Exhibit I-C-1: City Council and School Board Resolutions

RESOLUTION NO. 2004-23

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF HUNTINGTON BEACH APPROVING THE BY-LAWS OF THE HUNTINGTON BEACH/FOUNTAIN VALLEY HAZARD MITIGATION COMMITTEE

WHEREAS, the Disaster Mitigation Act requires that a Hazard Mitigation Plan be developed with local agencies in order for the City to be eligible for any future hazard mitigation grants from the Federal Emergency Management Agency; and

In order for the plan to be approved by the Federal Emergency Management Agency, a hazard mitigation planning committee must be formed which includes multi-jurisdictional participation; and

The cities of Huntington Beach and Fountain Valley, along with four school districts, have formed a committee to develop a joint Hazard Mitigation Plan, with the cities taking the lead in writing the plan; and

A grant for $135,000 has been written to supplement the personnel costs for the cities' employees involved in writing the plan; and

In order for the agencies to be eligible for future grants, the plan must be adopted by each participating agency's governing body,

NOW, THEREFORE, IT IS HEREBY RESOLVED by the City Council of the City of Huntington Beach as follows:

1. The bylaws for the Huntington Beach/Fountain Valley Hazard Mitigation Committee are hereby approved.

PASSED AND ADOPTED by the City Council of the City of Huntington Beach at a regular meeting thereof held on the _____ day of _____, 2004.

Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:

City Attorney

REVIEWED AND APPROVED:

City Administrator

INITIATED AND APPROVED:

Fire Chief

04reso/hazard/3/10/04

Resolution No. 8995

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF FOUNTAIN VALLEY ENDORSEING THE FOUNTAIN VALLEY/HUNTINGTON BEACH HAZARD MITIGATION PLANNING COMMITTEE AND BYLAWS FOR DISASTER MITIGATION ACT 2000 COMPLIANCE.

WHEREAS, the Disaster Mitigation Act requires that a Hazard Mitigation Plan be developed with local agencies in order for the City to be eligible for any future hazard mitigation grants from the Federal Emergency Management Agency; and

WHEREAS, in order for the plan to be approved by the Federal Emergency Management Agency, a hazard mitigation planning committee must be formed which includes multi-jurisdictional participation; and

WHEREAS, the cities of Fountain Valley and Huntington Beach, along with four school districts, have formed a committee to develop a joint Hazard Mitigation Plan, with the cities taking the lead in writing the plan; and

WHEREAS, a grant for $135,000 has been written to supplement the personnel and material costs for the cities' employees involved in writing the plan; and

WHEREAS, in order for the agencies to be eligible for future grants, the plan must be adopted by each participating agency's governing body

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FOUNTAIN VALLEY that the Fountain Valley/Huntington Beach Hazard Mitigation Planning Committee will create a hazard mitigation plan; and

BE IT FURTHER RESOLVED, that the bylaws for the Fountain Valley/Huntington Beach Hazard Mitigation Committee are hereby approved.

ADOPTED this 20th day of April, 2004.

Guy Carnozzo, Mayor

ATTEST:

City Clerk

899

OCEAN VIEW SCHOOL DISTRICT
Huntington Beach, California

RESOLUTION NO. 59:0304

RESOLUTION APPROVING THE BYLAWS OF THE HUNTINGTON BEACH/FOUNTAIN VALLEY HAZARD MITIGATION COMMITTEE

WHEREAS, the Disaster Mitigation Act requires that a Hazard Mitigation Plan be developed with local agencies in order for the City of Huntington Beach, the City of Fountain Valley, Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District and Fountain Valley School District to be eligible for any future hazard mitigation grants from the Federal Emergency Management Agency; and

In order for the plan to be approved by the Federal Emergency Management Agency, a hazard mitigation planning committee must be formed which includes multi-jurisdictional participation; and

The cities of Huntington Beach and Fountain Valley and Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District and Fountain Valley School District have formed a committee to develop a joint Hazard Mitigation Plan, with the cities taking the lead in writing the plan; and

A grant for $135,000 has been written to supplement the personnel costs for the cities' and school districts' employees involved in writing the plan; and

In order for the agencies to be eligible for future grants, the plan must be adopted by each participating agency's governing body,

NOW, THEREFORE, BE IT RESOLVED by the Board of Trustees of the Ocean View School District as follows:

1. The bylaws for the Huntington Beach/Fountain Valley Hazard Mitigation Committee (Exhibit B) are hereby approved.

APPROVED, PASSED, AND ADOPTED by the Board of Trustees of the Ocean View School District at its regular meeting held on June 1, 2004.

Barbara Boskovich, Board President

ATTEST:

Carolee Focht
Clerk of the Board of Trustees
Ocean View School District

Fountain Valley School District

RESOLUTION 2004-21
RESOLUTION OF THE BOARD OF TRUSTEES OF THE FOUNTAIN VALLEY SCHOOL DISTRICT APPROVING THE BYLAWS OF THE HUNTINGTON BEACH-FOUNTAIN VALLEY HAZARD MITIGATION COMMITTEE

WHEREAS, the Disaster Mitigation Act requires that a Hazard Mitigation Plan be developed with local agencies in order for the City of Huntington Beach, the City of Fountain Valley, the Fountain Valley School District, the Huntington Beach City School District, the Huntington Beach Union High School District and the Ocean View School District to be eligible for any future hazard mitigation grants from the Federal Emergency Management Agency; and

In order for the plan to be approved by the Federal Emergency Management Agency, a hazard mitigation planning committee must be formed which includes multi-jurisdictional participation; and

The cities of Huntington Beach and Fountain Valley, and the Fountain Valley School District, the Huntington Beach City School District, the Huntington Beach Union High School District and the Ocean View School District have formed a committee to develop a joint Hazard Mitigation Plan with the cities taking the lead in writing the plan; and

A grant for $135,000 has been written to supplement the personnel costs for the cities' and school districts' employees involved in writing the plan; and

In order for the agencies to be eligible for future grants, the plan must be adopted by each participating agency's governing body;

NOW THEREFORE BE IT RESOLVED by the Board of Trustees of the Fountain Valley School District as follows:

1. The bylaws for the Huntington Beach/Fountain Valley Hazard Mitigation Committee are hereby approved.

Passed and adopted by the Board of Trustees of the Fountain Valley School District at its regular meeting held on May 13, 2004 with the following vote:

Ayes: 5 Noes: 0 Abstain: 0 Absent: 0

Joanne Lew, Board President — Date: 5-13-04

ATTEST:
Pat Harney, Board Clerk — Date: 5-13-04

#5-I

RESOLUTION NO. 39

HUNTINGTON BEACH UNION HIGH SCHOOL DISTRICT
Orange County, California

A RESOLUTION TO APPROVE THE
HUNTINGTON BEACH/FOUNTAIN VALLEY
HAZARD MITIGATION PLANNING COMMITTEE BYLAWS

WHEREAS, the Disaster Mitigation Act requires that a Hazard Mitigation Plan be developed with the local agencies in order for the Huntington Beach Union High School District, the City of Huntington Beach, the City of Fountain Valley, Huntington Beach City School District, Ocean View School District and Fountain Valley School District to be eligible for hazard mitigation grants from the Federal Emergency Management Agency; and

WHEREAS, in order for the plan to be approved by the Federal Emergency Management Agency, a hazard mitigation planning committee must be formed which includes multi-jurisdictional participation; and

WHEREAS, the Huntington Beach Union High School District in concert with the City of Huntington Beach, the City of Fountain Valley and Huntington Beach City School District, Ocean View School District and Fountain Valley School District have formed a committee to develop a joint Hazard Mitigation Plan, with the cities taking the lead in writing the plan; and

WHEREAS, a grant for $135,000.00 has been written to supplement the personnel costs for the cities and school districts employees involved in writing the plan; and

WHEREAS, in order for the agencies to be eligible for future grants, the plan must be adopted by each participating agencies governing body.

NOW, THEREFORE, BE IT RESOLVED by the Board of Trustees of the Huntington Beach Union High School District that the attached bylaws for the Huntington Beach/Fountain Valley Hazard Mitigation Committee are hereby approved.

I, Van Riley, Ph.D., Secretary of the Board of Trustees of the Huntington Beach Union High School District of Orange County, California, hereby certify that the above Resolution was duly adopted by the said Board of Trustees at the regular meeting held on May 25, 2004 and was passed by a unanimous vote of the Board members present.

IN WITNESS WHEREOF I have hereunto set my hand and seal this 25 day of May, 2004.

Secretary of the Board of Trustees

HUNTINGTON BEACH CITY SCHOOL DISTRICT
RESOLUTION A-149-03/04 APPROVING THE BYLAWS OF THE HUNTINGTON BEACH/FOUNTAIN VALLEY HAZARD MITIGATION COMMITTEE

WHEREAS, the Disaster Mitigation Act requires that a Hazard Mitigation Plan be developed with local agencies in order for the City of Huntington Beach, the City of Fountain Valley, Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District and Fountain Valley School District to be eligible for any future hazard mitigation grants from the Federal Emergency Management Agency; and

In order for the plan to be approved by the Federal Emergency Management Agency, a hazard mitigation planning committee must be formed which includes multi-jurisdictional participation; and

The cities of Huntington Beach and Fountain Valley and Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District and Fountain Valley School District have formed a committee to develop a joint Hazard Mitigation Plan, with the cities taking the lead in writing the plan; and

A grant for $135,000 has been written to supplement the personnel costs for the cities and school district employees involved in writing the plan; and

In order for the agencies to be eligible for future grants, the plan must be adopted by each participating agency's governing board,

NOW, THEREFORE, BE IT RESOLVED, by the Board of Trustees of the Huntington Beach City School District that the bylaws for the Huntington Beach/Fountain Valley Hazard Mitigation Committee are hereby approved.

APPROVED AND ADOPTED by the Board of Trustees of the Huntington Beach City School District at its regular meeting on June 22, 2004.

Robert Mann, Ed.D.
Board President

Catherine McGough
Clerk of the Board

A-149-03/04
Page 2 of 6

(d) Public Meetings

Inclusion of the general public was a high priority. Every opportunity was taken to educate the public both on the Plan and on hazard mitigation measures that can be taken in the home, schools, and businesses. A combination of newsletters, newspapers, cable television, web sites, and postings by Cities and School Districts were utilized to engage the communities of Huntington Beach and Fountain Valley. See the ***Public Participation Plan*** in Appendix B for a complete list of activities geared to include the public in the hazard mitigation planning process.

Once the Public Participation Plan was approved, all meeting agendas were posted with each City Council agenda and School Board agenda.

2. Review of Existing City Documents

Committee members were required to review existing documents, ordinances, codes, and plans throughout the process. Information from the following documents is incorporated throughout the Plan.

Document Name	Responsibility	Reviewed
City of HB General Plan	Ricky Ramos and Glorria Morrison	February – June 2004
City of FV General Plan	Robert Franklin and Jacob Green	February – May 2004
HB Flood Management Plan (FMP)	Cecil Wright and Glorria Morrison	February – April 2004
FV Zoning Ordinances	Robert Franklin	March – July 2004
HB Emergency Operations Plan (EOP), Tsunami & Flood Plans	Glorria Morrison, Katie Freeman, Cecil Wright, and Jacob Green	February – August 2004
FV Emergency Operations Plan (EOP)	Glorria Morrison, Jacob Green, Katie Freeman, and Cecil Wright	February – August 2004
School District Emergency Operations Plans (EOP)	Scott Atkinson, Dick Masters, Carolyn Stocker, and Carl Dane	January – June 2004
FEMA/OES past Hazard Mitigation Grants	Glorria Morrison, Scott Atkinson, and Dick Masters	January – March 2004
HB Fire Codes	Glorria Morrison and Eric Engberg	March – June 2004
FV Fire and Building Codes	Steve Nagel	March – July 2004
HB Capital Improvement Program	Todd Broussard	June – July 2004
Orange County 7-Year Flood Plan	Ricky Ramos and Cecil Wright	February – June 2004
HB Storm Drain Master Plan	Steve Krieger	March-July 2004

3. Capability Assessment Process

Following the formation of the Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee, each agency was asked to identify resources that could be dedicated to the planning process. The Committee assessed human, technical and financial resources that could be utilized to complete this project.

Exhibit I-C-2: Capability Assessment

AGENCY	TYPE	RESPONSE
City of Huntington Beach	Human Resources	▪ Emergency Services staff, 1.75% employees ▪ Public Works staff three employees: 25% (1 employee) 10% (2 employees) ▪ Planning Department employees, 25% ▪ Information Systems GIS, 25% ▪ Fire Department Chief, 10% ▪ Fire Department Clerical, 25% ▪ Elected Official, Mayor, 5% ▪ City Public Information Officer, 10% ▪ Risk Manager, 10% ▪ Community Members: • Retired Engineer, 50% • Environmental Specialist, 10% • Business Representative, 10%
	Technical Resources	▪ Public Works, Planning, Fire, Risk Management, and Information Systems employees ▪ GIS mapping system ▪ City's EOP ▪ General Plan ▪ CRS and Flood Management Plan
	Financial Resources	▪ Lead agency of the FEMA Pre-Disaster Mitigation Planning Grant $78,678 (minus direct cost) ▪ Will front any costs that are reimbursable from the grant
City of Fountain Valley	Human Resources	▪ Emergency Services staff • Emergency Services Coordinator, 100% • Assistant to the Coordinator, 100% ▪ Public Works staff, 6% (2 employees) ▪ Planning Department staff, 15% (2 employees) ▪ Building Department staff, 10% ▪ Fire Department staff, 25% Fire Marshal and 10% Fire Chief ▪ Elected Official, Mayor, 5% ▪ City Public Information Officer, 10% ▪ Risk Manager, 10% ▪ Planner/Flood, 10% ▪ Community Member, 50%
	Technical Resources	▪ Public Works, Planning, and Fire employees ▪ Existing City Plans ▪ Internet
	Financial Resources	▪ FEMA Pre-Disaster Mitigation Planning Grant $22,578 (minus direct costs)

AGENCY	TYPE OF RESOURCE	PERCENT ASSIGNED TO THE PROJECT
Huntington Beach City School District	Human Resources	▪ School Districts Supervisor of Facilities and Construction, 25% employee ▪ Assistant to Administrative Services, 25%
	Technical Resources	▪ Risk Manager, 10%
	Financial Resources	None available
Huntington Beach Union High School District	Human Resources	▪ School Districts Security and Transportation Manager, 25% ▪ Office staff, 25%
	Technical Resources	▪ Risk Manager, 10%
	Financial Resources	None available
Ocean View School District	Human Resources	▪ School Districts Chief Operations and Facilities Officer, 25% employee ▪ Office staff, 25%
	Technical Resources	▪ Risk Manager, 10%
	Financial Resources	None available
Fountain Valley School District	Human Resources	▪ School Districts Assistant Superintendent and Personnel, 25% ▪ Office staff, 25%
	Technical Resources	▪ Risk Manager, 10%
	Financial Resources	None available

(a) Human Resources

Each of the six participating jurisdictions provided available human resources. Despite recent budget shortages, each agency committed appropriate staff time. The percents listed above were estimates drafted by the Committee came up with early in the process. In most cases, the estimates were accurate.

Committee Chair

Glorria Morrison, the Hazard Mitigation Planning Committee, is a 25-year employee of the City of Huntington Beach with eight years in the Huntington Beach Police Department and 17 years in the Huntington Beach Fire Department/Emergency Services Office. Currently serving as the Emergency Services Coordinator for the Cities of Huntington Beach and Fountain Valley, Glorria has led numerous multi-jurisdictional planning teams including Chair of the Orange County Emergency Management Organization (OCEMO) EOP Plan Writing Committee in 2003. In addition, Glorria wrote the FEMA Pre-Disaster Hazard Mitigation Planning Grant to fund the City personnel for this project.

Agency Leaders

Each jurisdiction provided a “Lead” individual as listed below. This person was responsible for ensuring that all assignment deadlines were met. This representative managed the bylaws and plan approval process through their City Council or School Board. In addition, this individual served as liaison with the Committee technical personnel. Major tasks completed by

jurisdictional representatives included: taking a lead in plan development, working to complete assigned monthly tasks, attending monthly planning meetings and presenting agency findings. These representatives also serve as their organization's emergency management contact.

Agency Lead Assignments

AGENCY	LEAD
City of Huntington Beach	▪ Glorria Morrison, Emergency Services Coordinator
City of Fountain Valley	▪ Steve Nagel, Fire Marshal
Huntington Beach City School District	▪ Dick Masters, Supervisor of Facilities and Construction
Huntington Beach Union High School District	▪ Scott Atkinson, Security and Transportation Manager
Ocean View School District	▪ Carolyn Stocker, Chief Operations and Facilities Officer
Fountain Valley School District	▪ Carl Dane, Assistant Superintendent, Personnel

Oversight Committee

In order to formalize the planning process, an Oversight Committee was created. The Oversight Committee consists of both Mayors and Fire Chiefs from Huntington Beach and Fountain Valley. The Mayors liaisoned with their City Councils regarding project progress. The Fire Chiefs were selected because of their day-to-day oversight of respective Emergency Management offices. The Fire Chiefs served as the link to City Department Heads and the City Administrator/Manager of their respective cities.

The Oversight Committee enabled an efficient political process and streamlined the Committee bylaw and plan approval process.

Oversight Committee Assignments

AGENCY	OVERSIGHT PERSONNEL
City of Huntington Beach	▪ Cathy Green, Mayor ▪ Duane Olson, Fire Chief
City of Fountain Valley	▪ Guy Carrozzo, Mayor ▪ Mark Haskell, Fire Chief

Community Members

To ensure that community issues were included in the plan, the committee agreed that community membership was imperative. Each City recruited an active community member. Huntington Beach selected Cecil Wright, a retired Boeing Aerospace Engineer and Past President of the Community Emergency Response Team (CERT) program. Mr. Wright was on the City's Flood Management Plan Development Committee in 2000, making him the perfect candidate. Jim Mc Lain, the Fountain Valley community member is a 17 year City volunteer, past President of the Chamber of Commerce, and a retired National Guardsman who has been involved in emergency preparedness and response for over 40 years. Luanne Scorza-Smith,

Security and Fire Protection Coordinator for the Boeing Company, was recruited to represent the local business community. The Boeing Company is the largest employer in the planning area.

The Committee discussed all politically sensitive community issues during the planning process. Along the coast, environmentalists and developers have been in dispute over land use for over 20 years. An environmental expert was therefore sought as a Committee member. Peter Green, the chosen representative, is a former Mayor of Huntington Beach and is an Environmental Professor at Golden West College. Inclusion of the academic community ensured widespread technical support.

Community Member Assignments

AGENCY	COMMUNITY PERSONNEL
City of Huntington Beach	▪ Cecil Wright, CERT Volunteer ▪ Peter Green, Environmental Rep ▪ Luanne Scorza-Smith, Business Rep
City of Fountain Valley	▪ Jim McLain, FIRST Volunteer

Plan Writers

Three City staff members were assigned as plan writers. They were selected from the Huntington Beach and Fountain Valley Emergency Services Offices. The Committee Chair, Glorria Morrison, serves as one plan writer and the other two are recent college graduates who work as Assistant Emergency Services Coordinators for the two Cities (Katie Freeman and Jacob Green). The plan writers conducted most of the hazard research and prepared five of the six hazard reports and corresponding PowerPoint presentations. The hazard, *Flood*, was researched and written by Huntington Beach community member, Engineer Cecil Wright. After writing the plan sections, the segments were submitted for review by the technical personnel and members of the oversight committee. Changes were made and plans were reviewed again before final plans were produced.

Plan Writer Assignments

AGENCY	PLAN WRITER PERSONNEL
City of Huntington Beach	▪ Glorria Morrison, Emergency Services Coordinator (75%) ▪ Katie Freeman, Assistant Emergency Services Coordinator
City of Fountain Valley	▪ Glorria Morrison, Emergency Services Coordinator (25%) ▪ Jacob Green, Assistant to the Emergency Services Coordinator

(b) Technical Resources

The technical personnel provided:

- History of emergencies and past mitigation projects to minimize disaster impact
- Maps of the study area
- Press releases, articles, press contacts
- Lists of City Boards, Commissions, and Committees
- Public facility contents and structure value
- Review of existing documents, codes, ordinances, and plans
- Demographics and housing information
- Capital Improvement Projects related to hazard mitigation
- Projects that met strategy criteria

Many of the technical personnel attended the monthly Planning Committee meetings and were available to the Plan Writers for consultation throughout the planning process. Technical personnel include City Planning Department, Public Works, Fire Department personnel, Building Department, Information System/GIS, Risk Managers, and Public Information personnel.

Technical Resources Assignments

AGENCY	TECHNICAL PERSONNEL
City of Huntington Beach	▪ Steve Krieger, Public Works Dept. ▪ Ricky Ramos, Planning Dept. ▪ Joe Mangiameli, Information Systems/GIS Division ▪ Karen Foster, Risk Management ▪ Duane Olson, Fire Dept. ▪ Laurie Payne, Public Information
City of Fountain Valley	▪ Steve Nagel, Fire/Building Dept. ▪ Bob Franklin, Planning Dept. ▪ Bill Ault, Public Works Dept. ▪ Steve Hauerwass, Public Works Dept. ▪ Vicki Lenard, Building Dept. ▪ Don Heinbuch, Public Information
Huntington Beach City School District	Deborah Nobles, Risk Manager
Huntington Beach Union High School District	Mae Krause, Risk Manager
Ocean View School District	Mary Lou Beckman, Risk Manager
Fountain Valley School District	Barry Blande, Risk Manager

(c) Financial Resources

In August 2003, the City of Huntington Beach (Lead Agency for the Grant) wrote a Pre-Disaster Hazard Mitigation Grant, and submitted it to FEMA via OES. In April 2004, the grant was awarded in the amount of $101,250. This is an actual $135,000 grant with the local share of 25% and FEMA 75% share. The locals agreed to use staff time to cover their 25% local match. With difficult budget times and personnel cutbacks, this grant made the project possible.

The City of Huntington Beach agreed to front any costs that were reimbursable from the grant. A "template" was purchased from Los Angeles Area G, which assisted with the planning process. Binders and tabs were also purchased. These costs were subtracted from the grant amount received prior to the per capita cost distribution.

Financial Resources

AGENCY	FINANCIAL LEAD
City of Huntington Beach	Glorria Morrison, Emergency Services Coord.
City of Fountain Valley	Steve Nagel, Fire Marshal
Huntington Beach City School District	Dick Masters, Supervisor of Facilities and Construction
Huntington Beach Union High School District	Scott Atkinson, Security and Transportation Manager
Ocean View School District	Carolyn Stocker, Chief Operations and Facilities Officer
Fountain Valley School District	Carl Dane, Assistant Superintendent/ Personnel

All resources (human, technical, and financial) from the six jurisdictions were brought together to develop the Huntington Beach/Fountain Valley Hazard Mitigation Plan.

4. Hazard Mitigation Community Forums

The City of Huntington Beach and City of Fountain Valley staff facilitated two public workshops to gather comments and ideas from both Cities residents about mitigation planning and priorities for mitigation plan goals. The first workshop held July 22, 2004 in the City of Huntington Beach, attracted 42 citizens, and the second, held August 5, 2004 in the City of Fountain Valley was attended by 31 citizens. Dozens of comments were made and each is listed below.

Both workshops began with an introduction from the City's Mayor who are both Hazard Mitigation Oversight Committee members. The workshops discussed the Disaster Mitigation Act 2000, natural hazards that impact the two Cities and School Districts, mitigation projects, and the importance of community input. The residents were given an opportunity to comment on the proposed mitigation strategies. The Fire Chiefs (Oversight Committee members) conducted closing statements requesting public written comments on the Plan and thanking all residents for taking time out of their busy schedule to attend.

Thanks to supportive community members, strategies were added to the Plan making the Cities of Huntington Beach and Fountain Valley and the four School Districts more disaster resilient. The strong community presence and input led to successful community forums.

Hazard Mitigation Community Forums Attendee Comments

HB - Huntington Beach
FV - Fountain Valley

Card # - Each form was assigned a number to ensure anonymity

Card #	Strategy #	Comments
HB-1	2-Other	Purchase a FIRST MOTION SENSOR to let city officials and the public know when an earthquake hits if it is offshore and therefore can cause a tsunami. This SENSOR SYSTEM should be connected to the City's Warning Siren System and go off immediately, notifying individuals to evacuate to higher ground.
HB-2	1-Other	I hope those of us who cannot attend the next meeting (8/5) will get a summary in the mail or some conclusive report from the mitigation.
	2A	Until Edwards Station gets a siren system, what is closest station to that area with a siren and can those homes and Seacliff Elementary School hear that siren? If not, what temporary warning system is in place for that area?
	3-Other	Strategies seemed mostly to address repairs as subsidence occurs, rather than determining how or where to build to avoid the problem.
	6E	I think 6E was encouraging purchase of earthquake insurance? Affordable earthquake insurance is key! Many of us dropped it having no choice because of the expense.
HB-3	Other	I request that responses to all public comment be prepared and included in the final plan.
	1A, 1B, 1C	There is no mandate that HB/FV take all actions on public owned trees to reduce likelihood of failure during high winds. Also no measure is included to ensure funding.
	2A,	Drawing for run up areas should include what wave height is the basis for that run up.
	2B	Some kind of test should be run to ensure that all residents in run up zones can hear the warning sirens. I have never heard a siren.
	3A, 3B, 3C, 3D, 3E	Mitigation primarily stress making repairs and do not include code changer and other
	4A, 4B	Should include actions to ensure the County completes all projects and to ensure that the Santa Ana River is dredged when required to minimize flooding.
	5-Other	Should include actions to ensure the County and City complete channel and Santa Ana River dredging as recommended. Also funding for dredging should be mandated by allocation of funds on an annual basis.
HB-4	1B	See little tree trimming in last 3 years. Need better coordination and education to homeowners.
HB-5	Other	Almost too much info to assimilate.
	2-Other	Do maps show worst-case height of wave-how high?
	4-Other	Is the forest growing in the Santa Ana River @ Adams going to be cleared?
	5-Other	We are also sitting behind the post office on Warner.
	6-Other	Are all the damage estimates for a "great" quake-how large?
	Other	Almost too much info to assimilate.
HB-6	2-Other	My house is 63 feet above sea level and is not at risk for tsunamis, but 89,000 of our residents are.
	3-Other	My house at 63 feet above sea level has dry substrata not liable to be affected by subsidence! That is one reason we moved there!

Card #	Strategy #	Comments
HB-6	4-Other	Our house is not in the inundation area from dam failure.
	5-Other	1938 was an El Nino year, I was 11, and you couldn't play outside cause of continuous rain. Lightning strike blew a hole 1" deep in the street 30 feet from our house.
HB-7	1-Other	Publish recommended building upgrades to mitigate risks of windstorms, not necessarily change the building codes.
	2A	Good idea to purchase siren system. Maybe also should publish tsunami danger map.
	3B, 3C, 3D, 3E	Hazard Mitigation is a good idea.
	4B	Need to include map of dam failure impact area.
	5E	Support long-term mitigation sandbagging program and CERT training.
	6A, 6B, 6C	Good ideas on the alternatives. CERT education good.
HB-8	Other	Thanks speakers and committee members great job!
	1C	Very good idea about finding about generators that area available. To whom will this be available?
	2A	Good idea for Edwards Station.
	3A	Good idea to add to CERT. How are you going to let the public know?
	5-Other	Thanks to Cecil Wright
	6A	Hope you get it approved!
HB-9	2A	How much to fund the Edwards station siren-warning apparatus?
	5A	5A & 5B have the projects on each list been prioritized individually?
HB-10	1A	Public education program are essential to mitigation of hazards.
	2A	Complete warning system essential for all potential disasters.
	3A, 3C	General education about subsidence.
	4A	Complete Mainstem project.
	5A, 5B	Upgrades pump stations and storm drains.
HB-11	1B	I think this is very important and we seemed to forget about this.
	1C	Good Idea
	2A	Let's do this soon.
	2B	Good idea
	3A, 3B	Good do it soon.
	3C, 3E	Do it right away
	5A	How can we afford this?
	5E	This seems reasonable.
	6A	Do it quickly
	6C	Get HAZUS
	6E	This is easy and important
HB-12	3B	Explosion of Power Plant on PCH (electrical can cause subsidence and all sorts of problems)
	5D	Need more flood channels in HB
	6B	Very concerned about Power Plants in HB and are they being checked for safe running. They are emitting carbon throughout own neighborhood causing cancer.

Card #	Strategy #	Comments
HB-13	1-Other	Education and public awareness
	2-Other	Public awareness and education
	3A	Need to be done before any other strategies will be accepted by the community.
	4-Other	Public awareness and education.
HB-13	5-Other	Public awareness and education.
	6E	Great idea, how soon can this and all the other education efforts be in place.
HB-14	3-Other	School sites again a priority due to # of personnel in a small area
	6-Other	Seismic retrofits at school sites are a priority.
HB-15	General	I believe that the plan should contain a section incorporating all comments received from the general public comment with responses to each comment. This would provide evidence that the plan was subject to public review and will also provide feedback to those people who took the time to comment. Comments with responses may also generate additional thoughts appropriate for the plan. Although during the presentation, pre-disaster mitigations were highlighted as a significant means to control costs of disaster assistance, I feel that most of the mitigations lacked substantial actions to truly lessen accomplish this. I believe that additional effort should be spent developing more specific mitigations for pre-disaster improvements that will reduce the cost of disaster assistance.
	1-General	Although mitigations included dissemination of information that could lead to more appropriate tree trimming that would lessen the potential for damages form branches during heavy winds, there was no action to require implementation of such recommendations by the City relating to all trees located on public property. Since this is a City of Huntington Beach Plan, it is appropriate to include directives for City departments that yield results. The mitigation could also be expanded to include training for residents desiring to do their own trimming. In addition, requiring training for local tree trimming companies may also be appropriate.
	2-General	Mitigations included the use of existing sirens to warn the public of impending dangers and the installation of a new siren at the Edwards Fire Station. Although a comment was made regarding the regular testing of existing sirens, I must say that I have never heard a siren as a result of these tests even though I have been a resident since 1978. I believe that the City should initiate a testing program to ensure that all residents can hear the sirens and that this should be include as a mitigation step.
	3-General	Although actions are being taken to repair damage from subsidence, the mitigations lacked substantial actions for pre-disaster mitigation. I believe that a new mitigation should include a requirement to review building codes to ensure that existing codes are sufficient to prevent anticipated damage. Existing construction techniques are available to resist the type of subsidence as shown on slides during the meeting. In addition, since subsidence damage to facilities owned and operated by the County of Orange, such as Prado Dam, can lead to catastrophic damage in Huntington Beach, I recommend that you include a mitigation requirement for an appropriate City Engineer to audit actions taken by the County as part of their Hazard Mitigation plan. To ensure that appropriate actions are being undertaken to protect residents of Huntington Beach.

Card #	Strategy #	Comments
HB-15	4-General	Although dredging is an important part of maintaining the flow of capacity of City and County channels, dredging has not always been completed when necessary. For Ex. The dredging and clearing of the Santa Ana River is years behind schedule and could have resulted in significant flooding had heavy rains occurred during the past season. I believe that a mitigation should include a review of dredging schedules for those channels under City control and that a funding mechanism be established to ensure that funds are available when dredging is required. In addition, due to the potential catastrophic impacts of deferred dredging of the Santa Ana River, I recommend that a mitigation be included that requires the City to take an active role in working with the County of Orange to ensure that dredging of the Santa Ana River is completed as scheduled. Since lack of funding is routinely faulted for delays, a funding mechanism should be included in the County Hazard Mitigation Plan to ensure that sufficient money is available to complete dredging when required. This could easily be accomplished by the use of an accrual fund that sets aside a portion of funds each year, thereby providing the total funds needed when dredging is required.
FV-1	1A	Seasonal mailing in water bill to remind people what to do to prepare for winds. Same information on City website, Neighborhood Watch newsletter and Fountain Pen.
	4-Other	Alert public to shortfalls in funding both from the state subvention and inadequate federal funding. Contractor may walk away from Prado project.
	5-Other	Why isn't east Wintersburg channel at top of list? Only problem that faces Fountain Valley.
	6A	First potential development of soaring elevated highway over only major flood control channel. Leveraged disasters.
FV-2	1B	Should be top priority as they can do the most good in area of implementation.
	3B, 3C, 3D	Grant writing needs to have experts who are trained in field so that the cities can benefit quickly.
	5A	Pump stations/flood control channels upgrades to be top priorities and meeting FEMA standards.
	6B, 6D, 6E	Need house plans to assist personnel accountability public awareness to assist individual response.
FV-3	3-Other	Consider the FVPD, which is on alluvial sand. Potential for flooded basement and sinking during earthquake.
	4-Other	What will keep FVPD dry in a flood from dam failure?
	6-Other	Back up communication between FD, PD & City to coordinate rescue efforts, think ham radio resources.

5. Multi-Jurisdictional Participation

(a) OCEMO

The Orange County Emergency Managers Organization (OCEMO) meets monthly to prepare Orange County public agencies for disasters. OCEMO is comprised of representatives from all jurisdiction in Orange County. These representatives include: County, Cities, Special Districts, School Districts, and the American Red Cross Orange County Chapter. Developing a Natural

Hazards Mitigation Plan is a major concern of all agencies. Each month, OCEMO met and discussed the Hazard Mitigation Plan and its affect on the jurisdictions. At each meeting a different topic was discussed. See Hazard Mitigation Meetings and Events (Part 1-C-6) for dates.

In the year 2003, in preparation for the Hazard Mitigation Plan, OCEMO formed the Orange County Emergency Operations Plan Committee. The County and 23 Cities developed and updated their EOP's together. The year long committee spent six months, meeting twice per month, discussing hazard analysis. The 24 agencies completed an in-depth hazard analysis for Orange County with each agency researching a different hazard and presenting their findings to the group.

(b) State Office of Emergency Services (OES)

The State Office of Emergency Services (OES) was helpful in each step during the Hazard Mitigation plan writing process. OES presented Hazard Mitigation Workshop 1 held in Rialto on August 7, 2003 and in Orange County on September 9, 2003. Both workshops discussed the Disaster Mitigation Act 2000, pre- and post-disaster funding, and mitigation grants. OES representatives Frank Hauck, Ken Leep, Marsha Renchler, and Linda McClanahan were always available via email.

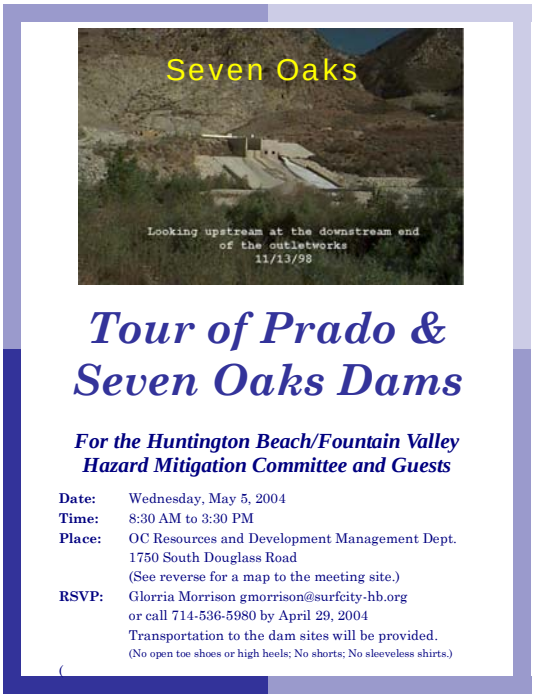
(c) Federal Emergency Management Agency (FEMA)

FEMA was also helpful in the hazard mitigation planning process. In August 2003, FEMA announced it was accepting applications for the Hazard Mitigation planning grants. This grant was a competitive grant written to supplement staff time in developing the Hazard Mitigation Plan. On April 8, 2004 FEMA announced by press release the nine California public agencies that had received the grant. The City of Huntington Beach, City of Fountain Valley, and four School Districts partnership were awarded $135,000 by FEMA with 25%City matching funds ($101,250 from FEMA).

Also, FEMA published and provided at no cost the Hazard Mitigation 386 Series. The City of Huntington Beach ordered 25 of the books and they arrived within a week. The books were distributed to the County-wide OCEMO Hazard Mitigation Committee. The 386 Series was very helpful and utilized on a daily basis. The 386 Series is a "how to guide" for writing Hazard Mitigation Plans. An Engineer on our Hazard Mitigation Committee referred to the 386 Series at every meeting and used it for the Hazard Assessment and Vulnerability study. ***The Hazard Mitigation Plan could not have been written without the guidance provided from the 386 Series.***

(d) Tour of Prado Dam and Seven Oaks Dam

On May 5, 2004, the Hazard Mitigation Planning Committee was given a tour of Prado and Seven Oaks Dams as part of the Committee's study of dam failure. Rick Benitez (Public Works Maintenance Supervisor & Dam Safety Inspector of the Orange County Resources Development and Management Department) gave the tour. Rick is the Prado Dam Manager and knowledgeable on the day-to-day activities of the dams as well as the Prado Dam and Seven Oaks Dam Emergency Response Plans. Rick explained how the daily releases of water from the dams affect the Santa Ana River which flows through Fountain Valley and Huntington Beach and out into the Pacific Ocean in Huntington Beach.



Rick also explained the response protocol in case of dam failure. A failure could cause catastrophic damage from a 15 mile wide wall of water and devastate both jurisdictions and all four School Districts.

The tour was excellent and was the basis for the Dam Failure report. See Dam Failure tour flyer above.

6. Hazard Mitigation Meetings and Events

Date	Time	Participants	Purpose/Discuss
1/16/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/DMA 2000 the law
2/20/2003	1:00-3:30 PM	OCEMO& County Members	Plan Writing/ Understanding the law
3/6/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/ Which jurisdiction will write a plan?
3/20/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Profiling County hazards
4/3/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Hazard Analysis
4/17/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Prioritizing Hazards
5/1/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Recruiting hazard speakers
5/15/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Earthquake
6/1/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Flood
7/3/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Landslides
7/17/2003	1:00-3:30 PM	OCEMO & County Members	Plan Writing/Tsunami
8/7/2003	8:00-4:00 PM	State OES and Southern California Public Agencies	OES Workshop 1/DMA 2000
8/19/2003	2:00-4:00 PM	HB/ FV School Districts & HB Emergency Services	Hazard Mitigation/ Schools participating in HB/FV Plan
8/21/2003	1:00-3:30 PM	OCEMO & County Members	Hazard Mitigation/ creating an Orange County Committee
9/4/2003	8:00-4:00 PM	State OES, and Southern California Public Agencies	OES Workshop 1/DMA 2000
10/2/2003	1:00-3:30 PM	OCEMO & County Members	County Hazard Mitigation Plans/FEMA guides
10/9/2003	1:00-3:30 PM	OCEMO & County Members	County Hazard Mitigation Plans /Plan of Action
11/6/2003	12:00-3:30 PM	OCEMO & County Members	County Hazard Mitigation Plan/Existing plan approved by FEMA Clackamas County, Oregon
12/9/2003	8:30-10:00 PM	OCEMO & County Members, Private Contractor	Contracting out the County Hazard Mitigation Plan/ Money, Constraints, Time, Personnel
1/20/2004	2:00-4:00 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/ Establishing a Committee, DMA 2000, Hazard Analysis
1/27/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/Committee briefing, Oversight input
2/2/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
2/12/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/ Results of Hazard Analysis, Focus on Natural hazards, Bylaws, Tracking hours, Becoming an official committee

Date	Time	Participants	Purpose/Discuss
3/1/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
3/11/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/ Windstorms report, Public Assets, FEMA Worksheet 3a, Maps needed, Time line, Plan Components
3/15/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
3/29/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
4/8/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/Tsunami report, Public Participation, Profiles.
4/12/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
4/20/2004	9:00-10:00 AM	Huntington Beach Fire Dept./Fountain Valley Fire Dept, & Southern California Edison Staff	HB/FV Hazard Mitigation Plan/Energy Statistics, tree failure impacts, Natural Hazard impacts to Edison
4/26/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
5/5/2004	8:00 AM to 4:00 PM	Hazard Mitigation Committee, County Public Works	Tour of Prado & Seven Oaks Dam; dam failure threat to HB and FV
5/10/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
5/13/2004	3:00-4:30PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/Dam Failure & Flood report, Community Profiles, Community Forums
5/24/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/Committee briefing, Oversight input
6/7/2004	9:00-10:00 AM	Fountain Valley Oversight Committee & Fountain Valley Plan Writers	HB/FV Hazard Mitigation Plan/ Committee briefing, Oversight input
6/10/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/Subsidence Report, Planning Process, School District Profiles
7/2/2004	10:00-11:00 PM	County Hazard Mitigation Workshop	County Hazard Mitigation Plan/Participants, timeline, and meetings
7/8/2004	3:00 AM and 4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/
7/22/2004	7:00-9:00 PM	HB/FV Hazard Mitigation Planning Committee, Oversight Committee, and residents	Discuss Hazard Mitigation Plan/ Obtain Public input

Date	Time	Participants	Purpose/Discuss
8/5/2004	7:00-9:00 PM	HB/FV Hazard Mitigation Planning Committee, Oversight Committee, and residents	Discuss Hazard Mitigation Plan/ Obtain Public input
8/12/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/
9/9/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/
9/30/2004	9:00 AM	HB/FV Hazard Mitigation Planning Committee	Mail the Plan to OES & FEMA
10/4/2004	5:00-5:30 PM	HB City Council & Fire Department	Special Study session presentation of the Hazard Mitigation Plan
10/5/2004	7:00-9:00 PM	FV City Council & Fire Department	Council Study Session and presentation of the Plan
10/14/2004	3:00-4:30 PM	HB/FV Hazard Mitigation Planning Committee	HB/FV Hazard Mitigation Plan/plan distribution to committee members
10/18/2004	7:00-9:00 PM	HB City Council & Fire Department	Council adoption of the Hazard Mitigation Plan
10/19/2004	7:00-9:00 PM	FV City Council & Fire Department	Council adoption of the Hazard Mitigation Plan
10/19/2004	7:00-9:00 PM	HBCSD, HBUHSD, OVSD, and FVSD School Board Meetings	School Board approvals of the Plan

7. Plan Distribution List

Agency	# of Copies
City of Huntington Beach	25
City of Fountain Valley	20
Huntington Beach City School District	5
Huntington Beach Union High School District	5
Ocean View School District	5
Fountain Valley School District	5
Orange County Operational Area	1
State of California Office of Emergency Services	1
Federal Emergency Management Agency	1

8. City Council/School Board Resolutions

The following page contains a copy of the jurisdiction's resolution approving the Hazard Mitigation Plan.

Part II-A

Community Profile
City of Huntington Beach
Table of Contents

A. OVERVIEW 1
B. POPULATION AND DEMOGRAPHICS 2
C. GEOGRAPHY AND THE ENVIRONMENT 4

Exhibit II-A-1: Map of Huntington Beach with Reporting District Grids 6

Exhibit II-A-2: Huntington Beach Elevation Ranges 7

D. CLIMATE 8
E. LAND AND DEVELOPMENT 9
F. PARKS AND LIBRARIES 9

Exhibit II-A-3: Huntington Beach Library Map 10

Exhibit II-A-4: Huntington Beach Parks and Recreational Facilities 11

G. HOUSING AND COMMUNITY DEVELOPMENT 12
H. EMPLOYMENT AND INDUSTRY 13
I. TRANSPORTATION 16
J. MAJOR FACILITIES IN THE CITY 18
K. HISTORICAL DISASTER EVENTS 22
L. ESSENTIAL SERVICE FACILITIES 24

Exhibit II-A-5: Huntington Beach Essential Services Map 26

M. GOVERNMENT FACILITIES (NON-CITY) 27

Exhibit II-A-6: Huntington Beach Government Facilities 28

N. UTILITIES 29
O. SOCIAL, CULTURAL AND ENVIRONMENTAL ASSETS 34
P. DEVELOPMENT TREND 36

(This page intentionally left blank)

City of Huntington Beach

A. Overview

Huntington Beach, also known as *Surf City*, is a coastal city along the Pacific Ocean. It has an area of 27.7 square miles and 8.5 miles of beachfront and is located 35 miles southeast of Los Angeles.

The City of Huntington Beach is rich in history. The oil boom of the 1920s contributed to its development and identity, but the City remained relatively small and quiet until the 1960s. From 1960 to 1970, Huntington Beach was one of the fastest growing cities in the nation with a population increase from 11,492 to 115,960.

On busy beach days, 100,000 additional visitors populate the City. Two annual events the increase the population by up to 150,000 persons they are the Fourth of July Parade & Fireworks and the Surfing Championships. According to 1994 FBI crime statistics, the City was awarded "America's Safest Big City" with a population over 100,000. For decades Huntington Beach has often been ranked among the Top Ten Safest Cities by City Crime Rankings.

The City has approximately 1,100 employees and a total budget of more than $300 million per year. The most recent data shows an average family household income of $101,579, highest in the nation based on the top 100 largest cities in the country. The median age is 37 and the average price for a home is $606,000. The City's park system includes 58 public parks, riding stables, and the largest city-owned and operated regional park in Orange County. There are three miles of equestrian trails, two golf courses, 72 tennis courts, a marina, and protected wildlife preserve. There are 35 elementary schools, and five high schools, and Golden West Junior College. Huntington Beach draws some of the largest crowds in the world to such professional sporting events as the US Open of Surfing, Van's World Championship of Skateboarding, and AVP Pro Beach Volleyball Championships.

City leaders are dedicated to preserving and enhancing the natural beauty along the coastline and throughout the City. Following the American Trader Oil Spill of 1990 (in which 400,000 gallons of crude oil were spilled at the coast) the environmental concerns and awareness by the community became and remain a City priority.

The Encyclopedia4U states, "Huntington Beach is one of the most emergency-prone settled areas on the West Coast of the United States." The City sits on the Newport-Inglewood Fault Zone, is at the mouth of the Santa Ana River, has areas below sea level, and is a coastal city with severe winter storms and water spout/tornados. The City of Huntington Beach has made disaster preparedness, mitigation and public education a high priority due to its vulnerability. This plan reflects the ongoing commitment of the City to prevent or mitigate hazards that face our community.

B. Population and Demographics

Huntington Beach has a population of 197,000. The population growth of the City of Huntington Beach has slowed since 1970. The City is 98% built-out and by 2020 is expected to peak at 230,000.

With the addition of several large hotels on the coast, the tourist population in Huntington Beach is on the increase. On a summer day, it is not unusual to have an additional 100,000 persons visiting the City, most in the downtown area and on the beach. Being a resort town, most of the population increase is seasonal, between the months of April (spring vacation) and the end of September.

The dense population could be significantly impacted during an earthquake. The City of Huntington Beach sits directly on the Newport-Inglewood Fault. Seven sub-faults traverse the City. The damage caused by an earthquake in this densely populated, high priced property would be tremendous. In addition, the secondary hazards of fire, hazardous materials incidents and building collapse due to liquefaction could be devastating. In the early 1990s, an article in the Los Angeles Times called the Newport-Inglewood Earthquake "The Bigger One." An earthquake on this fault is the City's worst-case scenario.

In the 1987 publication, Fire Following Earthquake issued by the All Industry Research Advisory Council, Charles Scawthorn explains how a post-earthquake urban conflagration would develop. The conflagration would be started by fires resulting from earthquake damage, but made much worse by the loss of pressure in the water mains, caused by either lack of electricity to power water pumps, and/or loss of water pressure resulting from broken water mains. The alluvial soils could cause serious liquefaction increasing the problems with broken gas and water mains.

Furthermore, increased density can affect risk. For example, narrower streets and alleys (such as in the downtown area) are more difficult for emergency service vehicles to navigate. The higher ratio of residents to emergency responders affects response times, and homes located closer together increase the chances of fires spreading. In addition, high-rise hotels make firefighting more difficult requiring many additional resources.

The City of Huntington Beach is experiencing a great deal of in-fill building, which increases the population density and creates greater service loads on city services and especially public safety personnel. This puts a drain on the built infrastructure, including roads, water supply, sewer services, and storm drains. The City attempts to keep the infrastructure on pace with the population increases, however, funding is not always available to do this.

Natural hazards do not discriminate, but the impacts in terms of vulnerability and the ability to recover vary greatly among the population. According to Peggy Stahl of the Federal Emergency Management Agency (FEMA) Preparedness, Training, and Exercise Directorate, 80% of the disaster burden falls on the public, and within that number, a disproportionate burden is placed upon special needs groups: women, children, minorities, and the low-income.

According to the latest census figures from American Fact Finder, the demographic breakdown of the City is as follows:

Huntington Beach Demographics

	Huntington Beach	Percent	U.S.
Caucasian	150,194	79.2%	75.1%
Hispanic	27,798	14.7%	12.5%
Asian	17,709	9.3%	3.6%
Black or African American	1,527	0.8%	12.3%
American Indian or Alaska Native	1,224	0.6%	0.9%
Average Household Size	2.56		2.59%
Average Family Size	3.08		3.14%
Total Housing Units	75,662	100%	
Occupied housing units	73,657	97%	91.0%
Owner-occupied housing units	44,658	60%	66.2%
Renter-occupied housing units	28,999	39%	33.8%

The ethnic and cultural diversity suggests a need to address multi-cultural needs and services.

Social Characteristics

Education	Huntington Beach	Percent	U.S.
High school graduate or higher	118,233	89.6%	80.4%
Bachelor's degree or higher	31,364	36.0%	24.4%
Other			
Civilian Veterans (25+ yrs)	16,695	11.3%	12.7%
Disability Status (21-64 yrs)	16,379	13.5%	19.2%
Foreign Born	32,155	16.9%	11.1%
Not Married (15+ yrs)	81,457	52.8%	54.4%
Speak non-English at home	39,106	21.9%	17.9%

Economic Characteristics

	Huntington Beach	Percent	U.S.
In Labor Force (16+ yrs)	107,133	70.5	63.9%
Mean Travel Time to Work	28.7		25.5%
Median Household Income ($)	64,824		41,994
Median Family Income ($)	74,378		50,046
Per Capita Income ($)	31,964		21,847
Families Below Poverty Level	2,081	4.3	9.2%
Individuals Below Poverty Level	12,442	6.6	12.4%

Housing Characteristics

	Huntington Beach	Percent	U.S.
Single-Family Owner-Occupied	37,527	100.0	
Median Value ($)	$606,000		119,600

The percentage of poverty in the City of Huntington Beach (6.6%) is about half that of the US average (12.4%). Vulnerable populations, including seniors, disabled citizens, women, and children, as well as those people living in poverty, may be disproportionately impacted by natural hazards. Because of this, Huntington Beach will make it a priority to alleviate and lessen hazards in the low-income areas of the City.

Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural disasters identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

The cost of natural hazards recovery can place an unequal financial responsibility on the general population when only a small proportion may benefit from governmental funds used to rebuild private structures. Discussions about natural hazards that include local citizen groups, insurance companies, and other public and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

C. Geography and the Environment

The City is bordered by the Pacific Ocean to the south and west, by Seal Beach on the northwest, by Newport Beach on the southwest, by Westminster and Fountain Valley on the north, and Costa Mesa on the east.

The City is served by the 405 freeway which follows the northern boundary of the City. The two major arterial highways through Huntington Beach are Pacific Coast Highway which follows the coastline on the west and Highway 39/Beach Boulevard which is a

north-south major transportation highway. These two highways are especially busy in summer months when tourists come to the beach.

The terrain of the City is flat. Elevations in the City range from a maximum of 100 feet above sea level to below sea level in the south end of Huntington Beach. On the southeast side of Huntington Beach the elevation is only 5-20 feet above sea level where the City of Huntington Beach meets the City of Fountain Valley. The south end of town is where the Santa Ana River flowed naturally before flood channels were built. Huntington Beach is famous for its long beautiful beaches, mild climate, and excellent surfing. The waves are a unique natural effect caused by edge-diffraction of ocean swells by the Catalina Islands. Because the coast curves so strongly eastward, the local beach actually faces south. This unique feature makes it one of the most pleasant, sunny beaches of the West Coast of the United States but increases its chances for coastal storms.

The Huntington Harbour, an affluent Venice-style enclave with over 5,000 homes valued in the millions of dollars each, 3,500 pleasure boats, and commercial property, is on the back channels of Anaheim Bay. The harbor was carved from wetlands four decades ago. The United States Navy (owner of Anaheim Bay) can restrict access to the harbor when munitions are loaded at the adjacent Seal Beach Naval Weapons Station, during actual terrorist incidents, or during times of national security increased threat levels. The Bolsa Chica Flood Channel empties into the Anaheim Bay-Huntington Harbour complex. The East Garden Grove-Wintersburg Flood Channel drains through Bolsa Bay into Huntington Harbour. Huntington Harbour consists of eight islands:

- Admiralty
- Gilbert
- Davenport
- Huntington Harbour Mainland
- Humboldt
- Coral Cay
- Trinidad
- Faire Marin

Bordering the northern edge of the harbor is a marsh known as the Bolsa Chica Wetlands. Ongoing disputes between land owners/developers and local conservationists regarding the development of the Bolsa Chica have dominated area politics for years. The City, the Coastal Commission, and the citizens of Huntington Beach are working together to try to maintain the site.

Huntington Beach sits above a large natural salt dome containing oil. Although the oil is mostly depleted, extraction continues at a slow rate and still provides some local income. There are several off shore extraction facilities. The City has an offshore oil terminus for the tankers that support the Alaska Pipeline. The terminus pipes run under Goldenwest Street to an inland oil storage facility at Gothard Street and Talbert Avenue, the second largest oil storage facility on the West Coast.

Exhibit II-A-1: Map of Huntington Beach with Reporting District Grids

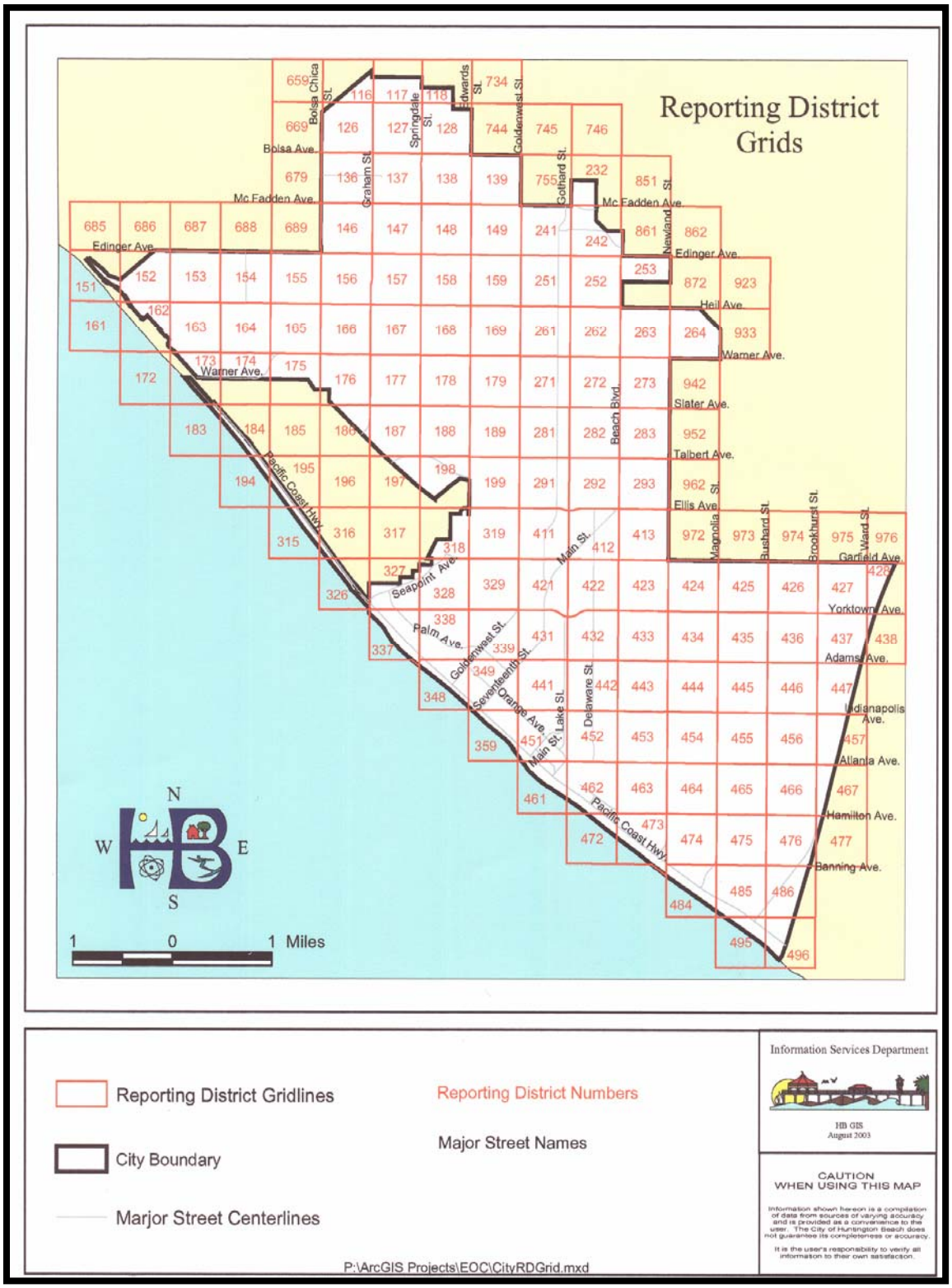
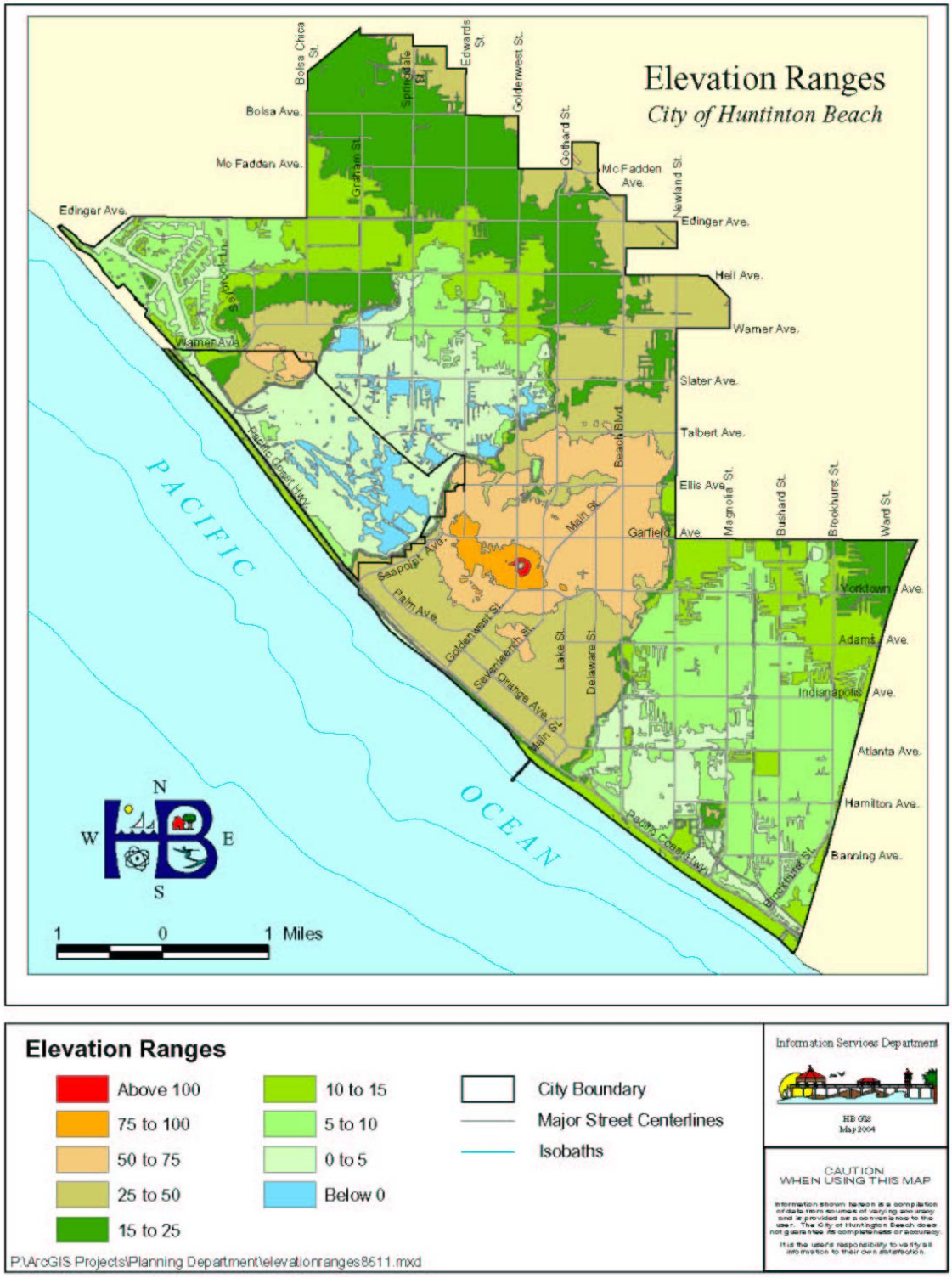


Exhibit II-A-2: Huntington Beach Elevation Ranges



D. Climate

Weather conditions for Huntington Beach are consistent with coastal Southern California. It is a semi-arid region, which experiences an average of 10-12 inches of rainfall during the winter months and has warm, dry summers. Temperatures are mild throughout the year. The continuing threat from severe winter storms is greatest from December to March. The threat from tropical storms is greatest August through October as the result of hurricanes from Mexico. The southwest-facing beach positioning can cause Huntington Beach to receive the surf and wave impact from both winter and summer storms. Heavy rains combined with high tide and rough surf create an increased potential for flooding.

Sporadic downpours characterize rainfall in Southern California. Rainfall patterns are inconsistent and might be described as feast or famine within a single year. Because the City is largely built-out, water originating in higher elevation communities can have a sudden impact on adjoining communities that have a lower elevation. Huntington Beach receives the runoff from San Bernardino, Riverside, and inland Orange County. This runoff comes down the Santa Ana River and out to the Pacific Ocean. Some areas close to the mouth of the river are below sea level and water must be pumped from City flood channels up to higher-level County flood channels and into the Santa Ana River.

Minerals and Soils

Coastal areas are made up primarily of alluvial type soils, subject to intensive ground shaking and liquefaction. Much of the City is built on peat varying in thickness from a few inches to a few feet. This is the reason that subsidence is persistent throughout the low-lying areas. The Huntington Harbour area and the lowlands of the Bolsa Chica Wetlands may also be subject to liquefaction.

Other Significant Geologic Features

Huntington Beach lies over an area of known earthquake faults, and potentially many more unknown faults, particularly so-called lateral or blind thrust faults. The major faults that have the potential to affect the City of Huntington Beach are the:

- San Andreas
- Newport-Inglewood
- San Joaquin Hills Fault
- Palos Verdes
- San Clemente

Southern California has a history of powerful and relatively frequent earthquakes, dating back to the powerful 8.0+ San Andreas earthquake of 1857 which did substantial damage to the relatively few buildings that existed at the time. Paleoseismological research indicates that large (8.0+) earthquakes occur on the San Andreas Fault at intervals between 45 and 332 years with an average interval of 140 years. Other lesser faults have also caused very damaging earthquakes since 1857. Notable earthquakes include the Long Beach earthquake of 1933, the San Fernando Earthquake of 1971, the

1987 Whittier Earthquake, and the 1994 Northridge Earthquake. The 1933 Long Beach Earthquake epicenter was in the Huntington Harbour area of Huntington Beach. Due to the sparse population in 1933, the earthquake did not have a significant impact on life and property. Central School (located on the site of Dwyer Middle School today) had to be demolished due to earthquake damage and Main Street had damage to the unreinforced brick buildings. Today, an earthquake of this magnitude would cause considerable damage.

E. Land and Development

The City of Huntington Beach General Plan addresses the use and development of private land, including residential and commercial areas. This plan is one of the City's most important tools in addressing environmental challenges including transportation and air quality, growth management, conservation of natural resources, clean water, and open spaces.

The City's 17,730 acres, or 27.7 square miles, is 98% developed with residential, commercial, industrial, institutional, public uses, and streets/highways. The remaining 2% of the land within the City boundaries is vacant. Residential is the largest single land use of which single family units represent the majority of all housing. As is described in the section below in more detail, the residential neighborhoods are structured as large super blocks throughout the City focusing on a school and/or park. The City's major commercial areas are generally located along the major streets, at major intersections, and in the downtown area. Industrial areas are generally developed into large centers in the northwest part of the City, as a linear corridor along Gothard Street, and adjacent to the coastal frontage in the southeast and southwest.

The environment of most Orange County cities is nearly identical with that of their immediate neighbors and the transition from one incorporated municipality to another is seamless to most people. Seamless too are the exposures to the natural hazards that affect all of Southern California. The areas this plan describes (the Cities of Huntington Beach and Fountain Valley) have many comparable hazards. In the past, Orange County was a suburb of Los Angeles. However, in recent years with the population explosion and increased density, Orange County has become its own busy metropolis known world wide for Disneyland, Knott's Berry Farm, Angel Stadium of Anaheim, the Anaheim Convention Center, the Pond, South Coast Plaza, and the beaches of Laguna, Newport and Huntington Beach. Orange County is one of the most sought after areas to live and visit in the United States and is known for mild weather, low crime, and outstanding tourist destinations.

F. Parks and Libraries

Huntington Beach contains 71 parks which encompass 577.28 acres. These include six mini parks totaling 2.7 acres, 58 neighborhood parks totaling 157.39 acres, seven community parks totaling 143.28 acres, and two regional parks (Huntington Central Park and Blufftop Park) encompassing 274 acres. Regional facilities adjacent to

Huntington Beach include Sunset Aquatic Park in Seal Beach (95 acres/260 boat slips), Mile Square Park in Fountain Valley (632 acres), and Bolsa Chica Ecological Preserve in Orange County (300 acres).

The future parks to be developed are as follows:

a. Four neighborhood parks will be developed with the Holly-Seacliff Specific Plan.
b. The proposed Harriett M. Weider Regional Park will link the Central Park with the Bolsa Chica State Beach.
c. The five acre Gibbs Park has a natural eucalyptus grove. This grove, which covers approximately 60% to 70% of the site, is a passive park with interpretive elements.
d. The 30 acre Bartlett Park with the historic Newland House, will be further developed, although the City has not determined what facilities will be established. Irby Park, an 11-acre site, has three developed acres and the City intends to develop two additional acres. Although City Council has authorized surplusing the additional acreage, it has not been sold due to the extreme peat condition of the soil.

Huntington Central Park is 370 acres of which 220 acres are developed. The remaining 150 acres are included in the 1994 Master Plan of Uses in Central Park.

Huntington Beach has one of the finest libraries in the country. A Central Library is located on Talbert at Golden West Street and four smaller library annexes are strategically located throughout the City.

Exhibit II-A-3: Huntington Beach Library Map

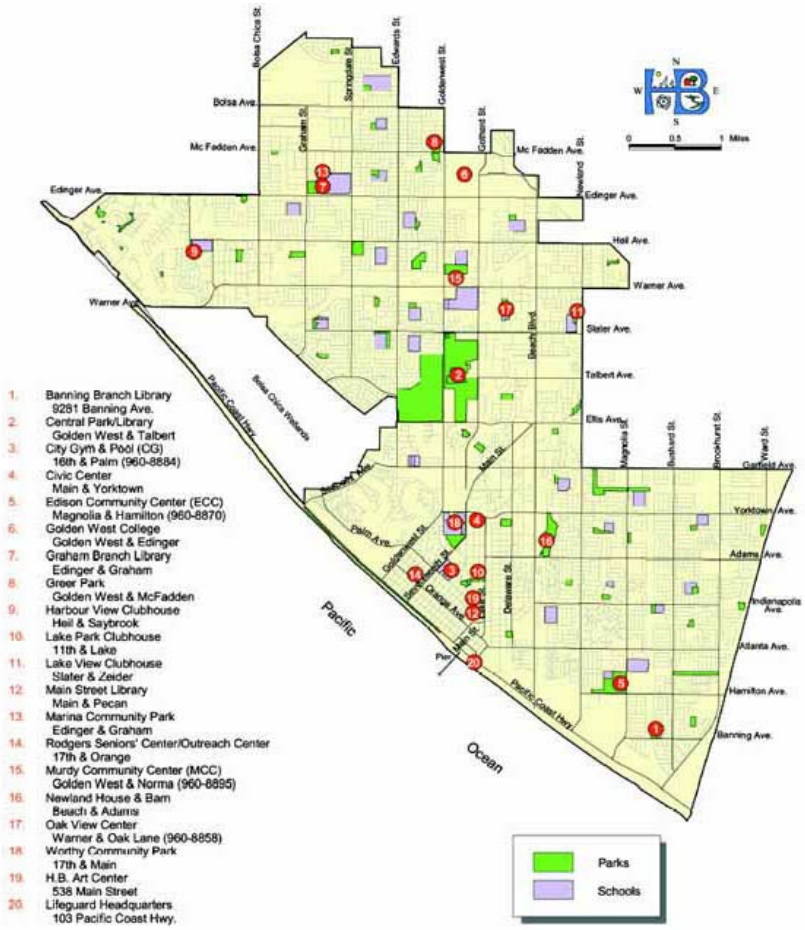
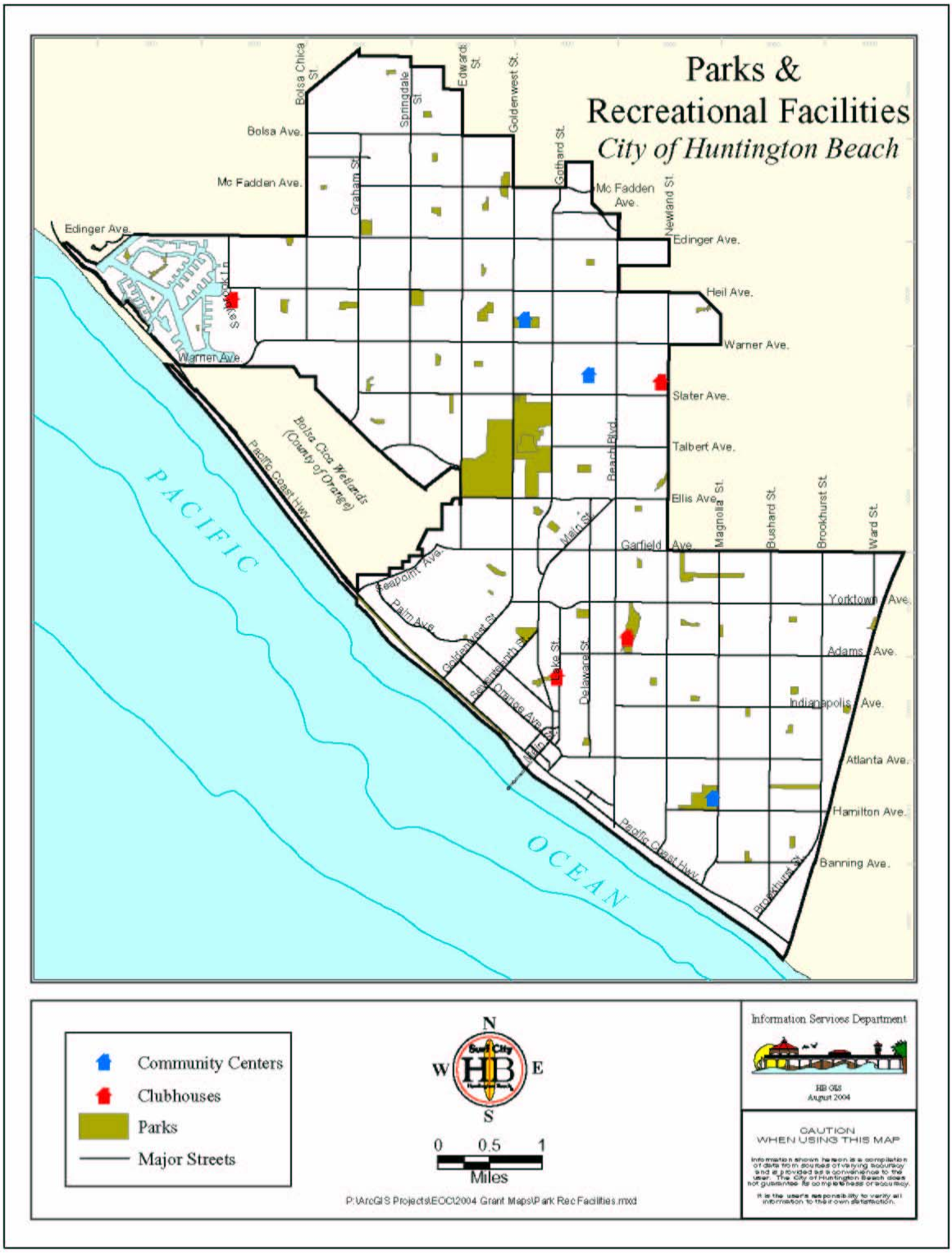


Exhibit II-A-4: Huntington Beach Parks and Recreational Facilities



G. Housing and Community Development

Huntington Beach is a suburban community of 197,000 residents with approximately 77,800 dwelling units comprised of 60% detached single-family residences, 36% multi-family residences, and four percent mobile homes. (Some housing statistics provided here are inconsistent with the General Plan statistics provided earlier in the plan because they come from different sources or are more up-to-date.) Residential is the largest single land use in the city. Residential neighborhoods are large "super blocks" generally defined by one-mile arterial grids. Multi-family residential uses are concentrated in several areas including: Huntington Harbour, downtown, along portions of Warner Avenue and Beach Boulevard, and near major intersections citywide. There are also 21 mobile home parks scattered throughout the City.

Most of the City's residential development occurred between 1960 and 1979. During the 1960s vacant land was plentiful and housing construction was characterized almost exclusively by large tracts of single-family homes. During the early 1970s condominium developments and small multi-family rental units became popular in response to changing housing demands, land constraints, and market conditions.

From 1980 to 1990 the housing stock grew by 14%. Apartments and condominiums, lower density duplex and triplex units, and some single-family dwellings characterized housing growth in the 1980s. During that time, the number of mobile homes increased significantly by about 20%, from 2,667 units in 1980 to 3,200 units in 1990. According to the Census, the City's housing stock in 1990 included 72,736 units and had grown by only 4% to 75,662 units in 2000. The City is now nearly built-out with relatively little vacant land remaining for new development.

In the City of Huntington Beach, the demand for housing outstrips the available supply, and the recent low interest rates have further fueled a pent up demand. Over the last three years homes have doubled in price in most of Orange County. Demand for low to medium priced homes continues to be strong. The average value for homes in Orange County as of May 7, 2004 is $606,000 with coastal areas being the highest.

To address development issues, the Planning, Building, and Economic Development Departments have engaged in activities that promote the quality of life for the citizens of the City of Huntington Beach. On December 18, 2000, the City produced the Community Development Chapter, 2000-2005 Housing Element to address City housing issues.

The City participates in the Community Development Block Grant (CDBG) program. The primary resource available to address non-housing community development needs is the CDBG. The CDBG is a yearly allocation of funds from the US Department of Housing and Urban Development (HUD). The CDBG requires that 70% of funds expended must benefit persons of 80% median income or less. The program requires citizen participation in developing the City's Consolidated Plan.

The City of Huntington Beach also receives a yearly allocation of funds from HUD for the HOME Investment Partnership Program. These HOME funds are used for acquisition and preservation of affordable housing for low-moderate income residents. Staff reviews individual projects with the Economic Development Committee and, after receiving a positive recommendation, the projects are sent to City Council for consideration. The Enhancement Areas, determined by Census 2000, are the City's eight geographic areas eligible for CDBG activities. Projects located in these areas must be for the general benefit of the residents. Citywide activities and services are available to residents who meet HUD income standards.

Gradual changes in the City's profile can increase the impact of disasters. One of these changes is an increase in population whereby population density increases hazard exposure. Economic changes like inflation increase the value of the real property and permanent improvements thus placing additional financial burden on the City and its residents and following disasters on insurance companies and FEMA. Finally, an increase in the amount of property owned per capita can place additional mitigation and recovery hardships on property owners, insurers, and FEMA. Additionally, information from the US Census Bureau shows gains in average housing standards.

Average Housing Standards 1975 vs 1998

Amount of Property per person	1975	1998
Increased Size of new homes	1,645 sq. ft.	2,190 sq. ft.
% of homes with 4+ bedrooms	21%	33%
% of homes with 2 ½ or more baths	20%	52%
Source: U.S. Department of Census		

When comparing the greatest recorded earthquakes in American history, and the level of population and development today with that which existed at the time of the event, the scale of potential damage is staggering.

Cost of Past Disasters in Today's Dollars

1906 San Francisco Earthquake M8.3 Significant fire following damage
Estimated insured damage, today's dollars - $36 Billion

1811-12 New Madrid Earthquake 1811-12, series of 4 Earthquakes over 7 weeks
Estimated insured damage, today's dollars - $88 Billion

H. Employment and Industry

As shown below, Huntington Beach's private and public sectors currently provide employment for approximately 60,800 people**,** primarily in the retail, service, manufacturing, and wholesaling sectors. The table also indicates that the City has experienced continual increases to its job base over the past 17 years. On average, 2,000 net new jobs have been added to the City's economy each year since 1975. The

City's compound annual rate of employment growth has been 4.9% over this same period. In addition, Huntington Beach has maintained a fairly consistent share (5.1-5.3) of the overall Anaheim-Santa Ana Metropolitan Statistical Area (MSA) employment base over these same years.

Wholesale sales grew at 50% over the most recent five year reporting period, down from its 75% growth during the previous five year period. The service area grew at 38% over the most recent five year period, down from 75% five years earlier. Retail sector declined 7%, whereas it was still increasing at 25% over the previous five years. The two main factors generally thought to have caused this reversal are the overall recession in the retail and real property industry and the increase in sales leakage seen in Huntington Beach. In the final area, Manufacturing, no data is available for the most recent five years, but this area grew at 49% during the previous five year period.

1992 Huntington Beach Employment

Employment by Business Type	Number of Employees
Retail Trade	15,069
Manufacturing	14,369
Business and Personal Services	10,411
Government	6,361
Wholesale Trade	4,759
Finance/Insurance/Real Estate	3,924
Construction	2,885
Transportation, Communications, and Public Utilities	2,611
Agriculture	250
Mining	200
TOTAL	**60,869**

Significant Business Sectors
Estimated Huntington Beach Employment

Significant Employment Categories	Number of Firms	Number of Employees
Retail Trade		
• Food Stores	82	1,640
• Eating and Drinking Places	394	7,092
• Auto Sales and Supplies	82	1,476
Subtotal	558	10,208
Percent of Total Retail	34.5%	72.0%
Services		
• Select Business Services	259	1,849
• Health Care Services	530	3,574
Subtotal	789	5,423
Percent of Total Services	18.5%	53.6%
Manufacturing		
• Aerospace	18	9,790
Subtotal	18	9,790
Percent of Total Manufacturing	3.5%	65.0%
Wholesaling		
• Industrial Machinery and Electrical Goods	175	1,093
• Sporting Goods, Toys and Photographic Supplies	75	940
Subtotal	250	2033
Percent of Total Wholesaling	46.0%	42.7%
Total for Significant Sectors	**1,615**	**27,454**
Percent of Total City Employment	**29.4%**	**45.1%**

Employment Growth
City of Huntington Beach and Santa Ana-Anaheim MSA

	1975	1980	1984	1987	1992	Total Growth Since 1975
Santa Ana-Anaheim MSA	568,600	843,800	959,500	1,100,500	1,209,300	640,700
Huntington Beach	26,724	44,452	48,731	58,091	60,869	34,145
Huntington Beach (as a Percent of MSA)	4.7%	5.3%	5.1%	5.3%	5.1%	5.3%

Average Number of Jobs Added Per Year (1975 to beginning of 1992)

- Huntington Beach 2,008
- Santa Ana-Anaheim MSA: 37,688
-

Compound Annual Rate of Job Growth (1975 to beginning of 1992)

- Huntington Beach: 4.96%
- Santa Ana-Anaheim MSA: 4.54%

The City business climate has been strong and growing. Mitigation activities are needed at the business level to ensure the safety and welfare of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from surrounding areas to industrial and business centers. This creates a greater dependency on roads, communications, accessibility, and emergency plans to reunite people with their families. Before a natural hazard event, large and small businesses can develop strategies to prepare for natural hazards, respond efficiently, and prevent loss of life and property.

I. Transportation

The City of Huntington Beach is the third largest city in Orange County. Over the past decade, the City has experienced very mild growth in population compared to the rest of Southern California.

Private automobiles are the dominant means of transportation in Southern California and in the City of Huntington Beach. However, the City of Huntington Beach utilizes the Orange County Transit Authority (OCTA) bus systems, as the primary mode of public transportation. In addition to this service, the City promotes alternative transportation activities such as ride sharing. The OCTA operates nineteen routes through the City and OCTA also operates the demand response services for the City through the “Dial-A-Ride” Program.

The City’s vehicular system is composed of a wide range of transportation facilities which serve two basic functions: mobility and land access. Mobility is defined as providing the ability for motorists to travel between their points of interest. Land access is defined as providing access to properties at the final destination which may include parking or driveway access.

Public Transit

Fixed route and demand responsive services currently exist in the City. Fixed route services are those transit lines that operate on regular schedules along a set route. Demand responsive services have defined service areas but do not operate on fixed routes or schedules.

Rail
The Southern Pacific Railroad right-of-way is generally located east of Gothard Street and extends from the northern City limits to its endpoint just north of Acacia Street. Presently, there is no plan to provide commuter rail service to the City. This corridor is being reserved by the City for future (but not yet planned) transportation facilities.

Bicycle Facilities
The City acknowledges the needs of bicycle enthusiasts and commuters by providing numerous bicycle facilities throughout the City. There are two types of bicycle facilities in the City. A Class I facility is for bicycle travel completely separated from any street or highway. An example of a Class I facility is the bike path that runs adjacent to the Santa Ana River. The majority of the bike routes in the City are designated as Class II facilities. Class II facilities are striped lanes for one-way travel on a street such as Garfield Avenue between Edwards Street and Ward Street.

Equestrian Facilities
Unlike bicycle facilities, equestrian facilities must be separated from vehicular traffic. The demand for equestrian facilities is linked to the preservation of the rural character of the community. The Huntington Central Park Equestrian Center provides equestrian access to Central Park as well as planned trails connecting to Harriett M. Weider Regional Park. Equestrian trails are also located within the Ellis-Golden West Quarter Section. The Quarter Section contains detached estate single-family residential with internal and perimeter equestrian trails.

Aviation and Waterway Facilities
There are five existing heliports located within the City. These helicopter facilities are used primarily for air ambulance business, emergency, and police uses. The five heliports are located at Boeing Corporation (Bolsa Chica Street at Bolsa Avenue), Guardian Center (Beach Blvd. at Warner Avenue), Police Station at Golden West Street and Talbert Avenue, Cal Resources at Pacific Coast Highway (between Seapoint Street and Warner Avenue) and the Civic Center (Main Street at Yorktown Avenue).

The existing waterways in the City include the Huntington Harbour and the Orange County Sunset Aquatic Marina. The primary use of these facilities is for recreational boating.

Localized flooding can render roads unusable. A severe winter storm has the potential to disrupt the daily driving routine of hundreds of thousands of people. Natural hazards can disrupt automobile traffic and shut down local and regional transportation systems.

In addition, earthquakes can cause freeway overpasses and bridges to collapse. Huntington Beach is bordered by Costa Mesa to the east where two bridges are the only routes into and out of the City. To the north and northeast a collapse of the 405 Freeway could make entry into and out of the City impossible. The only ingress and

egress to the west and southwest in the City is Pacific Coast Highway which sits on alluvial soils and could be severely damaged from liquefaction. A major earthquake in the Huntington Beach area could completely isolate the City. Families would become separated and mutual aid would not be able to respond to assist with emergency response.

J. Major Facilities in the City

These are facilities that if impacted by disaster would seriously impact the community.

AES Power Plant

The AES Power Plant sits on Pacific Coast Highway (PCH) is one of several sources of electricity for Orange County. The 12 acre site is located at 21730 Newland Street at PCH and about 600 feet east of the Pacific Ocean. The AES Huntington Beach Generating Station will be a 450- megawatt natural gas-fired boiler. The steam turbine generators have natural gas burners, a burner management system, draft fans, and Selective Catalytic Reduction equipment for emissions control. It uses natural gas via a 30-inch diameter pipeline. The system will use once through circulating water from the Pacific Ocean for cooling, while processing water for steam generation and potable water for domestic needs will by supplied by the City. Circulating cooling water, plant low volume waste streams such as water softeners regeneration brines, and storm water are currently discharged from the plant to the Pacific Ocean. Once the retooling project is complete, the site will employ approximately 43 full-time staff.

AES Power Plant and the Pacific Ocean

Orange County Sanitation District (OCSD)

Another major facility within Huntington Beach and Fountain Valley is the Orange County Sanitation District located at 22212 Brookhurst Street. The Orange County Sanitation District provides sanitation services to 21 cities and three sanitary districts. They perform primary and secondary

Sanitation District and the Talbert Marshland

treatment procedures. The agency treats 234 million gallons of sewage each day. They collect and treat wastewater, and rescue or dispose of the treated wastewater and the separated solids. There are two treatment plants (No. 1 in Fountain Valley and No. 2 in Huntington Beach). Plant No. 1 determines whether it has the capacity to treat the directed wastewater or if the wastewater should be transported to Plant No. 2. Plant No. 2 treats most of the City's sewage. They have 650 miles of collection systems and 20 pump stations. The treated wastewater is discharged into the Pacific Ocean. The existing sewage collection system consists of major trunk lines, smaller feeder lines, and lift stations. The City's Public Works Department is responsible for the local level of services while the OCSD is responsible for the regional service. The OCSD's trunk lines connect local lines to the treatment plants. The major trunk lines flowing to treatment plants are constructed and designed to incorporate all of the City's smaller outlet sewer lines. The sewage trunk lines are designed to not exceed 0.75 depth over diameter (D/D), the system is currently working at 0.5 D/D. OCSD also owns and operates three pump stations in the City. The pump stations help transport the sewage through the system onto the treatment plant.

Huntington Beach Pier

The Huntington Beach Pier is a famous landmark that is the center of tourism for the City. It is located at Main Street and the Pacific Ocean.

The pier's disaster history begins in 1903 when The Huntington Beach Company decided to build a pier at the end of Main Street. The pier was constructed completely of wood and extended out into the ocean 1,000 feet. By 1909, when Huntington Beach finally incorporated, the pier had already become a familiar sight to the citizens of the area. In the winter of 1912, the first, of several, damaging storms to strike the pier wrecked havoc on the wooden structure, knocking a large portion of it into the Pacific Ocean. By a popular vote of the citizens, a $70,000 bond was approved and construction on the new pier began. This time the pier would be built out of concrete and extended to a length of 1,350 feet.

When it was dedicated in June 1914 the Huntington Beach pier entered the record books as the longest, highest, and only concrete pleasure pier in the United States. In 1930, the City once again decided to modify the pier by extending it another 500 feet out in the waters off the coast of Huntington Beach. When the new construction was completed, the pier was now 1,850 feet long and a cafe had been built at the far end. However, there was a problem with the new addition: it was four feet lower than the rest of the pier and not well built. In 1933, an earthquake shook the pier hard enough to separate the new addition from the original portion of the pier. In response, the City had the separation paved over.

All seemed fine until 1939 when a rare hurricane made its appearance in the waters off of California. By the time the storm had left, the new addition and the cafe were resting

at the bottom of the ocean. Once again the people of Huntington Beach were forced to reconstruct their world famous pier, but work was fast and the pier reopened in 1940.

The next event in the life of the pier was not a storm, but a war. On December 7, 1941, the Japanese bombing of Pearl Harbor shocked the country and changed America forever. Like many cities on the west and east coasts of the United States, Huntington Beach soon found itself in the middle of the war effort. Shortly after the war started, the US Navy commandeered the pier for military use. The Navy installed a submarine lookout post on the end of the pier. They considered the threat serious enough to place a heavy caliber machine gun near the lookout post and there it stayed until the war's end.

After the war, the pier was returned to the people of Huntington Beach. Soon the tourist returned to walk the pier, to stop at the cafe at the end, and to watch the local fishermen cast their lines into the murky waters beneath the pier. Everything seemed peaceful for almost the next four decades.

In March 1983, Mother Nature once again decided to play havoc with the pier. As hundreds watched, safely from the shore, the storms and surging sea tore the end of the pier off, sending it and the End Cafe to a watery grave. By the time the 1983 winter storm season was over, plans were already being made to reconstruct the pier. This time, when the pier was completed, there was a new, two story End Cafe overlooking the calm Pacific.

But the calm did not last long. On January 18, 1988, a large winter storm hit the Huntington Beach coast ripping the new portions of the pier from their pilings, destroying the End Cafe and a large section of the pier. Once again part of the pier disappeared beneath the famous surfing waves of Huntington Beach. Many people wondered why the recently rebuilt pier had fallen prey to another storm. One of the reasons was, when the end of the pier had been rebuilt, the new addition was eight feet lower than the rest of the pier. This eight foot difference brought the new section down into the reach of the surging waves. The pier was declared unsafe and closed on July 12, 1988.

Huntington Beach Pier and Surf

Immediately, action began in an attempt to find funds to rebuild the pier. A local citizens organization was formed to raise money for the reconstruction. The new concrete pier uses reinforced steel, coated with epoxy, to protect it from the corrosive effect of the damp salt air. In

addition, the new pier is 13 feet higher than its predecessor, which puts it far above the waves. When the pier was completed, it was 1,856 feet long, 20 feet longer than the last one. Finally on July 18, 1992, surrounded by a estimated gathering of over 300,000 people, the new pier was dedicated in a ribbon cutting ceremony during Pierfest '92. By the end of the day, more than 500,000 people had visited the pier.

Bolsa Chica Wetlands and Marine Estuary

One and a half miles of the Pacific Ocean's shoreline on one side of the Pacific Coast Highway, and on the other is a 350 acre marine estuary known as Bolsa Chica Wetlands. Over one million visitors come to Bolsa Chica each year to connect with nature. Flocks of birds glide gracefully along the sea, sailing on warm air currents, south in the winter and north in the summer.

Bolsa Chica Marine Estuary

Bolsa Chica lies along the Pacific flyway, the primary route for migrating birds traveling between Alaska and South America. Many of these birds use the Bolsa Chica Marine Estuary as a stopover to rest and refuel before continuing to their final destinations. Others live here year round. A wooden footbridge, which places visitors directly over the center of the inner bay, facilitates a closer look at the winter migratory shorebirds and waterfowl. Summertime brings in scores of different species including the endangered California Least Tern and Belding's Savannah Sparrow.

The Boeing Company, Huntington Beach

The Boeing Company located at 5301 Bolsa Avenue is the largest employer in Huntington Beach and the fourth largest employer in Orange County. The site is 188 acres with 5,800 employees. There are 26 major buildings and was built in 1962. The site has a rich development history that dates back to the early days of human space flight. It has played a part in such major space initiatives as the Apollo Lunar Landing Program, the International Space Station, and the Delta family of expendable launch vehicles.

In recent years, the site has diversified to encompass a number of Boeing business units and programs. The site's mission is to be a "premier program management, design and development site for The Boeing Company." It currently houses several space-related programs, including the Delta, Space Shuttle, and International Space Station, as well as new cutting-edge national defense efforts. Also the Huntington

Beach Development Center which comprises several advanced technology labs, test facilities, and manufacturing capabilities is on this site.

Pacific City and Beachfront Hotels

The area known as Pacific City is bounded by Lake, Atlanta, Huntington, and Pacific Coast Highway. Pacific City includes a Boutique Resort & Spa, a Retail Promenade, and a Residential Village. Next to Pacific City is the Waterfront Hotel and the Hyatt Regency Hotel. This upscale resort is located on the inland side of PCH just across the street from the Pacific Ocean. This is an important economic asset within the City.

Pacific City

Other Special Facilities

In future years, a desalination plant may be considered. This plant would be located adjacent to the AES Power Plant and share features of the plant.

K. Historical Disaster Events

The Santa Ana River extends from Prado Dam to the Pacific Ocean outlet at Huntington Beach. This inlet/outlet has been the site of severe flooding. In 1938, before the Santa Ana River Channel was built, major flooding covered the area from Ward Street to Beach Boulevard, and Garfield Avenue to the ocean. Now, over 30,000 people live in this area that used to be known as “Gospel Swamps.” In 1983, during an El Niño condition and long after the river channel was built, flooding broke several spots in the unlined City channels and spilled into neighborhoods in the south end of town. One of the major causes of the flooding was the unusually high tides coming up the Santa Ana River as the flood water came down the river from the mountains. This pushed the water up into the smaller City and County flood channels and overflowed into a residential area where 3,000 residents had to be evacuated for their safety.

Other types of emergency situations experienced by the City include:

- flooding from severe winter storms; recent floods include: 1983 (El Niño) 1988, 1991, 1992, 1995, 1997 (El Niño) and 1998 (El Niño)
- riots, in the 1980s and 1990s on the beach and in the downtown area
- urban fires
- minor hazardous materials spills
- oil pipeline breaks
- tornadoes/water spouts (1978 and 1991)

- hurricane (1939)
- earthquakes on the Newport-Inglewood (1933), Whittier (1987), Northridge (1994), San Andreas, and other earthquake faults
- a major oil spill along the coast (American Trader Oil Spill 1990)
- bacteria in the ocean (2000)
- Stage III Power Blackouts (2001)
- oil well over-spraying a neighborhood of 350 homes and streets (2004).

The City has a dedicated Emergency Operations Center (EOC) that has been activated for the above listed emergencies. The facility includes a diesel generator with fuel for a two week period, a separate air handling system to shut off outside air and operate in hazardous materials or radiological incidents, showers, restrooms, kitchen facilities, and a protection factor of 1000. The City is dedicated to mitigating hazards, preparing for, responding to, and recovering from disasters.

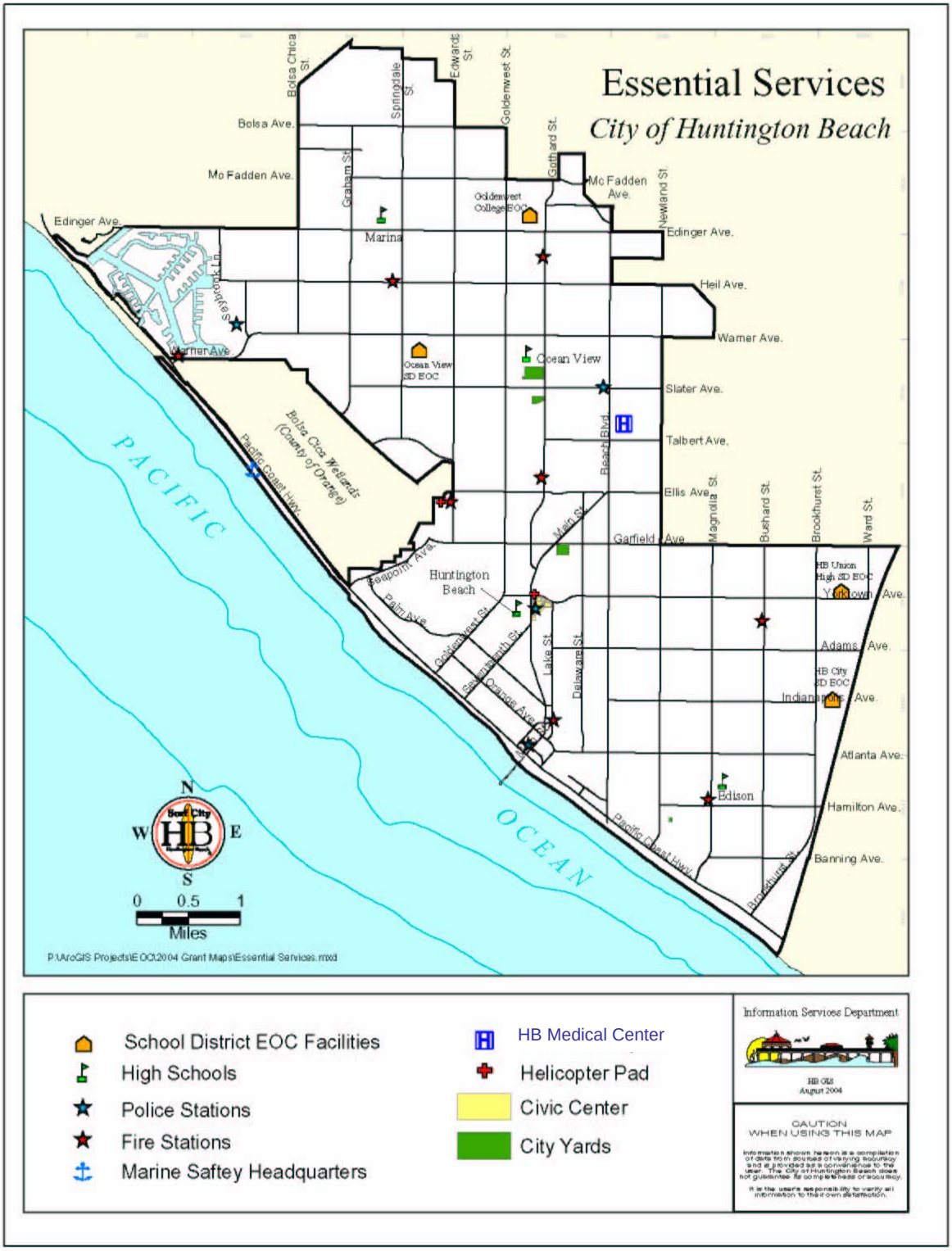
L. Essential Services Facilities

Name of Facility	Address	Contact Person	Contact #	RD	Generator	Other Information
Main Police Station	2000 Main St	Chief of Police Kenneth Small or Sgt. Irwin Feuerstein	374-1700	431	YES	Public Safety Answering Point (PSAP)
City EOC	2000 Main St	Glorria Morrison	536-5980	431	YES	Manage City emergencies
City Hall	2000 Main St	Public Works Engineering	536-5431	431	Partially covered by EOC generator	Citywide records and maps
Station 1 - Gothard Fire Station	18311 Gothard St	Fire Chief Duane Olson	536-5471	291	YES	Emergency response
Station 2 - Murdy Fire Station	16221 Gothard St	Fire Chief Duane Olson	536-5417	251	YES	Emergency response
Station 3 - Bushard Fire Station	19711 Bushard St	Fire Chief Duane Olson	536-5472	435	YES	Emergency response
Station 4 - Magnolia Fire Station	21441 Magnolia Ave	Fire Chief Duane Olson	536-5475	464	YES	Emergency response
Station 5 - Lake Fire Station	530 Lake St	Fire Chief Duane Olson	536-5474	451	YES	Emergency response
Station 6 - Edwards Fire Station	18591 Edwards St	Fire Chief Duane Olson	375-8400	319	YES	Emergency response
Station 7 - Warner Fire Station	3831 Warner Ave	Fire Chief Duane Olson	536-5928	173	YES	Emergency response
Station 8 - Heil Fire Station	5891 Heil Ave	Fire Chief Duane Olson	536-5464	157	YES	Emergency response
Fire Training Center	18301 Gothard St	Fire Chief Duane Olson	536-5414	291	YES	Backup EOC and Fire Dept Ops Center
Oakview Police Substation	17261 Oak Ln	Chief of Police Kenneth Small	374-1672	273	NO	Emergency Response
Downtown Police Substation	204 Fifth St	Chief of Police Kenneth Small	536-5229	451	NO	Emergency Response
Police Heliport	Morrison Way	Chief of Police Kenneth Small	536-5997	291	YES	Emergency Response

Essential Services Facilities (contd)

Name of Facility	Address	Contact Person	Contact #	RD	Generator	Other Information
Huntington Beach Medical Center	17772 Beach Blvd	Mark Telhan, Facilities Mgr Mary Bottichella, CEO	843-5000	283	YES	Hospital
Public Works Don Kiser Corporate Yard	17371 Gothard St	Maintenance Operations Mgr Jim Jones	536-5024	271	NO	Backup EOC and Public Works Dept. Ops Center
Public Works Park, Tree and Landscape Yard	17581 Gothard St	Maintenance Operations Mgr Jim Jones	536-5024	281	NO	Location of City maintenance resources
Public Works Utilities	19001 Huntington St	Howard Johnson	536-5503	452	YES	City-wide and utilities warehouse
Beach Maintenance Yard	8669 Edison	Larry Neishi	536-5287	474	NO	City resources
Marine Safety Headquarters	103 PCH	Marine Safety Chief Kyle Lindo	536-5281	461	YES	Backup EOC and Marine Safety Dept Ops Center
Ocean View High School	17071 Gothard St	Principal Karen Gilden	848-0656	271	YES 5k only	Shelter, Staging Area, Local Assistance Center (LAC)
Huntington Beach High School	1905 Main St	Principal Dr. Frank Berry	536-2514	431	YES 5k only	Shelter, Staging Area, LAC
Edison High School	21400 Magnolia Ave	Principal Cynthia Clark	962-1356	465	YES 5k only	Shelter, Staging Area, LAC
Marina High School	15871 Springdale Ave	Principal Steve Roderick	893-6571	147	YES 5k only	Shelter, Staging Area, LAC
HB City School District EOC	20451 Craimer Lane	Dick Masters	964-8888 x2052	447	YES	Manages school district operations
HB Union High SD EOC	10251 Yorktown Ave	Scott Atkinson	536-7521 x400	431	NO, a portable can be connected	Manages school district operations
Ocean View SD EOC	8291 Warner	Carolyn Stocker	847-2551 x3502	263		Manages school district operations
Golden West College	15644 GoldenWest St	Jim Pasinski		241		Security trailer

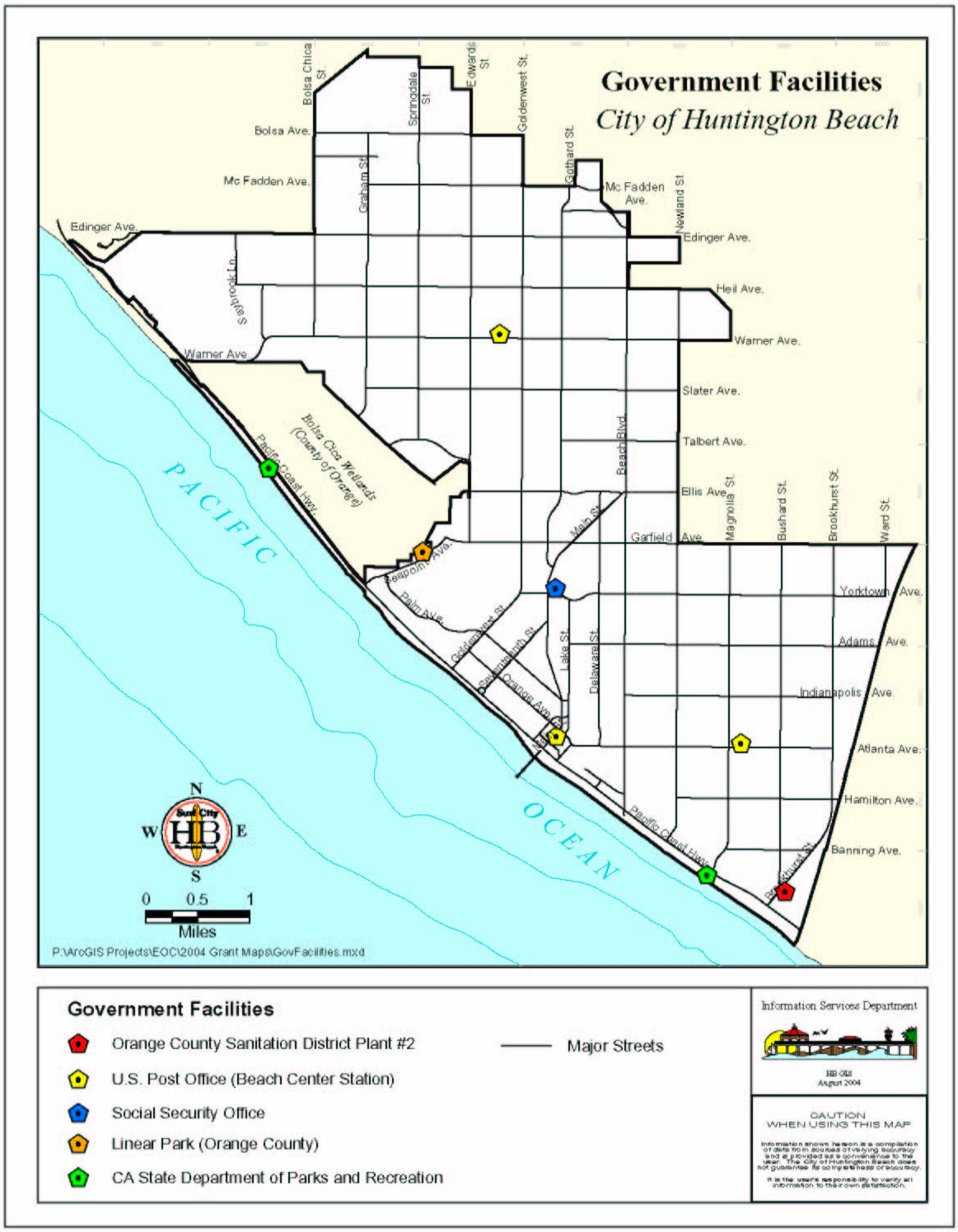
Exhibit II-A-5: Huntington Beach Essential Services Map



M. Government Facilities (Non-City)

Name of Facility	Address	Contact Person	Contact # (24hour)	RD	Generator	Other Information
US Post Office (Main Office)	6771 Warner Avenue	Postmaster: Aurora Gonzales Safety: Michael Miracle	843-4200 843-4203	169	NO	
US Post Office (Ida Jean Haxton Station)	9151 Atlanta Avenue	Station Manager: Paul Mendoza	963-0621	455	NO	
US Post Office (Beach Center Station)	316 Olive Avenue	Jessie Vargas	536-4973	451	NO	
CA State Dept of Parks and Recreation	Bolsa Chica State Beach (S of Warner)	Dispatch	Dispatch: 909-443-2969 or 70 846-3460	173 183, 184 and 194	NO	Orange Coast District North Sector (Includes Huntington & Bolsa Chica State Beaches)
	Huntington State Beach	Dispatch	536-1455	337, 349 and 359	NO	
Orange County Sanitation District, Plant No. 2	22212 Brookhurst St 92646	James Matte (24 hour) Control Center (24/7)	593-7155 962-2411 (24 hour) 593-7025	486 and 496	YES	
Social Security Office	2100 Main St Suite 260	800-772-1213			NO	

Exhibit II-A-6: Huntington Beach Government Facilities



N. Utilities

Electricity

The Southern California Edison (SCE) serves the City of Huntington Beach electricity needs. SCE has been in business 116 years and has a service area of 50,000 square miles. They serve 4.54 million meters in Central and Southern California with 12,000 employees. SCE has an Emergency Response & Recovery Plan which is updated annually to incorporate improvements in processes and technology. SCE conducts annual storm training. When an incident occurs, they categorize them by Category I, II or III with III being the most severe. SCE sites that serve Huntington Beach include:

Many of the City sites have backup power should the electricity fail. The EOC, Fire Operations Center, Heliport, Utilities Yard and Warehouse, and most of the water facilities are among the existing generators.

Natural Gas

The City of Huntington Beach is serviced by the Southern California Gas Company (SCG). The SCG receives its supply of natural gas from several sources: Southern California, Northern California, and out of state suppliers. The out of state natural gas enters the State through transmission lines which contain gas ranging from 500 to 1,000 lbs. of pressure. These lines connect to transmission compressor stations which decrease the pressure to 150 to 500 lbs. and clean the natural gas. From the compressor stations, the natural gas is transmitted through supply lines to distribution stations. The distribution stations to further reduce the natural gas pressure to approximately 44 lbs., and then provide the gas to consumers. SCG has no immediate plans to update the existing equipment or to implement new technologies other than the normal maintenance checks and replacements of deteriorating supply lines. SCG has stated that they are meeting present demands and can supply additional natural gas to Huntington Beach, if required.

Telecommunications

Telephone service is provided by Verizon located at 7532 Slater Avenue in Huntington Beach which is in RD 281. The contact person is Patrice Vance, 562-483-6254 or cell 310-749-8492. This individual works out of the Los Angeles office but handles the Huntington Beach service area through the Slater repair facility. The alternate contact is Verizon Wireless Corporate Security at 800-451-5242

Telephone lines are owned by AT&T. For all emergencies, contact AT&T Corporate Security at 800-822-9009.

The cell phone sites that cover Huntington Beach are owned by Spectrasite (Verizon) Broadcast Group. The contact is Erin Feduk at 818-335-9449 or after hours at 888-773-2872. The headquarters is in Irvine.

A microwave repeater relay tower is located at Springdale/Edinger, Tower #ORO58 in RD 148. The contact is Sprint PCS, Jack Sullivan located at 2592 DuPont Circle, Irvine, 92612 and can be reached by cell at 310-770-9727.

Cable television lines are owned by Time-Warner located at 7441 Chapman Avenue in Garden Grove. The contact is Gail Toth at 714-903-4170.

Radio and television station KOCE is located on the Golden West College campus at 15751 Gothard Street in RD 241. The contact is Judy Schaefer at 714-895-5623, extension 58440.

For Wireless Data networks, see AT&T Wireless Data. For emergencies, contact Corporate Security at 800-989-5558.

Microwave networks countywide 800 MHz are managed by the County of Orange Communications, headquartered in Orange. The contact person for problems is Joe Saddler at 714-704-7937.

For City of Huntington Beach 800 MHz, contact the City of Huntington Beach Information Services Radio Shop located at the Corporate Yard. The contacts are Jim Day or Bob Meadows at 714-960-8829.

Comcast Broadband Corporate Security can be reached at 800-871-6289, #3.

Water

The City Public Works Department Utilities Division operates the water system within Huntington Beach. All water assets have been included in the City asset list. The water system of the City is managed utilizing a Supervisory Control and Data Acquisition (SCADA) system which monitors the system 24 hours a day, 7 days a week and reports any problems. The various facilities use a combination of natural gas driven engines and electric motors. Natural gas facilities are equipped with propane-powered backup.

Huntington Beach Utilities Division (Water Operations) supplies approximately 30 Million Gallons Per Day (MGD) to 52,000 water meters. Typically, 66% of the City's water is supplied by groundwater wells while 34% is from imported sources. The City of Huntington Beach's water system is described below:

1. Water Supplied by Metropolitan Water District

The Metropolitan Water District (MWD) water supply is imported from the Colorado River and State Water Projects. The City of Huntington Beach has three connections with the Metropolitan Water District of Southern California. One connection (OC 9) has the capacity to deliver 6,750 gallons per minute into the water system. A second connection (OC 35) has a capacity of 11,250 gallons per minute, and a third (OC 44) has a capacity of 7,000 gallons per minute.

2. Water Supplied by Underground Water Wells

Water is presently produced from nine operating water wells that vary in depth from 250 feet to 1,020 feet, with production varying from 450 gallons per minute to 4,000 gallons per minute. Total production from all nine wells is rated at 27,500 gallons per minute.

3. Water Storage

The water storage system consists of Overmyer Reservoir, Peck Reservoir, Springdale Reservoir, and Edwards Hill Reservoir all located within the City. Peck Reservoir's capacity is 17 million gallons, Overmyer Reservoir has a capacity of 20

million gallons, Springdale and Edwards Hill each have a capacity of nine million gallons. The reservoirs store both groundwater and imported water. The reservoirs fill with water at night and empty during the day.

4. Water Booster Facilities

Booster facilities pump water from reservoir storage into the water distribution system. The pumping capacity into the system from all reservoirs is 44,365 gallons per minute.

5. Water Distribution System

The local distribution system consists of approximately 520 miles of water lines ranging in size from 2 to 42 inch diameter pipes. Huntington Beach has an emergency service agreement with the Cities of Fountain Valley, Seal Beach, and Westminster to receive water during a disaster.

6. Water System Backup Power

The Utilities Operations has a generator that fires over when electrical power is interrupted and feeds the entire facility including the warehouse. The booster station at the Edwards Hill reservoir can use electricity, natural gas or propane and Peck/Springdale complex runs the engines on natural gas with propane backup. Some of our groundwater wells run on electricity and would be impacted by an outage but the majority run on natural gas with propane backup. The Overmyer and the Reservoir Hill Booster Station (both located at the Utilities Operations site) are dual fuel with natural gas and propane backup. At Peck and Springdale Reservoirs, Wells 4, 7, and 13 have dual fuel capabilities.

Sanitation

Orange County Sanitation District Treatment Plant No. 2 is located at 22212 Brookhurst Street in Huntington Beach and Reclamation Plant No. 1 and their Administrative Offices are located at 10844 Ellis Avenue in Fountain Valley. The Orange County Sanitation District provides sanitation services to 21 cities and 3 sanitary districts. (See page 18 for details.)

The Sanitation Treatment and Sewerage services for the City of Huntington Beach are provided by the Orange County Sanitation District (OCSD). Currently, 98% of the City is connected to the sewer system. The remaining 2% utilizes septic tanks that are scattered throughout the City. These areas will convert from septic tanks to the sewer system when developed in the future.

Orange County Wastewater Treatment

The two wastewater treatment plants serving the City of Huntington Beach perform primary and secondary treatment procedures. Plant No. 1 is designed to treat the wastewater generated by neighboring cities and the northern portion of the City. Operators in Plant No. 1 determine whether it has the capacity to treat the directed wastewater or if the wastewater should be transported to Plant No. 2. Plant No. 2 treats

most of the City's sewage. The following table describes the characteristics of the two plants:

	Current Operating Capacity	Existing Operations	Planned Improvements
Plant No. 1	60 Primary MGD 60 Secondary MGD	50 Primary MGD	Additional 60 Primary MGD
Plant No. 2	200 Primary MGD 95 Secondary MGD	170 Primary MGD	None

The OCSD has developed engineering plans for plant improvements anticipated to meet the needs of the City to the year 2050. Implementation of these plans is dependent on increased demands rather than a set timetable. Many of these improvements will need to be implemented prior to the construction/occupancy of any planned large developments.

At present, the OCSD has seen a 14% drop in wastewater treatment demand due to water conservation practices, improvements to the system, and City and County imposed regulations. However, the OCSD states that this trend may be misleading and that it may be premature to determine future demand trends.

Existing Sewage Collection System

The existing sewage collection system consists of public and private systems which collectively include service laterals, local and trunk mains, and lift stations. The City's Public Works Department is responsible for the public level of service while the OCSD is responsible for the regional level.

The OCSD's trunk lines connect local lines to the treatment plants. The major trunk lines flowing to treatment plants are constructed and designed to incorporate all the City's smaller outlet sewer lines. The sewage trunk lines are designed to not exceed 0.75 depth over diameter (D/D), the system is currently working at about 0.5 D/D. OCSD has no immediate plans for updating the existing lines other than the normal replacement of deteriorating sewer lines and trunks.

The City currently owns, operates, and maintains 28 lift stations, which ensure that the sewage flows throughout the system. The City's Public Works Utilities Division maintains the lift stations.

Trash

The City contracts with Rainbow Disposal, a private business for solid waste collection. They also serve the Cities of Fountain Valley, Westminster and Seal Beach.

The City of Huntington Beach currently generates 348,219 tons of solid waste per year or approximately 954 tons per day. Of this total, 52,220 tons are generated by commercial sources, 155,625 tons are generated by residential sources, and 140,374 tons are generated by demolition and industrial sources. The amount of solid waste is expected to

increase proportionally in the future as the City's residential population and commercial/industrial activity increase.

Solid waste collection service for the City of Huntington Beach is provided by Rainbow Disposal, under an exclusive long term contract with the City. Collected solid waste is transported to a transfer station located in the City. At the transfer station, the solid waste is sorted and then processed through a Materials Recovery Facility (MRF) where recyclable materials are removed. The remaining solid waste is transported to the Bee Canyon Landfill located in the City of Irvine. The Bee Canyon Landfill has a remaining capacity in excess of thirty years based on present solid waste generation rates.

O. Social, Cultural and Environmental Assets

Cultural Assets

1. *Huntington Beach Art Center* - This Center features exhibitions, performances, film/video screenings, lectures, and both children's and adult educational programs. "Centered on the Center," is an annual exhibition of local and regional artists, attracts nearly 300 artists for a salon style presentation. (Contact 714-374-1650)
2. *HB Central Library and Cultural Center* - This center is an architectural landmark and is also home to the Huntington Beach Playhouse, a world-class children's library and a children's theater. (Contact 714-842-4481)
3. *The Newland House Museum* - The Newland House, built in 1898, is the City's oldest residence. Fully restored and authentically furnished, it was added to the National Register of Historic Places in 1985. (Contact 714-962-5777)
4. *Golden West College* - This California Community College of 16,000 students benefits from a strong Performance Arts Program. In two, first-class campus theaters, students and faculty productions by the Ballet Repertory Theater and the Student Theater ensemble are performed throughout the year. (Contact 714-895-8150)

Social Assets

1. *Huntington Beach Community Services Human Services Division* - The Recreation and Human Services Division provides a variety of programs and operates the Rodgers Seniors' Center, Seniors Outreach Center, and the City's senior housing complex - Emerald Cove. Other activities include adult sports, which involves hundreds of men, coed and seniors softball teams, Project Self-Sufficiency, Clubhouses, and the annual Fourth of July Celebration. This division also provides staff assistance for many boards and commissions which help to enrich the lives of less fortunate community members, including the Children's Needs Task Force, Fourth of July Board, Youth Shelter, United Way, and Council on Aging. These sites and commissions are valuable social assets within the City.

Unique Environmental Assets

1. *The Beach* - The Beach is about 8.56 miles long and averages about 100 yards wide. It is easily accessible with facilities, parking, equipment rentals, and fire rings (and public fire ranges). More than 14.5 million people use these facilities annually. Huntington Beach's beaches are controlled by two separate agencies. The California Department of Parks and Recreation operates Bolsa Chica State Beach to the north and Huntington State Beach to the south. The City is responsible for what lies in between. (Contact Phone: 714-846-5460)
2. *Bolsa Chica Ecological Reserve* - This reserve is one of the best Birding Spots in the US attracting flocks migrating the Pacific Flyway between North and South America. Nearly 200 bird species are documented annually, including many rare and endangered species. Entry is on PCH opposite the Bolsa Chica State Beach. (Contact 714-846-1114)
3. *Huntington Beach Central Park* – Central Park has 354 acres of mature trees, rolling lawns, and lakes. More than 200 bird species have been documented on the grounds. It has picnic tables, barbeques, restrooms, and playgrounds (including an adventure playground), a disc golf course, an equestrian center, and a 45 acre sports complex.

Vulnerable Populations

Examples of sites which house vulnerable populations include:

1. Huntington Beach Community Clinic, 8041 Newman, RD282
2. Boys & Girls Club of Huntington Beach, 9191 Pioneer Dr, RD435
3. City Gym and Pool, 16th & Palm, RD441
4. Social Security Administration, 2100 Main St, RD421
5. Senior Outreach, 1718 Orange Ave, RD349
6. Senior Recreation Center, 1706 Orange Ave, RD349
7. Hospitals and Surgery Centers:
   - Huntington Beach Hospital, 17772 Beach Blvd, RD283
   - Huntington Surgery Center, Inc., 7801 Center Ave, RD242
   - Orange County Surgery Center, 18800 Delaware St, RD412
   - HB Post Surgical Recovery Center, 17752 Beach Blvd, RD283
   - Premium Outpatient Surgery Center, 17672 Beach Blvd, RD283
8. Nursing Homes:
   - Golden Years Senior Care, 16052 Beach Blvd, RD253
   - Huntington Valley Healthcare Center, 8382 Newman Ave, RD283
   - SunBridge Care Center-Huntington Beach, 18811 Florida St, RD412
   - SunBridge Care Center-Garfield, 7781 Garfield Ave, RD412
9. Retirement & Life Care Communities & Homes:
   - Huntington Terrace, 18800 Florida St, RD412
   - Meadowlark Gardens, 5219 Midiron Circle, RD167
   - Sunrise Assisted Living of Huntington Beach, 7401 Yorktown Ave, RD421
10. Mobile Home Parks:
    - Beach View Mobile Park, 17261 Gothard St, RD291

- Brookfield Manor Mobile Homes, 9850 Garfield Ave, RD426
- Cabrillo Mobile Home Park, 21752 Pacific Coast Hwy, RD473
- Del Mar Mobile Estates, 19251 Brookhurst St., RD426
- Huntington By-The-Sea Mobile Village, 21851 Newland St., RD473
- Huntington Harbour Mobile Estates, 16400 Saybrook Lane, RD154
- Huntington Mobile Estates, 7652 Garfield Ave, RD422
- Huntington Shorescliffs Mobile Home Park, 20701 Beach Blvd., RD442
- Los Amigos Mobile Home Park, 18601 Newland St., RD413
- Mariners Point Mobile Home Park, 19350 Ward St., RD428
- Rancho Del Ray Mobile Homes Estates, 16222 Monterey Lane, RD154
- Rancho Huntington Mobile Park, 19361 Brookhurst St., RD426
- Sea Breeze Mobile Estates, 5200 Heil Ave, RD166
- Sea-Aira Mobile Estates, 6241 Warner Ave, RD168
- Skandia Mobile Country Club, 16444 Bolsa Chica St., RD156
- Villa Huntington Mobile Castles, 7850 Slater Ave, RD282

P. Development Trend

The City of Huntington Beach is nearly built-out with little vacant land remaining for new development. Future development in the City will consist of construction on the few remaining vacant infill sites as well as redevelopment of existing projects. The remaining vacant sites are likely to have constraints such as contamination, odd configuration, compatibility issues, or other limitations that will make development more difficult.

With the scarcity of vacant land, many older and underutilized residential properties are being demolished to make way for new development built to the maximum density permitted. A common example are the small bungalows downtown that are being demolished to make way for new three story dwellings on 25 foot wide lots.

Outdated shopping centers and freestanding commercial buildings will continue to be demolished and redeveloped or undergo façade improvements and remodeling. Some of the current examples include the new Bella Terra regional commercial center as well as mixed-use projects downtown.

Similarly, underutilized industrial properties, such as portions of the former Boeing campus, will probably continue to be recycled into modern industrial business parks. The trend to convert unused school sites to commercial or other development will also likely continue.

In summary, the City is 98% built-out and new development will be extremely limited.

Part II-B

Community Profile
City of Fountain Valley
Table of Contents

A. Geography and the Environment **1**
B. History **1**
Exhibit II-B-1 Map of Fountain Valley 2
D. Climate **3**
E. Population and Demographics **4**
F. Land and Development **6**
G. Housing and Community Development **7**
H. Employment and Industry **7**
I. Essential Services Facilities **9**
J. Major Facilities in the City **11**
K. Development Trend **13**

(This page intentionally left blank)

Fountain Valley Community Profile

Community Profile
Most of the information found in the City of Fountain Valley Community Profile was taken directly from three sources: Census 2000[i], and the City of Fountain Valley Housing Element Update 2000,[ii] and the Fountain Valley General Plan Update 1995[iii].

A. Geography and the Environment

Fountain Valley has an area of 9.87 square miles and is located in the northwestern portion of the County of Orange, 30 miles southeast of Los Angeles, along the Santa Ana River. Several major Orange County attractions are located in close proximity to Fountain Valley, including the Pacific Ocean (4 miles), John Wayne Airport (6 miles), the County Administration and Judicial Center (4.5 miles), Disneyland (9 miles), and Knott's Berry Farm (13 miles). Cities that border Fountain Valley are Costa Mesa to the east, Santa Ana to the north and east, Huntington Beach to the west and south, and Westminster and a portion of Garden Grove to the north. The City is served by the 405 freeway, and the major roads include Magnolia St., Bushard St., Brookhurst St., Euclid St., Newhope St. and parts of Harbor Blvd. (all of which run North/South) and Edinger Ave., Heil Ave., Warner Ave., Slater Ave., Talbert Ave., Ellis Ave., and Garfield Ave. (all of which run East/West). Elevations in the City range from a high of 45 feet to a low of 10 feet. The City has mostly flat terrain.

See the Fountain Valley map, Exhibit II-B-1

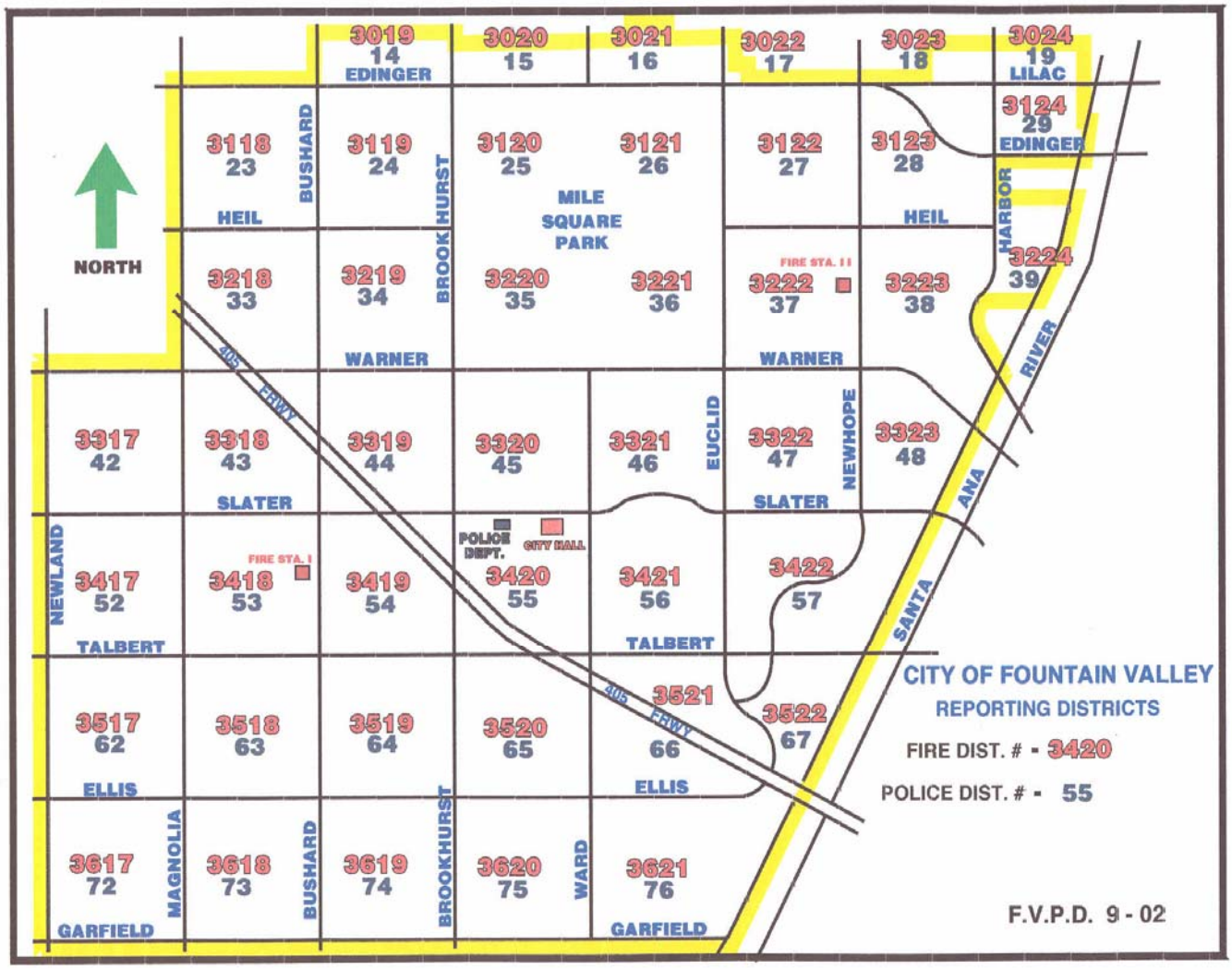
B. History

The history of what is now known as the City of Fountain Valley stretches all the way back to the 18th Century when the King of Spain granted the land to one of his Dons. The City is located on a portion of land which was part of the Las Bolsas Land Grant. This land was later given to an ex-soldier, Manuel Nieto, in 1784, by Spanish Governor Pedro Fages. In May of 1834, after Mexico had taken over California, the Las Bolsas Land Grant was given to Catarina Ruiz by the Mexican Governor Jose Figueroa. Upon the conclusion of the Mexican-American War, the United States Government officially honored several of the former Spanish Land Grants and reverted them to their original owners. Several public land auctions were held in the 1850's. During one of the auctions, Abel Stearns bought the land, then called Rancho Las Bolsas, and renamed it The Stearns Ranch Company. The original area is comprised of portions of what are now the Cities of Huntington Beach, Westminster, Garden Grove, and the entire City of Fountain Valley.

In 1878, a sheep rancher from the San Francisco area, Roch Courreges, leased land from The Stearns Ranch Company. He later purchased the land from the company and made his permanent home on the ranch. From the 1880s to the turn of the century the area became known as the "Gospel Swamps" by the members of the surrounding

communities. The present name, "Fountain Valley," derives its name from the many artesian wells and the abundant local water supply. Fountain Valley incorporated in 1957, as the 21st city into Orange County. Since its incorporation, Fountain Valley has established itself, both locally and nationally, as a forward-looking community dedicated to improving the quality of life for its citizens.

Exhibit II-B-1: Map of Fountain Valley



C. Major Rivers

The nearest major river is the Santa Ana River. This river has a potential negative impact on the City of Fountain Valley. The Santa Ana River forms the eastern border of the City. The riverbed is normally used for bicycling and recreation, but it has also been the site of severe flooding. While the northwestern region of the City remains in FEMA flood zone, one-hundred thousand Orange County residents were recently removed from the high-risk floodplain after completion of a US Army Corps of Engineers $1.4 billion, 10-year improvement project.

D. Climate

Weather conditions for Fountain Valley are consistent with coastal Southern California. It is a semi-arid region that experiences an average of 10-12 inches of rainfall during the winter months and has warm, dry summers. The continuing threat from severe winter storms is greatest from December to March. The threat from tropical storms is greatest August through October as the result of hurricanes from Mexico.

Minerals and Soils

Prior to the City's incorporation and the channelization of the Santa Ana River, the river meandered freely through this valley area, forming swampland throughout most of the planning area. Therefore, most of the City is comprised primarily of alluvial sediments with interbedded silts and sands. Areas of the City also contain irregular lenses of peat varying in thickness from a few inches to a few feet.

Much of the City of Fountain Valley has historically been located on a gently sloping flood zone. The soils found within the City are those typically found on slopes which are less than 5%, and are usually moderately alkaline and to varying degrees, calcareous. Vegetation found on these soils are typically grasses and forbs. Soil types range from those with poor drainage to those that are excessively drained. All of the soils within the City are good for crops and are also recommended for urban development. These soil conditions, while generally favorable, can lead to difficulties with flood drainage and liquefaction.

Other Significant Geologic Features

Of major importance to the hazard mitigation process are the significant geologic hazards that surround the City of Fountain Valley.

The following major faults and fault zones have the potential to affect the greater Los Angeles/Orange County area, and therefore the City of Fountain Valley:

Sam Andreas (Due to recent predictions of impending quake activity)
Newport-Inglewood (Due to close proximity and potential for large impact)
San Joaquin Hills (Newest find, research in progress)

The majority of the Fountain Valley planning area has been classified in terms of intensity as an 8 on the Rossi-Forel Intensity Scale. This score indicates that Fountain Valley would suffer surface fault rupture, liquefaction and other ground failure. Fountain Valley has a high potential of ground failure including liquefaction and settlement due to the high content of ground water. The City could suffer shocks strong enough to cause severe structural damage.

Recent news articles have called attention to the discovery of the San Joaquin Hills fault. Lisa Grant, assistant professor of environmental health, science and policy, and her research associates have found, "…active faults in the Puente Hills, San Joaquin Hills and Santa Ana Mountains that could potentially cause a catastrophic earthquake in Orange County" (Shen, 2004)[iv].

E. Population and Demographics

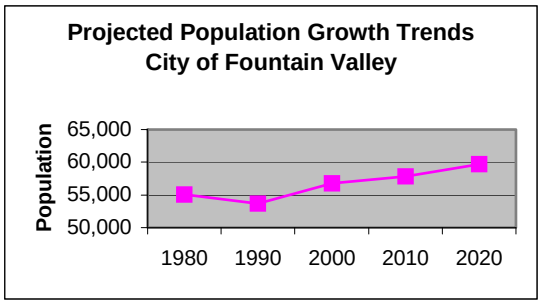
To best understand how a rise in population causes more disaster risk, the position of the City within the context of the greater County must be understood. The County of Orange has experienced rapid growth in the last two decades, with the majority of growth occurring in unincorporated portions of the County and new residential communities in the southern part of the County. From 1980 to 1990, the County's population increased by nearly 500,000 residents, a 19% increase. As a result of employment and residential market trends, the County population growth rate slowed to approximately 15% in the 1990s, equating to 365,063 new residents between 1990 and 1999.

Although the population of Fountain Valley decreased slightly in the 1980s, between 1990 and 1999 the City's population rebounded to 56,445 persons, a 5.1% increase over the ten year period. This is due, in part, to Orange County's dynamic growth, as previously mentioned.

Population Growth 1980-1999
City of Fountain Valley vs County of Orange

JURISDICTION	1980	1990	1999	1980-90 Growth		1990-99 GROWTH	
				NUMBER	PERCENT	NUMBER	PERCENT
Fountain Valley	55,080	53,691	56,445	-1,389	-2.5%	2,754	5.1%
Orange County	1,932,708	2,410,556	2,775,619	477,848	19.9%	365,063	15.1%

Source: City of Fountain Valley Housing Element Update



Source: Fountain Valley Housing Element Update 2000

The Fountain Valley Fire Department has experienced an annual increase in medical and non-fire related emergencies, while fire related emergencies have stabilized through the use of fire protection equipment and fire prevention education. Although Fountain Valley's population remains consistent at nearly 56,000 residents, the City is impacted by an aging and ever increasing number of freeway and cross-town commuters, which translates into a greater number of emergency responses for traffic and medical emergencies.

Increased density can affect risk. For example, narrower streets are more difficult for emergency service vehicles to navigate, the higher ratio of residents to emergency responders affects response times, and homes located closer together increase the chances of fires spreading.

The following age distribution table shows the change among age groups from 1990 to 1997. In 1997, residents in their prime working years comprised 48% of the City's population, nearly double the number of the next largest cohort, school age and young adult citizens, at 25%. Those in their early retirement years and over 65 made up the next most significant population groups with 12% and 9% of total City population, respectively. Additionally, the table demonstrates that between 1990 and 1997, persons over 55 experienced a much greater increase than any other age group. Simultaneously, the proportion of school age and young adult residents experienced a 4.7% net decrease, again suggesting that the population of Fountain Valley is becoming somewhat older.

Age Distribution 1990-1997
City of Fountain Valley

AGE GROUP/YEAR	1990		1997		1990-1997 % CHANGE
	NUMBER	% OF POPULATION	NUMBER	% OF POPULATION	
Preschool (0-4)	2,985	5.6%	3,124	5.7%	0.1%
School/Young Adult (5-24)	16,171	30.1%	14,040	25.4%	-4.7%
Prime Working (25-54)	25,800	48.1%	26,264	47.6%	-0.5%
Retirement (55-64)	4,841	9.0%	6,735	12.2%	3.2%
Senior Citizens (65+)	3,894	7.3%	5,067	9.2%	1.9%
Total	53,691	100.0%	55,230	100.0%	N/A

Source: City of Fountain Valley Housing Element Update

According to the 2000 US Census, the demographic makeup of the City is as follows:

Demographic Breakdown by Ethnicity 2000
City of Fountain Valley

ETHNICITY	NUMBER	PERCENT OF TOTAL
Caucasian or White	35,196	64.0%
Asian	14,165	25.8%
Hispanic or Latino (of any race)	5,870	10.7%
Two or More Races	2,362	4.3%
Other	2,172	4.0%
Black or African American	611	1.1%
American Indian and Alaska Native	252	0.5%
Native Hawaiian and Other Pacific Islander	220	0.4%

Source: Census 2000

The ethnic and cultural diversity suggests a need to address multi-cultural concerns such as language translation and other special population needs.

Although the percentage of individuals living below the poverty level in the City of Fountain Valley is minimal compared to the United States' percentage (Fountain Valley is 4.3%, United States is 12.4%), 598 individuals are children under the age of 18 and 375 individuals are age 65 or older. This is a large number of people that live under poor economic conditions. These individuals would experience a significant economic hardship following a disaster.

Vulnerable populations, including seniors, disabled citizens, women, and children, as well as those people living in poverty, may be disproportionately impacted by natural hazards. With the current rise in the senior residential population of Fountain Valley, planners must be particularly sensitive to the disaster-based needs of this population. Such needs include contingency medical planning, medication storage alternatives, generator accessibility, and interdependent evacuation strategies.

Examining the reach of hazard mitigation policies to special needs populations may improve access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural disasters identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

The cost of natural hazard recovery can place an unequal financial responsibility on the general population when only a small portion may benefit from governmental funds used to rebuild private structures. Discussions about natural hazards that include local citizen groups, insurance companies, and other public and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

F. Land and Development

The City of Fountain Valley is primarily built-out, with less than 2% of the City vacant. As of the 1995 General Plan update, approximately 3,040 acres, or 60% of the City, is devoted to residential land uses; 361 acres, or 7%, to commercial uses; 450 acres, or almost 9%, represent industrial land uses; public facilities and schools represent 362 acres, or 7%; parks and open space makeup 801 acres, or 15.5%.

The City has made a successful effort to provide a wide range of housing units appropriate to a diversity of resident' socio-economic requirements. In general, there is a good balance of residential, commercial, and industrial land uses.

The City has adopted redevelopment plans for two areas: the City Center and the Industrial Area adjacent to the Santa Ana River Channel. The sum of the two areas totals nearly 700 acres.

There are four areas of the City which are unique unto themselves; the Orange County Sanitation District property, the Fountain Valley Community Hospital with its adjacent vacant properties, Southpark and the Senior Center Project. These four sites, due to their unusual qualities, were best developed, redeveloped, and/or intensified through the preparation of specific plans. The four adopted specific plans depict existing and future uses with detail and precision; and interrelate the specific plan areas with the City as a whole within the context of the Land Use Element.

Mitigation planning will need to focus on updating current strategies utilized by the public and private sector.

G. Housing and Community Development

According to the 2000 Census, there are 12,496 single-family owner-occupied homes. As of May 7, 2004, the average Orange County home was priced at $606,000. Of the 18,473 total number of housing units in the City, 311 units were considered vacant. This is a vacancy rate of only 1.7 percent.

To assist the City of Fountain Valley with housing and community development issues, the City's Housing and Community Development Advisory Board and General Plan Citizens Advisory Committee are frequently consulted in the development and updating of the General Plan. The City Planning Commission and City Council are also active in guiding the development of the City in terms of housing expansion and community improvement.

H. Employment and Industry

An examination of employment is crucial in order to forecast what percentage of the City's residents will be able to implement mitigation recommendations and economically recover following a disaster. In the past 30 years, Fountain Valley's historic agricultural-based economy shifted to residential and commercial/industrial-oriented uses. The local working force of Fountain Valley residents was estimated at 28,818 by the 2000 Census.

The five largest industries based on the number of employed individuals in the City of Fountain Valley are as follows:

Five Largest Industry Categories 2000
City of Fountain Valley

RANK	INDUSTRY	NUMBER OF EMPLOYED	PERCENT
1	Educational, health and social services	5,109	18.5%
2	Manufacturing	4,598	16.6%
3	Retail Trade	3,517	12.7%
4	Professional, scientific, management, administrative, and waste management services	3,112	11.3%
5	Finance, insurance, real estate, and rental and leasing	2,670	9.7%

Source: Census 2000

Local residents span a wide scope of professional backgrounds that can be utilized for local disaster recovery efforts.

According to the California Employment Development Department (EDD), as of March 2004, approximately 97% of the estimated population aged 16 and above were in the labor force. The reported City unemployment rate was 3.0% or 1,090 unemployed individuals[v]. Fountain Valley's primary employers are listed below:

Largest Employers 2000
City of Fountain Valley

COMPANY	NUMBER OF EMPLOYEES
Fountain Valley Regional Hospital	1,500
Coastline Community College	750
Orange Coast Memorial Hospital	641
Hyundai Motor America	533
Kingston Technologies, Inc.	515
Costco Wholesale	369

Source: City of Fountain Valley Planning Department

Industry in the City of Fountain Valley must form a partnership with the City disaster preparedness entities to ensure business continuity following a disaster. Additionally, the major employers listed above, should ensure that their disaster plans are appropriate for the large number of employees. Given that 27,127 residents reportedly commute to work, a dependency on roads, communications, and accessibility must be highlighted. With so many Fountain Valley residents in the work force, community education efforts should promote family reunification planning in order to promote safety and welfare.

I. Essential Services Facilities

Name of Facility	Address	Contact Person	Contact #	RD	Other Information
Police Facility	10200 Slater	Police Chief Paul Sorrell	593-4453	3420 55	Public Safety Answering Point (PSAP)
City EOC Police Briefing Room	10200 Slater	Fire Marshal Steve Nagel	593-4436	3420 55	Manage city emergencies
City Hall	10200 Slater	City Manager Office	593-4410	3420 55	City-wide records and maps
Fire Station #1	17737 Bushard	Fire Chief Mark Haskell	593-4436	3419 54	Emergency response
Fire Station #2	16767 Newhope	Fire Chief Mark Haskell	593-4436	3222 37	Emergency response
Fountain Valley Regional Hospital & Medical Center	17100 Euclid	Hospital Switchboard	966-7200	3322 47	Hospital
Orange Coast Memorial Medical Center	9920 Talbert	Administrative House Supervisor	378-7000	3519 64	Hospital
City Yard	17300 Mt Herrmann	Bob Kellison	593-4633	3322 47	Backup EOC
Los Amigos High School	16566 Newhope	Connie Van Luit	663-8288	3223	Possible Shelter
Fountain Valley High School	17816 Bushard	Connie Mayhugh	962-3301	3419	Possible Shelter
Valley Vista Continuation High School	9600 Dolphin	George Green	964-7766	3419	Possible Shelter
Fountain Valley School District	17210 Oak	Dr. Marc Ecker	843-3200	3318	District Headquarters
Coastline Community College	11460 Warner	Gary Stromland	546-7600	3322	

City Parks

Park	Location	Acres
Allen	16149 Mesquite	**3.9**
Colony	10252 Cinco De Mayo	**.68**
Cordata	18761 Cordata	**6.23**
Courreges	8664 Rogue River	**12.31**
Ellis	10301 Ellis	**2.97**
FV Recreation Center	16400 Brookhurst	**55.09**
Fulton	8620 El Lago	**13.27**
Harper	8675 Bluebird	**8.14**
Helm	9170 Helm	**3.10**
Heritage	10200 Slater	**.60**
La Capilla	9720 La Capilla	**2.37**
Los Alamos	17901 Los Alamos	**3.99**
Monroe	11370 Mount Bodie	**2.74**
Plavan	9745 Warner	**2.06**
Stone Cress	11240 Stonecress	**2.22**
Vista View	9235 Honeysuckle	**3.03**
Westmont	8640 El Rancho	**11.39**

Socially, Culturally & Environmentally Important Areas

Name	Location	RD
Senior Center	NW corner Bushard/Talbert	**3418/53**
Heritage Park	Behind Library	**3420**
Carmel Retirement	17077 San Mateo	**3320**
Palm Island Retirement	11300 Warner	**3322**
Manor Care	11680 Warner	**3323**
Parkhurst Retirement	9925 La Alameda	**3319**

Non-City Government Facilities

Name	Location	RD
OC Sanitation District Facility	10844 Ellis	**3621**
OC Water District HQ	10500 Ellis	**3621**
Mile Square Park	16801 Euclid	**Numerous**
OC Public Library	17635 Los Alamos	**3420**
US Post Office	17227 Newhope	**3322**

J. Major Facilities in the City

Mile Square Park – 16801 Euclid, Fountain Valley

Mile Square Regional Park is an urban park located in the City of Fountain Valley and totals 640 acres of land. Within the park's boundaries are three regulation golf courses, two regulation soccer fields, baseball & softball diamonds, an archery range and a wilderness area. Also, there are two fishing lakes, concession operated bike and paddle boat operations, a wide expanse of picnic areas as well as numerous picnic shelters. Shelters serve a wide variety of visitors ranging from individuals to families and group organizations to annual company picnics.

Sixty-five acres of land located adjacent to Brookhurst is leased to the City of Fountain Valley for recreational purposes. This parcel has been developed by the City into a high-activity community park. Facilities provided by the City include a community center building, ball diamonds, basketball courts, outdoor play areas, and a tennis court complex.[vi]

Orange County Water District – 10500 Ellis, Fountain Valley

Orange County Water District (OCWD) was formed in 1933 by a special act of the California State Legislature to protect Orange County's rights to water in the Santa Ana River and to manage this important groundwater basin under north and central Orange County.

This important source provides local groundwater producers with a reliable supply of high-quality water. The OCWD was formed in 1933 by a special act of the California Legislature. Created to protect Orange County's rights to Santa Ana River water, OCWD's primary responsibility is managing the vast groundwater basin under north and central Orange County.

Orange County's groundwater basin supplies water to more than 20 cities and water agencies, serving more than 2 million Orange County residents. OCWD primarily recharges the basin with water from the Santa Ana River and to a lesser extent with imported water purchased from the Metropolitan Water District of Southern California. OCWD currently holds rights to all Santa Ana River flows reaching Prado Dam. Water enters the groundwater basin via settling or percolation ponds in the Cities of Anaheim and Orange. Behind Prado Dam (constructed and owned by the US Army Corps of Engineers for flood prevention), OCWD owns 2,400 acres in Riverside County, which OCWD uses for water conservation, water quality improvement, and environmental enhancement.

OCWD monitors the groundwater taken out each year to ensure that the basin is not

overdrawn; refills the basin; and carries out an assessment program to pay for operating expenses and the cost of imported replenishment water. The groundwater basin holds millions of acre-feet of water, of which about 1.25 to 1.5 million acre-feet is usable (an acre-foot satisfies the needs of two families for one year). The groundwater basin provides 75% of all water used within the District.

Protection, safety, and enhancement of groundwater are OCWD's highest priorities. With one of the most sophisticated groundwater protection programs in the country, OCWD uses 646 wells providing more than 1,200 sampling points—from which OCWD takes more than 13,000 water samples and conducts more than 300,000 analyses every year. OCWD's monitoring program looks for more than 190 constituents—which is more than the requirements of health agencies.

Since 1975, OCWD has operated Water Factory 21, a water purification plant that takes treated wastewater from the Orange County Sanitation District, purifies it to beyond drinking water standards, and then injects it into shallow aquifers near the coast to form a fresh water barrier, blocking seawater intrusion. This water eventually becomes a part of the groundwater basin and our water supply.

Water use efficiency is a major part of OCWD's ongoing efforts to increase available local water supplies. Examples of water use efficiency include providing ultra low-flush toilets for free and organizing a hotel towel and sheet program.

OCWD is leading the way in purification of wastewater for reuse to provide a reliable, new, drought-proof source of water. The Groundwater Replenishment System, a proposed project sponsored by OCWD and the Orange County Sanitation District, will produce enough near-distilled quality water for 200,000 families.

Additional efforts to increase local water supplies include expanding the capacity of the existing percolation facilities, treating poor quality water to make it useable, studying methods to extend the life of filtration membranes, improving advanced purification technologies, using bacteria to remove contaminants, and studying the quality of Santa Ana River water and other water-related issues. Other OCWD groundwater management and water quality activities focus on expanding the Prado wetlands, groundwater treatment at well heads, computer modeling of the groundwater basin, and conservation of endangered or threatened species.

Orange County's groundwater basin supplies 75% of the water needs for residents and businesses in Anaheim, Buena Park, Costa Mesa, Cypress, Fountain Valley, Fullerton, Garden Grove, Huntington Beach, Newport Beach, Irvine, La Palma, Los Alamitos, Orange, Placentia, Santa Ana, Seal Beach, Stanton, Tustin, Villa Park, Westminster, and Yorba Linda.[vii]

Orange County Sanitation District – 10844 Ellis, Fountain Valley
See Huntington Beach Community Profile

K. Development Trend

The City of Fountain Valley is primarily built-out, with less than 2% of the City vacant. The City is an urban community with a broad mix of land uses including residential, commercial, industrial, recreation, and open spaces uses. The predominant land use is residential. Approximately 60% of the City is devoted to residential uses, 18% to commercial and industrial uses, and schools and public facilities represent 8% of the land area. The balance of the City is devoted to parks and open spaces. Over the past few years, Fountain Valley has seen a significant interest in commercial and redevelopment opportunities.

Two major land use constraints have been identified as potential hazards to the City of Fountain Valley. For a number of years, the City was located within the flood hazard area. Improvements to the Santa Ana River flood control system has alleviated most of the flood threat although a small portion of the City is still in a flood hazard zone. The other major land use constraint is the potential for liquefaction. Fountain Valley does not have any seismic faults or Alquist-Priolo zones but the City is still subject to earthquake shaking. Due to the structure of the sub-surface soils and a high water table, the City has a high liquefaction potential in the areas adjacent to the Santa Ana River and south of the 405 freeway.

Community Profile Endnotes

[i] Census 2000, http://factfinder.census.gov
[ii] City of Fountain Valley Housing Element Update, Prepared by The Planning Center, November 2000
[iii] FV General Plan Update, General Plan Updated Resolution No. #8637, March 21, 1995
[iv] New University Newspaper, News Section, May 3, 2004, Author: Erica Shen, "Magnitude Seven Earthquake Possible in OC"
[v] California Employment Development Dept, http://www.calmis.ca.gov/file/lfmonth/oransub.txt.
[vi] Information taken from www.ocparks.com
[vii] Information taken from www.ocwd.com

Part II-C

Community Profile
Huntington Beach City School District
Table of Contents

1. SCHOOL DISTRICT OVERVIEW 1
2. DISASTER HISTORY 1
3. POPULATION AND DEMOGRAPHICS 1
4. SPECIAL POPULATIONS/SPECIAL NEEDS 1
5. TRANSPORTATION STATISTICS 2
6. SCHOOL SITE INFORMATION 3
7. SCHOOL DISTRICT INFORMATION 4

(This page intentionally left blank)

Huntington Beach City School District

1. School District Overview

The Huntington Beach City School District was established in 1905 and encompasses approximately 14 square miles within the City of Huntington Beach and unincorporated portions of Orange County (Bolsa Chica). It currently operates eight elementary schools and two middle schools serving slightly more than 6,700 students in grades K-8. Construction of the new Huntington Seacliff Elementary School was completed and opened the 1999-2000 school year. The District employs 343 certificated teachers and administrators and 298 non-teaching staff.

2. Disaster History

Central Elementary School, which once stood at 17th and Palm Avenue, was built in 1916 and destroyed by the 1933 Long Beach Earthquake. In 1983, the Huntington Beach area was hit by an El Niño storm. The southeast end of the City had severe flooding causing the evacuation of Eader School.

3. Population and Demographics

Huntington Beach City School District takes pride in all of its students and embraces children from all cultures. Presently, our population is composed of 76.9 percent White, 10.9 percent Hispanic, and 9.2 percent Asian students, with the remainder being of African American, American Indian, Pacific Islander, and Filipino heritage.

4. Special Populations/Special Needs

The Board of Trustees provides a full range of special educational alternatives, from the regular classroom to special full-day placements, so that students with special needs may interact with all children in a mutually respectful environment. Students are placed in a special setting only when the regular program fails to meet their needs.

When the special needs of a child are identified, the Superintendent or designee appoints an individualized education program (IEP) team, which includes educators, the student and his/her parents. The team carefully evaluates the student's needs and recommends appropriate placement. Consideration is given to the educational and nonacademic benefits of placing the student in a regular class and the support services needed to maintain such placement. Placement decisions promote maximum social interaction with nondisabled peers in a manner that is appropriate. Students with exceptional needs also receive instruction which fosters their independence and integration into the community.

West Orange County Consortium for Special Education (WOCCSE)
The Huntington Beach City School District participates in a consortium, along with other local school districts, to pool funds and resources to provide special education programs and services to students with special needs. The members of the consortium have developed a Local Plan, which is a public document describing its implementation of State and Federal law relating to special education. The goal of the consortium is to deliver high quality special education services to students with disabilities.

Membership in the Community Advisory Committee is open to all parents of special education children. Meetings are held bimonthly and all parents are invited to attend.

5. Transportation Statistics

Each day, more than 1,100 students in the Huntington Beach City School District are transported to and from school.

The District charges a fee for a child to ride the bus to and from school. Exceptions are made for low-income families (those that qualify for a free or reduced price lunch), or for special education students whose IEP requires that they receive transportation.

The charge for bussing was instituted because of the high cost of running the program. Home-to-school transportation costs more than the District receives from the State to operate the program. The transportation fee paid by parents reduces that deficit to increase available funding for instructional programs.

Parents can be assured that all possible safety precautions are practiced in the transportation of their children. Vehicles are inspected annually by the CHP for mechanical soundness and repair records. Busses undergo a Pre-Trip Inspection each morning where drivers check to be sure all equipment is working properly. Tire tread depth and inflation, door operation, special safety equipment, headlights, and air brakes, are but a part of each driver's careful examination before starting out on a daily run.

Drivers in the District's Transportation Department have an excellent safety record. Initial certification requires a minimum of 40 hours training in a State-mandated curriculum, as well as certification in first aid. Drivers must undergo at least ten hours of retraining yearly, pass a written examination and skills test every five years, and a medical examination every two years. The District complies with Federal law requiring all drivers of commercial vehicles to participate in a drug testing program.

Communication is viewed as essential in the Transportation Department. When necessary, parents are notified by letter of any major schedule changes. Each bus is equipped with a two-way radio system in the event of an emergency, and cellular phones are used for extended field trips.

In the early 1970s, the District pioneered a program of annual instruction for all children in how to ride the bus appropriately and to evacuate safely in the event of an emergency. That training continues today. The District installed the Silent Witness Program, a video surveillance system, which provides additional safety for children.

6. School Site Information

School Names, Addresses, Phone and Fax Numbers

Ethel R. Dwyer Middle School

1502 Palm Avenue, Huntington Beach, CA 92648
714-536-7507 • FAX: 714 -960-0955

Isaac L. Sowers Middle School
9300 Indianapolis Avenue, Huntington Beach, CA 92646
714-962-7738 • FAX: 714-968-5580

John H. Eader Elementary School
9291 Banning Avenue, Huntington Beach, CA 92646
714-962-2451 • FAX: 714- 378-3601

Dr. Ralph E. Hawes Elementary School
9682 Yellowstone Drive, Huntington Beach, CA 92646
714-963-8302 • FAX: 714-378-3603

Huntington Seacliff Elementary School
6701 Garfield Ave., Huntington Beach, CA 92648
714-841-7081 • FAX: 714-841-4593

William E. Kettler Elementary School
8750 Dorsett Drive, Huntington Beach, CA 92646
714-536-7568 • FAX: 714-960-7382

S. A. Moffett Elementary School
8800 Burlcrest Avenue, Huntington Beach, CA 92646
714-963-8985 • FAX: 714-378-3602

Joseph R. Perry Elementary School
19231 Harding Lane, Huntington Beach, CA 92646
714-962-3348 • FAX: 714-962-3347

John R. Peterson Elementary School
20661 Farnsworth Lane, Huntington Beach, CA 92646
714-378-1515 • FAX: 714-378-1520

Agnes L. Smith Elementary School
770 17th Street, Huntington Beach, CA 92648
714-536-1469 • Voice Mail: 714-536-1468 • FAX: 714-536-7484

District Office
20451 Craimer Lane, Huntington Beach, CA 92646
714-964-8888 • FAX: 714-964-2993

7. School District Information

Monday through Friday from 7:00 AM to 4:00 PM alarm response calls go to the Maintenance Office at 714-374-2812.

All other calls go to the District On-Call person who can be reached by pager at 714-802-3164. The On-Call person will rotate from week to week. The pager number will remain constant. The On-Call person also carries a cellular phone 714-746-0493. The pager number should be called first.

If there is no response in five minutes, call in the following order:

Wayne Nunnery Supervisor of Maintenance and Operations	Pager # 714-802-9296 Office # 714-374-2812 Cell # 714-815-6289
Dick Masters Supervisor of Facilities and Construction	Pager # 714-304-0564 Office # 714-378-2052
Dr. David Perry Assistant Superintendent Administrative Services	Cell # 714-746-0511 Office # 714-378-2050

Part II-D

Community Profile
Huntington Beach Union High School District
Table of Contents

1. SCHOOL DISTRICT OVERVIEW 3
2. DISASTER HISTORY 5
3. POPULATION AND DEMOGRAPHICS 5
4. SPECIAL POPULATIONS/SPECIAL NEEDS 6
5. TRANSPORTATION STATISTICS 6
6. SCHOOL SITE INFORMATION 7
7. SCHOOL DISTRICT INFORMATION 7

(This page intentionally left blank)

Huntington Beach Union High School District

1. School District Overview

Huntington Beach Union High School District (HBUHSD) was founded in 1903 under the name Las Bolsas Union High School, serving the elementary districts of Westminster, Garden Grove, Los Alamitos, Bolsa, New Hope, Fountain Valley, Chica, Ocean View, and Springdale. During its early years it was known as "The School on Wheels" because it moved frequently and had a somewhat uncertain destiny. The school was originally planned for Los Alamitos; however, after one student appeared, it was abandoned on the fourth day of school. A second try was made at Bolsa Avenue and Ward where a 40-acre site was obtained. Local opposition resulted in an injunction and the school was moved to Garden Grove in 1904. The following year, the school traveled to Wintersburg where it was housed in an old armory building.

However, community opposition was still brewing and there was a strong effort mounted to abandon the school. These early controversies resulted in several districts withdrawing, with only Fountain Valley, Ocean View, and Springdale remaining in the district, while at the same time Huntington Beach and Newport Elementary joined the union. Again in 1906, the “High School on Wheels” was on the road, finally settling in the basement of the old Methodist campground auditorium in Huntington Beach, where it remained until the completion of its first permanent building on its present site in 1908.

The early years of the on-school district were scarred by continuous legal struggles. Bonds were approved by a majority of residents for a school building and yet, due to opposition, they were often declared illegal. Through the assistance of a local state senator, a law was passed changing the name from Las Bolsas Union High School to Huntington Beach Union High School District. The Huntington Beach Company came to the rescue of the district when they donated a permanent site at Main Street and Utica, where the first cornerstone was laid in 1908. The passage of a $35,000 bond to construct the new school was met with controversy. However, the jolt that almost led to the demise of the district occurred in 1912, when the trustees purchased a two-ton truck to transport students. The controversial truck-bus transported students from Westminster, Newport, Huntington Beach, and Fountain Valley, increasing the enrollment of the fledgling school by seventy-five students and bringing Westminster back into the union.

The financial woes of the controversial district were solved in 1921 when oil was discovered in Huntington Beach. The 1908 building was replaced in 1926 by a distinctive new school that featured the current auditorium and clock tower, which was dedicated in 1987 as an historical landmark.

The first graduating class in 1906 consisted of six students out of a total school enrollment of eighteen students. By 1919 the enrollment grew to 364, 1933 to 637, and 1950 to 950 students. The 1926 facility remained the only school in the district until 1959 when the trustees purchased 50 acres for a Westminster site at a cost of $300,000. During the 1960's and 1970's, the agricultural community of West Orange County was rapidly transformed by the housing boom that occurred as residents flocked to the beach communities on the newly constructed 405 Freeway. Young families with school-age children created instant communities which caused an enrollment explosion that resulted in the construction of Marina High School in 1963, Fountain Valley High School in 1966, Edison High School in 1969, and Ocean View High School in 1974.

The district conducted nationwide searches for outstanding teachers to join the ranks of a young, progressive district focused on quality schools. The peak enrollment of the district occurred in 1978 when the six schools housed 21,193 students by utilizing ten-period days and eighty-four portable classrooms. Fountain Valley High School was recognized as the largest school west of the Mississippi with an enrollment in excess of 4,300 students. All the schools, with the exception of Ocean View, were in excess of 4,000 students.

The rapid enrollment increase of the 1960s and 1970s was met with an equally rapid enrollment decline during the 1980s and 1990s. The young families grew older, graduating students from high school, and yet parents remained in their homes as "empty nesters". During this time, the district experienced a roller coaster ride of highs and lows. The problems associated with school construction, portable classrooms, crowded facilities, and extended days were replaced by dwindling finances, program reductions, and staff layoffs.

During the past 90 years, as the district experienced the ups and downs of agriculture, oil and suburban economics, it maintained a strong commitment to education, which has provided a rich tradition of athletic and educational success for students. In recent years, the district has been praised by Newsweek Magazine and the Los Angeles Times for its commitment to academic excellence.

College admission test scores for the district class of 2003 are 59 points above the national average for the SAT 1 (Scholastic Achievement Test) and significantly above the national average for the ACT (American College Test). Highly successful Advanced Placement courses exist at each school; alternative programs provide rich opportunities for the other students. The Special Abilities Cluster and special day classes have been acknowledged as exemplary in meeting the needs of special education students.

In addition to preparing students for college, the district is helping non-college bound students make a successful transition to the work world. Students are given the opportunity to explore career options and learn marketable skills. It is expected that all students experience success in school and beyond.

2. Disaster History

Since the Huntington Beach Union High School District (HBUHSD) is within the city limits of Huntington Beach, Westminster, and Fountain Valley any major disasters that affect either city would also affect our district. The most current emergencies that have affected HBUHSD area as follows:

a) Flooding and evacuation of Westminster High School during the 1983 “El Niño.” All other severe storms resulted in minor water damage.
b) Maintenance and Operations clarifier overflow in 1991 discharging approximately two gallons of water saturated with oil/grease onto Main Street. The site was vacuumed up and steam cleaned under the direction of the City of Huntington Beach.
c) There has been no major damage from earthquakes in recent history.

HBUHSD has an emergency operations center located at the District Office, 10251 Yorktown Avenue. Additionally, each site has a designated emergency operations center along with an emergency generator and supplies for 72 hours. The District also maintains a mobile catering truck complete with generator, propane, fresh water, and the ability to cook, warm or refrigerate items if needed.

3. Population and Demographics

The Huntington Beach Union High School District encompasses three cities, Huntington Beach, Fountain Valley, and Westminster. There are eight schools of which six are comprehensive high schools, one is a continuation/adult school format and one is an alternative education site. There are a total of approximately 15,000 students plus 1,200 teachers and staff. Additionally the District Office at Yorktown and Brookhurst has approximately 58 staff members and the Maintenance and Operations, Transportation and Security offices at Yorktown and Main houses all vehicle maintenance, bus transportation, facilities maintenance, and security personnel.

The demographic breakdown of the various sites within HBUHSD is as follows:

HBUHSD Student Ethnicity (%)

Site	American Indian	Black	Asian	Filipino/ Pacific Isle	Hispanic	White
EHS	6	1	12	3	8	70
FVHS	3	1	34	3	11	48
HBHS	6	1	10	2	15	66
MHS	7	2	17	2	12	60
OVHS	5	2	17	3	34	39
WHS	5	2	40	3	36	14
VVHS	7	0	6	3	22	62
CHS	4	0	6	2	15	73
District	6	1	22	2	19	50

4. Special Populations/Special Needs

All of our schools have facilities for special education students of which there are currently approximately 350 enrolled. The programs meet the needs of students with developmental disabilities including hard of hearing, special needs, and special abilities. The students have opportunities for mainstreaming and integration with non-handicapped peers according to Federal and State guidelines regarding the education of students with severe handicaps.

The classes offer a wide range of instructional components for developing academic and functional skills through on-campus and community-based instruction. Additionally, students can take classes designed to take the skills and knowledge gained over their years in school programs and apply them to daily living, work, and community life.

5. Transportation Statistics

Huntington Beach Union High School District maintains two areas in transportation. The first is Vehicle Maintenance Department, which is composed of a supervisor and four vehicle maintenance technicians who maintain more than 250 vehicles, electric carts, busses, and field maintenance tools.

The second area is Bus Transportation, which provides busses for all special education students where transportation is required and for extra curricular activities such as athletic events, conferences, and special site functions. Bus Transportation program has 36 busses with 16 home-to-school routes and 16 full-time drivers, 12 substitute drivers, one supervisor and one driver trainer. The special education drivers work 11 months out of the school year, which includes summer school.

6. School Site Information

School Name and Address	Phone and Fax Number	Student & Staff Population
Huntington Beach High School 1905 Main Street, HB	714-536-2514 714-960-7042 Fax	2,600
Marina High School 15871 Springdale Street, HB	714-893-6571 714-892-7855 Fax	2,850
Ocean View High School 17071 Gothard Street, HB	714-848-0656 714-843-0541 Fax	1,775
Edison High School 21400 Magnolia Street, HB	714-962-1356 714-963-4280 Fax	2,420
Fountain Valley High School 17816 Bushard Street, FV	714-962-3301 714-964-0491	3,230
Westminster High School 14325 Golden West Street, Westminster	714-893-1381 714-898-4721	2,850
Valley Vista High School 9600 Dolphin Street, FV	714-964-7766 714-964-3045	250
Coast High School / Adult Ed 16666 Tunstall Street, HB	714-847-2873 714-841-9733	225
District Office 10251 Yorktown Avenue, HB	714-964-3339 714-963-7684	Staff: 85

7. School District Information

24 Hour Contact Name	Workplace Phone Number	After Hours Contact Phone Number
Patricia Koch	714-964-3339 ext.4360	----
Scott Atkinson	714-536-7521 ext. 400	714-334-0012
John Klungreseter	714-536-7521 ext. 410	714-334-0711
HBUHSD PD Dispatch	2130 – 0530 Monday – Sunday	714-536-7521 ext. 505

Part II-E

Community Profile
Ocean View School District
Table of Contents

1. OVERVIEW 1
2. HISTORY OF SCHOOL NAMES 1
3. DISASTER HISTORY 5
4. DEMOGRAPHICS 5
5. TRANSPORTATION 5
6. SCHOOL DISTRICT INFORMATION 5

(This page intentionally left blank)

Ocean View School District

1. Overview

The Ocean View School District (OVSD) was formed in 1874, when the area was sparsely populated and each of today's school sites were vegetable fields. Moderate growth affected the area through the first half of the century. Around 1950, Orange County leaped into prominence as the fastest growing county in the nation. The Ocean View School District went from a one-school District in the 1950s to a twenty-five school District in the 1970s. At one point, the District was growing by a classroom of students a week.

2. History Of School Names

Ocean View is an old school District. It was formed sometime around 1880 on a farming and floodplain area north of the City of Huntington Beach. It had only one school for many years, located on the northeast corner of Springdale and Warner. This school was closed and subsequently sold to one of the city councilmen who converted it into a private school called the Country Day School. This school did very well, busing from Long Beach, students whose parents wanted them to have a rural learning experience. The school closed in the middle 1970s.

Credit needs to go to former Ocean View School District Superintendent, Harold Petterson, who foresaw the growth of the area and made it his goal to get a school in every section of land and, if possible, every half-section. Superintendent Petterson was a visionary. He knew that the land would always increase in value and provide the District a solid financial source. Ocean View is the only true model of a District based on neighborhood school planning. Other Districts planned fewer but bigger schools and had to pay dearly for increased land values when the population explosion occurred.

One of the most frequently asked questions regarding the Ocean View School District is, "Why do all the schools' names end in view?" Well, not all of them do. Robinwood (now a closed site) and Westmont are the exceptions. As you read on, you will discover the answer to this question along with an interesting mix of history, identity, and location regarding the background of our District.

The School Board of the early 1960s wanted the District to have a unifying identity; hence, the word View was tacked onto each school name so that it would not be confused with Westminster to the north or Huntington Beach Elementary to the south. Both of these Districts named schools after people, which Ocean View did not do, enabling it to maintain its unique identity. Most people in those years identified with their tract and that is how some schools derived their names. Other school names came about through some uncommon circumstances. For instance, Circle View was a brand new state of the art facility which employed rooms clustered together in a circular design with a work room at the hub. The school was named for its design and the program of the day that advocated

small classes using team teaching and many aides.

College View: This school was named for its location near Golden West College. It has the largest square footage under one roof. Ocean View was a "lead District in motivation" and open space was a hot item at the time. The cost was also cheaper.

Crest View: Crest View was named for a tract that was south of the school. The school buildings have since been demolished and the District leases the land to Wal-Mart.

Glen View: This school was named for the street in front of it, Glen Drive. Glen View, now a closed site, was a small experimental school built with a television studio at the core. Television was to be the main method of instruction.

Golden View: Golden View was named after one of the many different tracts in the section of Golden West Street. One could see the campus of the school from the street as no houses were built east of the school. Many people did not know the name of the school, so they would refer to it as the school with the farm.

Haven View: This school was named for the Dutch Haven tract to the west and south of the school. One of the last "finger plan" schools built, it had no multipurpose room. It was designed to be a small school. This site is now leased.

Harbour View: This school was named for the Huntington Harbour development. The building reflects the middle stage of school construction which was an abandonment of the "finger plan" layout in favor of self-contained rooms under one roof. It was viewed as a cost saving matter because it did not take up a lot of space and the design was repeated at Marine View, Hope View, Lake View, and Spring View.

Hope View: Many years ago encyclopedia companies bought sections of swamp land in Huntington Beach and subdivided them into approximately 25 x 50 foot lots. These lots were used to sell encyclopedias everywhere with the promise to get "California land" with a purchase of the books. These tracts of land were scattered throughout northern Huntington Beach. It was very time consuming to clear title to these lots but through condemnation proceedings, buildable sites could be realized. Hope View got its name from the hope that all the legal hurdles could be met within a certain time line so that the District could purchase the

site and build a school. It is a large site that the District obtained at the best kind of price--almost nothing!

Lake View: This school was built on a spot where a lake would form after each rainfall. It now has a drainage ditch to carry off most of the water, but still forms a lake after a downpour occurs.

Lark View: Lark was the second half of the Meadowlark names. It was a small school built in the center of a tract. It epitomized the neighborhood school concept. Lark was overcrowded on the day it opened and stayed open until only 156 students were in attendance. It operated in tandem with the special education school, Nueva View. This site now houses the District administration.

Marine View: Initially there were plans to build a marina in the Bolsa Chica area. Huntington Harbour was not completed and everyone thought that the developers would build it. Sunset Harbour was not yet on the planning boards. Marina High School was also named for the new marina.

Mesa View: This school sat at the bottom of the mesa where Central Library now stands. In those days, there were no trees anywhere so the mesa could be clearly seen.

Meadow View: This was one of the first "new" schools built around 1958-59, along with Village View. Meadow was the first part of Meadowlark which was the name of the golf course and airport in the area. This site is now leased to various tenants.

Oak View: This school was named for the street in front of the school, Oak Lane.

Park View: Park View was named for its proximity to Murdy Park. This site is leased to the Huntington Beach Union High School District.

Pleasant View: No data exists on the origin of this school's name. It may have had something to do with the tract.

Rancho View: This was one of the first schools built in the new District and it replaced the old school on the corner of Beach Boulevard and Warner Avenue. It operated as the District Office for many years. After it was sold, Charter Center was developed which has one of the two, true high-rise buildings in Huntington Beach. The school buildings at Rancho View have been demolished and this site is leased to Lowe's

Hardware for a future store to be opened in January 2005.

Robinwood: This closed school site was named for the Robinwood tract that surrounded it. An example of good planning, it was built in anticipation of the housing tracts that were to be developed around it. The City of Huntington Beach changed the zoning to industrial and the school always had students bussed. This site is now leased to the Coastline Community College.

Spring View: The land for this school was acquired in 1963 and the school itself was built in 1965. The school was named for Springdale Street as it faces in that direction.

Star View: Legend has it that it was so far from the rest of the District that it was like a star.

Sun View: Built after Star View, it may have carried on the celestial theme. It is a "pod" school like Circle View with the same educational philosophy that was in vogue for that period in time.

Village View: This school was named for the first large tract built in north Huntington Beach, Huntington Village. This development covered 640 acres of land. It went from Bolsa Chica on the west side to Springdale on the east side, to Edinger on the north side, and extended to Heil on the south side.

Vista View: Vista View was designed as a large, open school, built to reduce overcrowding. It was developed on the District's eastern boundary, surrounded by Fountain Valley, and was named after the Sol Vista tract near it.

Westmont: This school was built at the same time as Robinwood and was named for the tract surrounding it. The Board of Trustees, at that time, was convinced by a Citizens' Committee that naming schools for the tracts surrounding them would be the wave of the future. It was not and the Board did not ask the community to suggest names anymore.

3. Disaster History

Since the Ocean View School District is within the Cities of Huntington Beach, Westminster, and Fountain Valley, any major disasters affecting those communities will also impact our District. Our most recent disaster was the flooding caused by El Niño in 1983. There has been no recent damage from any earthquakes. The Ocean View School District has an emergency operations center located at 8291 Warner Avenue Huntington Beach, CA 92647.

4. Demographics

The District reached its growth peak in 1998 at +2.7 percent. The District envisions maintaining approximately a +1.5% enrollment growth in grades K-8 for each of the next seven years. The current average daily attendance is estimated at 9,897 students and the number of special education students is 265.

5. Transportation

The District owns 41 busses: 13 busses are used to transport special education students and 19 busses are used to transport regular education students. The 9 spare busses are used for field trips and to replace other vehicles are out-of-service for repairs. We transport 2,577 students to school daily including 124 special needs students. We employ 32 bus drivers and provide service to 16 District sites. We provide transportation service for approximately 475 field trips annually and for 141 athletic events.

6. School District Information

Emergency calls to the Ocean View School District are responded to 24 hours a day, 7 days a week by calling 714 847-2551, ext. 4. The District rotates the assignment of on-call personnel for after-hours emergencies.

Part II-F

Community Profile
Fountain Valley School District
Table of Contents

1. SCHOOL DISTRICT OVERVIEW 1
2. DISASTER HISTORY 1
3. POPULATION AND DEMOGRAPHICS 1
4. SPECIAL POPULATIONS/SPECIAL NEEDS 2
5. TRANSPORTATION STATISTICS 2
6. SCHOOL SITE INFORMATION 2
7. SCHOOL DISTRICT INFORMATION 3

(This page intentionally left blank)

Fountain Valley School District

1. School District Overview

The Fountain Valley School District (FVSD) is a K-8 district serving 6,207 students. The District is organized into seven elementary schools (K-5), three middle schools (6-8), and one school that is K-8. The District owns and leases out three closed school sites. It has a new maintenance and operations facility and currently occupies a closed school site for its district office facility. In addition, it owns a 2-story office building that is designated for renovation as the District Office facility following the sale of the current site, McDowell School.

2. Disaster History

FVSD has relatively new facilities, the oldest constructed in the mid-1960s, the “newest” school having been completed in the mid-1970s. All schools are currently eligible for matching state funds for modernization and all are being modernized.

Other than the evacuation of one school site as a result of a flood in the early 1980s, and a fire in the late 1970s that destroyed much of one site the FVSD has been fortunate to escape any serious damage as a result of disaster.

3. Population and Demographics

6,207	Students
285	Teachers
352	Classified employees
564	Kindergarten
627	First grade
664	Second grade
643	Third grade
670	Fourth grade
685	Fifth grade
711	Sixth grade
772	Seventh grade
754	Eighth grade

4. Special Populations/Special Needs

In addition to the regular education students and traditional education programs, the FVSD operates extended school programs at each of its eight elementary campuses. Students report for care as early as 7:00 AM and may remain as late as 6:00 PM. In the summer, at least two of the sites operate summer school programs. The extended school program also offers summer camp.

5. Transportation Statistics

Our transportation division employs 11 bus drivers and operates 11 buses. The District transports 185 students on a daily basis. Approximately 80 of these students are transported to special education programs outside of these attendance areas.

6. School Site Information

School Name and Address	Phone and Fax Number
Roch Courreges School 18313 Santa Carlotta, FV	378-4280 378-4289 (fax)
James H. Cox School 17615 Los Jardines East, FV	378-4241 378-4249 (fax)
Harry C. Fulton School 8778 El Lago, FV	375-2816 375-2825 (fax)
Robert Gisler School 18720 Las Flores, FV	378-4211 378-4219 (fax)
Kazuo Masuda School 17415 Los Jardines West, FV	378-4250 378-4259 (fax)
Fred Moiola School 9790 Finch Avenue, FV	378-4271 378-4279 (fax)
William T. Newland School 8787 Dolphin Street, HB	378-4201 378-4209 (fax)
Isojiro Oka School 9800 Yorktown Avenue, HB	378-4261 378-4269 (fax)
Urbain H. Plavan School 9675 Warner Avenue, FV	378-4231 378-4239 (fax)
Samuel Talbert School 9101 Brabham Drive, HB	378-4221 378-4229 (fax)
Hisamatsu Tamura School 17340 Santa Suzanne, FV	375-6226 375-6235 (fax)

7. School District Information

24 Hour Contact – Name	Workplace Phone	24 Hour Contact Phone
Carl Dane	843-3228	949-697-3857
Barry Blade	843-3251	949-494-2529
Mark Ecker	843-3255	714-231-0289

Part III

Risk Assessment
Table of Contents

A. IDENTIFYING/PROFILING HAZARDS 1
Phase 1: County Hazard Analysis 2003 1
Phase 2: City Hazard Analysis 2003 2
Phase 3: Hazard Mitigation Committee Hazard Analysis 2
Phase 3: Hazard Mitigation Committee Hazard Analysis 3
Step 1: Review of Current Statistics and Information 3
Step 2: Hazard Mitigation Hazard Ranking 3
Step 3: Data Analysis 4
Step 4: Narrowing the Focus 6
Step 5: Hazard Assignments 7
Phase 4: Hazard Research 8
Step 1: Plan Writer Research 8
Step 2: Additional Committee Assignments 8
EXHIBIT III-B-1: CITY OF HUNTINGTON BEACH ASSET LIST 12
EXHIBIT III-B-2: CITY OF FOUNTAIN VALLEY ASSET LIST 19
EXHIBIT III-B-3: HB CITY SCHOOL DISTRICT ASSET LIST 21
EXHIBIT III-B-4: HB UNION HIGH SCHOOL ASSET LIST 23
EXHIBIT III-B-5: OCEAN VIEW SCHOOL DISTRICT ASSET LIST 24
EXHIBIT III-B-6: FOUNTAIN VALLEY SCHOOL DISTRICT ASSET LIST 26
EXHIBIT III-B-7: FEMA WORKSHEET 3A 30
Step 3: Estimated Potential Losses, FEMA Worksheet 4 31
EXHIBIT III-B-8: FEMA WORKSHEET 4 35
C. MULTI-JURISDICTIONAL RISKS 37
EXHIBIT III-C-1: MULTI-JURISDICTIONAL RISK ASSESSMENT MATRIX 38
D. SUMMARY 41

(This page intentionally left blank)

Part III-A

Risk Assessment

The following section details the process executed to analyze the six selected hazards. This two-year process ensured a consistent approach and a thorough analysis of planning area risk and recommended mitigation strategies.

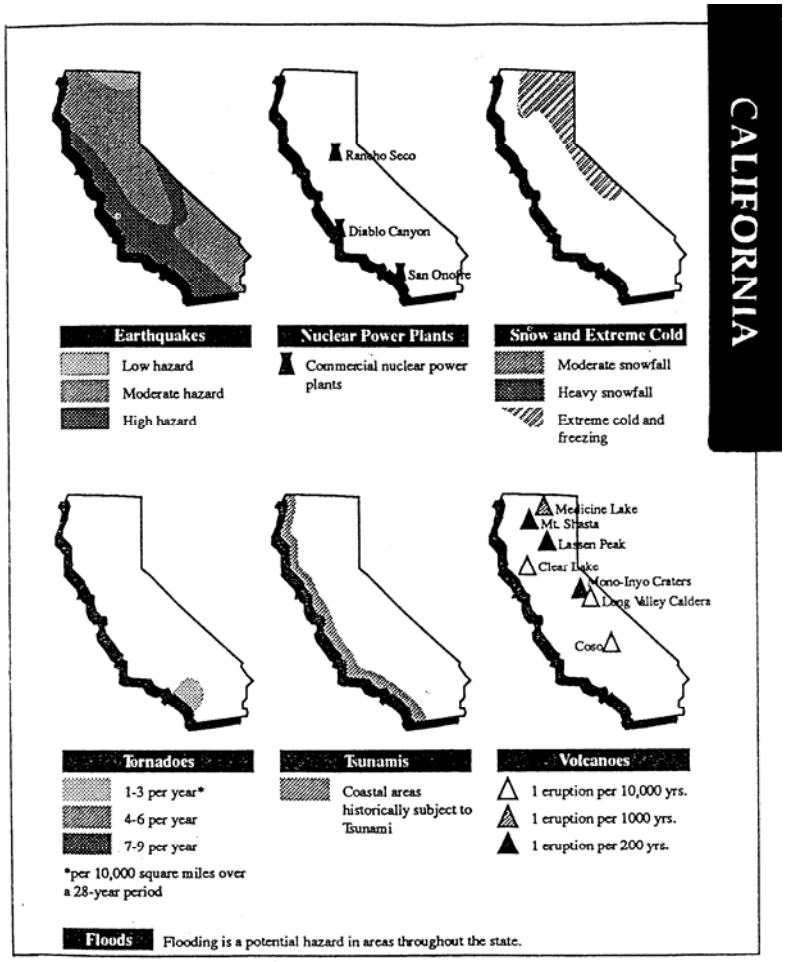
A. Identifying/Profiling Hazards

Four phases led to the analysis of natural hazards that affect the planning area. The four phases are:

Phase 1 - County Hazard Analysis 2003
Phase 2 - City Hazard Analysis 2003
Phase 3 - Hazard Mitigation Committee Hazard Analysis
Phase 4 - Hazard Research and Presentations

Phase 1: County Hazard Analysis 2003

The hazard ranking process for the Hazard Mitigation Plan began prior to the formation of the Hazard Mitigation Committee. In 2003, the Orange County Emergency Management Organization (OCEMO) met twice monthly to develop jurisdictional Emergency Operations Plans (EOPs). For the first six months, Orange County cities worked together to develop the Hazard Analysis section of their respective plans. The Committee reviewed maps such as the FEMA State Hazard Map (shown on the right) to determine hazards that impact Orange County. The group came to a consensus on ALL the hazards that impact the planning area. Each City was then assigned to research one of the hazards. Many months were spent conducting research. The hazards were then presented and discussed in depth. Experts were invited to the meetings to provide technical input.



After all presentations were made, members of the Orange County Operational Area ranked the hazards. The Orange County EOP Writing Committee ranked the hazards by "***Chance of Occurrence"*** and "***Effect."*** Staff members from the City of Huntington Beach and the City of Fountain Valley served on the Committee.

The matrix to the right depicts the results of this Orange County hazard research and ranking process.

County of Orange
Hazard Analysis

DISASTER THREAT	PROBABILITY OF OCCURRENCE			EFFECT			DISASTER RATING (Probability x Effect)
	Likely 10	Possible 5	Unlikely 1	High 10	Average 5	Low 1	
Flood/Storm	X				X		50
Hazardous Materials	X				X		50
Wildland Fire	X				X		50
Earthquake		X		X			50
Civil Disturbance/Riot		X			X		25
Aircraft Incident		X			X		25
Oil Spill		X			X		25
Train Accident		X			X		25
Dam Failure			X	X			10
Epidemic			X	X			10
SONGS			X	X			10
Terrorism			X	X			10
High Wind (Santa Ana Winds)	X					X	10
Urban Fire		X				X	5
AG/Vector		X				X	5
Mud/Landslide		X				X	5
Stage III Energy Failure		X				X	5
Tornado		X				X	5
Tsunami			X			X	1
War			X			X	1

Phase 2: City Hazard Analysis 2003

To localize the Orange County Operational Area hazard analysis process, key Huntington Beach and Fountain Valley staff members reviewed the results of the Orange County hazard analysis. Such staff members included: Fire Captains, Police Sergeants, and Emergency Services Personnel. This inter-departmental staff representation ensured input from field and management perspective.

In 2003, after a City-specific ranking process, the following Hazard Ranking Matrixes were developed:

City of Huntington Beach
Hazard Analysis

PLANNING PRIORITY	RISK	CHANCE OF OCCURRENCE	EFFECT**
#1	Earthquake	7	10
#2	Flood/Storm, Hurricane or Tidal Surge	10	7
#3	Urban Fire and/or Explosion	8	8
#4	Hazardous Chemical Spill/Oil Spill/Pipeline Breakage/Environmental Disaster	8	8
#5	Violence in the Workplace/School/or City Facility	7	7
#6	Terrorism/Weapons of Mass Destruction	5	9
#7	High Wind/Santa Ana Wind Condition	9	5
#8	Tornado/Water Spout	6	7
#9	Aircraft/Train Accident	4	9
#10	Riot/Civil Disturbance	7	5
#11	Epidemic/Pandemic	3	10
#12	Radiological/Nuclear Incident (Includes: nuclear war; San Onofre Nuclear Generating Station (SONGS) or Seal Beach Naval Weapons Station incident involving radiation; nuclear accident.	3	10
#13	Tsunami	3	9
#14	Power Outage or Stage III Energy	5	5
#15	Dam Failure (Prado/Seven Oaks)	2	8
#16	Agriculture or Vector	2	3

Chance of Occurrence and Effect numbers are rated from one to ten (1 to 10). Higher numbers signify greater chance of occurrence and a greater effect.
* **Chance of Occurrence** is based on Huntington Beach history, geography, and potential.
** **Effect** is the worst case scenario.

City of Fountain Valley
Hazard Analysis

Planning Priority	Hazard	Chance of Occurrence	Effect
#1	Earthquake	7	10
#2	Flood/Storm/Hurricane	10	5
#3	Urban Fire	5	7
#4	Hazardous Materials	5	7
#5	Terrorism (C-BRNE)	3	9
#6	Epidemic/Pandemic	3	6
#7	Aircraft Incident	2	8
#8	Dam Failure	2	5
#9	San Onofre Nuclear Generating Station (SONGS)	1	6
#10	High Winds (Santa Ana Winds/Tornado)	2	4
#11	Stage III Energy Failure	5	1
#12	Agriculture & Vector Control	1	2
#13	War	3	7

Phase 3: Hazard Mitigation Committee Hazard Analysis

Step 1: Review of Current Statistics and Information

County Hazard Analysis Review

The FEMA maps utilized in 2003 to complete the Orange County Operational Area hazard analysis were reviewed. The Committee agreed to focus mitigation efforts solely on natural hazards. Based on the FEMA hazard maps, the Committee came to the consensus that earthquake, tornado, and tsunami are threats to the local planning area (See Part 1-C, Planning Process for a list of Committee participants).

State of California Proclaimed Disasters

The Committee reviewed the "California Proclaimed States of Emergency Statistics from 1950 to 1997." This document was provided by the State of California Office of Emergency Services (OES) Hazard Mitigation Section. The following information relevant to Orange County was extrapolated from the document:

State of California Proclaimed Disasters: Orange County	
Hazard	**# of Proclamations**
Flood	9
Weather/Storm	5
Earthquake	3
Wildland Fires	3
Agricultural Emergency	2
Landslide	2
Energy Shortage	2
Fire/Urban	1
Epidemic	1

City General Plans

The Safety Elements of the General Plans for the Cities of Huntington Beach and Fountain Valley were reviewed. This education included reviewing related maps, studies, and crucial references listed in the General Plans. Significant overlap appropriately exists between the General Plan and the Mitigation Sections of the two City Emergency Operations Plans. Relevant maps and excerpts were taken from the General Plans for later integration into the Hazard Mitigation Plan.

Step 2: Hazard Mitigation Hazard Ranking

The next step was to allow Committee members to rank all the hazards. Committee members, educated during previous phases, were asked to re-rank the list of all potential hazards previously ranked in 2003 for the EOP. On January 20, 2004, Committee members were given instructions as to how to complete the FEMA Vulnerability Assessment Worksheet.

Committee members were asked to score the hazards based on the following categories:

- Magnitude
- Duration
- Distribution
- Area Affected
- Frequency
- Degree of Vulnerability
- Community Priorities

Each category was given a rating from 0 to 3, where 0 = no risk and 3 = high risk.

All hazards were included in the rankings. Hazard lists were taken from all three EOPs (both Cities and the County) and the additional hazards discussed by the committee (i.e., HB subsidence).

All City and School District personnel completed his/her form independently. School Districts were asked to rank hazards for the City that contained the most School District property.

Step 3: Data Analysis

Huntington Beach community member Cecil Wright (retired engineer) conducted the study for the Committee. It was agreed by the Committee members that the two Cities would be ranked separately. Using an Excel spreadsheet, the votes were compiled and ranked from highest to lowest. Due to the varying levels of expertise among Committee members, a simple averaging of all scores determined the final results.

Results from Huntington Beach Committee members are as follows:

Rank	Hazard	Score
1	Earthquake	22.00
2	Flood/Storm, Hurricane or Tidal Wave	20.22
3	Power Outage or Stage III Energy	14.33
4	Terrorism/Weapons of Mass Destruction	14.22
5	Subsidence	14.00
6	Hazardous Chemical Spill/ Oil Spill/Pipeline Breakage	13.89
7	High Winds/Santa Ana Wind Condition	13.44
8	Urban Fire or Explosion	11.56

9	Epidemic or Pandemic (SARS)	10.89
10	Radiological or Nuclear Accident	10.89
11	Violence in Workplace/ School/City Facility	10.78
12	Riot or Civil Disturbance	10.22
13	Tsunami	10.22
14	Dam Failure	9.89
15	Aircraft/Train Accident	8.78
16	Tornado or Water Spout	8.44
17	Special Events	7.78
18	Agriculture/Vector Both plant and animal	7.22

Results from Fountain Valley Committee members are as follows:

Rank	***Hazard***	***Score***
1	Earthquake	13.89
2	Flood/Storm/Hurricane	11.44
3	San Onofre Nuclear Generating Station (SONGS)	10.17
4	Hazard Materials	8.44
5	Urban Fire	8.00
6	High Winds (Santa Ana Winds/ Tornado)	8.00
7	Stage III Energy Failure	7.89
8	Epidemic or Pandemic	6.89
9	Dam Failure	6.67
10	Terrorism (C-BRNE)	6.22
11	Aircraft Incident	5.44
12	War	3.89
13	Agriculture/Vector	3.33

Multiple Committee members, after reviewing the FEMA 386 series guidance and reflecting upon recent newspaper coverage of hazard impacts, suggested that subsidence be added as a natural hazard.

Further discussion revealed local subsidence cases including damage to Murdy Fire Station, Marina High School, Edison High School, Thrifty Drug Store, and Huntington Beach Public Works Corporate Yard. Consensus was reached that subsidence does

have a significant impact upon the planning area, enough at least to warrant further investigation.

Due to the close proximity and similar environmental conditions, Committee members from all jurisdictions had similar ranking outcomes.

Step 4: Narrowing the Focus

Committee leadership reviewed the outcomes and noted that the planning area is not impacted by wildfire and mud/landslide. The two Cities are nearly all built-out and therefore lack open wildland and landslide prone topography. Considerable discussion was held on whether urban fire should be included as a natural hazard. After input from the Fire Department Committee members, it was concluded that most urban fires in the planning area are caused by arson, mechanical processes, and electrical processes (thus lacking a natural hazard categorization). It was therefore agreed that urban fire should be included in a future technological hazard mitigation study.

The remaining natural hazards were pulled out of the hazard analysis as follows:

Huntington Beach Hazard Analysis

- Earthquake
- Flood
- High Wind/Santa Ana Winds
- Tornado/Water Spout
- Tsunami
- Dam Failure

Fountain Valley Hazard Analysis

- Earthquake
- Flood/Storm/Hurricane
- Dam Failure
- High Winds (Santa Ana Winds/Tornado)

The above lists were considered and the Committee decided to consolidate related natural hazards creating two new categories:

Prior Hazards Combined	***New Hazard Name***
Santa Ana Winds ***Tornadoes***	Windstorms
Flood ***Storm*** ***Hurricane***	Flood

After many hours of Committee discussion, the hazard list for each City was narrowed to six overall natural hazards. The following six hazards were selected based on the results of the Committee rankings (no priority order):

1. **Windstorms: Santa Ana Wind & Tornadoes**
2. **Tsunami**
3. **Subsidence**
4. **Dam Failure**
5. **Flood (severe weather storms)**
6. **Earthquake**

Although subsidence did not originally appear on the Fountain Valley Hazard Ranking form, it was included as one of the six hazards for study due to its significant impact on the City of Huntington Beach and the discovery of subsidence damage to Fountain Valley High School, surrounding developments, and possibly Fountain Valley Fire Station 1.

The Committee voted unanimously on February 12, 2004 to include the above six natural hazards in the study.

Note: At the August 12, 2004 Hazard Mitigation Committee meeting, Fountain Valley Committee representatives were asked to revisit the original Fountain Valley Hazard Ranking list (see previous page) and insert subsidence appropriately given the research and subsequent presentations. Geologists from USGS and the University of California Irvine agreed that subsidence poses a threat to the local planning area, specifically as it pertains to long-term soil compaction. Committee members agreed to rank subsidence 11 ½. This placed subsidence below "*Aircraft Incident*" and above "*War*."

Step 5: Hazard Assignments

Following the natural hazard identification, ranking, and consensus, the hazards were assigned to four Committee members. Utilizing both the community profile sections and the hazard studies, an analysis of impact would be obtainable.

The hazard studies were assigned to the following plan writers:

Hazard	***Assigned Researcher***
Windstorm: Santa Ana Winds & Tornadoes	Jacob Green, FV
Tsunami	Katie Freeman, HB
Subsidence	Jacob Green, FV
Dam Failure	Katie Freeman, HB
Flood	Cecil Wright, HB Community Member
Earthquake	Glorria Morrison, HB

Phase 4: Hazard Research

Step 1: Plan Writer Research

From February 2004 through August 2004, plan writers conducted hazard research. They presented each hazard at five consecutive monthly meetings. Presentations included mitigation strategies recommended by the plan writers. Upon conclusion of the presentation, the Committee was asked to determine the percentage of each City that would be impacted during a worst-case scenario hazard event. After a consensus was obtained, the group made recommendations for additional mitigation strategies. Each strategy was discussed in relation to implementation feasibility and potential constraints.

For the extensive hazard reports, please see "Part IV: Hazards and Strategies."

The following depicts the hazard presentation schedule:

Hazard	Date Presented to Committee
Windstorms	March 11, 2004
Tsunami	April 8, 2004
Dam Failure	May 13, 2004
Flood	May 13, 2004
Subsidence	June 10, 2004
Earthquake	August 12, 2004

Step 2: Additional Committee Assignments

Community & School District Profiles

City community profiles were assigned to the following Committee members:

City	Profile Writer
City of Huntington Beach	Glorria Morrison, HB and FV
City of Fountain Valley	Jacob Green, Fountain Valley

School District Profiles were assigned to the following Committee members:

School District	Profile Writer
Huntington Beach City School District	Dick Masters and Dana Sauer
Huntington Beach Union High School	Scott Atkinson
Ocean View School District	Carolyn Stocker
Fountain Valley School District	Carl Dane

Following profile development, the participating Cities presented the Community Profile section to the Committee. The topics include:

A. Overview
B. Population and Demographics
C. Geography and Environment
D. Climate
E. Land and Development
F. Parks
G. Housing and Community Development
H. Employment and Industry
I. Transportation
J. Major Facilities
K. Historical Disaster Events
L. Essential Service Facilities
M. Government Facilities (Non-City)
N. Utilities
   - Electricity
   - Natural Gas
   - Telecommunications
   - Water, Sanitation & Trash
O. Social, Cultural and Environmental Assets
P. Vulnerable Populations
Q. Development Trends

The School District community profile includes:

A. Overview
B. School District Disaster History
C. Population and Demographics
D. Special Populations/Special Needs
E. Transportation Statistics
F. School Site Information
G. School District Information

FEMA Worksheet 3b

Each agency was assigned to gather a list of assets owned by the agency, the value of the assets, and the value of the contents. Participants were advised to contact their Risk Managers to secure this information and fill out FEMA Worksheet 386-3a. Detailed explanation of this Worksheet will follow in the next section.

(This page intentionally left blank.)

Part III-B

B. Assessing Vulnerability

Step 1: Agency Assets

The first step in identifying the types and numbers of existing buildings and critical facilities located in the hazard area was to compile a list of all City and District owned assets. Utilizing FEMA Hazard Mitigation Worksheet 3b, all six jurisdictions were instructed to complete the Worksheet listing the following information:

a. Name of Asset
b. Address of Asset
c. Building Size
d. Replacement Value
e. Contents Value
f. Total Dollar Value of Asset

The City of Huntington Beach obtained the data from the Economic Development Department. The City of Fountain Valley data was supplied by the Administrative Services Manager. The School Districts obtained the information from their risk managers.

The following Worksheets were submitted by the six jurisdictions:

Exhibit III-B-1: City of Huntington Beach Asset List
FEMA Worksheet 3b

Jurisdiction: Huntington Beach

June 24, 2004 rec'd — Worksheet 3b

	Name or Description of Asset	Address	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Considerations	Building Size (sq.ft.) (thousands)	Replacement Value ($) (thousands)	Contents Value ($) (thousands)	Total	LOR	BIME/V	Type Construction
			X	X	X	X	X							
1	Administration Bldg	2000 Main St	X					189,000	14,750,000	6,374,078	28,564,465	4665979	2,774,408	Frame
2	Police/Detention Bldg	2000 Main St	X					81,807	12,864,622	4,872,088	17,736,710			Frame
3	Murdy Community Center	7000 Norma						11,000	596,550	61,699	658,249			Concr.
4	Senior Citizen Center	17th & Orange		X				12,000	742,966	50,130	793,096			Comb.
5	Lake Park Club House	Lake & 12th						3,000	118,583	11,569	130,152			Comb.
6	Boy Scout	Lake & 12th, Bldg 2						1,200	73,596	1,283	74,879			Comb.
7	Edison Community	Magnolia/Hamilton						11,065	686,093	70,695	756,788			Comb.
8	Meadowlark Golf Course	Warner & Graham			X			3,000	746,596	232,655	979,251			Comb.
9	Park Maintenance Bldg	17581 Gothard						7,906	249,270	120,175	369,446			Comb.
10	City Gym & Pool	16th & Palm						23,600	2,667,700	8,997	2,676,697			Comb.
11	Harbor View Club House	Heil & Saybrook						1,980	118,583	11,569	130,152			Comb.
12	Lake View Club House	Slater & Zeider						2,000	75,023	7,712	82,735			Comb.
13	Lebard Club House	Crailet & Craimer						800	59,293	6,427	65,720			Comb.

14	Oak View Rec Center	17261 Oak Lane						10,000	416,024	4,358,716	4,774,740			MSRY
15	Terry Park Club House	7707 Taylor St						900	75,023	7,712	82,735			Comb.
16	Newland House	Adams & Beach					X	2,750	187,558	7,712	195,269			Comb.
17	Newland Museum	Adams & Beach					X	6,000	356,594		356,594			Stl Frame
18	Beach Maint Operation	8669 Edison Ave	X					4,000	3,189,000	60,000	3,249,000			4
19	Corp Yard Bldg 1	17371 Gothard	X					79,700	5,432,715	1,199,394	6,632,109			CONC.
20	Corp Yard Bldg 2	17371 Gothard	X											CONC.
21	Corp Yard Bldg 3	17371 Gothard	X					19,200						CONC.
22	Corp Yard Bldg 4	17371 Gothard	X											CONC.
23	Corp Yard Bldg 5	17371 Gothard	X					14,650						CONC.
24	Water Dept Main Reservoir	19051 Gothard	X					78,000	1,338,837		1,338,837			MSRY
25	Water Building	19001 Huntington	X					14,800	1,044,266	280,210	1,324,476			Concr.
26	Library & Cultural Center	7111 Talbert				X		72,000	12,953,482	14,724,824	28,608,800	93,494		Stl Frame
27	Eader Park Library	9281 Banning						2,400	59,293	120,825	180,118			Comb.
28	Murphy Branch Library	15882 Graham						1,200	37,510	102,831	140,341			Comb.
29	Fire Station #1	Gothard, N of Ellis	X					6,800	746,596	39,846	786,441			Concr.
30	Joint Powers Training Center	Gothard Street	X					13,400	1,586,431	1,029,584	3,815,409			Concr.
31	Fire Station #3	Bushard, N of Adams	X					5,700	297,672	32,134	329,806			Comb.
32	Fire Station #4	Magnolia & Hamilton	X					5,702	417,463	32,134	449,597			Concr.
33	Fire Station #2	Gothard & Murdy	X					6,800	746,596	32,391	778,987			Concr.
34	Fire Station #8	Heil, W of Springdale	X					5,712	297,672	35,991	333,663			Comb.

35	Fire Station #7	Warner E of PCH	X					5,700	999,493	39,846	1,039,339			Comb.
36	Fire Station #5	530 Lake Street	X					8,000	1,193,101	39,846	1,232,946			Comb.
37	Snack Bar	Central Park/Golden West						4,820	72,602	25,707	98,308			Comb.
38	Library & Cultural Center	Main & Fifth						4,500	568,721	218,513	787,234			Concr.
39	Nature Center	Central Park Nature Center				X		1,400	82,283	12,854	95,137			
40	Special Education	17341 Jacquelyn Lane						2,500	181,505	0	181,505			MSRY
41	Police Helicopter Hangar	18401 Gothard	X					7,000	517,898	321,344	839,242			Steel
42	Water Reservoir	14561 Springdale	X					435,600	544,518	0	544,518			Concr.
43	Club House	18381 Gothard						1,400	113,413	11,994	125,408			Comb.
44	Shenk House	411 Olive	X					1,000	145,240	0	145,240			Comb.
45	Single Family Resident	19071 Huntington St						900	46,291	0	46,291			Comb.
46	Single Family Resident	204 5th Street						2,760	191,647	0	191,647			Comb.
47	Mobile Home #25 Clubhouse	7151 Ellis							1,097,017	0	1,097,017			Stl Frame
48	Single Family Dwelling	150 Historical Society						1,200	69,438	0	69,438			Comb.
49	Cultural Center	538 N Main Street						10,761	877,224	0	877,224			MSRY
50	Warehouse	17371 Gothard						15,000	1,157,285	599,697	1,756,982			Concr.
51	Storage Worthy Park	17371 Gothard						2,000	34,718	0	34,718			Stl Frame
52	Storage Building	17581 Gothard						150	32,404	0	32,404			Stl Frame
53	5 Story Parking Structure	2000 Main St			X			317,261	12,563,911	0	13,342,880	533,540	245,428	Concr.
54	Warehouse	7512 Garfield						9,300	1,297,951	0	1,297,951			WD RF
55	Brooks House	7201 Talbert						3,000	283,372	0	283,372			WD RF

56	Caretaker Residence	Warner & Graham						2,000	266,703	0	266,703			WD RF
57	Sr. Citizen Housing 16 Units	18111 Jolly Lane		X				10,400	700,669	29,309	1,397,245	667,268		Comb.
58	Sr. Citizen Housing 16 Units	18111 Jolly Lane		X				7,200	485,171	22,428	507,599			Comb.
59	Sr. Citizen Housing 16 Units	18151 Jolly Lane		X				10,400	700,670	29,308	729,977			Comb.
60	Sr. Citizen Housing 16 Units	18142 Park View Lane		X				11,400	768,268	33,131	801,399			Comb.
61	Sr. Citizen Housing 20 Units	18162 Park View Lane		X				13,000	846,016	36,571	912,587			Comb.
62	Sr. Citizen Housing 20 Units	18222 Park View Lane		X				13,000	876,016	36,571	912,587			Comb.
63	Sr. Citizen Housing 16 Units	18192 Park View Lane		X				10,400	700,553	29,308	729,861			Comb.
64	Sr. Citizen Housing 20 Units	18201 Park Tree Lane		X				111,400	768,268	33,131	801,399			Comb.
65	Sr. Citizen Housing 20 Units	18202 Park Tree Lane		X				13,000	876,016	36,571	912,587			Comb.
66	Sr. Citizen Housing 20	18191 Park Tree Lane		X				2,500	168,454	8,920	177,374			Comb.
67	Modular Restroom	Municipal Pier, Main/PCH							35,103	0	35,103			Comb.
68	Municipal Pier	Main & PCH			X				9,872,997	0	9,872,997			Comb.
69	Restroom Trailer/Office	East of Pier							60,000	103,000	163,000			Comb.
70	Various Vehicles/Mobile	Comp. Only							0	0	14,539,961		14,539,961	
71	Ruby's Restaurant	End of HB Pier			X				0	0	213,416	213,416		3
72	Edwards Fire Station	18592 Edwards St	X					6,818	3,880,712	53,100	3,933,812			B
	CITY SEWER LIFT STATIONS	City Lift Pump Stations												
73	Lift Station "A" #4	PCH & 17th St							1,304,600		1,304,600			
74	Lift Station "B" #7	PCH & 3rd St							1,304,600		1,304,600			
75	Lift Station "C" #8	Warner-A/F Fire Sta.							1,304,600		1,304,600			

76	Lift Station "D" #9	Warner & Edgewater							3,674,400		3,674,400			
77	Lift Station "E" #3	Gilbert & Peale							815,500		815,500			
78	Lift Station - ALGONQUIN #10	Algonquin & Pearce							2,055,600		2,055,600			
79	Lift Station - ATLANTA #18	Atlanta & Beach							1,186,600		1,186,600			
80	Lift Station - BRIGHTON #26	Brighton & Shoreham							1,541,800		1,541,800			
81	Lift Station - BROOKHURST #17	Brookhurst & Effingham							1,541,800		1,541,800			
82	Lift Station - BUSHARD #19	Bushard & Oettswood							1,186,600		1,186,600			
83	Lift Station - CORAL CAY #28	Coral Cay & Bluewater							1,227,600		1,227,600			
84	Lift Station - DAVENPORT #5	Davenport & Baruna							1,227,600		1,227,600			
85	Lift Station - EDGEWATER #6	Edgewater & Davenport							1,541,800		1,541,800			
86	Lift Station - EDWARDS #24	Edwards & Balmoral							1,541,800		1,541,800			
87	Lift Station - ELLIS #14	Ellis & Ashley							3,195,100		3,195,100			
88	Lift Station - GRAHAM #1	Graham & Kenilworth							1,186,600		1,186,600			
89	Lift Station - HUMBOLT #2	Gumbolt & Wayfarer							1,227,600		1,227,600			
90	Lift Station - LARK #11	Lark & Warner							1,186,600		1,186,600			
91	Lift Station - McFADDEN #21	McFadden & Dawson							1,186,000		1,186,000			
92	Lift Station - NEW BRITAIN #23	New Britian & Adams							1,186,000		1,186,000			
93	Lift Station - OCEANHILL #15	Oceanhill & Beach							1,227,600		1,227,600			
94	Lift Station - RANGER #16	Ranger & Adams							1,541,800		1,541,800			
95	Lift Station - ST BARBARA #25	Santa Barbara & Edinger							1,186,600		1,186,600			
96	Lift Station - SAYBROOK #22	Saybrook & Edinger							1,340,700		1,340,700			

97	Lift Station - SPEER #20	Speer & Crab							1,227,600		1,227,600			
98	Lift Station - SPRINGERDALE #13	Springdale & Slater							1,541,800		1,541,800			
99	Lift Station - TRINIDAD #29	Trinidad & Aquarius							1,186,000		1,186,000			
	CITY MAJOR WATER FACILITIES													
100	H.B. Well #1	15041 Capetown Ln							700,000		700,000			
101	H.B. Well #3a	17032 Oak Ln							2,500,000		2,500,000			
102	H.B. Well #4	14561 Springdale St							700,000		700,000			
103	H.B. Well #5	8651 Warner Ave							2,500,000		2,500,000			
104	H.B. Well #6	16221 Gothard St							3,000,000		3,000,000			
105	H.B. Well #7	14561 Springdale St							3,000,000		3,000,000			
106	H.B. Well #9	8851 Warner Ave							3,000,000		3,000,000			
107	H.B. Well #10	16192 Sher Ln							3,000,000		3,000,000			
108	H.B. Well #12	5350 Rancho Rd							2,500,000		2,500,000			
109	H.B. Well #13	14621 Springdale St							3,000,000		3,000,000			
110	Edwards Hill Reservoir & Pump Station	6401 Overlook Dr							18,000,000		18,000,000			
111	Overmyer Reservoir & Pump Station	19071 Huntington St							24,000,000		24,000,000			
112	Reservoir Hill Pump Station	19071 Huntington St							2,500,000		2,500,000			
113	Peck & Springdale Reservoirs	14561 Springdale St							21,000,000		21,000,000			
114	Springdale Reservoirs	14561 Springdale St							10,000,000		10,000,000			
	CITY STORM DRAIN PUMP STATIONS													
115	ADAMS	19961 Chesapeake Ln							2,992,000		2,992,000			

116	ATLANTA	8151 Atlanta Ave							2,992,000		2,992,000			
117	BANNING	22011 Malibu Ln							2,992,000		2,992,000			
118	BOLSA CHICA	18401 Springdale St							2,992,000		2,992,000			
119	FLOUNDER	9731 Flounder Dr							2,992,000		2,992,000			
120	HAMILTON	10101 Hamilton St							4,986,000		4,986,000			
121	HEIL	7231 Heil Ave							2,992,000		2,992,000			
122	INDIANAPOLIS	9221 Indianapolis Ave							2,992,000		2,992,000			
123	MARILYN	6742 Marilyn Dr							2,992,000		2,992,000			
124	MEREDITH	20192 Midland Ln							4,986,000		4,986,000			
125	NEWLAND	8612 Hamilton St							4,986,000		4,986,000			
126	SCENARIO	6252 Scenario Dr							1,995,000		1,995,000			
127	SHIELDS	6252 Scenario Dr							2,992,000		2,992,000			
128	SLATER	5250 Slater Ave							7,978,000		7,978,000			
129	YORKTOWN	9211 Yorktown Ave							2,992,000		2,992,000			
	TOTAL									361,547,570				

Exhibit III-B-2: City of Fountain Valley Asset List
FEMA Worksheet 3b

Jurisdiction: Fountain Valley

June 24, 2004 rec'd — Worksheet 3b

	Name or Description of Asset	Address	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Considerations	Building Size (sq.ft.) (thousands)	Replacement Value ($) (thousands)	Contents Value ($) (thousands)	Function, Use or Value ($) (thousands)	Displacement Cost ($ per day) (thousands)	Occupancy or Capacity (#)	RD
			X	X	X	X	X							
1	City Hall	10200 Slater	X					17,751	1,403,196	240,732				3420/55
2	Fountain	10200 Slater						0	385,000	$0				3420/55
3	Council Chambers	10200 Slater						4,555	589,772	72,218				3420/55
4	Police Facility	10200 Slater	X					60,250	4,826,374	490,249				3420/55
5	Storage(Coastline)	10200 Slater						8,218	923,256	0				3420/55
6	Police Carport	10200 Slater						2,300	219,195	0				3420/55
7	Community Center	10200 Slater	X					8,721	942,116	42,731				3420/55
8	Child Care Facility	17565 Los Alamos						9,311	1,269,333	0				3420/55
9	Fire Station #1	17737 Bushard	X					8,519	2,092,717	90,274				3419/54
10	Fire Station #2	16767 Newhope	X					5,141	1,354,112	48,146				3222/37
11	Parks Bldg/restroom	17902 Los Alamos						707	72,920	0				3420/55
12	Water reservoir #1	18460 Euclid	X					180	35,911	54,768				3522/67
13	Water reservoir #2	9300 Tanager	X					800	101,722	119,462				3618/73

14	Well site pump #3	11560 Iris	X					2,400	47,761	76,885				3123/28
15	Well site pump #4	17300 Calle Zargoza	X					900	60,705	129,243				3320/45
16	Well site pump #12	16201 Euclid	X					2,200	71,461	118,476				3122/27
17	Well site pump #8	Richardson/Edinger	X					1,250	68,726	97,796				3123/28
18	Pump Station	16489 Sandlewood	X					450	21,942	109,682				3118/23
19	Pump station	8917 Cockatoo	X					600	26,500	109,682				3618/73
20	Recreation Ctr (4 bldg)	16400 Brookhurst	X					21,945	1,666,263	13,751				3120/25
21	Softball storage/restrm	16400 Brookhurst						721	120,568	22,055				3120/25
22	Tennis storage/restrm	16400 Brookhurst						721	120,568	22,055				3120/25
23	SE fields storage	16400 Brookhurst						721	120,568	22,055				3120/25
24	NE fields storage	16400 Brookhurst						721	120,568	22,055				3120/25
25	Maintenance Bldg	16400 Brookhurst						765	120,568	110,280				3120/25
26	Replica Firehouse	Heritage Park						1,216	172,770	6,017				3420/55
28	Library	17635 Los Alamos						15,578	2,700,712	0				3420/55
29	Well site pump #10	17302 Newhope	X					4,050	228,749	119,731				3323/48
30	Well site pump #11	16640 Brookhurst	X					1,350	316,639	119,731				3220/35
31	Well site pump #6	11775 Warner	X					600	227,876	115,794				3322/47
32	House of Furniture	18080 Euclid						14,000	437,400	0				3522/67
33	Tire Warehouse	18140 Euclid						16,800	527,198	0				3522/67
34	City Yard Offices	17300 Mt Herrmann						29,390	2,778,555	0				3322/47
35	Lease building	11140 Talbert						44,100	2,257,860	0				3522/67
		TOTAL							$26,429,581	$2,373,868				

Exhibit III-B-3: HB City School District Asset List
FEMA Worksheet 3b

Jurisdiction: Huntington Beach City School District

Worksheet 3b

	Name or Description of Asset	Sources of Information	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Considerations	Building Size (sq.ft.) (thousands)	Replacement Value ($) (thousands)	Contents Value ($) (thousands)	Function, Use or Value ($) (thousands)	Displacement Cost ($ per day) (thousands)	Occupancy or Capacity (#)	Other Hazard Specific Information
			X	X	X	X	X							
1	Burke	Insurance	X	X				34,895	4,091,057	33,625			Tenant	
2	Dwyer	Insurance	X	X				99,922	12,714,460	2,955,991		31,923	1298	
3	Eader	Insurance	X	X				46,631	5,328,916	1,195,459		14,710	599	
4	Gisler	Insurance	X	X				49,676	6,546,932				Tenant	
5	Hawes	Insurance	X	X				42,493	4,870,803	1,009,441		11,620	479	
6	Hunt. Seacliff	Insurance	X	X				51,797	5,825,864	1,486,620		17,110	696	
7	Kettler	Insurance	X	X				43,497	4,899,241	1,017,007		12,003	492	
8	District Office	Insurance	X	X				31,815	4,019,100	1,162,018			40	
9	Moffett	Insurance	X	X				41,775	4,757,161	$997,116		12,131	496	
10	Perry	Insurance	X	X				48,517	5,784,866	1,254,012		12,616	517	
11	Peterson	Insurance	X	X				57,988	7,061,062	$324,700		17,391	709	
12	Smith	Insurance	X	X				47,997	5,183,169	1,228,223		15,885	648	
13	Sowers	Insurance	X	X				59,389	7,087,641	1,611,827		32,203	1307	

14	Maintenance &	Insurance	X	X				9,994	968,263	358,819			40	
	Transportation													
15	Warehouse	Insurance	X	X										
	(leased property)							10,500	961,781	333,453			2	

Exhibit III-B-4: HB Union High School Asset List
FEMA Worksheet 3b

Jurisdiction: Huntington Beach Union High School District

June 22, 2004 Rec'd — Hazard: — Worksheet 3b

	Name or Description of Asset	Sources of Information	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Considerations	Building Size (sq.ft.) (thousands)	Replacement Value ($) (thousands)	Contents Value ($) (thousands)	Function, Use or Value ($) (thousands)	Displacement Cost ($ per day) (thousands)	Occupancy or Capacity (#)	Other Hazard Specific Information
			X	X	X	X	X							
1	Hunt. Beach HS	District Office		X		X	X	256,000	32,000,000	8,018,000			2,600	
2	Marina HS	District Office		X		X		225,000	28,125,000	11,596,000			2,850	
3	Ocean View HS	District Office		X		X		182,000	22,750,000	7,556,000			1,775	
4	Edison HS	District Office		X		X		229,000	28,625,000	11,631,000			2,420	
5	Fountain Valley HS	District Office		X		X		245,000	30,625,000	18,499,000			3,230	
6	Valley Vista HS	District Office		X		X		25,000	3,125,000	1,834,000			250	
9	MOT Facility	District Office	X			X		24,000	3,000,000	1,670,000			20	
7	Coast/Adult Ed	District Office		X		X		Leased	Leased	110,232			225	
8	District Office	District Office	X			X		Leased	Leased	270,000			85	
		TOTALS							148,250,000	61,184,232				

Exhibit III-B-5: Ocean View School District Asset List
FEMA Worksheet 3b

	Name or Description of Asset	Sources of Information	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Considerations	Building Size (sq.ft.) (thousands)	Replacement Value ($) (thousands)	Contents Value ($) (thousands) 100%	Function, Use or Value ($) (thousands)	Displacement Cost ($ per day) (thousands)	Occupancy or Capacity (#)	Other Hazard Specific Information
			X	X	X	X	X							
1	Circle View	Insurance	X	X	X			49,636	6,218,502	6,218,502			662	
2	College View	Insurance	X	X	X			62,214	8,065,375	8,065,375			588	
3	Golden View	Insurance	X	X	X			46,010	5,730,349	5,730,349			561	
4	Harbour View	Insurance	X	X	X			57,992	6,445,082	6,445,082			808	
5	Haven View	Insurance	X	X	X			26,658	3,429,966	3,429,966			Tenant	
6	Hope View	Insurance	X	X	X			35,454	3,929,721	3,929,721			689	
7	Lake View	Insurance	X	X	X			41,012	4,812,331	4,812,331			414	
8	Marine View	Insurance	X	X	X			44,512	5,337,118	5,337,118			899	
9	Mesa View	Insurance	X	X	X			52,731	6,299,035	6,299,035			775	
10	Oak View	Insurance	X	X	X			56,442	6,059,963	6,059,963			799	
11	Spring View	Insurance	X	X	X			56,882	7,034,913	7,034,913			914	
12	Star View	Insurance	X	X	X			37,082	3,927,975	3,927,975			595	
13	Sun View	Insurance	X	X	X			32,476	3,500,964	3,500,964			444	
14	Village View	Insurance	X	X	X			42,753	5,284,238	5,284,238			573	
15	Vista View	Insurance	X	X	X			51,590	6,294,593	6,294,593			919	

16	Westmont	Insurance	X	X	X			47,051	5,814,483	5,814,483			546	
17	Glen View	Insurance	X	X	X			18,078	2,339,719	2,339,719			Tenant	
18	District Offices	Insurance	X	X	X			38,568	5,095,054	5,095,054			100	
19	Meadow View	Insurance	X	X	X			35,972	4,823,185	4,823,185			Tenant	
20	Park View	Insurance	X	X	X			46,762	5,930,369	5,930,369			Tenant	
21	Pleasant View	Insurance	X	X	X			22,222	2,962,793	2,962,793			Tenant	
22	Robinwood	Insurance	X	X	X			28,437	3,825,857	3,825,857			Tenant	
23	Maintenance Complex	Insurance	X	X	X			33,513	2,527,550	2,527,550			75	
24	Oak View Preschool	Insurance	X	X	X			10,080	569,369	569,369			180	

Exhibit III-B-6: Fountain Valley School District Asset List
FEMA Worksheet 3b

Jurisdiction Fountain Valley School District

June 24, 2004 rec'd — Hazard: — Worksheet 3b

	Name or Description of Asset	Address	Critical Facility	Vulnerable Population	Economic Assets	Special Considerations	Historic/Other Considerations	Building Size (sq.ft.) (thousands)	Replacement Value ($) (thousands)	Contents Value ($) (thousands)	Function, Use or Value ($) (thousands)	Displacement Cost ($ per day) (thousands)	Occupancy or Capacity (#)	RD
			X	X	X	X	X							
1	District Office	17210 Oak St Fountain Valley	X					43,489	5,218,680	805,599				
2	Courreges School	18313 Santa Carlotta Fountain Valley	X					43,730	5,247,600	571,058				
3	Cox School	17615 Los Jardines E. Fountain Valley	X					51,305	6,156,600	581,197				
4	Fulton Middle School	8778 El Lago Fountain Valley	X					46,655	5,598,600	624,322				
5	Gisler School	18720 Las Flores St Fountain Valley	X					45,545	5,465,400	555,960				
6	Masuda Middle School	17415 Los Jardines W. Fountain Valley	X					42,955	5,154,600	520,380				
7	Moiola School	9790 Finch Ave Fountain Valley	X					47,465	5,695,800	544,144				
8	Newland School	8787 Dolphin St Huntington Beach	X					45,447	5,453,640	504,726				
9	Oka Elementary	9800 Yorktown Ave Huntington Beach	X					45,305	5,436,600	589,105				
10	Plavan School	9675 Warner Ave Fountain Valley	X					48,304	5,796,480	607,579				
11	Talbert Middle School	9101 Brabham Dr Huntington Beach	X					51,394	6,167,280	567,370				

12	Tamura School	17340 Santa Suzanne Fountain Valley	X					44,346	5,321,520	643,960				
13	Operations Facility	17330 Mt. Herrmann Fountain Valley	X					19,559	3,000,000					
14	STAR Plaza (Leased Property)	10055 Slater Ave Fountain Valley	X					38,305	5,900,000					
15	Nieblas Site (Leased Property)	9300 Gardenia Fountain Valley	X					43,489	5,218,680					
16	Wardlow Site (Leased Property)	9191 Pioneer Dr Huntington Beach	X					43,978	5,277,360					
17	LAMB Site (Leased Property)	10251 Yorktown Huntington Beach	X					41,466	4,975,920					
18	Crossroads (Leased Property)	265 S. Anita Dr Orange	X					43,191	5,900,000					
		TOTALS							$96,984,760	$7,115,400				

Step 2: Estimated Potential Losses, FEMA Worksheet 3a

The next step in determining the potential losses to structures was to calculate hazard impact using estimation. FEMA Worksheet 3a was used to expedite this task.

The Cities of Huntington Beach and Fountain Valley do not currently have a HAZUS program. Therefore, the calculation of number of buildings and dollar loss had to be estimated using a consistent methodology. In both Cities, the following guidelines helped assure consistency:

a. Within each City, an equal distribution of types of structure (categories on Worksheet 3a; i.e., residential, commercial, industrial, etc.) within a given land area (RD) was assumed.
b. The value of each type of structure was assumed to be of equal value.

Next, the percent of the City's assets within each hazard zone had to be calculated. This is a direct ratio of land area affected compared to the total land area of the City.

In order to calculate an acceptable percentage of the planning area affected by the specific hazard, the following steps were taken:

a. Calculate the Total City Areas

   Huntington Beach:

   The City of Huntington Beach Community Profile states that the total area of the City is 27.7 square miles. Exhibit II-A-1 depicts the City boundaries and shows the Reporting Districts (RD) grids. Each grid is constructed with 0.5 mile sides, making each grid 0.25 square miles in area. By dividing the total land area (27.7 square miles) by 0.25 square miles, the result is a total of 110 RD's. By actual count, a total of 109 RD's exist.

   Fountain Valley:

   The Fountain Valley Community Profile report states that the City comprises of 9.75 square miles in area. Using the same methodology as above, FV has a total of 39 RD's. Actual count is approximately 39 RD's.

b. Calculate the Area Affected by Hazard Type

   Windstorm:

   Both Huntington Beach and Fountain Valley are completely within the Santa Ana Wind area, resulting in a maximum affected area of 100%.

Tsunami:
Huntington Beach - Exhibit IV-B-1 depicts the run-up area for a tsunami impacting Huntington Beach. Approximately 17 RD's are within this run-up area or 16% of the total Huntington Beach land area.
Fountain Valley - The City is inland and is not within the tsunami run-up affected area.

Subsidence:
Huntington Beach - Exhibit IV-C-5 depicts the Subsidence areas for both Huntington Beach and Fountain Valley. An estimated 74 RD's within Huntington Beach or 66.7% of the total land area is affected
Fountain Valley- It is estimated that 95% or 37 RD's are within the subsidence impact area based on the above referenced USGS map.

Dam Failure:
Huntington Beach - Exhibit IV-D-2 depicts the Prado Dam Inundation Map. By count, approximately 83 RD's are within the Inundation area. Therefore, 83/110 is equal to 75% of the Huntington Beach area affected.
Fountain Valley - Exhibit IV-D-4 shows only a portion of one RD is out of the inundation area resulting in a 98% maximum impact percentage.

Flood:
Huntington Beach - For both Cities, recent improvements of the Orange County and City flood control channels have decreased the land areas affected by localized flooding from heavy rains. Exhibit IV-E-1 depicts the area floodplain for the surrounding areas. Thirty-eight RD's are impacted resulting in 35% of the total land area.
Fountain Valley - Four RD's are affected or 10% of the total land area after an analysis of IV-E-2 (Fountain Valley Flood Plan Map).

Earthquake:
Both Huntington Beach and Fountain Valley are considered to be entirely within an earthquake impact zone. Therefore, the affected area is 100%.

Worksheet 3a depicts the total number of structures in the hazard area, the total dollar loss, and the total number of people affected in the planning area. While the following page shows a sample of Worksheet 3a, all completed Worksheet 3a's are inserted into the appropriate hazards in Part IV. A total of 12 Worksheet 3a's were completed (2 Cities x 6 hazards).

Exhibit III-B-7: FEMA Worksheet 3a
Number of Structures, Value of Structures and Number of Personnel Impacted by Hazard

Jurisdiction: **SAMPLE**

Hazard: **SAMPLE** Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential									
Commercial									
Industrial									
Agricultural									
Religious / Non-Profit									
Government									
Education									
Utilities									
Total									

Step 3: Estimated Potential Losses, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimated the area of each City that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

The FEMA Manual 386-2 provides many tables used to estimate losses for both structures and the content of these structures for several types of disasters. However, some of the selected hazards are not covered by FEMA 386-2 Manual. In these cases, estimates provided by the Hazard Mitigation Committee members were utilized.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e., Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of damage of that area or sub area. Content losses are derived by multiplying the percent of content damage by the loss of structure.

As stated, Committee members have assumed that residential, industrial, commercial, etc. types of structures are equally distributed throughout the Cities.

Dam Failure

The FEMA 386-2 Manual does not have an estimated loss table for Dam Failures. The Committee agreed to use the Coastal Storms table of FEMA 386-2 for this disaster. Reviewing the City of Huntington Beach Prado Dam Inundation Map, Exhibit IV-D-2, shows that 75% of the land area would be affected if the dam were to fail. The Northwestern area would be under seven feet of water and the Southeastern area under four feet.

Huntington Beach:

25% of City (27RD's) = Minimal or no flooding
50% of City (55RD's) = Flood depth of 7 feet
25% of City (28RD's) = Flood depth of 4 feet.

Fountain Valley:

5% of City (4RD's) = Minimal or no flooding
63% of City (25RD's) = Flood depth of 7 feet
32% of City (11RD's) = Flood depth of 4 feet

To estimate the building losses of structures, see FEMA Manual 386-2, pages 4-29.

Flood depth of 4 feet = 58% loss
Flood depth of 7 feet = 70% loss

To estimate the content losses, see FEMA Manual 386-2, pages 4-31.

Flood depth of 4 feet = 58% loss
Flood depth of 7 feet = 70% loss

Earthquake

Both Cities of Huntington Beach and Fountain Valley lie over numerous earthquake faults. The tables in FEMA 386-2 do not cover the potential magnitude of earthquake that the area could experience.

Data from the Earthquake Engineering Research Institute Study of the Huntington Beach area provides the potential damage used in this portion of the Plan. The values listed below apply to both Huntington Beach and Fountain Valley. They are as follows:

Earthquake Damage to Structures

15 to 30% of structures	-	No Damage	used 21%
15 to 30% of structures	-	Slight Damage	used 21%
30 to 55% of structures	-	Moderate Damage	used 42%
6 to 20% of structures	-	Extensive Damage	used 13%
> 4% of structures	-	Complete Damage	used 3%
		Total =	100%

The above percentages estimate what portion of the structures would or would not receive damage from an earthquake. The Committee has estimated the amount of the building value assigned to "Slight," "Moderate," and "Extensive" classifications of damage.

Estimated Building Damage

No Damage	=	0% of building value
Slight Damage	=	15% of building value
Moderate Damage	=	50% of building value
Extensive Damage	=	80% of building value
Complete Damage	=	100% of building value

Pages 4-23 of FEMA 386-2 states that, "Earthquake content damage ratios are generally around half of the building damage ratios." Using this guidance, the following contents damage table was created:

Estimated Content Damage

No Damage	=	0% of building damage
Slight Damage	=	50% of building damage
Moderate Damage	=	50% of building damage
Extensive Damage	=	50% of building damage
Complete Damage	=	50% of building damage

Floods

The losses suffered from flooding and dam failure differ due to the fact that localized flooding is the result of heavy rains, the possible overflow of the Santa Ana River, and the lack of drainage. The percentages of area flooded are:

Huntington Beach
72 RD's (65%) = No flooding
13 RD's (12%) = One foot flooding
25 RD's (23%) = Three feet flooding

Fountain Valley
36 RD's (90%) = No flooding
1 RD's (3%) = One foot flooding
3 RD's (7%) = Three feet flooding

The FEMA Manual lists losses from flood by both single and two story structures. The Committee has estimated that one half of all structures are one story and the second half are two story. To obtain damage percentages, a simple average of losses were computed. Example: A one story loss from a foot of water is 14% and a two story structure loss would be 9%, resulting in a simple average of (14 + 9)/2 = 11.5%.

The loss percentage list below applies to both Cities.

Building losses (FEMA 386-2, pages 4-13)
1 foot flooding = (14 + 9)/2 = 11.5%
3 feet flooding = (27 + 18)/2 = 22.5%

The content losses were derived using the same simple average method.

Content losses (FEMA 386-2, page 4-13)
1 foot flooding = (21 + 13.5)/2 = 17.25%
3 feet flooding = (40.5 + 27)/2 = 33.75%

Subsidence

FEMA loss guidance does not outline subsidence formulas. Both the Cities of Huntington Beach and Fountain Valley are located in an area of organic and peat soils with a high water table. Therefore, subsidence does impact both Cities and is considered a natural disaster condition.

The Committee has estimated that only one percent of the structures and their value would be impacted by subsidence, and half of that figure for the content of the building.

Windstorms

FEMA 386-2, pages 4-27, indicates that there are no standard loss estimation tables for tornadoes. The losses from wind conditions would primarily be from the Santa Ana winds. Tornadoes or waterspouts are considered to be infrequent. The Committee estimates that a 3% loss of the value of structures and 1% of the contents would occur from this type of disaster.

Tsunami

Pages 4-25 of FEMA 386-2 also indicates that no standard loss tables for tsunamis are available. The Committee has developed an estimated loss table that compares the cost in relation to the amount of damage to structures.

Huntington Beach: 17 of 110 RD's are in the run-up area for tsunamis.

Tsunami Damage to Structures

0 to .5 miles from coast = Complete Damage (7 RD's)
.5 to 1 mile from coast = Extensive Damage (6 RD's)
1 to 1.5 miles from coast = Moderate Damage (3 RD's)
1.5 to 2 miles from coast = Slight Damage (1 RD)
more than 2 miles distance = No Damage (93 RD's)

Estimated Damage to Structures

Complete Damage = 100% loss
Extensive Damage = 75% loss
Moderate Damage = 50% loss
Slight Damage = 25% loss
No Damage = 0% loss

Fountain Valley is an inland city and may not be affected (or minimally affected) by a tsunami.

A sample of Worksheet 4, Degree of Loss, Structure and Contents, is on the following page. All completed Worksheet 4's are inserted into the appropriate hazards in Part IV.

Exhibit III-B-8: FEMA Worksheet 4
Degree of Loss, Structure and Contents

					City of:	SAMPLE						
August 20, 2004					Hazard:	SAMPLE						Worksheet 4
Name or Description of Structure	Structure Replace-ment Value (in $1000's)	Percent Damage	Loss to Structure (in $1000's)	Replacement Value of Contents (in $1000's)	Percent Damage	Loss to Contents (in $1000's)	Average Daily Operating Budget (in $1000's)	Functional Downtime in days	Displace-ment Cost Per Day (in $1000's)	Displace-ment Time in Days	Structure Use & Function Loss (in $1000's)	Structure + Content + Function Losses (in Dollars)
Structure Loss				**Contents Loss**			**Structure Use and Function Loss**					
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0
			0			0					0	$0

(This page intentionally left blank.)

Part III-C

C. Multi-Jurisdictional Risks

The following matrix is the result of the multi-jurisdictional risk assessment. Utilizing the information provided in Part IV, maps of each hazard impact area were examined to determine exactly which jurisdictions were affected. An “X” indicates that the jurisdiction is impacted by the hazard. An absence of an “X” indicates that the jurisdiction should not be impacted by the hazard. However, in such cases, it is possible that the area would be minimally impacted or could be impacted by secondary effects such as dispatch of emergency personnel and equipment and traffic congestion.

Exhibit III-C-1: Multi-Jurisdictional Risk Assessment Matrix
How Does Each Hazard Impact Each Jurisdiction?

Jurisdiction	Address	City	RD	Wind	Tsunami	Dam	Flood	Sub	Earth
City of Huntington Beach	City Limits	HB		X	X	X	X	X	X
City of Fountain Valley	City Limits	FV		X		X	X	X	X
Huntington Beach Union High School District									
District Office	10251 Yorktown	HB	427	X		X	X		X
Maintenance	525 Yorktown	HB	431	X		X	X		X
HBHS	1905 Main	HB	431	X					X
Edison HS	21400 Magnolia	HB	465	X	X		X		X
Ocean View HS	17071 Gothard	HB	271	X		X	X		X
Marina HS	15871 Springdale	HB	147	X		X	X		X
Valley Vista Continuation	9600 Dolphin	FV	3419	X					X
Fountain Valley HS	17816 Bushard	FV	3419	X					X
Huntington Beach City School District									
District Office	20451 Craimer	HB	447	X	X	X	X		X
Maintenance	770 17th St	HB	441	X					X
Perry	19231 Harding	HB	423	X				X	X
Dwyer Middle	1502 Palm	HB	441	X					X
Smith	770 Seventeenth	HB	441	X					X
Moffett	8800 Burlcrest	HB	444	X		X	X	X	X
Hawes	9682 Yellowstone	HB	446	X		X	X	X	X
Sowers	9300 Indianapolis	HB	455	X		X	X	X	X
Kettler	8750 Dorsett	HB	464	X	X	X	X	X	X
Eader	9291 Banning	HB	475	X		X	X	X	X
Peterson School	20661 Farnsworth	HB	453	X	X	X	X	X	X

Ocean View School District									
District Office	17200 Pinehurst	HB	178	X	X	X		X	X
Maintenance	8291 Warner	HB	263	X					X
Circle View	6261 Hooker	HB	148	X		X		X	X
Village View	5361 Sisson	HB	156	X		X		X	X
College View	6582 Lenox	HB	159	X	X	X		X	X
Harbour View	4343 Pickwick	HB	164	X		X			X
Spring View	16662 Trudy	HB	168	X		X		X	X
Marine View	5682 Tilburg	HB	177	X	X	X		X	X
Golden View	17251 Golden View	HB	179	X	X	X		X	X
Mesa View	17601 Avilla	HB	189	X	X	X		X	X
Sun View	7721 Juliette Low	HB	252	X		X			X
HB Adult	16666 Tunstall	HB	261	X		X		X	X
Lake View	17451 Zeider	HB	273	X		X			X
Oak View	17125 Pak	HB	272	X		X		X	X
Vista View	16250 Hickory	FV	3118	X		X			X
Fountain Valley School District									
District Office	17210 Oak	FV	3318	X		X	X	X	X
Maintenance	17330 Mt Herrmann	FV	3322	X		X	X	X	X
Talbert Middle	9101 Brabham	HB	455	X		X	X	X	X
Newland	8787 Dolphin	HB	434	X		X	X	X	X
Oka	9800 Yorktown	HB	436	X		X	X	X	X
Courreges	18313 Santa Carlotta	FV	3517	X		X		X	X
Cox	17615 Los Jardines East	FV	3421	X		X		X	X
Fulton	8778 El Lago	FV	3417	X		X		X	X
Gisler	18720 Las Flores	FV	3620	X		X		X	X
Masuda	17415 Los Jardines West	FV	3321	X		X		X	X
Moiola	9790 Finch Ave	FV	3619	X		X		X	X
Plavan	9675 Warner Ave	FV	3219	X		X	X	X	X
Tamura	17340 Santa Suzanne	FV	3317	X		X		X	X

Part III-D

D. Summary

Due to the time line constraint of this year's Hazard Mitigation planning process, the Hazard Mitigation Committee relied on estimates derived from City personnel and community experts. While the estimates have provided a general idea of the scope of hazard impact, it is conceivable that the next Hazard Mitigation study to be completed in five years will entail a more in-depth and structured damage assessment. However, regardless of the constraints, the Committee is confident that the estimates derived have assisted in the creation of effective mitigation strategies found in Part IV of the Plan.

Part IV-A

Windstorm
Table of Contents

WINDSTORM: SANTA ANA WINDS AND TORNADOES 2
EXHIBIT IV-A-1: FUJITA TORNADO DAMAGE SCALE 3
LOCAL HISTORY OF WINDSTORM EVENTS 4
EXHIBIT IV-A-2: MAJOR WINDSTORM/SANTA ANA WIND EVENTS 4
EXHIBIT IV-A-3: MAJOR TORNADO EVENTS 6
WINDSTORM HAZARD ASSESSMENT 7
EXHIBIT IV-A-4: SANTA ANA WINDS PATH MAP 8
COMMUNITY WINDSTORM ISSUES 8
EXHIBIT IV-A-5: BEAUFORT SCALE 10
EXHIBIT IV-A-6: TREE CAUSED CIRCUIT INTERRUPTION INVESTIGATIONS 11
EXISTING MITIGATION ACTIVITIES 11
WINDSTORM MITIGATION STRATEGIES 13
EXHIBIT IV-A-7: PROPOSED ACTIVITY CRITERIA EVALUATION 14
ESTIMATED POTENTIAL LOSSES 14
EXHIBIT IV-A-8: HUNTINGTON BEACH ESTIMATED POTENTIAL LOSSES 16
EXHIBIT IV-A-9: FOUNTAIN VALLEY ESTIMATED POTENTIAL LOSSES 17
EXHIBIT IV-A-10: HUNTINGTON BEACH DEGREE OF LOSS 18
EXHIBIT IV-A-11: FOUNTAIN VALLEY DEGREE OF LOSS 19

Windstorm: Santa Ana Winds and Tornadoes

Based on local history, most incidents of high wind in the City of Huntington Beach and the City of Fountain Valley are the result of the Santa Ana Wind Conditions. While high impact wind incidents are not common to the area, significant Santa Ana Wind events and sporadic tornado activity has been known to negatively impact the local community.

What are Santa Ana Winds?

Santa Ana Winds (sometimes referred to as "Santa Ana's") are warm, dry, gusty offshore winds that blow from the east or northeast and occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles Basin. According to the National Weather Service, winds must blow at speeds greater than 25 knots to be called Santa Ana Winds. These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots.

Several meteorological conditions contribute to the phenomenon. The Bernoulli Effect accounts for increased speeds when the desert wind is pushed through narrow canyons. Bernoulli's Law mathematically describes the relationship between pressure and velocity in the horizontal flow of fluids. Although different scenarios may contribute to a Santa Ana Wind, the most common pattern involves a high-pressure region sitting over the Great Basin (the high plateau west of the Rockies and east of the Sierra Mountains).

These regional winds typically occur from October to March; and, according to most accounts, are named either for the Santa Ana River Valley where they originate or for the Santa Ana Canyon, southeast of Los Angeles, where they pick up speed.

In different regional areas, similar wind conditions exist and are named respectively. In the Pacific Northwest, the "Chinooks" are caused by a downhill flow very similar to the Santa Ana Winds. The Northern California version of this wind is sometimes referred to as the "Diablo."[i]

What are Tornadoes?

Tornadoes are spawned when there is warm, moist air near the ground, cool air aloft, and winds that speed up and change direction. An obstruction, such as a house, in the path of the wind causes it to change direction. This change increases pressure on parts of the house, and the combination of increased pressures and fluctuating wind speeds creates stresses that frequently cause structural failures.

In order to measure the intensity and wind strength of a tornado, Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale. This scale compares the estimated wind velocity with the corresponding amount of suspected damage. The scale measures six classifications of tornadoes with increasing magnitude from an "F0" tornado to a "F6+" tornado. The following chart depicts the Fujita Tornado Damage Scale:

Exhibit IV-A-1: Fujita Tornado Damage Scale

Scale	Wind Estimate (mph)	Typical Damage
F0	< 73	**Light damage.** Some damage to chimneys and TV antennas; breaks twigs off trees; pushes over shallow-rooted trees.
F1	73-112	**Moderate damage.** Peels surface off roofs; windows broken; light trailer houses pushed or overturned; some trees uprooted or snapped; moving automobiles pushed off the road. 74 mph is the beginning of hurricane wind speed.
F2	113-157	**Considerable damage.** Roofs torn off frame houses leaving strong upright walls; weak buildings in rural areas demolished; trailer houses destroyed; large trees snapped or uprooted; railroad boxcars pushed over; light object missiles generated; cars blown off highway.
F3	158-206	**Severe damage.** Roofs and some walls torn off frame houses; some rural buildings completely demolished; trains overturned; steel-framed hangar-warehouse-type structures torn; cars lifted off the ground; most trees in a forest uprooted snapped or leveled.
F4	207-260	**Devastating damage.** Whole frame houses leveled, leaving piles of debris; steel structures badly damaged; trees debarked by small flying debris; cars and trains thrown some distances or rolled considerable distances; large missiles generated.
F5	261-318	**Incredible damage.** Whole frame houses tossed off foundations; steel-reinforced concrete structures badly damaged; automobile-sized missiles generated; trees debarked; incredible phenomena can occur.
F6-F12	319 to sonic	**Inconceivable damage.** Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures.

Chart taken from the LA Times Weather Section at the following URL: http://weather.latimes.com/tornadoFAQ.asp

What are Waterspouts?
A waterspout is simply a tornado that occurs over water. A waterspout appears during the same atmospheric conditions as a tornado[ii]. When a waterspout reaches land, it is then termed a "tornado." Waterspouts are common occurrences off the Coast of Orange County. They are typically spotted off the Seal Beach, Huntington Beach, and Newport Beach coasts during winter and summer storms.

Local History of Windstorm Events

While the effects of Santa Ana Winds are often overlooked, it should be noted that in 2003, two deaths in Southern California were directly related to the fierce condition. A falling tree struck one woman in San Diego. The second death occurred when a passenger in a vehicle was hit by a flying pickup truck cover launched by the Santa Ana Winds.[iii]

The following is a glimpse of some major Santa Ana Wind/windstorm events to hit the local area:

Exhibit IV-A-2: Major Windstorm/Santa Ana Wind Events

MAJOR WINDSTORM/SANTA ANA WIND EVENTS ORANGE COUNTY AREA 1961- 2001		
DATE	**LOCATION**	**DAMAGE**
November 5-6, 1961	Santa Ana Winds	Fire in Topanga Canyon
February 10-11, 1973	Strong storm winds. 57 mph at Riverside, 46 Newport Beach	Some 200 trees uprooted in Pacific Beach alone
October 26-27, 1993	Santa Ana winds	Fire in Laguna Hills
October 14, 1997	Santa Ana winds: gusts 87 mph in central Orange County	Large fire in Orange County
December 29, 1997	Gusts 60+ mph at Santa Ana	
March 28-29, 1998	Strong storm winds in Orange County: sustained 30-40 mph. Gust 70 mph at Newport Beach, gust 60 **Huntington Beach**	Trees down, power out, and damage across Orange and San Diego Counties. 1 person died in Jamul.
September 2, 1998	Strong winds from thunderstorms in Orange County with gusts to 40 mph	Large fires in Orange County
December 6, 1998	Thunderstorm in Los Alamitos and Garden Grove: gust 50-60 mph called "almost a tornado"	
December 21-22, 1999	Santa Ana Winds: gust 68 mph at Campo, 53 **Huntington Beach**, 44 Orange	House and tree damage in Hemet.
March 5-6, 2000	Strong thunderstorm winds at the coast: gust 60 mph at **Huntington Beach**	Property damage and trees downed along the coast
April 1, 2000	Santa Ana Winds: gust 93 mph at Mission Viejo, 67 Anaheim Hills	
December 25-26, 2000	Santa Ana Winds: gust 87 mph at Fremont Canyon	Damage and injuries in Mira Loma, Orange and Riverside Counties
February 13, 2001	Thunderstorm gust to 89 mph in east Orange	

Information depicted on chart taken from http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf

The following Santa Ana Wind events were featured in news resources during 2003:

January 6, 2003

OC Register

"One of the strongest Santa Ana windstorms in a decade toppled 26 power poles in Orange early today, blew over a mobile derrick in Placentia, crushing two vehicles, and delayed Metrolink rail service." This windstorm also knocked out power to thousands of people in northeastern Orange County.

January 8, 2003

CBSNEWS.com

"Santa Ana's roared into Southern California late Sunday, blowing over trees, trucks and power poles. Thousands of people lost power."

March 16, 2003

Dailybulletin.com

Fire Officials Brace for Santa Ana Winds

"The forest is now so dry and so many trees have died that fires, during relatively calm conditions, are running as fast and as far as they might during Santa Ana Winds. Now the Santa Ana season is here. Combine the literally tinder dry conditions with humidity in the single digits and 60-80 mph winds, and fire officials shudder."

The following is a glimpse of major tornado related events to hit the Huntington Beach, Fountain Valley, and surrounding area:

Exhibit IV-A-3: Major Tornado Events

MAJOR TORNADO EVENTS ORANGE COUNTY AREA 1958-2001		
DATE	**LOCATION**	**DAMAGE**
April 1, 1958	Tornado Laguna Beach	
February 19, 1962	Tornado Irvine	
April 8, 1965	Tornado Costa Mesa	
November 7, 1966	Newport Beach and Costa Mesa	Property Damage
March 16, 1977	Tornado skipped from Fullerton to Brea	Damage to 80 homes and injured four people
February 9, 1978	Tornado Irvine	Property damage and 6 injured
January 31, 1979	Tornado Santa Ana	Numerous power outages
November 9, 1982	Tornadoes in Garden Grove and Mission Viejo	Property damage
January 13, 1984	Tornado **Huntington Beach**	Property damage
March 16, 1986	Tornado Anaheim	Property damage
February 22-24, 1987	Tornadoes and waterspouts **Huntington Beach**	
January 18, 1988	Tornadoes Mission Viejo and San Clemente	Property damage
February 28, 1991	Tornado Tustin	
March 27, 1991	Tornado **Huntington Beach**	
December 7, 1992	Tornadoes Anaheim and Westminster	Property damage
January 18, 1993	Tornado Orange County	Property damage
February 8, 1993	Tornado Brea	Property damage
February 7, 1994	Tornado from Newport Beach to Tustin	Roof and window damage. Trees were also knocked down
December 13, 1994	Two waterspouts about 0.5 mile off Newport Beach	
December 13, 1995	Funnel cloud near Fullerton Airport	
March 13, 1996	Funnel cloud in Irvine	
November 10-11, 1997	Waterspout came ashore at Newport Pier on the 10th and dissipated over western Costa Mesa. Tornadoes in Irvine on the 11th and a funnel cloud developed.	10th: Winds estimated at 60-70 mph. 11th: Minor power outages occurred with little property damage. A fisherman was blown from one end of Newport Pier to the other. Property and vehicle damage in Irvine from flying debris. Ten cars were thrown a few feet.
December 21, 1997	Waterspout and tornado in **Huntington Beach**	Damage to boats, houses, and city property
February 24, 1998	Tornado in **Huntington Beach**	Property damage with a power outage, roof flew ¼ mile
March 13-14, 1998	Numerous waterspouts between Long Beach, **Huntington Beach**, and Catalina	
March 31-April 1, 1998	Numerous funnel clouds reported off Orange County coastline, two of which became waterspouts off Orange County. One waterspout briefly hit the coast off the **Huntington Beach** pier.	
June 6, 1998	Two funnel clouds off Dana Point	
December 31, 1998	Funnel clouds in Santa Ana. Waterspout off Costa Mesa coast	
February 21, 2000	Tornado Anaheim Hills	Property damage
October 28, 2000	Funnel clouds around Newport Beach and Costa Mesa	
January 10, 2001	Funnel cloud at Orange County airport and Newport Beach	
February 24, 2001	Tornado in Orange	Damage to warehouse, 6 structures, fences, and telephone wires.

Information depicted on chart taken from http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf

Windstorm Hazard Assessment

Hazard Identification

A windstorm event in Orange County can range from a short term tornado lasting only minutes to a long duration Santa Ana Wind condition that can last for several days as in the case of the January 2003 Santa Ana Wind event. Windstorms in the Huntington Beach and Fountain Valley area can cause extensive damage including heavy tree stands, exposed coastal properties, road and highway infrastructure, and critical utility facilities. The coastal region of Huntington Beach is vulnerable to damage as offshore waterspouts transform into tornadoes. Heavy tourist traffic on the State and Local beach property is at great risk during windstorm activity.

On March 11, 2004, the Hazard Mitigation Planning Committee ranked Santa Ana Winds and Tornadoes as follows:

City	Hazard	Ranking
Huntington Beach	Santa Ana Winds	7 of 16
Huntington Beach	Tornado	8 of 16
Fountain Valley	Santa Ana Wind/Tornado	6 of 13

City	Hazard	Chance of Occurrence	Effect
Huntington Beach	Santa Ana Winds	9	5
Huntington Beach	Tornado	6	7
Fountain Valley	Santa Ana Wind/Tornado	2	4

Chance of Occurrence and **Effect** numbers are rated from one to ten.
Higher numbers signify greater chance of occurrence and a greater effect.
Chance of Occurrence is based on history, geography, and potential.
Effect is based on the worst-case scenario.

A discussion followed as to what percent of each City area could be impacted by a Santa Ana Wind/Tornado event. The following is the result of that discussion:

City	Percentage of City that could be impacted by Santa Ana Wind/Tornado
Huntington Beach	3%
Fountain Valley	1%

Exhibit IV-A-4: Santa Ana Winds Path Map

Map taken from NASA's "Observatorium"[1]

The map shows clearly the direction of the Santa Ana Winds as they travel from the stable, high-pressure weather system called the Great Basin through the canyons and towards the low-pressure system off the Pacific. Clearly the areas of Huntington Beach and Fountain Valley are in the direct path of the ocean-bound Santa Ana Winds.

Vulnerability and Risk

Upon receipt of HAZUS software, an analysis of windstorm impact upon life and property will be computed and placed into the windstorm report.

However, with an analysis of the high wind and tornado events depicted in the "Local History" section, we can deduce the common windstorm impact areas including impacts on life, property, utilities, infrastructure, and transportation. Additionally, if a windstorm disrupts power to local residential communities, the American Red Cross and City resources might be called upon for care and shelter duties. Displacing residents and utilizing City resources for shelter staffing and disaster cleanup can cause an economic hardship on the community.

Community Windstorm Issues

What is Susceptible to Windstorms?

Life and Property

Based on the history of Orange County, windstorm events can be concluded that widespread areas of the County can be impacted during a windstorm event. This can result in the complete involvement of both Huntington Beach and Fountain Valley during a wide-ranging windstorm or traveling tornado. Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift suction forces that pull building components and surfaces outward. With extreme wind forces, the roof or entire building can fail causing considerable damage. Such damage to property occurred on February 24, 1998 when a roof in Huntington Beach was launched down the street by severe winds.

Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls. When severe windstorms strike a community, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

The following is the Beaufort Scale, coined and developed by Sir Francis Beaufort in 1805, illustrates the effect that varying wind speed can have on sea swells and structures:

Exhibit IV-A-5: Beaufort Scale

BEAUFORT SCALE				
Beaufort Force	**Speed (mph)**	**Wind Description**	**State of Sea**	**Effects on Land**
0	**Less 1**	Calm	Mirror-like	Smoke rises vertically
1	**1-3**	Light Air	Ripples look like scales; No crests of foam	Smoke drift shows direction of wind, but wind vanes do not
2	**4-7**	Light Breeze	Small but pronounced wavelets; Crests do not break	Wind vanes move; Leaves rustle; You can feel wind on the face
3	**8-12**	Gentle Breeze	Large Wavelets; Crests break; Glassy foam; A few whitecaps	Leaves and small twigs move constantly; Small, light flags are extended
4	**13-18**	Moderate Breeze	Longer waves; Whitecaps	Wind lifts dust and loose paper; Small branches move
5	**19-24**	Fresh Breeze	Moderate, long waves; Many whitecaps; Some spray	Small trees with leaves begin to move
6	**25-31**	Strong Breeze	Some large waves; Crests of white foam; Spray	Large branches move; Telegraph wires whistle; Hard to hold umbrellas
7	**32-38**	Near Gale	White foam from breaking waves blows in streaks with the wind	Whole trees move; Resistance felt walking into wind
8	**39-46**	Gale	Waves high and moderately long; Crests break into spin drift, blowing foam in well marked streaks	Twigs and small branches break off trees; Difficult to walk
9	**47-54**	Strong Gale	High waves with wave crests that tumble; Dense streaks of foam in wind; Poor visibility from spray	Slight structural damage
10	**55-63**	Storm	Very high waves with long, curling crests; Sea surface appears white from blowing foam; Heavy tumbling of sea; Poor visibility	Trees broken or uprooted; Considerable structural damage
11	**64-73**	Violent Storm	Waves high enough to hide small and medium sized ships; Sea covered with patches of white foam; Edges of wave crests blown into froth; Poor visibility	Seldom experienced inland; Considerable structural damage
12	**>74**	Hurricane	Sea white with spray. Foam and spray render visibility almost non-existent	Widespread damage. Very rarely experienced on land

Information taken from the following URL: http://www.compuweather.com/decoder-charts.html

Utilities

Historically, falling trees have been the major cause of power outages in Orange County. Windstorms such as Tornadoes and Santa Ana Wind conditions can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Falling trees can bring electric power lines down to the pavement, creating the possibility of lethal electric shock. Rising population growth and new infrastructure in the County creates a higher probability for damage to occur from windstorms as more life and property are exposed to risk.

Exhibit IV-A-6: Tree Caused Circuit Interruption Investigations

Date	Location	City	Details	Tree Type
12-25-03	Blaylock/Granada	Huntington Beach	Wind blew frond from tree	Palm
12-25-03	Santa Ana X Beacon	Huntington Beach	Wind blew tree into line	Euc
12-5-03	2316 Delaware	Huntington Beach	Wind blew tree limb/palm frond into equipment	Palm
1-9-03	Palm & 8th	Huntington Beach	Wind blew tree limb/palm frond into equipment	Palm

Infrastructure

Windstorms can damage buildings, power lines, and other property, and infrastructure due to falling trees and branches. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds.

Windstorms can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from windstorms related to both physical damages and interrupted services.

Existing Mitigation Strategies

As stated, one of the most common problems associated with windstorms is power outage. High winds commonly occur during winter storms, and can cause trees to

bend, sag, or fail (tree limbs or entire trees), coming into contact with nearby distribution power lines. Fallen trees can cause short-circuiting and conductor overloading. Wind-induced damage to the power system causes power outages to customers, incurs cost to make repairs, and in some cases can lead to ignitions that start wildland fires.

One of the strongest and most widespread existing mitigation strategies pertains to tree clearance. Currently, California State Law requires utility companies to maintain specific clearances (depending on the type of voltage running through the line) between electric power lines and all vegetation.

Enforcement of the following California Public Resource Code Sections provides guidance on tree pruning regulations:[iv]

- 4293: Power Line Clearance Required
- 4292: Power Line Hazard Reduction
- 4291: Reduction of Fire Hazards Around Buildings
- 4171: Public Nuisances

The following pertain to tree pruning regulations and are taken from the California Code of Regulations:

- Title 14: Minimum Clearance Provisions
- Sections 1250-1258
- General Industry Safety Orders
- Title 8: Group 3: Articles 12, 13, 36, 37, 38
- California Penal Code Section 385

Finally, the following California Public Utilities Commission section has additional guidance:

- General Order 95: Rule 35

In order to assist companies like Southern California Edison with law compliance, homeowners may be liable for damages and injuries incurred from a vegetation hazard.

The power companies, in compliance with the above regulations, collect data about tree failures and their impact on power lines. This mitigation strategy assists the power company in preventing future tree failure. From the collection of this data, the power company can advise residents as to the most appropriate vegetative planting and pruning procedures. Exhibit IV-A-6 depicts local tree failure events.

There are no additional local ordinances that detail tree pruning and tree failure prevention regulations.

Windstorm Mitigation Strategies

The windstorm mitigation action strategies provide direction on specific activities that organizations and residents in Huntington Beach and Fountain Valley can undertake to reduce risk and prevent loss from windstorm events. Each action item is followed by ideas for implementation, which can be used by the Hazard Mitigation Planning Committee and Local decision-makers in pursuing strategies for implementation.

Natural Hazard	**WINDSTORM HAZARD STRATEGY #1A**		
Action Item	Windstorm Education Campaign		
Coordinating Organization	Huntington Beach Fire Department & Fountain Valley Fire Department Emergency Services Offices		
Ideas for Implementation	Compile mitigation brochures from public agencies, distribute the materials to Huntington Beach and Fountain Valley residents, display windstorm PowerPoint materials to CERT/RACES training events.		
Time line	Ongoing		
Constraints	None		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**WINDSTORM HAZARD STRATEGY #1B**		
Action Item	Awareness of Tree Pruning and Wind-Resistant Utility Operations		
Coordinating Organization	City of Huntington Beach & City of Fountain Valley		
Ideas for Implementation	Compile comprehensive list of pertinent State and Local regulations; send letters of code endorsement from each Jurisdiction encouraging utility compliance with guidelines. Build relationship between Edison and respective Public Works departments.		
Time line	Ongoing		
Constraints	None		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

Natural Hazard	**WINDSTORM HAZARD STRATEGY #1C**		
Action Item	Track Generators in Public Facilities		
Coordinating Organization	HB/FV Public Works, HB/FV Emergency Services		
Ideas for Implementation	Gather data on backup power equipment for public facilities, test all critical facility backup power generators, keep accurate record of equipment specification and testing date information.		
Time line	Ongoing		
Constraints	Staffing		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
X	Partnerships and Implementation	X	Emergency Services

Exhibit IV-A-7: Proposed Activity Criteria Evaluation

PROPOSED ACTIVITY				
CRITERIA	**Strategy 1A**	**Strategy 1B**	**Strategy 1C**	
Cost Effective	4	4	3	5 = Excellent 4 = Good 3 = Fair 2 = Bad 1 = Unacceptable
Technically Feasible	5	4	4	
Environmentally Sound	5	5	4	
Social Impacts	5	5	4	
Activity Addresses the Problem	5	5	5	
Meets Federal, State, and Local Regulations	5	5	4	
Politically Acceptable	5	4	4	
Activity Reduces the Risk	4	4	5	
Total	38	36	33	

The Hazard Mitigation Committee developed a chart comparing selected criteria on a one through five scale. The following criteria were analyzed: cost effective, technically feasible, environmentally sound, social impacts, activity addresses the problem, meets Federal, State, and Local regulations, politically acceptable, activity reduces the risk. After reviewing the chart, the Committee concluded that all jurisdictions would support the proposed activities.

Estimated Potential Losses

Estimated Potential Losses, FEMA Worksheet 3a

The following City-specific FEMA worksheets depict the estimated loss to the number of City structures, dollar value of the structures, and the total number of people impacted. These figures are calculated by type of structure (occupancy class) and then totaled at the bottom of the chart. A complete description of how the figures were obtained is available in Part III-B-2 – Risk Assessment.

Estimated Degree of Loss, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimated the area of each City that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e., Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of

damage of that area or sub area. Content losses are derived by multiplying the percent of content damage by the loss of structure. A complete description of how the figures were obtained is also available in Part III-B-2 – Risk Assessment.

Exhibit IV-A-8: Huntington Beach Estimated Potential Losses

City of: **Huntington Beach**

June 25, 2004 | Hazard: **Windstorms** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	77,800	77,800	100	11,508,176,000	11,508,176,000	100	199,500		
Commerical	2,260	2,260	100	1,167,322,771	1,167,322,771	100	28,900		
Industrial	1,161	1,161	100	1,135,822,248	1,135,822,248	100	32,900		
Agricultural									
Religious / Non-Profit	174	174	100	192,900,040	192,900,040	100	24,000		
Government	129	129	100	361,547,570	361,547,570	100	900		
Education	555	555	100	410,857,447	410,857,447	100			
Utilities									
Total	82,079	82,079	100	14,776,626,076	**14,776,626,076**	100	286,200	0	

Exhibit IV-A-9: Fountain Valley Estimated Potential Losses

City of: **Fountain Valley**

June 25, 2004 | Hazard: **Tornado** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	13,729	13729	100	2,745,800,000	2,745,800,000	100	55,321	55,321	100%
Commercial	268	268	100	1,608,000,000	1,608,000,000	100	16,734	16,734	100%
Industrial	275	275	100	584,375,000	584,375,000	100	13,740	13,740	100%
Agricultural	8	8	100	1,500,000	1,500,000	100	175	175	100%
Religious / Non-Profit	16	16	100	19,200,000	19,200,000	100	2,370	2,370	100%
Government	35	35	100	26,430,000	26,430,000	100	45	45	100%
Education	18	18	100	96,985,000	96,985,000	100			
Utilities									100%
Total	14349	14349	100	5,082,290,000	**5,082,290,000**	100	88,385	88,385	100%

Exhibit IV-A-10: Huntington Beach Estimated Degree of Loss

Degree of Loss									
				City of:	**Huntington Beach**				
August 25, 2004				Hazard:	**Windstorm**				Worksheet 4
Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	% Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	Roofs, Siding, Patio Covers, etc.	100	11,508,176,000	3	345,245,280	1	3,452,453	0	348,697,733
Commercial	"	100	1,167,322,771	3	35,019,683	1	350,197	0	35,369,880
Industrial	"	100	1,135,822,248	3	34,074,667	1	1,022,240	0	35,096,907
Agriculture			0						
Religious/ Non-Profit	"	100	192,900,040	3	5,787,001	1	173,610	0	5,960,611
Government	"	100	361,547,570	3	10,846,427	1	325,393	0	11,171,820
Education	"	100	410,857,447	3	12,325,723	1	369,772	0	12,695,495
Utilities									
	Totals:		14,776,626,076		443,298,782		5,693,664	0	448,992,447

Exhibit IV-A-11: Fountain Valley Estimated Degree of Loss

Degree of Loss									
				City of:	**Fountain Valley**				
August 25, 2004				Hazard:	**Windstorm**				Worksheet 4
Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	% Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	Roofs, Siding, Patio Covers, etc.	100	2,745,800,000	3	82,374,000	1	823,740	0	83,197,740
Commercial	"	100	1,608,000,000	3	48,240,000	1	482,400	0	48,722,400
Industrial	"	100	584,375,000	3	17,531,250	1	525,938	0	18,057,188
Agriculture									
Religious/ Non-Profit	"	100	19,200,000	3	576,000	1	17,280	0	593,280
Government	"	100	26,430,000	3	792,900	1	23,787	0	816,687
Education	"	100	96,985,000	3	2,909,550	1	87,287	0	2,996,837
Utilities									
	Totals:		5,080,790,000		152,423,700		1,960,431	0	154,384,131

[i] Information taken directly from the Huntington Beach Emergency Operations Plan and Fountain Valley Emergency Operations Plan
[ii] http://www.tornadoproject.com/cellar/tttttttt.htm
[iii] www.cbsnews.com, January 8, 2003, www.cbsnews.com/stories/2003/01/06/national/
[iv] Information taken from the California Public Utilities Commission Website www.cpuc.ca.gov/js/pf.asp

Part-IV-B

Tsunami Plan
Table of Contents

OVERVIEW **3**
EARTHQUAKES AND TSUNAMIS **4**
TSUNAMI EARTHQUAKES **4**
TSUNAMI FACTS **5**
TYPES OF TSUNAMIS **5**
LOCAL HISTORY OF TSUNAMIS **6**
TSUNAMI HAZARD ASSESSMENT **9**
Exhibit IV-B-1: Tsunami Run-up Areas for Huntington Beach 11
Exhibit IV-B-2: Huntington Beach Siren Location Map 13
Exhibit IV-B-3:School Sites Impacted 15
Exhibit IV-B-4: Tsunami Run-up Areas and School District Sites 16
Exhibit IV-B-5: Tsunami Evacuation Map for Huntington Beach 17
COMMUNITY TSUNAMI ISSUES **18**
Exhibit IV-B-6: Huntington Beach Impacted Essential Service Facilities 20
Exhibit IV-B-7: Huntington Beach Impacted Government (Non-City) Facilities 21
Exhibit IV-B-8: Tsunami Run-Up Area and Essential Service Facilities 22
Exhibit IV-B-9: Tsunami Run-Up Area and Government Facilities 23
EXISTING MITIGATION ACTIVITIES **24**
TSUNAMI MITIGATION ACTION ITEMS **24**
Exhibit IV-B-10: Tsunami Multi-Hazard Strategies 24
Exhibit IV-B-11: Proposed Activity Criteria Evaluation 25
ESTIMATED POTENTIAL LOSSES **26**
Exhibit IV-B-12: Huntington Beach Estimated Potential Losses 27
Exhibit IV-B-13: Fountain Valley Estimated Potential Losses 28
Exhibit IV-B-14: Huntington Beach Degree of Loss 29
Exhibit IV-B-15: Fountain Valley Degree of Loss 30
REFERENCES **31**

(This page intentionally left blank)

Overview

History has shown that the probability of a tsunami in the City of Huntington Beach is extremely low and in Fountain Valley it is not considered a threat. However, if a tsunami should occur, the consequences would be great. As shown on the Tsunami Run-up Map (Exhibit IV-B-1), the entire 8.5 miles of the Huntington Beach coastline could be impacted. Forty-five percent of the City's residents would have to be evacuated. The impact could cause loss of life, destroy thousands of high priced homes and greatly affect the City's downtown and coastal businesses, and impact tourism. Even if all residents and visitors were safely evacuated, the damage to property in this densely populated, high property value area would be tremendous.

What are Tsunamis?

The phenomenon we call "tsunami" (soo-NAH-mee) is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. In the deep ocean, the tsunami waves propagate across the deep ocean with a speed exceeding 800 kilometers per hour (~500 miles per hour) and a wave height of only a few tens of centimeters (1 foot) or less. Tsunami waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding a 100 km (60 miles) or more in the deep ocean, and by the time between these crests, ranging from 10 minutes to an hour.

As they reach the shallow waters of the coast, the waves slow down and the water can pile up into a wall of destruction tens of meters (30 feet) or more in height. The effect can be amplified where a bay, harbor or lagoon funnels the wave as it moves inland. Large tsunamis have been known to rise over 30 meters (100 feet). Even a tsunami 3-6 meters high can be very destructive and cause many deaths and injuries.

What causes Tsunami?

There are many causes of tsunamis but the most prevalent is earthquakes. In addition, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis.

<u>Plate Tectonics</u>

Plate Tectonic theory is based on an earth model characterized by a small number of lithosphere plates, 70 to 250 km (40 to 150 miles) thick, that float on a viscous under layer called the asthenosphere. These plates, which cover the entire surface of the earth and contain both the continents and seafloor, more relative to each other at rates of up to ten cm/year (several inches/year). The region where two plates come in contact is called a plate boundary, and the way in which one plate moves relative to another determines the type of boundary: spreading, where the two plates move away from each other; subduction, where the two plates move toward each other and one slides beneath the other; and transform, where the two plates slide horizontally past each other. Subduction zones are characterized by deep ocean trenches, and the

volcanic islands or volcanic mountain chains associated with the many subduction zones around the Pacific rim are sometimes called the Ring of Fire.

Earthquakes and Tsunamis

An earthquake can be caused by volcanic activity, but most are generated by movements along fault zones associated with the plate boundaries. ***Most strong earthquakes, representing 80% of the total energy released worldwide by earthquakes, occur in subduction zones where an oceanic plate slides under a continental plate or another younger oceanic plate.***

Not all earthquakes generate tsunamis. To generate a tsunami, the fault where the earthquake occurs must be underneath or near the ocean, and cause vertical movement of the seafloor (up to several meters) over a large area (up to a hundred thousand square kilometers). Shallow focus earthquakes (depth less than 70 km or 42 miles) along subduction zones are responsible for most destructive tsunamis. The amount of vertical and horizontal motion of the sea-floor, the area over which it occurs, the simultaneous occurrence of slumping of underwater sediments due to the shaking, and the efficiency with which energy is transferred from the earth's crust to the ocean water are all part of the tsunami generation mechanism. ***Although all oceanic regions of the world can experience tsunamis, the most destructive and repeated occurrences of tsunamis are in the Pacific Ocean region.***

Tsunami Earthquakes

The September 2, 1992 earthquake (magnitude 7.2) was barely felt by residents along the coast of Nicaragua. Located well offshore, the severity of shaking on a scale of I to XII, was mostly II along the coast, and reached III at only a few places. Twenty to 70 minutes after the earthquake occurred, a tsunami struck the coast of Nicaragua with wave amplitudes 4 m (13 feet) above normal sea level in most places and a maximum run-up height of 10.7 m (35 feet). The waves caught coastal residents by complete surprise and caused many casualties and considerable property damage.

This tsunami was caused by a tsunami earthquake - an earthquake that produces an unusually large tsunami relative to the earthquake magnitude. Tsunami earthquakes are characterized by a very shallow focus, fault dislocations greater than several meters, and fault surfaces that are smaller than for a normal earthquake.

Tsunami earthquakes are also slow earthquakes, with slippage along the fault beneath the seafloor occurring more slowly than it would in a normal earthquake. The only known method to quickly recognize a tsunami earthquake is to estimate a parameter called the seismic moment using very long period seismic waves (more than 50 seconds/cycle). Two other destructive and deadly tsunamis from tsunami earthquakes have occurred in recent years in Java, Indonesia (June 2, 1994) and Peru (February 21, 1996).

Tsunami Facts

How Fast?

Unnoticed tsunami waves can travel at the speed of a commercial jet plane, over 800 km per hour (~500 miles per hour). They can move from one side of the Pacific Ocean to the other in less than a day. This great speed makes it important to be aware of the tsunami as soon as it is generated. Scientists can predict when a tsunami will arrive at various places by knowing the source characteristics of the earthquake that generated the tsunami and the characteristics of the seafloor along the paths to those places. ***Tsunamis travel much slower in more shallow coastal waters where their wave heights begin to increase dramatically***.

How Big?

Offshore and coastal features can determine the size and impact of tsunami waves. Reefs, bays, entrances to rivers, undersea features and the slope of the beach all help to modify the tsunami as it attacks the coastline. When the tsunami reaches the coast and moves inland, the water level can rise many meters. In extreme cases, water level has risen to more that 15 m (50 feet) for tsunamis of distant origin and over 30 m (100 feet) for tsunami waves generated near the earthquake's epicenter***. The first wave may not be the largest in the series of waves***. One coastal community may see no damaging wave activity while in another nearby community destructive waves can be large and violent. The flooding can extend inland by 300 m (~1,000 feet) or more, covering large expanses of land with water and debris.

How Frequent?

Since scientists cannot predict when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. However, by looking at past historical tsunamis and run-up maps, scientists know where tsunamis are most likely to be generated. Past tsunami height measurements are useful in predicting future tsunami impact and flooding limits at specific coastal locations and communities.

Types of Tsunamis

Pacific-Wide And Regional Tsunamis

Tsunamis can be categorized as "local" and Pacific-wide. Typically, a Pacific-wide tsunami is generated by major vertical ocean bottom movement in offshore deep trenches. A "local" tsunami can be a component of the Pacific-wide tsunami in the area of the earthquake or a wave that is confined to the area of generation within a bay or harbor and caused by movement of the bay itself or landslides.

The last large tsunami that caused widespread death and destruction throughout the Pacific was generated by an earthquake located off the coast of Chile in 1960. It caused loss of life and property damage not only along the Chile coast but also in

Hawaii and as far away as Japan. The Great Alaskan Earthquake of 1964 killed 106 people and produced deadly tsunami waves in Alaska, Oregon, and California.
In July 1993, a tsunami generated in the Sea of Japan killed over 120 people in Japan. Damage also occurred in Korea and Russia but spared other countries since the tsunami wave energy was confined within the Sea of Japan. The 1993 Japan Sea tsunami is know as a "regional event" since its impact was confined to a relatively small area. For people living along the northwestern coast of Japan, the tsunami waves followed the earthquake within a few minutes.

During the 1990s, destructive regional tsunamis also occurred in Nicaragua, Indonesia, the Philippines, Papua New Guinea, and Peru, killing thousands of people. Others caused property damage in Chile and Mexico. Some damage also occurred in the far field in the Marquesas Islands (French Polynesia) from the July 30, 1995 Chilean and February 21, 1996 Peruvian tsunamis.

In less than a day, tsunamis can travel from one side of the Pacific to the other. However, people living near areas where large earthquakes occur may find that the tsunami waves will reach their shores within minutes of the earthquake. For these reasons, ***the tsunami threat to many areas such as Alaska, the Philippines, Japan and the U.S. West Coast can be immediate*** (tsunamis from nearby earthquakes which take only a few minutes to reach coastal areas) or less urgent (tsunamis from distant earthquakes which take from three to 22 hours to reach coastal areas).

Local
The local tsunami may be the most serious threat as it strikes suddenly, sometimes before the earthquake shaking stops. Alaska has had six serious local tsunamis in the last 80 years and Japan has had many more.

Local History of Tsunamis

Tsunamis have been reported since ancient times. They have been documented extensively in California since 1806. Although the majority of tsunamis have occurred in Northern California, Southern California has been impacted as well. In the 1930s, four tsunamis struck the Los Angeles, Orange County, and San Diego coastal areas. ***In Orange County, the tsunami wave reached heights of 20 feet or more above sea level.*** In 1964, following the Alaska 8.2 Earthquake, *tidal surges* of approximately 4 to 5 feet hit the Huntington Harbour area causing moderate damage.

Personal Interview
Name: Bill Richardson
Title: Huntington Beach Lifeguard
Year: 1964 – Alaska Good Friday Earthquake and Tsunami
(paraphrased by Glorria Morrison)

I was the lifeguard working in the tower on the pier. We received warning by phone from the Fire Department who had received information from the National Weather Service. We were told to tell folks on the pier and beach that if the situation escalated they would be advised to evacuate the area and that they should be prepared to move quickly.

I witnessed heavy title surges on the beaches. The tide changed in 10 minutes from what it normally was to a very different tide. Normally it takes six hours to change and in 10 minutes it sucked water out and when it came in, it went over the berm, three quarters of the way across the beach. The accelerated tide came within one hour and went twice. The highs were extreme and the lows were extreme, very like our astronomical tides. I monitored the radio and heard of all the docks breaking loose in the harbor. The current was so strong and movement of water that the radio was being overwhelmed with calls for response. Only the two islands of Admiralty and Gilbert existed at the time.

Bill Richardson referred me to Walt Sawyer a Lifeguard Lieutenant at the time. Walt was in Huntington Harbour during this event.

<u>Personal Interview</u>
Name: Walt Sawyer
Title: Huntington Beach City Lifeguard Lieutenant in the Harbor
Year: 1964 – Alaska Good Friday Earthquake and Tsunami
(paraphrased by Glorria Morrison)

I was called out at daybreak due to the tidal surges in the Huntington Harbour. I got in the City's only rescue boat. The tidal surges were huge and making whirlpools. They were moving at a much faster and higher rate than normal tide.

When the surges would come in, they would tear the boats away from their moorings. Then when the surges would go out, they would take the boats through the bridge at Pacific Coast Highway to the Seal Beach (Anaheim Landing Bridge) and when they hit the pilings it would tear the boats apart. The high tides were carrying the boats into the weapons station. When surges retreated the boats would end up on dry land at the weapons station high and dry and broken up.

In 1964, there were only about 200-300 boats in the harbor and today Walt estimated there are 3,500 plus boats. There were only 300-400 homes then and now he estimates an excess of 5,000. This occurred during a low tide. The sea wall in Huntington Harbour is 9 feet. Had this occurred during a high tide, Walt stated the surges would have easily gone over the sea walls and damaged many homes.

Tsunami Events In California 1930-2004			
Date	**Location**	**Maximum Run-up*(m)**	**Earthquake Magnitude**
08/31/1930	REDONDO BEACH	6.10	5.2
08/31/1930	SANTA MONICA	6.10	5.2
08/31/1930	VENICE	6.10	5.2
03/11/1933	LA JOLLA	0.10	6.3
03/11/1933	LONG BEACH	0.10	6.3
08/21/1934	NEWPORT BEACH	12.00	Unknown
02/09/1941	SAN DIEGO	Unknown	6.6
10/18/1989	MONTEREY	0.40	7.1
10/18/1989	MOSS LANDING	1.00	7.1
10/18/1989	SANTA CRUZ	0.10	7.1
04/25/1992	ARENA COVE	0.10	7.1
04/25/1992	MONTEREY	0.10	7.1
09/01/1994	CRESCENT CITY	0.14	7.1
11/04/2000	POINT ARGUELLO	5.00	

Information was taken from the Worldwide Tsunami Database www.ngdc.noaa.gov

* Maximum Run-Up (M): The maximum water height above sea level in meters. The run-up is the height the tsunami reached above a reference level such as mean sea level. It is not always clear which reference level was used.

Tsunami Hazard Assessment

Hazard Identification

A tsunami threat to the City of Huntington Beach is considered low to moderate. There is no imminent threat in the City Fountain Valley since it is not a coastal city. However, where Huntington Beach and Fountain Valley converge is only 5-25 feet above sea level. Just west of Brookhurst along Garfield is only 5-10 feet above sea level.

The Hazard Mitigation Planning Committee ranked Tsunami as follows in the City of Huntington Beach:

City	Hazard	Ranking
Huntington Beach	Tsunami	13 of 18 hazards
Fountain Valley	Tsunami	Not Ranked as a Priority Hazard

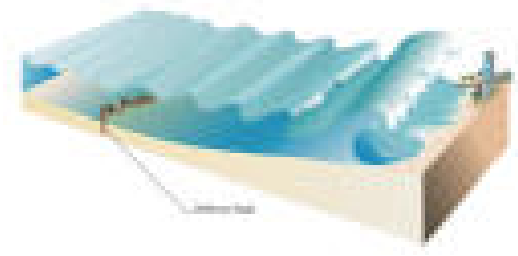
Huntington Beach has identified 18 hazards that could impact the City while Fountain Valley has identified 13.

City	Chance of Occurrence	Effect
Huntington Beach	3	9
Fountain Valley	Not Ranked	Not Ranked

Chance of Occurrence and **Effect** numbers are rated from one to ten.
Higher numbers signify greater chance of occurrence and a greater effect.
Chance of Occurrence is based on history, geography, and potential.
Effect is based on the worst-case scenario.

The Hazard Mitigation Committee met April 8, 2004 to discuss the tsunami hazard. A discussion followed as to what percent of each city area could be impacted by a tsunami. The following is the percentage the committee came to a consensus on:

City	Percentage of City that could be impacted by a Tsunami
Huntington Beach	16%
Fountain Valley	0%



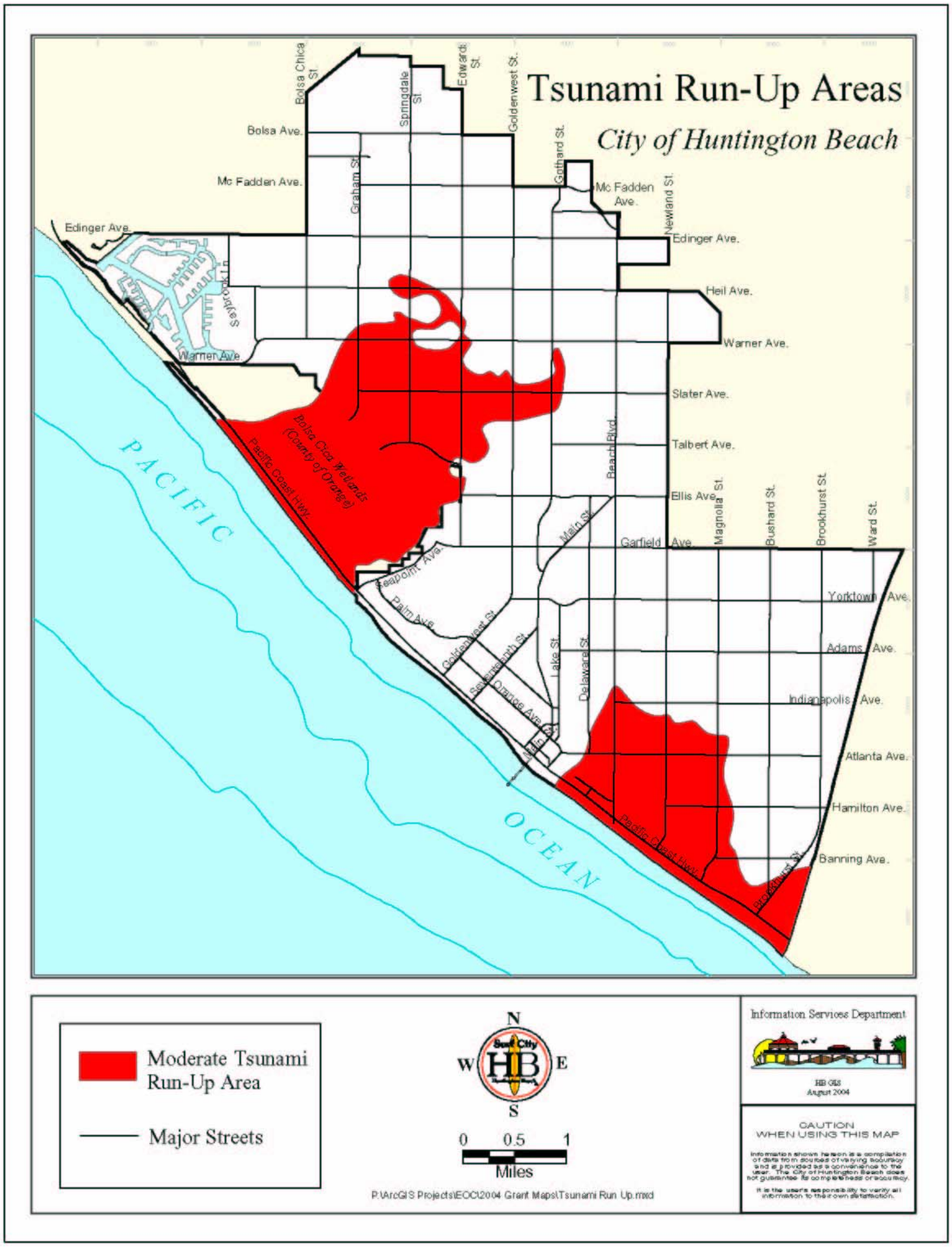
A United States Government study reports that, “Local earthquakes will not generate a tsunami, in this area.” Tsunamis are due to large offshore earthquakes and ocean landslides. Dangerous tsunamis would most likely originate in the Aleutian and Chilean trenches. Huntington Beach has southwestern facing beaches that are vulnerable to tsunamis or tidal surges from the south and from the west.

Predicted wave heights, exclusive of tide and storm generated wave heights are:

For a 100 year occurrence	For a 500 year occurrence
4.0 feet minimum	6.8 feet minimum
6.6 feet average	11.4 feet average
9.2 feet maximum	16.0 feet maximum

According to the Modern Tsunami Run-up Map (Exhibit IV-B-1) the entire 8.5 miles of coastline would be severely impacted. During the summer months, Huntington Beach can attract over 100,000 people a day to its beaches. If a tsunami were to occur, it could devastate the entire coastal area.

Exhibit IV-B-1: Tsunami Run-Up Areas for Huntington Beach



Warning System

The tsunami warning system in the United States is a function of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service. Development of the tsunami warning system was impelled by the disastrous waves generated in Alaska in April 1946, which surprised Hawaii and the US West Coast, taking a heavy toll in life and property.

www.prh.noaa.gov/pr/ptwc/

The disastrous 1964 tsunami resulted in the development of a regional warning system in Alaska. The Alaska Tsunami Warning Center is in Palmer, Alaska. This facility is the nerve center for an elaborate telemetry network of remote seismic stations in Alaska, Washington, California, Colorado, and other locations. Tidal data is also telemetered directly to the ATWC from eight Alaskan locations. Tidal data from Canada, Washington, Oregon, and California are available via telephone, teletype, and computer readout.

Watch vs. Warning

The National Warning System (NAWAS) is an integral part of the Alaska Tsunami Warning Center. Reports of major earthquakes occurring anywhere in the Pacific Basin that may generate seismic sea waves are transmitted to the Honolulu Observatory for evaluation. An Alaska Tsunami Warning Center is also in place for public notification of earthquakes in the Pacific Basin near Alaska, Canada, and Northern California. The Observatory Staff determines action to be taken and relay warnings over the NAWAS circuits to inform and warn West Coast states. The State NAWAS circuit is used to relay the information to the Orange County Operational Area warning center, which will in turn relay the information to local warning points in coastal areas. The same information is also transmitted to local jurisdictions over appropriate radio systems, teletype, and telephone circuits to ensure maximum dissemination. Additional warning systems include Emergency Digital Information Service (EDIS) and Emergency Alerting System (EAS).

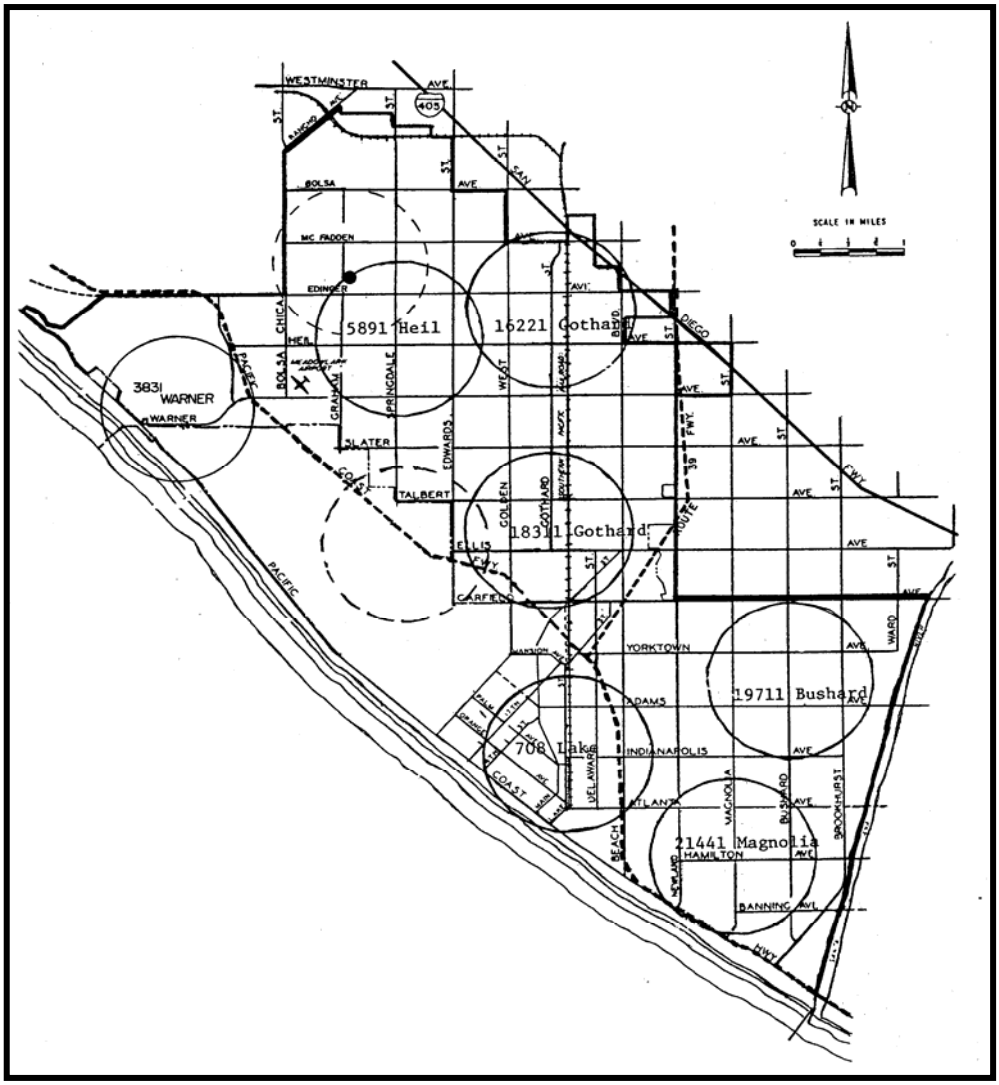
The Local Warning Points for the Cities of Huntington Beach and Fountain Valley are the Police Watch Commander's Offices. The 24-hour a day on-duty Watch Commanders are responsible for activating appropriate city departments and personnel and the City's Emergency Operations Center (EOC) if needed. The Police Department is responsible for alerting and warning the public of any imminent threat and evacuating the public to safe areas. Under the direction of the Police Department, the Marine Safety Officers would evacuate everything west of Pacific Coast Highway and liaison with State beach officials to ensure this occurs on the State beaches.

A Tsunami <u>Watch</u> Bulletin is issued if an earthquake has occurred in the Pacific Basin and could cause a tsunami. A Tsunami <u>Warning</u> Bulletin is issued when an

earthquake has occurred and a tsunami is spreading across the Pacific Ocean. When a threat no longer exists, a Cancellation Bulletin is issued.

When there is a high probability that a tsunami will reach Huntington Beach, the City will activate its Warning Siren System. Within the City of Huntington Beach there are seven siren towers located at seven of the eight Fire Stations. The siren towers are strategically placed throughout the City and will be heard by approximately 80% of the residents. When activated, the sirens alert the public to turn on their AM/FM radio and listen to the Emergency Alerting System (EAS). The sirens are simultaneously tested the last Friday of each month at noon to ensure that they are working correctly. The City Public Information Officer will activate EAS and provide them with a prepared statement of who should evacuate, where to evacuate to and what routes to take.

Exhibit IV-B-2: Huntington Beach Siren Location Map



Evacuation
Upon receipt of a Tsunami Watch/Warning Bulletin, an immediate evaluation of the potential threat to the coastal areas of Huntington Beach will be made. After a thorough evaluation, a determination will be made as to the degree of evacuation necessary to eliminate any threats to the resident and visiting populations.

Once the degree of evacuation has been determined, the Police Department will begin an immediate evacuation of the low-lying areas that have been determined to be at risk. According to the Tsunami Evacuation Map (Exhibit IV-B-5) approximately 45% of local residents will have to be evacuated. Police Officers will block all movements on Pacific Coast Highway except those necessary to gain access to the nearest arterial highway leading away from the ocean. The population will be directed inland using the closest available northbound or eastbound arterial highway. It is imperative that the evacuation routes be kept open and clear at all times.

Primary Evacuation Routes:
- Brookhurst Street
- Magnolia Street
- Newland Street
- Beach Boulevard
- Lake Street
- Golden West Street
- Seapoint Street
- Warner Avenue

Alternate Evacuation Routes:
- Any other roadway leading away from the beach

Additionally, if a large tsunami were to hit the Huntington Beach Coastline, approximately 89,000 local residents would have to be evacuated to neighboring cities such as Costa Mesa. These neighboring jurisdictions along with the American Red Cross would be called upon for care and shelter duties. Displacing residents, utilization of city resources, and disaster cleanup can cause an economic hardship on all impacted communities.

School Impacts
Schools would also be heavily impacted if a tsunami where to hit the Huntington Beach coastline. Many School Districts are in the low-lying evacuation areas. All schools should be notified if a Tsunami Warning is issued. School Districts that would be affected include:

Exhibit IV-B-3: School Sites Impacted

Huntington Beach City School District

Eader School	RD 475	Evacuation Zone 4
Kettler School	RD 464	Evacuation Zone 4
Peterson School	RD 453	Evacuation Zone 6
Sowers School	RD 455	Evacuation Zone 6
Hawes School	RD 446	Evacuation Zone 6
Moffett School	RD 444	Evacuation Zone 4

Huntington Beach Union High School District

District Office	RD 427	Evacuation Zone 6
Edison High School	RD 431	Evacuation Zone 4

Ocean View School District

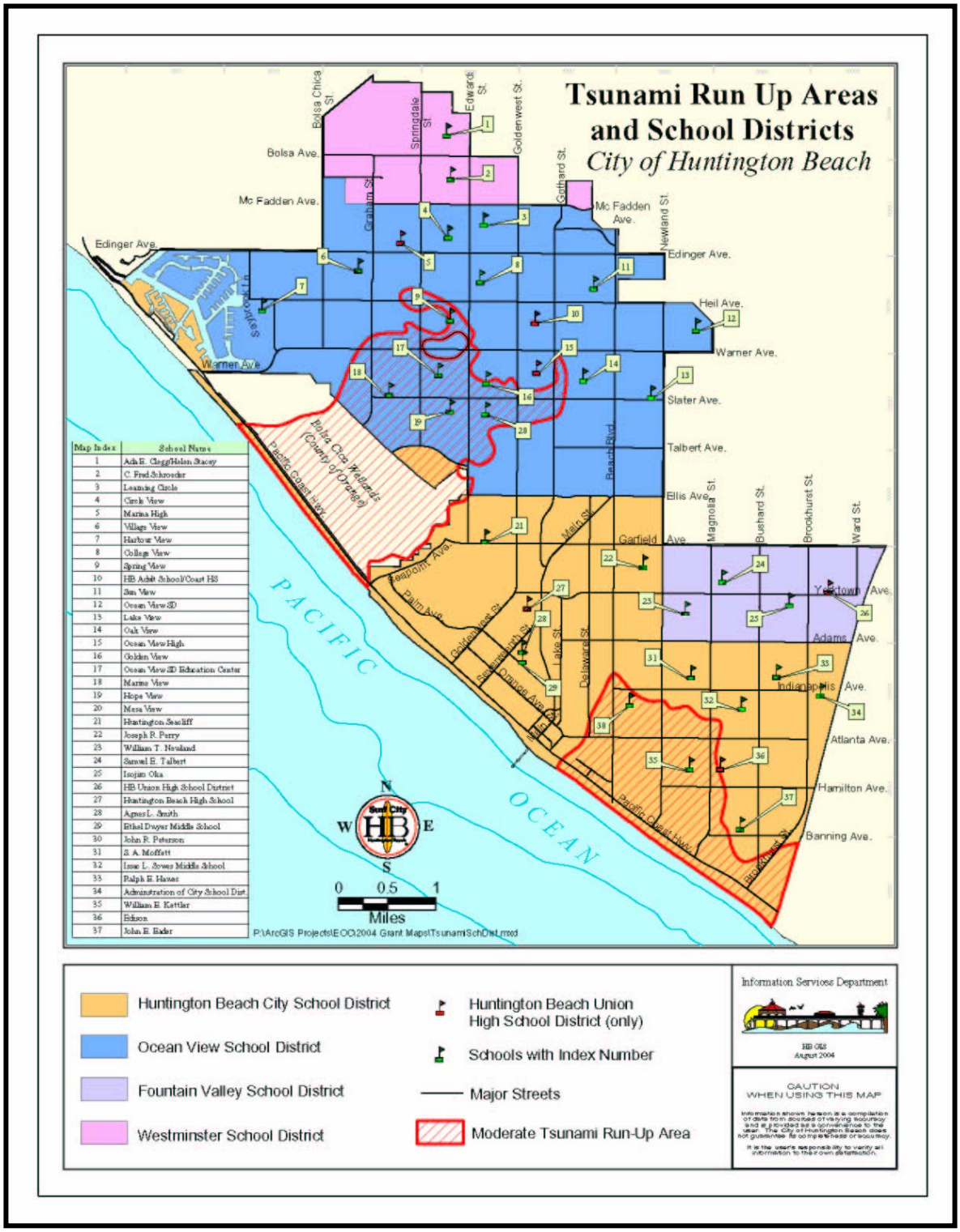
Marine View	RD 177	Evacuation Zone 3
Golden View	RD 179	Evacuation Zone 3
Mesa View	RD 189	Evacuation Zone 3
Oak View	RD 272	Evacuation Zone 3
Harbour View	RD 164	Evacuation Zone 5
Spring View	RD 168	Evacuation Zone 3
School District EOC	RD 178	Evacuation Zone 3
School District Education Center	RD 178	Evacuation Zone 3

Newland School	RD 434	Evacuation Zone 6
Talbert School	RD 435	Evacuation Zone 6
Oka	RD 436	Evacuation Zone 6

Fountain Valley School District

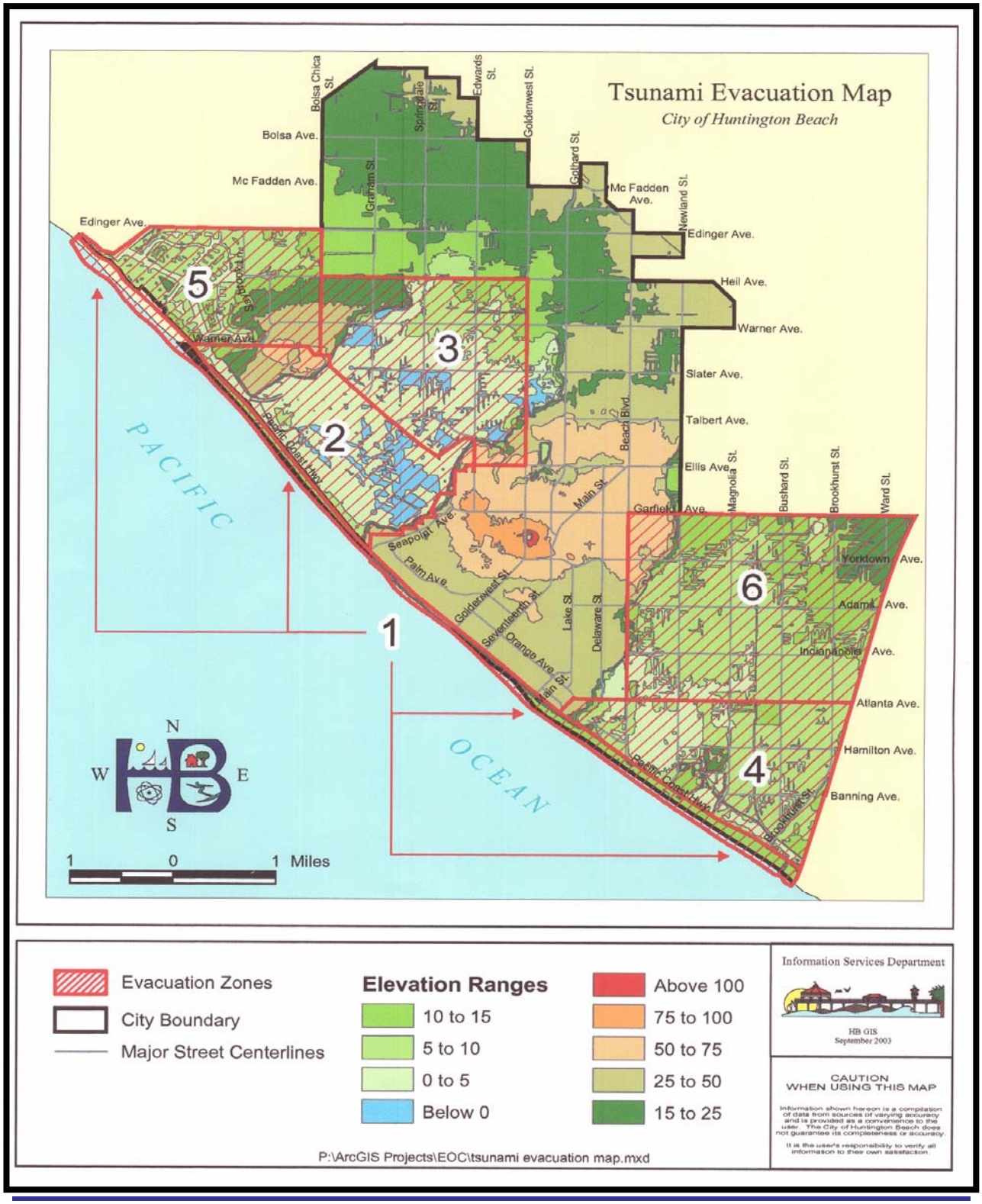
See Huntington Beach Tsunami Run-up Areas and School District Sites, Exhibit IV-B-4, for a complete map.

Exhibit IV-B-4: Tsunami Run-up Areas and School District Sites



Map Index	School Name
1	Ada E. Clegg/Helen Stacey
2	C. Fred Schroeder
3	Learning Circle
4	Circle View
5	Marina High
6	Village View
7	Harbour View
8	College View
9	Spring View
10	HB Adult School/Coast HS
11	Sun View
12	Ocean View SD
13	Lake View
14	Oak View
15	Ocean View High
16	Golden View
17	Ocean View SD Education Center
18	Marine View
19	Hope View
20	Mesa View
21	Huntington Seacliff
22	Joseph R. Perry
23	William T. Newland
24	Samuel E. Talbert
25	Isojiro Oka
26	HB Union High School District
27	Huntington Beach High School
28	Agnes L. Smith
29	Ethel Dwyer Middle School
30	John R. Peterson
31	J. A. Moffett
32	Isaac L. Sowers Middle School
33	Ralph E. Hawes
34	Administration of City School Dist.
35	William E. Kettler
36	Edison
37	John E. Euler

Exhibit IV-B-5: Tsunami Evacuation Map for Huntington Beach



Vulnerability and Risk
It is a future goal of the cities to complete a HAZUS vulnerability assessment. It would include impacts on life, property, infrastructure, and transportation exposed to a tsunami hazard. Funds are not available at this time to conduct this study.

Community Tsunami Issues

What is Susceptible to Tsunami?
Life and Property
Based on the "local" history events of tsunamis, we can conclude that approximately 16% of the City of Huntington Beach would be heavily impacted (utilizing the Tsunami Run-up Map and estimating that 17 reporting districts (RD) are in the impacted area). The largest impact on the community from a tsunami event is the loss of life and property.

Known risk areas include, but are not limited to:

- City and State Beaches
- City pier
- All buildings and apartments on the water side of Pacific Coast Highway (PCH)
- Vehicles and pedestrians on PCH in low lying areas
- Buildings that are on the inland side of PCH facing the ocean including Huntington By-The-Sea Mobile Home, Cabrilla Mobile Home and RV Parks
- Huntington Harbour area, RDs 152, 153, 154, 162, 163, 164, 173, and 174
- The area generally south of Warner Avenue between Graham Street and Edwards Street, RDs 177, 178, 187, 188, and 189
- The southeast corner of the City generally south of Garfield and east of Beach Boulevard

Using the *Tsunami Warning and Watch Bulletin* would provide time to allow coastal residents to evacuate and seek higher ground for shelter. This would greatly reduce injuries and loss of life.

Residential
Also property along the coast could be devastated. Huntington Beach is an affluent community; the median price of a home on the coastline is $800,000 to $1 million+ dollars. A large tsunami could potentially destroy or damage hundreds to thousands of homes spreading debris for miles. A tsunami would devastate the City of Huntington Beach's economy.

Commercial
Huntington Beach pier and beaches are world famous. During summer months, up to 100,000 people a day come into the community to stay in the beautiful hotels and shop at the unique boutiques. The local government relies heavily on tourism and sales tax.

A tsunami event would impact businesses by damaging property and by interrupting business and services. Any residential or commercial structure with weak reinforcement would be susceptible to damage.

Infrastructure

Tsunamis (and earthquakes) can damage buildings, power lines, and other property and infrastructure due to flooding. Tsunamis can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Damage to public water and sewer systems, transportation networks, and flood channels would greatly impact daily life for residents.

Roads blocked by objects during a tsunami may have severe consequences to people who are attempting to evacuate or who need emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from tsunamis related to both physical damages and interrupted services.

Exhibit IV-B-6: Huntington Beach Impacted Essential Service Facilities

Name of Facility	Address	Contact Person	Contact #	RD	Generator	Other Information
Station 1 Gothard Fire Station	18311 Gothard St	Fire Chief Duane Olson	536-5471	291	YES	Emergency response
Station 4 Magnolia Fire Station	21441 Magnolia Ave	Fire Chief Duane Olson	536-5475	464	YES	Emergency response
Station 8 Heil Fire Station	5891 Heil Ave	Fire Chief Duane Olson	536-5464	157	YES	Emergency response
Fire Training Center	18301 Gothard St	Fire Chief Duane Olson	536-5414	291	YES	Backup EOC and Fire Department Operations Center
Police Heliport	Morrison Way	Police Chief Kenneth Small	536-5997	291	YES	Emergency Response
Public Works Don Kiser Corporate Yard	17371 Gothard St	Jim Jones	536-5024	271	NO	Backup EOC and Public Works Dept. Ops Center
Public Works Park, Tree and Landscape Yard	17581 Gothard St	Jim Jones	536-5024	281	NO	Location of City maintenance resources
Beach Maintenance Yard	8669 Edison	Larry Neishi	536-5287	474	NO	City heavy equipment resources
Marine Safety Headquarters	103 PCH	Kyle Lindo	536-5281	461	YES	Backup EOC and Marine Safety Dept Ops Center
Ocean View High School	17071 Gothard St	Principal Karen Gilden	848-0656	271	YES 5k only	Shelter, Staging Area, Disaster Application Center (DAC)
Edison High School	21400 Magnolia Ave	Principal Cynthia Clark	962-1356	465	YES 5k only	Shelter, Staging Area, DAC
HB City School District EOC	20451 Craimer	Dick Masters	964-8888	447	YES	Manages school district operations
Ocean View SD EOC	8291 Warner	Carolyn Stocker	847-2551	263	No Response	Manages school district operations

See Huntington Beach Tsunami Run-up Area and Essential Service Facilities Exhibit IV B-6 for a complete map.

Exhibit IV-B-7: HB Impacted Government (Non-City) Facilities

Name of Facility	Address	Contact Person	Contact # (24 hour)	RD	Generator	Other Information
U.S. Post Office (Ida Jean Haxton Station)	9151 Atlanta Avenue	Station Manager: Paul Mendoza	963-0621	455		
U.S. Post Office (Beach Center Station)	316 Olive Avenue	Jessie Vargas	536-4973	451		
CA State Department of Parks and Recreation	Bolsa Chica State Beach (S of Warner)	Dispatch	Dispatch: (909) 443-2969 or 70 846-3460	173 183, 184 and 194	No	Orange Coast District North Sector (Includes Huntington & Bolsa Chica State Beaches)
	Huntington State Beach	Dispatch	536-1455	337, 349 and 359	No	
Orange County Sanitation District, Plant #2	22212 Brookhurst	James Matte (24 hour) Control Center (24/7)	593-7155 962-2411 (24 hour) 593-7025	486 and 496	Yes	

See Huntington Beach Tsunami Run-up Area and Government (Non-City) Essential Service Facilities, Exhibit IV-B-9 for a complete map.

Exhibit IV-B-8: Tsunami Run-up Area/Essential Service Facilities

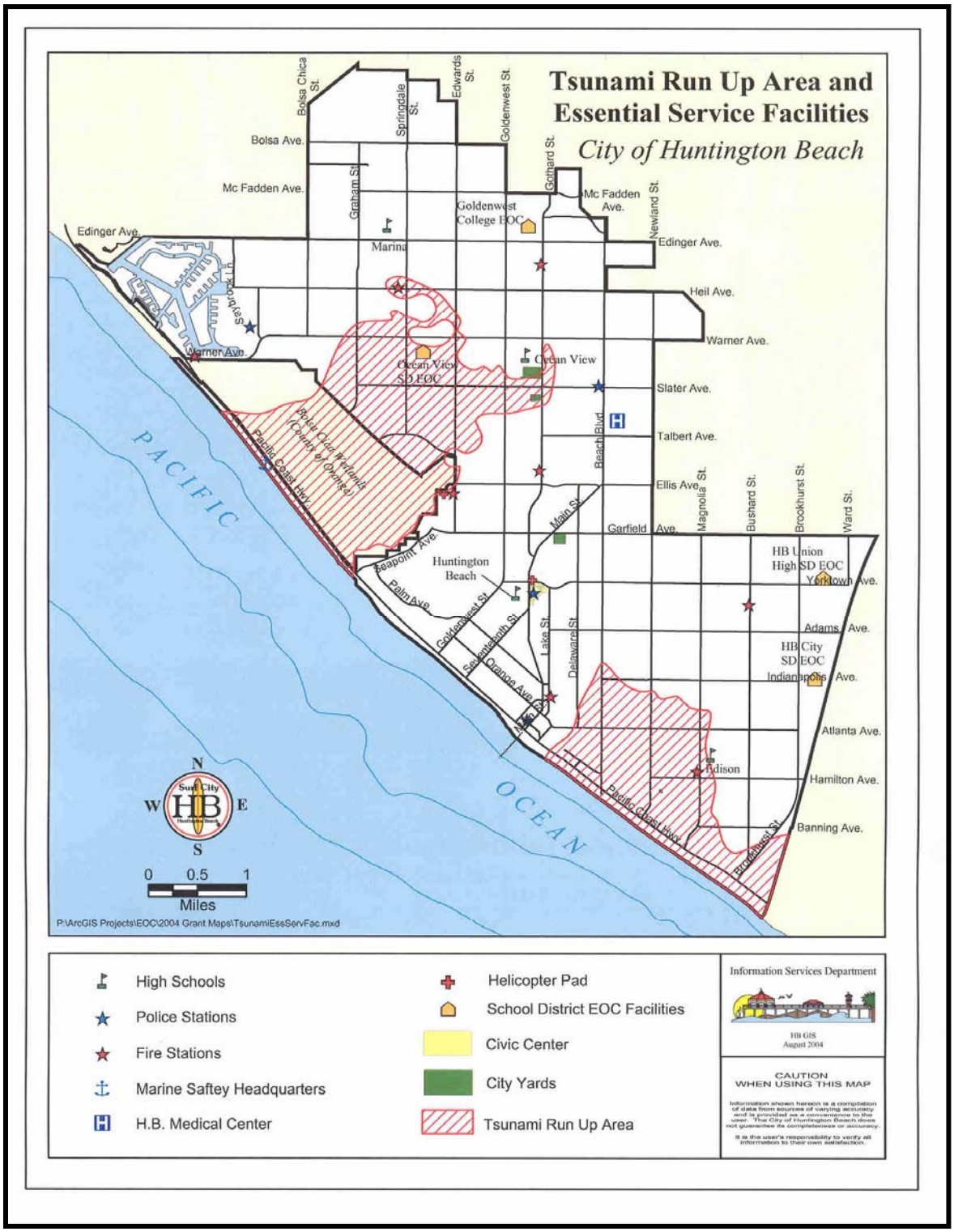
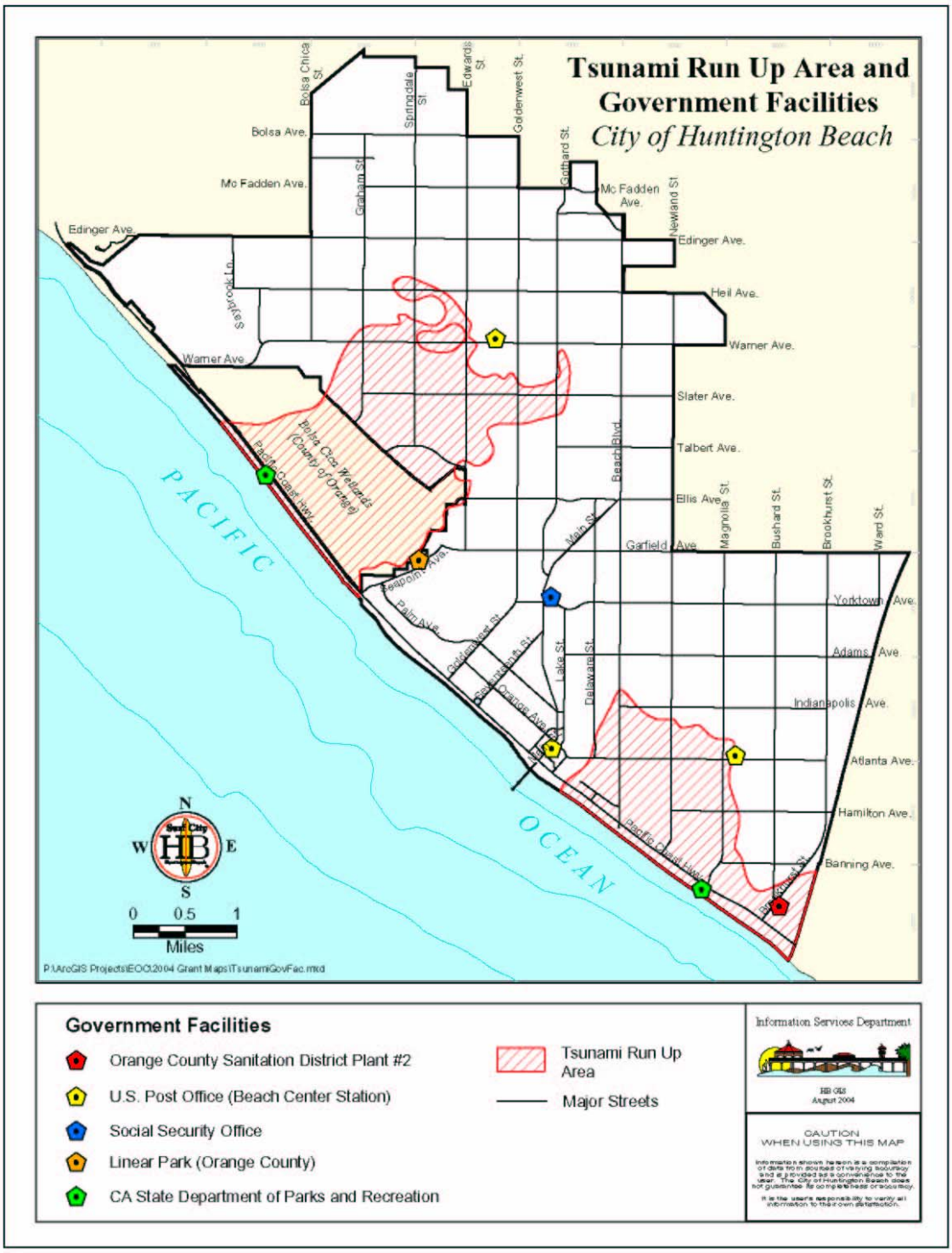


Exhibit IV-B-9: Tsunami Run-Up Area/Government (Non-City) Facilities



Existing Mitigation Activities

Huntington Beach has implemented a number of tsunami mitigation activities over the years. The City has been acknowledged and received many awards for being a leader in terms of preparing and training its residents for a disaster. Some of the current mitigation programs include:

- The City's Warning Siren System
- California's Emergency Alerting System (EAS)
- City of Huntington Beach Emergency Operations Plan (EOP)
  - Police Branch – Evacuation & Alerting and Warning Plan
  - Public Information Unit Plan
- Extensive Disaster Preparedness Public Education

Tsunami Mitigation Strategies

The tsunami mitigation strategies provide direction on specific activities that organizations and residents in Huntington Beach and Fountain Valley can undertake to reduce risk and prevent loss from tsunami events. Each action item is followed by ideas for implementation, which can be used by the Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee and local decision makers in pursuing strategies for implementation.

Exhibit IV-B-10: Tsunami Multi-Hazard Strategies

Natural Hazard	**TSUNAMI STRATEGY #2A**:		
Action Item	Purchase and install a warning siren system in the Edwards Fire Station (Station 6) located at 18591 Edwards Street in Huntington Beach. The other seven Fire Stations in Huntington Beach have these sirens. When they built the new station, there were no funds available to purchase and install the siren system.		
Coordinating Organization	Huntington Beach Fire Department		
Ideas for Implementation	Utilize the funds from cell site rental of Warner Fire Station. Annually $1,800 is received for the rental of the siren pole at Warner Fire Station. This money is utilized to maintain the sirens in working order but is not sufficient to purchase a siren system for Edwards Fire Station.		
Time line	Since all sirens are in perfect working order and electrical and painting maintenance has been completed in recent years, this money may be available for this purpose in the 2004/05-budget year.		
Constraints	The Fire Department must approve funds and coordinate purchase and installation.		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**TSUNAMI STRATEGY #2B**		
Action Item	Tsunami Public Education Campaign		
Coordinating Organization	Huntington Beach Fire Department Emergency Services Office		
Ideas for Implementation	Include Tsunami education in all existing CERT Classes. Develop a special Tsunami Education Campaign. Each year a different (1) hazard or (2) group of people is targeted. For example: (1) Y2K, Power Outages or Terrorism; (2) Schools, Mobile Home Parks, Businesses, or Neighborhoods.		
Time line	The 2005 target hazard could be Tsunami if the community believes it would be a worthwhile activity.		
Constraints	Some individuals may believe this to be a waste of time due to the low probability of a tsunami hitting the Orange County Coastline.		
Plan Goals Addressed			Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

The Huntington Beach Fire Department Emergency Services Office has conducted numerous public education campaigns over the years including preparing residents for Terrorism, Power Outages, Y2K, and Earthquakes. In addition, they have conducted campaigns directed towards special target audiences such as mobile home owners, senior and disabled populations, non-English speaking, businesses, neighborhoods, etc. The City utilizes its Community Emergency Response Team (CERT) Program as its education arm into the community. Volunteers are trained through a train-the-trainer program and they in turn can educate their neighborhoods, churches, businesses, schools, and community groups. This is an efficient and cost-effective way to provide public education campaigns.

All included mitigation strategies were evaluated by the Huntington Beach/Fountain Valley Hazard Mitigation Committee to determine their appropriateness. Costs vs. benefits were analyzed and the appropriate recommended actions are the result of this planning project. Citizen input into the hazard and mitigation strategies was coordinated through community forums on July 22 and August 5, 2004.

Exhibit IV-B-11: Proposed Activity Criteria Evaluation

The Hazard Mitigation Committee developed a chart comparing selected criteria on a one through five scale. The following criteria were analyzed: cost effective, technically feasible, environmentally sound, social impacts, activity addresses the problem, meets federal, state, and local regulations, politically acceptable, activity reduces the risk. After reviewing the chart, the committee concluded that all jurisdictions would support the proposed activities.

	PROPOSED ACTIVITY				
CRITERIA	**Strategy 2A**	**Strategy 2B**			
Cost Effective	5	5			5 = Excellent 4 = Good 3 = Fair 2 = Bad 1 = Unacceptable
Technically Feasible	5	5			
Environmentally Sound	5	5			
Social Impacts	5	5			
Activity Addresses the Problem	5	5			
Meets Federal, State, and Local Regulations	5	5			
Politically Acceptable	5	4			
Activity Reduces the Risk	5	5			
Total	40	39			

Estimated Potential Losses

Estimated Potential Losses, FEMA Worksheet 3a

The following City-specific FEMA Worksheets depict the estimated loss to the number of City structures, dollar value of the structures, and the total number of people impacted. These figures are calculated by type of structure (occupancy class) and then totaled at the bottom of the chart. A complete description of how the figures were obtained is available in Part IIIB2 – Risk Assessment.

Estimated Degree of Loss, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimated the area of each city that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e. Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of damage of that area or sub area. Content losses are derived by multiplying the percent of content damage by the loss of structure. A complete description of how the figures were obtained is also available in Part IIIB2 – Risk Assessment.

Exhibit IV-B-12: Huntington Beach Estimated Potential Losses

City of: **Huntington Beach**

June 28, 2004 | Hazard: **Tsunami** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	% in Hazard Area	# in Hazard Area
Residential	77,800	12060	15.5%	$ 11,508,176,000	$1,783,767,000	15.5%	199,500	15.5%	30,922
Commercial	2,260	350	15,5%	$ 1,167,322,771	$ 180,935,000	15.5%	28,900	15.5%	4,479
Industrial	1,161	116	10.0%	$ 1,135,822,248	$ 113,600,000	10.0%	32,900	10.0%	3,290
Agricultural	0						0		
Religious / Non-Profit	174	27	15.5%	$ 192,900,040	$ 29,900,000	15.5%	24,000	15.5%	3,720
Government	129	20	15.5%	$ 361,547,570	$ 56,040,000	15.5%	900	15.5%	139
Education	555	86	15.5%	$ 410,857,447	$ 63,683,000	15.5%	2,500	15.5%	388
Utilities									
Total	82,079	12,659	15.4%	$ 14,776,626,076	**$2,227,925,000**	15.5%			

Exhibit IV-B-13: Fountain Valley Estimated Potential Losses

City of: **Fountain Valley**

June 25, 2004 | Hazard: **Tsunami** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	% in Hazard Area	# in Hazard Area
Residential	13,729	0	0%	2,745,800,000	0	0%	55,321	0	0%
Commercial	268	0	0%	1,608,000,000	0	0%	16,734	0	0%
Industrial	275	0	0%	584,375,000	0	0%	13,740	0	0%
Agricultural	8	0	0%	1,500,000	0	0%	175	0	0%
Religious / Non-Profit	16*	0	0%	19,200,000	0	0%	2,370	0	0%
Government	35	0	0%	26,430,000	0	0%	45	0	0%
Education	18	0	0%	96,985,000	0	0%	800	0	0%
Utilities		0							
Total	14,333	0	0%	5,082,290,000	0	0%			

Exhibit IV-B-14: Huntington Beach Estimated Degree of Loss

Estimated Degree of Loss

City of: **Huntington Beach**

August 25, 2004 — Hazard: **Tsunami** — Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	11,508,176,000								
	Out of Area	84	9,666,867,840	0	-	0%	-		
	Slight Damage	0.5	57,540,880	15	8,631,132	50%	4,315,566	0	
	Moderate Damage	3.5	402,786,160	50	201,393,080	50%	100,696,540	0	
	Extensive Damage	5.5	632,949,680	80	506,359,744	50%	253,179,872	0	
	Complete Damage	6.5	748,031,440	100	748,031,440	100%	748,031,440	0	
	Totals	100	11,508,176,000		1,464,415,396		1,106,223,418	0	2,570,638,814
Commercial		16	1,167,322,771	*	148,541,823	*	112,208,901	0	260,750,724
Industrial		16	1,135,822,248	*	144,533,381	*	109,180,914	0	253,714,295
Agriculture			0						
Religious/ Non-Profit		16	192,900,040	*	24,546,530	*	18,542,516	0	43,089,046
Government		16	361,547,570	*	46,006,928	*	34,753,760	0	80,760,688
Education		16	410,857,447	*	52,281,610	*	39,493,672	0	91,775,282
Utilities									
	Totals:		14,776,626,076		1,880,325,668		1,420,403,182	0	3,300,728,850

* = Used the same ratios and formulas as Residential.

Exhibit IV-B-15: Fountain Valley Estimated Degree of Loss

Estimated Degree of Loss									
				City of:	Fountain Valley				
August 25, 2004				Hazard:	Tsunami				Worksheet 4
Occupancy Class	**Description of Damage**	**% in Hazard Area**	**Structural Replacement Value**	**Percent Damage**	**Subtotal Loss to Structures**	**Content Loss % of Loss**	**Content Loss Replacement Value**	**Function Losses**	**Total Structural + Content Loss + Function Losses**
Residential	11,508,176,000								
	Out of Area	100	11,508,176,000	0	-	0%	-		
	Slight Damage	0	-	15	-	50%	-	0	
	Moderate Damage	0	-	50	-	50%	-	0	
	Extensive Damage	0	-	80	-	50%	-	0	
	Complete Damage	0	-	100	-	100%	-	0	
	Totals	100	11,508,176,000		-		-	0	-
Commercial		0	1,167,322,771	*	-	*	-	0	-
Industrial		0	1,135,822,248	*	-	*	-	0	-
Agriculture			0						
Religious/ Non-Profit		0	192,900,040	*	-	*	-	0	-
Government		0	361,547,570	*	-	*	-	0	-
Education		0	410,857,447	*	-	*	-	0	-
Utilities									
	Totals:		14,776,626,076		-		-	0	-

* = Used the same ratios and formulas as Residential.

References

General Tsunami Information
http://www.pmel.noaa.gov/tsuanmi-jazard/tsuanmi_faqs.htm
http://wcatwc.gov/sAftery.htm
http://www.redcrosss.org/services/disaster.html

Huntington Beach Publications
The City of Huntington Beach General Plan
The City of Huntington Beach Emergency Operations Plan (EOP)
Operations Plan #2 Tsunami

General Tsunami Publications
The Great Waves presented by NOAA, International Tsunami Information Center (ITIC), Intergovernmental Oceanographic Commission (IOC)

FEMA Publications
State and Local Mitigation Planning how to guide: Understanding Your Risks 386-2

New Guinea Tsunami Information
http://walrus.wr.usgs.gov/tsunami/PNG.html
http://whyfiles.org

The National Tsunami Hazard Mitigation Program
http://www.pmel.noaa.gov/tsuanmi-hazard/wcms.html

Worldwide Tsunami Database
http://www.ngdc.noaa.gov/seg/hazard/tsuintro.shtml

Part IV-C

Subsidence Report
Table of Contents

SUBSIDENCE **1**
Exhibit IV-C-1: Location of Murdy Fire Station 9
Exhibit IV-C-2: Map of Murdy Fire Station in Liquefaction Zone 10
SYNOPSIS OF OTHER SUBSIDENCE EVENTS **20**
Exhibit IV-C-3: Subsidence Areas and School Districts 26
SUBSIDENCE HAZARD ASSESSMENT **27**
Exhibit IV-C-4: Liquefaction Areas 28
Exhibit IV-C-5: Subsidence Areas from USGS Quadrangle 29
Exhibit IV-C-6: City of Huntington Beach Liquefaction Potential 30
Exhibit IV-C-7: City of Huntington Beach Subsidence Areas 31
Exhibit IV-C-8: City of Huntington Beach Peat and Organic Soils 32
Exhibit IV-C-9: City of Huntington Beach Near Surface Water 33
COMMUNITY SUBSIDENCE ISSUES **34**
Exhibit IV-C-10: Subsidence Areas and Government Facilities 35
Exhibit IV-C-11: Subsidence Areas and Essential Services Facilities 36
SUBSIDENCE MITIGATION STRATEGIES **37**
Exhibit IV-C-12: Subsidence Mitigation Action Items 37
Exhibit IV-C-13: Proposed Activity Criteria Evaluation 38
ESTIMATED POTENTIAL LOSSES **39**
Exhibit IV-C-14: Huntington Beach Estimated Potential Losses 40
Exhibit IV-C-15: Fountain Valley Estimated Potential Losses 41
Exhibit IV-C-16: Huntington Beach Estimated Degree of Loss 42
Exhibit IV-C-17: Fountain Valley Estimated Degree of Loss 43

(This page intentionally left blank)

Subsidence

Of all hazards studied for the Hazard Mitigation Plan, subsidence is the least understood and the most overlooked. While subsidence heavily impacts the Cities of Huntington Beach and Fountain Valley, local information is sparse and is most commonly extracted from geotechnical reports and private consultant projects. Until now, almost all available City reports do not include subsidence as a natural hazard. However, given the recent impact of subsidence on numerous public and private properties, a closer examination of the local subsidence threat will allow for future savings of life and property. Due to the history of the study area with numerous occurrences and ongoing problems, subsidence has a HIGH probability of occurrence in the Cities of Huntington Beach and Fountain Valley

Hazard Rankings for Huntington Beach and Fountain Valley

As detailed in Part III-A Risk Assessment, the Hazard Mitigation Planning Committee began the hazard analysis process by ranking all available natural hazards. The following is the result of the hazard analysis conducted by the Hazard Mitigation Planning Committee:

City	Hazard	Ranking
Huntington Beach	Subsidence	5 of 18
Fountain Valley	Subsidence	11.5 of 13

As noted in the Risk Assessment section, subsidence was not originally listed as a potential hazard to the City of Fountain Valley. However, research uncovered examples of recent damage to the City of Fountain Valley and was therefore later added by the Committee to the hazard analysis.

The following chart depicts the **Chance of Occurrence** and **Effect** of the subsidence hazard as determined in the 2003 Emergency Operations Plan update:

City	Chance of Occurrence	Effect
Huntington Beach	Not Determined	Not Determined
Fountain Valley	Not Determined	Not Determined

Chance of Occurrence and **Effect** numbers are rated from one to ten.
Higher numbers signify greater chance of occurrence and a greater effect.
Chance of Occurrence is based on history, geography, and potential.
Effect is based on the worst-case scenario.

The Hazard Mitigation Committee met on June 10, 2004 to discuss the subsidence hazard. A discussion followed as to what percent of each City area could be impacted by subsidence. The following is the result of that discussion:

City	Percentage of City that could be impacted by Subsidence
Huntington Beach	67%
Fountain Valley	95%

What Is Subsidence?

According to the United States Geological Survey, subsidence is "the loss of surface elevation due to removal of subsurface support."[i] This geologic hazard occurs when loosely associated materials such as surface silt, sand, and gravel, transition from a state of loose compaction[ii] to a condition of tight compaction. When these materials below the surface compact, the surface elevation drops taking with it any structure resting on the surface. This process can happen slowly over a long period of time or rapidly after an earthquake or other sudden land intervention. In the United States, subsidence has directly affected 45 states (including California) and more than 17,000 square miles. The total annual cost due to subsidence is roughly $125 million.[iii] This rough estimate does not take into account areas that are difficult for scientists to map and the cost of destroying the natural environment.

What Causes Subsidence?

The primary cause of subsidence in the southwestern United States is overdrafting of aquifers. An aquifer is a below surface layer of earth that contains water. When groundwater is pumped out for community usage, construction projects, or other industrial projects, the beds of clay and weak soil lose their support and compact, lowering the surface of the ground. The primary cause of subsidence in the local planning area is the slow, long-term natural subsiding of soil.

The three categories of ground subsidence can be summarized as follows:

1) Groundwater withdrawal – as water is removed from an area, the soils compact and the surface sinks
2) Tectonic subsidence – faulting and folding of the group surface causes a drop
3) Earthquake-induced – shaking from an earthquake causes sediment liquefaction which then leads to subsidence

Additional causes of subsidence are drainage of organic and peat soils, underground mining (mine-related subsidence), hydrocompaction (first-time wetting of moisture-deficient low-density soils), natural compaction, crustal deformation, sinkholes, thawing of permafrost, and withdrawal of other fluids such as petroleum.[iv] While subsidence can occur naturally, it is usually the result of man's geologic intervention. In the areas occupied by the six participating jurisdictions, the main cause of subsidence is the natural compression of peat and organic soils over a long period of time.

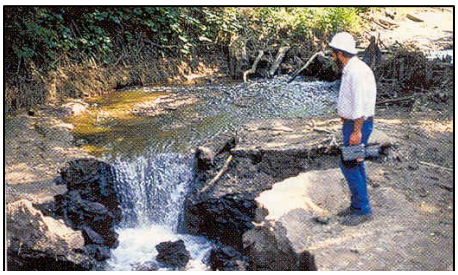
What Is Liquefaction?

Liquefaction is also related to the density and movement of soil particles and water. Unlike subsidence, liquefaction usually occurs quickly after a sudden event like an earthquake or a construction activity such as blasting. Soils that are highly saturated with water are more likely to experience liquefaction. Prior to the disruptive event, the water exerts pressure on the soil particles, prohibiting the particles from compacting. During an earthquake, these highly saturated conditions cause the water particles to increase pressure upon the soil particles, thereby dispersing the soil particles. The water does not have time to gradually be released from the area. The soil therefore weakens and "liquefies." Building foundations, retaining walls, and surface infrastructure are compromised in conditions of serious liquefaction. Landslides and dam failures may also result in cases of severe liquefaction.[v]

Impact Of Subsidence

Over a long or short period of time, subsidence can seriously impact surface activity. All the following may occur as a result of subsidence:

1) Changes in elevation and slope of streams, canals, and drains



Source: Land Subsidence in the United States

The picture on the left depicts a change in creek water flow after the development of a sinkhole from local subsidence.

2) Damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees

Source: Pennsylvania Department of Environmental Protection

Subsidence passing under railroad tracks caused a sinking of the tracks, making passing dangerous.

Source: Pennsylvania Department of Environmental Protection

3) Damage to private and public buildings

The picture to the right depicts an uninhabitable structure. The building leans significantly due to mine subsidence in the anthracite coal region of Eastern Pennsylvania.

Source: Pennsylvania Department of Environmental Protection

4) Failure of well casings from forces generated by compaction of fine-grained materials in aquifer system

The picture on the right illustrates how subsidence can cause surface impacts on well casings and depicts the sinkage of land surface independent of the concrete well casing.

Source: U.S. Geological Survey

Additionally, after an area has been impacted by subsidence, high tides can gather in an area previously unreachable by tidal patterns. This occurs due to the lowering in elevation of coastal land.

<u>San Joaquin Valley, California</u>

One of the most well known cases of California subsidence is in the San Joaquin Valley. Consisting of the San Joaquin Valley, the Sacramento Valley, and the Sacramento-San Joaquin Delta, the San Joaquin Valley is not only one of the world's largest agricultural producers, it is also an example of the largest man-induced surface altered regions in the world. A major study conducted in 1970 by renown researcher Joseph Poland concluded that 5,200 square miles of land had subsided in excess of one foot. In Mendota, subsidence reached more than 28 feet in depth.

Source: United States Geological Survey

The four major reasons for subsidence in the San Joaquin Valley are:

1) subsidence caused by aquifer-system compaction due to the lowering of groundwater levels by sustained groundwater overdraft 2) subsidence caused by the hydrocompaciton of moisture-deficient deposits above the water table
3) subsidence related to fluid withdrawal from oil and gas fields
4) subsidence related to crustal neotectonic movements

Sediments composed of fine-grained stream and lake deposits including clay, sandy clay, sandy silt, and silt dominated the Valley's soil levels. While regulations pertaining to restrictions in groundwater pumping have slowed the subsidence rate, future levels of subsidence will be dependent on the availability of surface water. Some of the damage to the Valley is permanent and includes decreased storage in aquifers, partial or complete submergence of canals and associated bridges and pipe crossings, collapse of well casings, and disruption of collector drains. Conservative estimates of damage are placed at $25 million. Estimates are as high as $180 million when property decline and mitigation costs are factored into the loss estimates.[vi]

<u>Murdy Fire Station, Huntington Beach</u>

Murdy Fire Station, also called Station 2, opened in 1971 at 16221 Gothard Street in the City of Huntington Beach. The Station is located in the northeast area of the City and serves the public around the Huntington Center, Golden West College, and the San Diego Freeway.

The fire station is built on a 3 ½ to 4 inch asphalt concrete surface layer. Beneath this layer is a 5 to 6 foot thick layer of loose Silty Sand (SM). Below the Silty Sand is an 18 to 20 foot thick layer of soft dark gray to black silt to organic clay interbedded with Peat. The deeper layers of soft dark silt, organic clay, and peat are highly compressible and very weak based on testing performed by GeoPentech.[vii] Furthermore, the Fire Station is located in a region highly susceptible to liquefaction.

When initial observations were made of the interior and exterior damage, the following observations were made by GeoPentech:

Interior

- Partition wall separation from ceiling
- Slab cracking and differential movement noted through the floor carpet

- Numerous floor slabs sagging with low points at the middle of the bay between pile caps
- Jamming of doors at several locations and evidence of trimmed top of doors and variable space at the base of doors

Exterior

- Concrete walkways, patios, driveways have experienced settlement and cracking. At certain areas, settlement on the order of 2 to 3 inches and separation from the perimeter walls as much as 1 inch was noted
- Tilting and separation of the masonry wall (fence) from the building at the south side of the building
- Titling and separation of attached storage areas from the building
- Asphalt concrete pavement is in poor condition with severe alligator cracking
- Vertical crack in stucco on northern side of the tower

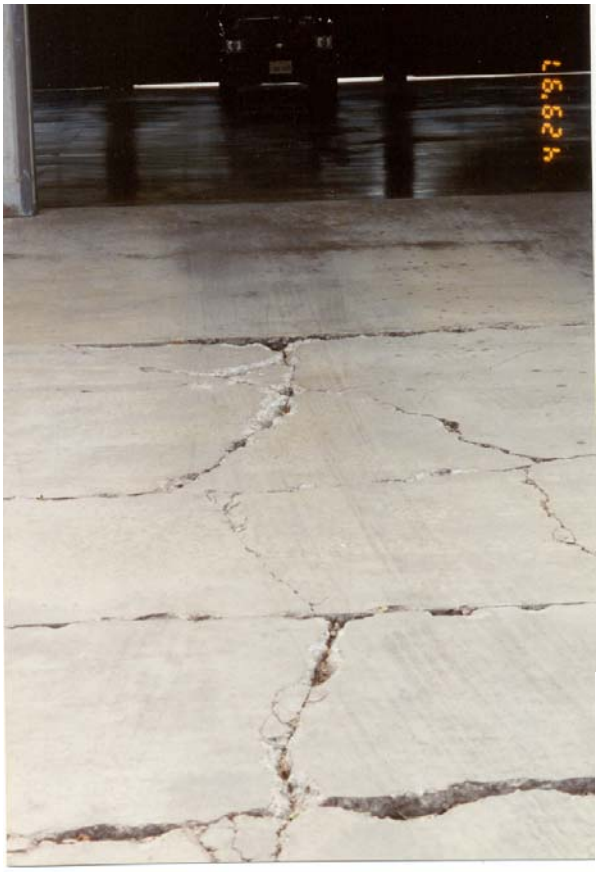
GeoPentech concluded that the damage noted above was caused by low compaction of the upper soils below the floor slabs, compression of the peat layer and the soft silt and organic clay layer and compression induced by groundwater variation.

The following chart depicts the remediation GeoPentech remediation options:

Option	Description	Advantages	Disadvantages
1-Cosmetic Repairs	Fixing of existing cracks on floor slab and flatwork, adjustment of doors, partition walls and local treatment as necessary. Filling and sealing of separated areas.	-Inexpensive -Quick repair -Does not require Specialty \contractors	-No improvement to subgrade -Will require repeating after some time -Requires continued maintenance -Requires continued observation and monitoring
2-Slab Topping	Filling of existing cracks and leveling of the floor slab surface to bring it to generally acceptable standards.	-Relatively inexpensive -Quick repair -Does not require Specialty contractors	-No improvement to subgrade -Will require repeating after some time -Requires continued maintenance -Relatively disruptive -Requires continued observation and monitoring
3- Slab Jacking	Lifting and leveling of floor slab by injecting grout consisting of sand/cement mixture below slab.	-Some improvement to subgrade	-Relatively more expensive than (2) -Limited effectiveness -Risk of further damage to slab -Disruptive -Requires filling voids under slab -Will not eliminate future settlement
4-Compaction Grouting and Slab Jacking	Involves treatment of underlying peat Layer by injection of grout consisting of sand/cement mixture. As the grout is injected, it grows as a bulb which applies radial pressure to the soft peat layer causing it to compress. Slab jacking would then follow to lift and level floor slab.	-Relatively long-term solution -Relatively greater improvement to subsurface materials	-Relatively more expensive than (3) -Risk of further damage to slab -Very disruptive -Requires filling voids under slab -Reduces further settlement but does not eliminate it
5-Replacement of Slab-on-Grade with Thicker Slabs and the Addition of Grade Beams at some Locations at the Southern portions of Builgding	Involves the removal of the existing slabs and the replacement with thicker slab/grade beams capable of spanning areas of 12 foot by 12 foot. Requires the addition of grade beams to be supported on existing pile caps or connected to existing beams.	-Long-term solution -Low maintenance -Reduces future settlement	-Extensive work effort -Relatively expensive -Extremely disruptive -Requires evaluation of existing pile foundations for carrying additional loads
6-Option 5 plus the use of helical piles	Option 5 plus the option of using additional deep support such as the addition of helical piles. Assume one dozen helical piles to 40 feet deep each will be required.	-Long-term solution -Additional capacity -Low maintenance -Reduces future settlement	-Extensive work effort -Relatively expensive -Extremely disruptive -Requires evaluation of existing pile foundations for carrying additional loads

Firefighters, paramedics, and ambulance operators relocated to a temporary trailer in the parking lot while site repairs were in progress. It was determined that the total construction cost to make proper permanent renovations of the facility would cost approximately $2.5 million. Due to the excessive cost of rebuilding, the City collaborated with the Public Works and the Fire Department to implement a cost-effective plan to make major repairs and prevent further damage. The temporary fix is expected to last until fiscal year 2006/07. These temporary actions were implemented in order to maintain essential station operations and improve building aesthetics. The completed project mitigates some of the slab settlement issues by pressure grouting the voids beneath the slabs and leveling the floors. The interior walls were straightened and painted, and the cracked tile areas replaced with linoleum. Throughout construction, the facility remained habitable, and there were no health or safety concerns for the occupants. This short-term solution cost the City $350,000 and was completed by November 2003.[viii] Funding for long-term renovation is still needed.

The above picture shows damage to the apparatus bay floor at the front of the station. A 35,000 lb fire engine rolls over this area.

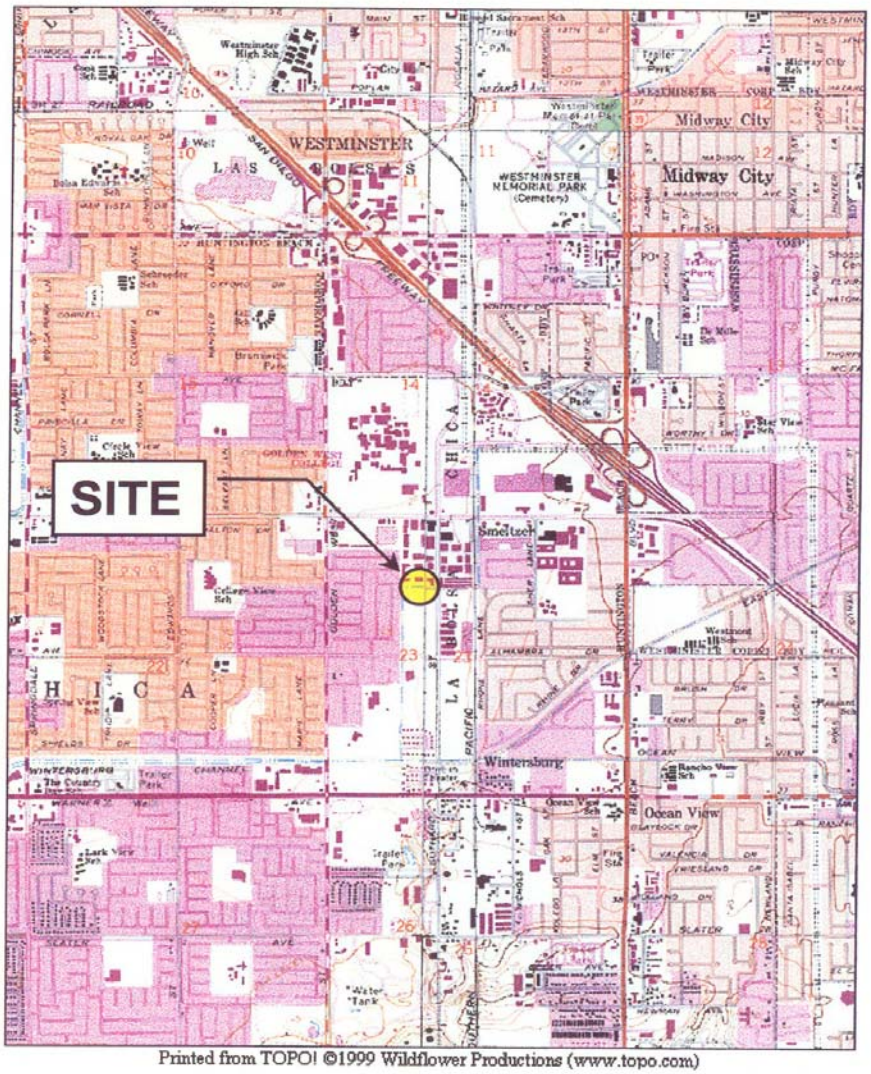


The above picture depicts subsidence damage on the outside concrete in front of the center apparatus bay. The interior slab has sunk and the exterior driveway has risen. There is a 1-3" difference between the two slabs.

Interior Kitchen wall which is separating from the exterior outbuilding.

Rear of the station; Captain's bedroom; separation of the rear wall from the foundation. The wall is staying level and the foundation is dropping because they were never tied together.

Exhibit IV-C-1: Location of Murdy Fire Station



0 4000 8000
Scale, feet

N

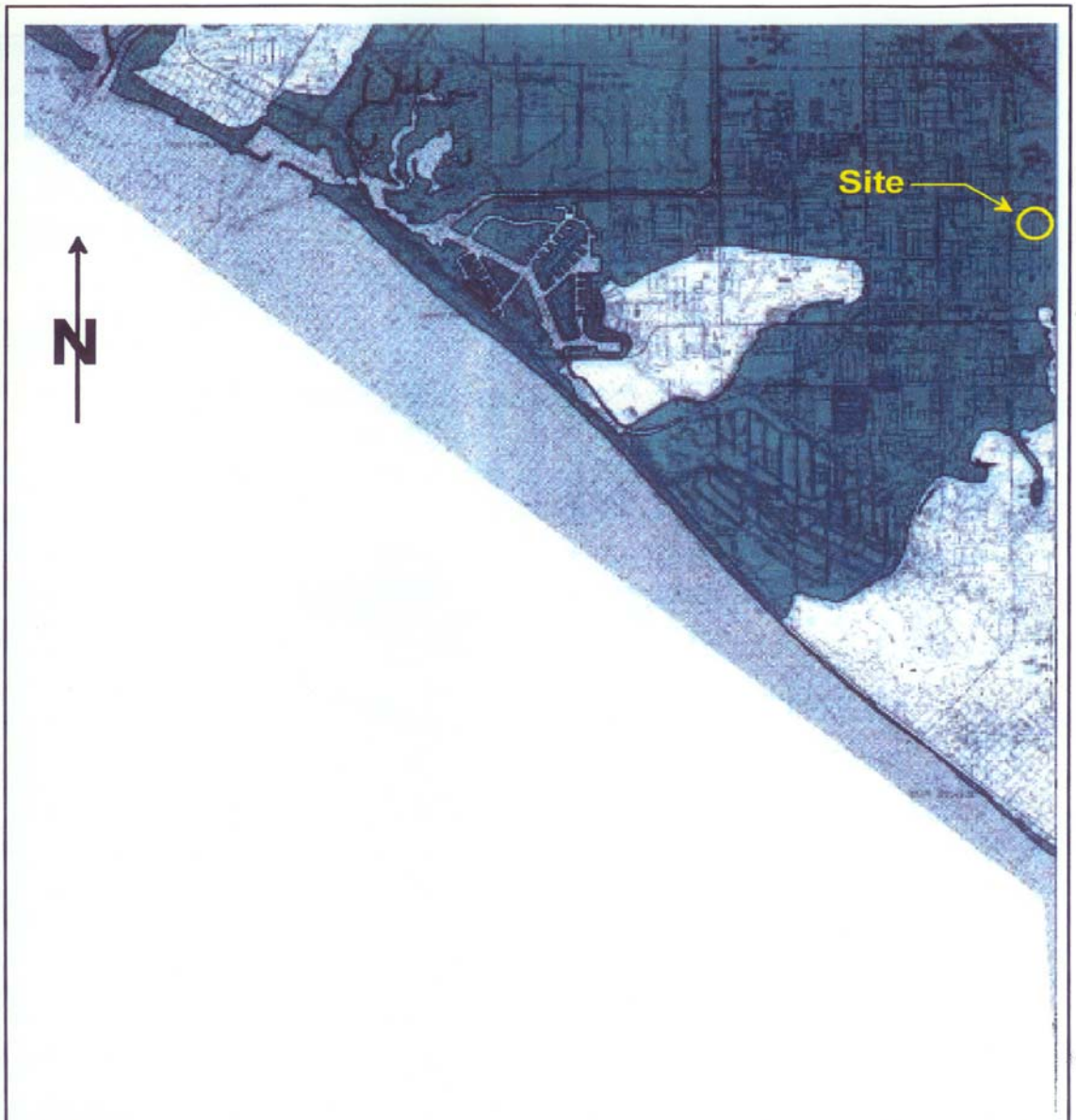
Source: USGS 7-1/2 Minute Quadrangle Series Maps

SITE LOCATION MAP

Murdy.ppt	Proj. No. 01019A	Project: Murdy Fire Station	Figure 1

GeoPentech

Exhibit IV-C-2: Map of Murdy Fire Station in Liquefaction Zone



Map source: CDMG Seismic Hazard Maps (www.consrv.ca.gov/dmg/shezp/maps/m_sealb.htm)

MAP OF AREAS SUBJECT TO LIQUEFACTION

Fig 4 - liquef map.grf	Proj. No. 01019A	Project: Murdy Fire Station	Figure 4

GeoPentech

Exhibit IV-C-2 depicts the location of Murdy Fire Station on the Huntington Beach liquefaction map. It can be deduced that in areas susceptible to liquefaction, the chance for subsurface soil subsidence is substantially higher.

City of Huntington Beach Corporate Yard

According to a report prepared by Integrated Design Services, Inc. dated June 9, 2003, two of the City of Huntington Beach Corporate Yard facilities (Building C & E) are in need of repair due to damage from subsidence. Both buildings are located at 17371 Gothard Street, Huntington Beach.

Built in 1973, Building C has approximately 19,200 square feet and consists of a single-story maintenance shop with two partial mezzanine areas with offices. Building E, built in 1988, is a single-story warehouse with a partial mezzanine for storage and covers a total area of 14,650 square feet. A loading dock is connected to the west side of the building housing over 7,000 square feet of additional storage.

According to the report, the buildings were constructed above a peat deposit that has compressed and resulted in large differential settlements of the buildings. Due to a lack of available funds, two areas of temporary repairs were recommended to ensure an adequate work and storage environment. It should also be noted that in order to comply with the Americans with Disabilities Act (ADA), temporary repairs are critical. The two areas needing immediate attention are:

1) Excessive slopes on the floors of the Records and Traffic Signal rooms in Buildings C and the entire Building E
2) Tripping hazards in both buildings

Integrated Design Services, Inc. recommended the following temporary mitigation projects to allow for adequate building operations:

Building C Recommendations

1) Tripping Hazard Mitigation – Eliminate steps over ½" in vertical height by providing concrete topping to mitigate tripping hazards which are also barriers to the handicapped.

2) Slab Slope Mitigation – Slab underpinning piers (Chance Anchors) should be added in the areas of the highest slopes in the Records and Traffic Signals Rooms. Spacing and length will be determined in the next phase of engineering design. A total of 18 piers will be installed. After the piers are installed, a topping slab can be added. The slope on the topping slab shall be 2% maximum. The existing slab will be roughened and coated with epoxy bonder. Steel reinforcement dowels will be inserted with epoxy. The new reinforced topping slab will be poured over the existing surface.

3) High Point in Slab Mitigation – Saw-cut the slab around the caisson and steel column at grids 5 and B on the floor plan. This will allow the raised slab to settle close to the level of the surrounding building, and eliminate expected voids. Cracking of the existing slab due to this saw-cutting will be repaired with epoxy. The curb or pedestal, which is left, can be wrapped with studs and drywall extending to the roof structure.

Building E Recommendations

1) Tripping Hazard Mitigation – Grind down steps over ½" in vertical height or provide concrete topping to mitigate tripping hazards which constitute barriers to the handicapped. Several exterior doors have steps in excess of ½" in height. Some interior areas of the building have slab-steps, which should be mitigated with grinding, or by adding topping slabs.

2) Slab-Slope Mitigation – Topping slabs with underpinning piers (Chance Anchors) could be added to select areas of this building to reduce the slope of portions of the interior concrete slab. The topping slab should be sloped a maximum of 2%. This is the maximum allowed by Code. The existing slab could be roughened and coated with epoxy bonder, and dowels will be inserted with epoxy in the existing slab. The new reinforced topping slab would be poured over the existing. The exterior concrete walk near the southeast corner of the building should be sawcut, removed and replaced.

3) Shelf Slope Mitigation – Shelf units will be carefully shimmed to level to allow safe storage.

4) Limit loading capacity of storage shelves.

The total cost for the temporary repairs to Building C is $40,000. The total cost for repairs to Building E is $196,000.

Huntington Beach Corporate Yard Subsidence Photographs (1 of 7)

Photo No. 1
Building C- Looking West.

Photo No. 2
Building C- Sliding Door Entrance

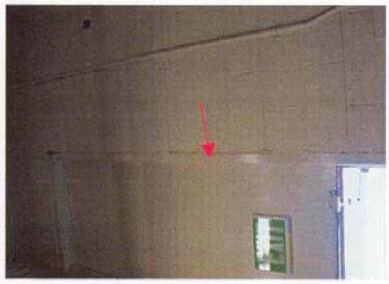


Photo No. 3
Building C- Slight Separation at Door

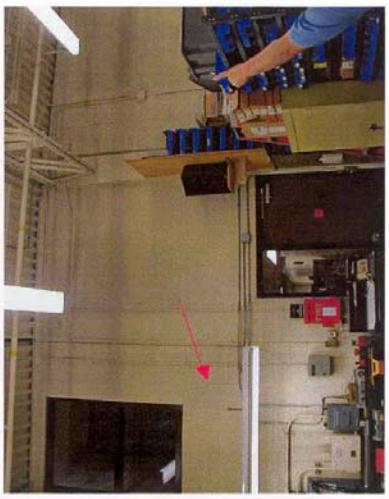


Photo No. 4
Building C- Cracks in Block Wall

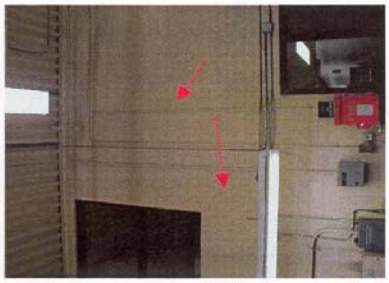


Photo No. 5
Building C- Cracks in Block Wall

Photo No. 6
Building C- Cracks in Block Wall

Huntington Beach Corporate Yard Subsidence Photographs (2 of 7)

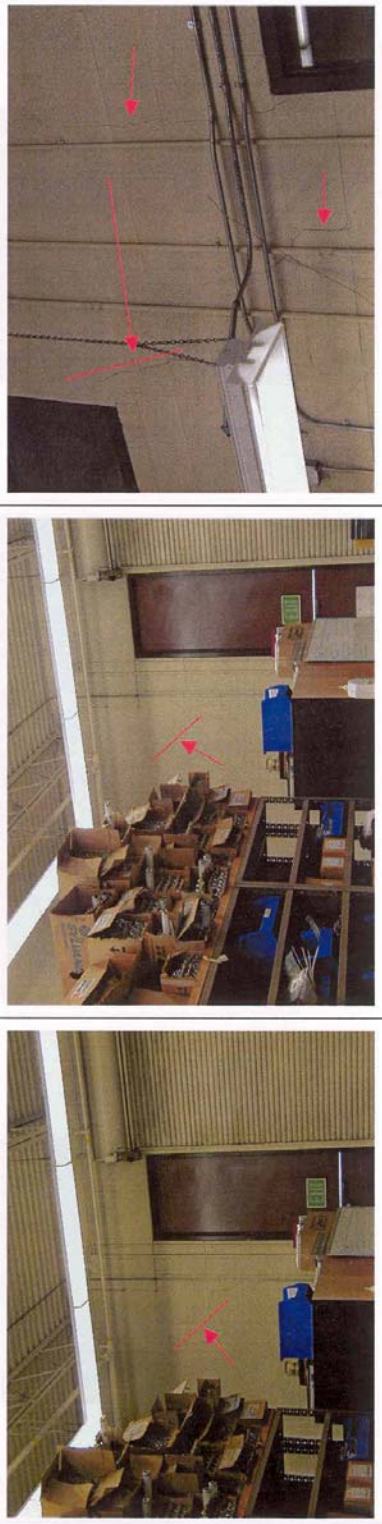


Photo No. 7
Building C – Distress in Block Walls

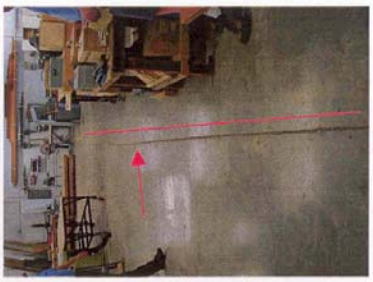


Photo No. 10
Building C- Deformed Slab Joint

Photo No. 8
Building C – Distress in Block Walls

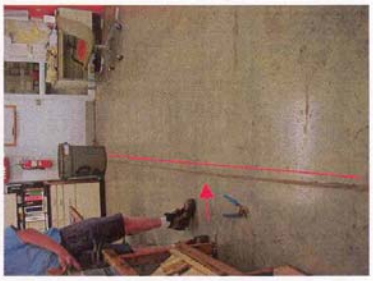


Photo No. 11
Building C – Deformed Slab Joint

Photo No. 9
Building C – Distress in Block Walls

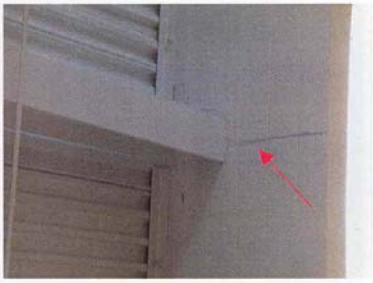


Photo No. 12
Building C – Distress in Block Walls

Huntington Beach Corporate Yard Subsidence Photographs (3 of 7)

Photo No. 13
Building C- Distress in Block Wall

Photo No. 14
Building C- Uplift of Slab

Photo No. 15
Building C- Sloped Slab Under Mezzanine

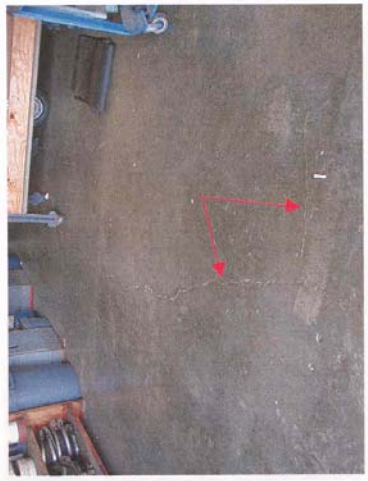


Photo No. 16
Building C- Diagonal Cracks in Slab

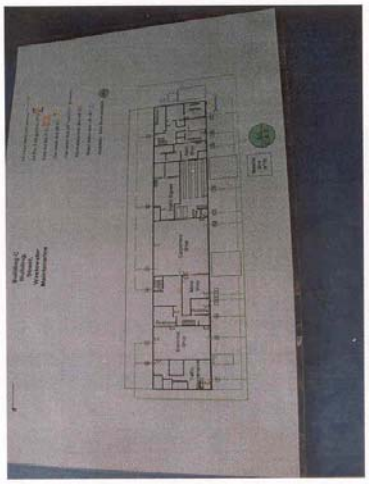


Photo No. 17
Building C- Current Floor Layout is Different from Drawings

Photo No. 18
Approaching Building E

Huntington Beach Corporate Yard Subsidence Photographs (4 of 7)

Photo No. 19
Building E- Separation at Pavement

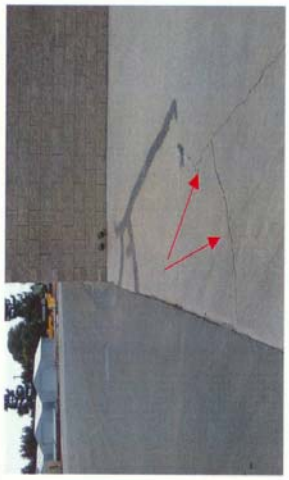


Photo No. 20
Building E- Cracks at Front Slab

Photo No. 21
Building E- Distorted Slab Causing Front Desk Rotation and Distress at Partition Walls

Photo No. 22
Building E- Settlement at Wall Perimeters and Entrance

Photo No. 23
Building E- Diagonal Cracks in Slab

Photo No. 24
Building E- Visible Displacement of Slab at Perimeter Grade Beams

Huntington Beach Corporate Yard Subsidence Photographs (5 of 7)

Photo No. 25
Building E- Large Relative Displacement of Slab-on-Grade (Typical)

Photo No. 26
Building E- Slab Deformation Starts at Grade Beams

Photo No. 27
Building E- Relative Displacement Next to Perimeter Wall Foundation

Photo No. 28
Building E- Deformed Storage Racks

Photo No. 29
Building E- Deformed Storage Racks

Photo No. 30
Deformed Slab and Storage Racks

Huntington Beach Corporate Yard Subsidence Photographs (6 of 7)

Photo No. 31
Building E- Distorted Storage Racks

Photo No. 32
Building E- Sloped Slab

Photo No. 33
Building E- Deformed Slab and Racks

Photo No. 34
Building E- Deformed Slab and Racks

Photo No. 35
Building E- Overall View

Photo No. 36
Building E- Overall View of Interior

Huntington Beach Corporate Yard Subsidence Photographs (7 of 7)

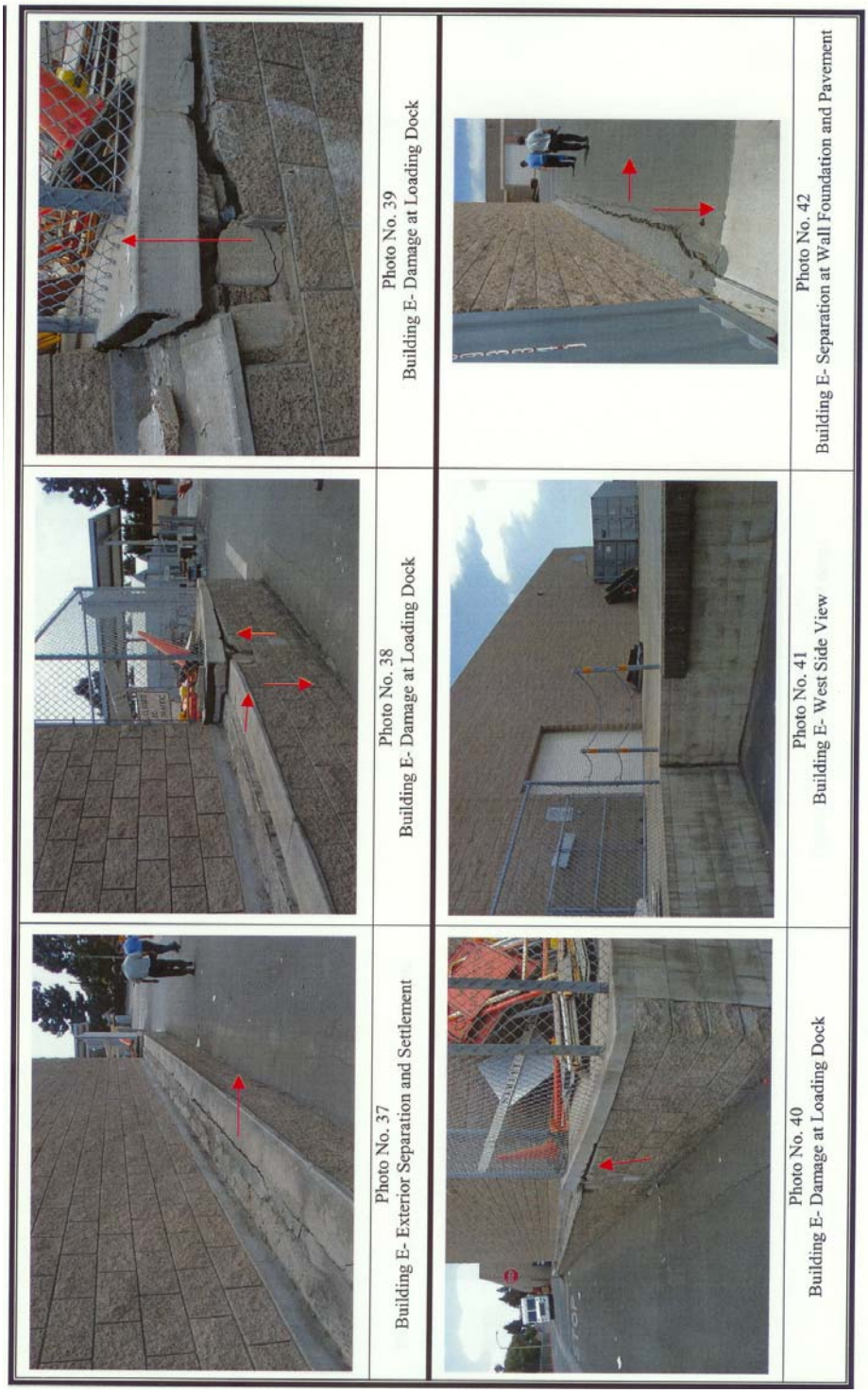


Photo No. 37
Building E- Exterior Separation and Settlement

Photo No. 38
Building E- Damage at Loading Dock

Photo No. 39
Building E- Damage at Loading Dock

Photo No. 40
Building E- Damage at Loading Dock

Photo No. 41
Building E- West Side View

Photo No. 42
Building E- Separation at Wall Foundation and Pavement

Synopsis Of Other Subsidence Events

Golden West College – 15744 Goldenwest Street, Huntington Beach

According to Don Bailer, Facilities Director at Golden West College, the community college has had major problems with subsidence. Ten years ago, two buildings had to undergo multimillion-dollar reconstruction projects due to damage from foundation sinking. Currently, one building is in need of urgent repairs due to subsidence.

Private Residences – City of Huntington Beach

According to Ross Cranmer, Director of Building and Safety for the City of Huntington Beach, "Subsidence has been and continues to be an issue in the Graham/Springdale area – many homes in the past have hired companies to inject a weak concrete mix to elevate portions of structures so that they are level."

Thrifty Drug Store – 5881 Warner Ave, Huntington Beach

Prior to the change of name and ownership, Thrifty Drug Store (Store #5745) was located at the corner of Warner and Springdale. According to Russ Terresa of the Rite Aid Real Estate Division, the Thrifty Store was built in the 1970s. The store sunk 22 inches as a result of the peat soil. Peat soil is organic soil that contains more than 20% organic matter in various degrees and states of decomposition.[ix] After an offshore earthquake in the early 1980s, it was determined that the building was no longer safe for operations. A lawsuit followed between the owner and the City of Huntington Beach. The building was ultimately rebuilt and eventually transitioned into a Rite Aid Drug Store.[x]

St. Bonaventure – 16400 Springdale St, Huntington Beach

Dedicated in 1971, the St. Bonaventure Catholic Church has had a long history in the City of Huntington Beach. According to Parish Manager Linda Garofalo, subsidence has always existed on the Church property. The evidence includes: slab swaging in the Church and hall resulting in pews that squeak and uneven floor surfaces and flooding on the City street (Heil) along the Church property due to a street depression. The original construction identified the soil conditions so the foundations have remained solid and the doors square, slabs show all the evidence of the soil condition.

Several short-term solutions have been implemented to compensate for the 5 ½ inches of subsoil that has subsided. Fixes include mud jacking the hall (with a very short-term

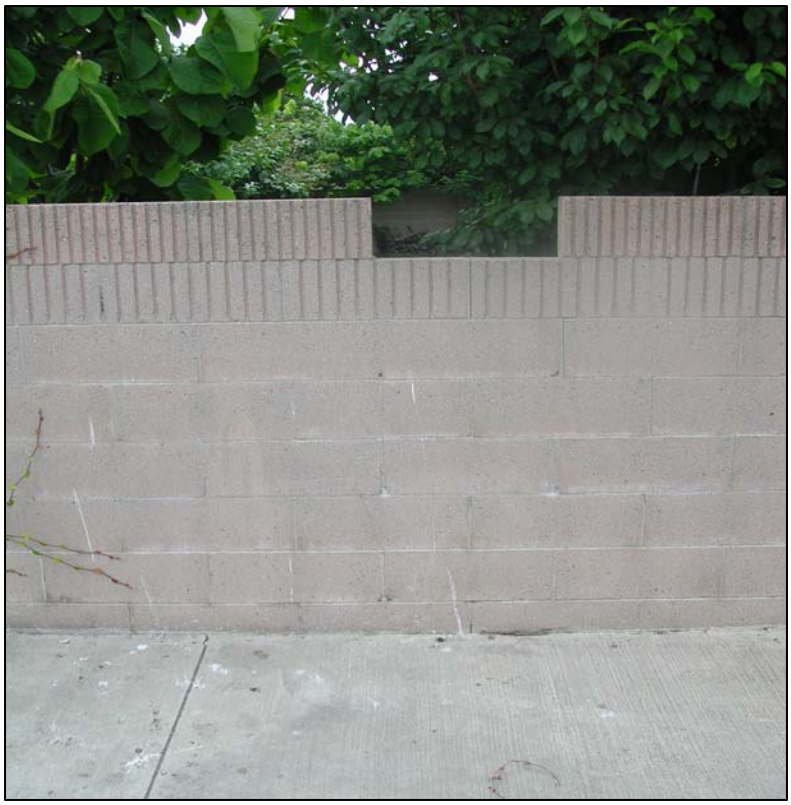
success), floating of foam and other lightweight materials onto the hall slab to fill a dip then adding new flooring. When funds can be raised the hall will be completely rebuilt and architects will compensate for the peat condition in the soil when constructing the new building. According to Linda, the church slab swags and a solution that can be afforded has not been found. A Church renovation is planned when additional funds can be raised; and at that time, the Church condition will be resolved probably using additional mid-structure pilings under a new slab.

Fire Station 1 – 17737 Bushard St, Fountain Valley

The west wall and portions of concrete to the rear of the Fountain Valley Fire Station 1 are exhibiting signs of potential subsidence damage. Upon visual inspection, the wall appears to be unstable, incongruent with the concrete foundation, and cracked in several sections. Fountain Valley High School, located directly across from the fire station, and portions of new developments throughout the surrounding area have endured damage from subsidence. Funds are needed to make site repairs.

The following pictures depict the damage to Station 1:

Station 1 west wall, missing brick from cracking.



Fire Station 1 west wall, cracking, concrete separation, and missing brick.

Fire Station 1 west wall staircase cracking

Edison High School – 21400 Magnolia Street, Huntington Beach
Edison High School falls within the Huntington Beach Union High School District (one of the six planning jurisdictions represented on the Committee).

The geotechnical consulting firm of Law/Crandall[xi] reported on the soil conditions and seismic/liquefaction hazard potentials at Edison High School. Conditions at Edison High School were found to be similar to those at Fountain Valley High School (see example below) with the exception of peat deposits found at Fountain Valley High School. The consultants found the following areas of damage:

- Separation between the building floor slabs and the structurally supported building walls
- Separation between the floor slabs and ceilings and the interior partition walls
- Separation and cracks on the floor tiles and especially at the locations of the grade beams
- Cracks in the interior partition walls and especially adjacent to columns, door frames, and exterior building walls
- Cracks in the exterior concrete walks adjacent to the buildings and separation between the walks and the exterior building walls
- Several of the precast units which support the roof overhangs have suffered some cracking

The site was previously marked by the Orange County Safety Element (1995) and the Huntington Beach General Plan (1996) as an area of high to very high liquefaction potential. This finding was reiterated by the consultant who then calculated the liquefaction-induced post event settlement potential at 2 to 3 inches.

After analysis of all reports provided to the consultant and many on-site soil and structural tests, Law/Crandall concluded that:

> *…the distress in the slabs, partition walls, and sidewalks adjacent to the buildings is the result of the settlement of the upper soft and compressible silty clay and clayey silt soils underlying the school site. This is confirmed by the relatively small settlements at the locations of the pile supported columns, exterior building walls, and the grade beams that connect the pile caps of adjacent columns."*

The consultant recommended that structural engineers check the integrity of the pile supported columns, walls, and roofs against the ongoing soil compaction. If structural engineers find a weakening and unsafe soil, the structures should be repaired or replaced. While immediate repairs were not suggested, the impact of seismic events could require significant building upgrades or renovations.

Marina High School – 15871 Springdale St, Huntington Beach
Marina High School falls within the Huntington Beach Union High School District (one of the six planning jurisdictions represented on the Committee).

The consulting firm of Law/Crandall[xii] performed a geotechnical investigation for remediation of the distressed conditions of Buildings B and C at Marina High School. While soft soil conditions exist throughout the school, Buildings B and C are the most impacted.

After analysis of the soil conditions, Law/Crandall concluded that the upper silty clay soils have medium to high expansion potential and would swell and shrink with changes in subsurface moisture conditions. Furthermore, the upper clay soils underlying the site are at a moisture level 20% above the usual soil levels. While peat deposits were not found through boring exploration, organic weak soil deposits were present.

As a result of these compaction-prone soil conditions, the school buildings have experienced the following damage:

- Cracks, separation and upward/downward movement inside the buildings and in the concrete walkways and asphaltic paving adjacent to the buildings
- Differential movement from one end of a building to the other end
- Varying area settlement over the length of a building due to inconsistent subsurface soil textures
- Structural distress
- Pronounced lateral movement along the existing channel at the south side of Buildings B and C

After analysis of the present conditions, Law/Crandall recommended the following remediation techniques:

- Replacement of floor slabs, non-bearing walls, and concrete slabs and walkways adjacent to the buildings
- Placement of additional grade beams between the footings
- Underpinning the footings along the south side of the buildings
- Mud jacking of new and existing footings along the south of the buildings
- Establishing a positive drainage around the buildings and checking the roof drains and leakage in the existing utility lines
- Evaluation of the structural conditions of the buildings and strengthening and/or replacing any distressed structural elements of the building

Fountain Valley High School – 17816 Bushard St, Fountain Valley
Fountain Valley High School falls within the Huntington Beach Union High School District (one of the six planning jurisdictions represented on the Committee).

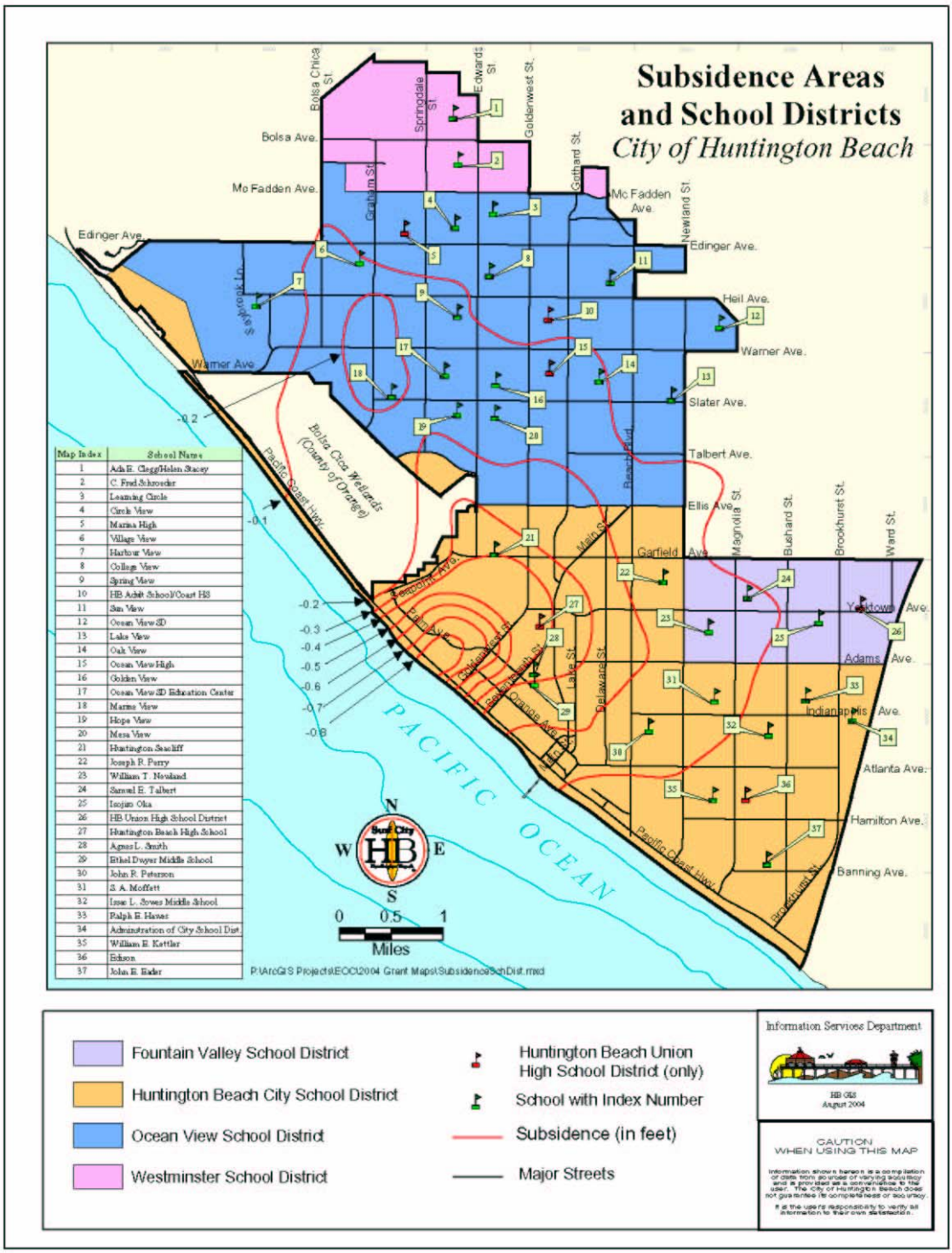
According to John Klungreseter, the Maintenance and Operations Manager at Fountain Valley High School, the school has had major problems with subsidence over the last several years. Over the last two years, major construction projects overhauling the 300 building have taken place due to subsidence damage. The concrete foundations under numerous school facilities need lifting and stabilizing after serious subsidence. On January 3, 2002, Anthony-Taylor Consultants[xiii], reviewed the site occupied by one administration building, two classroom buildings, and one locker room/gymnasium building along with sports fields and parking areas. Their report states:

> *Review of the available references indicates that the existing buildings are supported by driven piles extending through the shallow compressible soils into denser materials. These references and the results of our floor level survey also indicate the apparent sagging of the interior floor between pile members, with floor slab differentials of up to 4 inches in some areas.*

Fill soils and alluvium deposits were found at the site with varying consistency and density levels. It should be noted that the alluvial soils were observed to contain minor amounts of organic peat throughout the study area (peat is highly condensable and leads to subsidence).

After review of the findings, the consultant concluded that "…*the soils underlying the subject site are potentially compressible and the continuing settlement of the existing structures is still a possibility*." In order to stabilize/densify the underlying soils and minimize the continuing settlement and resulting damage to the facility, the consultant recommended in-place treatment of the potentially compressible soils. Furthermore, the consultant concludes that compaction grouting is the most viable alternative given the potential for liquefaction, the need to mitigate the loose soils, and the need to repair damaged slabs and pavement.

Exhibit IV-C-3: Subsidence Areas and School Districts



Map Index	School Name
1	Ada E. Clegg/Helen Stacey
2	C. Fred Schroeder
3	Learning Circle
4	Circle View
5	Marina High
6	Village View
7	Harbour View
8	College View
9	Spring View
10	HB Adult School/Coast HS
11	Sun View
12	Ocean View JD
13	Lake View
14	Oak View
15	Ocean View High
16	Golden View
17	Ocean View JD Education Center
18	Marine View
19	Hope View
20	Mesa View
21	Huntington Seacliff
22	Joseph R. Perry
23	William T. Newland
24	Samuel E. Talbert
25	Isojiro Oka
26	HB Union High School District
27	Huntington Beach High School
28	Agnes L. Smith
29	Ethel Dwyer Middle School
30	John R. Peterson
31	S. A. Moffett
32	Isaac L. Sowers Middle School
33	Ralph E. Hawes
34	Administration of City School Dist.
35	William E. Kettler
36	Edison
37	John E. Rader

From a review of Exhibit IV-C-3, it can be deduced that to varying degrees, all of the schools located within the City of Huntington Beach are susceptible to subsidence.

Subsidence Hazard Assessment

Hazard Identification

Subsidence has long been a problem in the City of Huntington Beach. As outlined in previous pages, subsidence has also been a problem in the City of Fountain Valley, though with fewer case studies. While subsidence is a problem that affects all areas of the community, due to its historical emphasis as solely a construction challenge, subsidence has not received widespread attention until recent times. Subsidence is usually a slow process that creates moderate to severe damage to local structures.

The Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee ranked subsidence as follows:

City	Hazard	Ranking
Huntington Beach	Subsidence	5 of 18
Fountain Valley	Subsidence	N/A

Subsidence was ranked 5 of 18 by the Planning Committee members from Huntington Beach. Prior to this hazard mitigation project, the City of Fountain Valley had not yet explored the impact of subsidence on the community. Therefore, Committee Members were not asked to rank subsidence when compared to more visible hazards at the inception of the planning process. However, upon thorough examination of all natural hazards, subsidence has been determined to have an impact upon the Local area. After viewing a presentation and analyzing the effect of subsidence on the City of Fountain Valley, Huntington Beach/Fountain Valley Hazard Mitigation Committee Members agreed to include subsidence as one of the six natural hazards. A motion was made and unanimously approved on June 10, 2004 to include subsidence in the Hazard Mitigation Plan.

Exhibit IV-C-4: Liquefaction Areas
City of Huntington Beach & Fountain Valley

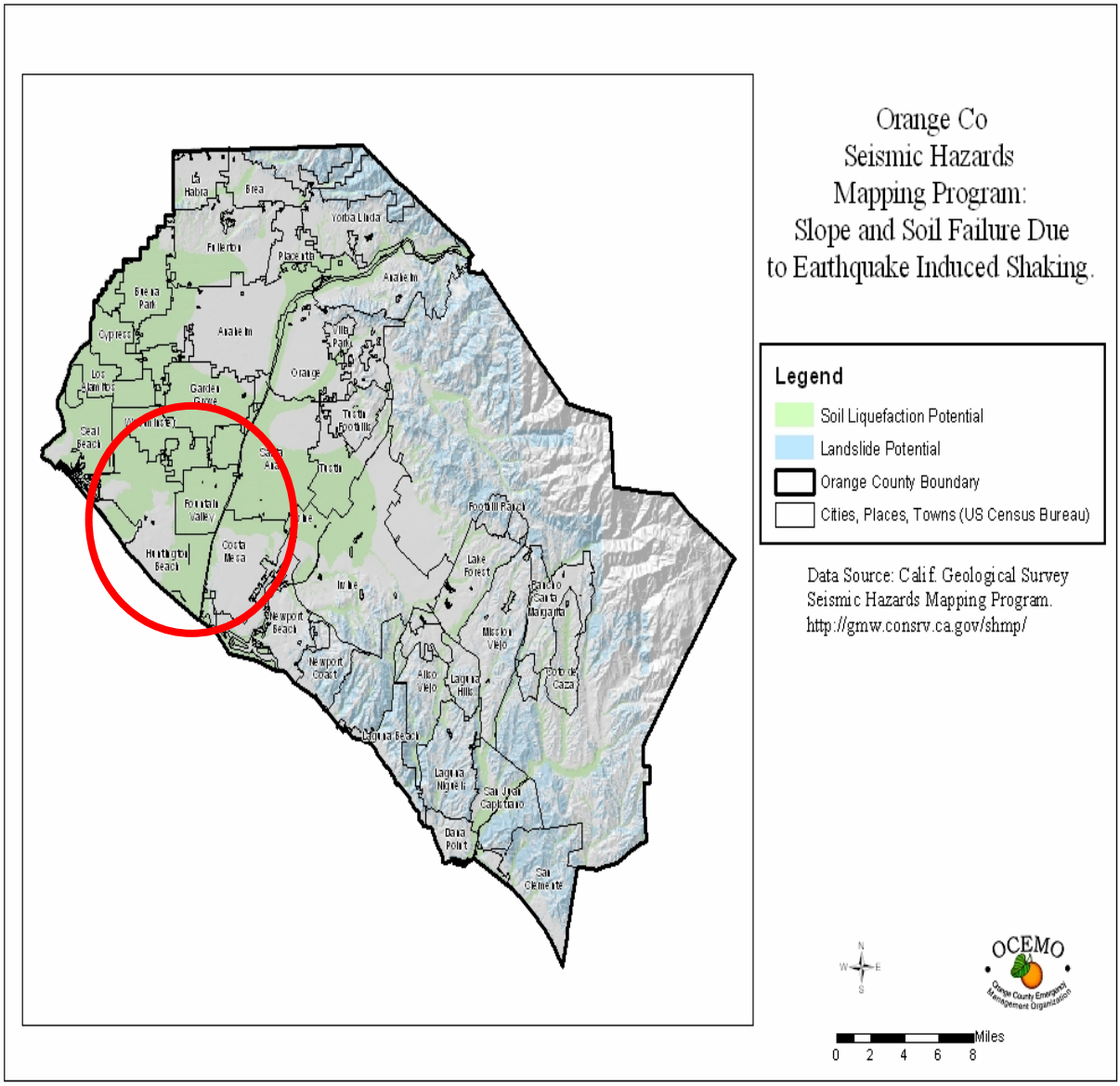
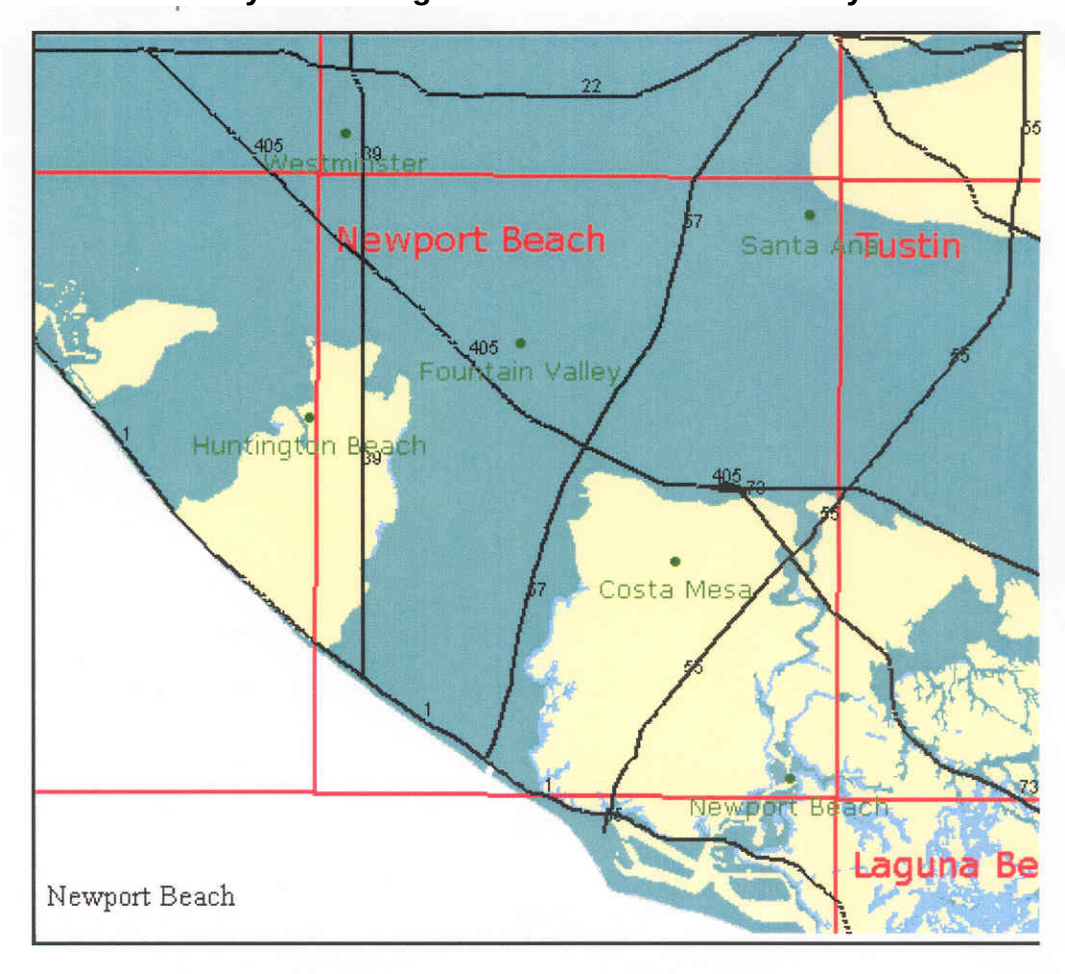


Exhibit IV-C-5: Subsidence Areas from USGS Quadrangle
City of Huntington Beach & Fountain Valley



After reviewing the map depicted in Exhibit IV-C-5, the Hazard Mitigation Planning Committee determined that approximately 2/3 or 75% of the City of Huntington Beach is in an area susceptible to subsidence. Additionally, the City of Fountain Valley is almost completely engulfed by soils susceptible to subsidence. The Committee determined that approximately 95% of the City of Fountain Valley is susceptible to subsidence.

Exhibit IV-C-6: City of Huntington Beach Liquefaction Potential

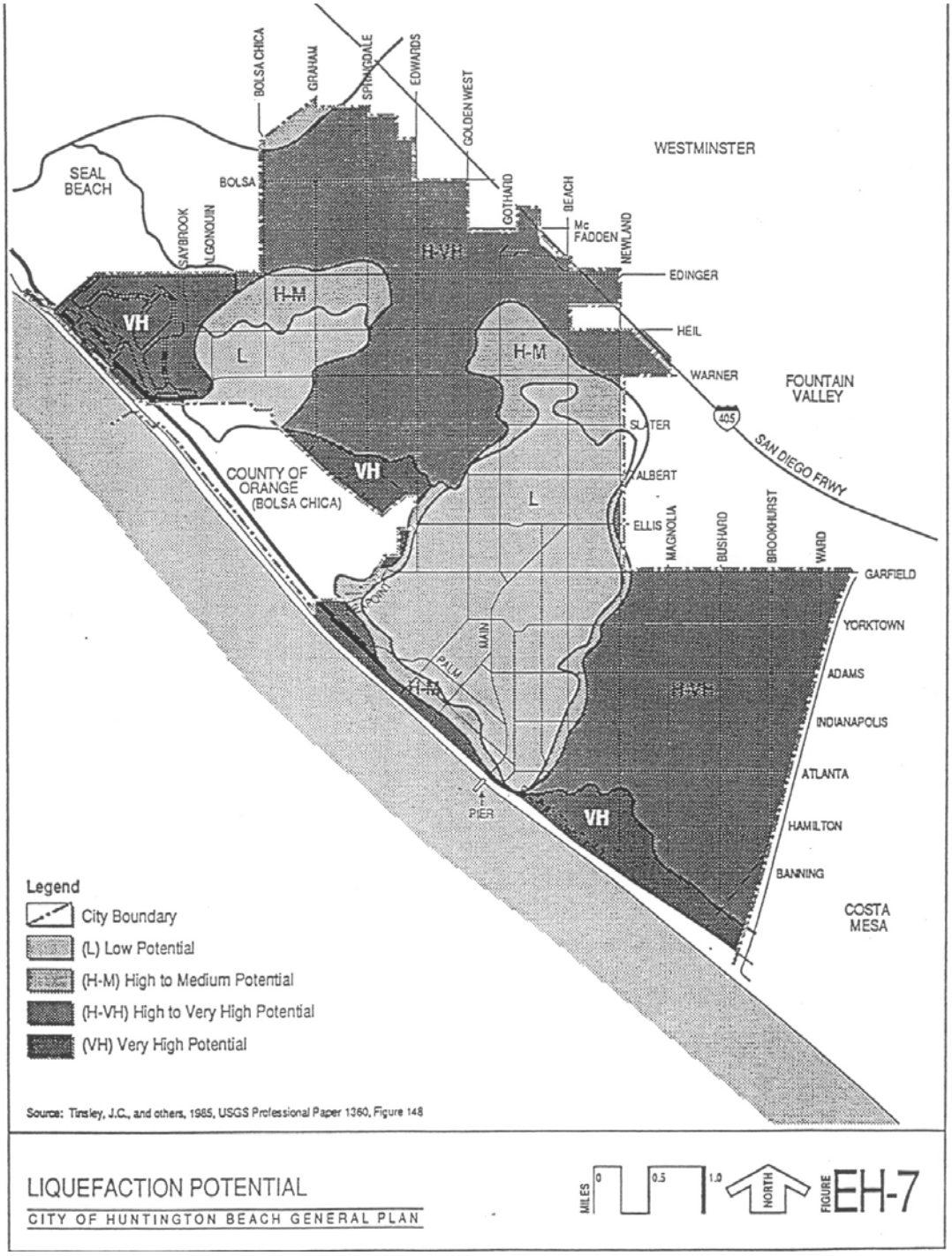


Exhibit IV-C-7: City of Huntington Beach Subsidence Areas

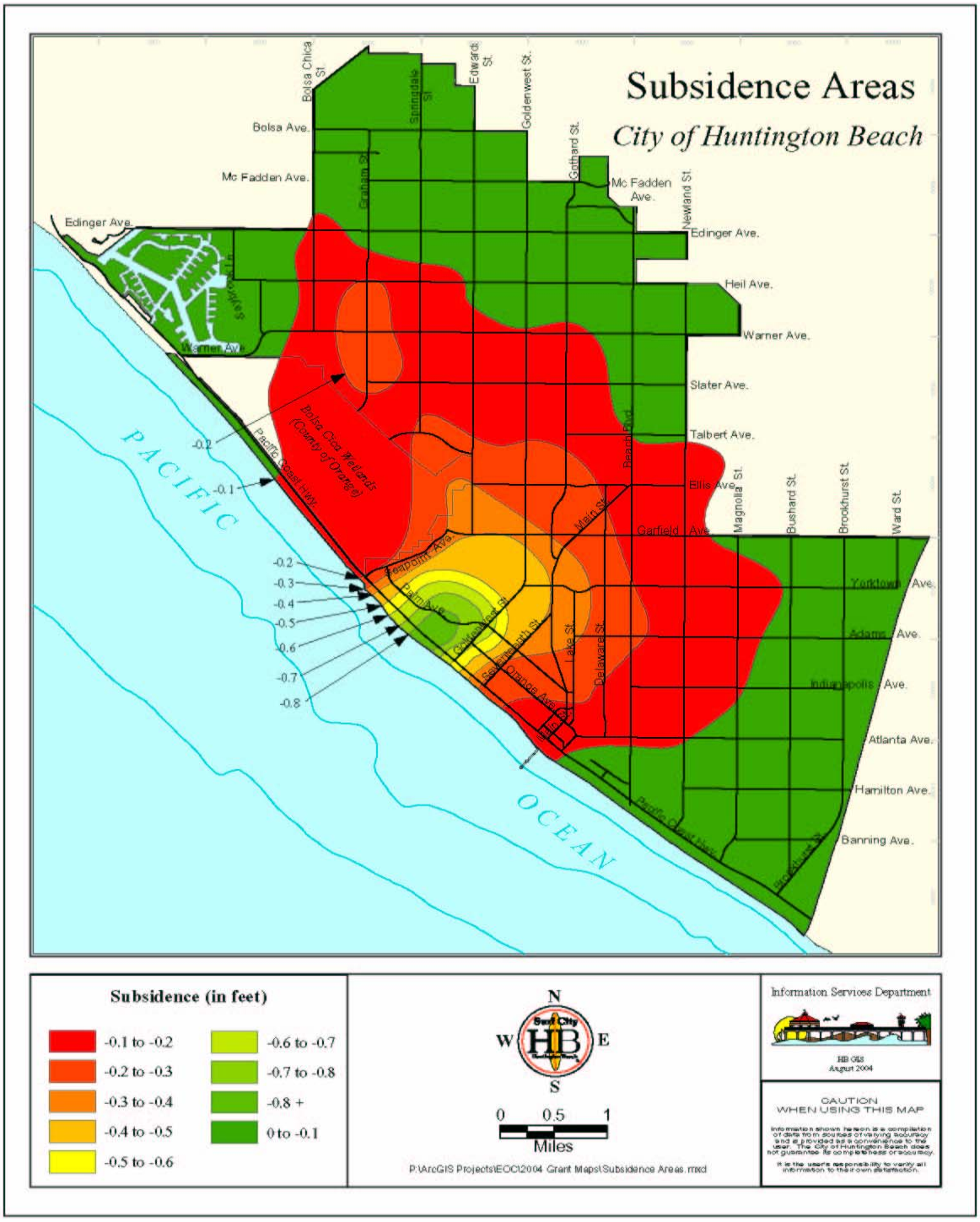


Exhibit IV-C-8: City of Huntington Beach Peat and Organic Soils

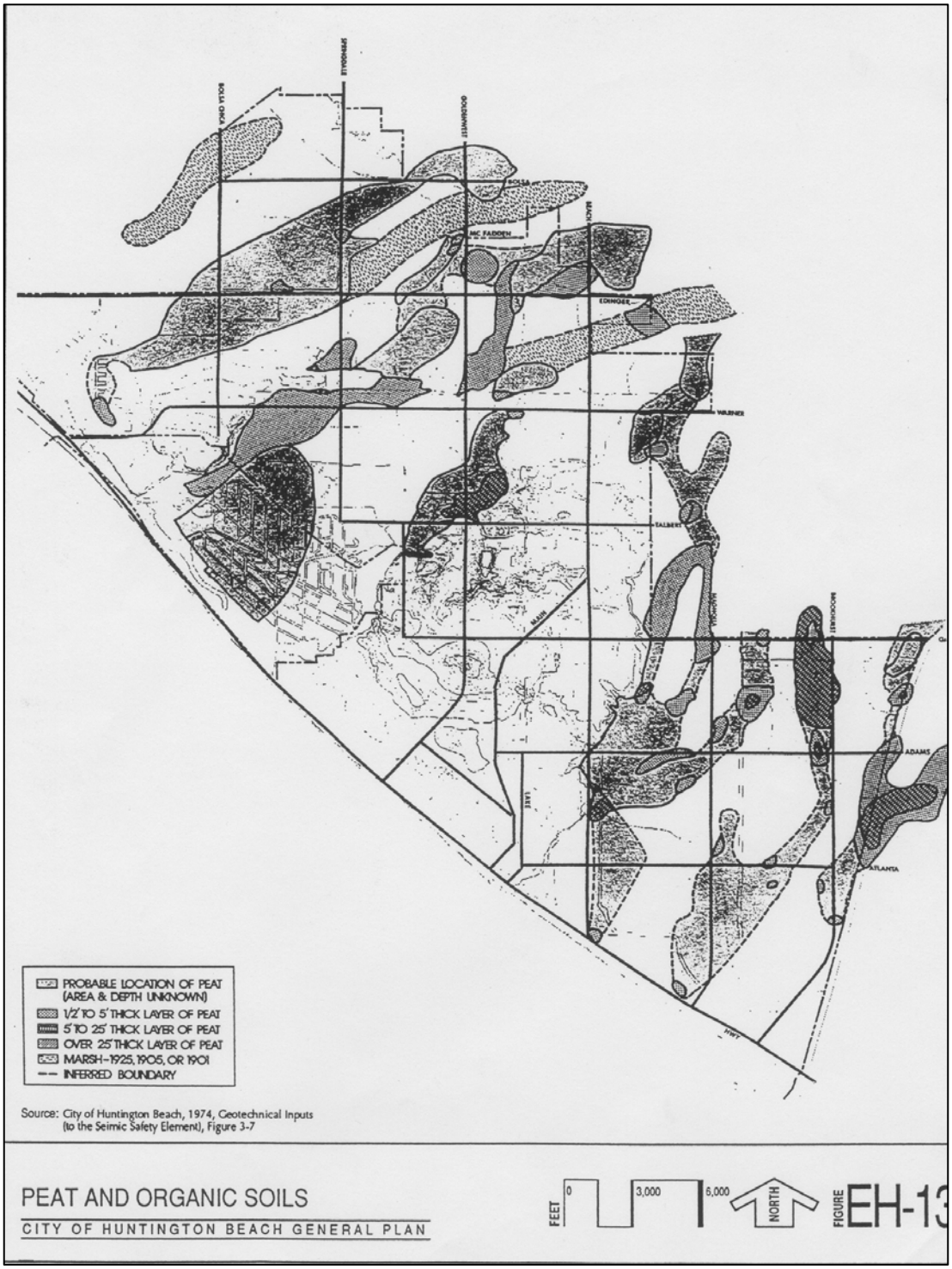
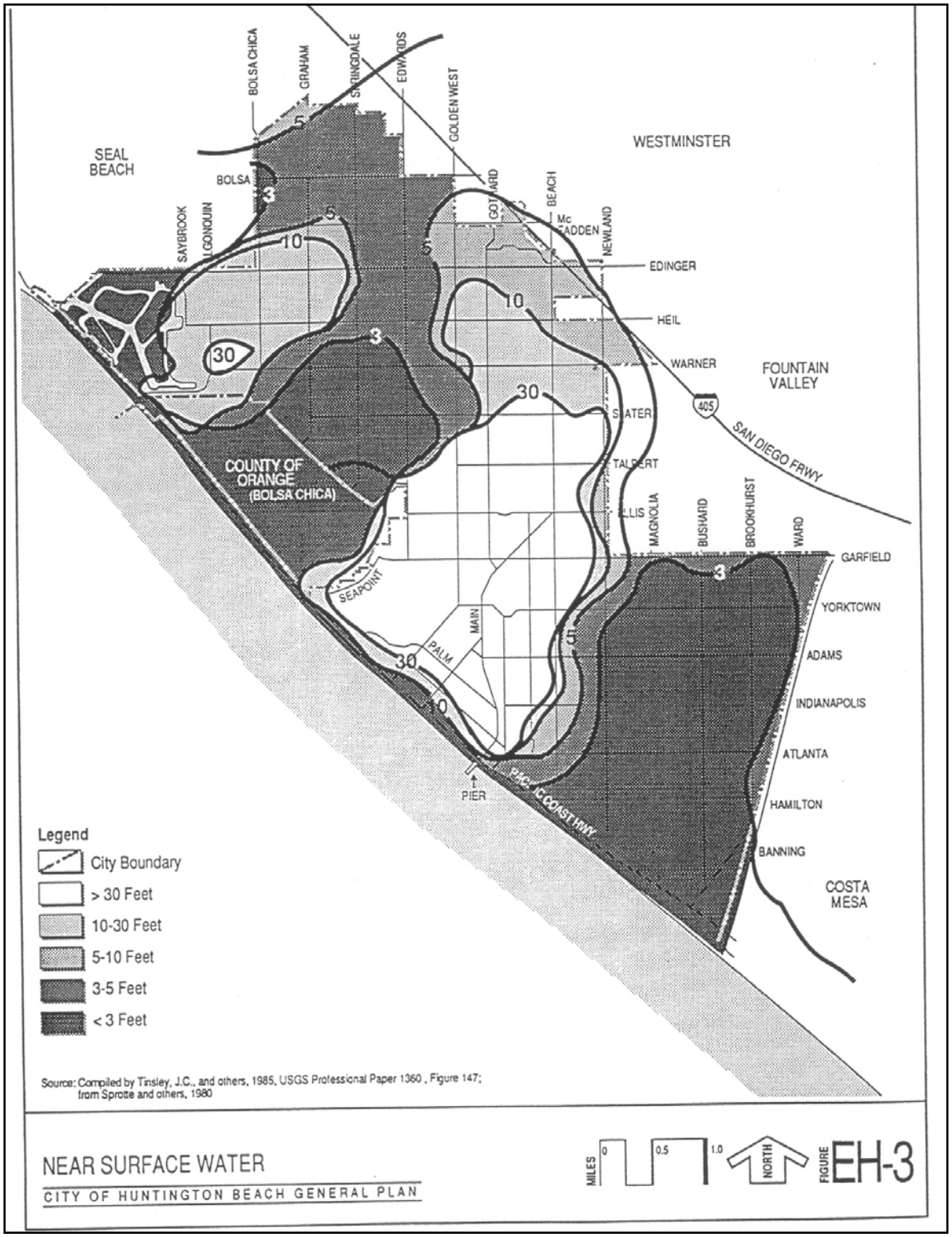


Exhibit IV-C-9: City of Huntington Beach Near Surface Water



Community Subsidence Issues

Local Area Impact

Life and Property

Clearly through an examination of the subsidence case studies, it can be concluded that citizens and structures within the Cities of Huntington Beach and Fountain Valley are impacted by subsidence. Areas at higher risk are those regions known to be built on peat and soft soils. Also at risk are areas of exposure to liquefaction. Both residential and commercial areas of the Cities are at risk. As stated, the impact from subsidence can vary from minor cracks in concrete to condemnation of unsafe structures and disruption of subsurface utility operations.

Estimate

As stated, after reviewing Exhibit IV-C-5, it can be concluded that approximately 66.7% of the City of Huntington Beach would be impacted by long term or catastrophic seismically impacted subsidence events. Almost the entire City of Fountain Valley, approximately 95%, would be impacted by the same, worst-case scenario subsidence event. The following chart reflects these conclusions:

Cities of Huntington Beach & Fountain Valley
Local Subsidence Impact

City	Total Number of Structures	Subsidence Percent Impact	Number of Structures Impacted
Huntington Beach	81,950	66.7%	54,661
Fountain Valley	14,280	95%	13,294

Exhibit IV-C-10: Subsidence Areas and Government Facilities

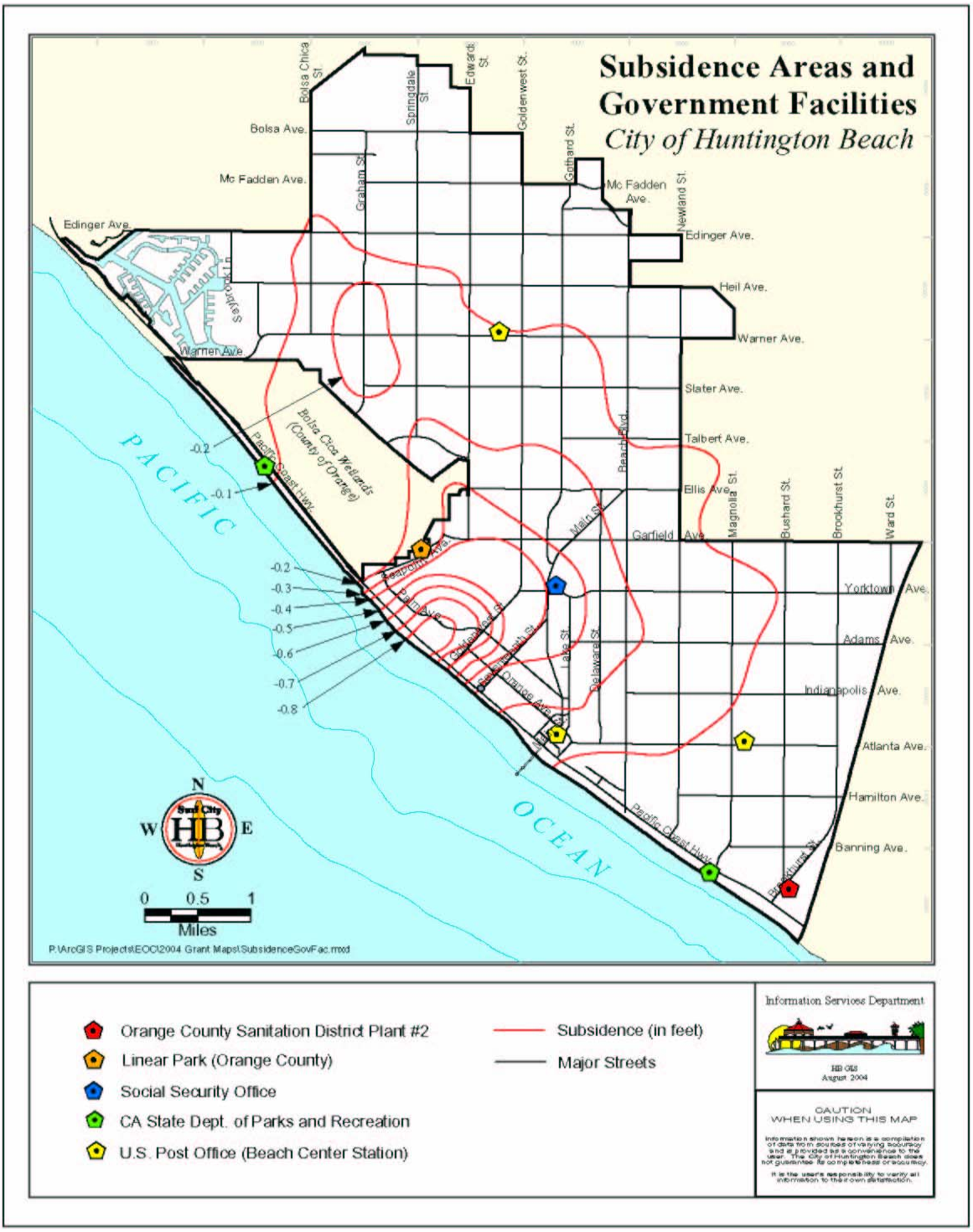
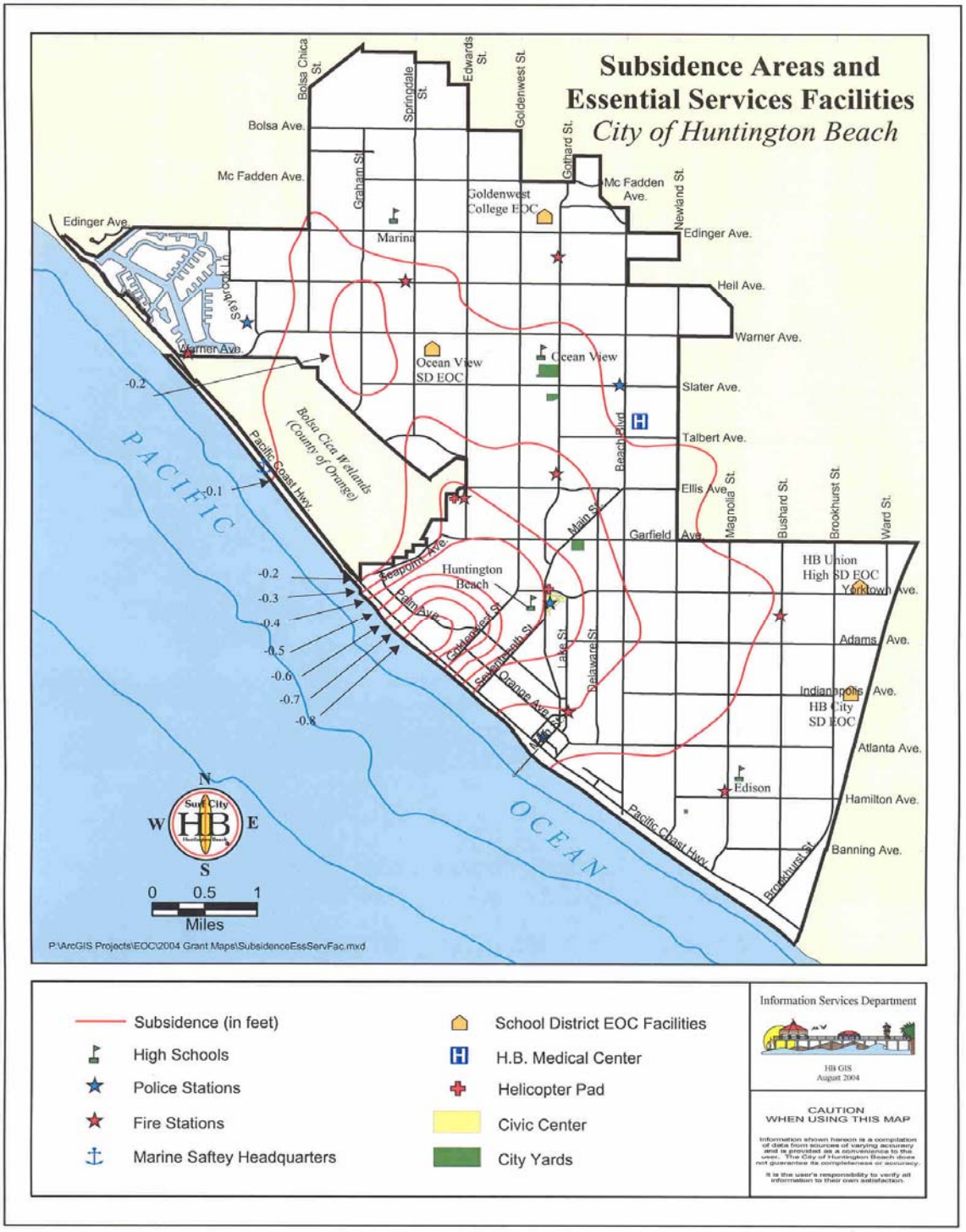


Exhibit IV-C-11: Subsidence Areas and Essential Services Facilities
Huntington Beach



Subsidence Mitigation Strategies

The subsidence mitigation action items that follow reflect a need to acquire County, State, and Federal sources of funding to address damaged structures and prevent future structural catastrophes. Clearly, both private residences, public City buildings, and School District properties have been impacted by the poor structural soil conditions located in this area. The subsidence strategies listed below are not in priority order.

Exhibit IV-C-12: Subsidence Mitigation Action Items

Natural Hazard	**SUBSIDENCE HAZARD STRATEGY #3A**		
Action Item	Subsidence Education Campaign		
Coordinating Organization	Huntington Beach Fire Department & Fountain Valley Fire Department Emergency Services Offices		
Ideas for Implementation	Include subsidence education in all existing CERT Classes. Provide community with subsidence presentations and literature.		
Time line	2005-2006		
Constraints	Resistance to this project may be a lack of current subsidence knowledge. Some may not consider subsidence a true hazard.		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**SUBSIDENCE HAZARD STRATEGY #3B**		
Action Item	Huntington Beach Union High School District Repairs Funding Acquisition		
Coordinating Organization	Huntington Beach Union High School District & Huntington Beach Fire Department Emergency Services		
Ideas for Implementation	Review construction bids. Acquire funding through grants or capital improvement funds.		
Time line	2005-2006		
Constraints	Lack of available funding.		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services
Natural Hazard	**SUBSIDENCE HAZARD STRATEGY #3C**		
Action Item	Huntington Beach Corporate Yard Repairs Funding Acquisition		
Coordinating Organization	Huntington Beach Fire Department Emergency Services & Huntington Beach Public Works		
Ideas for Implementation	Review construction bids. Acquire funding through grants or capital improvement funds.		
Time line	2005-2006		
Constraints	Lack of available funding.		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

Natural Hazard	**SUBSIDENCE HAZARD STRATEGY #3D**		
Action Item	Huntington Beach Murdy Fire Station Funding Acquisition		
Coordinating Organization	Huntington Beach Fire Department Emergency Services & Huntington Beach Public Works		
Ideas for Implementation	Note: a FEMA Hazard Mitigation Project Grant has been written for this project but has not yet been approved.		
Time line	2005-2006		
Constraints	Lack of available funding.		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

It should be noted that California Proposition 55 titled "Kindergarten-University Public Education Facilities Bond Act of 2004" passed on March 2, 2004. This bond authorized the sale of $12.3 billion in bonds intended to relieve overcrowding and to repair public education facilities from the elementary school to university level. The funds are intended to fix "…leaky roofs, repair broken bathrooms…(and ensure buildings) meet earthquake and fire standards." According to Hazard Mitigation Regulations, a jurisdiction may not accept hazard mitigation funds if it has received State bond money for the same project. If the School District projects listed above receive State funds, the mitigation strategy will be removed from the hazard mitigation report.

Exhibit IV-C-13: Proposed Activity Criteria Evaluation

	PROPOSED ACTIVITY				
CRITERIA	**Strategy 3A**	**Strategy 3B**	**Strategy 3C**	**Strategy 3D**	
Cost Effective	4	3	3	3	5 = Excellent 4 = Good 3 = Fair 2 = Bad 1 = Unacceptable
Technically Feasible	5	3	3	3	
Environmentally Sound	5	4	4	4	
Social Impacts	5	4	4	4	
Activity Addresses the Problem	5	5	5	5	
Meets Federal, State, and Local Regulations	5	5	5	5	
Politically Acceptable	5	4	4	4	
Activity Reduces the Risk	4	5	5	5	
Total	38	33	33	33	

The Hazard Mitigation Committee developed a chart comparing selected criteria on a one through five scale. The following criteria were analyzed: cost effective, technically

feasible, environmentally sound, social impacts, activity addresses the problem, meets Federal, State, and Local regulations, politically acceptable, and activity reduces the risk. After reviewing the chart, the Committee concluded that all jurisdictions would support the proposed activities.

Estimated Potential Losses

Estimated Potential Losses, FEMA Worksheet 3a

The following City-specific FEMA worksheets depict the estimated loss to the number of City structures, dollar value of the structures, and the total number of people impacted. These figures are calculated by type of structure (occupancy class) and then totaled at the bottom of the chart. A complete description of how the figures were obtained is available in Part III-B-2 – Risk Assessment.

Estimated Degree of Loss, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimated the area of each City that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e., Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of damage of that area or subarea. Content losses are derived by multiplying the percent of content damage by the loss of structure. A complete description of how the figures were obtained is also available in Part III-B-2 – Risk Assessment.

Exhibit IV-C-14: Huntington Beach Estimated Potential Losses

City of: **Huntington Beach, CA**

September 14, 2004 | Hazard: **Subsidence** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	77,800	51,893	67	11,508,176,000	7,675,953,392	67	199,500	133,067	67
Commercial	2,260	1,507	67	1,167,322,771	778,604,288	67	28,900	19,276	67
Industrial	1,161	774	67	1,135,822,248	757,593,439	67	32,900	21,944	67
Agricultural									
Religious / Non-Profit	174	116	67	192,900,040	128,664,327	67	24,000	16,008	67
Government	129	86	67	361,547,570	241,152,229	67	900	600	67
Education	555	370	67	410,857,447	274,041,917	67		-	67
Utilities									
Total	82,079	54,747	67	14,776,626,076	**9,856,009,593**	67	286,200	190,895	67

Exhibit IV-C-15: Fountain Valley Estimated Potential Losses

City of: **Fountain Valley, CA**

June 25, 2004 | Hazard: **Subsidence** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	13,729	13,043	95	2,745,800,000	2,608,510,000	95	55,321		0
Commercial	268	255	95	1,608,000,000	1,527,600,000	95	16,734		0
Industrial	275	261	95	584,375,000	555,156,000	95	13,740		0
Agricultural	8	7	95	1,500,000	1,425,000	95	175		0
Religious / Non-Profit	16	15	95	19,200,000	18,240,000	95	2,370		0
Government	35	33	95	26,430,000	25,109,000	95	45		0
Education	18	17	95	96,985,000	92,136,000	95			0
Utilities									
Total	14,349	13,631	95	5,082,290,000	4,828,176,000	95	88,385	0	0

Exhibit IV-C-16: Huntington Beach Estimated Degree of Loss

				City of:	**Huntington Beach**				
August 25, 2004				Hazard:	**Subsidence**				Worksheet 4
Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss		Function Losses	Total Structural + Content Loss + Function Losses
						% of Loss	Replacement Value		
Residential	Slabs, Walls, Windows & Doors	67	11,508,176,000	1	115,081,760	1	1,150,818	0	116,232,578
Commercial	"	67	1,167,322,771	1	11,673,228	1	116,732	0	11,789,960
Industrial	"	67	1,135,822,248	1	11,358,222	1	340,747	0	11,698,969
Agriculture									
Religious/ Non-Profit	"	67	192,900,040	1	1,929,000	1	57,870	0	1,986,870
Government	"	67	361,547,570	1	3,615,476	1	108,464	0	3,723,940
Education	"	67	410,857,447	1	4,108,574	1	123,257	0	4,231,832
Utilities									
	Totals:		14,776,626,076		147,766,261		1,897,888	0	149,664,149

Exhibit IV-C-17: Fountain Valley Estimated Degree of Loss

				City of:	**Fountain Valley, CA**				
August 25, 2004				Hazard:	**Subsidence**				Worksheet 4
Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss		Function Losses	Total Structural + Content Loss + Function Losses
						% of Loss	Replacement Value		
Residential	Slabs, Walls, Windows & Doors	95	2,745,800,000	1	27,458,000	1	274,580	0	27,732,580
Commercial	"	95	1,608,000,000	1	16,080,000	1	160,800	0	16,240,800
Industrial	"	95	584,375,000	1	5,843,750	1	175,313	0	6,019,063
Agriculture									
Religious/ Non-Profit	"	95	19,200,000	1	192,000	1	5,760	0	197,760
Government	"	95	26,430,000	1	264,300	1	7,929	0	272,229
Education	"	95	96,985,000	1	969,850	1	29,096	0	998,946
Utilities									
	Totals:		5,080,790,000		50,807,900		653,477	0	51,461,377

Footnotes

[i] United States Geological Survey http://ca.water.usgs.gov/groundwater/sub, May 24, 2004
[ii] Compaction is a measure of the density of geologic materials
[iii] United States Geological Survey, "Measuring Land Subsidence from Space," April 2000
[iv] "Land Subsidence in the United States" Circular 1182, US Geological Survey, 1999, edited by Devin Galloway, David R. Jones, S.E.Ingebritsen. Reston, Virginia
[v] www.ce.washington.edu/~liquefaction/html/what/what1.html
[vi] Book: Land Subsidence in the United States
[vii] GeoPentech report dated July 11, 2001 Geotechnical Investigation for Evaluation of Distress Murdy Fire Station, Huntington Beach, California"
[viii] Information taken from City of Huntington Beach Office Website November 12, 2003 Weekly Update
[ix] http://banglapedia.search.com.bd/HT/P_0137.htm, June 1, 2004,
[x] Interview with Russ Terresa, Rite Aid Real Estate Division, May 24, 2004
[xi] Law/Crandall Consultants, Project No. 70131-9-0372.0001, Draft Report of Geotechnical Investigation Liquefaction Study and Preliminary Foundation Design Recommendations of Existing Edison High School, November 29, 1999
[xii] Law/Crandall Consultants, Project No. 70131-9-0256.0001, Report of Geotechnical Investigation Recommendations for Remediation of Distressed Conditions Existing Buildings B and C, September 20, 1999
[xiii] Anthony-Taylor Consultants, Project No. 00-1657.2, Report of Limited Subsurface Investigation & Grouting Recommendations, January 3, 2002

Part IV-D

Dam Failure
Table of Contents

OVERVIEW OF DAMS **3**
TYPES OF DAMS **5**
SANTA ANA RIVER **8**
SEVEN OAKS AND PRADO DAM **10**
Exhibit IV-D-1: Downstream Inundation Map 15
Exhibit IV-D-2: City of Huntington Beach Prado Dam Inundation Map 16
Exhibit IV-D-3: City of HB Prado Dam Inundation Maps 17
Exhibit IV-D-4: Fountain Valley Prado Dam Inundation Map 18
SANTA ANA MAINSTEM PROJECT **20**
Exhibit IV-D-5: Santa Ana Mainstem Map 21
LOCAL HISTORY OF DAM FAILURE **21**
DAM FAILURE HAZARD ASSESSMENT **24**
Exhibit IV-D-6: Huntington Beach Elevation Ranges Map 27
Exhibit IV-D-7: Huntington Beach School Sites Impacted 28
Exhibit IV-D-8: Prado Dam Inundation and School Districts Sites 29
COMMUNITY DAM FAILURE ISSUES **30**
Exhibit IV-D-9: Huntington Beach Impacted Essential Service Facilities 32
Exhibit IV-D-10: HB Prado Dam Inundation Essential Service Facilities 33
Exhibit IV-D-11: Fountain Valley Impacted Essential Service Facilities 34
EXISTING MITIGATION ACTIVITIES **35**
DAM FAILURE MITIGATION STRATEGIES **35**
Exhibit IV-D-12: Proposed Activity Criteria Evaluation 37
ESTIMATED POTENTIAL LOSSES **38**
Exhibit IV-D-13: Huntington Beach Estimated Potential Losses 39
Exhibit IV-D-14: Fountain Valley Estimated Potential Losses 40
Exhibit IV-D-15: Huntington Beach Estimated Degree of Loss 41
Exhibit IV-D-16: Fountain Valley Estimated Degree of Loss 42
REFERENCES **43**

(This page intentionally left blank)

Part IV
Dam Failure

Dam Failure

The cities of Huntington Beach and Fountain Valley are subject to potential flooding from two dams, Prado and Seven Oaks. These two dams are located to the northeast of Orange County in San Bernardino County. They feed directly into the Santa Ana River and are considered the only two dams that could fail and potentially impact the Huntington Beach and Fountain Valley area. The impact could cause loss of life, destroy thousands of high dollar properties and greatly affect residential, businesses, and tourism to the area.

Overview of Dams

What is a Dam?

A dam is a barrier preventing the flow of water or loose solid materials (such as soil or snow); or a barrier built across a watercourse for impounding water. Dams are artificial barriers, which are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more.

Advantages of Dams

Dams are important because they provide water for drinking, for industry, irrigation, fishing and recreation, water for hydroelectric power production, water for navigation in rivers, and other needs. Dams also protect people by reducing or preventing floods. The primary purpose of this report is to discuss the Prado and Seven Oak Dams and the flood protection they provide to the Huntington Beach and Fountain Valley area.

Causes of Dam Failure

Dam failures can result from a number of natural or man-made causes such as earthquakes, erosion of the face or foundation and improper sitting of the dam, rapidly rising floodwaters, and structural/design flaws. Dam failure can result in severe flood events to lower-lying areas. A dam failure from the Seven Oaks and/or Prado Dams could severely impact both Fountain Valley and Huntington Beach. Huntington Beach is at the mouth of the Santa Ana River where the river flows into the Pacific Ocean.

Impacts of Dam Failure

A dam failure will cause loss of life, damage to property, and other ensuing hazards, as well as the displacement of persons residing in the inundation path. Damage to electric generating facilities and transmission lines could also impact life support systems in communities outside the immediate hazard areas.

A catastrophic dam failure, depending on the size of the dam and the population downstream, could exceed the response capability of local communities especially overtaxing the public safety personnel and resources. Damage control and disaster

relief support would be required from other local government agencies, private organizations, the State of California, and possibly the Federal government.

Types of Dams

There are four general types of dams: Arch, Buttress, Gravity (Prado), and Embankment (Seven Oaks). Each of these types of dams has different failure characteristics.

Arch Dams

Arch dams are best suited to narrow canyons where they divert the force of the water behind the dam to the sides of the cavern in order to help support the weight. Therefore, arch dams need not be as thick as gravity dams since the dam itself supports less weight making them less expensive to construct. Arch dams may carry less weight than other dams; however, they are affected by the same kinds of force. These forces must be considered when building one, and include pressure of the water, weight of the water, and weight of the dam.

Pressure of the Water

Pressure applied by the water: For any type of dam, the water applies pressure to the dam that is proportional to the depth of the water. Therefore, the pressure exerted by the water in the reservoir must be considered before building a dam. The force of the water pushing on the dam is proportional to the depth of the water contained behind the dam. So, as the depth increases, the pressure increase - at the bottom of the dam, pressure is highest.

Weight of the Water and Weight of the Dam

The weight of the water and the weight of the dam must be considered to ensure that the foundation can support the dam. The earth supporting the dam must be strong enough to support the weight of the dam. Therefore, the normal force (N) must be sufficient to support the weight (W) of the dam and the water. A well-known example of an arch dam is Hoover Dam, which sits in the Colorado River on the border of Nevada and Arizona. Dams are also used to generate energy by harnessing the potential energy of water contained in the reservoir.

Buttress Dams

Buttress dams can also be called Ambursen dams after the American engineer who used this type of dam in the early 20th century.

Originally, buttress dams were used in areas requiring irrigation, but where the land was not capable of supporting the size and weight of other types of dams. Generally, buttress dams are built in wide valleys. The name "buttress" dam comes from the structure of the dam itself. The dam is supported at intervals by several buttresses, concrete slabs reinforced with steel, which form a watertight seal against the river. There are two main types of buttress dams: flat slab and multiple arch. Multiple arch

dams are generally more expensive and time consuming to build. This is because the front of the dam consists of several arches that face upstream instead of just a flat front.

Physics Involved in Buttress Dams

As with the arch dam and the gravity dam, the same forces must be considered for a buttress dam. The weight of the dam is also another factor involved. This is the downward force exerted by the concrete. To determine this, the specific weight of the concrete is used. This is the volume of concrete times the specific weight of the concrete. The specific weight of the concrete and the ratio of the density of concrete is compared to the density of water at 4 degrees Celsius. For concrete, the specific gravity is 23.6 N/m3. The weight of the dam times gravity is the total downward force that is exerted by the dam.

The normal force is the upward force that is exerted by the Earth. Since the dam is not in motion, the normal force provides equilibrium for the weight. Thus, the normal force for a dam is equal but opposite in direction to the weight of the dam times gravity.

Gravity Dams

Gravity dams serve the same purposes as arch and buttress dams; however, they differ in structure and method of retaining water. This type of dam is solid and triangular in shape; therefore, it requires a large amount of concrete or other construction material. The immense weight of the concrete provides stabilization and allows the dam to maintain control of the water. As you can see, gravitational force holds the dam to the ground, hence the name. A well-known example of a Gravity Dam is Prado and Friant Dam.

Forces Acting on Gravity Dams

The forces acting on gravity dams include the force of the water in the reservoir (acting horizontally and vertically), the weight of the concrete (acting in a downward direction), and the uplift force that results from the water pressure under the dam pushing in an upward direction (a result of the buoyant force of water) if there is not a drainage source. The overall force acts one-third of the way from the bottom of the dam, which is its center of gravity.

Pressure Acting on the Dam

Gravity dams must be able to withstand the pressure of the reservoir water. As a result of the triangular shape of the dam, the pressure of the water is also distributed in the shape of a triangle. The amount of pressure on the dam increases proportionally to the depth of the water; therefore, the pressure is at a maximum at the bottom of the reservoir. A portion of the weight of the dam is cancelled by the water pressure resulting from the uplift force, so if the dam is not properly constructed, it could be uplifted and overturned.

Energy Production

As far as energy production is concerned, gravity dams are also used in the generation of hydroelectric power by the conversion of the potential energy of the water into mechanical energy.

Embankment Dams

Embankment dams in the US prior to 1930 had a poor track record. Of those over 490 feet high, almost 10% failed, usually due to overtopping in a flood. Overtopping is when the water level in the reservoir reaches maximum height and begins to flow over the top of the dam.

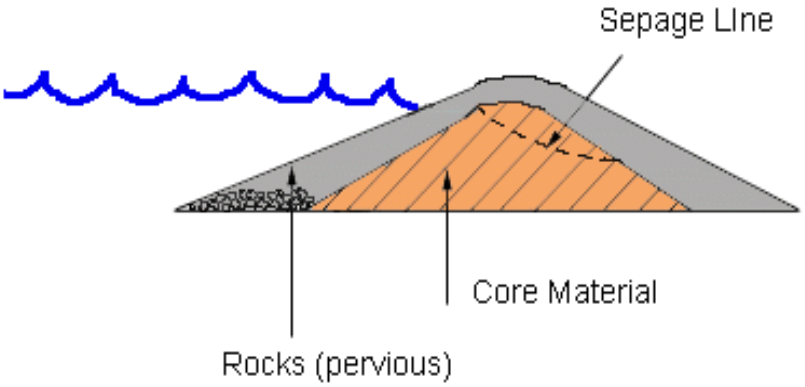
The South Fork dam in Johnstown, PA was one of the first to use rockfills, or loose rocks, on the downstream face. This dam failed after being overtopped in 1889, killing over 2,000 people.

Embankment dams are massive dams made of earth or rock. Embankment dams usually have some sort of waterproof interior (called the core), which is covered with earth or rock fill. Grass may even be grown on the earth fill. Water will seep in through the earth or rock fill, but should not seep into the core. They rely on the weight to resist the flow of water, just like concrete gravity dams.

The main force on an embankment dam is the force of the water. The weight of the dam is also a force, but each material has a different weight, so it is not shown here as one force the way it is on the concrete dams. The uplift force is also acting on the embankment dam, but some of the water seeps into the dam so the force is not the same as on a concrete dam.

The embankment dam is the only dam type that is not made of concrete. Embankment dams may be made of earth or rock, both of which are pervious to water that is, water can get into it. You see above that the water will seep into the core material and should stop at the seepage line. The core material is usually more watertight than the rock or earth that is on the outside of the dam, but the core material is still not totally impervious to water. Concrete is not truly impervious either, but it does not allow as much seepage as these materials do.

The diagram shown to the right is only one configuration of what an embankment dam may look like. It could be any combination of earth, rock, and core material in any number of arrangements. Other forces that may act on an embankment dam are:



- There may be water on the downstream side of the dam as well; this water will have the same sort of vertical and horizontal forces on the dam as the water on the upstream side
- Internal hydrostatic pressure: in pores, cracks, joints, and seams
- Silt pressure: silt will build up over time on the upstream side. Silt provides about one and a half times the horizontal pressure of water and twice the vertical pressure of water
- Ice load on the upstream side
- Wave load on the upstream side
- Earthquake loads
- Settlement of the foundation or abutments
- Other structures on top of the dam -- gates, bridge, cars, etc.

Santa Ana River

There are two flood control dams that control flood flow in the Santa Ana River. The Seven Oaks Dam is located on the river in the upper Santa Ana Canyon about eight miles northeast of the City of Redlands in San Bernardino County. This dam was completed in 1999. The Prado Dam is about 40 miles downstream of the Seven Oaks Dam. Approximately 47 billion gallons (145,600 acre-feet) of water can be stored in the Seven Oaks reservoir and 61 billion gallons (187,600 acre-feet) in the Prado Dam, reservoir.

During a flood, the Seven Oaks Dam will store water destined for the Prado Dam for as long as the reservoir at Prado Dam is rising. When the water surface of Prado Dam reservoir is less than the buffer pool, water conservation releases are then made in coordination with the Orange County Water District based on the capacity of the groundwater recharge facilities and agreements with other agencies. Flood control releases occur when the water surface in the reservoir exceeds the buffer pool.

Releases are increased to match inflow from upstream (5,000 cubic feet per second). The objective of the flood control operation is to drain the reservoir pools as quickly as possible without exceeding the capacity of the channel downstream. When the water surface elevation in the Prado Dam reservoir exceeds 543 feet, uncontrolled releases from the spillway occur.

In the event of Prado Dam failure, floodwaters would flow through the Santa Ana Canyon on its way to the Pacific Ocean. The flood would range from about 3,000 feet wide in the canyon to over 15 miles wide downstream at the Santa Ana Freeway (Interstate 5). The flooding would impact over one million people and 110,000 acres. Within 8-10 hours, the intersection of Beach Boulevard and Edinger Avenue would experience severe flooding. The peak elevation would be 32 feet with 7 feet average over the river's bank depth. The greatest flooding would occur in the area between the Bolsa Chica Mesa and the Newport Beach Mesa where flood depths can vary from one to nine feet.

Huntington Beach and Fountain Valley lie within the Santa Ana River floodplain. The Santa Ana River begins near the Mt. San Gorgonio summit in the San Bernardino Mountains at an elevation of over 8,000 feet. Its course drains over 90 miles through both the San Bernardino and Santa Ana ranges; 27 miles of the river course flows through Orange County to the Pacific Ocean. The Santa Ana River drainage basin covers 2,450 square miles and is the largest basin in southern California. This was once considered the "worst flood threat west of the Mississippi River." With the recent work on the dams and flood control channels, the situation is much improved.

Seven Oaks and Prado Dam

Seven Oaks Dam

Seven Oaks Dam is a single-purpose flood control project constructed by the US Army Corps of Engineers, Los Angeles District. The project is located on the Santa Ana River in the upper Santa Ana Canyon about eight miles (13 km) northeast of the city of Redlands, in San Bernardino County. Authorization for the project is contained in the Water Resources Development Act of 1986. Construction was completed on November 15, 1999.

The project is planned to operate in tandem with Prado Dam, also located on the Santa Ana River 40.3 miles (64.9 km) downstream, to provide flood protection to Orange County. During the early part of each flood season, runoff will be stored behind the dam in order to build a debris pool to protect the outlet works. Small releases will be made on a continual basis in order to maintain the downstream water supply. During a flood, Seven Oaks Dam will store water destined for Prado Dam for as long as the reservoir pool at Prado Dam is rising. When the flood threat at Prado Dam has passed, Seven Oaks will begin to release its stored floodwater at a rate which does not exceed the downstream channel capacity. At the end of each flood season, the reservoir at Seven Oaks will be gradually drained and the Santa Ana River will flow through the project unhindered.

Seven Oaks Physical Data

NGVD – National Geodetic Vertical Datum

Embankment		
Type	Earth and Rock Fill	
Embankment Volume	37,626,983 CY	28,767,893 CM
Crest Elevation	2610 feet NGVD	795.5 meters NGVD
Stream-bed elevation at dam centerline	2060 feet NGVD	627.9 meters NGVD
Maximum height above stream-bed	550 feet	167.6 meters
Crest Length	2980 feet	908.3 meters
Freeboard	5.6 feet	1.7 meters
Spillway		
Type	Rock Cut with Flush Concrete Crest	
Crest Elevation	2580 feet NGVD	786.4 meters NGVD
Crest Length	500 feet	152.4 meters
Elevation of Maximum Water Surface	2604.4 feet NGVD	793.8 meters NGVD
Main Outlet Works		
Intake Tower		
Elevation of Tower Deck	2302.0 feet NGVD	701.7 meters NGVD
High-level Intake Elevation	2265 feet NGVD	690.4 meters NGVD
Height of Tower	225.5 feet	68.7 meters
Diameter of Main Wet Well	36 feet	11 meters
Upstream Conduit		
Flow Regime	Pressure Flow	
Diameter of Conduit	18 feet	5.5 meters
Length of Conduit	1009 feet	307.5 meters
Elevation of Conduit Invert at Intake	2100 feet NGVD	640.1 meters NGVD
Gate Chamber		
Length	69 feet	21 meters
Number of Main Gate Passages	2	
Height x Width of Main Gates	8.5 x 5 feet	2.59 x 1.52 meters
Number of Low Flow Gate Passages	1	
Height x Width of Low Flow Gate	3.5 x 2 feet	1.07 x 0.61 meters
Downstream Conduit		
Flow Regime	Open Channel Flow	
Length of Conduit	578 feet	176.2 meters
Height x Width of Conduit	9 x 18 feet	2.74 x 5.49 meters
Exit Channel		
Flow Regime	Open Channel Flow	
Length of Channel	280 feet	85.3 meters
Height x Width of Channel	14 x 18 feet	4.27 x 5.49 meters

Elevation of End of Exit Channel	2050.3 feet NGVD	624.9 meters NGVD
Multilevel Withdrawal Structure		
Elevation of top of structure	2275.4 feet NGVD	693.5 meters NGVD
Elevation of invert of wet well	2100 feet NGVD	640.1 meters NGVD
Diameter of Minimum Discharge Line	3.0 feet	0.91 meters
Minimum Discharge Fixed Cone Valve	14 inches	0.36 meters
Water Supply Fixed Cone Valve	8 inches	0.20 meters
Reservoir		
Area at Spillway Crest	780 Acres	3,156,548 sm
Gross Storage at Spillway Crest	145,600 Acre-feet	179.6 MCM
Flood Control Allocation	113,600 Acre-feet	140.1 MCM
Sedimentation Allocation	32,000 Acre-feet	39.5 MCM
Reservoir Design Flood		
Total Volume (4-day)	115,000 Acre-feet	141.8 MCM
Peak Inflow	85,000 cfs	2406.9 cms
Peak Outflow	7,000 cfs	198.2 cms
Recurrence Interval	350 years (based on volume)	
Spillway Design Flood		
Total Volume	356,000 Acre-feet	439.1 MCM
Peak Inflow	180,000 cfs	5097.0 cms
Peak Outflow	174,000 cfs	4927.1 cms

Prado Dam

Prado Dam was completed in April 1941. It is located at the upper end of the Lower Santa Ana River Canyon, which is a natural constriction controlling 2,255 square miles (5,840 square kilometers) of the 2,450 square mile (6,345 square kilometer) Santa Ana River watershed. Authorization for the project is contained in the Flood Control Act of June 22, 1936 (PL 74-738). Modifications to the dam affect the basin below 566 feet elevation. The basin comprises more than 11,500 acres, 4,100 acres of which are riparian habitat (mostly willow woodland), a 4,823-acre recreation area (1,041 developed, 3,782 undeveloped) and 2,400 acres owned by the Orange County Water District.

Prado Dam provides flood control and water conservation storage for Orange County. It is the downstream element of the Santa Ana River flood control system. The purpose of the project is to collect runoff from the uncontrolled drainage areas upstream along with releases from other storage facilities. Generally, when the water surface elevation in the reservoir pool is below the top of the buffer pool elevation (494.0 feet NGVD during the flood season, 505.0 feet NGVD during the non-flood season), water conservation releases are made. These releases are coordinated with the Orange County Water District and are based upon the capacity of their groundwater recharge facilities and agreements with other agencies. If the water surface in the reservoir exceeds the top of the buffer pool, flood control releases commence. The objective of the flood control operation is to drain the reservoir back to the top of the buffer pool as quickly as possible without exceeding the capacity of the channel downstream. In current practice, when the water surface in the reservoir exceeds the top of the buffer pool, releases are increased to match inflow up to 5,000 cfs (142 cms). When inflows exceed 5,000 cfs, the excess water is stored in the reservoir.

When the water surface elevation in the reservoir reaches 543.0 feet NGVD, uncontrolled releases from the spillway will commence. The 5000 cfs limit on controlled releases from Prado Dam is based upon the old non-damaging capacity of the downstream channel. In the event of Prado Dam failure, floodwaters would flow through the Santa Ana Canyon on its way to the Pacific Ocean. (See Inundation maps Exhibits IV-D-1 thru IV-D-4). The flood would range from about 3,000 feet wide in the canyon to over 15 miles wide downstream at the Santa Ana Freeway (Interstate 5). The flooding would impact over one million people and 110,000 acres. Within 8-10 hours, the intersection of Beach Boulevard and Edinger Avenue in Huntington Beach would

experience severe flooding. The peak elevation would be 32 feet with 7 feet average over the river's bank depth. The greatest flooding would occur in the area between the Bolsa Chica Mesa and the Newport Beach Mesa where flood depths can vary from one to nine feet. (See Exhibit IV-D-4)

When the downstream channel improvements that are part of the Corps of Engineers' Santa Ana River project are completed, the downstream channel capacity will increase dramatically to over 30,000 cfs (850 cms). The Santa Ana River project will also increase the capacity of the reservoir behind Prado Dam. The modifications to the dam, which will take place in three phases over the next five to eight years, consist of:

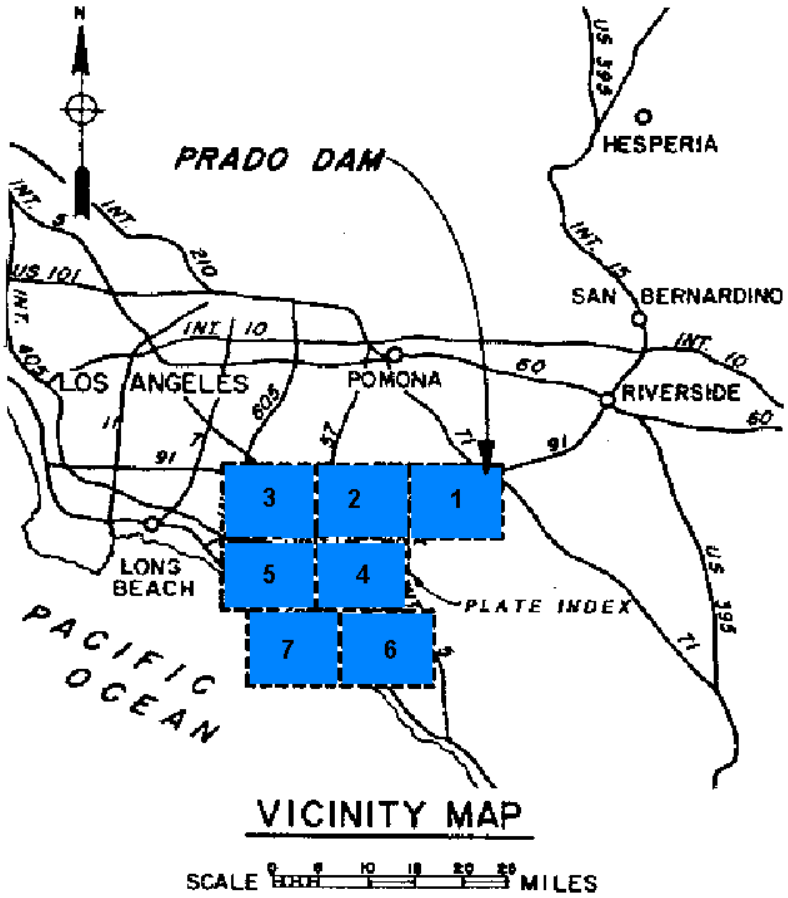
- Raising the height of the dam 30 feet; building a new intake tower; and, constructing improvements to the dam's outlet works (Mar 2003 – Oct 2006)
- Constructing dikes in the basin to protect property (Sep 2004 – Sep 2007)
- Raising the height of the adjacent spillway 20 feet (Jul 2006 – Jan 2008).

The modifications will provide an additional 140,000 acre-feet to the reservoir. (One acre-foot is the volume of water that would cover one acre with one foot of water.) These changes will increase Prado Dams' current 70-year level of protection to 190-year protection. These new improvements would prevent $15 billion in damages.

The total cost of the improvements to Prado Dam is estimated at $430 million ($221 federal, $209 non-federal). The non-federal sponsor for this project is Orange County Flood Control District.

The project is authorized under the 1986 Water Resources Development Act (WRDA), the 1988 Energy and Water Appropriation Act (San Timoteo), and Section 309 of WRDA 1996. In 1997 federal officials, following the appropriate laws, concluded that Prado Dam is distinct from the Santa Ana River project. (See "Santa Ana Mainstem Project" on page 19 & 20.) These improvements will enable the dam to take full advantage of the improved channel capacity downstream and will greatly increase the level of flood protection to the Orange County communities in the Santa Ana River floodplain. When these improvements near completion, a new water control plan and manual for the project will be developed.

Exhibit IV-D-1: Downstream Inundation Map



Huntington Beach & Fountain Valley – Plates 5 & 7

Exhibit IV-D-2: City of Huntington Beach Prado Dam Inundation Map

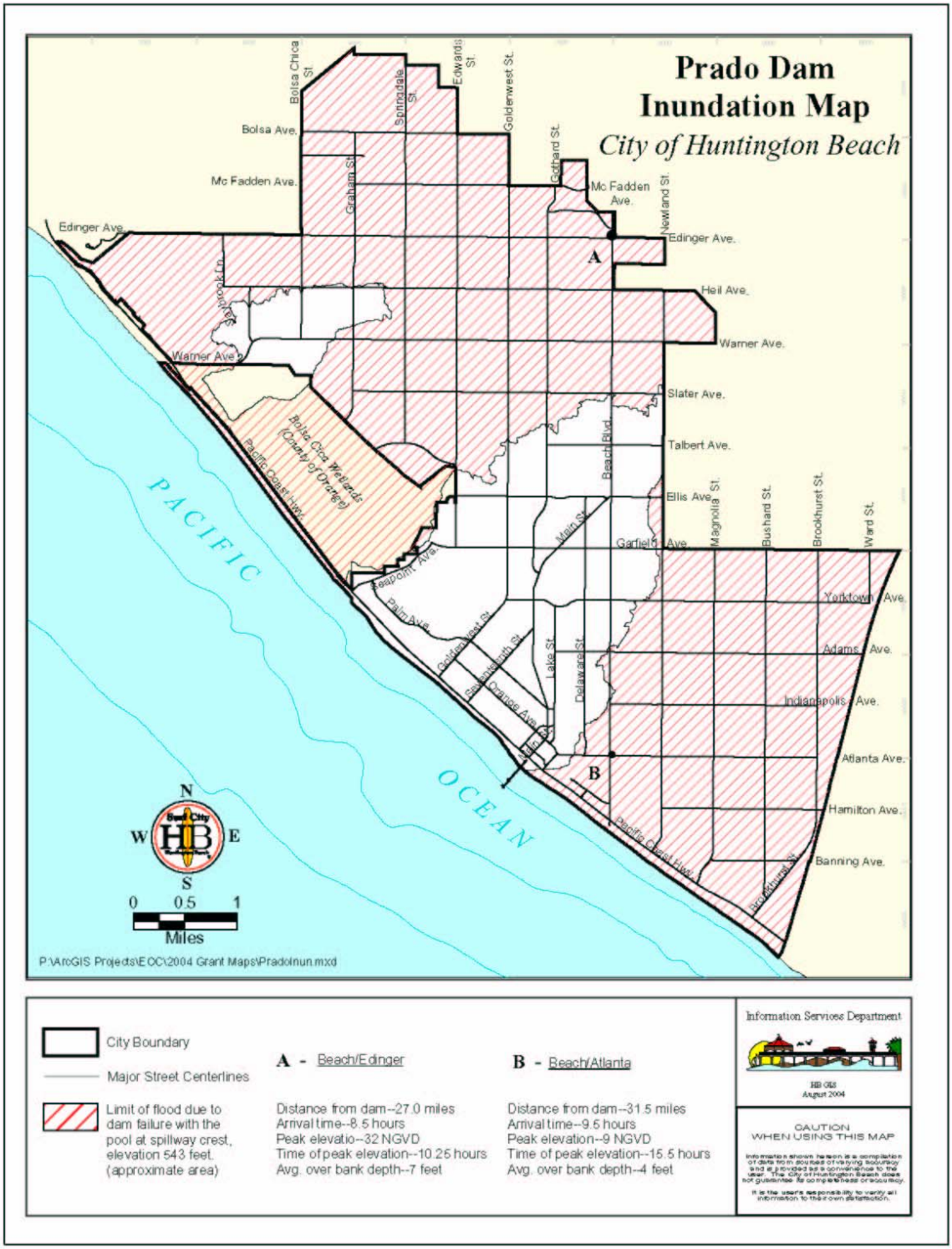


Exhibit IV-D-3: City of HB Prado Dam Inundation Maps

With City and County Channels Included

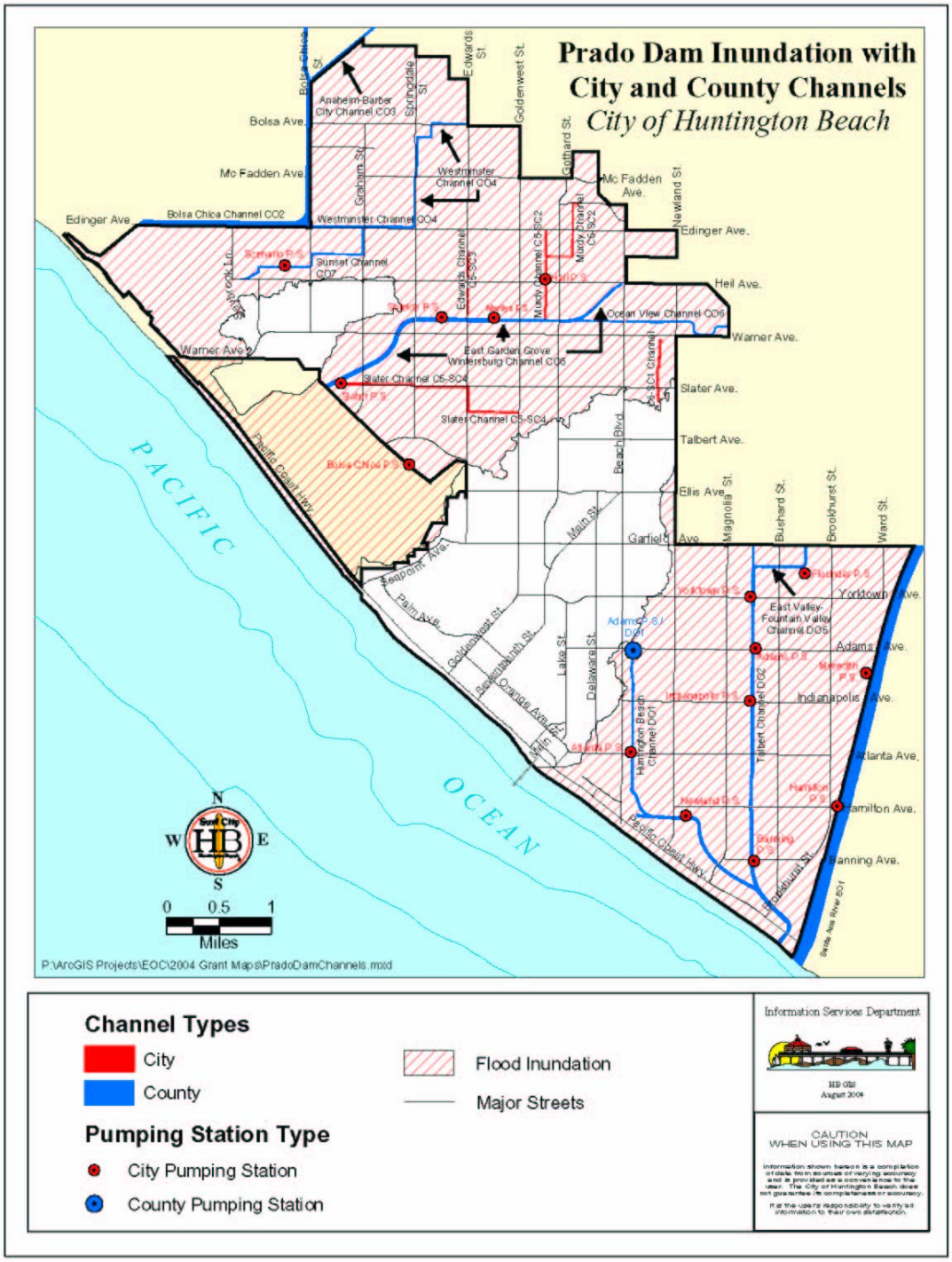


Exhibit IV-D-4: Fountain Valley Prado Dam Inundation Map

Note: 98% of Fountain Valley is in the Prado Dam Inundation Area. Area shaded in blue is not in the Inundation Area.

Prado Dam Physical Data

Embankment		
Type	Earth Fill	
Crest Elevation	566 feet NGVD	172.5 meters NGVD
Maximum height above streambed	106 feet	32.3 meters
Crest Length	2,280 feet	695 meters
Freeboard during PMF	(-4.3) feet	(-1.3) meters
Spillway		
Type	Concrete Ogee Crest with Converging Chute	
Spillway Crest	543.0 feet NGVD	165.5 meters NGVD
Crest Length	1000 feet	305 meters
Outlet Works		
Number of Passages	6	
Gate Type	Vertical Lift	
Height x Width (each)	12 x 7 feet	3.7 x 2.1 meters
Entrance Invert Elevation	460.0 feet NGVD	140.2 meters NGVD
Maximum Capacity	17,000 cfs	481 cms
Reservoir		
Debris Pool		
Elevation of top of Pool	490.0 feet NGVD	149.4 meters NGVD
Area at top of Pool	768 Acres	311 ha
Gross Storage at top of Pool	4,689 Acre-feet	5.8 MCM
Flood Season Buffer Pool		
Elevation of top of Pool	494.0 feet NGVD	150.6 meters NGVD
Area at top of Pool	1,081 Acres	438 ha
Gross Storage at top of Pool	8,437 Acre-feet	10.4 MCM
Non-Flood Season Buffer Pool		
Elevation of top of Pool	505.0 feet NGVD	153.9 meters NGVD
Area at top of Pool	2,123 Acres	859 ha
Gross Storage at top of Pool	25,760 Acre-feet	31.8 MCM
Top of Dam		
Elevation of top of Pool	566.0 feet NGVD	172.5 meters NGVD
Area at top of Pool	11,030 Acres	4,468 ha
Gross Storage at top of Pool	383,500 Acre-feet	473.0 MCM
Historic Maximum Water Surface		
Date	22 February 1980	
Maximum Elevation	528.0 feet NGVD	160.9 meters NGVD
Historic Maximum Release		
Date	22 February 1980	
Maximum Release	5,992 cfs	169.7 cms

Santa Ana Mainstem Project

The Santa Ana Mainstem Project extends some 75 miles along the Santa Ana River from the upper canyon in the San Bernardino Mountains downstream to the Pacific Ocean at Newport Beach. The project provides urban flood protection to growing communities in Orange, Riverside, and San Bernardino counties. The system is designed to provide various levels of flood protection ranging from 100 to 190 years for areas most susceptible to damages from flooding.

The Mainstem Project includes the following:

- Seven Oaks Dam in the upper Santa Ana River Canyon, to control a 350-year flood event at the dam site
- 5.4 miles of trapezoid-shaped channel and 18 sediment basins inside the channel of San Timoteo Creek in the cities of San Bernardino, Loma Linda, Redlands, and Colton
- delineation of the 100-year floodway and floodway fringe between Seven Oaks Dam and Prado Dam
- local authorities will manage this area according to guidelines established by the Federal Emergency Management Agency (FEMA)
- modifications to the existing federal flood control levees at Mill Creek to restore the original Standard Project Flood level of protection
- construction of a 100-year level of flood protection channel on the Oak Street Drain in the City of Corona
- changes in the existing Prado Dam to provide a 190-year level of protection
- channel improvements along Santiago Creek in Orange County to provide 100-year-level flood protection
- construction of the lower Santa Ana River channel to provide 190-year level flood protection, and
- enhancement of 84 acres of degraded marshland at the mouth of the Santa Ana River for endangered species and the restoration of eight acres of marshland for wildlife habitat.

Construction of the Mainstem project started in 1990 and various stages have been phased-in based on budget approval and appropriations, engineering requirements, safety and environmental scheduling windows.

Exhibit IV-D-5: Santa Ana Mainstem Map

Local History of Dam Failure

The Huntington Beach and Fountain Valley area has never been impacted by a dam failure. To the best of our knowledge and after extensive research, the two dams (Prado and Seven Oaks) that threaten the study area have never had a known problem that impacted the area or even threatened the area. (as of October 1, 2004)

There have been a total of 45 dam failures in California. Failures have occurred for a variety of reasons, the most common failure being overtopping. Other Dams have failed due to specific shortcomings in the dam itself or an inadequate assessment of the surrounding geomorphologic characteristics. The first notable dam failure occurred in 1883 in Sierra County, while the most recent failure occurred in 1965. The greatest catastrophe relating to California dam failures was William Muholland's infamous St. Francis Dam, which failed in 1928 and resulted in a major disaster. Because of this failure and the exposure to potential risk to the general populace from a number of

water storage dams in California, the Legislature in 1929 enacted legislation providing for supervision over non-federal dams in the State. Before the enactment of this legislation, either the State Engineer or the State Railroad Commission exercised State supervision over dams. This supervision was limited in scope and extended to less than half of the dams in the State. The statute enacted in 1929 provided for (1) examination and approval or repair of dams completed prior to the effective date of the statute, August 14, 1929; (2) approval of plans and specifications, and supervision of construction of new dams, and of the enlargement, alteration, repair, or removal of existing dams; and (3) supervision over maintenance and operation of all dams of jurisdictional size. Overall, there have been at least 460 deaths from dam failures in California, as outlined on the next page.

Dam Failure Events In California			
Year Failed	**Dam**	**Location**	**Cause of Failure/Deaths**
1883	English	Sierra County	Dam Crumbles to foundations, decay of timber used
1892	Long Valley Creek	San Jacinto	Heavy rains, dam carried away by flood
1895	The Angels	Calaveras County	Undetermined during flood, poor foundation/ 1 death reported
1896	Vernon Heights	Oakland	Shallow foundation
1898	Snake Ravine	Stanislaus County	Poor compaction
1905	Piedmont No.1	Oakland	Outlet pipe sheared off at core wall
1906	San Andreas		Crack along axis
1912	Morena	San Diego	Overtopping
1916	Lower Otay	San Diego	Leakage and overtopping due to inadequate spillway
1918	Lake Hodges	San Diego	Cracks in pier
1963	Baldwin Hills	Los Angeles	Leak through embankment turned into washout/ 3 Deaths
1964	Hell Hole	Rubicon River	Failed during construction due to unprecedented rains
1965	Matilija	Ventura	Bad foundation and concrete disintegrating

Information was taken from UC Davis Civil & Environmental Engineering
http://cee.engr.ucdavis.edu/faculty/lund/dam_history

Dam Failure Hazard Assessment

Hazard Identification

A dam failure threat to the cities of Huntington Beach and Fountain Valley are considered low to moderate. This is a low probability incident with high consequences. More than 75% of the city of Huntington Beach is in the inundation area of Prado Dam. More than 98% of the city of Huntington Beach is in the inundation area.

The Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee ranked dam failure as follows:

City	Hazard	Ranking
Huntington Beach	Dam Failure	16 of 18 hazards
Fountain Valley	Dam Failure	8 of 13

Huntington Beach has identified 18 hazards that could impact the City while Fountain Valley has identified 13.

City	Chance of Occurrence	Effect
Huntington Beach	2	8
Fountain Valley	2	5

Chance of Occurrence and **Effect** numbers are rated from one to ten.
Higher numbers signify greater chance of occurrence and a greater effect.
Chance of Occurrence is based on history, geography, and potential.
Effect is based on the worst-case scenario.

The Hazard Mitigation Committee met May 13, 2004 to discuss the dam failure hazard. A discussion followed as to what percent of each city area could be impacted by a dam failure. The Committee came to a consensus on the following percentages:

City	Percentage of City that could be impacted by a Dam Failure
Huntington Beach	75%
Fountain Valley	98%

Warning System

Emergency Readiness Stages

There are six levels or stages of response actions keyed to the Santa Ana River flow, measured at the 5th Street Bridge in Santa Ana. The Orange County Flood Control District/Orange County Resources and Development Management Department - Storm Center will declare readiness stages based on a variety of circumstances; weather forecasts not only for the immediate area but the entire drainage basin, tidal conditions, dam releases, and levee conditions.

Following are the Emergency Readiness Stages:

- **STAGE I:** (Watch): Light to moderate rain.
- **STAGE II:** Moderate to heavy rain.
- **STAGE III:** Beginning system deterioration; Continuation of heavy rain.
- **STAGE IV:** Emergency Operations are likely to be beyond City control, increasing threat/or damage to property.
- **STAGE V:** Heavy damage, potential/or actual; Orange County declaration of emergency.
- **STAGE VI:** Damage beyond all local resources; Governor's Declaration – State of Emergency.
- **STAGE VII:** Presidential Declaration.

Evacuation

Mass evacuation of the inundation areas is essential to save lives, if warning time permits. Extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food, and temporary shelter would be required for injured or displaced persons. Identification and burial of many dead persons (if evacuations were not successful) would pose difficult problems; public health issues after the initial emergency would be a major concern. Many families would be separated, particularly if the failure should occur during working hours, and a personal injury or locator system would be essential. These and other emergency operations could be seriously hampered by the loss of communications, damage to transportation routes, and the disruption of public utilities and other essential services. Cleanup operations would be extremely expensive and take months.

Peak Elevation Distance and Time

The following are examples of “distance from the dam” and “peak elevation times” to assist the cities in planning evacuations. Evacuation areas would include all residents in low-lying areas. (See Exhibit IV-D-6.)

Beach Blvd. and Edinger Avenue

Distance from Dam:	27	miles
Arrival Time:	8.5	hours
Peak Elevation:	32	NGVD
Time of Peak Elevation:	10.25	hours
Average Over Bank Depth:	7	feet

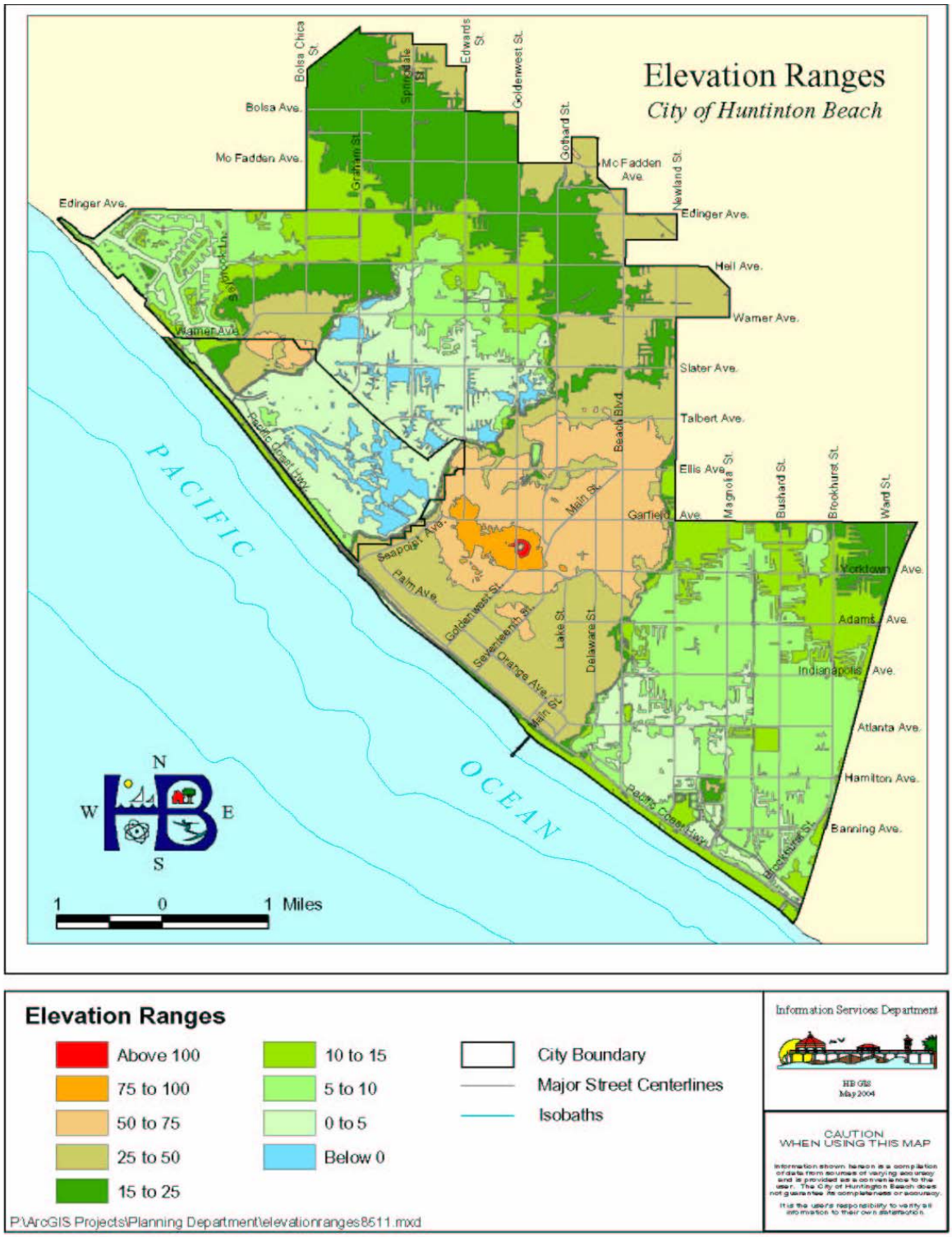
Garfield Avenue and Ellis Avenue

Distance from Dam:	31	miles
Arrival Time:	9.5	hours
Peak Elevation:	9	NGVD
Time of Peak Elevation:	15.5	hours
Average Over Bank Depth:	4	feet

Beach Blvd. and Atlanta Avenue

Distance from Dam:	31.5	miles
Arrival Time:	9.5	hours
Peak Elevation:	9	NGVD
Time of Peak Elevation:	15.5	hours
Average Over Bank Depth:	4	feet

Exhibit IV-D-6: Huntington Beach Elevation Ranges Map



School Impacts

Schools would also be heavily impacted if a dam failed. Many School Districts and schools are located along the Santa Ana River and the coastline. They would have to be evacuated immediately. All School Districts should be notified if there is a dam failure.

Exhibit IV-D-7: Huntington Beach School Sites Impacted

Huntington Beach Union High School District

District Office	RD 427
Edison High School	RD 431
Ocean View High School	RD 271
HB Adult School/Coast HS	RD 261
Marina High School	RD 147

Huntington Beach City School District

Eader School	RD 475
Kettler School	RD 464
Peterson School	RD 453
Sowers School	RD 455
Hawes School	RD 446
Moffett School	RD 444

Ocean View School District

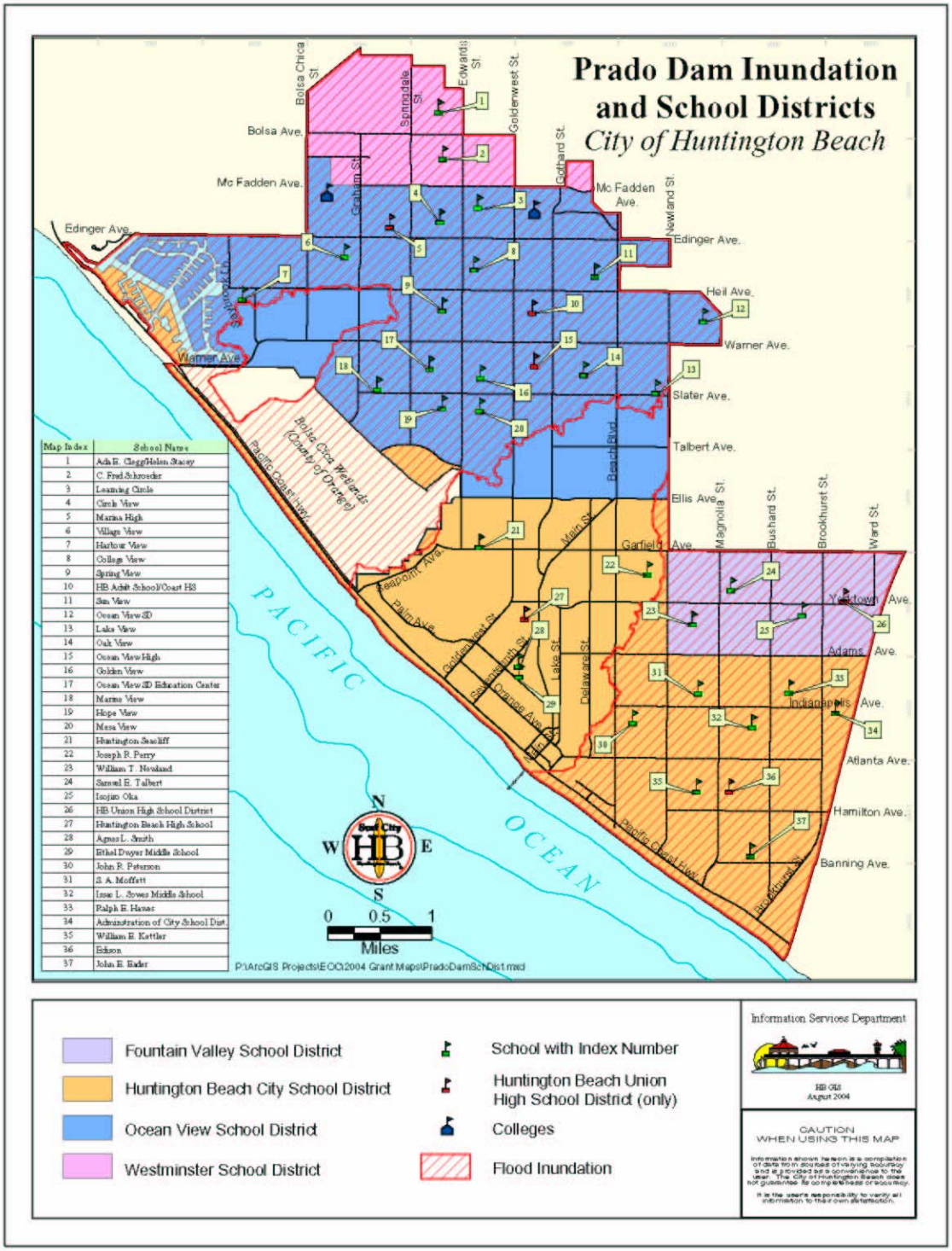
Learning Circle	RD 149
Circle View	RD 148
Village View	RD 155
College View	RD 159
Sun View	RD 252
Lake View	RD 273
Marine View	RD 177
Golden View	RD 179
Mesa View	RD 189
Oak View	RD 272
Harbour View	RD 164
Spring View	RD 168
School District EOC	RD 178
School District Education Center	RD 178

Fountain Valley School District

Newland School	RD 434
Talbert School	RD 435
Oka	RD 436

See Exhibit IV-D-8 Huntington Beach Prado Inundation and School Sites on page 28 for a complete map.

Exhibit IV-D-8: Prado Dam Inundation and School Districts Sites



Map Index	School Name
1	Ada B. Clegg/Helen Stacey
2	C. Fred Schroeder
3	Learning Circle
4	Circle View
5	Marina High
6	Village View
7	Harbour View
8	College View
9	Spring View
10	HB Adult School/Coast HS
11	Sun View
12	Ocean View SD
13	Lake View
14	Oak View
15	Ocean View High
16	Golden View
17	Ocean View SD Education Center
18	Marine View
19	Hope View
20	Mesa View
21	Huntington Seacliff
22	Joseph R. Perry
23	William T. Newland
24	Samuel E. Talbert
25	Isojiro Oka
26	HB Union High School District
27	Huntington Beach High School
28	Agnes L. Smith
29	Ethel Dwyer Middle School
30	John R. Peterson
31	J. A. Moffatt
32	Isaac L. Stowe Middle School
33	Ralph E. Hawes
34	Administration of City School Dist.
35	William E. Kettler
36	Edison
37	John E. Euler

Vulnerability and Risk
It is a future goal of the cities to complete a HAZUS vulnerability assessment. It would include impacts on life, property, infrastructure, and transportation exposed to a flood and would assist in dam failure flooding estimimates. Funds are not available at this time to conduct this study.

Community Dam Failure Issues

What is Susceptible to Dam Failure?

Life and Property
Based on the "local" history events of flooding along the Santa Ana River, we can conclude that cities of Huntington Beach and Fountain Valley would be heavily impacted. The largest impact on the communities from a dam failure event is the loss of life and property.

Known risk areas include, but are not limited to:

- North and South sections of the city of Huntington Beach including the coastline (Refer to Exhibit IV-D-4, the Prado Dam Inundation Map on page 17)
- Fountain Valley areas along the Santa Ana River and all low-lying areas of Fountain Valley

The cities would utilize every method known to warn the public of an impending dam failure including the following systems:

- Warning Siren System (Huntington Beach only)
- Emergency Alerting System (EAS)
- Teleminder (Huntington Beach only)
- Police and Fire sirens
- Police helicopter loudspeakers
- Door-to-door canvassing

This would greatly reduce injuries and loss of life.

Residential
Property along the flood channel and coastline could be devastated. Huntington Beach and Fountain Valley are affluent communities; the median price of a home is $606,000. Dam failure could potentially destroy or damage hundreds to thousands of homes spreading debris for miles. A dam failure could devastate both cities' economies.

Estimate
If 75% of Huntington Beach's structures were damaged or destroyed and there are 77,800 dwellings, that means the worst-case scenario is 58,350 structures damaged or destroyed.

Commercial

Huntington Beach and Fountain Valley are very desirable places to live and visit. The local governments rely heavily on tourism and sales tax. A dam failure event would impact businesses by damaging property and infrastructure and by interrupting business and services. Any residential or commercial structure with weak reinforcement in the impact area would be susceptible to damage.

Infrastructure

Dam failure can cause damaged buildings, power lines, and other property and infrastructure due to flooding. A dam failure can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Damage to public water and sewer systems, transportation networks, and flood channels would greatly impact the life of residents of both Huntington Beach and Fountain Valley.

Roads blocked by objects during a dam failure may have severe consequences to people who are attempting to evacuate or who need emergency services. Emergency response operations can be complicated when roads are blocked by water or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from dam failure related to both physical damages and interrupted services.

Exhibit IV-D-9: Huntington Beach Impacted Essential Service Facilities

Name of Facility	Address	Contact Person	Contact #	*RD*	Generator	Other Information
Station 4 Magnolia Fire Station	21441 Magnolia Ave	Fire Chief Duane Olson	536-5475	464	YES	Emergency response
Station 8 Heil Fire Station	5891 Heil Ave	Fire Chief Duane Olson	536-5464	157	YES	Emergency response
Public Works Don Kiser Corporate Yard	17371 Gothard St	Jim Jones	536-5024	271	NO	Backup EOC and Public Works Dept Ops Center
Public Works Park, Tree and Landscape Yard	17581 Gothard St	Jim Jones	536-5024	281	NO	Location of City maintenance resources
Beach Maintenance Yard	8669 Edison	Larry Neishi	536-5287	474	NO	City resources
Marine Safety Headquarters	103 PCH	Kyle Lindo	536-5281	461	Yes	Backup EOC and Marine Safety Dept Ops Center
Ocean View High School	17071 Gothard St	Principal Karen Gilden	848-0656	271	YES 5k only	Shelter, Staging Area, Disaster Application Center (DAC)
Edison High School	21400 Magnolia Ave	Principal Cynthia Clark	962-1356	465	YES 5k only	Shelter, Staging Area, DAC
HB City School District EOC	20451 Craimer	Dick Masters	964-8888	447	YES	Manages school district operations
Ocean View SD EOC	8291 Warner	Carolyn Stocker	847-2551	263	No Response	Manages school district operations

See Huntington Beach Prado Dam Inundation and Essential Service Facilities Exhibit IV-D-10 on page 31 for a complete map.

Exhibit IV-D-10: HB Prado Dam Inundation Essential Service Facilities

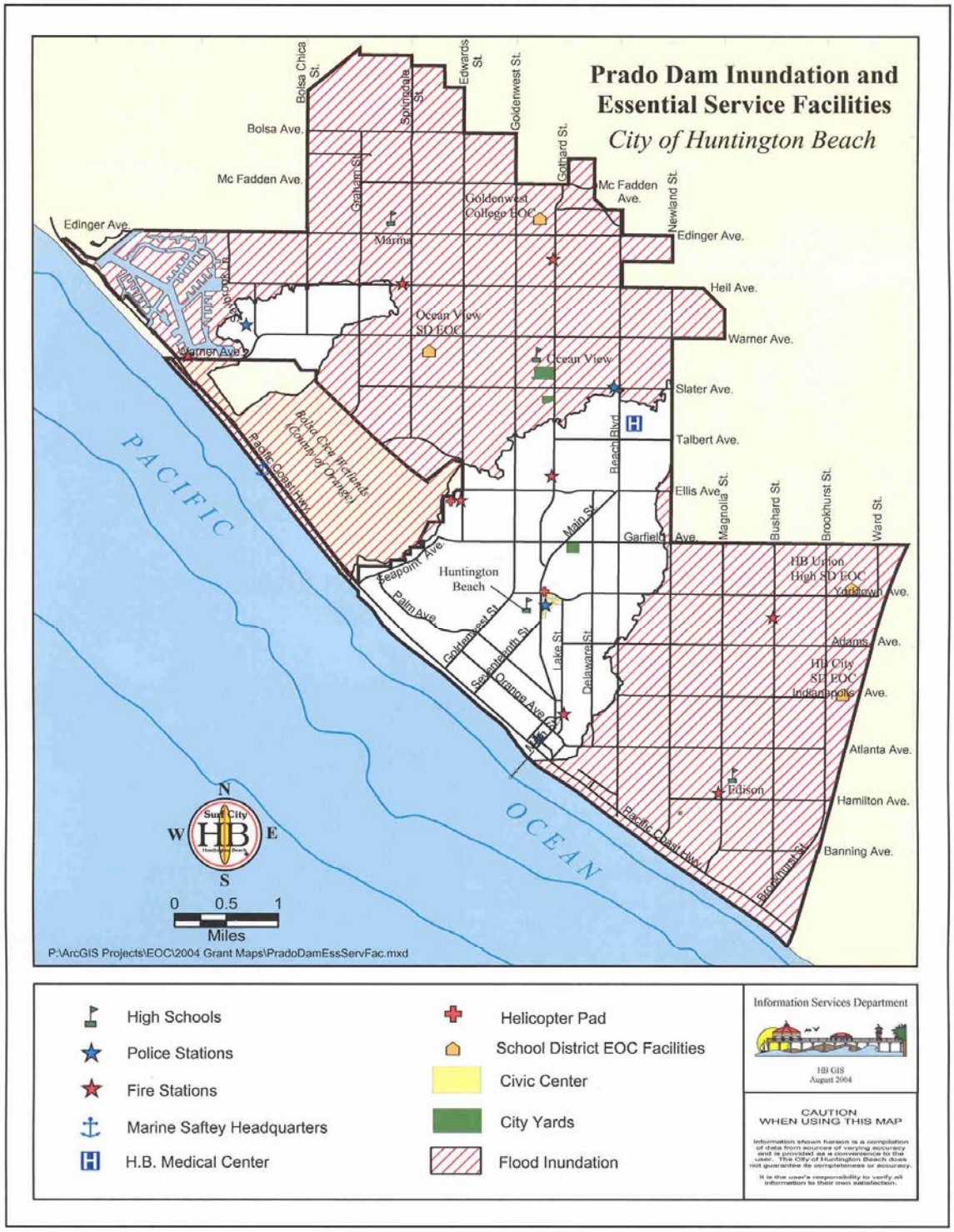


Exhibit IV-D-11: Fountain Valley Impacted Essential Service Facilities

Name of Facility	Address	Contact Person	Contact #	RD	Other Information
Police Facility	10200 Slater	Police Chief Paul Sorrell	593-4453	3420 55	Public Safety Answering Point (PSAP)
City EOC Police Briefing Room	10200 Slater	Chief Steve Nagel	593-4436	3420 55	Manage city emergencies
City Hall	10200 Slater	City Manager Office	593-4410	3420 55	City-wide records and maps
Fire Station #1	17737 Bushard	Fire Chief Mark Haskell	593-4436	3419 54	Emergency response
Fire Station #2	16767 Newhope	Fire Chief Mark Haskell	593-4436	3222 37	Emergency response
Fountain Valley Regional Hospital & Medical Center	17100 Euclid	Hospital Switchboard	966-7200	3322 47	Hospital
Orange Coast Memorial Medical Center	9920 Talbert	Administrative House Supervisor	378-7000	3519 64	Hospital
City Yard	17300 Mt Herrmann	Bob Kellison	593-4633	3322 47	Backup EOC
Los Amigos High School	16566 Newhope	Connie Van Luit	663-8288	3223	Possible Shelter
Fountain Valley High School	17816 Bushard	Connie Mayhugh	962-3301	3419	Possible Shelter
Valley Vista Continuation High School	9600 Dolphin	George Green	964-7766	3419	Possible Shelter
Fountain Valley School District	17210 Oak	Dr. Marc Ecker	843-3200	3318	District Headquarters
Coastline Community College	11460 Warner	Gary Stromland	546-7600	3322	

See Fountain Valley Prado Dam Inundation Map, Exhibit IV-D-12 and Essential Service Facilities on page 34 for a complete map.

Existing Mitigation Activities

Huntington Beach and Fountain Valley along with Orange County, State, and Federal government agencies have implemented a few dam failure mitigation activities over the years. The cities have received many awards and been acknowledged for being a leader in terms of preparing and training its residents for a disaster. Some of the current mitigation programs include:

- Improvements of the Santa Ana River Flood channel (Mainstem Project)
    - Orange County Seven Oaks Dam Flood Improvement Project to provide 350 year flood protection
    - Prado Dam Flood Improvement Project to provide190-year-level protection (to be completed in 2008)
    - Channel improvements along Santiago Creek in Orange County to provide 100-year-level flood protection
    - Construction of the lower Santa Ana River channel to provide 190-year-level flood protection, and
    - Enhancement of 84 acres of degraded marshland at the mouth of the Santa Ana River for endangered species and the restoration of 8 acres of marshland for wildlife habitat.
- City of Huntington Beach Master Plan Storm Drain Improvement Project
- City of Huntington Beach Master Plan Pump Station Improvement Project
- City of Huntington Beach Emergency Operations Plan (EOP), updated 3/2004
- City of Fountain Valley Emergency Operations Plan, updated 2/2004
- Cities of Huntington Beach and Fountain Valley Public Information Plan for Emergency Alerting System (EAS)
- Disaster Preparedness Public Education/Community Emergency Response Team (CERT) class series that teaches residents to be self-sufficient and assist in their neighborhoods in an emergency.

Dam Failure Mitigation Strategies

The dam failure mitigation strategies provide direction or specific activities that organizations and residents in Huntington Beach and Fountain Valley can undertake to reduce risk and prevent loss from a dam failure event. Each strategy is followed by ideas for implementation, which can be used by the Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee and local decision makers in pursuing strategies for implementation. The City of Huntington Beach has made these strategies a high priority as confirmed by the following statement by the Huntington Beach Mayor

> *"The issue of flooding and dam failure mitigation is a much larger issue than one City can deal with alone. It is a regional issue. Flooding mitigation efforts involve local, state, and federal government agencies. The city of Huntington Beach has benefited greatly and we are appreciative of the outstanding work the Federal Army Corps of Engineers and the Counties of Orange, Riverside, and San Bernardino have done, making flood mitigation through the Mainstem Project a high priority for the region.*

Considerable mitigation efforts have been completed and are ongoing. No jurisdiction will benefit more from these efforts than the City of Huntington Beach. Every day our communities are made safer through this collaboration."

Mayor Cathy Green
City of Huntington Beach
May 13, 2004

Dam Failure Hazard Strategies

Natural Hazard	**DAM FAILURE STRATEGY #4A**:		
Action Item	Dam Failure Education Campaign		
Coordinating Organization	Huntington Beach Fire Department Emergency Services Office		
Ideas for Implementation	Include dam failure education in all existing CERT Classes. Develop a special dam failure Education Campaign. Each year a different (1) hazard or (2) group of people is targeted. For example: (1) Y2K, Power Outages or Terrorism; (2) Schools, Mobile Home Parks, Businesses, or Neighborhoods.		
Time line	The 2005 target hazard could be dam failure if the community believes it would be a worthwhile activity.		
Constraints	Some individuals may believe this to be a waste of time due to the low probability of a dam failing in Orange County.		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**DAM FAILURE STRATEGY #4B**		
Action Item	Supporting completion of the Mainstem Project		
Coordinating Organization	Huntington Beach Fire Department Emergency Services Office		
Ideas for Implementation	Attend project meetings, tour and visit sites to ensure progress. Educate the public on the outstanding work the Army Corps of Engineers and the Counties of Orange, Riverside, and San Bernardino have done and are doing to make our communities safer.		
Time line	Till completed		
Constraints	Staff constraints due to budget cuts in the Emergency Services Office is limited on staff		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

The Huntington Beach Fire Department Emergency Services Office has conducted numerous public education campaigns over the years including preparing residents for Terrorism, Power Outages, Y2K, and Earthquakes. In addition, they have conducted campaigns directed toward special target audiences such as mobile home owners, senior and disabled populations, non-English speaking, businesses, neighborhoods, etc. The City utilizes its Community Emergency Response Team (CERT) Program as its education arm into the community. Volunteers are trained through a train-the-trainer program and they, in turn, can educate their neighborhoods, churches, businesses, schools, and community groups. This is an efficient and cost-effective way to provide public education campaigns.

All included mitigation strategies were evaluated by the Huntington Beach/Fountain Valley Hazard Mitigation Committee to determine appropriateness. Costs vs benefits were analyzed and the appropriate recommended actions are the result of this planning project. Citizen input into the hazard and mitigation strategies was coordinated through community forums on July 22 and August 5, 2004.

Exhibit IV-D-12: Proposed Activity Criteria Evaluation

The Hazard Mitigation Committee developed a chart comparing selected criteria on a one through five scale. The following criteria were analyzed: cost effective, technically feasible, environmentally sound, social impacts, activity addresses the problem, meets federal, state, and local regulations, politically acceptable, activity reduces the risk. After reviewing the chart, the committee concluded that all jurisdictions would support the proposed activities.

	PROPOSED ACTIVITY					
CRITERIA	**Strategy 4A**	**Strategy 4B**				
Cost Effective	5	5				5 = Excellent 4 = Good 3 = Fair 2 = Bad 1 = Unacceptable
Technically Feasible	5	5				
Environmentally Sound	5	5				
Social Impacts	5	5				
Activity Addresses the Problem	5	5				
Meets Federal, State, and Local Regulations	5	5				
Politically Acceptable	5	4				
Activity Reduces the Risk	5	5				
Total	40	39				

Estimated Potential Losses

Estimated Potential Losses, FEMA Worksheet 3a

The following City-specific FEMA worksheets depict the estimated loss to the number of City structures, dollar value of the structures, and the total number of people impacted. These figures are calculated by type of structure (occupancy class) and then totaled at the bottom of the chart. A complete description of how the figures were obtained is available in Part IIIB2 – Risk Assessment.

Estimated Degree of Loss, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimated the area of each city that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e., Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of damage of that area or sub area. Content losses are derived by multiplying the percent of content damage by the loss of structure. A complete description of how the figures were obtained is also available in Part IIIB2 – Risk Assessment.

Exhibit IV-D-13: Huntington Beach Estimated Potential Losses

City of: **Huntington Beach**

June 25, 2004 — Hazard: **Dam Failure** — Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	77,800	58,350	75.0%	$ 11,508,176,000	$ 8,631,130,000	75.0%	199,500	14,963	75%
Commercial	2,260	1,695	75.0%	$ 1,167,322,771	$ 875,492,000	75.0%	28,900	21,675	75%
Industrial	1,161	871	75.0%	$ 1,135,822,248	$ 851,867,000	75.0%	32,900	24,675	75%
Agricultural	0						0		75%
Religious / Non-Profit	174	130	75.0%	$ 192,900,040	$ 144,675,000	75.0%	24,000	18,000	75%
Government	129	97	75.0%	$ 361,547,570	$ 271,161,000	75.0%	900	675	75%
Education	555	416	75.0%	$ 410,857,447	$ 308,143,000	75.0%			75%
Utilities									
Total	82,079	61,559	75.0%	$ 14,776,626,076	**$ 11,082,468,000**	75.0%	286,200	214,650	75%

Exhibit IV-D-14: Fountain Valley Estimated Potential Losses

City of: **Fountain Valley**

June 28, 2004 | Hazard: **Dam Failure** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	13,729	13,043	95%	2,745,800,000	2,608,510,000	95%	55,321	52,555	95%
Commercial	268	255	95%	1,608,000,000	1,527,600,000	95%	16,734	15,897	95%
Industrial	275	261	95%	584,375,000	555,156,000	95%	13,740	13,053	95%
Agricultural	8	7	95%	1,500,000	1,425,000	95%	175	166	95%
Religious / Non-Profit	16	15	95%	19,200,000	18,240,000	95%	2,370	2,252	95%
Government	35	33	95%	26,430,000	25,109,000	95%	45	43	95%
Education	18	17	95%	96,985,000	92,136,000	95%			95%
Utilities									
Total	14,349	13631	95%	5,082,290,000	4,828,176,000	95%	88,385	83,966	95%

Exhibit IV-D-15: Huntington Beach Estimated Degree of Loss

Estimated Degree of Loss

City of: **Huntington Beach**

August 25, 2004 — Hazard: **Dam Failure** — Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	11,508,176,000								
	Out of Flood Area	25	2,877,044,000	0	-	0%	-		
	Flood depth - 4 ft.	25	2,877,044,000	58	1,668,685,520	58%	967,837,602	0	
	Flood depth - 7 ft.	50	5,754,088,000	70	4,027,861,600	70%	2,819,503,120	0	
	Totals	100	11,508,176,000		5,696,547,120		3,787,340,722	0	9,483,887,842
Commercial		75	1,167,322,771	*	577,824,772	*	384,165,924	0	961,990,696
Industrial		75	1,135,822,248	*	562,232,013	*	373,799,102	0	936,031,115
Agriculture			0						
Religious/ Non-Profit		75	192,900,040	*	95,485,520	*	63,483,403	0	158,968,923
Government		75	361,547,570	*	178,966,047	*	118,985,305	0	297,951,352
Education		75	410,857,447	*	203,374,436	*	135,213,186	0	338,587,622
Utilities									
	Totals:		14,776,626,076		7,314,429,908		4,862,987,642	0	12,177,417,549

* = Used the same ratios and formulas as Residential.

Exhibit IV-D-16: Fountain Valley Estimated Degree of Loss

Estimated Degree of Loss

City of: **Fountain Valley**

August 25, 2004 — Hazard: **Dam Failure** — Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	2,745,800,000								
	Out of Flood Area	5	137,290,000	0	-	0%	-		
	Flood depth - 4 ft.	32	878,656,000	58	509,620,480	58%	295,579,878	0	
	Flood depth - 7 ft.	63	1,729,854,000	70	1,210,897,800	70%	847,628,460	0	
	Totals	100	2,745,800,000		1,720,518,280		1,143,208,338	0	2,863,726,618
Commercial		95	1,608,000,000	*	1,007,572,800	*	669,487,584	0	1,677,060,384
Industrial		95	584,375,000	*	366,169,375	*	243,303,363	0	609,472,738
Agriculture			0						
Religious/ Non-Profit		95	19,200,000	*	12,030,720	*	7,993,882	0	20,024,602
Government		95	26,430,000	*	16,561,038	*	11,004,078	0	27,565,116
Education		95	96,985,000	*	60,770,801	*	40,379,511	0	101,150,312
Utilities									
	Totals:		5,080,790,000		3,183,623,014		2,115,376,755	0	5,298,999,769

* = Used the same ratios and formulas as Residential.

References

General Dam Information
http://damsafety.water.ca.gov/about.htm
Http://cee.engr.ucdavis.edu/faculty/lund/dams/Damlist.htm

Prado and Seven Oaks Dam Information
http://www.spl.usace.army.mil/

Mainstem Project information
http://www.spl.usace.army.mil/
http://www.co.san-bernardino.ca.us/flood/dampage.htm

Huntington Beach Publications
The City of Huntington Beach Flood Management Plan August 2000
The City of Huntington Beach Emergency Operations Plan (EOP)

FEMA Publications
State and Local Mitigation Planning How To Guide: Understanding Your Risks 386-2 Series

Part IV-E

Flood: Severe Weather and Storms
Table of Contents

FLOODS/SEVERE WEATHER/STORMS **3**
COMMUNITY DESCRIPTION **5**
Exhibit IV-E-1: Huntington Beach100 & 500 Year Rain Flood Level 6
Exhibit IV-E-2: Fountain Valley Flood Plain Map 7
Exhibit IV-E-3: Huntington Beach Elevation Ranges 8
WEATHER RELATED FLOODING **9**
EXISTING COMMUNITY FLOOD CONTROL INFRASTRUCTURE **11**
Exhibit IV-E-4: Regional Drainage System Map 12
Exhibit IV-E-5: HB Drainage Channels and Pumping Stations Map 13
Exhibit IV-E-6: FV Drainage Channels and Pumping Stations Map 14
FLOODS/SEVERE WEATHER/STORMS HAZARD ASSESSMENT **17**
LOCAL HISTORY OF FLOODING EVENTS **18**
FEMA'S NATIONAL FLOOD INSURANCE PROGRAM **22**
Exhibit IV-E-7: 100 & 500 Year Rain Flood Level and School Districts 23
COMMUNITY FLOODING ISSUES **24**
Exhibit IV-E-8: 100 & 500 Year Flood Level and Government Facilities 25
Exhibit IV-E-9: Huntington Beach History of Local Flooding Map 26
EXISTING MITIGATION STRATEGIES **27**
Exhibit IV-E-10: Huntington Beach100 & 500 Year Rain Flood Level 33
Essential Service Facilities 34
Government Facilities (Non-City) 35
FLOODING MITIGATION STRATEGIES **36**
Exhibit IV-E-11: Proposed Activity Criteria Evaluation 39
ESTIMATED POTENTIAL LOSSES **40**
Exhibit IV-E-12: Huntington Beach Estimated Potential Losses 41
Exhibit IV-E-13: Fountain Valley Estimated Potential Losses 41
Exhibit IV-E-14: Huntington Beach Estimated Degree of Loss 43
Exhibit IV-E-15: Fountain Valley Estimated Degree of Loss 44

(This page intentionally left blank)

Floods/Severe Weather/Storms

Based on history, a flood is the most common type of disaster, either natural or man caused. Flooding situations have occurred in all the 50 states. Land along rivers and streams, lakeshores, and coastlines are particularly susceptible to flooding.

Each year, many low-lying areas of Huntington Beach and Fountain Valley face flooding problems. There are areas that are below and near sea level. The water damage is costly to those who are unprepared. The primary responsibility of the local governments during widespread flooding is to protect public safety. Secondary is protection of the environment followed by property such as: highways, streets, bridges, and structure protection.

The types and causes of flooding that can occur within Huntington Beach and Fountain Valley boundaries are the result of:

- Heavy rains
- Flood control channel overflow
- Santa Ana River overflow
- High tides
- Waste water flooding within residences as a result of lift station failures
- Coastal, tropical, and/or hurricane storms
- Tsunami
- Tornadoes
- Accidents such as reservoir leaks and water main breaks
- High water table

Some flooding occurs on an average of every other year in the Orange County area with severe floods occurring approximately every ten (10) years. Floods resulting from heavy rains and coastal storms are the most common disaster affecting Huntington Beach and Fountain Valley, which is why extra effort has been made to prepare for flood emergencies.

What are floods?

A flood occurs any time a body of water rises to cover what is usually dry land. Floods have many causes, including heavy rains, spring snowmelt, tsunamis, hurricanes, coastal storms, and dam or levee failure. When flooding occurs, affected areas may sustain damage to structures and personal property, as well as severe damage to the environment in the form of soil erosion and deforestation and damage to utilities and transportation systems.

The special hazards that threaten Huntington Beach and Fountain Valley include:

- Santa Ana River - Inland runoff from San Bernardino, Riverside, and Orange Counties fill the Santa Ana River. The river is the eastern border of both Fountain Valley and Huntington Beach. The mouth of the river flows into the

Pacific Ocean in Huntington Beach. According to Fountain Valley City staff, the Santa Ana River is no longer a major threat to the City of Fountain Valley. Due to all the flood channel improvements by the County and the Army Corps of Engineers, the risk of being impacted by the Santa Ana River is minimal.

- Pacific Ocean: being a coastal community increases the threat of storms with high winds and flooding.
- High tides: during high tides, it may become more difficult or even impossible for the Santa Ana River to empty into the ocean and therefore cause floodwaters to back up in residential areas as occurred during an El Niño season in 1983.
- Tsunami: although tsunamis are extremely rare to the West Coast of the continental United States, they remain a possibility here as in every coastal area.
- Dam Failure: there are two flood control dams that control flood flow of the Santa Ana River. The Seven Oaks Dam is located on the river in the upper Santa Canyon about eight miles northeast of the City of Redlands in San Bernardino County. This dam was completed in 1999. The Prado Dam is about 40 miles downstream of the Seven Oaks Dam. Approximately 47 billion gallons (145,600 acre-feet) of water can be stored in the Seven Oaks reservoir and 61 billion gallons (187,600 acre-feet) in the Prado reservoir.

NOTE: Flooding caused by tsunamis and dam failures are covered in other sections of this Hazard Mitigation Plan.

Indianapolis Avenue and Beach Boulevard area in Huntington Beach – 1983 El Niño

Community Description

Huntington Beach and Fountain Valley are located at the northwestern edge of Orange County. Exhibits IV-E-1 and IV-E-2 show the potential flooding hazard within the Huntington Beach and Fountain Valley areas.

(The City of Fountain Valley does not have GIS mapping capability. Therefore, limited Fountain Valley specific maps are included.)

Huntington Beach and Fountain Valley have a mean annual rainfall of 12 inches, and a mean monthly temperature of approximately 62° F. The topography, which is primarily flat, varies from below sea level to over 100 feet above sea level. There are two mesa areas of Huntington Beach that disrupt the steady slope of the land toward the ocean. A considerable portion of the community is less than 10 feet above sea level and properties located in the eastern portion are lower than the Santa Ana River (See Exhibit IV-E-3). Several areas of the beach in Huntington Beach are also lower than the top of the adjacent County flood control channel.

Three major highways traverse the Cities to provide both regional and inter-regional access. Pacific Coast Highway (State Highway 1) parallels the shore and provides regional access from Newport Beach to Seal Beach. State Highway 39 (Beach Boulevard) runs in a north-south direction. It provides access from Orange and Los Angeles Counties to the coast. Interstate 405 (San Diego Freeway) at the northern edge of the City provides regional access to coastal cities in both Orange and Los Angeles Counties.

Good Shepherd Cemetery Huntington Beach viewed from Newman Avenue - 1994

Exhibit IV-E-1: Huntington Beach100 & 500 Year Rain Flood Level

Exhibit IV-E-2: Fountain Valley Flood Plain Map

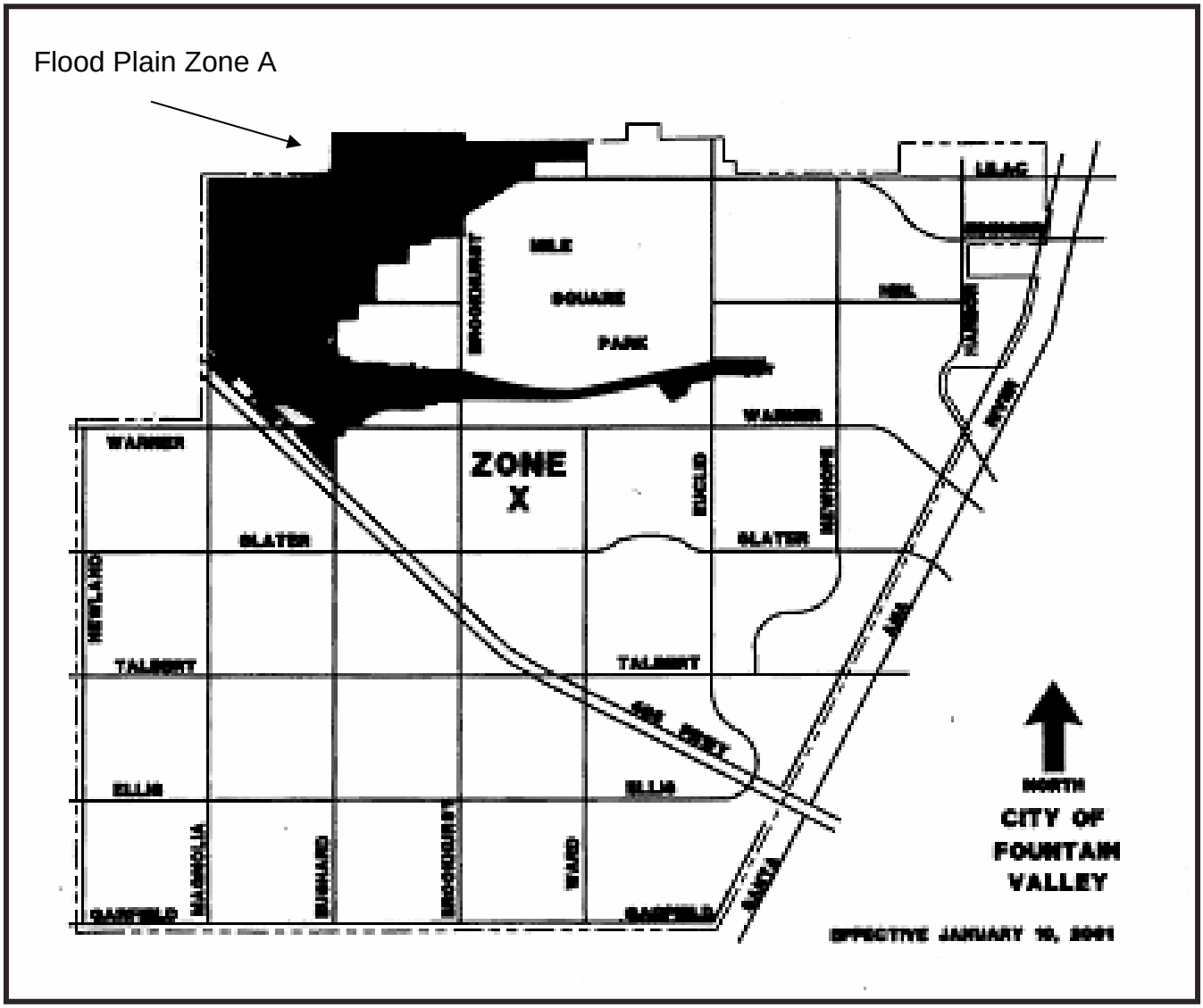
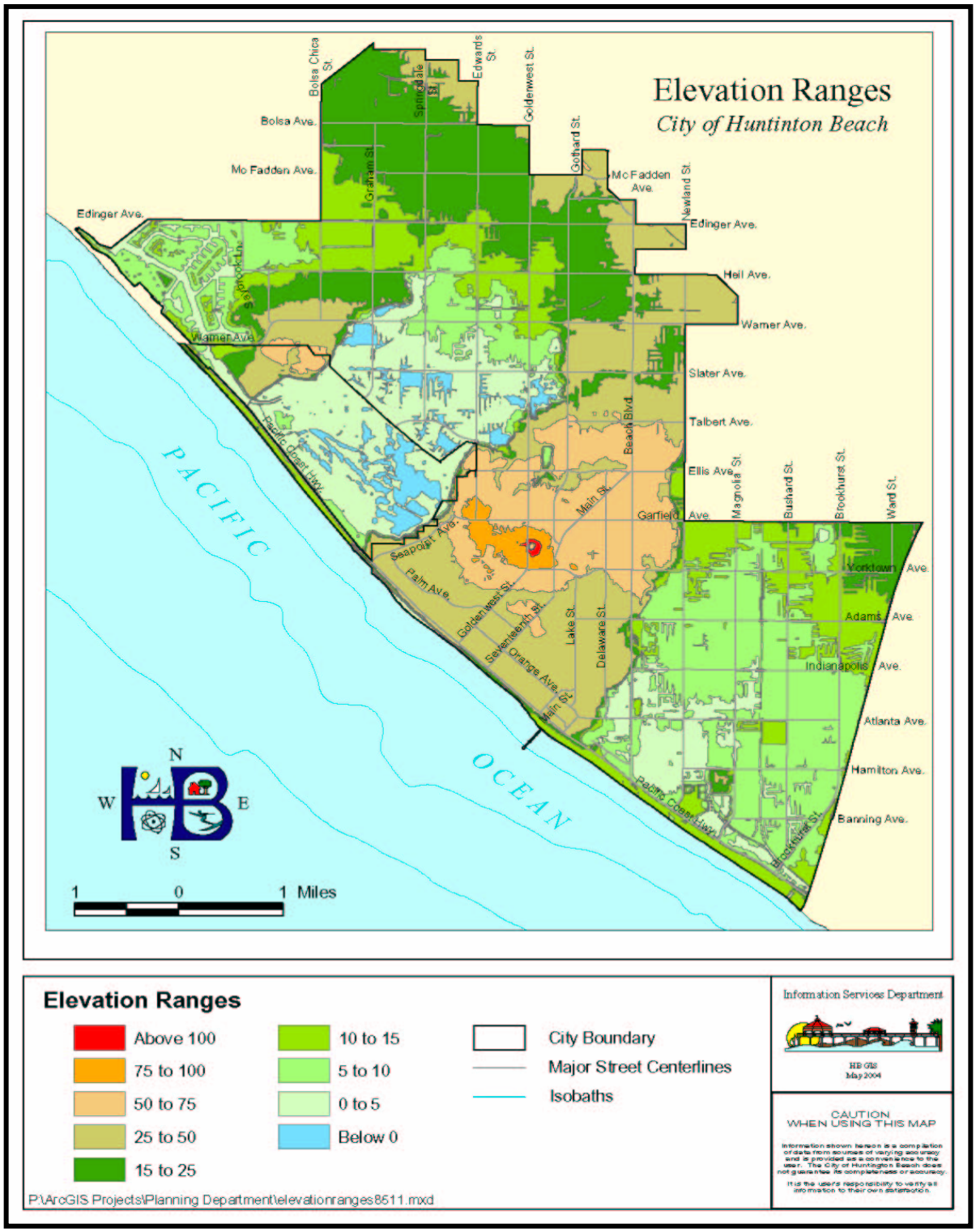


Exhibit IV-E-3: Huntington Beach Elevation Ranges



Weather Related Flooding

Huntington Beach and Fountain Valley weather conditions are consistent with coastal southern California, which is semi-arid. Summer months are warm and dry. A threat of severe winter storms is greatest during December through March. The threat from tropical storms is greatest August through October as a result of hurricanes from Mexico. The southwest facing beach of Huntington Beach can experience surf and wave impact from both winter and summer storms. Heavy rains combined with high tide and rough surf create an increased potential for flooding. High tides may prevent the Santa Ana River flow into the ocean and result in flooding in the south end of the Huntington Beach.

Tropical Storms

The Cities have experienced tropical storms related to an El Niño condition. An El Niño is an oceanic and atmospheric phenomenon in the Pacific Ocean that causes climatic disturbances. The disturbances occur when the ocean temperatures in the southeastern portion of the Pacific are unusually high. Air pressure is very low over the warm water. This causes the moist air to rise, causing clouds and heavy rainfall. As the trade winds blow from east to west, the unusually warm weather and tropical rainstorms hit southern California including Huntington Beach and Fountain Valley.

Heavy Rain

Several areas in the City of Huntington Beach have repeatedly experienced local flooding due to heavy rain. Many of these areas are adjacent to pump stations and/or flood control channels that are not capable of containing the floodwaters. Several areas are low-lying areas where proper drainage is not provided. (Refer to Exhibit IV-E-4 Regional Drainage System Map). And, in some areas, there are no catch basins to direct water flow to a storm drainage system. Because the City of Huntington Beach is relatively flat, there is not enough decline in elevation to allow water flow by gravity to the ocean and pumps must be used or provided to ensure timely drainage.

During periods of heavy rains, water fills the storm drainage system to capacity. Nearby pump stations are unable to pump the accumulated rainwater into the substandard flood control channels. Drainage problems occur as the excess water begins to fill streets and accumulates on adjacent properties.

High Water Table/Wetlands

A large portion of the southeastern area of the City of Huntington Beach has a high water table. When the City experiences heavy rains, the land is incapable of absorbing any additional water and flooding may occur. Some of the high water table areas have been classified as wetlands. Wetlands are found on the inland side of Pacific Coast Highway between the Santa Ana River and Beach Boulevard and in the Bolsa Chica area inland of Pacific Coast Highway between Warner Avenue and Seapoint Street. The Talbert Marsh wetland and the Bolsa Chica receive local drainage waters and tidal

influx from the Pacific Ocean. These wetlands provide a holding area for localized flooding and a habitat for wildlife.

High Tides

Tides are the periodic rise and fall of all ocean waters resulting from the gravitational attraction of the moon and the sun upon the water and upon the earth. Because the moon is much closer to the earth than the sun, it is the principal cause of tides. The location of the moon over the earth creates a powerful pull on the water, which then rises above its normal level. High and low waters alternate in a continuous cycle with two high waters and two low waters every lunar day. The average lunar day is 24 hours, 50 minutes, and 28 seconds. Two successive high or low waters are generally the same height.

High Surf

High surf occurs when wind from storms at sea forces the water level and wave action toward the shore. Typical surf in Huntington Beach is two to four feet, and waves up to 25 feet have occurred during heavy storms.

Beach/Bluff Erosion

Beach and bluff erosion is a result of the high tides and high surf. Continual erosion could impact highway and beach access and possible bluff failure.

Other Geological Hazards

Some geologic hazards may create or be affected by flooding. These include earthquake faults, subsidence, and unstable slopes. A series of earthquake faults traverse the City of Huntington Beach. An earthquake could rupture water lines, damage bridges and flood control channels, or create crevices that would allow water accumulation. Earthquake tremors can cause soils with liquefaction potential to lose strength and liquefy. This may result in ground settlement, which sometimes causes buildings to sink or tip over, or shallow landslide conditions.

Oil, water, and gas extraction in the City of Huntington Beach has created areas where subsidence may occur. This extraction reduces the force on the ground surface allowing land and/or structures to collapse and become more tightly packed. Sea level rise affects coastal flooding as land subsidence occurs. When the two are combined there is threat of serious future flood damage to the coastal areas. Unstable slopes may fail during heavy rains and may create mudflows.

These hazards plus methane, which is found in areas where oil extraction has occurred, are addressed in the Hazard Element of the General Plan. Methane does not create or impact flood damage but is a known hazard to the community. It is included for information only.

Existing Community Flood Control Infrastructure

As stated earlier, each year, some low-lying areas of Huntington Beach and Fountain Valley face flooding situations. The Federal, State, County, and City governments have completed many projects to mitigate these conditions. Efforts are still ongoing to further mitigate the problem and to accommodate new homes and businesses. These efforts include the: Prado and Seven Oaks Dams, Santa Ana River Mainstem Project, Flood Control Channels, and Pump Stations.

Santa Ana River Mainstem Project

Almost thirty years ago, planning efforts began to tame the Santa Ana River, which is the greatest flood threat west of the Mississippi River. This project is known as the Santa Ana River Mainstem Project and cost $1.4 billion. A coordinated effort between Local, County, State and Federal agencies and the business community was realized in 1990 when land was cleared in preparation for construction of the Seven Oaks Dam, a 550 foot high, 3,000 foot long dam, in San Bernardino County. In 1991, construction began on the lower three miles of the riverbed from Adams Avenue to the Pacific Ocean. The river channel adjacent to Huntington Beach was deepened, widened, and lined with concrete. Later the remaining portion of the river in Orange County was completed. The Seven Oaks Dam was completed in 1999. These measures protect Huntington Beach and Fountain Valley from a 100 year flood caused by heavy and prolonged mountain rainfall and/or sudden snowmelt.

A core component of the Santa Ana River Mainstem Project includes the increase in the Prado Dam's capacity to maintain a major flood. The Prado Dam will be raised 28.4 feet and approximately 2,000 acres added to accommodate the reservoir behind it. This portion of the project when completed will provide protection to the Cities of Huntington Beach and Fountain Valley from a 190 year flood. Lack of sufficient funding sources and the Orange County bankruptcy have impacted the progress of the Prado Dam project. Later Federal legislation appropriated partial funds for this project. The anticipated completion date is 2005. Prado Dam expenses are estimated to be $470 million.

Flood Control Channels

Large amounts of water from other parts of Orange County flow through Fountain Valley and Huntington Beach on the way to the ocean. These regional water flows are carried through flood control channels owned and operated by the County of Orange. In addition to these channels, the City of Huntington Beach maintains flood control channels to drain local floodwaters. (See Exhibits IV-E-4, IV-E-6 and IV-E-6 on the following pages.)

Exhibit IV-E-4: Regional Drainage System Map

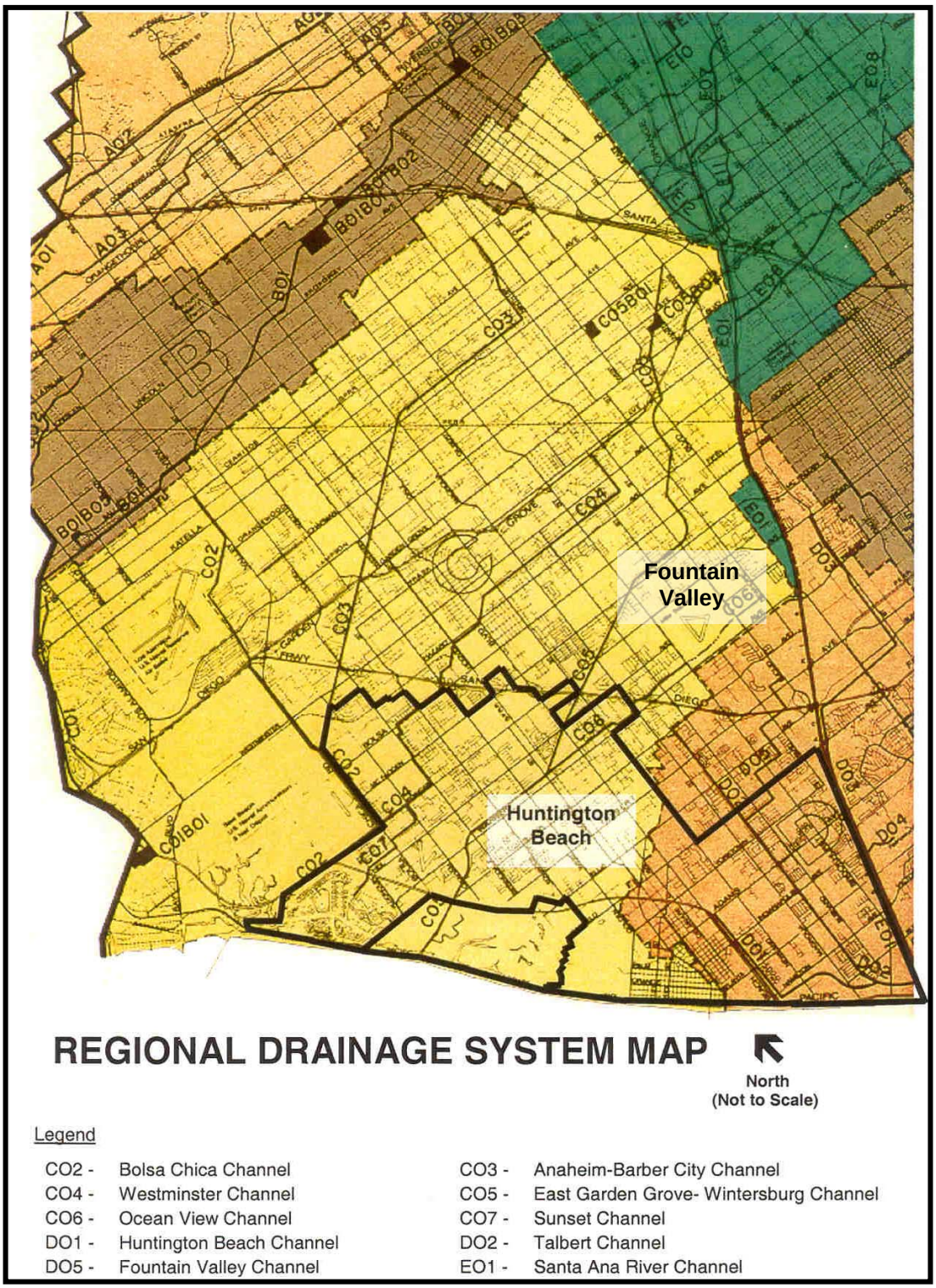


Exhibit IV-E-5: HB Drainage Channels and Pumping Stations Map

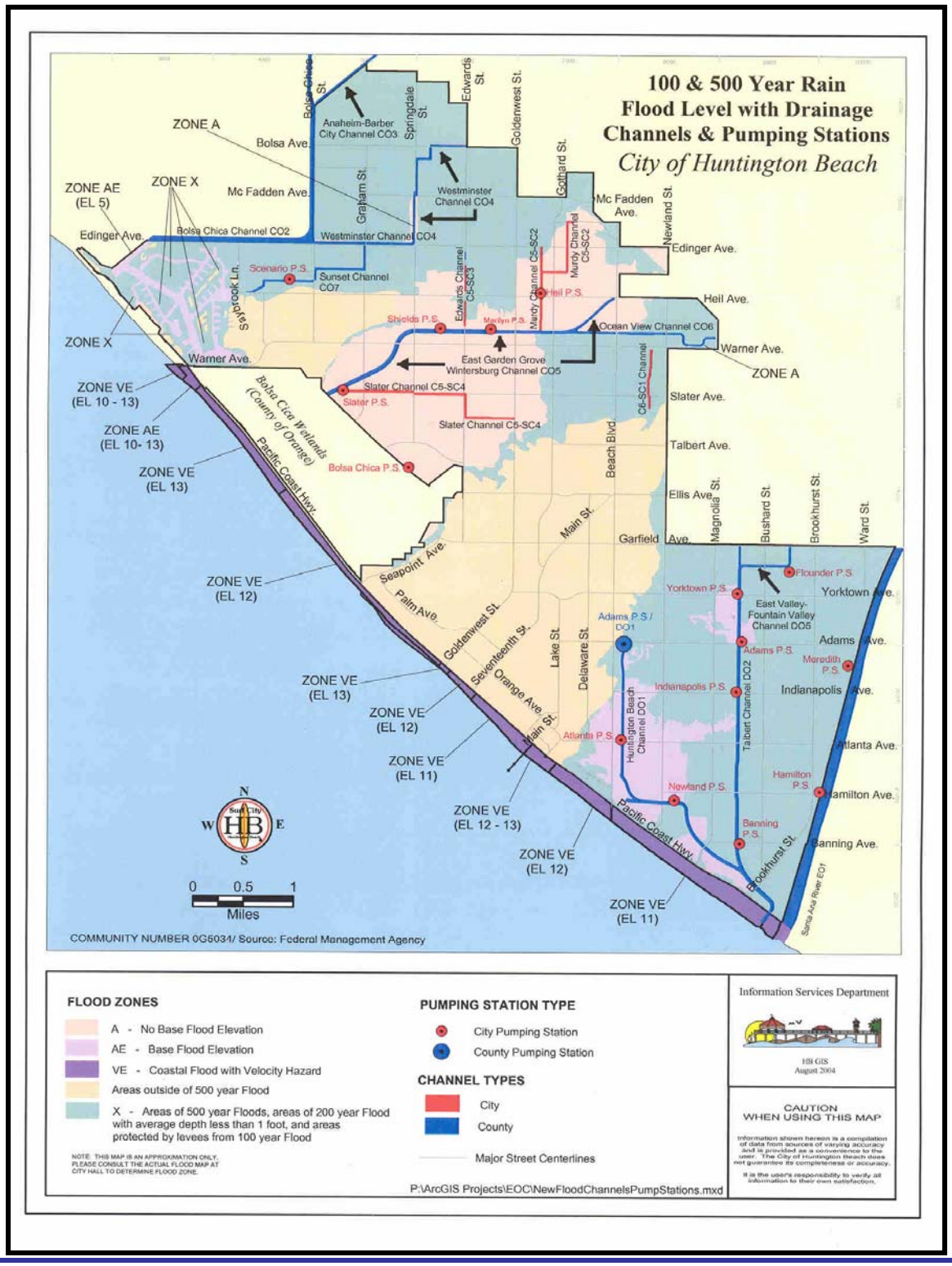
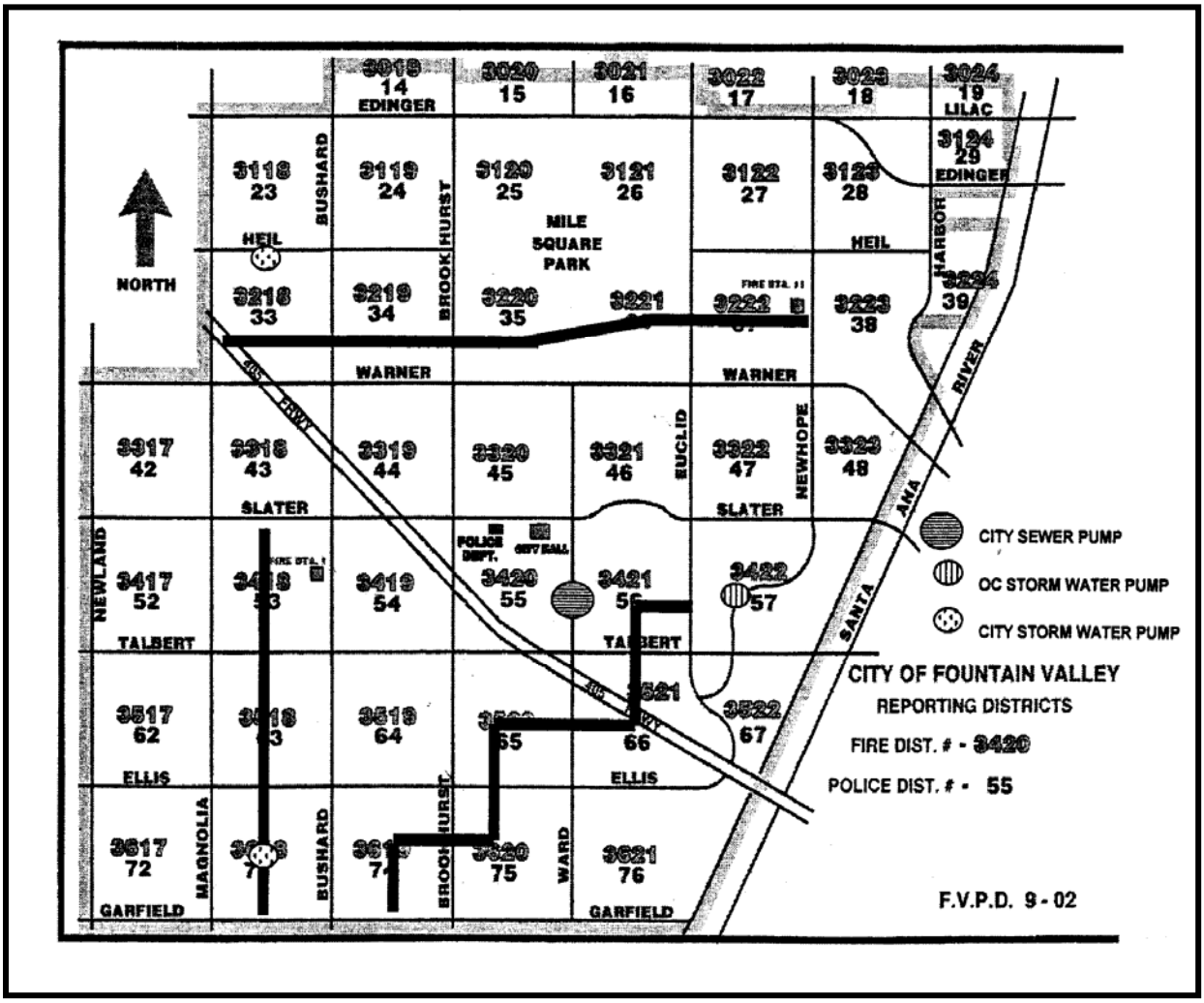


Exhibit IV-E-6: FV Drainage Channels and Pumping Stations Map



County Channels
The existing County channels were constructed in the early 1960s to meet 65 percent of the 25 year rainfall (flood) level, the design criterion at that time. These channels were constructed with a restrictive bottom, which reduces the amount of water that could be carried. The restrictive bottoms allow the County to slow the runoff water flow rate while still allowing the system to remove runoff water. At that time, the County believed that the restrictive design could be removed or the channel bottom smoothed in the future to increase the efficiency of the channel capacity.

Bartlett Park, located north of Adams Avenue and east of Beach Boulevard, is an emergency retention basin. The County has an easement on this property to retain water that will eventually be pumped by the County's pump station, that is located on the south side of Adams Avenue, downstream into the Huntington Beach (D01) channel and eventually into the Pacific Ocean. The basin was constructed approximately ten years ago.

City Channels – Huntington Beach
The City of Huntington Beach maintains four storm drain channels throughout the City. These channels were designed to accommodate up to 60 percent of a 25 year flood event. Ground level channels exacerbate flooding because the amount of water that can be pumped into these channels is less than a channel constructed below grade. Localized flooding then occurs because the pump stations are unable to pump additional water into the channel without the possibility of overflow onto adjacent properties.

City Channels – Fountain Valley
Fountain Valley maintains three local storm drain channels. These channels originate within the southern area of Fountain Valley and connect to the Ocean View (C06), the East Valley (D05), and the Talbert (D02) channels in Huntington Beach. The City also maintains two storm water pumps.

Pump Stations
There are 16 pump stations within Huntington Beach that are an important part of the drainage system. They are used to pump water flow from low lying public and private property to higher channel elevations for eventual flow to the ocean. Pump stations may also pump water into flood control channels from storm drains that do not flow directly to the ocean. One of the pump stations is owned and operated by the County of Orange; it has six pumps. The remaining stations are owned and operated by the Huntington Beach Public Works Department. Depending on the size of the tributary area a station can have two to eight pumps. Currently there are 47 pumps in the 15 City-owned stations.

Fountain Valley has two City and one County storm water pumps operated by the Fountain Valley Public Works Department.

Every station is setup differently but their functionality remains the same. The number of operating pumps in a station is correlated to the height of the water within the station. Once a predetermined elevation has been breached the first pump is activated. If the water level continues to rise, additional pumps are activated. Each pump operates in unison trying to keep the water level at the predetermined elevation. The pumps continue to run until the water level recedes. Once this happens, the pumps shut down in the opposite order that they start. Pump station locations are shown on Exhibits IV-E-5 and IV-E-6. Presently, all of the Cities pump stations are operating within their current design capacities and are considered deficient by current standards.

The County of Orange has informed the City of Huntington Beach that installation of additional pumps or pump stations will not improve the drainage problems that frequently exist during periods of heavy rains until its channels are improved. The main problem lies with the incapacity of the channel system to carry any additional water that may be pumped. Capacity in a channel is dependent on its height and width and on the design of the channel(s) downstream. When a channel does not comply with the minimum FEMA 100-year capacity, any additional water pumped into a channel may breach the channel banks, cause channel failure, and/or create flooding problems for adjacent properties.

Shields Pump Station Huntington Beach

Floods/Severe Weather/Storms Hazard Assessment

Hazard Identification

A flood event in Orange County can range from a few isolated areas where a number of streets are flooded preventing temporary access to homes and businesses, to numerous homes inundated with several feet of water causing millions of dollars of damage. Floods in the Huntington Beach and Fountain Valley area can cause extensive damage to residential and business properties, parks and recreational facilities, road and highway infrastructure, and critical utility facilities. The coastal region of Huntington Beach is the most vulnerable to tropical storms and high surf conditions affecting heavy tourist traffic on the State and Local beach properties.

The Hazard Mitigation Planning Committee ranked Floods/Severe Weather/Storms as follows:

City	Hazard	Ranking
Huntington Beach	Floods/Severe Weather/Storms	2 of 16
Fountain Valley	Floods/Severe Weather/Storms	2 of 13

City	Chance of Occurrence	Effect
Huntington Beach	10	7
Fountain Valley	10	5

Chance of Occurrence and **Effect** numbers are rated from one to ten.
Higher numbers signify greater chance of occurrence and a greater effect.
Chance of Occurrence is based on history, geography, and potential.
Effect is based on the worst-case scenario.

The Hazard Mitigation Committee met May 13, 2004 to discuss the flood hazard. A discussion followed as to what percent of each City area could be impacted by a flood. The following is the percentage the committee came to a consensus on:

City	Percentage of City that could be impacted by an Flood
Huntington Beach	35%
Fountain Valley	10%

Vulnerability and Risk

It is a future goal of the Cities to complete a HAZUS vulnerability assessment. It would include impacts on life, property, infrastructure, and transportation exposed to a flood hazard. Funds are not available at this time to conduct this study.

Local History of Flooding Events

COMPILED BY TRACEY SALTZMAN,
HUNTINGTON BEACH PLANNING INTERN
SEPTEMBER, 1995

Huntington Beach Flood History

Most of Orange County, as well as Huntington Beach, are located in a flood plain. The greatest flood was probably that of 1884 though it did comparatively little damage as the County was sparsely settled at that time. Measurement of stream flow in Southern California began in the period of 1893-1895, but it was not until after 1906 that any large number of streams was regularly measured. Previous to that time only rainfall records were available. (LA Times 3/4/38)

Since only general deductions about floods can be made from rainfall records alone, accurate information about large floods in the recent past is impossible to obtain. For still earlier information, it is necessary to look at old books, records of the missions, and the writings of early day travelers. This information is of minimal value except as an indication that floods have occurred. (LA Times 3/4/38)

1825:

The historical record of flooding in Huntington Beach dates back to the flood of 1825, which changed the course of the Santa Ana River. Previous to that year, the Santa Ana River entered the ocean several miles to the northwest of its present channel. (OC Flood Control District)

1861-62:

The flood of 1861-62 has been called the "great Flood" and the “Noachian deluge of California Floods." Beginning December 24, 1861, it rained for almost four weeks but for two brief interruptions. (Friis 52) In San Bernardino, Riverside, and Orange Counties, the Santa Ana River became a raging torrent during the flood of 1862. The prosperous colonies along the banks of the river were completely inundated, and vineyards, orchards, and grain fields became a barren waste. (OC Flood Control District)

Storms in 1862 accounted for a peak flow of 320,000 cubic feet per second in the upper river and created an inland sea in Orange County. Lasting about three weeks with water standing four feet deep up to four miles from the river, this disaster almost equaled a 200 year or worst possible flood. (City of Huntington Beach Flood Study 1974).

1884:
There were two floods in 1884, the first in the latter part of February. This flood did little damage but the large quantity of water that fell apparently used much of the absorptive capacity of the ground. The second flood came six or eight days later and did a great deal of damage. Beginning at a point below where Santiago Creek enters the Santa Ana River, the river cut through the fertile lands east of the old channel and discharged into the ocean about three miles southeast of its former outlet. (OC Flood Control District) With 32.65 inches of rain, this became the County's wettest year on record. It was noted that after one storm, it was possible to row a boat from Newport Beach to Santa Ana. (OC Register 1/13/95)

1916:
The estimated average rainfall in January and February of this year was 11 inches. After three days of rain, the Santa Ana River overflowed, sending a wall of mud through farmland and streets. Four lives were lost and property damage was estimated to be $520,500. (OC Flood Control District)

1938:
A series of heavy rainstorms in the coastal area, extending from San Diego on the south to San Luis Obispo on the north and inland to parts of the Mojave desert, produced extreme floods, the greatest within the last 70 years. (OC Flood Control District) At the peek of the flood an eight foot high wall of water swept out of the Santa Ana Canyon. (City of Huntington Beach Flood Study 1974) Just after midnight on March 3, the roaring waters of the Santa Ana River issued from Santa Ana Canyon at an estimated rate of 100,000 cubic feet per second. (Friis 145) The Great Flood of 1938 was the most destructive in Orange County's history. The swirling waters claimed 19 lives, left 2,000 homeless and deposited a thick layer of alkaline silt and debris on thousands of acres of farmland. (OC Register 1/13/95) Hours after waters subsided in other districts, flood perils struck the area between Santa Ana and Huntington Beach. An area fifteen miles long and seven miles wide was inundated as the Santa Ana River overflowed its banks near the ocean. Only the roofs showed on many of the houses surrounding Talbert, where a relief station was established. (LA Times 3/4/38)

1939:
Following a heat wave--record temperature of 119 degrees September 21--a tropical rainstorm with heavy winds walloped the coast, drowning dozens of people, sinking boats and flooding homes. (OC Register 1/13/95) In Huntington Beach, a 300 foot section of the pier was torn out. (Friis 147)

1969:
On February 24, almost six inches of rain fell, overflowing dams and flooding parks and nearby canyons. In Huntington Beach, the storm drains and flood control channels were unable to handle the extreme water flow and nearly all the lowlands were covered by

water. (OC Register 1/13/95) The twin floods of 1969 resulted in $21 million damages and five deaths. Peak velocities above Prado Dam reached 77,000 cubic feet per second and 6,000 cubic feet per second below the dam. Only emergency sandbagging efforts kept the river in its channel as it approached the City and the ocean. (City of Huntington Beach Flood Study 1974)

1983:
A series of storms lashed the County's coast, causing heavy damage to the Huntington Beach pier and flooding many homes. (OC Register 1/13/95). As a result, 780 homes in Huntington Beach were damaged, 200 of which suffered major damage. (CERT Newsletter, February 1995)

1988:
In January, a powerful storm whipped up 10 foot waves and dropped 250 feet of the Huntington Beach pier into the ocean. (OC Register 1/13/95)

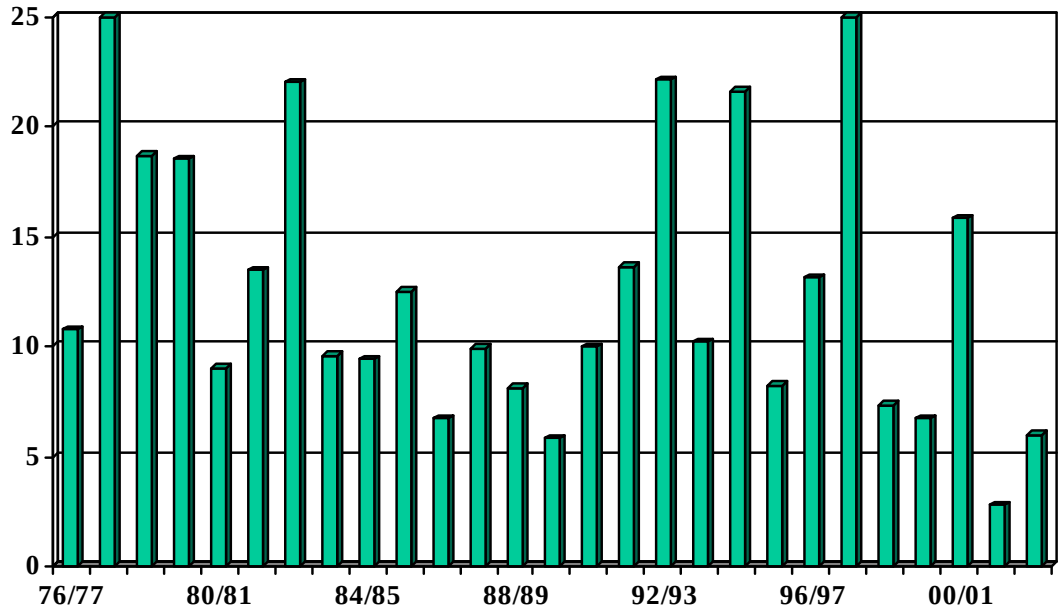
End of Pier – 1988

1995:
On January 4, Huntington Beach received 4.5 inches of water causing flooding in different areas of the City. Streets were flooded, cars were stalled and the water surrounding their homes stranded people. Marine Safety was called to evacuate eight neighborhoods where people could not safely leave their homes due to waist-high water. (CERT Newsletter, February 1995) The City was declared a disaster site on January 5. A $2.1 million claim was submitted by the Office of Emergency Services to the Federal Emergency Management Agency to recover the expenses incurred from the flood disaster.

2001:
Rainfall for fiscal year 2000/2001, measured 15.8 inches, which is above the mean average of 12 inches. Almost five inches of rain occurred during January and February 2001. During this period, Pacific Coast Highway was closed periodically due to flooding coupled with high tides.

Extreme Rainfall Years
As previously mentioned, the mean average rainfall for Huntington Beach and Fountain Valley area is 12 inches. Rainfall records measured at the Meadowlark Golf Course area for the past 23 fiscal years are shown below.

RAINFALL DATA CHART
(Cumulative Rainfall in inches)



Fiscal Years (July – June)

Periods of heavy rainfall over 20 inches are:

1977/1978	26.0 inches
1982/1983	22.5 inches
1992/1993	22.1 inches
1994/1995	21.8 inches
1997/1998	27.5 inches

FEMA'S National Flood Insurance Program

The City of Huntington Beach joined the FEMA flood insurance program on September 5, 1983 by adoption of Floodplain Regulations. Following City Council direction in 1994, the Planning Department submitted an application to FEMA for participation in the Community Rating System (CRS), a special program that rewards communities that implement more activities than the minimum requirements for participation in the flood insurance program. CRS works by awarding points for implementing certain activities. In 1995, FEMA's consultant verified the activities, which resulted in 1,112 points. The points are then related to a class rating which allows a reduction in flood insurance premiums. Following a re-verification visit by a FEMA consultant, the City earned 1,551 points and became a class 7 community effective October 1999. This allows property owners in flood zones AE, A, V, and VE a 15% reduction in flood insurance premium. A 5% reduction is the maximum available to property owners in flood zone X. Refer to Exhibit I-VE-1 for the current Huntington Beach flood zones.

In 1999, the City of Huntington Beach was notified by FEMA that 15 properties had received flood insurance benefits two or more times within a ten year period and as part of the CRS program, the City must prepare and adopt a Flood Management Plan (FMP) by October 1, 2000. Failure to adopt a FMP would jeopardize the CRS rating and insurance rate reduction.

During the FMP process, FEMA advised the City that the plan did not need to comply with the mandatory completion time because 8 of the 15 properties would benefit from recent improvements to County flood control channels. However, City staff believed that the FMP was important to the community and continued the process. The FMP was approved by the City Council on September 5, 2000, by the adoption of Resolution No. 2000-85 following approval by the City's Planning Commission in August 2000.

Section 9 (Implementation) of the FMP mandates that an annual review of the FMP's recommended activities must be presented to the City's Planning Commission and City Council as required by FEMA to demonstrate that the City is actively pursuing implementation to the FMP. Following the City Council's review of the annual report, it must be submitted to FEMA by October 1 of each year as part of the annual re-certification. Failure to adhere to this deadline may jeopardize the City's participation in the flood insurance program.

Exhibit IV-E-7: 100 & 500 Year Rain Flood Level and School Districts

Community Flooding Issues

What is Susceptible to Floods?
Areas that have experienced local flooding within the past 20 years are depicted in Exhibit IV-E-9. Common problems include: inadequate drainage, properties lower than the nearby flood control channel or lower than the nearest arterial street. During normal rains as well as heavy rains, many of the residential neighborhoods in the City of Huntington Beach experience flooding. This is a result of a common development design in the 1960-1970s that created neighborhoods below the level of the adjacent arterial. In these areas, it is common to experience curb-to-curb flooding. Many properties that have been graded in a manner that allows water flow toward the house/structure. Flooding occurs where tree roots have raised sidewalks and cracked curbs and gutters, preventing natural drainage to the storm drain.

The approved Flood Management Plan enhances the Environmental Hazards Element of the City of Huntington Beach's General Plan by providing additional hazard information and mitigation measures. The recommendation of the FMP implements seven goals. These FMP goals are listed, in priority, as follows:

1. **Flooding (EH4):** Eliminate to the greatest degree possible, the risk from flood hazards to life, property, public investment, and social order in the City.

2. **Storm Drainage (U3):** Provide a flood control system which is able to support the permitted land uses while preserving the public safety; upgrade existing deficient systems and pursue funding sources to reduce the cost of flood control to the City

3. **Tsunami (EH5):** Protect human life, to the greatest extent feasible, from tsunamis and seiche hazards.

4. **Biological Resources (ERC2):** Protect and preserve significant habitats of plant and wildlife species, including wetlands for their intrinsic values.

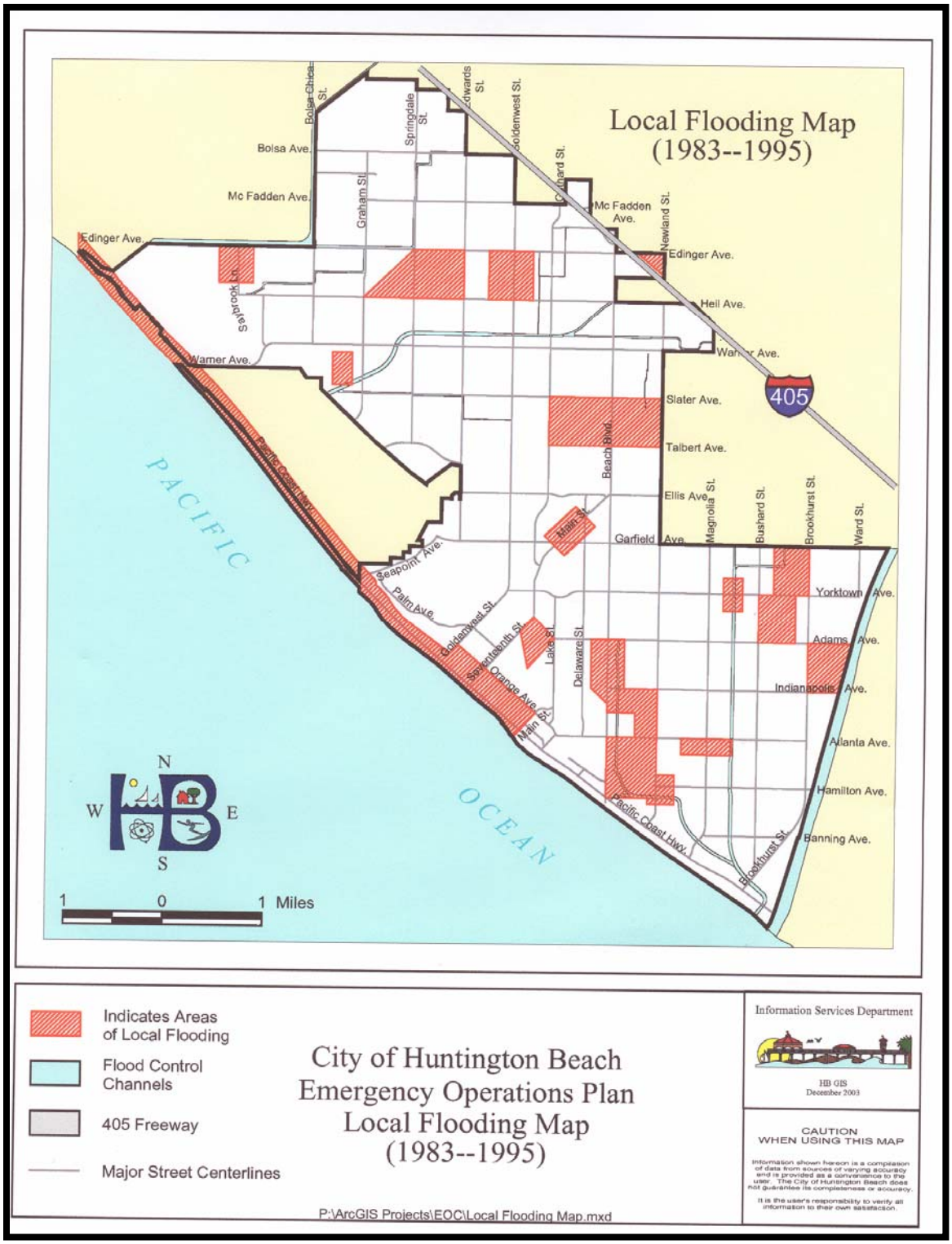
5. **Erosion (EH2):** Reduce the potential threat for mesa edge and bluff erosion hazards and the potential for beach sand loss.

6. **Open Space (LU14):** Preserve the City's open space.

7. **Historical Resources (HCR1):** Promote the preservation and restoration of the sites, structures and districts which have architectural, historical and/or archaeological significance to the Cities of Huntington Beach and Fountain Valley.

Exhibit IV-E-8: 100 & 500 Year HB Flood Level & Government Facilities

Exhibit IV-E-9: Huntington Beach History of Local Flooding Map



Existing Mitigation Strategies

Huntington Beach

The following Mitigation Activities were taken from City of Huntington Beach, "Flood Management Plan," adopted in 2000.

Goal: E4 – Flooding

Activity 8.1.1: Continue to enforce and update floodplain regulations when revised by the Federal government.
Schedule: Ongoing
Responsible Department: Planning

Activity 8.1.2: Protect public facilities from flooding.
Schedule: Ongoing
Responsible Department: Public Works

Activity 8.1.3: Assist managers and owners of critical facilities as listed in Section 5.4.3 to develop flood protection plans.
Schedule: Ongoing
Responsible Department: Fire

Activity 8.1.4: Encourage flood-proofing and retrofitting property/structures to prevent substantial flood damage and provide technical information.
Schedule: Ongoing
Responsible Departments: Planning, Fire, and Building

Activity 8.1.5: Continue to update, distribute, and provide flood protection information and materials.
Schedule: Ongoing
Responsible Departments: Planning, Fire, and Library

Activity 8.1.6: Maintain adequate flood insurance on public structures
Status: City maintains $45,000,000. Earthquake/flood insurance coverage with minimum $100,000 loss.
Schedule: Ongoing
Responsible Department: Administrative Services

Activity 8.1.7: Provide floodplain information to property and business owners, realtors, and prospective buyers and encourage flood insurance.
Schedule: Ongoing
Responsible Department: Planning

Activity 8.1.8: Maintain close liaison with nearby cities and with County, State, and Federal agencies.

Schedule: Ongoing
Responsible Departments: Planning, Public Works, and Administration

Activity 8.1.9: Continue to participate in the National Flood Insurance program and Community Rating System.
Schedule: Ongoing
Responsible Departments: Planning and Administration

Activity 8.1.10: Continue to implement the City's emergency operations procedures as outlined in the City's Emergency Management Plan, in particular, the Flood Warning and Evacuation procedures.
Schedule: Ongoing
Responsible Department: Fire

Activity 8.1.11*:* Continue to utilize citizen volunteers; e.g., Community Emergency Response Team (CERT) and Radio Amateur Civil Emergency Services (RACES)
Schedule: Ongoing
Responsible Department: Fire

Activity 8.1.12: Continue to provide a sandbag program.
Schedule: Ongoing
Responsible Department: Public Works

Activity 8.1.13: Encourage the State to modify the roadway profile of Pacific Coast highway between Warner Avenue and Golden West Street to prevent street closure due to flooding.
Schedule: Ongoing
Responsible Departments: Planning, Public Works, and Administration

Goal: U3 - Storm Drainage

Activity 8.2.1**:** Upgrade the City's flood control system (storm drains, catch basins, pump stations, and channels) to current FEMA standards (100-year floods) and concentrate on the repetitive flood areas first.
Schedule: October 2020
Responsible Department: Public Works

Activity 8.2.2: Quarterly the City Council shall lobby the County to correct, upgrade, and maintain the County's flood control system to current FEMA standards (100 year flood).
Schedule: Quarterly after January 2001.
Responsible Department: City Council

Activity 8.2.3: Evaluate existing street conditions for replacement and/or installation of facilities to allow proper conveyance of storm flows to the City's flood control system.
Schedule: January 2010
Responsible Department: Public Works

Activity 8.2.4**:** Maintain the City's flood controls system and continue biannual inspection and cleaning of the system.
Schedule: Ongoing
Responsible Department: Public Works

Activity 8.2.5: Update the City's Master Plan of Drainage to evaluate the effectiveness of the City's flood control system.
Schedule: October 2005
Responsible Department: Public Works

Activity 8.2.6: Lobby the Federal, State, and County governments to study, pursue, and expand the wetlands from Beach Boulevard to Brookhurst Street for floodwater mitigation.
Schedule: Ongoing
Responsible Departments: Planning, Public Works, and Administration

Activity 8.2.7: Evaluate and upgrade open areas, e.g., Meadowlark Golf Course, Central Park, Good Shepherd Cemetery, to eliminate offsite drainage and subsequent impact to private property.
Schedule: Ongoing
Responsible Department: Public Works

Activity 8.2.8: Continue to support reconstruction of deteriorating seawalls.
Schedule: Ongoing
Responsible Department: Planning

Activity 8.2.9: Pursue funding from County, State, and Federal Agencies.
Schedule: Ongoing
Responsible Departments: Public Works and Administration

Activity 8.2.10: Develop and support new funding sources to help accomplish drainage goals.
Schedule: Ongoing
Responsible Departments: Public Works, Administrative Services, and Administration

Activity 8.2.11: Continue to participate in County watershed studies and programs.
Status: See Activity 8.1.8
Schedule: Ongoing
Responsible Department: Public Works

Goal EH5 - Tsunami
(Note: This is covered in another section of this Hazard Mitigation Plan)

Goal ERC2 – Biological Resources

Activity 8.4.1: Implement best management practice plans and National Pollution Discharge Elimination Plans.
Schedule: Ongoing
Responsible Departments: Planning and Public Works

Activity 8.4.2: Investigate and install in-line wetlands in drainage courses wherever feasible.
Schedule: Ongoing
Responsible Department: Public Works

Activity 8.4.3: Prohibit filling of wetlands except as allowed by the General Plan.
Schedule: Ongoing
Responsible Department: Planning

Activity 8.4.4: Encourage the State to maintain the coastal dunes adjacent to the Bolsa Chica wetlands and in the Huntington Beach wetlands to better protect the areas from storm surges.
Schedule: Ongoing
Responsible Department: Community Services

Activity 8.4.5: Continue the Coastal Conservation District zoning on the wetlands.
Schedule: Ongoing
Responsible Department: Planning

Goal EH2 – Erosion

Activity 8.5.1: Establish building setbacks from all slopes including mesa and bluff edges.
Schedule: October 2010
Responsible Department: Public Works

Activity 8.5.2: Participate in the bluff (between Goldenwest and Seapoint Streets) erosion study and implement recommendations.
Schedule: Ongoing
Responsible Departments: Planning and Community Services.

Goal LU15 – Open Space

Activity 8.6.1: Limit construction in existing open space areas to only necessary structures such as restrooms, and picnic shelters.
Schedule: Ongoing
Responsible Departments: Planning and Community Services

Activity 8.6.2: Evaluate the possibility of the City purchasing surplus school sites to allow play fields to remain as open areas and provide for floodwater retention areas.
Schedule: Ongoing
Responsible Department: Community Services

Goal HCR1 – Historical Resources

Activity 8.7.1: Encourage property owners to flood proof historical structures.
Schedule: Ongoing
Responsible Department: Planning

Activity 8.7.2: Encourage property owners of historical structures to maintain adequate flood insurance.
Schedule: Ongoing
Responsible Department: Planning

Fountain Valley

The City of Fountain Valley has also taken extensive steps to lessen the impact of flood including the following:

Flood Plain Ordinance Chapter 21.37 FP "FLOODPLAIN" – FLOOD DAMAGE PREVENTION. This comprehensive document deals with the promotion of public health, safety, and general welfare and to minimize public and private losses due to flood conditions. It includes:

- Methods of reducing flood losses
- Standards of construction
- Standards for storage of materials and equipment
- Standards for utilities
- Standards for sub-division
- Standards for manufactured homes and manufactured home parks and sub-divisions

COUNTY OF ORANGE
SEVEN-YEAR FLOOD CONTROL IMPROVEMENT PLAN
January 2004

Fiscal Year	Channel	Location	City	$Estimate
2004-2005	CO5	2,600 feet downstream of Graham to upstream of Warner	Huntington Beach	10,160,000
2004-2005	DO1	Magnolia to Indianapolis Cathodic Protection (rust proofing)	Huntington Beach	1,750,000
2005-2006	CO5	Upstream of Warner to Edwards	Huntington Beach	6,750,000
2007-2008	C05	Edwards to Golden West	Huntington Beach	4,500,000
2007-2008	C05	Confluence with C06 to Beach	Huntington Beach	5,200,000
2007-2008	C06	Bushard to Brookhurst	Fountain Valley	1,300,000
2009-2010	C05S05	Edinger to C05	Fountain Valley	2,700,000
Total:				**32,360,000**

D01 – Huntington Beach Flood Control Channel
C05 – East Garden Grove-Wintersburg Flood Control Channel
C06 – Oceanview Channel
C05S05 – Edinger Channel

Completion of the entire County channel improvements in Huntington Beach is anticipated to occur within the next 10-15 years barring any unforeseen catastrophes. All improvements should ideally begin at the lowest portion of the channel with the work progressing upstream so that the completed portions are capable of containing water from a 100-year storm. The County, however, improves portions of the channels in various areas of the County that will provide protection and not create additional flood problems in other areas.

Until these improvements are completed, certified by FEMA, and the official flood maps are revised, properties located within 100-year flood areas are subject to flood loss and flood insurance requirements. Flood control projects will result in a reduction in the floodplain and may eliminate the requirement for flood insurance for residents in impacted areas.

Essential Service Facilities/Flood Impact
The one ***utility*** facility that could be impacted in a flooding situation is:

- Southern California Edison EPTC Pump Station located at 21730 Newland Street in Huntington Beach.

In the City of Fountain Valley, there are no Essential Services Facilities in the flood impact zone.

The City of Huntington Beach Essential Service Facilities in the flood impact zone are outlined in the following pages:

Exhibit IV-E-10: Huntington Beach100 & 500 Year Rain Flood Level

Essential Service Facilities

Name of Facility	Address	Contact Person	Contact #	RD	Generator	Other Information
Station 2 Murdy Fire Station	16221 Gothard St	Fire Chief Duane Olson	536-5417	251	YES	Emergency response
Station 7 Warner Fire Station	3831 Warner Ave	Fire Chief Duane Olson	536-5928	173	YES	Emergency response
Station 8 Heil Fire Station	5891 Heil Ave	Fire Chief Duane Olson	536-5464	157	YES	Emergency response
Huntington Beach Medical Center	17772 Beach Blvd	Mark Telhan, Facilities Mgr Mary Bottichella, CEO; Dave West Emergency Coord	843-5000	283	YES	Hospital
Public Works Don Kiser Corporate Yard	17371 Gothard St	Maintenance and Operations Jim Jones	536-5024	271	NO	Backup EOC and Public Works Dept. Ops Center
Public Works Park, Tree and Landscape Yard	17581 Gothard St	Maintenance and Operations Jim Jones	536-5024	281	NO	Location of City maintenance resources
Beach Maintenance Yard	8669 Edison	Larry Neishi	536-5287	474		City resources
Marine Safety Headquarters	103 PCH	Marine Safety Chief Kyle Lindo	536-5281	461		Backup EOC and Marine Safety Dept Ops Center
Ocean View High School	17071 Gothard St	Principal Karen Gilden	848-0656	271	YES 5k only	Shelter, Staging Area, Disaster Application Center (DAC)
Marina High School	15871 Springdale Ave	Principal Steve Roderick	893-6571	147	YES 5k only	Shelter, Staging Area, DAC
Ocean View SD EOC	8291 Warner	Carolyn Stocker	847-2551 x3502	263		Manages school district operations

Government Facilities (Non-City)

Name of Facility	Address	Contact Person	RD	Generator	Other Information
US Post Office (Ida Jean Haxton Station)	9151 Atlanta Avenue	Station Manager Paul Mendoza	455		
CA State Dept. of Parks and Recreation	Bolsa Chica State Beach (S of Warner)	Dispatch	173 183, 184 and 194	No	Orange Coast District North Sector (Includes Huntington & Bolsa Chica State Beaches)
	Huntington State Beach	Dispatch	337, 349 and 359	No	

Percentages of the community that are in the flood impact area are:

Huntington Beach	35%
Fountain Valley	10%

Flooding Mitigation Strategies

Following is a list of flood mitigation items that are needed to improve the flood threat to Huntington Beach:

Natural Hazard	**FLOOD STRATEGY #5A**:
Action Item	Upgrade Huntington Beach Flood Pump Stations
Coordinating Organization	Huntington Beach Public Works Department
Ideas for Implementation	▪ Arrange Funding ▪ Acquire consultant ▪ Acquire right-of-way ▪ Develop Construction documents ▪ Construction Bid ▪ Manage construction project ADAMS (No. 1) $3,432,000 ATLANTA (No. 3) $3,432,000 BANNING (No. 4) $1,716,000 BOLSA CHICA (No. 5) $ 858,000 HEIL (No. 8) $ 858,000 INDIANAPOLIS (No. 9) $2,574,000 MARILYN (No. 10) $ 858,000 MEREDITH (No. 11) $1,716,000 SCENARIO (No. 13) $ 858,000 SLATER (No. 15) $2,574,000 YORKTOWN (No. 16) $1,716,000 PROJECT TOTAL $24,024,000 The prioritizing process will include but not be limited to funding, individual project constraints and if located within a FEMA repetitive flood area.
Time line	10+ years
Constraints	Funding, Right-of-way

Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**FLOOD STRATEGY #5B**
Action Item	Upgrade Huntington Beach Storm Drains
Coordinating Organization	Huntington Beach Public Works Department
Ideas for Implementation	▪ Arrange Funding ▪ Acquire consultant ▪ Develop Construction documents ▪ Construction Bid ▪ Manage construction project 17TH STREET (Phase 1) $331,800 17TH STREET (Phase 2) $886,600 18TH STREET $643,500

	MARILYN DRIVE	$100,000	
	MURDY FLOOD CHANNEL, C05SC2	$2,500,000	
	PALM STREET $300,000		
	SHIELDS/TROPHY	$819,000	
	TRUDY	$778,300	
	WATERSHED No. 1	$5,981,200	
	WATERSHED No. 2	$7,300,000	
	WATERSHED No. 3	$1,631,100	
	WATERSHED No. 4	$1,105,100	
	WATERSHED No. 5	$4,321,600	
	WATERSHED No. 6	$2,042,100	
	WATERSHED No. 7	$4,089,500	
	WATERSHED No. 8	$6,764,600	
	WATERSHED No. 9	$955,900	
	WATERSHED No. 10	$2,639,000	
	WATERSHED No. 11	$2,596,900	
	WATERSHED NO. 12	$7,493,500	
	WATERSHED NO. 13	$5,748400	
	WATERSHED NO. 14	$8,634,000	
	WATERSHED NO. 15	$6,046,700	
	WATERSHED NO. 16	$547,400	
	WATERSHED NO. 17	$0	
	WATERSHED NO. 18	$2,224,900	
	WATERSHED NO. 19	$5,873,600	
	WATERSHED NO. 20	$3,334,600	
	WATERSHED NO. 21	$3,546,200	
	WATERSHED NO. 22	$1,700,200	
	WATERSHED NO. 23	$7,233,300	
	WATERSHED NO. 24	$4,952,000	
	WATERSHED NO. 25	$2,663,900	
	WATERSHED NO. 26	$4,348,000	
	WATERSHED NO. 27	$3,011,800	
	WATERSHED NO. 28	$7,028,500	
	WATERSHED NO. 29	$2,667,200	
	WATERSHED NO. 30	$3,701,900	
	WATERSHED NO. 31	$2,069,600	
	WATERSHED NO. 32	$4,901,000	
	MISCELLANEOUS	$350,000	
	SUB TOTAL:	$136,443,000	
	The prioritizing process will include but not be limited to funding, individual project constraints and if located within a FEMA repetitive flood area		
Time line	10+ years		
Constraints	Funding, Right-of-way		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**FLOOD STRATEGY #5C**		
Action Item	Retention Basins at Schools and Parks		
Coordinating Organization	Huntington Beach Public Works Department and School Districts		
Ideas for Implementation	▪ Form a Partnership ▪ Develop cost estimate ▪ Seek approval by the City Council and School Board ▪ Contract out the work ▪ Manage the contract		
Time line	10+ years		
Constraints	Funding, Right-of-way		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

Natural Hazard	**FLOOD STRATEGY #5D**		
Action Item	Purchase mechanical pumps to pump water		
Coordinating Organization	Huntington Beach City School District Huntington Beach Union High School District Ocean View School District Fountain Valley School District		
Ideas for Implementation	▪ Develop cost estimates ▪ Develop a plan for use, maintenance, and storage ▪ Obtain City permits ▪ Purchase pumps		
Time line	2 Years		
Constraints	Funding, Right-of-ways, City permits		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**FLOOD STRATEGY #5E**		
Action Item	Support the County of Orange Seven Year Flood Control Improvement Plan		
Coordinating Organization	Huntington Beach Public Works Department		
Ideas for Implementation	▪ Educate the City Council, Public Works, Planning Department, Emergency Services Office, and City Public Information Officer on the importance of this plan and ways to support it ▪ Ensure all parties are supporting the plan at every opportunity		
Time line	Ongoing		
Constraints	County Funding		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

Natural Hazard	**FLOOD STRATEGY #5F**		
Action Item	Train RACES as Weather Spotters & Flood Channel Observers		
Coordinating Organization	Huntington Beach Emergency Services Office, Fountain Valley Police Department will be invited.		
Ideas for Implementation	Train RACES to work with the National Weather Service to track rainfall; Train RACES to respond to the flood channels and report flood levels and breaches.		
Time line	2 years		
Constraints	Staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation	X	Emergency Services

Exhibit IV-E-11: Proposed Activity Criteria Evaluation

The Hazard Mitigation Committee developed a chart comparing selected criteria on a one through five scale. The following criteria were analyzed: cost effective, technically feasible, environmentally sound, social impacts, activity addresses the problem, meets federal, state, and local regulations, politically acceptable, activity reduces the risk. After reviewing the chart, the committee concluded that all jurisdictions would support the proposed activities.

	PROPOSED ACTIVITY					
CRITERIA	**Strategy 5A**	**Strategy 5B**	**Strategy 5C**	**Strategy 5D**	**Strategy 5E**	
Cost Effective	5	5	5	5	5	
Technically Feasible	5	5	5	5	5	
Environmentally Sound	5	5	5	5	5	5 = Excellent 4 = Good 3 = Fair 2 = Bad 1 = Unacceptable
Social Impacts	5	5	5	5	5	
Activity Addresses the Problem	5	5	5	5	5	
Meets Federal, State, and Local Regulations	5	5	5	5	5	
Politically Acceptable	5	5	5	4	5	
Activity Reduces the Risk	5	5	5	5	5	
Total	40	40	40	39	40	

Estimated Potential Losses

Estimated Potential Losses, FEMA 3a Worksheet

The following City-specific FEMA worksheets depict the estimated loss to the number of City structures, dollar value of the structures, and the total number of people impacted. These figures are calculated by type of structure (occupancy class) and then totaled at the bottom of the chart. A complete description of how the figures were obtained is available in Part IIIB2 - Risk Assessment.

Estimated Degree of Loss, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimated the area of each city that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e. Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of damage of that area or sub area. Content losses are derived by multiplying the percent of content damage by the loss of structure.

See Worksheets 3a and 4 on the following pages.

Exhibit IV-E-12: Huntington Beach Estimated Potential Losses

				City of:		**Huntington Beach, CA**			
August 23, 2004				Hazard:		**Floods**			Worksheet 3a
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	77,800	27,230	35.0%	$ 11,508,176,000	$ 4,027,861,600	35%	199,500	69,825	35%
Commerical	2,260	791	35.0%	$ 1,167,322,771	$ 408,562,970	35%	28,900	10,115	35%
Industrial	1,161	406	35.0%	$ 1,135,822,248	$ 397,537,787	35%	32,900	11,515	35%
Agricultural	0						0	-	
Religious / Non-Profit	174	61	35.0%	$ 192,900,040	$ 67,515,014	35%	24,000	8,400	35%
Government	129	45	35.0%	$ 361,547,570	$ 126,541,650	35%	900	315	35%
Education	555	194	35.0%	$ 410,857,447	$ 143,800,106	35%			35%
Utilities						35%			35%
Total	82,079	28,728	35.0%	$ 14,776,626,076	**$ 5,171,819,127**	35%	199,500	69,825	35%

Exhibit IV-E-13: Fountain Valley Estimated Potential Losses

City of:									
				Fountain Valley, CA					
June 25, 2004			Hazard:	**Floods**			Worksheet 3a		
Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	13,729	1963	14%	2,745,800,000	392,649,000	14%	55,321		0%
Commercial	268	38	14%	1,608,000,000	230,000,000	14%	16,734		0%
Industrial	275	39	14%	584,375,000	83,566,000	14%	13,740		0%
Agricultural	8	1	13%	1,500,000	214,500	14%	175		0%
Religious / Non-Profit	16	2	14%	19,200,000	2,746,000	14%	2,370		0%
Government	35	5	14%	26,430,000	3,779,000	14%	45		0%
Education	18	3	14%	96,985,000	13,869,000	14%			0%
Utilities									
Total	14,349	2051	14%	5,082,290,000	726,823,500	14%	88,385	0	0%

*14 churches/2 hospitals

Exhibit IV-E-14: Huntington Beach Estimated Degree of Loss

Estimated Degree of Loss

City of: **Huntington Beach, CA**

August 25, 2004 Hazard: **Floods** Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	11,508,176,000								
	No Flooding	65	7,480,314,400	0	-	0%	-		
	Flood depth - 1 ft.	12	1,380,981,120	11.5	158,812,829	17%	27,395,213	0	
	Flood depth - 3 ft.	23	2,646,880,480	22.5	595,548,108	34%	200,997,486	0	
	Totals	100	11,508,176,000		754,360,937		228,392,699	0	982,753,636
Commercial		35	1,167,322,771	*	76,518,008	*	23,166,834	0	99,684,841
Industrial		35	1,135,822,248	*	74,453,148	*	22,541,670	0	96,994,819
Agriculture			0						
Religious/ Non-Profit		35	192,900,040	*	12,644,598	*	3,828,318	0	16,472,916
Government		35	361,547,570	*	23,699,443	*	7,175,318	0	30,874,761
Education		35	410,857,447	*	26,931,706	*	8,153,928	0	35,085,634
Utilities									
	Totals:		14,776,626,076		968,607,839		293,258,768	0	1,261,866,607

* = Used the same ratios and formulas as Residential.

Exhibit IV-E-15: Fountain Valley Estimated Degree of Loss

Estimated Degree of Loss

City of: **Fountain Valley, CA**

25-Aug-04 Hazard: **Flood** Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	2,745,800,000								
	Out of Flood Area	90	2,471,220,000	0	-	0%	-		
	Flood depth - 1 ft.	3	82,374,000	11.5	9,473,010	17%	1,634,094	0	
	Flood depth - 3 ft.	7	192,206,000	22.5	43,246,350	34%	14,595,643	0	
	Totals	100	2,745,800,000		52,719,360		16,229,737	0	68,949,097
Commercial		10	1,608,000,000	*	30,873,600	*	9,504,486	0	40,378,086
Industrial		10	584,375,000	*	11,220,000	*	3,454,095	0	14,674,095
Agriculture			0						
Religious/ Non-Profit		10	19,200,000	*	368,640	*	113,486	0	482,126
Government		10	26,430,000	*	507,456	*	156,221	0	663,677
Education		10	96,985,000	*	1,862,112	*	573,254	0	2,435,366
Utilities									
	Totals:		5,080,790,000		97,551,168		30,031,279	0	127,582,447

* = Used the same ratios and formulas as Residential.

Part IV-F

Earthquake
Table of Contents

HAZARD RANKINGS FOR HUNTINGTON BEACH AND FOUNTAIN VALLEY 1
RECENT LARGE EARTHQUAKES THAT AFFECTED THE AREA 2
ACTIVE FAULTS THAT COULD IMPACT THE AREA 4
Exhibit IV-F-1: Southern California Earthquake Fault Map 5
Exhibit IV-F-2: Orange County Earthquake Ground Shaking Map 6
THE SAN ANDREAS FAULT 7
MODIFIED MERCALLI INTENSITY SCALE 12
Exhibit IV-F-3: Modified Mercalli Intensity Scale 13
Exhibit IV-F-4: San Andreas Fault Shaking Intensity Map 14
THE NEWPORT-INGLEWOOD FAULT 15
Exhibit IV-F-5: Newport-Inglewood Fault Shaking Intensity Map 17
COMPARISON: SAN ANDREAS FAULT VS NEWPORT-INGLEWOOD FAULT 18
THE SAN JOAQUIN HILLS THRUST FAULT 19
PALOS VERDES FAULT ZONE 20
Exhibit IV-F-6: San Joaquin Hills Thrust Fault 21
SAN CLEMENTE FAULT 22
HISTORICAL EARTHQUAKES OF CALIFORNIA 22
EARTHQUAKE RELATED HAZARDS 24
Exhibit IV-F-7: Orange County Slope and Soil Failure Liquefaction 25
Exhibit IV-F-8: Orange County Liquefaction Zones 26
Exhibit IV-F-9: Huntington Beach Liquefaction Potential 27
SECONDARY AFFECTS OF EARTHQUAKES 28
Exhibit IV-F-10: Tsunami Risk for Coastal Southern California 29
Exhibit IV-F-11: Orange County Hazardous Materials Locations 30
Exhibit IV-F-12: HB Hazardous Materials Storage Sites 31
EARTHQUAKE HAZARD ASSESSMENT 32
Exhibit IV-F-13: HB Earthquake Faults & Essential Service Facilities 36
Exhibit IV-F-14: HB Earthquake Faults & Non-City Government Facilities 36

Exhibit IV-F-14: HB Earthquake Faults & Non-City Government Facilities.....37

EXISTING MITIGATION ACTIVITIES.....38

SCHOOLS AND EARTHQUAKES.....43

Exhibit IV-F-15: Earthquake Faults and School Districts.....44

EARTHQUAKE MITIGATION STRATEGIES 45

Exhibit IV-F-16: Proposed Activity Criteria Evaluation 48

ESTIMATED POTENTIAL LOSSES 49

Exhibit IV-F-17: Huntington Beach Estimated Potential Losses.....50

Exhibit IV-F-18: Fountain Valley Estimated Potential Losses.....51

Exhibit IV-F-19: Huntington Beach Estimated Degree of Loss.....52

Exhibit IV-F-20: Huntington Beach Estimated Degree of Loss.....53

EARTHQUAKE RESOURCE DIRECTORY 54

Hazard Rankings for Huntington Beach and Fountain Valley

The Huntington Beach Hazard Mitigation Committee ranked earthquake as the number one threat to the City of Huntington Beach and the City of Fountain Valley. Earthquake is the number one concern for West Orange County due to the proximity of the Newport-Inglewood Fault and liquefaction potential.

City	Hazard	Ranking
Huntington Beach	Earthquake	1 of 18 hazards
Fountain Valley	Earthquake	1 of 13 hazards

Huntington Beach has identified 18 hazards that could impact the City while Fountain Valley has identified 13.

Each City's Emergency Operations Plan (EOP) lists "earthquake" as having out of a high of 10, a Chance of Occurrence of 7 and an Effect of 10, the highest ranking possible.

City	Chance of Occurrence	Effect
Huntington Beach	7	10
Fountain Valley	7	10

Chance of Occurrence and **Effect** numbers are rated from one to ten.
Higher numbers signify greater chance of occurrence and a greater effect.
Chance of Occurrence is based on history, geography, and potential.
Effect is based on the worst-case scenario.

The Hazard Mitigation Committee met August 12, 2004 to discuss the earthquake hazard. The committee discussed what percent of each city area could be impacted by an earthquake and came to the following consensus:

City	Percentage of City that could be impacted by an Earthquake
Huntington Beach	100%
Fountain Valley	100%

This report describes the earthquake history, significant earthquake faults, and pertinent areas of shaking potential and liquefaction potential. Huntington Beach and Fountain Valley are in the highest possible seismic risk zone (Zone 4) according to the Uniform Building Code of the International Conference of Building Officials. They are located on an alluvial flood plain, which, for the most part, has a high potential for shaking intensity and ground failure (liquefaction) damage.
One of the best indicators of earthquake potential is learning the earthquake history of the area. The following is a discussion on recent large earthquakes that affected the Huntington Beach/Fountain Valley area.

Recent Large Earthquakes that Affected the Area

1933 Long Beach Earthquake

In 1933, the Long Beach 6.4 magnitude earthquake struck the Los Angeles Basin. The quake was on the Newport-Inglewood Fault and the epicenter was in the Huntington Harbour area of Huntington Beach. Huntington Beach and Fountain Valley were mostly undeveloped at that time so much of the damage was in the more heavily populated City of Long Beach, hence the name of the earthquake. Damage to Huntington Beach was concentrated in the downtown area, especially along Main Street where numerous unreinforced masonry buildings were damaged. Central School, which sat on the site where Dwyer Middle School resides today, had severe damage and had to be demolished.

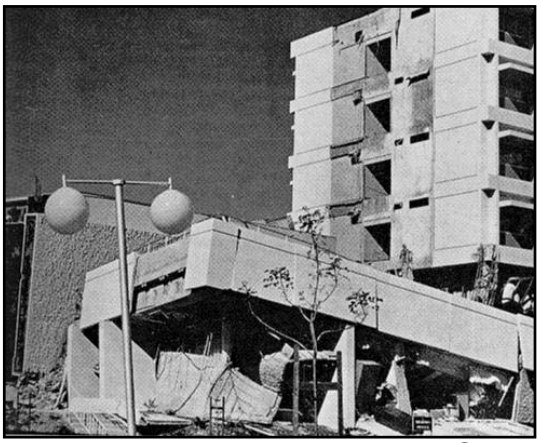
1933 Long Beach Earthquake

Excerpt from www.anaheimcolony.com/ -

> *On March 10, 1933 at 5:54 in the evening, a severe earthquake shook Southern California. Four deaths occurred in Orange County. In Santa Ana, a man and his wife raced out of the Rossmore Hotel and were crushed under an avalanche of bricks and mortar. Another man, while walking in front of the Richelieu Hotel, was struck by a piece of falling cornice and instantly killed. In Garden Grove, a 13-year old girl was planning a freshman party with her friends when the earthquake hit. She was sitting on the steps of a local high school and was crushed by a falling wall. Two of her friends were injured.*

In Newport Beach, 800 chimneys were broken off at the roofline and several hundred buildings were destroyed. In Huntington Beach, steel oil derricks were "squashed" several inches out of the ground. In Santa Ana, Anaheim and Garden Grove, business centers were badly damaged and debris covered downtown streets. A heavy fog enveloped the Southland, making rescue work difficult. The 1933 Long Beach earthquake affected 75,000 square miles, and resulted in the formation of more stringent building codes for Orange County structures.

1997 Sylmar Earthquake (San Fernando)



On February 9, 1971 at 6:02 AM, the Los Angeles basin shook for over one minute. There were 65 deaths and a financial cost of over $500 million. The earthquake resulted in a crack in the Van Norman Dam where an 80-square mile area had to be evacuated due to fear the dam would break. Scores of people were trapped in buildings and fires were started from natural gas line breaks. Two hospitals collapsed killing nine persons. The Veterans Administration Hospital had seven deaths (photo left) and the Olive View Hospital had two deaths. Following this earthquake the Alquist Hospital Seismic Act was passed.

1987 Whittier Narrows Earthquake

In October 1987, the Whittier Narrows Earthquake struck the Los Angeles area with a 5.9 magnitude quake. This quake occurred on a fault system not previously known for seismic activity. There were eight deaths and 200 injuries. The quake damage was estimated at $358 million. The quake was felt throughout Orange County.

1994 Northridge Earthquake

On January 17, 1994, the Northridge Earthquake 6.7 magnitude struck the Los Angeles area. There were 57 deaths and over 1,500 people were injured. The quake caused billions of dollars in damage and disrupted the lives of thousands of residents, schools and businesses in Southern California. This quake was also felt throughout Orange County.

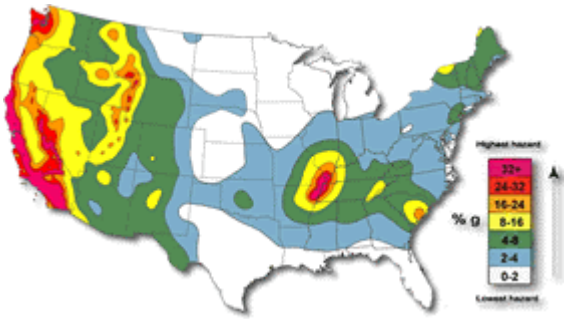
For days afterward, thousands of homes and businesses were without electricity; tens of thousands had no gas; and nearly 50,000 had little or no water. Approximately 15,000 structures were moderately to severely

damaged, which left thousands of people temporarily homeless. Over 66,500 buildings were inspected. Nearly 4,000 were severely damaged and over 11,000 were moderately damaged. Several collapsed bridges and overpasses created commuter havoc on the freeway system. Ground shaking caused extensive damage, but the earthquake triggered liquefaction and dozens of fires also caused additional severe damage. This extremely strong ground motion in large portions of the Los Angeles Basin resulted in record economic losses.

However, the earthquake occurred early in the morning on a holiday. This circumstance considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open. The direct and indirect economic losses ran into the tens of billions of dollars.

Active Faults that Could Impact the Area

After reviewing maps of the United States, California and specifically the Southern California area, the research resulted in earthquakes that could impact the Huntington Beach and Fountain Valley area. Faults that were reviewed include: the San Andreas, Newport-Inglewood, Whittier-Elsinore, El Modina, San Jacinto, Norwalk, Santa Monica-Raymond Hill, Christianos, San Joaquin Hills, Peralta Uplift and Palos Verdes Faults. These faults, all considered active, are capable of producing earthquakes in the 4.5 – 8+ range.



After consultation with Jeffrey B. Reardon, Registered Geologist, the research was narrowed to the five faults that were felt could most seriously impact the area. Mr. Reardon is a City of Huntington Beach resident and graduate of the Huntington Beach Fire Department Community Emergency Response Team (CERT) program. His consultation on this project was invaluable.

The five faults are:

(1) San Andreas Fault
(2) Newport-Inglewood Fault
(3) San Joaquin Hills Thrust Fault
(4) Palos Verdes Fault
(5) San Clemente Fault

A major earthquake along any of these five faults could result in substantial casualties and damage resulting from collapsed buildings, damaged roads and bridges, fires, flooding, and other threats to life and property. Other faults traversing the Los Angeles Basin, Riverside, San Bernardino, and San Diego Counties could also affect Huntington Beach, but not as severely. There may still be unmapped earthquake faults throughout Southern California that could also affect the Huntington Beach and Fountain Valley area. See Exhibit IV-F-1 for a Southern California Earthquake Fault Map.

Exhibit IV-F-1: Southern California Earthquake Fault Map

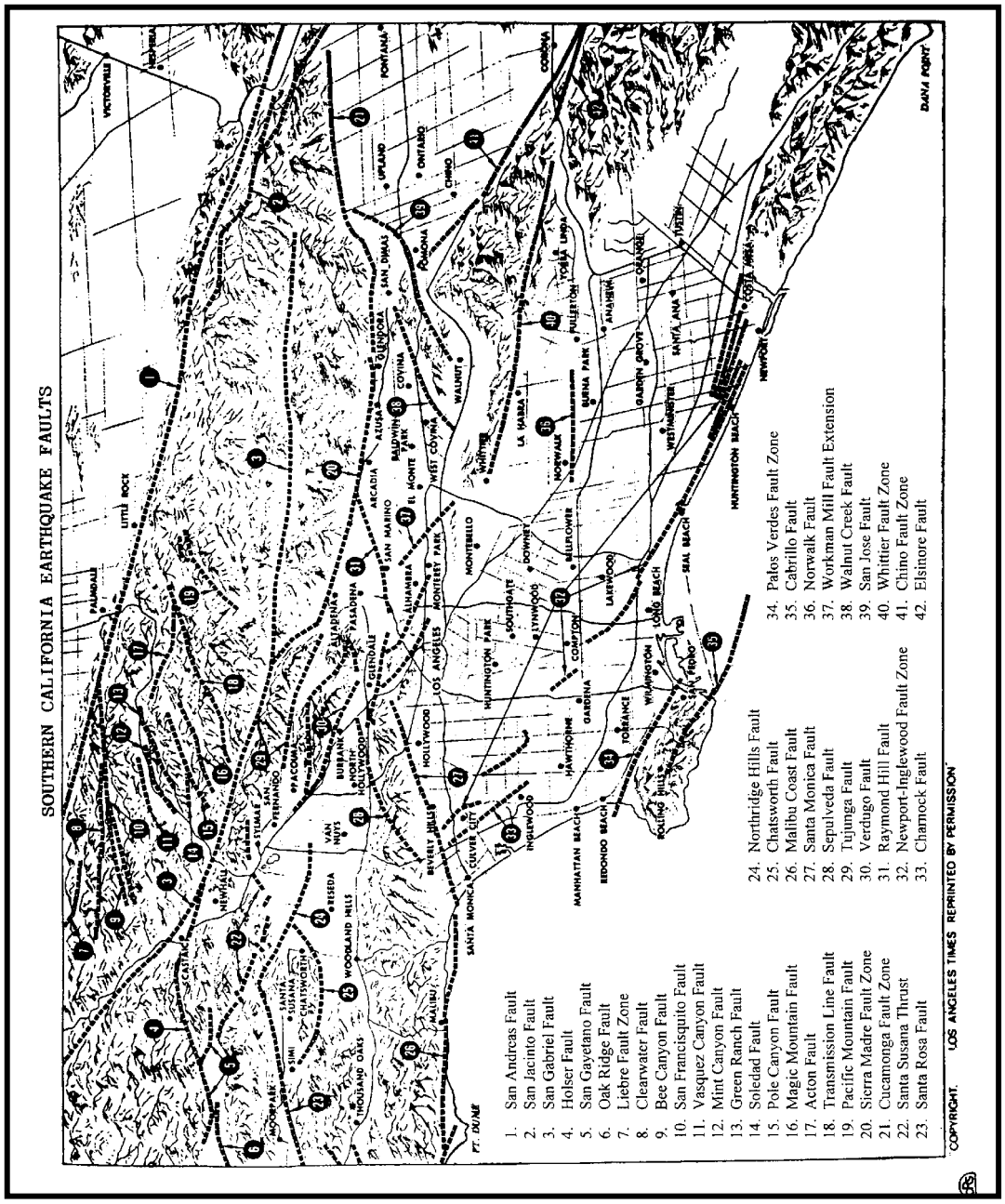
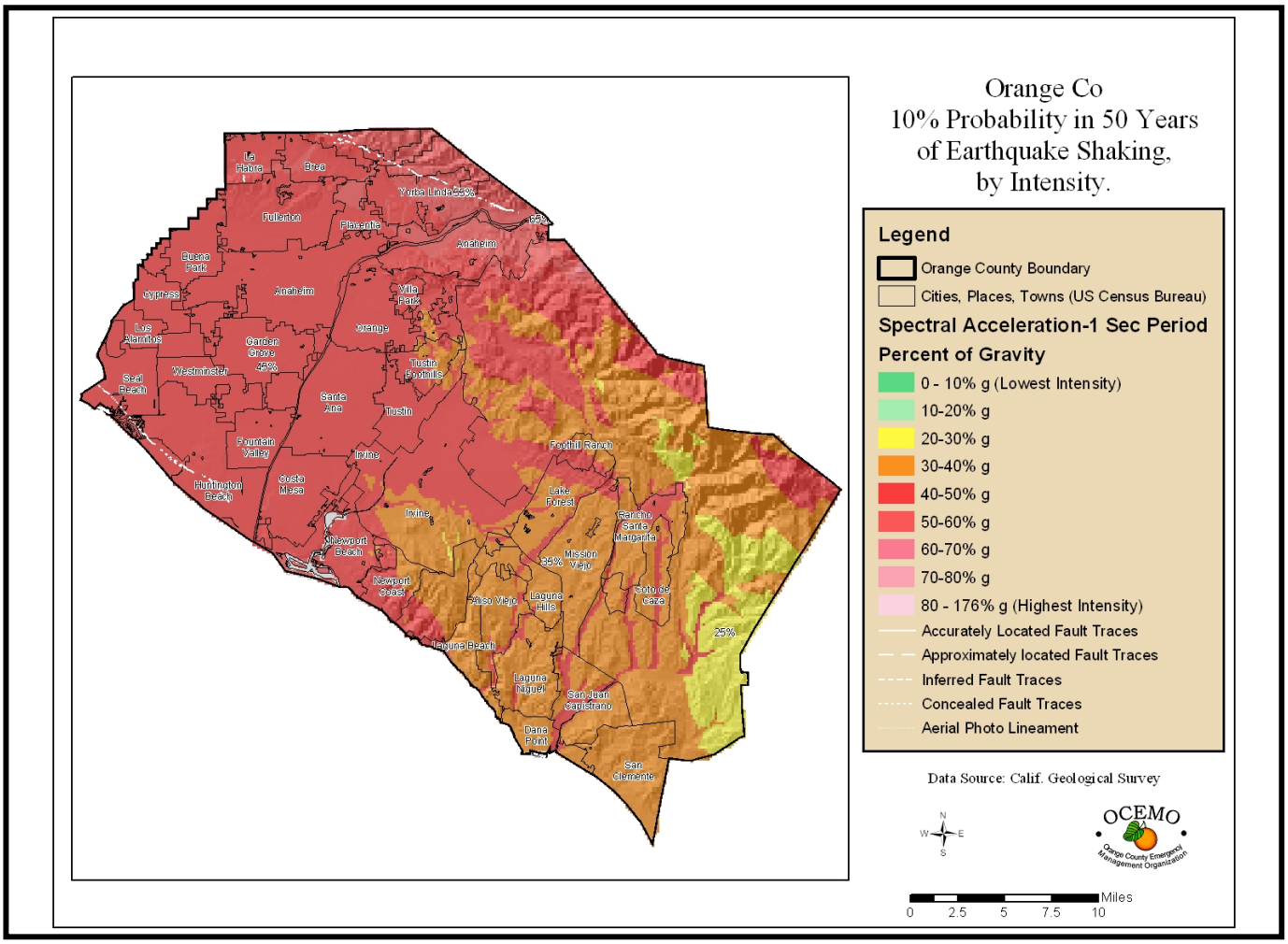


Exhibit IV-F-2: Orange County Earthquake Ground Shaking Map

This is a map depicting the probability of experiencing ground acceleration in a specified amount of time. Exhibit IV-F-2 depicts an estimated 10% probability of exceeding 50 – 60% peak ground acceleration or g. Note: one g equals the amount of acceleration or force required to throw an object off the ground within a 50-year period.



Vulnerability and Risk
It is a future goal of the cities to complete a HAZUS vulnerability assessment. It would include impacts on life, property, infrastructure, and transportation exposed to an earthquake hazard. Funds are not available at this time to conduct this study.

The San Andreas Fault

The San Andreas Fault is located approximately 70 miles east of the cities. This fault is capable of producing earthquakes in the magnitude 8+ range. It has been scientifically determined through a carbon dating process that a major earthquake on this fault has occurred approximately every 145 years plus or minus 20 years. The last major earthquake on the Southern San Andreas Fault occurred in 1857 (147 years ago as of 2004). The San Andreas is considered one of the most active faults in the world today. A major earthquake up to an 8.3 magnitude is expected to occur again within the next 20 years.

USGS Studies
The San Andreas Fault traverses the Southern California Region. The ground shaking of an 8.3 magnitude earthquake on the Southern San Andreas Fault would result in serious damage in Southern California. The information listed below provides detailed estimates of potential earthquake losses in Huntington Beach and Fountain Valley from an 8.3 magnitude earthquake on the Southern San Andreas Fault. The data is extracted from the following studies:

- *U.S. Geological Survey, Metropolitan San Francisco & Los Angeles Earthquake* studies.
- *Special Publication 60, California Division of Mines and Geology - Earthquake Planning Scenario for a Magnitude of 8.3 Earthquake on the San Andreas Fault in the Southern California Area.*
- *U.S. Geological Survey, Newport-Inglewood Fault Zone, Special Publication 99.*

<u>Casualties</u>
There are many variables, which will affect the number of casualties as a result of a major earthquake. Intensity and duration of shaking, liquefaction, and the location of the population are all major elements, which must be considered. Time of day will affect these numbers due to other factors such as school being in session, families being separated, freeway traffic, people working in high-rise buildings, etc. The Federal and State Governments have done some analyses for planning and exercises considering these threats at the County level. Using a simple percentage share of casualty estimates for Orange County as drawn from previous FEMA, NOAA and USGS studies, the following would be minimum estimates for Huntington Beach casualties.

San Andreas Fault Statistics

- Deaths depending on time of day: 57 - 296
- Seriously injured (requiring hospital/surgical care): 227 - 916
- Injuries (requiring non-hospital medical care): 1,711 – 8,874

Mobile Homes

There are 15 mobile home parks within the Huntington Beach City limits and two in Fountain Valley. Many of these are in the areas of greatest shaking potential from earthquakes. There are approximately 3,000 mobile homes in Huntington Beach and 381 in Fountain Valley. Most of the mobile home parks in both cities are senior citizen parks making the populations even more vulnerable.

Earthquake damage to mobile homes is expected to be very severe. Generally, only about ten percent (10%) of coaches had any form of seismic tie-downs in 1996. Following the Northridge Earthquake of 1994, the Federal Emergency Management Agency (FEMA) provided funding to secure mobile homes in the impacted area. Some individuals within the two cities took advantage of this opportunity to secure their coaches. All new mobile homes are required to be secured. The damage to mobile homes can be both life-threatening and create large-scale mass care problems. Mobile homes close to the coast on alluvial soils have a greater potential for damage. There are five mobile home parks located within a mile of the coast.

Under extended shaking from large earthquakes, mobile homes have a tendency to move off their pedestals, then drop onto their axles. When this occurs, rigid utility lines can sever, causing fires. In addition, the pedestals, which originally held the coach up will penetrate the floor when the coach falls. This can cause injury and significant damage. Many individuals living in mobile homes are elderly, making escapes from damaged mobile homes slower and more difficult.

When there has been extensive damage to mobile home coaches, it is often difficult for residents to find care and shelter nearby. This is often due to their inability to go "next door" in the mobile home park because of widespread damage. This situation will then create an added burden on the Cities of Huntington Beach and Fountain Valley by having to provide for additional mass care facilities.

If forty percent (40%) of the non-seismic protected mobile home coaches are damaged and uninhabitable, it would create a homeless population of approximately 1,620 citizens in Huntington Beach. In Fountain Valley, there are 381 coaches; 205 is the estimated homeless population after an earthquake. These estimates are for planning purposes only and not considered actual predictions. Of course, relatives and friends would take in some of the homeless, but it still creates a major planning problem, and the percentage could be much higher under extended shaking.

City	Total Number of Mobile Homes	Estimated Homeless Population
Huntington Beach	3,000	1,620
Fountain Valley	381	205

[How was this number reached? 3,000 mobile homes x 90% without bracing = 2700 x 40% with damage = 1,080 mobiles with 1.5 persons per mobile home = 1,620 persons]

Damage to Vital Public Services, Systems, and Facilities

Bed Loss in Major Hospitals
Hospital beds will be in short supply following a major earthquake.

Hospital	City	Day-to-Day Beds	Beds available following a major Earthquake (56% loss)
Huntington Beach Hospital and Medical Center	Huntington Beach	135	59
Fountain Valley Regional Hospital and Medical Center	Fountain Valley	400	176
Orange Coast Memorial Medical Center	Fountain Valley	230	101
Total Beds Available following a major earthquake			336

According to the scientific studies during a major earthquake due to damage to the facilities and/or fires, up to 56% of all hospital beds could be unavailable. This would leave 336 out of 765 hospital beds available for the injured.

Access and Egress
The 405 Freeway crosses several sections of the northern part of Huntington Beach and divides Fountain Valley basically in half. This freeway may be closed due to road damage, collapsed overpasses, accidents, etc. This would make entrance and exit from the north difficult to impossible for Huntington Beach. To the east of Huntington Beach, connecting to Costa Mesa, are bridges at Hamilton Avenue and Adams Avenue at Brookhurst Street. Damage to these bridges will impact access to the City from the east. Pacific Coast Highway sits on alluvial soil and is expected to have severe damage in a major earthquake. This will limit access to Huntington Beach from both the north and the south.

The 405 Freeway basically divides Fountain Valley in half by diagonally transecting the City. Management and response to the earthquake would be extremely difficult if the

freeway collapsed and the City was divided making moving resources to the east and west impossible. The City should maintain resources equally on both sides of the freeway. The casualties could be numerous and the numbers of response personnel could immediately be insufficient to respond. The freeways, if not severely damaged, are expected to be opened within 72 hours.

Communications

Telephone Systems

Telephone communications will be adversely affected due to overload resulting from post-earthquake calls, both within and outside the area. Also some of the older telephone instruments will be knocked off their hooks further complicated by physical damage to equipment due to ground shaking, loss of service due to loss of electrical power, and subsequent failure of some auxiliary power sources. The majority of phones sold today require electricity.

Key system failures would likely be located near the San Andreas Fault in areas projected to experience intense ground shaking. It is likely that the telephone systems in Huntington Beach and Fountain Valley will have systematic failures not readily bypassed by alternative traffic routing. It is also probable that the recovery effort will be delayed because many telephone company employees will have difficulty getting access to damaged areas to accomplish repairs.

Radio Systems

Cities and surrounding area radio systems will generally operate at 40% effectiveness for the first 12 hours after the earthquake, increase to 50% for the second 12 hours, then begin a slow decline to approximately 40% within 36 hours. The long-term implications are that individual systems gradually will become less useful to the overall recovery effort when supplanted by systems relocated from outside the disaster area. It is unlikely that public safety radio systems would become saturated with non-critical communications from mobile units. However, it is clear that radio traffic densities on redundant (non-emergency designated) channels would increase, particularly when remote base station and repeater failures would tend to limit the number of redundant channels available. Nonetheless, after 12 hours, at which time the number of operable units will have declined (because of exhaustion of emergency power fuel) and because recovery efforts will have restored some order, the radio traffic density problem will ease.

Commercial Broadcasters

Many radio and television facilities are expected to be out of operation in Los Angeles/Orange County for 24 hours due to in-house problems, and/or power supply problems, and/or transmission line problems. Elsewhere in the area, 1/3 of the facilities are also expected to be out of service for 24 hours. After 24 hours, 50% of the entire area facilities are expected to be in operation.

Water Supply and Waste Disposal
The major aqueducts supplying water to our region: Colorado, California, and Los Angeles, are expected to sustain damage causing temporary interruptions in outside water supply. The numerous major reservoirs in the Southern California region will provide ample storage to meet demands during the time required for repairs. However, damage to water transmission lines, local storage reservoirs and pumping plants, as well as local distribution systems, will affect water availability and pressure. The absence of electrical power for extended periods will, in some areas, preclude water deliveries where pumping is necessary, even though conveyance facilities may be intact. Fortunately a majority of the water in the Huntington Beach and Fountain Valley area is supplied by local water wells. Some areas may be dependent on tanker trucks to provide their basic water needs if water lines are destroyed. Safe drinking water is always a priority of the City Public Works Utility Divisions of the two cities and will remain a high priority during a major incident.

Sewage collection systems will also sustain widespread damage, particularly in the low-lying areas. The Orange County Sanitation District's sewage treatment facilities, also located in structurally poor ground (Plants 1 & 2 are located in Fountain Valley and Huntington Beach respectively), may be damaged and experience electrical power losses resulting in discharge of raw sewage into the area.

Electric Power
Damage to power plants and their ancillary facilities in affected areas can be expected to reduce generating capacity by 50%. The potential impact of this reduction in local output is lessened, however, by the availability of power from other sources outside the affected area and by the obvious significant reduction in consumer demand that will occur. Immediate concerns will focus on repairs necessary to restore power to areas of greatest need. Major restoration problems include repairs necessary to route power through the major substations, restoration of damaged and collapsed transmission line towers, reactivation of equipment at local substations, and replacement of fallen poles, burned transformers, etc.

It is reasonable to assume that, during some portion of the first 72-hour period following the earthquake, virtually all areas would experience some temporary loss of power. All critical facilities will require standby generating equipment and emergency fuel supplies. It is assumed that all substations in Orange County will be heavily damaged.

Natural Gas Facilities
Damage to natural gas facilities will consist primarily of: (1) some isolated breaks in the major transmission lines and (2) innumerable breaks in mains and individual service connections within the distribution systems, particularly in the areas of intense ground shaking and/or ground failure. This many leaks in the distribution system will affect a major portion of Huntington Beach and Fountain Valley resulting in a loss of service for

extended periods. Sporadically distributed fires should be expected at the sites of a small percentage of ruptures both in the transmission lines and the distribution system.

San Andreas Overall Impact

While heavily impacted, the County will not suffer the extent of physical damage or population vulnerability some of our neighboring eastern counties will incur. The County will not be as high a priority for application of outside resources as, for example, San Bernardino and Riverside Counties, Los Angeles (due to its extensive population), or Ventura Counties. The County may be called upon to provide resources to more heavily impacted areas in locations from other areas and serve as a staging and support area for resources moving to the more heavily affected areas. Because of the distance from the fault, shaking would be more hazardous to large structures than to one to two story houses. The expected long duration of shaking (two or more minutes) could cause liquefaction particularly in coastal areas.

Recurrence Interval

Dr. Kerry Sieh, Cal Tech, has investigated the San Andreas fault at Pallett Creek states, "The record at Pallett Creek shows that rupture has recurred about every 130 years, on average, over the past 1500 years. But actual intervals have varied greatly, from less than 50 years to more than 300. The physical cause of such irregular recurrence remains unknown." [1] Damage from a great quake on the San Andreas would be widespread throughout Southern California.

Exhibit IV-F-4 depicts shaking intensity from a seismic event on the San Andreas Fault following the Modified Mercalli Intensity Scale. The scale is defined in Exhibit IV-F-3.

Modified Mercalli Intensity Scale

The County of Orange could be heavily impacted and will require considerable and immediate outside assistance. All primary utilities would be heavily damaged and there would be major structural damage to buildings and transportation/communication facilities. Liquefaction in widespread areas of the north and west part of the County is highly probable and, in addition to the intensive shaking, will contribute considerably to overall damage. Approximately 80% of the population this plan targets is within the area expected to experience the highest shaking intensity (Modified Mercalli - intensity IX).

Exhibit IV-F-3: Modified Mercalli Intensity Scale

I. Not felt. Marginal and long-period effects of large earthquakes.

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 motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frames creak.

V. Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.

VI. 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. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle).

VII. Difficult to stand. Noticed by drivers of motorcars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roofline. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and cave-ins along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.

VIII. 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. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged (general damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames cracked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas, sand and mud ejected, earthquake fountains, sand craters.

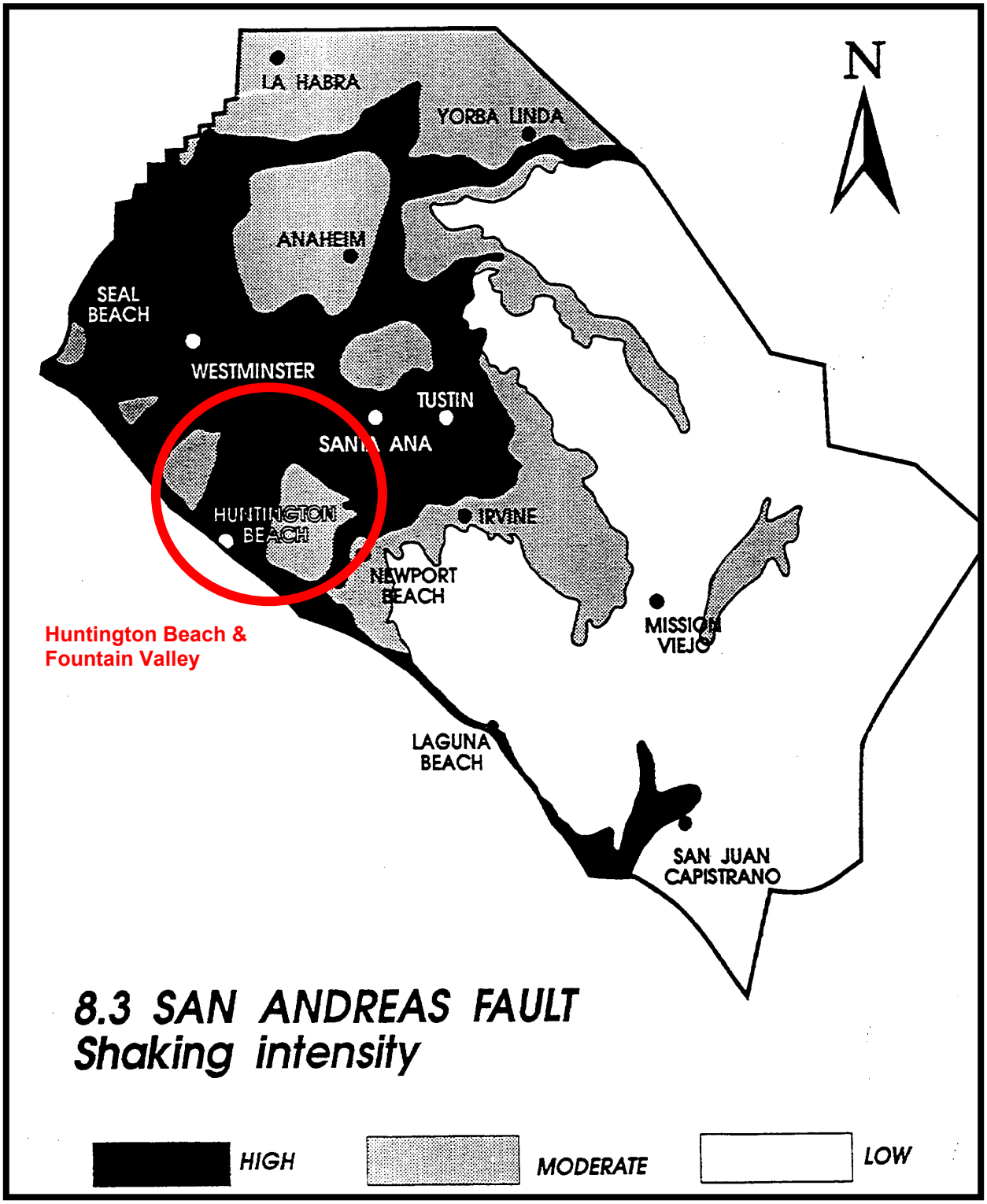
X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.

XI. Rails bent greatly. Underground pipelines completely out of service.

XII. Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Definition of Masonry A, B, C, D: Masonry A - Good workmanship, mortar and design; reinforced, especially laterally and bound together by using steel, concrete, etc.; designed to resist lateral forces. Masonry B - Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces. Masonry C - Ordinary workmanship and mortar; no extreme weaknesses, as in failing to tie in at corners, but neither reinforced nor designed against horizontal forces. Masonry D - Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Exhibit IV-F-4: San Andreas Fault Shaking Intensity Map



The Newport-Inglewood Fault

The Newport-Inglewood fault is considered the second most active fault in California. It runs from the City of Inglewood through Huntington Beach and out into the Pacific Ocean in the Newport Beach area. Surface location of the fault in the Huntington Beach areas is shown in Exhibit IV-F-1. This fault is capable of producing earthquakes in the range of 6.3 to 7.5 magnitude. The 6.5, 1933 Long Beach earthquake occurred on the Newport-Inglewood fault causing 120 deaths and severe damage. Unreinforced masonry buildings collapsed leaving people trapped beneath the rubble. Many schools collapsed. The 1933 Long Beach earthquake epicenter was actually located in Huntington Beach (the Huntington Harbour area).

Earthquake Study

Earthquakes are to be considered a major threat to the cities. When scientists refer to the San Andreas Fault, they often call it "The Big One." In 1990, the Los Angeles Times Newspaper did a series of articles on the Newport-Inglewood Fault and described it as "The Bigger One." Both faults would cause considerable damage, however, a 7.5 magnitude Newport-Inglewood quake would be more severe to the Huntington Beach/Fountain Valley area (especially Los Angeles and Orange County coastal areas) than an 8.3 on the San Andreas due to its proximity to the Cities. The cost estimates of damage are four times greater for the Newport-Inglewood *worst-case scenario* than the San Andreas *worst-case scenario.*

Generally the areas of the cities that are at the greatest risk, are sitting directly above and close to the Newport-Inglewood fault. Next, would be coastal areas where liquefaction potential is highest. Coastal areas are made up primarily of alluvial type soils, subject to intensive ground shaking and liquefaction. This area is densely populated and has considerable commercial property.

The area where the *old* Santa Ana River ran free, from Beach Blvd. east to Ward Street and from Fountain Valley to the ocean, would also be affected by a Newport-Inglewood earthquake. The area, being a natural lakebed has soft alluvial soil giving it a great potential for liquefaction.

The Huntington Harbour area and the lowlands of the Bolsa Chica Wetlands may also be subject to liquefaction. The City requires the properties in this area be built on compacted soils, which should lessen the potential.

Newport-Inglewood Fault Statistics

- Deaths depending on time of day: 87 - 208
- Seriously injured (requiring hospital/surgical care): 349 - 833
- Injuries (requiring non-hospital medical care): 2,622 – 6,251

Long-Term Homeless

Homeless households are those, which for one reason or another cannot be allowed to re-occupy their dwelling units. These persons may require mass care sheltering if they cannot first find temporary shelter with relatives, friends, etc.

There were 82,079 building units in Huntington Beach as of 2000. In addition, damage to mobile homes can create additional homeless caseload problems.

According to the Earthquake Engineering Research Institute, based on the Modified Mercalli Intensity Scale and the Standardized Damage States, the expected damage after an earthquake on the Newport-Inglewood Fault in Huntington Beach and Fountain Valley would be as follows:

City of Huntington Beach Statistics – 82,079 structures

Percent of Damage	Damage Category	Average Percent	# of Structures Impacted
15% to 30%	No Damage	22%	18,057
15% to 30%	Slight Damage	22%	18,057
30% to 55%	Moderate Damage	42%	34,473
6% to 20%	Extensive Damage	13%	10,670
Less than 4%	Complete Damage	4%	3,283

City of Fountain Valley Statistics – 14,280 structures

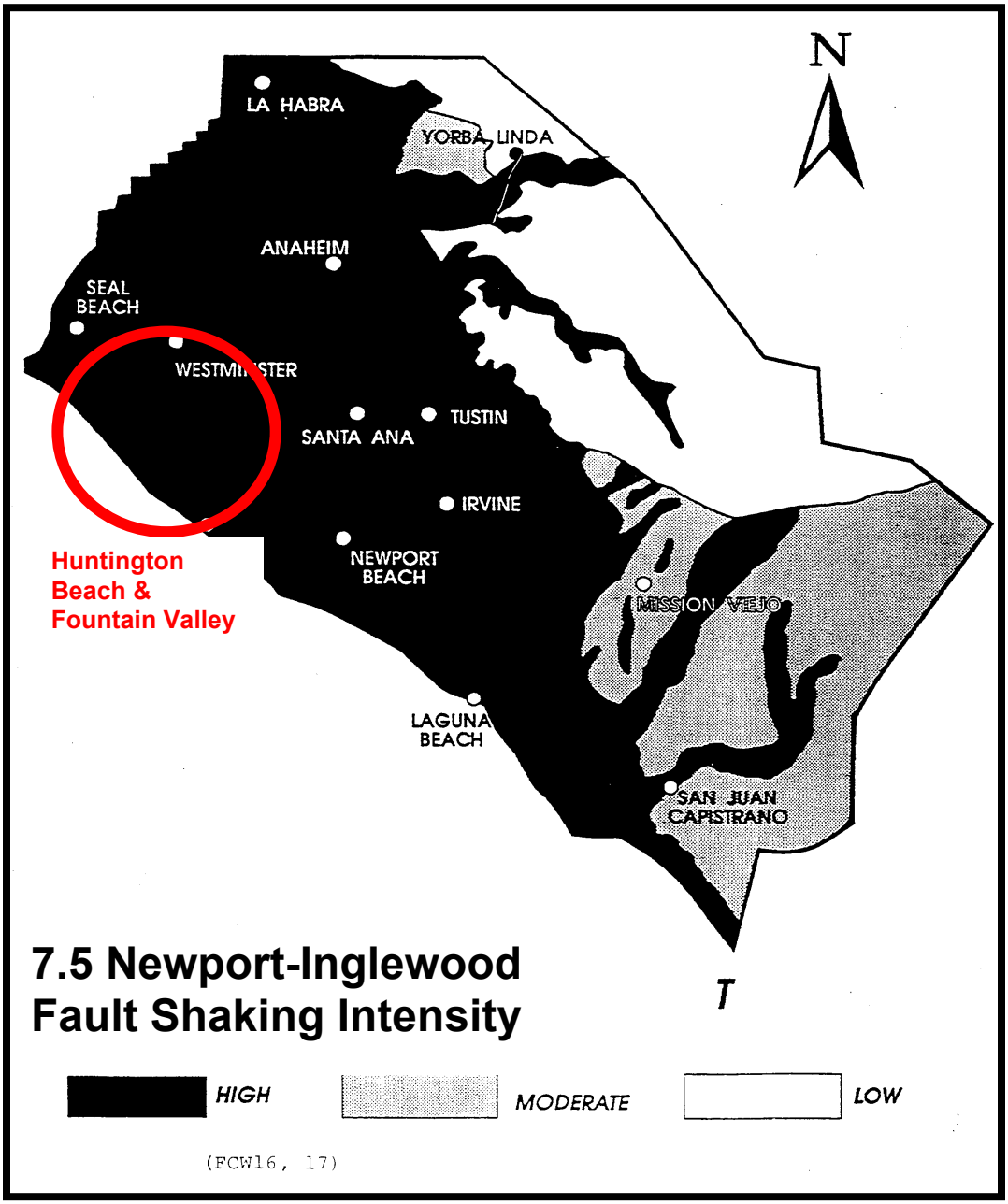
Percent of Damage	Damage Category	Average Percent	# of Structures Impacted
15% to 30%	No Damage	22%	3,141
15% to 30%	Slight Damage	22%	3,141
30% to 55%	Moderate Damage	42%	6,069
6% to 20%	Extensive Damage	13%	1,856
Less than 4%	Complete Damage	4%	571

Note: The above statistics are estimates only based on scientific studies and are for planning purposes only.

Rose Canyon Fault

"Most people tend to think that there is some connection between the Rose Canyon and the Newport-Inglewood. The National Hazard maps includes a fault segment extending from Newport Beach down to the Rose Canyon fault," stated Dr. Lucy Jones in a personal interview. Therefore, it is believed the Rose Canyon Fault studies should be closely followed.

Exhibit IV-F-5: Newport-Inglewood Fault Shaking Intensity Map



Comparison: San Andreas Fault vs Newport-Inglewood Fault

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a magnitude of 8+ on the Richter scale, some of the "lesser" faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood would result in far more death and destruction than a "great" quake on the San Andreas, because the San Andreas is relatively remote from the urban centers of Southern California.

Property Loss

Specific estimates for Huntington Beach have not been developed. In 1980, an ad hoc committee of the National Security Council estimated the loss for Southern California's six affected counties (Orange, Los Angeles, San Bernardino, Riverside, Ventura, and San Diego Counties) as follows:

	Loss To Buildings In Billions	Loss To Contents In Billions	Total Loss in Billions
San Andreas	11	6	17
Newport-Inglewood	45	24	69

Casualties

	Time	Dead	Serious Injury (Hospitalized)	Injury (Non-Hospital)
San Andreas	2:30 AM	620	2,480	18,600
	9:00 AM	2,490 -3,215	9,959	96,466
	2:00 PM	1,310	5,240	39,300
	4:30 PM	1,450	5,800	43,500
Newport-Inglewood	2:30 AM	950	3,800	28,500
	2:30 PM	2,060	8,240	61,800
	4:30 PM	2,265	9,060	67,950

Orange County Hospital Bed Losses San Andreas vs. Newport-Inglewood

There are 26 paramedic receiving center hospitals in Orange County with a total capacity of approximately 6,750 beds.

San Andreas: Approximately 900 beds expected to be lost due to structural damage. Approximately 5,850 beds remain for the seriously injured, in addition to those already hospitalized.

Newport-Inglewood: Approximately 2,935 beds expected to be lost. Approximately 3,815 beds remain for the seriously injured, in addition to those already hospitalized.

Although a percentage of the remaining beds could be made available by discharging or transferring non-emergency patients, it will probably be necessary to receive an immediate influx of emergency medical aid (like Federal Disaster Medical Aid Teams or DMAT) and/or exporting some of the seriously injured to out-of-county facilities, possibly even out of State.

The San Joaquin Hills Thrust Fault

Following are the results of the California Institute of Technology (CalTech) study on the San Joaquin Hills Fault.

The San Joaquin Hills Fault is a blind thrust fault, which will not break the earth's surface but can cause severe damage. It is 24 miles in length from Dana Point to Huntington Beach. This thrust fault may interact with the projected Compton Thrust Fault thrust to the west (Exhibit IV-F-6). CalTech reported that the maximum magnitude the quake could produce was up to a 7.3, which is a large and powerful seismic event. They utilized the research on the fault conducted by Lisa Grant at UCI to complete an earthquake-shaking model showing the intensity, velocity and acceleration.

CalTech used the software programs HAZUS and EPEDAT to model the following impacts on Orange County from a **6.6 magnitude** earthquake on the San Joaquin Hills Thrust Fault:

Losses	**HAZUS**	**EPEDAT**
Total $ Losses (b$)	14.6	8.2 - 13.6
Persons Displaced	22,404	16 to 27,000
Deaths	224	100-200
Injuries	6,293	up to 21,000
Debris Generated (mt)	10.4	Not Calculated
Building Damage (Res)	33,028	4,500 – 9,500
Building Damage (Com)	2,712	5,100-8,600

The study went on to look at how the earthquake would impact the performance of our potable water and the power systems. This estimate is based on 828,849 households in the impact area and predicts the number of households that would be without services.

System	***# of Days Without Service***		
	Day 1	***Day 3***	***Day 7***
Water	165,048	103,634	11,349
Electricity	97,534	7,957	5

Additional results of the study looked at some of the vulnerable and critical facilities throughout the impacted area of Orange County:

Mobile Homes	8,106 damaged/destroyed
Steel Frame Buildings	8,792 damaged/destroyed
Critical Facilities	
Hospitals	60% reduced function day 1
EOC's	of 13, 1 w/>50% function
Police Stations	of 39, 9 w/>50% function
Fire Stations	of 28, 7 w/>50% function

Palos Verdes Fault Zone

Type of fault:	Right-reverse
Length:	Roughly 80 km
Nearby Communities:	San Pedro, Palos Verdes Estates, Torrance, Redondo Beach
Most recent surface rupture:	Holocene offshore; Late Quaternary onshore;
Slop rate:	Between 0.1 and 3.0 mm/yr
Interval between major ruptures:	Unknown
Probable magnitudes:	6.0 – 7.0 (or greater); fault geometries may allow only partial rupture at any one time.

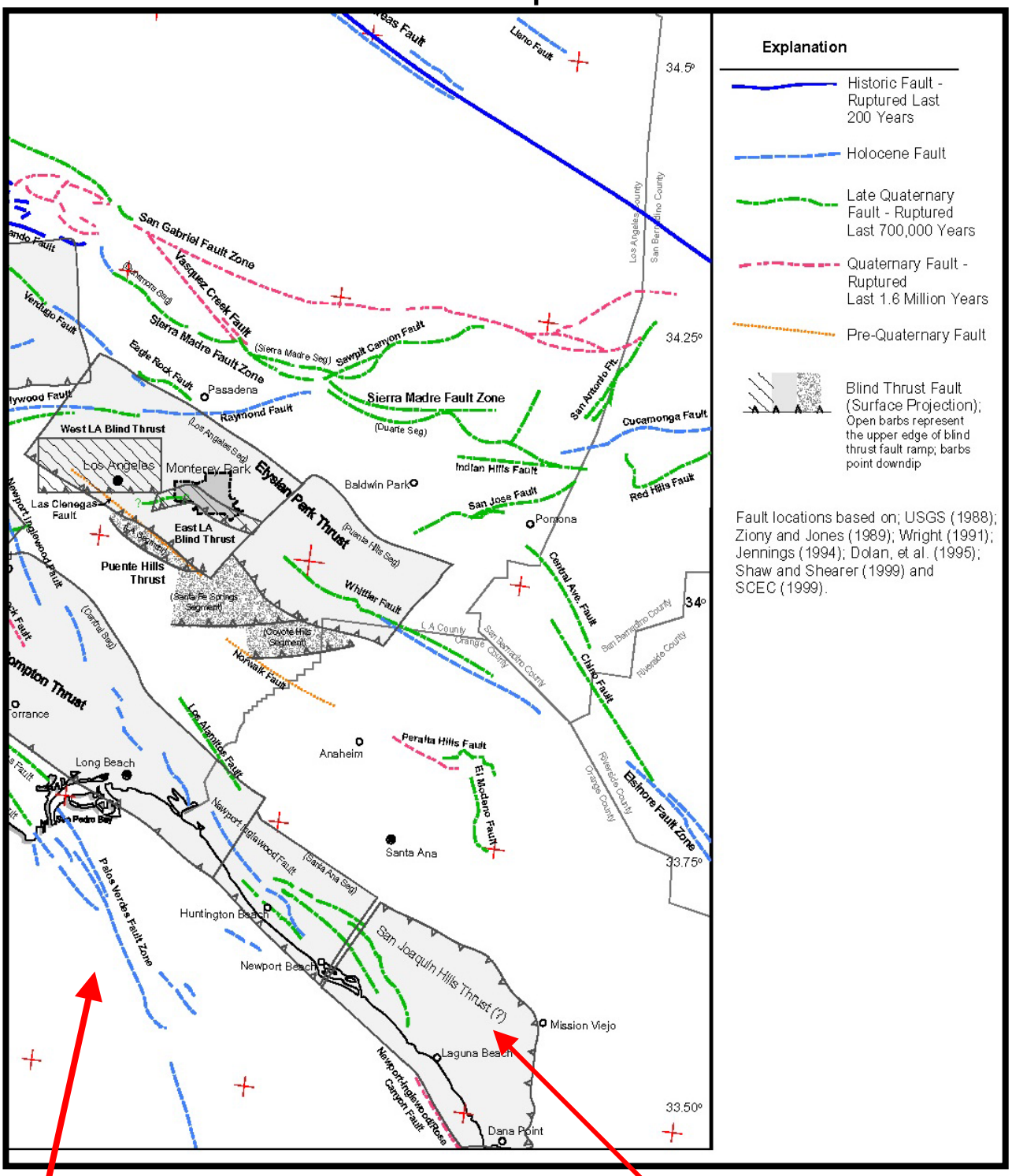
Map showing the Palos Verdes Hills-Coronado Bank fault zone outlined in red

The Palos Verdes Hills Fault is capable of a 6.0-7.0 magnitude earthquake. It has two main branches and continues southward as the Palos Verdes-Coronado Bank Fault Zone.

This fault is located off the coast of Huntington Beach. It starts north of Long Beach and extends south past Newport Beach where it is projected to join the Coronado Bank Fault Zone. The issue of concern is the fault causing shaking, liquefaction, and a local tsunami that would strike without sufficient warning time to evacuate the Orange County and Long Beach coastal areas.

Also, see Exhibit IV-F-6 for a closer look at the Palos Verdes Fault Zone. Also, Exhibit IV-F-1 shows this fault as #34.

Exhibit IV-F-6: San Joaquin Hills Thrust Fault



Palos Verdes Fault Zone **San Joaquin Hills Fault**

San Clemente Fault

Type of fault:	Right-lateral and vertical offsets
Length:	At least 210 km; essentially continuous with the San Ilsidoro Fault Zone, off the coast of Mexico
Nearby Communities:	San Diego (70 km offshore) forms scarp on east side of San Clemente Island
Most recent surface rupture:	Holocene
Slop rate:	Roughly 1.5 mm/yr

As with the Palos Verdes Fault, the San Clemente Fault being offshore could cause ground shaking, liquefaction and a tsunami along the coast.

Historical Earthquakes of California

Earthquake Events In The Southern California Region

Southern California Region Earthquakes with a Magnitude 5.0 or Greater	
1769 Los Angeles Basin	1916 Tejon Pass Region
1800 San Diego Region	1918 San Jacinto
1812 Wrightwood	1923 San Bernardino Region
1812 Santa Barbara Channel	1925 Santa Barbara
1827 Los Angeles Region	1933 Long Beach
1855 Los Angeles Region	1941 Carpenteria
1857 Great Fort Tejon Earthquake	1952 Kern County
1858 San Bernardino Region	1954 West of Wheeler Ridge
1862 San Diego Region	1971 San Fernando
1892 San Jacinto or Elsinore Fault	1973 Point Mugu
1893 Pico Canyon	1986 North Palm Springs
1894 Lytle Creek Region	1987 Whittier Narrows
1894 East of San Diego	1992 Landers
1899 Lytle Creek Region	1992 Big Bear
1899 San Jacinto and Hemet	1994 Northridge
1907 San Bernardino Region	1999 Hector Mine
1910 Glen Ivy Hot Springs	

Source:
http://geology.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fpasadena.wr.usgs.gov%2Finfo%2Fcahist_eqs.html

To better understand the earthquake hazard, the scientific community has looked at historical records and specific instrumental research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records are generally divided into two records, of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection of earthquakes is based on field observations and reports of what people felt, and is dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult.

However, two very large earthquakes, the Fort Tejon in 1857 (7.9) and the Owens Valley in 1872 (7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times, two 7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because they occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons as occurred in past earthquakes.

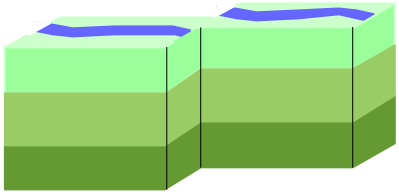
Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in Southern California, most with a magnitude below three. No community in Southern California is beyond the reach of a damaging earthquake.

Causes and Characteristics of Earthquakes in Southern California

Earthquake Faults

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

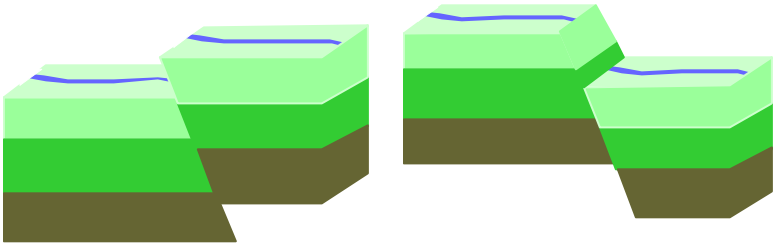
Strike-slip Fault



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/Thrust Fault

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 are a reverse fault with a dip of 45 ° or less.

Earthquake Related Hazards

Ground shaking, 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, 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. A map showing projected ground shaking in the Huntington Beach/Fountain Valley area is shown in Exhibit IV-F-2.

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. 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 (see Exhibits IV-F-7, 8 and 9).

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.

Exhibit IV-F-7: Orange County Slope and Soil Failure Liquefaction

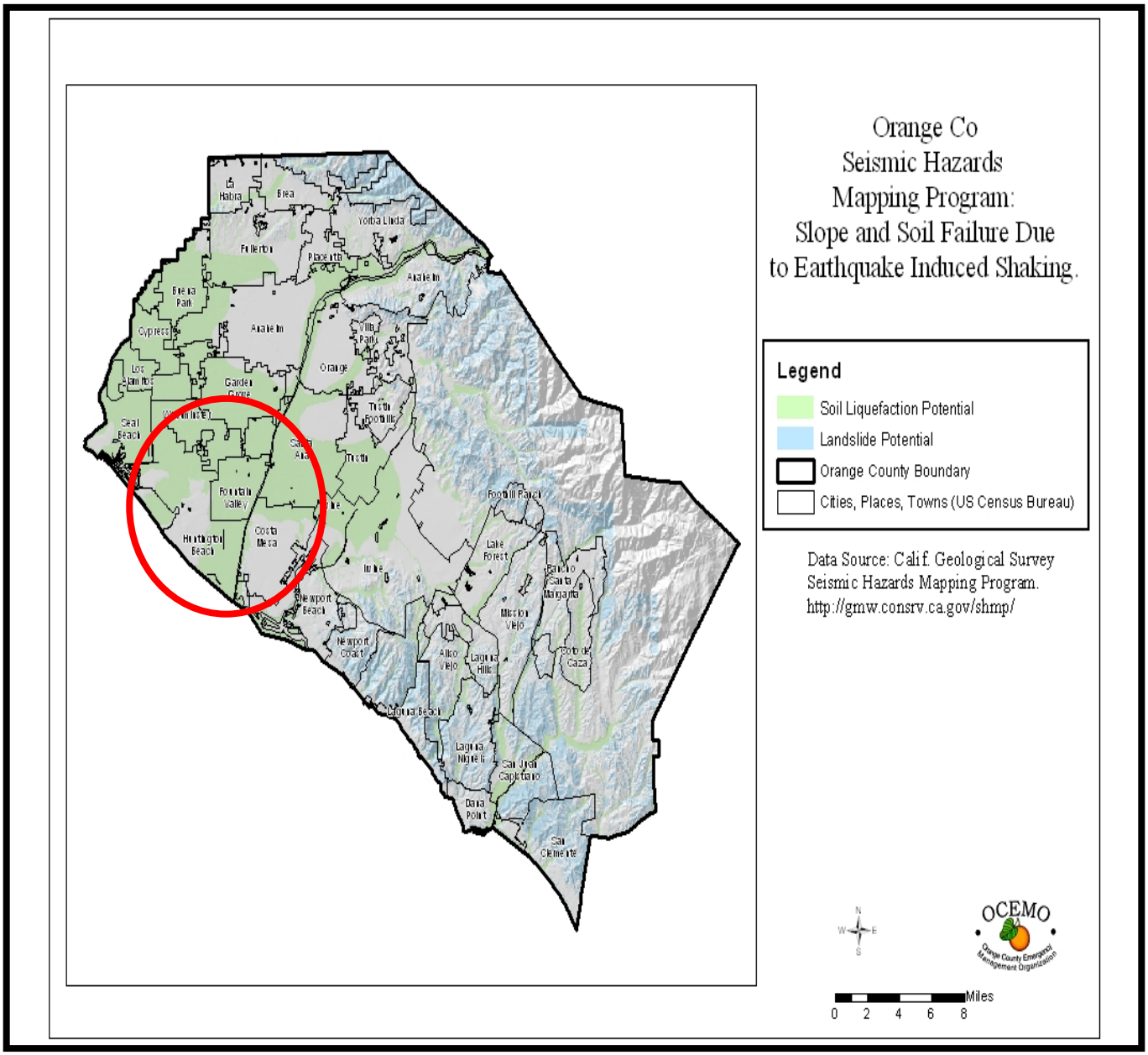


Exhibit IV-F-8: Orange County Liquefaction Zones

Prepared by the County of Orange

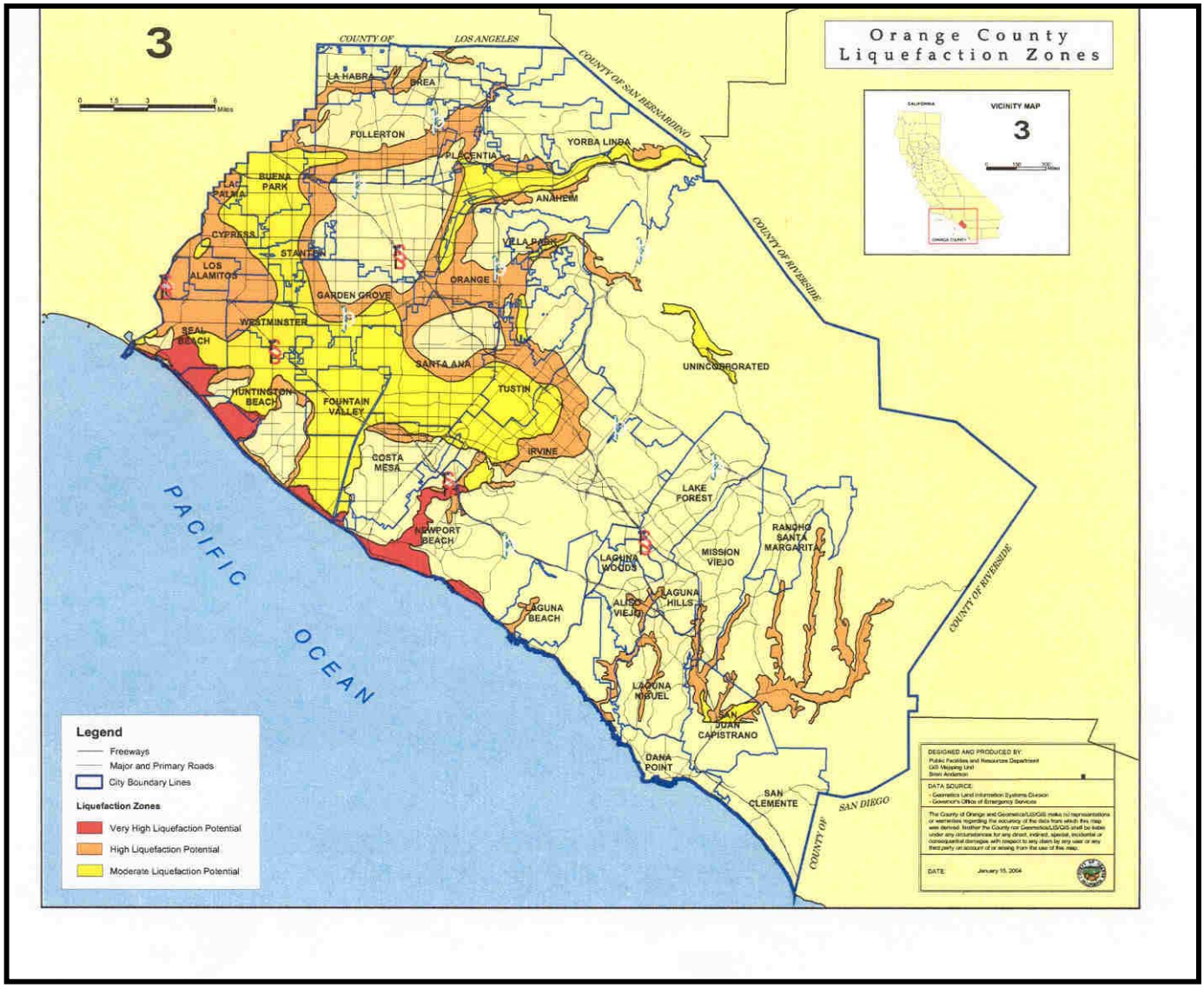
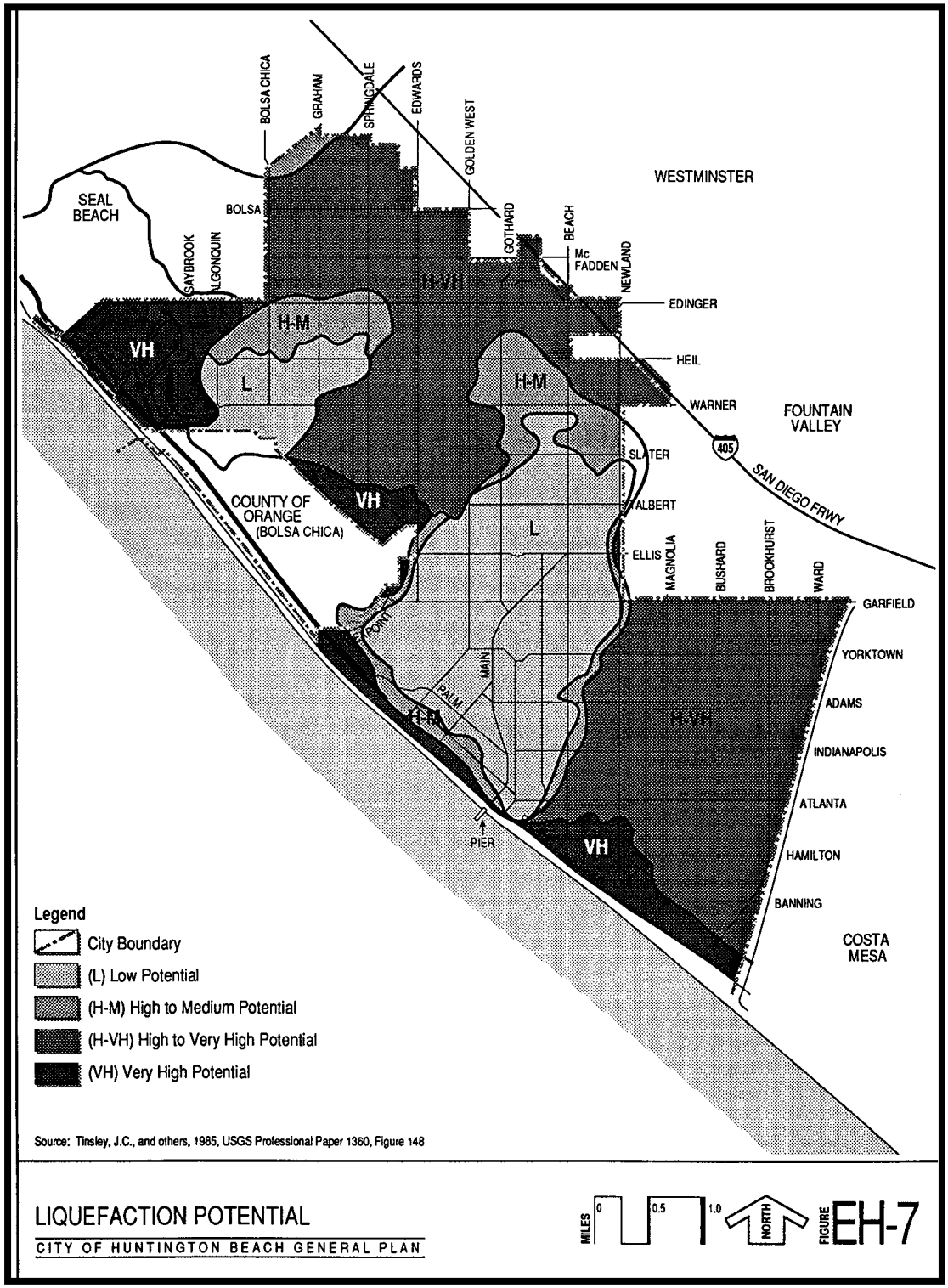


Exhibit IV-F-9: Huntington Beach Liquefaction Potential



Secondary Affects of Earthquakes

1. Fires - There is a high probability of fires following an earthquake due to the number of broken gas lines that typically occur. Water mains and lines also break due to ground movement. The combination of fires and a potential water shortage can seriously complicate the response to earthquake.

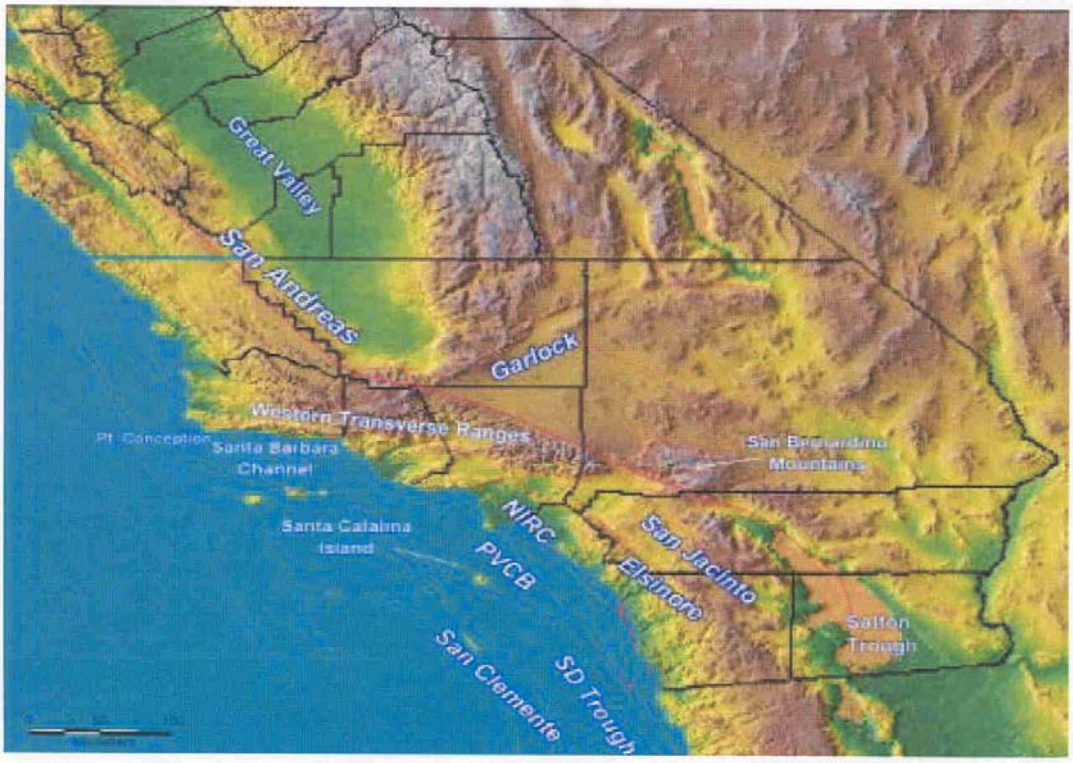
2. Dam Failure - In addition to the direct affects caused by earth shaking and ground failure (liquefaction), the Cities could be impacted by flooding caused by earthquake induced dam failure, however, the probability is low since the Prado Dam is rarely full.

3. Oil Spills & Pipeline Breakage - Oil fields and oil storage tanks are being consolidated but can be seen throughout Huntington Beach. The City has one of the four largest aboveground oil storage tanks in the United States. Although the tanks are diked, a major earthquake could damage the tanks and dikes causing vast amounts of oil spillage.

   The City of Huntington Beach has numerous underground pipelines going from the offshore ship moorings inland to Los Angeles County. An earthquake could easily cause pipeline breakage releasing either natural crude oil (on its way to Los Angeles to be refined) or refined petroleum products (coming back from Los Angeles County refineries).

4. Tsunami – An earthquake anywhere in the Pacific Ocean can cause a tsunami, which could impact Huntington Beach. The Alaska 1964 Good Friday Earthquake caused a tsunami in Crescent City, California and tidal surges all the way south in Huntington Beach. Of particular concern are faults off the coast of Huntington Beach that could cause earthquakes with very little warning time. There may be other likely sources of a tsunami including the Palos Verdes, the San Clemente or uncharted faults off the coast of California capable of producing a tsunami.

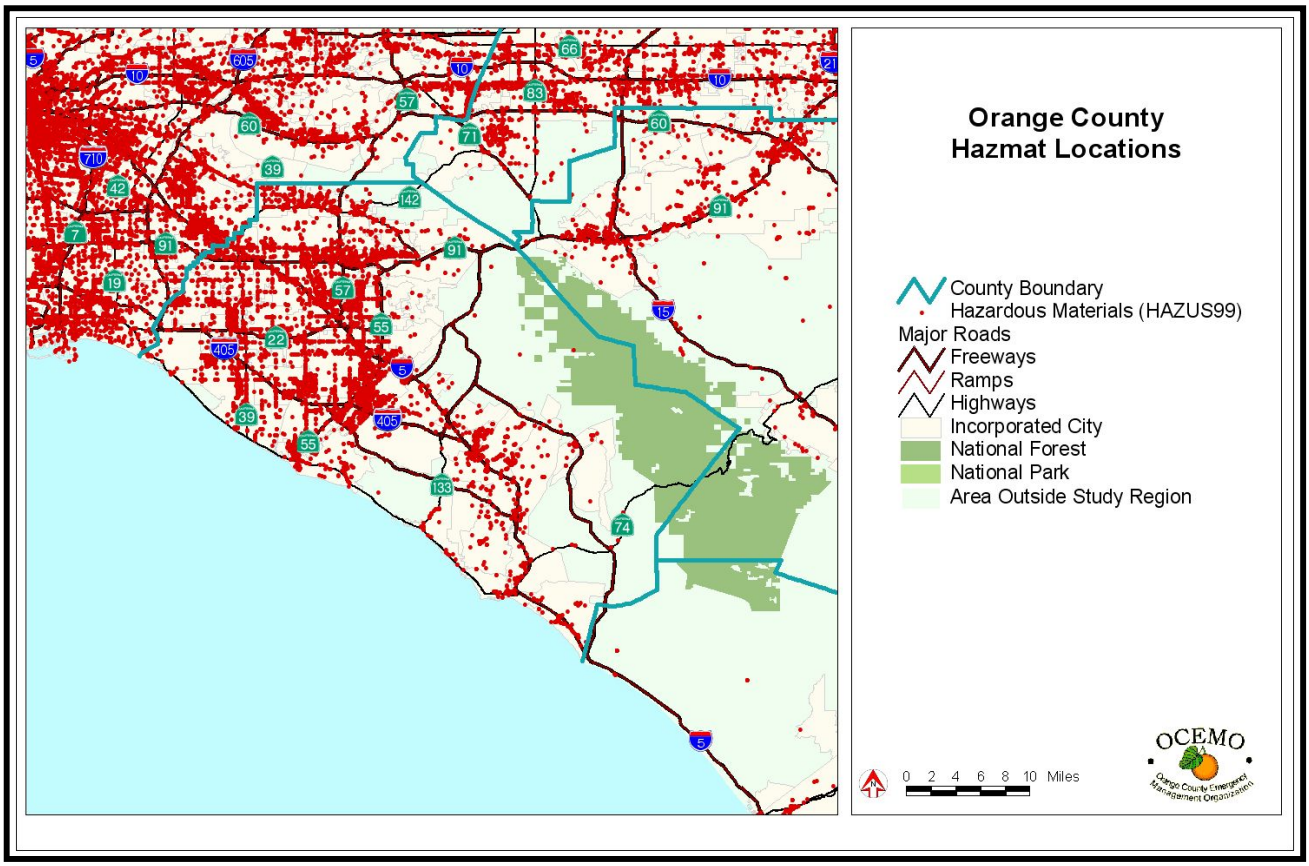
Exhibit IV-F-10: Tsunami Risk for Coastal Southern California



.Map showing major faults of the southern California region. Northwest-trending faults are right-slip in character. The "big bend" of the San Andreas fault curves from the Salton Trough to the Great Valley. Major offshore faults include the Newport-Inglewood-Rose Canyon (NIRC), Palos Verdes - Coronado Bank (PVCB), San Diego Trough, and San Clemente. (Shaded relief base map from NOAA State DEM).

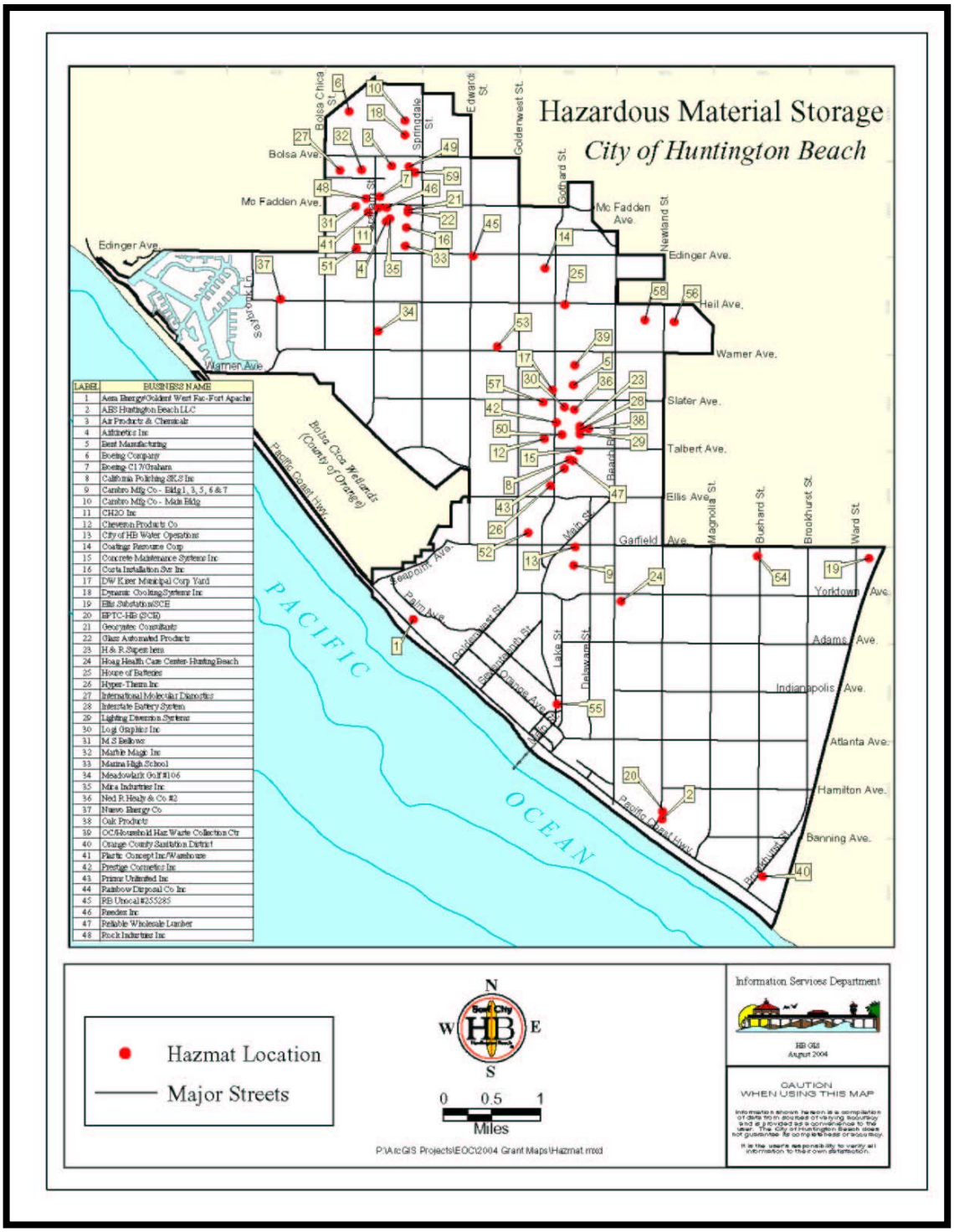
5. Hazardous Chemical Spills – As can be seen in Exhibit IV-11, the entire North West part of Orange County has extensive hazardous materials sites including Huntington Beach and Fountain Valley.

Exhibit IV-F-11: Orange County Hazardous Materials Locations



The north end of Huntington Beach (RD's 146, 147, 136, 137, 126, and 127) as well as the Gothard corridor houses a large percentage of the City of Huntington Beach's industries with quantities of hazardous chemicals (Exhibit IV-F-12). This area, extending into the City of Westminster, would be most affected by hazardous chemical spills and hazardous chemical fires as the result of earthquakes.

Exhibit IV-F-12: HB Hazardous Materials Storage Sites



Earthquake Hazard Assessment

Hazard Identification

In California, many agencies are focused on seismic safety issues: the State's Seismic Safety Commission, the Applied Technology Council, Governor's Office of Emergency Services, United States Geological Survey, CalTech, the California Geological Survey as well as a number of universities and private foundations.

These organizations, in partnership with other state and federal agencies, have undertaken a rigorous program in California to identify seismic hazards and risks including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. Seismic hazard maps have been published and are available for many communities in California through the State Division of Mines and Geology.

Building Code Improvements as the result of Earthquakes

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 and 1994 Northridge earthquakes. These code changes have resulted in stronger and more earthquake resistant structures.

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. Surface rupture is the most easily avoided seismic hazard.[2] Huntington Beach is in the Alquist-Priolo Study Zone for the Newport-Inglewood Fault.

Huntington Beach is in the Alquist-Priolo Study Zone. Fountain Valley is in the State of California Seismic Hazards Zone.

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.[3] The State Department of Conservation operates the Seismic Mapping Program for California. Extensive information is available at their website:
http://gmw.consrv.ca.gov/shmp/index.htm

Vulnerability Assessment

The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California region would probably be felt throughout the region. However, the degree to which the earthquakes are felt, and the damages associated with them may vary. At risk from earthquake damage are large stocks of old buildings

and bridges; many high tech and hazardous materials facilities: extensive sewer, water, petroleum and natural gas pipelines; earth dams; power generation station; and other critical facilities and private property located in the county. Associated or secondary earthquake hazards, which are liquefaction, ground shaking, amplification, and earthquake-induced landslides, can be just as devastating as the earthquake.

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.

Risk Analysis

Risk analysis is the third phase of a hazard assessment. Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time[4]. Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, rupture and liquefaction potential, landslide susceptibility, building classification/type, infrastructure, and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the region due to an earthquake event in a specific location. FEMA's software program, HAZUS, uses mathematical formulas and information about building type, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake.[5] The HAZUS software is available from FEMA at no cost. The City of Huntington Beach and Fountain Valley GIS systems are not currently compatible with the FEMA software. A complete HAZUS study will be done at a future time when funding is available.

For greater Southern California there are multiple worst-case scenarios, depending on which fault might rupture, and which communities are in proximity to the fault. But damage will not necessarily be limited to immediately adjoining communities. Depending on the hypocenter of the earthquake, seismic waves may be transmitted through the ground to unsuspecting communities. In the 1994 Northridge Earthquake, Santa Monica suffered extensive damage, even though there was a range of mountains between it and the origin of the earthquake.

Non-structural bracing of equipment and contents is often the most cost-effective type of seismic mitigation. Inexpensive bracing and anchoring may be the most cost effective way to protect expensive equipment. Non-structural bracing of equipment and furnishings will also reduce the chance of injury for the occupants of a building.

Community Earthquake Issues

What is Susceptible to Earthquakes?

Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines) suffer damage in earthquakes and can cause death or injury to humans. The survival of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by city governments.

Buildings

The building environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk and the cost to clean up the damage is great. In most California communities, including the cities of Huntington Beach and Fountain Valley, many buildings were built before 1993 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings.

Damages for a large earthquake almost anywhere in Southern California are likely to run into the billions of dollars. Although building codes are some of the most stringent in the world, tens of thousands of older existing buildings were built under much less rigid codes. California has laws affecting unreinforced masonry buildings (URM's) and although many building owners have retrofitted their buildings, hundreds of pre-1933 buildings still have not been brought up to current standards. Today, the Cities of Huntington Beach and Fountain Valley have no unreinforced masonry buildings. Huntington Beach had dozens of these building in the downtown area but they have all been either demolished or retrofitted to today's building codes.

Infrastructure and Communication

Residents in the Cities of Huntington Beach and Fountain Valley commute frequently by automobiles and rarely by public transportation. An earthquake can greatly damage bridges and roads, hampering emergency response efforts and the normal movement of people and goods. Damaged infrastructure strongly affects the economy of the community because it disconnects people from work, school, food, and leisure, and separates businesses from their customers and suppliers.

Bridge Damage

Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link - with even minor damages making some areas inaccessible. Because bridges vary in size, materials, location and design, any given earthquake will

affect each differently. Bridges built before the mid-1970s have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made.

Much of the interstate highway system was built in the mid to late 1960s. The bridges in the Cities of Huntington Beach and Fountain Valley are state, county or privately owned. Caltrans has retrofitted most bridges on the freeway systems, however, there are still some county maintained bridges that have not been retrofitted. The FHWA requires that bridges on the National Bridge Inventory be inspected every two years. Caltrans checks when the bridges are inspected because they administer the Federal funds for bridge projects.

Numerous bridges within Huntington Beach and Fountain Valley cross the Santa Ana River and Huntington Beach has several bridges in the Huntington Harbour area.

Damage to Lifelines

Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, electricity, and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. Lifelines need to be usable after an earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event. Most critical facilities within Huntington Beach are located directly on the Newport-Inglewood Fault.

Exhibit IV-F-13: HB Earthquake Faults & Essential Service Facilities

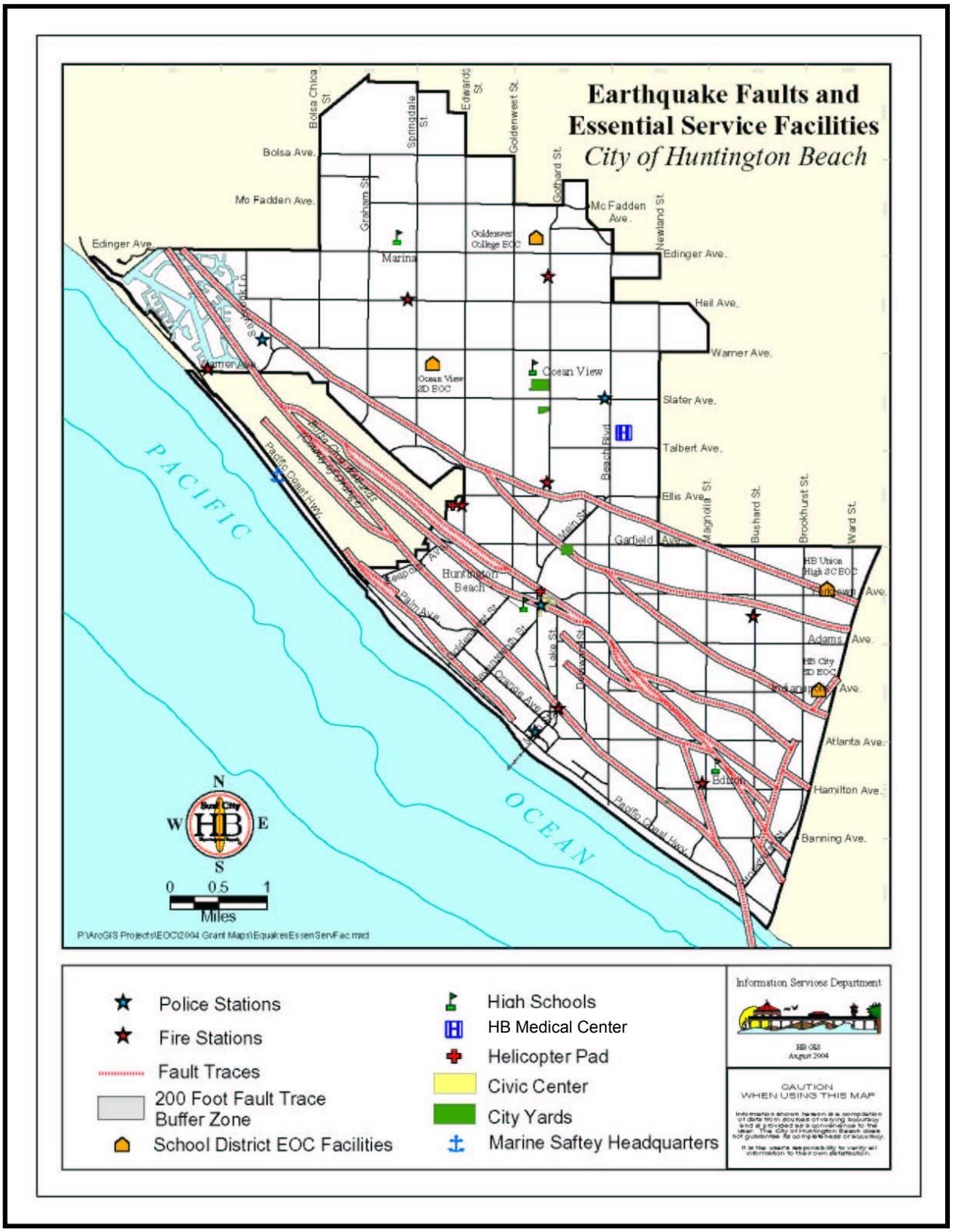
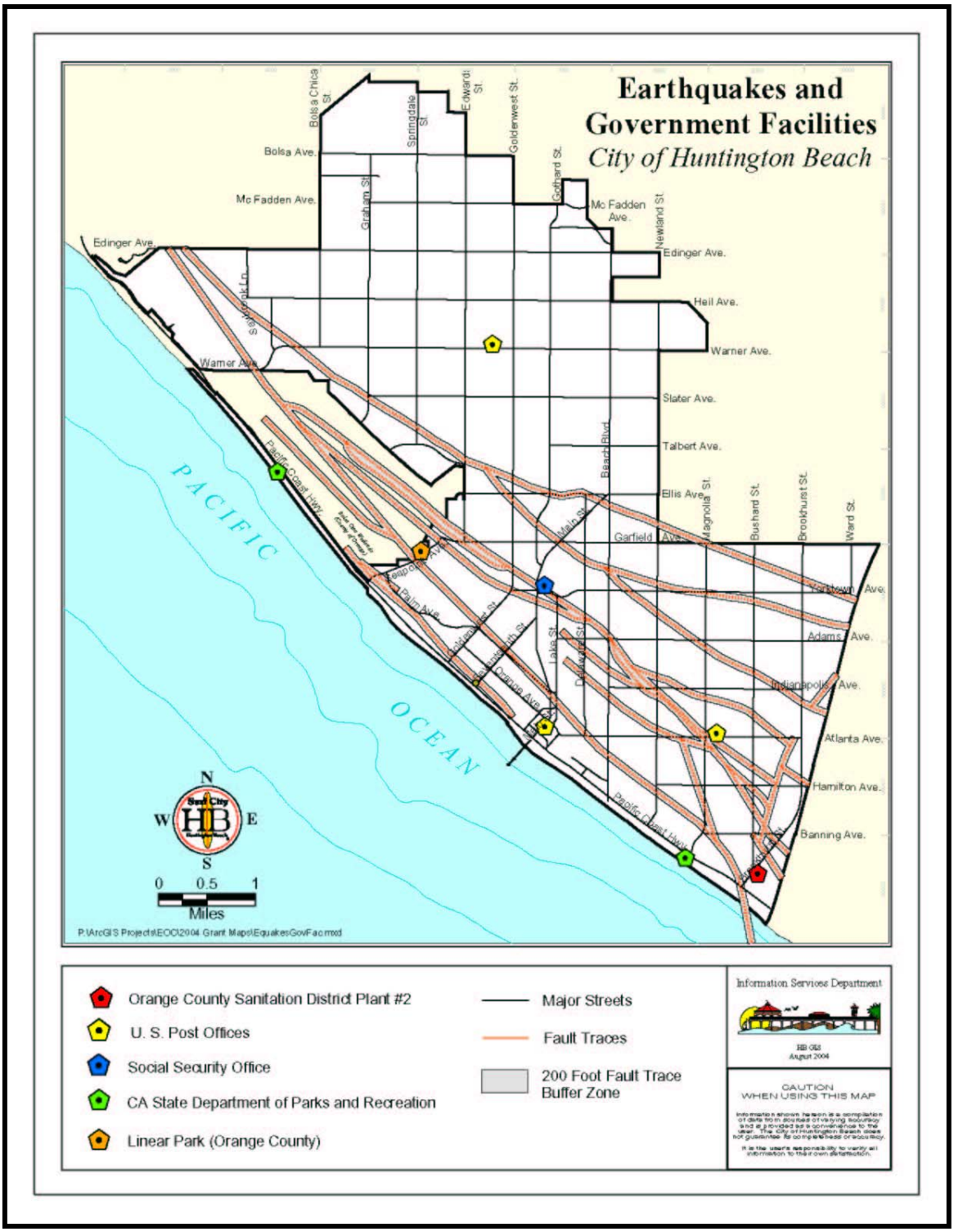


Exhibit IV-F-14: HB Earthquake Faults & Non-City Government Facilities

Most non-city government facilities within Huntington Beach are sitting on the Newport-Inglewood Fault.
(See Community Profile for a complete list of Non-City Governmental Facilities)



Businesses

Seismic activity can cause great loss to businesses, both large-scale corporations and small retail shops. When a company is forced to stop production for just a day, the economic loss can be tremendous, especially when its market is at a national or global level. Seismic activity can create economic loss that presents a burden to large and small shop owners who may have difficulty recovering from their losses.

Forty percent of businesses do not reopen after a disaster and another twenty-five percent fail within one year according to the Federal Emergency Management Agency (FEMA). Similar statistics from the United States Small Business Administration indicate that over ninety percent of businesses fail within two years after being struck by a disaster.[6]

Individual Preparedness

Because the potential for earthquake occurrences and earthquake related property damage is relatively high in the Cities of Huntington Beach and Fountain Valley, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake insured and anchoring buildings to foundations are just a few steps individuals can take to prepare for an earthquake.

Huntington Beach has developed the Community Emergency Response Team (CERT) Program to educate and train the community on emergency preparedness. Over 4,000 persons have attended classes in Huntington Beach and there are 450 graduates from the 32-hour class series which teaches: (1) Disaster Preparedness, (2) First Aid and Triage, (3) CPR, (4) Light Search & Rescue, (5) Fire Extinguisher Use and Hazard Mitigation of the Home, (6) Emergency Communications & Damage Assessment, (7) Care & Shelter and Disaster Mental Health, and (8) How to Manage Your Disaster Team & Command Post Operations.

The Huntington Beach CERT Program goes one step further with graduates being registered as State Disaster Service Workers. They will take care of themselves, their families, their homes, their neighborhood, and then report to the City of Huntington Beach to assist.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations.

Cities of Huntington Beach and Fountain Valley Codes

Implementation of earthquake mitigation policy most often takes place at the local government level. The Building Departments of the cities of Huntington Beach and Fountain Valley enforce building codes pertaining to earthquake hazards.

Example: The following sections of the UBC address the earthquake hazard:

- *1605, 1 (Distribution of Horizontal Sheer)*
- *1605. 2 (Stability against Overturning)(Seismic)*
- *1605. 3 (Anchorage)*
- *1632, 1633, 1633. 9 deal with specific earthquake hazards*

The cities of Huntington Beach and Fountain Valley Planning Departments enforce the zoning and land use regulations relating to earthquake hazards.

Generally, the codes seek to discourage development in areas that could be prone to flooding or seismic hazards; and where development is permitted, that the applicable construction standards are met. Developers in hazard-prone areas may be required to retain a qualified professional engineer to evaluate level of risk on the site and recommend appropriate mitigation measures.

Coordination Among Building Officials

Huntington Beach and Fountain Valley Building Codes set the minimum design and construction standards for new buildings, and they have adopted the most recent seismic standards in building codes, which requires that new buildings be built to a higher seismic standard.

Huntington Beach and Fountain Valley also require that site-specific seismic hazard investigations be performed for new essential facilities, major structures, hazardous facilities, and special occupancy structures such as schools, hospitals, and emergency response facilities.

Businesses/Private Sector

Natural hazards have a devastating impact on businesses. In fact, of all businesses that close following a disaster, more than forty-three percent never reopen, and an additional twenty-nine percent close for good within the next two years.[7] The Institute of Business and Home Safety has developed “Open for Business,” which is a disaster planning tool kit to help guide businesses in preparing for and dealing with the adverse affects of natural hazards. The kit integrates protection from natural disasters into the company's risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters, and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.

Hospitals

"The Alfred E. Alquist Hospital Seismic Safety Act ("Hospital Act") was enacted in 1973 in response to the moderate Magnitude 6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty-seven people. Three others were killed in another hospital that nearly collapsed.

In approving the Act, the Legislature noted: Hospitals house patients who have less than the capacity of normally healthy persons and cannot protect themselves and must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds. (Health and Safety Code Section 129680)

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

The moderate Magnitude 6.7 Northridge Earthquake in 1994 caused $3 billion in hospital-related damage and evacuations. Twelve hospital buildings constructed before the Act were cited (red tagged) as unsafe for occupancy after the earthquake. Those hospitals that had been built in accordance with the 1973 Hospital Act were very successful in resisting structural damage. However, nonstructural damage (for example, plumbing and ceiling systems) was still extensive in those post-1973 buildings.

Senate Bill 1953 ("SB 1953"), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated, and retrofitted, if needed, by 2030, so that they are in substantial compliance with the Act (which requires that the hospital buildings be reasonably capable of providing services to the public after disasters). SB 1953 applies to all urgent care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

SB 1953 directed the Office of Statewide Health Planning and Development ("OSHPD"), in consultation with the Hospital Building Safety Board, to develop emergency regulations including "…earthquake performance categories with subgradations for risk to life, structural soundness, building contents, and nonstructural systems that are critical to providing basic services to hospital inpatients and the public after a disaster." (Health and Safety Code Section 130005)

The Seismic Safety Commission Evaluation of the State's Hospital Seismic Safety Policies: In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD that revealed that a large percentage (40%) of California's operating hospitals are in the highest category of collapse risk.[8]

California Earthquake Mitigation Legislation

Californians are painfully aware of the threats they face from earthquakes. Dating back to the 19th Century, Californians have been killed, injured, and lost property as a result of earthquakes. As the State's population continues to grow, and urban areas become even more densely built up, the risk will continue to increase. For decades, the Legislature has passed laws to strengthen the built environment and protect the citizens. This Table provides a sampling of some of the 200 plus of the State's laws.

Partial List of the Over 200 California Laws on Earthquake Safety	
Government Code Section 8870-8870.95	Creates Seismic Safety Commission.
Government Code Section 8876.1-8876.10	Established the CA Center for Earthquake Engineering Research.
Public Resources Code Section 2800-2804.6	Authorized a prototype earthquake prediction system along the central San Andreas fault near the City of Parkfield.
Public Resources Code Section 2810-2815	Continued the Southern California Earthquake Preparedness Project and the Bay Area Regional Earthquake Preparedness Project.
Health and Safety Code Section 16100-16110	The Seismic Safety Commission and State Architect, will develop a state policy on acceptable levels of earthquake risk for new and existing state-owned buildings.
Government Code Section 8871-8871.5	Established the California Earthquake Hazards Reduction Act (1986)
Health and Safety Code Section 130000-130025	Defined earthquake performance standards for hospitals.
Public Resources Code Section 2805-2808	Established the California Earthquake Education Project.
Government Code Section 8899.10-8899.16	Established the Earthquake Research Evaluation Conference.
Public Resources Code Section 2621-2630 2621.	Established the Alquist-Priolo Earthquake Fault Zoning Act.
Government Code Section 8878.50-8878.52 8878.50.	Created the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990.
Education Code Section 35295-35297 35295.	Established emergency procedure systems in kindergarten through grade 12 in all the public or private schools.
Health and Safety Code Section 19160-19169	Established standards for seismic retrofitting of unreinforced masonry buildings.
Health and Safety Code Section 1596.80-1596.879	Required all child day care facilities to include an Earthquake Preparedness Checklist as an attachment to their disaster plan.

Source: http://www.leginfo.ca.gov/calaw.html

Earthquake Education

Earthquake research and education activities are conducted at several major universities in the Southern California region, including CalTech, USC, UCLA, UCSB, UCI, and UCSB. The local clearinghouse for earthquake information is the Southern California Earthquake Center located at the University of Southern California, Los Angeles, CA 90089, Telephone: (213) 740-5843, Fax: (213) 740-0011, Email: SCEinfo@usc.edu, Website: http://www.scec.org. The Southern California Earthquake Center (SCEC) is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

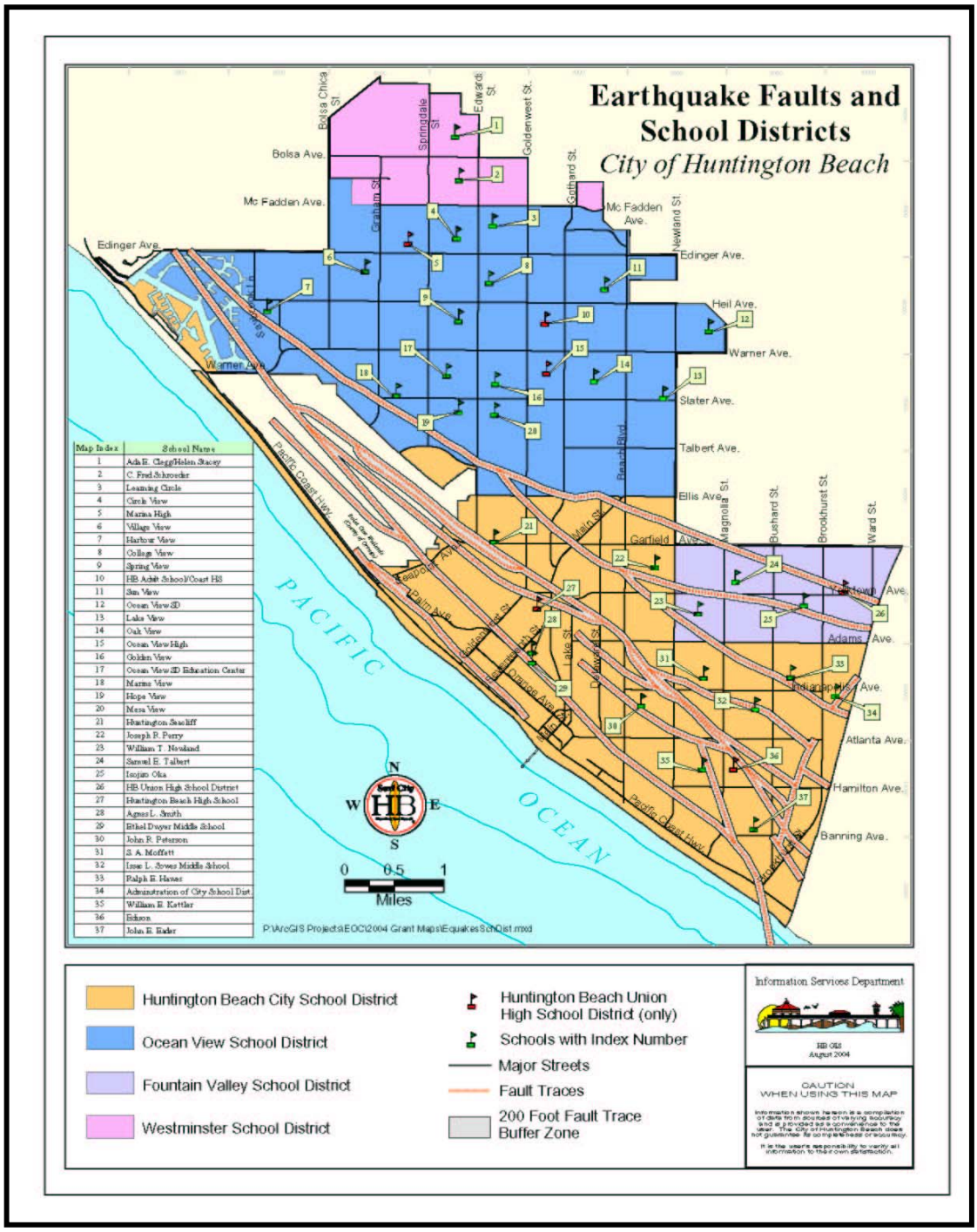
On a more local level, Huntington Beach and Fountain Valley are extremely proactive in disaster preparedness education. Huntington Beach formed the Community Emergency Response Team (CERT) program in 1991. The program is open to anyone in Orange County and many Fountain Valley residents have also attended. The classes are offered to persons who work in Huntington Beach, such as school personnel. Dozens of special classes have been conducted for school personnel over the past 10 years. All individuals are trained to manage a response in their neighborhood, school, and/or business and then they will respond to the City of Huntington Beach. There they will be dispatched to assist the community.

Schools and Earthquakes

Based on earthquake modeling, virtually 100% of the schools in the Huntington Beach/Fountain Valley area would be impacted by an earthquake on the San Andreas Fault and the Newport-Inglewood Fault. Earthquake models indicate that the hardest hit schools from an earthquake on the San Joaquin Hills Thrust Fault are in the south east area of Huntington Beach centered around Edison High School, the Huntington Beach City School District, and the three Fountain Valley Schools located in Huntington Beach.

Exhibit IV-F-15: Earthquake Faults and School Districts

This map clearly depicts the need for Huntington Beach schools to take every precaution to ensure their buildings are built to code, have secured all non-structural hazards, have disaster plans in place, training is ongoing for personnel and earthquake exercises are held regularly.



Earthquake Mitigation Strategies

The earthquake mitigation strategies provide guidance on suggesting specific activities that agencies, organizations, and residents in the cities can undertake to reduce risk and prevent loss from earthquake events. Each mitigation strategy is followed by ideas for implementation, which can be used by the planning committee and local decision makers in pursuing strategies for implementation.

The Huntington Beach Union High School District completed a mitigation project with the financial assistance of Federal Emergency Management Agency (FEMA). The hazard mitigation project was to prepare every school in the district for earthquakes. The district secured pendant lighting and ceilings and glass retrofits. This hazard mitigation grant was the result of the Northridge Earthquake mitigation money made available through FEMA.

Natural Hazard	**EARTHQUAKE STRATEGY #6A**		
Action Item	Seismic Retrofit of Huntington Beach City Hall This is also the location of the City's Emergency Operations Center (EOC).		
Coordinating Organization	Huntington Beach Building Department		
Ideas for Implementation	Note: a FEMA Hazard Mitigation Project Grant has been written for this project but has not yet been approved.		
Time line	ASAP – This is a high priority and should be completed as soon as funding becomes available		
Constraints	Insufficient Funding		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6B**		
Action Item	Fountain Valley Seismic Retrofit of Reservoir #2		
Coordinating Organization	Fountain Valley Public Works Department		
Ideas for Implementation	■ Solicit an engineering needs assessment ■ Request cost estimates ■ Secure funding ■ Develop plans and specifications ■ Contract project out ■ Manage retrofit contract		
Time line	ASAP – This is a high priority and should be completed as soon as funding becomes available.		
Constraints	Lack of funding		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6C**		
Action Item	Integrate new earthquake hazard mapping for the Cities of Huntington Beach and Fountain Valley and improve technical analysis of earthquake hazards. (HAZUS)		
Coordinating Organization	Huntington Beach/Fountain Valley Fire Department Emergency Services Offices		
Ideas for Implementation	■ Update the Cities of Huntington Beach and Fountain Valley earthquake data using HAZUS and localized data including the building inventory to improve accuracy of the vulnerability assessment ■ Utilize data for improved EOC training provide information to the public		
Time line	3-5 years		
Constraints	Budget, Staffing resources and sensitivities		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6D**		
Action Item	Encourage purchase of earthquake hazard insurance.		
Coordinating Organization	Huntington Beach and Fountain Valley Fire Department Emergency Services Offices		
Ideas for Implementation	Provide earthquake insurance information to the Cities of Huntington Beach and Fountain Valley residents		
Time line	Ongoing		
Constraints	None		
Plan Goals Addressed			Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6E**		
Action Item	Encourage seismic strength evaluations of critical facilities in the Cities of Huntington Beach and Fountain Valley to ■ identify vulnerabilities ■ to meet current seismic standards.		
Coordinating Organization	Huntington Beach/Fountain Valley Building Departments		
Ideas for Implementation	■ Develop an inventory of any schools and critical facilities that do not meet current seismic standards; ■ Encourage owners of non-retrofitted structures to upgrade them to meet seismic standards		
Time line	5 years		
Constraints	Budget, Expertise, and Staff Time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6F**		
Action Item	Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.		
Coordinating Organization	Huntington Beach/Fountain Valley Emergency Services Offices		
Ideas for Implementation	■Provide information to government building and school facility managers on securing bookcases, filing cabinets, light fixtures, and other objects that can cause injuries and block exits; and ■Encourage facility managers refer to FEMA's practical guidebook: "Reducing the Risks Nonstructural Earthquake Damage"; and ■Encourage homeowners and renters to use "Is Your Home Protected from Earthquake Disaster? A Homeowner's Guide to Earthquake Retrofit"		
Time line	Ongoing		
Constraints	Personnel shortages		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6G**		
Action Item	Hazard Mitigation of Non-Structural Earthquake Hazards for Public Schools		
Coordinating Organization	Huntington Beach City School District, Huntington Beach Union High School District, Ocean View School District, and Fountain Valley School District, assisted by the Huntington Beach and Fountain Valley Emergency Services Offices.		
Ideas for Implementation	Develop a program utilizing the maintenance staff at the four school districts to survey each site and determine non-structural mitigation measures needed. Purchase and install hardware.		
Time line	5 years		
Constraints	Staff time is limited due to budget cuts		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**EARTHQUAKE STRATEGY #6H**		
Action Item	Damage Assessment Training		
Coordinating Organization	Huntington Beach Fire Department, Huntington Beach Building & Safety Department and Huntington Beach Public Works Department.		
Ideas for Implementation	Train building inspectors on how to conduct building inspections following disasters utilizing ATC 20 forms		
Time line	3 years		
Constraints	Staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Exhibit IV-F-16: Proposed Activity Criteria Evaluation

The Hazard Mitigation Committee developed a chart comparing selected criteria on a one through five scale with the highest numbers being the most acceptable. The following criteria were evaluated: cost effectiveness, technically feasible, environmentally sound, social impacts, activity addresses the problem, meets federal, state, and local regulations, politically acceptable, activity reduces the risk. After reviewing the chart, the committee concluded that all jurisdictions would support the proposed activities.

CRITERIA	Strategy 6A	Strategy 6B	Strategy 6C	Strategy 6D	Strategy 6E	Strategy 6F	Strategy 6G	Strategy 6H
Cost Effective	5	5	5	5	5	5	5	5
Technically Feasible	5	5	3	5	5	5	5	5
Environmen-tally Sound	5	5	5	5	5	5	5	5
Social Impacts	5	5	5	3	5	4	5	5
Activity Addresses the Problem	5	5	5	0	5	5	5	5
Meets Federal, State, and Local Regulations	5	5	5	5	5	5	5	5
Politically Acceptable	5	5	5	3	4	4	5	5
Activity Reduces the Risk	5	5	0	0	5	5	5	5
Total	40	40	32	26	39	38	40	40

Estimated Potential Losses

Estimated Potential Losses, FEMA 3a Worksheet

The following City-specific FEMA forms depict the estimated loss to the number of City structures, dollar value of the structures, and the total number of people impacted. These figures are calculated by type of structure (occupancy class) and then totaled at the bottom of the chart. A complete description of how the figures were obtained is available in Part IIIB2 - Risk Assessment.

Estimated Degree of Loss, FEMA Worksheet 4

Worksheet 4 provides the formula to estimate the losses for each selected disaster. This follows the effort of Worksheet 3a, which estimates the area of each City that ***could*** be affected by these disasters. For example, in a severe earthquake, some structures will be spared from destruction and other structures will have minor damage.

To obtain a value of loss, a simple multiplication of the value of the Occupancy Class (i.e., Residential) by (x) the percent in the Hazard area or sub area by (x) the percent of damage of that area or sub area. Content losses are derived by multiplying the percent of content damage by the loss of structure.

See Worksheets 3a and 4 on the following pages.

Exhibit IV-F-17: Huntington Beach Estimated Potential Losses

City of: **Huntington Beach, CA**

June 25, 2004 | Hazard: **Earthquake** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	77,800	77,800	100%	$ 11,508,176,000	$ 11,508,176,000	100%	199,500	199,500	100%
Commercial	2,260	2,260	100%	$ 1,167,322,771	$ 1,167,322,771	100%	28,900	28,900	100%
Industrial	1,161	1,161	100%	$ 1,135,822,248	$ 1,135,822,248	100%	32,900	32,900	100%
Agricultural	0						0	0	
Religious / Non-Profit	174	174	100%	$ 192,900,040	$ 192,900,040	100%	24,000	24,000	100%
Government	129	129	100%	$ 361,547,570	$ 361,547,570	100%	900	900	100%
Education	555	555	100%	$ 410,857,447	$ 410,857,447	100%			100%
Utilities									
Total	82,079	82,079	100%	$ 14,776,626,076	**$ 14,776,626,076**	100%	286,200	286,200	100%

Exhibit IV-F-18: Fountain Valley Estimated Potential Losses

City of: **Fountain Valley, CA**

June 25, 2004 | Hazard: **Earthquake** | Worksheet 3a

Type of Structure (Occupancy Class)	Number of Structures			Value of Structures			Number of People		
	# in Community	# in Hazard Area	% in Hazard Area	$ in Community	$ in Hazard Area	% in Hazard Area	# in Community	# in Hazard Area	% in Hazard Area
Residential	13,729	13729	100%	2,745,800,000	2,745,800,000	100%	55,321	55,321	100%
Commercial	268	268	100%	1,608,000,000	1,608,000,000	100%	16,734	16,734	100%
Industrial	275	275	100%	584,375,000	584,375,000	100%	13,740	13,740	100%
Agricultural	8	8	100%	1,500,000	1,500,000	100%	175	175	100%
Religious / Non-Profit	16	16	100%	19,200,000	19,200,000	100%	2,370	2,370	100%
Government	35	35	100%	26,430,000	26,430,000	100%	45	45	100%
Education	18	18	100%	96,985,000	96,985,000	100%			
Utilities									100%
Total	14349	14349	100%	5,082,290,000	5,082,290,000	100%	88,385	88,385	100%

Exhibit IV-F-19: Huntington Beach Estimated Degree of Loss

Estimated Degree of Loss

City of: **Huntington Beach, CA**

August 25, 2004 Hazard: **Earthquake** Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	11,508,176,000								
	No Damage	21	2,416,716,960	0	-	0%	-		
	Slight Damage	21	2,416,716,960	15	362,507,544	50%	181,253,772	0	
	Moderate Damage	42	4,833,433,920	50	2,416,716,960	50%	1,208,358,480	0	
	Extensive Damage	13	1,496,062,880	80	1,196,850,304	50%	598,425,152	0	
	Complete Damage	3	345,245,280	100	345,245,280	100%	345,245,280	0	
	Totals	100	11,508,176,000		4,321,320,088		2,333,282,684	0	6,654,602,772
Commercial		100	1,167,322,771	*	438,329,701	*	236,674,692	0	675,004,392
Industrial		100	1,135,822,248	*	426,501,254	*	230,287,961	0	656,789,215
Agriculture			0						
Religious/ Non-Profit		100	192,900,040	*	72,433,965	*	39,110,483	0	111,544,448
Government		100	361,547,570	*	135,761,113	*	73,303,770	0	209,064,882
Education		100	410,857,447	*	154,276,971	*	83,301,347	0	237,578,319
Utilities									
Totals:			14,776,626,076		5,548,623,092		2,995,960,937	0	8,544,584,028

* = Used the same ratios and formulas as Residential.

Exhibit IV-F-20: Huntington Beach Estimated Degree of Loss

Estimated Degree of Loss

City of: **Fountain Valley, CA**

August 4, 2004 Hazard: **Earthquake** Worksheet 4

Occupancy Class	Description of Damage	% in Hazard Area	Structural Replacement Value	Percent Damage	Subtotal Loss to Structures	Content Loss % of Loss	Content Loss Replacement Value	Function Losses	Total Structural + Content Loss + Function Losses
Residential	2,745,800,000								
	No Damage	21	576,618,000	0	-	0%	-		
	Slight Damage	21	576,618,000	15	86,492,700	50%	43,246,350	0	
	Moderate Damage	42	1,153,236,000	50	576,618,000	50%	288,309,000	0	
	Extensive Damage	13	356,954,000	80	285,563,200	50%	142,781,600	0	
	Complete Damage	3	82,374,000	100	82,374,000	100%	82,374,000	0	
	Totals	100	2,745,800,000		1,031,047,900		556,710,950	0	1,587,758,850
Commercial		100	1,608,000,000	*	603,804,000	*	326,022,000	0	929,826,000
Industrial		100	584,375,000	*	219,432,813	*	118,482,031	0	337,914,844
Agriculture			0						
Religious/ Non-Profit		100	19,200,000	*	7,209,600	*	3,892,800	0	11,102,400
Government		100	26,430,000	*	9,924,465	*	5,358,683	0	15,283,148
Education		100	96,985,000	*	36,417,868	*	19,663,709	0	56,081,576
Utilities									
	Totals:		5,080,790,000		1,907,836,645		1,030,130,173	0	2,937,966,818

* = Used the same ratios and formulas as Residential.

Earthquake Resource Directory

Personal Interview:
Dr. Lucy M. Jones
Scientist-in-charge for Southern California
Earthquake Hazards Team
U. S. Geological Survey
525 S. Wilson Aveue
Pasadena, CA 91106

Local and Regional Resources
Southern California Earthquake Center (SCEC)
Level: Regional
Hazard: Earthquake
www.scec.org
3651 Trousdale Parkway, Suite 169
Los Angeles, CA 90089-0742
Ph: 213-740-5843 Fx: 213-740-0011
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 Resources
California Department of Transportation (Caltrans)
Level: State
Hazard: Multi
http://www.dot.ca.gov/
120 S. Spring Street
Los Angeles, CA 90012
Ph: 213-897-3656
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 intercity passenger rail service in California.

California Resources Agency
Level: State
Hazard: Multi
http://resources.ca.gov/
1416 Ninth Street
Suite 1311
Sacramento, CA 95814

Ph: 916-653-5656
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.

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
Ph: 916-445-1825 Fx: 916-445-5718
Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geologic hazards, and mineral resources.

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
Ph: 213-239-0878 Fx: 213-239-0984
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 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.
Governor's Office of Emergency Services (OES)
Level: State
Hazard: Multi
www.oes.ca.gov
P.O. Box 419047
Rancho Cordova, CA 95741-9047
Ph: 916 845-8911 Fx: 916 845-8910

Notes: The Governor's Office of Emergency Services 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.

Federal and National Resources

Building Seismic Safety Council (BSSC)
Level: National
Hazard: Earthquake
www.bssconline.org
1090 Vermont Avenue, NW
Suite 700
Washington, DC 20005
Ph: 202-289-7800 Fx: 202-289-109
Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.

Federal Emergency Management Agency, Region IX
Level: Federal
Hazard: Multi
www.fema.gov
1111 Broadway
Suite 1200
Oakland, CA 94607
Ph: 510-627-7100 Fx: 510-627-7112
Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.

Federal Emergency Management Agency, Mitigation Division
Level: Federal
Hazard: Multi
www.fema.gov/fima/planhowto.shtm
500 C Street, S.W.
Washington, D.C. 20472
Ph: 202-566-1600
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has a number of programs and activities which provide citizens *Protection*, with flood insurance; *Prevention*, with mitigation measures and *Partnerships*, with communities throughout the country.

United States Geological Survey
Level: Federal
Hazard: Multi
http://www.usgs.gov/
345 Middlefield Road
Menlo Park, CA 94025
Ph: 650-853-8300
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.

Institute for Business & Home Safety
Level: National
Hazard: Multi
http://www.ibhs.org/
4775 E. Fowler Avenue
Tampa, FL 33617
Ph: 813-286-3400 Fx: 813-286-9960
Notes: The Institute for Business & Home Safety (IBHS) is a nonprofit association that engages in communication, education, engineering, and research. The Institute works to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters.

Publications
"Land Use Planning for Earthquake Hazard Mitigation: Handbook for Planners";
Wolfe, Myer R. et. al., (1986) University of Colorado, Institute of Behavioral Science, National Science Foundation.
This handbook provides techniques that planners and others can utilize to help mitigate for seismic hazards. It provides information on the effects of earthquakes, sources on risk assessment, and effects of earthquakes on the built environment. The handbook also gives examples on application and implementation of planning techniques to be used by local communities.
Contact: Natural Hazards Research and Applications Information Center
Address: University of Colorado, 482 UCB,
Boulder, CO 80309-0482
Phone: 303-492-6818 Fx: 303-492-2151
Website: http://www,colorado.edu/UCB/Research/IBS/hazards

"Public Assistance Debris Management Guide" FEMA (July 2000)
The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing, and controlling large-scale debris clearance, removal, and disposal operations. Debris management is generally associated with post-disaster recovery. While it should be compliant with local and county emergency operations

plans, developing strategies to ensure strong debris management is a way to integrate debris management within mitigation activities. The "Public Assistance Debris Management Guide" is available in hard copy or on the FEMA website.

End Notes

[1] http://www.gps.caltech.edu/~sieh/home.html

[2] http://www.consrv.ca.gov/CGS/rghm/ap/

[3] Ibid

[4] Burby, R. (Ed.) Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities (1998), Washington D.C., Joseph Henry Press.

[5] FEMA HAZUS http://www.fema.gov/hazus/hazus2.htm (May 2001).

[6] http://www.chamber101.com/programs_committee/natural_disasters/DisasterPreparedness/Forty.htm

[7] Institute for Business and Home Safety Resources (April 2001),

[8] http://www.seismic.ca.gov/pub/CSSC_2001-04_Hospital.pdf

Part IV-G
Multi-Hazard Strategies

After the planning committee had completed the studies on the six hazards, they scheduled discussion on multi-hazard strategies. The Plan Writers developed a laundry list of recommended strategies for the August 12, 2004 Committee meeting. We discussed each recommended strategy from the two Community Forums. The Plan Writers to the Committee submitted the list. We went through each item and discussed them individually as to their feasibility. We then asked each Committee member if they had any additional strategies to submit. We discussed each of these items.

The Committee narrowed the recommended strategies to the following list. These strategies were then voted on, as were all strategies for jurisdictional priorities.

Natural Hazard	**MULTI-HAZARD STRATEGY MH#1**		
Action Item	Conduct a HAZUS Study		
Coordinating Organization	Huntington Beach Fire Department, Huntington Beach Public Works Department, Fountain Valley Fire Department, Fountain Valley Public Works Department		
Ideas for Implementation	Contract with a company that has HAZUS geological overlay software and have them conduct in-depth risk analysis for Flood and Earthquake by census tracks		
Time line	5 Years		
Constraints	Budgets and Staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#2**		
Action Item	Upgrade Geographic Information Systems (GIS) for the City of Fountain Valley		
Coordinating Organization	Fountain Valley Information Systems		
Ideas for Implementation	Secure funding to provide upgraded GIS mapping system in the City of Fountain Valley		
Time line	5 Years		
Constraints	Budgets and Staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#3**		
Action Item	Huntington Beach Warning Siren System Public Education Campaign		
Coordinating Organization	Huntington Beach Fire Department		
Ideas for Implementation	Provide a public education flyer to each City resident through the City's water billing system. Detail how the system works, what to do when the system is sounded, and when the system is utilized.		
Time line	Budget year 2004/05		
Constraints	Staff time and cost		
Plan Goals Addressed		X	Protect Life and Property
X	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#4**		
Action Item	School/City Radio System		
Coordinating Organization	City of Huntington Beach, City of Fountain Valley, Huntington Beach City School District, Huntington Beach Union High School District, Fountain Valley School District, and Ocean View School District		
Ideas for Implementation	Purchase a radio system for the four School Districts' internal use and install the system in the Huntington Beach and Fountain Valley EOCs		
Time line	Budget year 2004/05		
Constraints	Staff time and cost		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#5**		
Action Item	School Generator Acquisition		
Coordinating Organization	Huntington Beach City School District, Huntington Beach Union High School District, Fountain Valley School District, and Ocean View School District		
Ideas for Implementation	Purchase a generator for each school and School District site within the two Cities.		
Time line	5 years		
Constraints	Budgets		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation		Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#6**		
Action Item	Cargo Container Acquisition		
Coordinating Organization	Huntington Beach City School District, Huntington Beach Union High School District, Fountain Valley School District, and Ocean View School District; Cities of Huntington Beach and Fountain Valley Emergency Services Offices		
Ideas for Implementation	Purchase cargo containers for each school and School District site within the two Cities. Working with the City Emergency Services Offices, set minimum standards for disaster response equipment. Outfit containers with lifesaving equipment.		
Time line	5 years		
Constraints	Budgets and staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#7**		
Action Item	School District Training Program		
Coordinating Organization	Huntington Beach City School District, Huntington Beach Union High School District, Fountain Valley School District, and Ocean View School District; Cities of Huntington Beach and Fountain Valley Emergency Services Offices; Private Schools.		
Ideas for Implementation	Develop a series of classes to teach lifesaving skills to school personnel (Disaster Preparedness, First Aid, Light Search & Rescue, CPR, Fire Safety, Evacuation, Managing a Disaster, etc. Conduct the classes every 2 years and ensure a cadre of school personnel are assigned Response Team positions and trained regularly.		
Time line	5 years		
Constraints	Budgets and staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation	X	Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#8**		
Action Item	SEMS and EOC Training for the Cities of Huntington Beach and Fountain Valley personnel; and for all four School District key personnel		
Coordinating Organization	Huntington Beach Fire Department and Fountain Valley Fire Department		
Ideas for Implementation	Conduct regular training for all City employees and key School District personnel with EOC responsibilities.		
Time line	Ongoing		
Constraints	Staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
X	Partnerships and Implementation		Emergency Services

Natural Hazard	**MULTI-HAZARD STRATEGY MH#9**		
Action Item	Tabletop & Full Scale Disaster Exercises for City Employees and School Districts		
Coordinating Organization	Huntington Beach Fire Department and Fountain Valley Fire Department		
Ideas for Implementation	Conduct regular training for all City employees and key School District personnel with EOC responsibilities.		
Time line	Ongoing		
Constraints	Staff time		
Plan Goals Addressed		X	Protect Life and Property
	Public Awareness		Natural Systems
	Partnerships and Implementation	X	Emergency Services

Part V

Plan Maintenance

Table of Contents

A. Reviewing the Plan 1
1. Coordinating Body 1
2. Convener 1
3. Bi-Annual Meetings 1

B. Plan Follow-Up 3
1. Monitoring, Evaluating, and Updating the Plan 3
2. Plan Rewrite 3
3. Plan Adoption 4
4. Incorporating Mitigation into Existing Planning Mechanisms 4

Exhibit V-B-1: Incorporating Mitigation into Existing Planning Mechanisms 5

5. Incorporating into New Buildings and Infrastructure 8
6. Local Mitigation Funding Sources 9
7. Economic Analysis of Natural Hazard Mitigation Projects 9

Why Evaluate Mitigation Strategies? 10

8. Continued Public Involvement 16
9. Plan Maintenance Matrix 16

Exhibit V-B-2: Plan Maintenance Matrix 17

(This page intentionally left blank)

Part V-A

A. Reviewing the Plan

The Plan maintenance process is based upon annual review and complete plan revisions will be produced every five years. This section describes how the Huntington Beach/Fountain Valley Hazard Mitigation Committee will maintain the Plan and integrate public participation throughout the plan maintenance process. Also this section includes an explanation of how the Committee intends to incorporate the mitigation strategies into existing planning mechanisms such as the two City General Plans, Capital Improvement Projects, and Building & Safety Codes.

1. Coordinating Body

The ***Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee*** will be responsible for the maintenance of this Plan. The Cities of Huntington Beach and Fountain Valley Emergency Services Offices will take the lead in Plan maintenance issues, by coordinating maintenance of this Plan and undertaking the formal review process and the rewrite of the Plan.

2. Convener

The Cities of Huntington Beach and Fountain Valley Emergency Services Offices will take the lead on conducting the annual review of the Hazard Mitigation Plan, as well as facilitate Plan updates every five years. The Hazard Mitigation Plan Maintenance Matrix will be utilized to review the Plan.

The matrix will be faxed to each planning member and they will be asked to update all mitigation strategies assigned to their jurisdiction and department. The two City Emergency Services Offices will consolidate all responses and then send out the final consolidated responses to all Committee members. Copies will be sent to the two City Councils and four School Boards of each of the participating agencies.

3. Bi-Annual Meetings

Every two years, the Huntington Beach/Fountain Valley Hazard Mitigation Committee will be reconvened to conduct a full review of the progress being made on the recommended strategies. Each strategy will be discussed to determine its priority, the progress towards completion, and new potential funding sources. All Committee members will be asked to recommend alternative funding mechanisms to accomplish the strategies.

Meeting dates will be as follows:

- October 2006
- October 2008

At the October 2008 meeting, the Plan rewrite will be discussed. At that time, the Committee will decide who will take the lead on updating, who will participate, will other

agencies be asked to participate, what hazards will be studied, and when the process will begin. This will give the Committee a chance to notify their agency and department as to what is expected of them the following year. They can therefore plan for staffing time, consider future mapping needs, and determine who would best represent their agency and department. Committee members will also be encouraged to review existing hazards and consider the addition of technological hazards.

Part V-B

B. Plan Follow-Up

As indicated in Section Part 1-C, all six jurisdictions have adopted the Plan through their governing body. This endorsement requires that the strategies recommended within the Plan receive adequate attention and follow through. This section details the process by which all six jurisdictions will collaborate to ensure implementation of Plan mitigation strategies.

1. Monitoring, Evaluating, and Updating the Plan

The Huntington Beach/Fountain Valley Hazard Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of goals and strategies and to reflect changes in programs that may affect mitigation priorities. The evaluation process includes a schedule and time line, and identifies all agencies that will be participating in the Plan evaluation. The Cities of Huntington Beach and Fountain Valley will be responsible for contacting the Hazard Mitigation Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress for the mitigation strategies in the Plan.

The Committee members will review the goals and action items to determine their relevance to changing situations in the City, County, State, and Federal policies to ensure they are addressing current and expected conditions. The coordinating organizations responsible for implementing strategies will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and strategy revisions.

2. Plan Rewrite

Every five years Committee members will update the Plan incorporating revisions suggestion since the 2003 Plan construction. The Cities of Huntington Beach and Fountain Valley Emergency Services Offices will be responsible for notifying all Committee members that the plan is being updated. The committee members convene six months prior to the Plan rewrite date.

The 2004 Hazard mitigation Committee recommended in February 2004 that technological hazards be added during the 2009 rewrite. The 2009 Hazard Mitigation Committee will make the final decision as to the incorporation of technological hazards. Additionally, the committee should review the natural hazard reports and add any additional natural hazards that pose a threat to the planning area.

Once the Plan has been updated, each agency will present the Plan for approval to their governing body. Once approved, the Plan will be submitted to State Office of Emergency Services (OES) and Federal Emergency Management Agency (FEMA) for final approval.

The following is a list of additional hazards not studied in the 2004 planning process:

- Terrorism/Weapons of Mass Destruction
- Urban Fire and or Explosion,
- Hazardous Chemical Spill
- Oil Spill/Pipeline Breakage/Environmental Disaster
- Violence in the Workplace/School/or City Facility
- Aircraft / Train Accident
- Riot/Civil Disturbance
- Epidemic / Pandemic
- Radiological/ Nuclear Incident
- Power Outage or Stage III Energy
- Agriculture or Vector

In addition to the above list, any hazards that pose a threat to the planning area should be reviewed by the committee.

3. Plan Adoption

Each City Council and School Board is responsible for adopting the Hazard Mitigation Plan and corresponding. This formal adoption should take place every five years. Once the Plan has been adopted, the Cities of Huntington Beach and Fountain Valley Emergency Services Offices will be responsible for final submission to State Office of Emergency Services. The State Office of Emergency Services will then submit the Plan to the Federal Emergency Management Agency (FEMA) for final review. By adopting the plan, the six participating agencies are agreeing to commit agency resources to the Plan implementation.

4. Incorporating Mitigation into Existing Planning Mechanisms

The following chart depicts all existing City documents that either support mitigation efforts or can integrate suggested mitigation strategies. Each Committee member was given a copy of the following table and asked to add any plans they reviewed as a part of this hazard mitigation planning process and see how the Hazard Mitigation Plan could be incorporated into the other plans. The results of that effort are in Exhibit V-1

Exhibit V-B-1: Incorporating Mitigation into Existing Planning Mechanisms

Document Name	Assigned to	Strategy #s	How strategy will be incorporated in document
City of HB General Plan	City of Huntington Beach Planning Dept.	Earthquake 1, 2, 4, 5, 6 Tsunami 1, 2 Subsidence 1 Dam 1, 2 Flood 1-6 Windstorm 1, 2	The mitigation strategies are reflected in General Plan goals, objectives, and policies such as: EH 1.2 – Ensure that new structures are designed to minimize damage resulting from seismic hazards, ensure that existing unsafe structures are retrofitted to reduce hazards and mitigate other existing unsafe conditions. EH 1.2.4 – Support the education and dissemination of information about the potential environmental hazards that may exist in Huntington Beach. EH 4 – Eliminate, to the greatest degree possible, the risk from flood hazards to life, property, public investment, and social order in the City of Huntington Beach. EH 4.2.1 – Support the Santa Ana River Mainstem Project. EH 5 – Protect human life, to the greatest extent feasible, from tsunamis and seiche hazards.
City of FV General Plan	City of Fountain Valley Planning Dept.	Dam Failure Earthquake Flood Tsunami Windstorms Subsidence	The mitigation strategies are reflected in General Plan goals, objectives, and polices such as: Public Safety 6.1- Minimize hazards to pubic health, safety, and welfare resulting from natural and man-made hazards. Public Safety 6.1.1- Improve the City's ability to respond to large scale emergencies and disasters. PS 6.1.3 – Educate and coordinate preparation of private sector emergency plans. PS 6.2 – The City shall promote increased public awareness regarding seismic safety. PS 6.2.2 – Coordinate and cooperate with agencies within the County to assist in the investigation of geologic and seismic hazards. PS 6.2.3 – Develop a program to identify and rehabilitate seismically vulnerable structures within the City.

			PS 6.3 – Minimize risk and damage from flood hazards in the City. PS 6.3.1 – Plan and review standards to reduce risk and damage from flood hazards in the City. 6.3.3 – The City shall increase public awareness of flood hazards.
HB Flood Management Plan (FMP)		Flood 1-6 Tsunami 1, and 2	The mitigation strategies are reflected in Flood Management Plan recommended activities such as: 8.1.2 – Protect public facilities from flooding. 8.1.11 – Continue to utilize citizen volunteers. 8.2.1 – Upgrade the City's flood control system to current FEMA standards and concentrate on the repetitive flood areas first. 8.3.3 – Educate the public regarding the potential threat of tsunami.
HB Emergency Operations Plan (EOP), Tsunami & Flood Plans	Huntington Beach Emergency Services Office	1A, 4A, 2B, 3A, 6H 1C 6C 6D, 6E, 6F	Provide Windstorm, Dam Failure, Tsunami, Subsidence, Earthquake and Flood and Damage Assessment Public Education as part of EOP training. Track Generators in critical facilities and place information in the City EOCs. Earthquake HAZUS Mapping – budget for HAZUS prior to next EOP update. Encourage purchase of earthquake insurance, encourage seismic strength evaluations of critical facilities, and encourage reduction of non-structural and structural earthquake hazards as part of the EOP City Management and Public Education programs.
FV Emergency Operations Plan (EOP)	Fountain Valley Emergency Preparedness Office	1A, 4A, 2B, 3A, 6H 1C 6C 6D, 6E,	Provide Windstorm, Dam Failure, Tsunami, Subsidence, Earthquake, Flood and Damage Assessment Public Education as part of EOP training Track Generators in critical facilities and place information in the City EOCs. Earthquake HAZUS Mapping – budget for HAZUS prior to next EOP update. Encourage purchase of earthquake insurance,

		6F	encourage seismic strength evaluations of critical facilities, and encourage reduction of non-structural and structural earthquake hazards as part of the EOP City Management and public education programs.
City of FV Development Code	City of FV Planning Department	Flood Hazard	The mitigation strategies are reflected in Flood Management as requirements in Chapter 21.14.040 Floodplain Zone 21.14.040 A. The Floodplain Zone is intended to identity areas in the City that may be susceptible to flood inundation hazards. 21.14.040 B. The Floodplain Zone is applied to all areas determined to be at risk for flood hazards as identified by the Federal Emergency Management Agency. 21.14.040 C. Development and new land uses located within the Flood Zone shall comply with all applicable requirements of the Building Department.
		Earthquake Hazard	The mitigation strategies are reflected in Seismic Management as required in Chapter 21.14.050 Seismic Zone 21.14.050 A. The Seismic Zone is intended to identify areas in the City that may be susceptible to seismic hazards. 21.14.050 B. To reduce liquefaction potential in areas structures shall comply with building standards as required by State adopted Building Codes.
School District Emergency Operations Plans (EOP)	HB City SD, HB Union High SD, Ocean View SD, and FVSD	1A, 4A, 2B, 3A ,6H	Provide Windstorm, Dam Failure, Tsunami, Subsidence, Earthquake and Flood Public Education as part of EOP training.
FEMA/OES past Hazard Mitigation Grants	HB Union High School District		Retrofit pendant lighting ceilings and windows after Northridge Earthquake.
FV Fire and Building Codes	City of FV Fire & Building Department	Earthquake Flood	Grading compliance incorporated in flood prevention components, seismic considerations Bldg/Fire inspection ensures minimum code standards are maintained
HB Capital Improvement Program		Flood 1-6	Mitigation strategies are reflected in the HB Capital Improvement Program, which recommends activities such as improvements to storm drain systems.
HB Storm Drain Master Plan		Flood 1-6	Mitigation strategies are reflected in the HB Storm Drain Master Plan, which recommends activities such as improvements to storm drain systems.

In addition to the above cited local planning mechanisms, the City of Fountain Valley incorporates additional flood control measures coordinated by the Orange County Flood Control, City Engineers, Flood Control Advisory Committee, including the Army Corp of Engineers ongoing studies and mitigation measures. The City of Fountain Valley actively cooperates with the Regional Water Quality Control Board to control storm water run-off, implanting erosion control measures under the NPDES (National Pollution Discharge Elimination System) guidelines, using BMP's (Best Management Practices) to control or eliminate pollution in to the storm water drainage systems.

The extensive process that Fountain Valley will use to incorporate the mitigation strategies into other plans (when appropriate) will ensure consistency amongst Fountain Valley documents. The Fountain Valley General Plan is due for an update in 2010. At that time, all of the elements of the Fountain Valley General Plan will be reviewed and if appropriate the hazard mitigation language will be incorporated. The Development Code was updated in 2001. When the need arises, additional language regarding hazard mitigation can be incorporated.

Additionally, future modifications may be made to the Fountain Valley Fire & Building Codes if relevant hazard mitigation recommendations need to be inserted. This process includes the cooperation of many facets of local government. The local Building Official (Building Manager or Fire Marshal) would complete a staff report and submit recommendations to the City Council. The City Council would then invite public comments and would either enact the modifications recommended or reject the Building Official's suggestions. Every three years, the State Fire Marshal along with the Building Standards Commission revise and update the State Codes. A local municipality may amend codes that are more stringent than the standard State codes. These modifications must be made based on the climactic, topographic and geographic features of the municipality.

Huntington Beach will be revising the General Plan in the next few years. The City of Huntington Beach will use existing revision regulations to update all existing documents if necessary. The Hazard Mitigation Plan will be available to all City staff and public participants as reference during the review process.

5. Incorporating into New Buildings and Infrastructure

The City of Huntington Beach is nearly built-out. However, the City's General Plan, Zoning and Subdivision Ordinance, as well as the requirements of the Building and Safety Department, among others, assure that damage to future buildings and infrastructure from natural hazards such as flood and earthquakes will be minimized.

The City of Fountain Valley is 99% built-out. Single-family dwellings built in the 1970's and the 1980s comprise the majority of the structures. The goals, objectives, and polices contained in the General Plan and the Flood Hazard and Seismic Hazard requirements in the Development Code assure that damage from natural hazards such

as flood and earthquakes will be minimized. When the commercial and manufacturing structures are renovated, the City will require compliance with the requirements of the Building Department regarding flood and seismic hazard mitigation.

6. Local Mitigation Funding Sources

Each participating Committee member was asked if they had ideas on ways to fund the identified mitigation projects. The following are the responses received from Committee members:

- Huntington Beach Public Works responded that other than the General Fund, the City of Huntington Beach currently has one funding source available which is dedicated for improvements to the public storm drain systems. The Drainage District Fund was established by the City's Municipal Code and is amended by resolution of the City Council. Currently the drainage fee ranges from $5,500 to $9,000 per gross acre and is collected by the City from a developer when development occurs.

Additionally, the Huntington Beach Fire Marshal did not know of any funding sources for mitigation or prevention measures related to flood, earthquake, subsidence, windstorm, tsunami, or dam failure.

For the City of Fountain Valley, the following local mitigation funding sources will be examined to promote mitigation activities:

- Application and receipt of available Federal Hazard Mitigation funds will channel through appropriate local accounts into Hazard Mitigation projects
- Storm drain mitigation projects, such as those mentioned in the Flood Hazard section will be funded with Hazard Mitigation grants sand General funds. These funds will cover capital improvements necessary to ensure efficient operations.
- The Fire Department can enforce hazardous materials violations and levee fees against offending parties. Collected expenses will then be processed into supply reimbursement or General Fund allocation.
- County flood control channel improvements will be handled by the County resources and Development Management Department (RDMD). Property taxes collected by the County fund the necessary improvements.

7. Economic Analysis of Natural Hazard Mitigation Projects

Benefit/cost analysis is a key mechanism used by the State Office of Emergency Services (OES), the Federal Emergency Management Agency, and other State and Federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

This section outlines several approaches for conducting economic analysis of natural hazard mitigation projects. It describes the importance of implementing mitigation

activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, Oregon State Police – Office of Emergency Management 2000, and Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Natural Hazard Mitigation.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred.

Evaluating natural hazard mitigation provides 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. Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools.

Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster’s social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are Some Economic Analysis Approaches for Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

Benefit/Cost Analysis

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. 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. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1 in order to be funded.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in public sector mitigation activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions that involve a diverse set of beneficiaries and nonmarket benefits.

Investing in private sector mitigation activities

Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost-effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time

consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

How can an Economic Analysis be Conducted?
Benefit/cost analysis and cost-effectiveness analysis are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating alternative mitigation activities is outlined below:

Estimating the costs and benefits of a hazard mitigation strategy can be a complex process. Employing the services of a specialist can assist in this process.

1. Identify the Alternatives: Alternatives for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation project can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits: Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate alternative. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.

- **Estimate the benefits.** Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- **Consider costs and benefits to society and the environment.** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- **Determine the correct discount rate.** Determination of the discount rate can

just be the risk-free cost of capital, but it may include the decision-maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Alternatives: Once costs and benefits have been quantified, economic analysis tools can rank the alternatives. Two methods for determining the best alternative given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.

- **Internal Rate of Return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project.

Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk; project effectiveness; and economic, environmental, and social returns in choosing the appropriate project for implementation.

How are Benefits of Mitigation Calculated?

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or landowner as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only

include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision-makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards

developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

8. Continued Public Involvement

The Cities of Huntington Beach and Fountain Valley are committed to involve and notify the public of updates and revisions to the Hazard Mitigation Plan. The public will have access and ample opportunity to suggest Plan revisions. Copies of the plan will be placed at the City of Huntington Beach City Clerks Office at City Hall, 2000 Main Street, and also at the City of Fountain Valley City Clerks Office at City Hall, 10200 Slater Avenue.

The public may contact agency representatives an disclosed on the first page of the introduction section. During each revision of the plan, public comments will be reviewed and documented throughout the planning process. Additionally, each year a public presentation of the Plan will be made in the City of Huntington Beach. The presentation will give the public the opportunity to comment on their concerns and ideas for improvement of the Plan.

The data derived from the 2004 Hazard mitigation Plan research will be incorporated in to City public education efforts. Huntington Beach will utilize this information in its Community Emergency Response Team (CERT) training classes. Both Cities and the School Districts will utilize the information when training their employees on emergency preparedness and disaster management. Each year, Huntington Beach sets up “Disaster Alley” for the public to tour the City’s Emergency Operations Center (EOC) and view photos and maps of the hazards that face the community. The maps and photos from this Plan will be used for this purpose. The accompanying class will utilize the PowerPoint presentations prepared for the Hazard Mitigation Community Forums.

The maps developed for this Plan will be utilized for future Emergency Operations Plans (EOP) for all six agencies. They show the “why” prepare which is always important for plans, for training city and school district personnel, and for training the public.

Also this information will be used to apply for grants to mitigate the hazards identified in the plan. This is excellent background information for the grants.

9. Plan Maintenance Matrix

The Hazard Mitigation Plan Maintenance Matrix will be utilized to review the Plan.
The matrix identifies the strategy number, the location were it could be found in the Plan and a brief description of the strategy. It also states which jurisdiction the strategy was assigned to, and the date the strategy will be reviewed. Once the strategy is reviewed the status column will be updated accordingly (See Exhibit V-2 below).

Exhibit V-B-2: Plan Maintenance Matrix

(Page 1 of 5)

Strategy #	Location in Plan	Strategy Description	Assigned to						Review Date	Status
			City of HB	City of FV	HBC SD	HBUH SD	OV SD	FV SD		
1A	Windstorm	Windstorm Education Campaign	X	X					11/05	
1B	Windstorm	Awareness of Tree Pruning and Wind Resistant Utility Operations	X	X					11/05	
1C	Windstorm	Track Generators in Public Facilities	X	X					11/05	
2A	Tsunami	Purchase and install a warning siren system in Edwards Fire Station	X						11/05	
2B	Tsunami	Tsunami Public Education Campaign	X						11/05	
3A	Subsidence	Subsidence Public Education Campaign	X	X					11/05	
3B	Subsidence	HBUHSD Repairs Funding Acquisition	X			X			11/05	

Exhibit V-2: Plan Maintenance Matrix

(Page 2 of 5)

Strategy #	Location in Plan	Strategy Description	Assigned to						Review Date	Status
			City of HB	City of FV	HBC SD	HBUH SD	OV SD	FV SD		
3C	Subsidence	HB Corporate Yard Repairs Funding Acquisition	X						11/05	
3D	Subsidence	Murdy Fire Station Funding Acquisition	X						11/05	
4A	Dam Failure	Dam Failure Public Education Campaign	X						11/05	
4B	Dam Failure	Support Completion of the Mainstem Project	X						11/05	
5A	Flood	Upgrade HB Flood Pump Stations	X						11/05	
5B	Flood	Upgrade HB Storm Drains	X						11/05	
5C	Flood	Retention Basins at Schools and Parks	X		X	X	X	X	11/05	
5D	Flood	Purchase Mechanical Pumps to Pump Water			X	X	X	X	11/05	

Exhibit V-2: Plan Maintenance Matrix

(Page 3 of 5)

Strategy #	Location in Plan	Strategy Description	Assigned to						Review Date	Status
			City of HB	City of FV	HBC SD	HBUH SD	OV SD	FV SD		
5E	Flood	Support the County of Orange Seven Year Flood Control Improvement Plan	X						11/05	
5F	Flood	Train RACES as Weather Spotters & Flood Channel Observers							11/05	
6A	Earthquake	Seismic Retrofit HB City Hall							11/05	
6B	Earthquake	FV Seismic Retrofit of Reservoir	X						11/05	
6C	Earthquake	Purchase Earthquake Software HAZUS	X						11/05	
6D	Earthquake	Encourage the Purchase of Earthquake Insurance	X	X					11/05	
6E	Earthquake	Encourage Seismic Strength Evaluations of Critical Facilities	X	X					11/05	

Exhibit V-2: Plan Maintenance Matrix

(Page 4 of 5)

Strategy #	Location in Plan	Strategy Description	Assigned to						Review Date	Status
			City of HB	City of FV	HBC SD	HBUH SD	OV SD	FV SD		
6F	Earthquake	Encourage Reduction of Nonstructural and Structural Hazards in Homes, Schools, Business, and Government Offices	X	X					11/05	
6G	Earthquake	Hazard Mitigation of Nonstructural Earthquake Hazards for Public Schools	X	X	X	X	X	X	11/05	
6H	Earthquake	Damage Assessment Training	X	X					11/05	
MH#1	Part IV-G	Conduct HAZUS Study	X	X					11/05	
MH#2	Part IV-G	Upgrade Geographic Information System (GIS) for FV		X					11/05	

Exhibit V-2: Plan Maintenance Matrix

(Page 5 of 5)

Strategy #	Location in Plan	Strategy Description	Assigned to						Review Date	Status
			City of HB	City of FV	HBC SD	HBUH SD	OV SD	FV SD		
MH#3	Part IV-G	HB Warning Siren System Public Education Campaign	X						11/05	
MH#4	Part IV-G	School/City Radio System	X	X	X	X	X	X	11/05	
MH#5	Part IV-G	School Generator Acquisition			X	X	X	X	11/05	
MH#6	Part IV-G	Cargo Container Acquisition	X	X	X	X	X	X	11/05	
MH# 7	Part IV-G	School District Training Program	X	X	X	X	X	X	11/05	
MH# 8	Part IV-G	SEMS & EOC Training for HB & FV	X	X					11/05	
MH# 9	Part IV-G	Tabletop & Full Scale Disaster Exercise for City Employees and School Districts	X	X					11/05	

Part VI-A

Appendices
Hazard Mitigation Planning Committee Bylaws
Table of Contents

SECTION 1: MEMBERSHIP 1
SECTION 2: SUBCOMMITTEES 2
SECTION 3: MEETINGS 2
SECTION 4: VOTING RIGHTS 3
SECTION 5: RESPONSIBILITIES 3

(This page intentionally left blank)

Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee

Committee Bylaws

Created February 12, 2004

Section 1: Membership

The Committee will have four levels of membership:

a. **Agency Lead:**

An agency lead is any representative listed on the Agency Lead Roster as maintained by the Huntington Beach/Fountain Valley Emergency Services Coordinator. An agency lead has voting rights when present at the planning meetings.

b. **Agency Participant:**

An agency participant is any participant listed on the Planning Team Member Roster who therefore works for one of the six represented agencies. An agency participant has voting rights when present at the planning meetings.

c. **Community Participant:**

A community participant is any citizen or business representative from the City of Huntington Beach or the City of Fountain Valley approved by the Committee. Community participants retain voting rights when present at planning committee meetings.

d. **Agency Consultant:**

Though not required to attend monthly planning committee meetings, an agency consultant may be any member of the agency that is consulted, questioned, or indirectly participates in the planning process. An agency consultant does not attend monthly meetings and therefore does not retain voting rights.

Section 2: Subcommittees

The following subcommittees shall meet on an ad hoc basis:

a. **Cities Subcommittee**:

Open to any agency leads and agency participants from the City of Huntington Beach and/or Fountain Valley.

b. **Schools Subcommittee**:

Open to any agency leads and agency participants from HB City School District, HB Union High School District, Ocean View School District, and/or Fountain Valley School District.

c. **Oversight Subcommittee**:

Members of this sub committee include the Fire Chiefs of Huntington Beach and Fountain Valley along with the Mayors of the respective Cities will be available for the primary purpose of policy consultation and legal support.

d. **Technical Subcommittee**:

Members of the Planning Committee with special skills in data collection and statistical analysis will meet to scrutinize committee databases and findings.

Section 3: Meetings

Meetings are open to the public and are held on the second Thursday of each month at the Huntington Beach Emergency Operations Center (EOC), 2000 Main Street, Huntington Beach, from 3:00 PM to 4:30 PM as follows:

February 12, 2004

March 11, 2004

April 8, 2004

May 13, 2004

June 10, 2004

July 8, 2004

August 12, 2004

September 9, 2004 (as needed)

Section 4: Voting Rights

a. As specified in Section 1, Agency Leads, Agency Participants, and Community Participants are eligible to vote only if present during the planning meeting.

b. Agency Leads, Agency Participants, and Community Participants shall be entitled to one vote upon each matter submitted for vote.

c. A decision shall be final with a majority vote based on the hand count tallied by the Huntington Beach/Fountain Valley Emergency Services Coordinator.

d. Planning Committee members can vote in a new member by a voting majority at any time during the hazard mitigation process.

Section 5: Responsibilities

a. Of the six agencies represented, all agencies must attend at least four of the seven meetings in order to be considered a contributing agency and receive future DMA 2000 compliance.

b. All outside assignments must be completed by the deadline specified by the Committee and indicated in the meeting minutes.

c. If two or more assignments are not completed by an agency, the agency will be dropped from the project and committee unless exempted by a voting majority of the Hazard Mitigation Planning Committee.

d. Meeting agendas and minutes will be composed and distributed by the Huntington Beach/Fountain Valley Emergency Services Coordinator's Office.

Part VI-B

Public Participation Plan

Table of Contents

HAZARD MITIGATION COMMITTEE PLAN MISSION 1
CITY OF HUNTINGTON BEACH 1
CITY OF FOUNTAIN VALLEY 2
SCHOOL DISTRICTS 2
PARTICIPANT AGREEMENT 4

(This page intentionally left blank)

Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee Public Participation Plan

A combination of newsletters, newspapers, cable television, websites, and postings by Cities and School Districts will be utilized to engage the communities of Huntington Beach and Fountain Valley.

It is the goal of this Committee to include the public in all phases of this Hazard Mitigation Plan. Every opportunity will be taken to educate the public both on the Plan and on hazard mitigation measures that can be taken in the home, schools, and businesses.

Hazard Mitigation Committee Plan Mission

The mission of the Cities of Huntington Beach and Fountain Valley as well as the Huntington Beach City, Huntington Beach Union High, Ocean View, and Fountain Valley School Districts is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the Cities towards building a safer, more sustainable community.

City of Huntington Beach

- Huntington Beach Fire Department Community Emergency Response Team Newsletter, circulation 5,000
  - September 2003, page 1 – *Emergency Preparedness*
  - November 2003, page 1 – *Working Together to make a Safer Community City, State and Feds*
  - March 2004
- Huntington Beach Police Department Neighborhood Watch Newsletter, circulation 13,000
  - 2004 - April front page
- Huntington Beach City Community Connection Electronic Newsletter, circulation 1,200
  - 2004 - April, June, August
- City Clerk posted agenda outside City Hall with City Council agendas
  - 2004 - March 15, April 5, May 3, June 7, July 19, August 2
- HBTV-3 cable television character generator message, monthly
  - 2004 - March, April, May, June, July, August
  - Message: Hazard Mitigation Planning meeting for Cities of HB and FV and 4 HB/FV School Districts, Meeting open to public, March 11 at 3 PM City Hall Emergency Operations Center.

- Huntington Beach Fire Department website, post agenda
  - 2004 - March 11, May 13, July 8
- Send the monthly meeting agenda to the City's Public Works Commission beginning in March
- Mail notices to all boards and commissions about the two Community Forums
- Submit press releases to the Huntington Beach Independent and Wave announcing two Community Forums on the Natural Hazard Mitigation Plan.
  - July - The first forum will concentrate on Natural Hazard Analysis and Risk Assessment asking the public for ideas on problem areas of the City and mitigation strategies to solve the problems.
  - August – Review of City's proposed Hazard Mitigation Plan; citizens may comment on the priority of the mitigation strategies listed in the Plan.

City of Fountain Valley

- Fountain Valley Police Department Neighborhood Watch Newsletter, circulation 18,000
  - Article to be printed in June 2004
- Fountain Valley View, Orange County Register, circulation 14,500
  - Weekly announcements section
  - Feature article for print in June reference open forums
  - Hazard Mitigation Information article printed March 4, 2004
- Fountain Valley Website Bulletin Section
  - Will post community forum information in June
- City Clerk posted agenda outside City Hall with City Council agendas
  - 2004 - May 11, June 8
- Fountain Valley Fire Department website
  - Post agenda, minutes, and announcements
  - 2004 - May 11, June 8
- Submit press releases to the Fountain Valley Fountain Pen announcing two Community Forums on the Natural Hazard Mitigation Plan.
  - July - The first forum will concentrate on Natural Hazard Analysis and Risk Assessment asking the public for ideas on problem areas of the City and mitigation strategies, to solve the problems.
  - August – Review of City's proposed Hazard Mitigation Plan; citizens may comment on the priority of the mitigation strategies listed in the Plan.
- Mail notices to all boards and commissions about the two Community Forums

School Districts

- The Huntington Beach City School District will post the agenda with their School Board agendas
- The Huntington Beach Union High School District will post the agenda with their School Board agendas

- The Ocean View School District will post the agenda with their School Board agendas
- The Fountain Valley School District will post the agenda with their School Board agendas
- Provide information on the two Community Forums in Principal's newsletters, PTA letters, and/or newsletters to parents

Participant Agreement

By signing below, I have read and agree to follow the preceding bylaws created by the Huntington Beach/Fountain Valley Hazard Mitigation Planning Committee.

Printed Name	Agency	Signature	Date
1) Jacob Green	Fountain Valley		2/12/04
2) JAMES P. McLAIN	FOUNTAIN VALLEY	James P. McLain	2-12-04
3) PETER GREGG	Huntington Beach		2/12/04
4) Luanne Scorza	The Boeing Company-HB		2/12/04
5) SCOTT ATKINSON	H.B. UNION HIGH SD		2/12/04
6) Robert Frankl	FV		2/12/04
7) Kathie Freeman	Huntington Beach	Kathie Freeman	2/12/04
8) Carolyn Stocker	Ocean View S.D.		2/12/04
9) RICKY RAMOS	HUNTINGTON BEACH		2/12/04
10) CEAIL WRIGHT	HUNTINGTON BEACH		2/12/04
11) Cathy GREEN	Huntington Beach	Cathy Green	2/12/04
12) CARL DANE	FOUNTAIN VALLEY S.D.		2/12/04
13) Duane Olson	Huntington Beach		2/12/04
14)			
15)			
16)			
17)			
18)			
19)			
20)			
21)			
22)			
23)			
24)			
25)			
26)			

Part IV-H

Strategy Prioritization

Per DMA 2000 requirement 201.6(c)(3)(iii), the strategies recommended by the Hazard Mitigation Committee and community members were prioritized. This process resulted in two types of rankings:

1) Hazard/Multi-Hazard Priorities
2) Top Five Strategy Priorities

Hazard/Multi-Hazard Priorities

Step 1: All mitigation strategies were compiled from the hazard reports including the multi-hazard strategies. This resulted in the following seven categories:

1. Windstorms
2. Tsunami
3. Subsidence
4. Flood
5. Earthquake
6. Dam Failure
7. Multi-Hazard/General Strategies

Step 2: The FEMA 386-2 Hazard Mitigation guidance was reviewed.

Step 3: A voting form was created and a column was designated to depict which jurisdiction would be affected and responsible for the specific strategy.

Step 4: Committee members present at the general Hazard Mitigation meeting on August 12, 2004 were given a "Strategy Prioritization Voting Form" and associated instructions for completing the form. Committee members then ranked those hazards that applied to their jurisdiction. For example, if three of the hazards affected their jurisdiction, the member then ranked the relevant strategies "1-3."

Step 5: All forms were collected and the strategy scores were tallied. The number of strategies in the hazard determined the number of points assigned to each ranking. For example, in the Subsidence hazard, three hazards pertain to the City of Huntington Beach. After Committee members ranked those three strategies in priority order,

a "1" received three points, a "2" received two points, and a priority order designation of "3" received one point.

Step 6: The category specific orders were then determined based on the total number of points each strategy received.

Each jurisdiction has a unique list of their categorical priorities. Final rankings are listed below and all final ranking worksheets can be found in the appendix section.

Hazard/Multi-Hazard Priorities

City of Huntington Beach

Windstorms

#1 Public Works & Utility Relationship Building Code Collaboration
#2 Windstorm Education Campaign
#3 Track Generators in Public Facilities

Tsunami

#1 Edwards Fire Station Warning Siren Purchase
#2 Tsunami Education Campaign

Subsidence

#1 Murdy Fire Station Repairs Funding Acquisition
#2 HB Corporate Yard Repairs Funding Acquisition
#3 Subsidence Education Campaign

Flood

#1 Update HB Flood Pump Stations
#2 Upgrade HB Storm Drain
#3 Support the County of Orange 7 Year Flood Control Project
#4 HB Retention Stations at Schools and Parks *(tie vote)*
#4 RACES Weather & Flood Channel Spotters *(tie vote)*

Earthquake

#1 Seismic Retrofit of HB City Hall
#2 Integrate EQ Hazard Mapping HAZUS
#3 Encourage Seismic Strength Evaluation of Critical Facilities
#4 Building Inspector Training
#5 Encourage Reduction of Non Structural EQ Hazards
#6 Encourage Purchase of EQ Hazard Insurance

Dam Failure

#1 Support Completion of Mainstem Project
#2 Dam Failure Education Campaign

Multi-Hazard/General Strategies

#1 HAZUS Study
#2 HB Warning Siren System Public Education Campaign
#3 SEMS & EOC Training
#4 School to City Radio System *(tie vote)*
#4 Tabletop & Full Scale Disaster Exercises *(tie vote)*
#5 School District Training Program

City of Fountain Valley

Windstorms

#1 Windstorm Education Campaign
#2 Track Generators in Public Facilities
#3 Public Works & Utility Relationship Building Code Collaboration

Tsunami

#1 Tsunami Education Campaign

Subsidence

#1 Subsidence Education Campaign
#2 FV Fire Station #1 Repairs Funding Acquisition

Flood

#1 Update FV Flood Pump Stations
#2 Support the County of Orange 7 Year Flood Control Project
#3 RACES Weather & Flood Channel Spotters

Earthquake

#1 FV Seismic Retrofit of Reservoir #2
#2 Encourage Seismic Strength Evaluation of Critical Facilities
#3 Encourage Reduction of Non-Structural EQ Hazards *(tie vote)*
#3 Building Inspector Training *(tie vote)*
#4 Integrate EQ Hazard Mapping HAZUS
#5 Encourage Purchase of EQ Hazard Insurance

Dam Failure

#1 Support Completion of Mainstem Project
#2 Dam Failure Education Campaign

Multi-Hazard/General Strategies

#1 GIS
#2 HAZUS Study
#2 SEMS & EOC Training
#3 Tabletop & Full Scale Disaster Exercises
#4 School District Training Program
#5 School to City Radio System

Huntington Beach City School District

Windstorm

#1 Track Generators in Public Facilities

Flood

#1 Schools Purchase Mechanical Pumps
#2 Huntington Beach Retention Stations at Schools and Parks

Earthquake

#1 Hazard Mitigation of Non-Structural Earthquake Hazards for Schools

Multi-Hazard/General Strategies

#1 School to City Radio System
#2 SEMS & EOC Training
#3 School District Training Program

#4 Tabletop & Full Scale Disaster Exercises
#5 School Generator Acquisition
#6 Cargo Container Acquisition

Huntington Beach Union High School District

Windstorm
#1 Track Generators in Public Facilities

Subsidence
#1 HBUHSD Repairs Funding Acquisition

Flood
#1 Schools Purchase Mechanical Pumps
#2 HB Retention Stations at Schools and Parks

Earthquakes
#1 Hazard Mitigation of Non-Structural Earthquake Hazards

Multi-Hazard/General Strategies
#1 School to City Radio System
#2 Cargo Container Acquisition
#3 School District Training Program
#4 School Generator Acquisition
#5 SEMS & EOC Training
#6 Tabletop & Full Scale Disaster Exercises

Ocean View School District

Windstorm
#1 Track Generators in Public Facilities

Flood
#1 Schools Purchase Mechanical Pumps
#2 HB Retention Stations at Schools & Parks

Earthquake
#1 Hazard Mitigation of Non-Structural EQ Hazards for Schools

Multi-Hazard/General Strategies
#1 School Generator Acquisition
#2 School to City Radio System
#3 Cargo Container Acquisition
#4 School District Training Program
#5 SEMS & EOC Training
#6 Tabletop & Full Scale Disaster Exercises

Fountain Valley School District

Windstorm
#1 Track Generators in Public Facilities

Flood
#1 Schools Purchase Mechanical Pumps

Earthquake
#1 Hazard Mitigation of Non-Structural Earthquake Hazards

Multi-Hazard/General Strategies

#1 School to City Radio System
#2 Cargo Container Acquisition
#3 School Generator Acquisition
#4 SEMS & EOC Training
#5 Tabletop & Full Scale Disaster Exercises
#6 School District Training Program

Top-Five Strategy Priorities

Step 1: Same as above Step 1.

Step 2: Same as above Step 2.

Step 3: A voting form was created and titled "Overall Ranking Assignments."

Step 4: Committee members present at the general Hazard Mitigation meeting on August 12, 2004 were given a "Overall Ranking Assignments Voting Form" and associated instructions for completing the form. Committee members then prioritized the top five strategies for their own jurisdiction, choosing from any of the seven categories (Windstorms, Tsunami, Subsidence, Flood, Earthquake, Dam Failure, Multi-Hazard/General Strategies).

Step 5: All forms were collected and the strategy scores were tallied. Forms were tallied based on the following scale:

Priority Number	Points Designated
#1	5 pts
#2	4 pts
#3	3 pts
#4	2 pts
#5	1 pts

Step 6: All forms were tallied and the final top five strategies were determined for each jurisdiction.

The following chart depicts the results of the Top Five Multi-Categorical Strategy voting process:

Jurisdiction	Final Priority Order	Total Points Received	Strategy Name	Strategy Number
City of Huntington Beach	1	15	HB Flood Pump Stations	5A
	1	15	Murdy Fire Station Repairs	3E
	2	10	HB Storm Drain	5B
	2	10	HB City Hall Retrofit	6A
	3	7	HB Corporate Yard Repairs	3D
	3	7	Edwards Fire Station Warning System	2A
City of Fountain Valley	1	25	Retrofit Reservoir #2	6B
	2	11	FV Flood Pump Stations	5A
	3	7	GIS	
	4	6	Non-Structural EQ Hazards	6F
	5	4	Track Generators	1C
	5	4	Fire Station #1 Repairs	3B
	5	4	EQ HAZUS	6C
	5	4	Support Mainstem Project	4A
Huntington Beach City School District	1	9	Schools Purchase Mechanical Pumps	5D
	2	8	School to City Radio System	
	3	4	HB Retention Stations at Schools & Parks	5C
	4	3	School District Training Program	
	5	2	Track Generators in Public Facilities	1C
	5	2	SEMS & EOC Training	
Huntington Beach Union High School District	1	5	School District Training Program	
	2	4	Cargo Container Acquisition	
	3	3	HBUHSD Subsidence Repairs	3C
	4	2	School to City Radios	
	5	1	Non-Structural EQ Haz for Schools	
Ocean View School District	1	5	School Generator Acquisition	
	2	4	School to City Radios	
	3	3	Cargo Container Acquisition	
	4	2	School District Training Program	
	5	1	SEMS & EOC Training	
Fountain Valley School District	1	5	Non-Structural EQ Haz for Schools	
	2	4	School to City Radios	
	3	3	School District Training Program	
	4	2	Tabletop & Full Scale Exercises	
	5	1	School Generator Acquisition	

Some of the overlap of strategy prioritization will allow for future collaboration between jurisdictions. Mitigation strategies that affect more than one jurisdiction may allow for jurisdictions to apply for mitigation grants as part of a joint venture. It should also be noted that strategies not appearing on the above “Top 5” lists may also be targeted for completion.

Part VI-D

List of Exhibits

Part I – Introduction

Exhibit I-C-1: City Council and School Board Resolutions 25
Exhibit I-C-2: Capability Assessment 28

Part II – Community Profiles

CITY OF HUNTINGTON BEACH COMMUNITIY PROFILE

Exhibit II-A-1: Map of Huntington Beach with Reporting District Grids 6
Exhibit II-A-2: Huntington Beach Elevation Ranges 7
Exhibit II-A-3: Huntington Beach Library Map 10
Exhibit II-A-4: Huntington Beach Parks and Recreational Facilities 11
Exhibit II-A-5: Huntington Beach Essential Services Map 26
Exhibit II-A-6: Huntington Beach Government Facilities 28

CITY OF FOUNTAIN VALLEY COMMUNITY PROFILE

Exhibit II-B-1: Map of Fountain Valley 2

HUNTINGTON BEACH CITY SCHOOL DISTRICT

No Exhibits

HUNTINGTON BEACH UNION HIGH SCHOOL DISTRICT

No Exhibits

OCEAN VIEW SCHOOL DISTRICT

No Exhibits

FOUNTAIN VALLEY

No Exhibits

Part III – Risk Assessment

Exhibit III-B-1: City of Huntington Beach Asset List 12
Exhibit III-B-2: City of Fountain Valley Asset List 19
Exhibit III-B-3: HB City School District Asset List 21
Exhibit III-B-4: HB Union High School Asset List 23
Exhibit III-B-5: Ocean View School District Asset List 24
Exhibit III-B-6: Fountain Valley School District Asset List 26
Exhibit III-B-7: FEMA Worksheet 3a 30
Exhibit III-B-8: FEMA Worksheet 4 35
Exhibit III-C-1: Multi-Jurisdictional Risk Assessment Matrix 38

Part IV – Hazards and Strategies

WINDSTORM

Exhibit IV-A-1: Fujita Tornado Damage Scale 3
Exhibit IV-A-2: Major Windstorm/Santa Ana Wind Events 4
Exhibit IV-A-3: Major Tornado Events 6
Exhibit IV-A-4: Santa Ana Winds Path Map 8
Exhibit IV-A-5: Beaufort Scale 10
Exhibit IV-A-6: Tree Caused Circuit Interruption Investigations 11
Exhibit IV-A-7: Proposed Activity Criteria Evaluation 14
Exhibit IV-A-8: Huntington Beach Estimated Potential Loses 16
Exhibit IV-A-9: Fountain Valley Estimated Potential Losses 17
Exhibit IV-A-10: Huntington Brach Estimated Degree of Loss 18
Exhibit IV-A-11: Fountain Valley Estimated Degree of Loss 19

TSUNAMI

Exhibit IV-B-1: Tsunami Run-Up Areas For Huntington Beach 11
Exhibit IV-B-2: Huntington Beach Siren Location Map 13
Exhibit IV-B-3 Huntington Beach School Sites Impacted 15
Exhibit IV-B-4: Tsunami Run-Up Areas and School District Sites 16
Exhibit IV-B-5: Tsunami Evacuation Map For Huntington Beach 17
Exhibit IV-B-6: Huntington Beach Impacted Essential Service Facilities 20
Exhibit IV-B-7: Huntington Beach Impacted Government (Non City) Facilities 21
Exhibit IV-B-8: Tsunami Run-Up Area And Essential Service Facilities 22
Exhibit IV-B -9: Tsunami Run-Up Area And Government Facilities 23
Exhibit IV-B-10: Tsunami Multi-Hazard Strategies 24
Exhibit IV-B-11: Proposed Activity Criteria Evaluation 25
Exhibit IV-B-12: Huntington Beach Estimated Potential Losses 27
Exhibit IV-B-13: Fountain Valley Estimated Potential Losses 28
Exhibit IV-B-14: Huntington Beach Estimated Degree of Loss 29
Exhibit IV-B-15: Fountain Valley Estimated Degree of Loss 30

SUBSIDENCE

Exhibit IV-C-1: Location Of Murdy Fire Station 9
Exhibit IV-C-2: Map Of Murdy Fire Station In Liquefaction Zone 10
Exhibit IV-C-3: Subsidence Areas And School Districts 26
Exhibit IV-C-4: Liquefaction Areas 28
Exhibit IV-C-5: Subsidence Areas From USGS Quadrangle 29
Exhibit IV-C-6: Liquefaction Map City of Huntington Beach 30
Exhibit IV-C-7: Subsidence Areas City of Huntington Beach 31
Exhibit IV-C-8: City of Huntington Beach Peat and Organic Soils 32
Exhibit IV-C-9: City of Huntington Beach Surface Water 33
Exhibit IV-C-10: Subsidence Areas And Government Facilities 35
Exhibit IV-C-11: HB Subsidence Areas And Essential Services Facilities 37
Exhibit IV-C-12: Subsidence Mitigation Action Items 38
Exhibit IV-C-13: Proposed Activity Criteria Evaluation 39
Exhibit IV-C-14: Huntington Beach Estimated Potential Losses 41
Exhibit IV-C-15: Fountain Valley Estimated Potential Losses 42
Exhibit IV-C-16: Huntington Beach Estimated Degree of Loss 43
Exhibit IV-C-17: Fountain Valley Estimated Degree of Loss 44

DAM FAILURE

Exhibit IV-D-1: Downstream Inundation Map 15
Exhibit IV-D-2: City of Huntington Beach Prado Dam Inundation Map 16
Exhibit IV-D-3: City of HB Prado Dam Inundation/City and County Channels Map 17
Exhibit IV-D-4: Fountain Valley Prado Dam Inundation Map 18
Exhibit IV-D-5: Santa Ana Mainstem Map 21
Exhibit IV-D-6: Huntington Beach Elevation Ranges Map 26
Exhibit IV-D-7 Huntington Beach School Sites Impacted 27
Exhibit IV-D-8: Prado Dam Inundation and School District Sites 28
Exhibit IV-D-9: Huntington Beach Impacted Essential Service Facilities 31
Exhibit IV-D-10: HB Prado Dam Inundation and Essential Services Facilities Map 32
Exhibit IV-D-11: Fountain Valley Prado Dam Inundation Map 33
Exhibit IV-D-12: Proposed Activity Criteria Evaluation 36
Exhibit IV-D-13: Huntington Beach Estimated Potential Losses 38
Exhibit IV-D-14: Fountain Valley Estimated Potential Losses 39
Exhibit IV-D-15: Huntington Beach Estimated Degree of Loss 40
Exhibit IV-D-16: Fountain Valley Estimated Degree of Loss 41

FLOOD

Exhibit IV-E-1: 100 and 500 Year Rain Flood Level 4
Exhibit IV-E-2: Fountain Valley Flood Plain Map 5
Exhibit IV-E-3: Huntington Beach Elevations 6
Exhibit IV-B-4: Regional Drainage System Map 10
Exhibit IV-E-5: Huntington Beach Drainage Channels & Pumping Stations Map 11
Exhibit IV-E-6: Fountain Valley Drainage Channels & Pumping Stations Map 13
Exhibit IV-E-7: Local Flood Areas and School Districts 22
Exhibit IV-E-8: 100 & 500 Year Rain Flood Level and School Districts 23
Exhibit IV-E-9: 100 & 500 Year Rain Flood Level and Government Facilities 25
Exhibit IV-E-10: Huntington Beach History of Local Flooding Map 26
Exhibit IV-E-11: Proposed Activity Criteria Evaluation 39
Exhibit IV-E-12: Huntington Beach Estimated Potential Losses 42
Exhibit IV-E-13: Fountain Valley Estimated Potential Losses 43
Exhibit IV-E-14: Huntington Beach Estimated Degree of Loss 44
Exhibit IV-E-15: Huntington Beach Estimated Degree of Loss 45

EARTHQUAKE

Exhibit IV-F-1: Southern California Earthquake Fault Map 5
Exhibit IV-F-2: Orange County Earthquake Ground Shaking Map 6
Exhibit IV-F-3: Modified Mercalli Intensity Scale 13
Exhibit IV-F-4: San Andreas Fault Shaking Intensity Map 14
Exhibit IV-F-5: Newport-Inglewood Fault Shaking Intensity Map 17
Exhibit IV-F-6: San Joaquin Hills Thrust Fault 21
Exhibit IV-F-7: Orange County Slope and Soil Failure Liquefaction 25
Exhibit IV-F-8: Orange County Liquefaction Zones 26
Exhibit IV-F-9: Huntington Beach Liquefaction Potential 27
Exhibit IV-F-10: Tsunami Risk For Coastal Southern California 29
Exhibit IV-F-11: Orange County Hazardous Materials Locations 30
Exhibit IV-F-12: HB Hazardous Materials Storage Sites 31
Exhibit IV-F-13: HB Earthquake Faults and Essential Service Facilities 36
Exhibit IV-F-14: HB Earthquake and Non-City Government Facilities 37
Exhibit IV-F-15: Earthquake Faults And School Districts 43

Exhibit IV-F-16: Proposed Activity Criteria Evaluation 47
Exhibit IV-F-17: Huntington Beach Asset List..... 49
Exhibit IV-F-18: Fountain Valley Asset List 50
Exhibit IV-F-19: Huntington Beach Estimated Losses..... 51
Exhibit IV-F-20: Huntington Beach Estimated Losses..... 52

Part V – Plan Maintenance

Exhibit V-B-1 - Incorporating Mitigation into Existing Planning Mechanisms
Exhibit V-B-2 Plan Maintenance Matrix

Part VI – Appendices

No Exhibits

Part VI - Appendix E
Plan Resources Directory

The Resource Directory provides contact information for Local, Regional, State, and Federal programs that are currently involved in hazard mitigation activities. The Hazard Mitigation Advisory Committee 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.

Various community members interested in hazard mitigation information and projects may also use this section.

American Public Works Association			
Level: National	Hazard: Multi	http://www.apwa.net	
2345 Grand Boulevard		Suite 500	
Kansas City, MO 64108-2641		Ph: 816-472-6100	Fax: 816-472-1610
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			
Level: Federal	Hazard: Flood	www.floods.org	
2809 Fish Hatchery Road			
Madison, WI 53713		Ph: 608-274-0123	Fax:
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 Avenue, NW		Suite 700	
Washington, DC 20005		Ph: 202-289-7800	Fax: 202-289-1099
Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.			

California Department of Transportation (CalTrans)			
Level: State	Hazard: Multi	http://www.dot.ca.gov/	
120 South Spring Street			
Los Angeles, CA 90012		Ph: 213-897-3656	Fax:
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 intercity passenger rail service in California.			

California Resources Agency			
Level: State	Hazard: Multi	http://resources.ca.gov/	
1416 Ninth Street		Suite 1311	
Sacramento, CA 95814		Ph: 916-653-5656	Fax:
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.			

California Division of Forestry (CDF)			
Level: State	Hazard: Multi	http://www.fire.ca.gov/php/index.php	
210 West San Jacinto			
Perris, CA 92570		Ph: 909-940-6900	Fax:
Notes: The California Department of Forestry (CDF) and Fire Protection protects over 31 million acres of California's privately-owned wildlands. CDF emphasizes the management and protection of California's natural resources.			

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		Ph: 916-445-1825	Fax: 916-445-5718
Notes: The California Geological Survey develops and disseminates technical information and advice on California’s geology, geologic hazards, and mineral resources.			

California Environmental Resources Evaluation System (CERES)			
Level: State	Hazard: Multi	http://ceres.ca.gov/	
900 North Street		Suite 250	
Sacramento, CA 95814		Ph: 916-653-2238	Fax:
Notes: California Environmental Resources Evaluation System (CERES) is an excellent website for access to environmental information and websites.			
California Department of Water Resources (DWR)			
Level: State	Hazard: Flood	http://wwwdwr.water.ca.gov	
1416 9th Street			
Sacramento, CA 95814		Ph: 916-653-6192	Fax:
Notes: The Department of Water Resources (DWR) 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 Department of Conservation: Southern California Regional Office			
Level: State	Hazard: Multi	www.consrv.ca.gov	
655 South Hope Street		#700	
Los Angeles, CA 90017-2321		Ph: 213-239-0878	Fax: 213-239-0984
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.			
Environmental Protection Agency (EPA), Region 9			
Level: Regional	Hazard: Multi	http://www.epa.gov/region09	
75 Hawthorne Street			
San Francisco, CA 94105		Ph: 415-947-8000	Fax: 415-947-3553
Notes: The mission of the US Environmental Protection Agency (EPA) 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		Ph: 510-627-7100	Fax: 510-627-7112
Notes: The Federal Emergency Management Agency (FEMA), under the direction of the Department of Homeland Security 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		Ph: 202-566-1600	Fax:
Notes: The Federal Emergency Management Agency (FEMA) (under the direction of the Department of Homeland Security) Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has a number of programs and activities 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		Ph: 775-626-6389	Fax: 775-626-6389
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.			

Governor's Office of Emergency Services (OES)			
Level: State	Hazard: Multi	www.oes.ca.gov	
P.O. Box 419047			
Rancho Cordova, CA 95741-9047		Ph: 916-845-8911	Fax: 916-845-8910
Notes: The Governor's Office of Emergency Services (OES) 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.			

National Resources Conservation Service (NRCS)			
Level: Federal	Hazard: Multi	http://www.nrcs.usda.gov/	
14th & Independence Avenue, South West		Room 5105-A	
Washington, DC 20250		Ph: 202-720-7246	Fax: 202-720-7690
Notes: National Resources Conservation Service (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 sharing and financial incentives are available in some cases.			

National Interagency Fire Center (NIFC)			
Level: Federal	Hazard: Wildfire	www.nifc.gov	
3833 South Development Avenue			
Boise, ID 83705-5354		Ph: 208-387-5512	Fax:
Notes: The National Interagency Fire Center (NIFC) in Boise, Idaho is the nation's support center for wildland firefighting. Seven Federal agencies work together to coordinate and support wildland fire and disaster operations.			

National Fire Protection Association (NFPA)			
Level: National	Hazard: Wildfire	http://www.nfpa.org/catalog/home/index.asp	
1 Batterymarch Park			
Quincy, MA 02169-7471		Ph: 617-770-3000	Fax: 617-770-0700
Notes: The mission of the international nonprofit National Fire Protection Association (NFPA) is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training, and education.			

National Floodplain Insurance Program (NFIP) Mitigation Division			
Level: Federal	Hazard: Flood	www.fema.gov/nfip/	
500 C Street, South West			
Washington, D.C. 20472		Ph: 202-566-1600	Fax:
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has a number of programs and activities which provide citizens Protection, with flood insurance; Prevention, with mitigation measures, and Partnerships, with communities throughout the country.			

National Oceanic Atmospheric Administration			
Level: Federal	Hazard: Multi	www.noaa.gov	
14th Street & Constitution Avenue NW		Room 6013	
Washington, DC 20230		Ph: 202-482-6090	Fax: 202-482-3154
Notes: The National Fire Protection Association (NOAA's) historical role has been to predict environmental changes, protect life and property, provide decision-makers with reliable scientific information, and foster global environmental stewardship.			

National Weather Service (NWS)			
Level: Federal	Hazard: Multi	http://www.nws.noaa.gov/	
520 North Elevar Street			
Oxnard, CA 93030		Ph: 805-988-6615	Fax:
Notes: The National Weather Service (NWS) 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 (NWS), Office of Hydrologic Development (OHD)			
Level: Federal	Hazard: Flood	http://www.nws.noaa.gov/	
1325 East West Highway		SSMC2	
Silver Spring, MD 20910		Ph: 301-713-1658	Fax: 301-713-0963
Notes: The National Weather Service (NWS) 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.			

Orange County Sheriff Department (OCSD) – Emergency Management			
Level: County	Hazard: Multi	tduensing@ocsd.org	
2644 Santiago Canyon Road			
Silverado, CA 92672		Ph: 714-628-7158	Fax:
Notes: Provides Operational Area via the Orange County Emergency Management Organization (OCEMO).			

Orange County Resources and Management Development (OC RDMD)			
Level: County	Hazard: Flood and Dam Failure	www.ocrdmd.com	
300 North Flower			
Santa Ana, CA 97203		Ph:	Fax: 213-236-1825
Notes: The Orange County Resources Development and Management Department Public Works Branch on Douglass Road in Anaheim provides flood channels and maintenance information, Prado Dam oversight, and flood and dam failure plans.			

South Coast Air Quality Management District (AQMD)			
Level: Regional	Hazard: Multi	www.aqmd.gov	
21865 East Copley Drive			
Diamond Bar, CA 91765		Ph: 800-CUT-SMOG	Fax:
Notes: AQMD is a Regional government agency that seeks to achieve and maintain healthful air quality through a comprehensive program of research, regulations, enforcement, and communication. The AQMD covers Los Angeles and Orange Counties and parts of Riverside and San Bernardino Counties.			
Southern California Earthquake Center (SCEC)			
Level: Regional	Hazard: Earthquake	www.scec.org	
3651 Trousdale Parkway		Suite 169	
Los Angeles, CA 90089-0742		Ph: 213-740-5843	Fax: 213-740-0011
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.			

Southern California Association of Governments (SCAG)			
Level: Regional	Hazard: Multi	www.scag.ca.gov	
818 West Seventh Street		12th Floor	
Los Angeles, CA 90017		Ph: 213-236-1800	Fax: 213-236-1825
Notes: The Southern California Association of Governments (SCAG) 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 SCAG is mandated by the Federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.			

State Fire Marshal (SFM)			
Level: State	Hazard: Wildfire	http://osfm.fire.ca.gov	
1131 "S" Street			
Sacramento, CA 95814		Ph: 916-445-8200	Fax: 916-445-8509
Notes: The Office of the State Fire Marshal (SFM) supports the mission of the California Department of Forestry and Fire Protection (CDF) 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.			

The Community Rating System (CRS)			
Level: Federal	Hazard: Flood	http://www.fema.gov/nfip/crs.shtm	
500 C Street, South West			
Washington, DC 20472		Ph: 202-566-1600	Fax:
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.			

United States Geological Survey (USGS)			
Level: Federal	Hazard: Multi	http://www.usgs.gov/	
345 Middlefield Road			
Menlo Park, CA 94025		Ph: 650-853-8300	Fax:
Notes: The United States Geological Survey (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.			

United States Geological Survey (USGS) Water Resources			
Level: Federal	Hazard: Multi	www.water.usgs.gov	
6000 J Street		Placer Hall	
Sacramento, CA 95819-6129		Ph: 916-278-3000	Fax: 916-278-3070
Notes: The United States Geological Survey (USGS) Water Resources mission is to provide water information that benefits the Nation's citizens: publications, data, maps, and applications software.			

US Army Corps of Engineers			
Level: Federal	Hazard: Multi	http://www.usace.army.mil	
P.O. Box 532711			
Los Angeles CA 90053- 2325		Ph: 213-452- 3921	Fax:
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.			

United States Department of Agriculture (USDA) Forest Service			
Level: Federal	Hazard: Wildfire	http://www.fs.fed.us	
1400 Independence Avenue South West			
Washington, DC 20250-0002		Ph: 202-205-8333	Fax:
Notes: The Forest Service is an agency of the US Department of Agriculture. The Forest Service manages public lands in national forests and grasslands.			

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		Ph: 650-330-1101	Fax: 650-326-1769
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	http://www.westside-la.or	
120 Wilshire Boulevard			
Santa Monica, CA 90401		Ph: 310-458-1521	Fax: 310-458-6479
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.			

Part VI-F

List of Acronyms
Table of Contents

PART VI-F **1**
FEDERAL ACRONYMS **1**
A 1
B 1
C 1
E 1
F 1
G 1
H 1
I 2
N 2
S 2
T 2
U 2
W 2
CALIFORNIA ACRONYMS **3**
A 3
B 3
C 3
D 3
E 4
F 4
G 5
H 5
I 5
L 5
M 5
N 5
O 6
P 6
R 6
S 6
T 7
U 7
W 7

(This page intentionally left blank)

Federal Acronyms

A

AASHTO	American Association of State Highway and Transportation Officials
ATC	Applied Technology Council

B

b/ca	benefit/cost analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BSSC	Building Seismic Safety Council

C

CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CRS	Community Rating System

E

EDA	Economic Development Administration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)

F

FAS	Federal Aid System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (FEMA Program)
FTE	Full Time Equivalent

G

GIS	Geographic Information System
GNS	Institute of Geological and Nuclear Sciences (International)
GSA	General Services Administration

H

HAZUS	Hazards United States
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	Housing and Urban Development (United States, Department of)

I

IBHS	Institute for Business and Home Safety
ICC	Increased Cost of Compliance
IHMT	Interagency Hazard Mitigation Team

N

NCDC	National Climate Data Center
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHMP	Natural Hazard Mitigation Plan (also known as "409 Plan")
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service

S

SBA	Small Business Administration
SEAO	Structural Engineers Association of Oregon
SHMO	State Hazard Mitigation Officer

T

TOR	Transfer of Development Rights

U

UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFA	United States Fire Administration
USFS	United States Forest Service
USGS	United States Geological Survey

W

WSSPC	Western States Seismic Policy Council

California Acronyms

A

A&W	Alert and Warning
AA	Administering Areas
AAR	After Action Report
ARC	American Red Cross
ARP	Accidental Risk Prevention
ATC20	Applied Technology Council20
ATC21	Applied Technology Council21

B

BCP	Budget Change Proposal
BSA	California Bureau of State Audits

C

CAER	Community Awareness & Emergency Response
CalARP	California Accidental Release Prevention
CalBO	California Building Officials
CalEPA	California Environmental Protection Agency
CalREP	California Radiological Emergency Plan
CALSTARS	California State Accounting Reporting System
CalTRANS	California Department of Transportation
CBO	Community Based Organization
CD	Civil Defense
CDF	California Department of Forestry and Fire Protection
CDMG	California Division of Mines and Geology
CEC	California Energy Commission
CEPEC	California Earthquake Prediction Evaluation Council
CESRS	California Emergency Services Radio System
CHIP	California Hazardous Identification Program
CHMIRS	California Hazardous Materials Incident Reporting System
CHP	California Highway Patrol
CLETS	California Law Enforcement Telecommunications System
CSTI	California Specialized Training Institute
CUEA	California Utilities Emergency Association
CUPA	Certified Unified Program Agency

D

DAD	Disaster Assistance Division (of the State Office of Emergency Services)
DFO	Disaster Field Office
DGS	California Department of General Services

DHSRHB	California Department of Health Services, Radiological Health Branch
DO	Duty Officer
DOC	Department Operations Center
DOE	Department of Energy (U.S.)
DOF	California Department of Finance
DOJ	California Department of Justice
DPA	California Department of Personnel Administration
DPIG	Disaster Preparedness Improvement Grant
DR	Disaster Response
DSA	Division of the State Architect
DSR	Damage Survey Report
DSW	Disaster Service Worker
DWR	California Department of Water Resources

E

EAS	Emergency Alerting System
EDIS	Emergency Digital Information System
EERI	Earthquake Engineering Research Institute
EMA	Emergency Management Assistance
EMI	Emergency Management Institute
EMMA	Emergency Managers Mutual Aid
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency (US)
EPEDAT	Early Post Earthquake Damage Assessment Tool
EPI	Emergency Public Information
EPIC	Emergency Public Information Council
ESC	Emergency Services Coordinator

F

FAY	Federal Award Year
FDAA	Federal Disaster Assistance Administration
FEAT	Governor's Flood Emergency Action Team
FEMA	Federal Emergency Management Agency
FFY	Federal Fiscal Year
FIR	Final Inspection Reports
FIRESCOPE	Firefighting Resources of So Calif Organized for Potential Emergencies
FMA	Flood Management Assistance
FSR	Feasibility Study Report
FY	Fiscal Year

G

GIS	Geographic Information System

H

HAZMAT	Hazardous Materials
HAZMIT	Hazardous Mitigation
HAZUS	Hazards United States (earthquake damage assessment prediction tool)
HAD	Housing and Community Development
HEICS	Hospital Emergency Incident Command System
HEPG	Hospital Emergency Planning Guidance
HIA	Hazard Identification and Analysis Unit
HMEP	Hazardous Materials Emergency Preparedness
HMGP	Hazard Mitigation Grant Program

I

IDE	Initial Damage Estimate
IA	Individual Assistance
IFG	Individual & Family Grant (program)
IRG	Incident Response Geographic Information System
IPA	Information and Public Affairs (of state Office of Emergency Services)

L

LAN	Local Area Network
LEMMA	Law Enforcement Master Mutual Aid
LEPC	Local Emergency Planning Committee

M

MARAC	Mutual Aid Regional Advisory Council
MHID	Multi-hazard Identification
MOU	Memorandum of Understanding

N

NBC	Nuclear, Biological, Chemical
NEMA	National Emergency Management Agency
NEMIS	National Emergency Management Information System
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Association
NPP	Nuclear Power Plant
NSF	National Science Foundation
NWS	National Weather Service

O

OA	Operational Area
OASIS	Operational Area Satellite Information System
OCC	Operations Coordination Center
OCD	Office of Civil Defense
OEP	Office of Emergency Planning
OES	California Governor's Office of Emergency Services
OSHPD	Office of Statewide Health Planning and Development
OSPR	Oil Spill Prevention and Response

P

PA	Public Assistance
PC	Personal Computer
PDA	Preliminary Damage Assessment
PIO	Public Information Office
POST	Police Officer Standards and Training
PPA/CA	Performance Partnership Agreement/Cooperative Agreement (FEMA)
PSA	Public Service Announcement
PTAB	Planning and Technological Assistance Branch
PTR	Project Time Report

R

RA	Regional Administrator (OES)
RADEF	Radiological Defense (program)
RAMP	Regional Assessment of Mitigation Priorities
RAPID	Railroad Accident Prevention & Immediate Deployment
RDO	Radiological Defense Officer
RDMHC	Regional Disaster Medical Health Coordinator
REOC	Regional Emergency Operations Center
REPI	Reserve Emergency Public Information
RES	Regional Emergency Staff
RIMS	Response Information Management System
RMP	Risk Management Plan
RPU	Radiological Preparedness Unit (OES)
RRT	Regional Response Team

S

SAM	State Administrative Manual
SARA	Superfund Amendments & Reauthorization Act
SAVP	Safety Assessment Volunteer Program
SBA	Small Business Administration
SCO	California State Controller's Office

SEMS	Standardized Emergency Management System
SEPIC	State Emergency Public Information Committee
SLA	State and Local Assistance
SONGS	San Onofre Nuclear Generating Station
SOP	Standard Operating Procedure
SWEPC	Statewide Emergency Planning Committee

T

TEC	Travel Expense Claim
TRU	Transuranic
TTT	Train the Trainer

U

UPA	Unified Program Account
UPS	Uninterrupted Power Source
USAR	Urban Search and Rescue
USGS	United States Geological Survey

W

WC	California State Warning Center
WAN	Wide Area Network
WIPP	Waste Isolation Pilot Project

Part VI-G

Glossary

Acceleration	The rate of change of velocity with respect to time. Acceleration due to gravity at the Earth's surface is 9.8 meters per second squared i.e. every second that something falls toward the surface of the earth its velocity increases by 9.8 meters per second.
Asset	Any man-made or natural feature that has value, including, but not limited to: people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.
Base Flood	Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100 year flood.
Base Flood Elevation (BFE)	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.
Bedrock	The solid rock that underlies loose material, such as: soil, sand, clay, or gravel.
Building	A structure that is walled and roofed, principally aboveground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.
Coastal High Hazard Area	Area, usually along an open coast, bay, or inlet, that is subject to inundation by storm surge and, in some instances, wave action caused by storms or seismic sources.
Coastal Zones	The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas having direct drainage to the ocean.
Community Rating System (CRS)	An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.

Computer-Aided Design and Drafting (CADD)	A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross section drawings.
Contour	A line of equal ground elevation on a topographic (contour) map.
Critical Facility	Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to: shelters, police and fire stations, and hospitals.
Debris	The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.
Digitize	To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer applications.
Displacement Time	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.
Duration	How long a hazard event lasts.
Earthquake	A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of Earth's tectonic plates.
Erosion	Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
Erosion Hazard Area	Area anticipated to be lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.
Essential Facility	Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
Extent	The size of an area affected by a hazard or hazard event.

Extratropical Cyclone	Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these non-tropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large – 1,000 mile wide storms are not uncommon.
Fault	A fracture in the continuity of a rock formation caused by a shifting or dislodging of the Earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.
Federal Emergency Management Agency (FEMA)	Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response, and recovery.
Fire Potential Index (FPI)	Developed by USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on-the-ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.
Flash Flood	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.
Flood	A general and temporary condition of partial or complete inundation of normally dry land areas from:(1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.
Flood Depth	Height of the floodwater surface above the ground surface.
Flood Elevation	Elevation of the water surface above an established datum; e.g., National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.
Flood Hazard Area	The area shown to be inundated by a flood of a given magnitude on a map.

Flood Insurance Rate Map (FIRM)	Map of a community, prepared by the Federal Emergency Management Agency, that shows both the special flood hazard areas and the risk premium zones applicable to the community.
Flood Insurance Study (FIS)	A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.
Floodplain	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
Frequency	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100 year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.
Fujita Scale of Tornado Intensity	Rates tornadoes with numeric values from F0 to F5 based on tornado windspeed and damage sustained. An F0 indicates minimal damage such as broken tree limbs or signs, while F5 indicates severe damage sustained.
Functional Downtime	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
Geographic Area Impacted	The physical area in which the effects of the hazard are experienced.
Geographic Information Systems (GIS)	A computer software application that relates physical features on the Earth to a database to be used for mapping and analysis.
Ground Motion	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, but soft soils can further amplify ground motions.
Hazard	A source of potential danger or adverse condition. Hazards will include naturally occurring events such as: floods, earthquakes, tornadoes, tsunamis, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.

Hazard Event	A specific occurrence of a particular type of hazard.
Hazard Identification	The process of identifying hazards that threaten an area.
Hazard Mitigation	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.
Hazard Profile	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.
HAZUS (Hazards US)	A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.
Hurricane	An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center or "eye." Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
Hydrology	The science of dealing with the waters of the Earth. A flood discharge is developed by a hydrologic study.
Infrastructure	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access; vital services such as public water supplies and sewer treatment facilities; and includes an area's transportation system such as airports; heliports; highways; bridges; tunnels; roadbeds; overpasses; railways; rail yards; depots; and waterways, canals, locks, seaports, ferries, harbors, drydocks, piers, and regional dams.
Intensity	A measure of the effects of a hazard event at a particular place.
Landslide	Downward movement of a slope and materials under the force of gravity.

Lateral Spreads	Develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies in a seismic event. The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.
Liquefaction	Results when the soil supporting structures liquefies. This can cause structures to tip and topple.
Lowest Floor	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.
Magnitude	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
Mitigation Plan	A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the State and includes a description of actions to minimize future vulnerability to hazards.
National Flood Insurance Program (NFIP)	Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.
National Geodetic Vertical Datum of 1929 (NGVD)	Datum established in 1929 and used in the NFIP as a basis for measuring flood, ground, and structural elevations, previously referred to as Sea Level Datum or Mean Sea Level. The Base Flood Elevations shown on most of the Flood Insurance Rate Maps issued by the Federal Emergency Management Agency are referenced to NGVD.
National Weather Service (NWS)	Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and State entities in preparing weather and flood warning plans.
Nor'easter	An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.
Outflow	Follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.
Planimetric	Describes maps that indicate only man-made features like buildings.

Planning	The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.
Probability	A statistical measure of the likelihood that a hazard event will occur.
Recurrence Interval	The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.
Repetitive Loss Property	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1,000 each have been paid within any 10 year period since 1978.
Replacement Value	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.
Richter Scale	A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935.
Risk	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
Riverine	Of or produced by a river.
Scale	A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the Earth's surface.
Scarp	A steep slope.
Scour	Removal of soil or fill material by the flow of flood waters. The term is frequently used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.
Seismicity	Describes the likelihood of an area being subject to earthquakes.

Special Flood Hazard Area (SFHA)	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100 year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.
Stafford Act	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107, was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.
State Hazard Mitigation Officer (SHMO)	The representative of State government who is the primary point of contact with FEMA, other State and Federal agencies, and Local units of government in the planning and implementation of pre- and post disaster mitigation activities.
Storm Surge	Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.
Structure	Something constructed. (See also Building)
Substantial Damage	Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage.
Super Typhoon	A typhoon with maximum sustained winds of 150 mph or more.
Surface Faulting	The differential movement of two sides of a fracture – in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.
Tectonic Plate	Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.
Topographic	Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include man-made features.
Tornado	A violently rotating column of air extending from a thunderstorm to the ground.

Tropical Cyclone	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.
Tropical Depression	A tropical cyclone with maximum sustained winds of less than 39 mph.
Tropical Storm	A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.
Tsunami	Great sea wave produced by submarine Earth movement or volcanic eruption.
Typhoon	A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.
Vulnerability	Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.
Vulnerability Assessment	The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.
Water Displacement	When a large mass of earth on the ocean bottom sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.
Wave Runup	The height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).
Wildfire	An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

Zone	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.