



FLOODPLAIN MANAGEMENT PLAN

COUNTY OF SAN DIEGO, CALIFORNIA

Prepared for:



FEMA

Region IX

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LIST OF ACRONYMS

ALERT	Automated Local Evaluation in Real Time
BCEGS	Building Code Effectiveness Grading Schedule
BFE	Base Flood Elevation
BMP	Best Management Practice
CFS	Cubic Feet per Second
COESS	California Office of Emergency Services and Security
CRS	Community Rating System
CTP	Cooperating Technical Partner
DHS	Department of Homeland Security
DPW	Department of Public Works
DMA2000	Disaster Mitigation Act of 2000
EOP	Emergency Operation Plan
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMP	Floodplain Management Plan
ICC	Increased Cost of Compliance
GIS	Geographic Information System
JURMP	Jurisdictional Urban Runoff Management Plan
MJMHM	Multi-Jurisdiction Multi-Hazard Mitigation Plan
NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
OES	Office of Emergency Services

RWQCB	Regional Water Quality Control Boards
RL	Repetitive Loss Structures
SanGIS	San Diego Geographic Information System
SDCWA	San Diego County Water Authority
SEMS	California Standardized Emergency Management System
SFHA	Special Flood Hazard Area
SOP	Standard Operating Procedures
SUSMP	Standard Urban Storm Water Mitigation Plan
SWPPP	Storm Water Pollution Prevention Plan
UDC	Unified Disaster Council
WPO	“County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance”

EXECUTIVE SUMMARY

Purpose and Scope of the Floodplain Management Plan

This Floodplain Management Plan (FMP) for the County of San Diego (County) assesses the flooding hazards within the unincorporated areas of the County, summarizes current County programs, describes potential mitigation strategies, and presents a plan for future action. It was prepared with input from County residents, responsible officials, and consultants, and with the support of the State of California Office of Emergency Services and Security and the Federal Emergency Management Agency.

Although the FMP provides an overall summary of flooding issues in the County of San Diego and holistically describes existing programs and capabilities, it is intended primarily to address concerns with Repetitive Loss (RL) properties¹ under the National Flood Insurance Program for the unincorporated areas of the County. The County's Multi-Jurisdiction Multi-Hazard Mitigation Plan (MJMHM Plan), which was completed in 2004 in accordance with the Disaster Mitigation Act of 2000, contains a more comprehensive hazard identification and risk assessment for flooding on a countywide basis. The MJMHM Plan addresses all areas of the County, including the eighteen incorporated cities; thus, it has a broader scope than the FMP, which is limited to the unincorporated areas of the County.

The County of San Diego developed the FMP in fulfillment of a basic requirement to join the NFIP Community Rating System (CRS) and in accordance with CRS guidelines.

Process for Developing the FMP

A core working group was established to facilitate the development of the FMP. The working group members included staff from the County's Department of Public Works, Flood Control Engineering and Hydrology, a member of the County's Flood Control Board, and the consultants hired by the County to assist in preparation of the FPM and County's CRS application. The working group assisted in identifying the specific hazards/risks and programs and capital improvement projects aimed at reducing flood risk, and in proposing and prioritizing hazard mitigation measures. The working group also participated in outreach efforts to involve the public, local and regional agencies, and adjacent municipalities.

Flood Hazard Identification and Risk Assessment

Building on the County's MJMHM Plan, which was adopted in 2004 in accordance with the Disaster Mitigation Act of 2000, the FMP summarizes the significant historical floods that have impacted the County and the flood hazard risks to which the County is subject. The most common flood hazard risks for the County are riverine flooding and flash flood events, but the risks also include dam/levee breach inundation. The working group identified "hot spots" localized flooding (discussed in Section 5), some of which share features with the RL properties.

¹ A "repetitive loss property" is one for which two flood insurance claim payments of at least \$1,000 have been paid by the NFIP within any 10-year period since 1978 (e.g., two claims during the periods 1978–1987, 1979–1988, etc.).

Also drawing on the MJMHM Plan, the FMP discusses the population, number of residential and commercial buildings, and critical facilities subject to the 1% annual chance and 0.2% annual chance floods, as well as to dam failure inundation risks. In addition to presenting the flood risk exposure, the FMP discusses the loss estimates for flood hazards in the County, based on the Federal Emergency Management Agency's HAZUS-MH models.

Repetitive Loss Analysis

While the work group welcomed information and participation from all interested residents and stakeholders in the community, the team specifically targeted repetitive loss property owners and lessees and neighboring properties facing similar flood risk. The County conducted an analysis of seven repetitive loss areas. The analysis followed a FEMA-prescribed five-step process:

Step 1: Advise all property owners in the repetitive loss study area that the analysis will be conducted.

Step 2: Collect data on each building and determine the cause(s) of the repetitive damage.

Step 3: Review alternative approaches and determine whether any property protection measures or drainage improvements are feasible.

Step 4: Contact agencies or organizations that may have plans that could affect the cause or impacts of the flooding.

Step 5: Document the findings, including a map showing all parcels in the area.

Specific recommendations were made for each repetitive loss area (Section 14 of the FMP).

Recommendations and Follow-up Actions

The FMP discusses the following flood hazard issues and presents follow-up actions and recommendations for risk reduction. Based on the findings and recommendations in each of these areas, the County developed a Mitigation Action Plan (MAP). The County's Hazard MAP identifies mitigation activities, the priority assigned to implementing each activity, a responsible lead Department or staff position, and deadline. Deadlines are either "ongoing" (for programs that should continue) or a date for the action to be completed. Additionally, for each action item, general categories of expenditure have been identified along with potential sources of funding.

Prevention measures and property protection: To increase the level of protection from natural hazards, the FMP recommends additional standards to those already required within the County. Property protection measures are used to modify buildings or other facilities subject to flood damage rather than to keep floodwaters away. Among the FMP's recommended prevention and protection measures are that the County:

- Adopt a one-foot freeboard requirement.
- Prohibit siting of critical facilities in areas subject to flooding by the 1% annual chance flood and discourage siting of critical facilities in areas subject to flooding by the 0.2% annual chance flood.

- Actively participate in FEMA's Cooperating Technical Partner program. Under this partnership, the County will assist in the development of the countywide digital FIRM currently underway.
- Develop a post-disaster recovery program that establishes policies and procedures that will be used to administer acquisition and demolition grants.
- Consider adoption of addition and cumulative substantial improvement rules.
- Conduct a study on the benefits of adding a repetitive loss provision to the floodplain management ordinance.

Natural resource protection: Preserving or restoring natural areas or the natural functions of floodplain and watershed areas produces flood loss reduction benefits as well as improves water quality and habitats. The FMP discusses the County's current activities regarding wetland protection, best management practices, erosion and sediment control, and dumping regulations. It recommends that the County:

- Continue to ensure erosion and sedimentation permits are obtained.
- Continue to enforce stream dumping regulations.

Structural measures: Structural flood control projects are used to prevent floodwaters from reaching properties. The FMP discusses the County's current activities regarding levees/floodwalls, detention ponds, drainage channel modifications, and channel and basin maintenance. It recommends that the County:

- Increase the number of road crew members available to maintain the drainage system so that inspections and maintenance can be completed on all system streams and ditches annually.
- Complete drainage maintenance projects identified in Section 14, Repetitive Flood Losses.
- Continue to enforce the County's stormwater regulations.
- Conduct a study of the drainage system and make recommendations on needed improvements.
- Document damages from inadequate drainage and develop a capital improvements program to eliminate problem sites.

Emergency management: Emergency management measures that protect people during and after disasters are described in local emergency operations plans and Standard Operating Procedures (SOPs). The FMP discusses the County's current SOPs in the areas of flood threat recognition, response and mitigation operations, emergency warning dissemination, and post-disaster recovery and mitigation. It recommends the following additional actions:

- Adopt an updated Emergency Operations Plan that includes hazard mitigation actions and identifies resources needed to accomplish response and mitigation tasks.
- Conduct an annual exercise of the Emergency Operations Plan.
- Prepare an application for designation as a StormReady Community.
- Provide adequate maintenance for ALERT system components.
- Continue the public awareness program "Preparedness Starts with You."

Public information: The County recognizes that strong community floodplain management programs emphasize outreach and education, as well as identifying and minimizing risk. The FMP discusses the County's current activities in the public information areas of map information, outreach projects, real estate disclosure, library, technical assistance, and education programs. The FMP recommends that the County:

- Continue providing flood map information to the public.
- Send flood mitigation brochures to the public.
- Prepare news releases on property protection measures and progress made in implementing the FMP.
- Prepare a public outreach strategy.
- Continue to provide mitigation materials in the library.

The County recognizes that mitigation programs can help the County attain a level of sustainability, ensure long-term economic vitality, and promote the environmental health for the community as a whole. Monitoring and evaluating how successfully the County is in implementing each mitigation strategy is important. Leading the evaluation effort for the County of San Diego will be the Flood Control District Advisory Committee, which will prepare and present an annual evaluation report on the FMP by August 15 of each year.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

This Floodplain Management Plan (FMP) for the County of San Diego (County) assesses the flooding hazards within the unincorporated areas of the County, summarizes previous and current County programs, describes potential mitigation strategies, and presents a plan for future action. It was prepared with input from County residents, responsible officials, and consultants, and with the support of the State of California Office of Emergency Services and Security (COESS) and the Federal Emergency Management Agency (FEMA).

Although this FMP provides an overall summary of flooding issues in the County of San Diego and holistically describes existing programs and capabilities, it is intended primarily to address concerns with Repetitive Loss (RL) properties² under the National Flood Insurance Program (NFIP) for the unincorporated areas of the County. The County's Multi-Jurisdiction Multi-Hazard Mitigation Plan (MJMHM Plan), which was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA2000) and adopted by the County of San Diego on March 15, 2004, contains a more comprehensive hazard identification and risk assessment for flooding on a countywide basis. The MJMHM Plan addresses all areas of the County, including the eighteen incorporated cities; thus, it has a broader scope than this FMP, which is limited to the unincorporated areas of the County.

The FMP is intended to be a living document. It will be reviewed by the San Diego County Department of Public Works, Flood Control, on an annual basis and updated to reflect progress with programs and projects identified within this plan as well as relevant changes in County policy, or state and federal regulations enacted after the adoption of the plan. In addition, it will be updated, as required, to ensure accuracy of data and to meet the requirements of the NFIP.

1.2 THE FMP AND THE COMMUNITY RATING SYSTEM

The County of San Diego has developed this FMP in fulfillment of a basic requirement to join the NFIP Community Rating System (CRS). The CRS, which is administered by the Federal Emergency Management Agency (FEMA), was implemented to recognize and encourage community floodplain management activities that exceed minimum NFIP standards. As a basic requirement for joining the CRS, communities with properties that have received repeated flood insurance claim payments must map the areas affected, and communities with 10 or more such properties, such as San Diego County, must prepare, adopt, and implement a plan to reduce damage in repetitive loss areas. Additional basic requirements are that the community must be in the Regular Phase³ of the NFIP, be in full compliance

² A "repetitive loss property" is one for which two flood insurance claim payments of at least \$1,000 have been paid by the NFIP within any 10-year period since 1978 (e.g., two claims during the periods 1978–1987, 1979–1988, etc.).

³ Most communities joined the NFIP in the 1970s. At that time, they were provided with a Flood Hazard Boundary Map, which showed only the approximate boundaries of the floodplain. Generally, they entered the "Emergency Phase" whereby their regulatory responsibilities were limited because of the limited flood hazard data provided on the map. Subsequently, most communities have received a Flood Insurance Rate Map (FIRM) and, in most cases, a Flood Insurance Study with more detailed flood hazard data. Once a FIRM has been issued and the community has adopted NFIP compliant floodplain management regulations, the community is converted to the "Regular Phase."

with the minimum requirements of the NFIP, and maintain FEMA elevation certificates⁴ for all new and substantially improved construction⁵ in the floodplain after the date of application for CRS classification.

The CRS provides a credit system that correlates to flood insurance premium reductions for participating County residents. Through the CRS program, the County and its residents may receive federal assistance during natural flooding disasters and discounts on flood insurance premiums. As of March 31, 2007, there were 1,637 flood insurance policies in effect throughout the unincorporated areas of the County, with an annual premium of approximately \$1,191,131 covering over \$357 million in property. It is estimated the County's participation in the CRS program will save NFIP insured residents \$119,113⁶ per year.

Of the over 20,000 communities participating in the NFIP nationwide, only 1,049⁷ communities participate in the CRS. These 1,049 communities represent a significant portion of the nation's flood risk; over 66%⁸ of the NFIP's policy base is located in these communities. These CRS communities are benefiting not only from the flood insurance rate premium reductions, but, more importantly, from the floodplain, storm water, and watershed management improvements that result from CRS membership and help to protect property, the environment, and lives.

1.3 GOALS OF THE FMP

The principal goal of the County's floodplain management program and this FMP is to minimize losses associated with flooding. Other goals of this FMP include:

- Promote disaster-resistant future development
- Increase public understanding and support for effective hazard mitigation
- Reduce the possibility of damage and losses to existing assets, including people, critical facilities/infrastructure, and public facilities due to floods

Objectives for each goal and strategies to meet those objectives are presented in Section 7.

⁴ A community's permit file must have an official record that shows new buildings and substantial improvements in all identified Special Flood Hazard Areas (SFHAs) are properly elevated. This elevation information is needed to show compliance with the floodplain management ordinance. FEMA encourages communities to use the Elevation Certificate developed by FEMA to fulfill this requirement since it also can be used by the property owner to obtain flood insurance. Communities participating in the Community Rating System (CRS) are required to use the FEMA Elevation Certificate.

⁵ "Substantial improvement" means any rehabilitation, addition, or other improvement of a building when the cost of the improvement equals or exceeds 50% of the market value of the building before start of construction of the improvement.

⁶ Assumes the County of San Diego will become a class 8 once it joins the program.

⁷ Communities participating in CRS as of October 1, 2006 (<http://www.fema.gov/business/nfip/crs.shtm>)

⁸ Percentage as of October 1, 2006 (<http://www.fema.gov/business/nfip/crs.shtm>)

1.4 ORGANIZATION OF THE PLAN

This planning document has been organized in a format that follows the process set forth by the CRS. The FMP is organized as follows:

Section 2.0 – County Profile summarizes the physical characteristics and provides an overview of the demographic profile of the County.

Section 3.0 – Planning Process and Public Participation defines the processes followed throughout the creation of this plan and describes the process used to involve the public and local agencies in the development of the plan, including public meetings, community outreach (surveys, press releases, web postings, etc.), and direct feedback from the community.

Section 4.0 – Flooding History describes past flooding events throughout the County.

Section 5.0 – Flood Hazard Identification and Risk Assessment presents an evaluation of the flooding risks likely to affect County of San Diego, and quantification of where and how the County may be vulnerable.

Section 6.0 – Capabilities Assessment analyzes the County’s programs, plans, and resources capable of reducing flood hazards in the community.

Section 7.0 – Goals and Objectives identifies the overall goal and objectives shared between the Multi-Jurisdictional Multi-Hazard Mitigation Plan (MJMHHM Plan) and this plan including recommended actions related to flood hazard reduction.

Section 8.0 – Prevention Measures identifies potential floodplain management programs and policies and loss reduction activities to address flooding hazards.

Section 9.0 – Property Protection discusses the measures that can be taken to modify buildings to protect them from flooding.

Section 10.0 – Natural Resource Protection discusses the measures that can be taken to protect natural resources.

Section 11.0 – Structural Measures describes structures that are used to prevent floodwaters from reaching properties.

Section 12.0 – Emergency Management identifies actions that can be taken to warn residents of impending disasters and to recover from them. It provides specific recommendations for the County of San Diego.

Section 13.0 – Public Information discusses outreach activities that help the public know the hazards, know how to protect themselves, and understand how their actions affect others.

Section 14.0 – Repetitive Loss Analysis describes the process taken as part of this plan to locate the properties that have experienced repetitive flood losses and neighborhoods facing similar risks, and to develop loss reduction recommendations for implementation.

Section 15.0 – Mitigation Action Plan

Section 16.0 – Plan Monitoring provides the measures for how the County will monitor, evaluate, and update the plan.

Section 17.0 – References identifies the documents, plans, and resources consulted during the development of the plan.

2.0 COUNTY PROFILE

2.1 GEOGRAPHY, DEMOGRAPHICS, AND CLIMATE

The County of San Diego is located in the southwest corner of California. It is bounded on the west by the Pacific Ocean, on the north by Riverside County, on the east by Imperial County, and on the south by Mexico.

One of 58 counties in the State of California, San Diego was established on February 18, 1850, just after California became the 31st state. The County stretches 65 miles from north to south, and 86 miles from east to west, covering 4,260 square miles. Elevation ranges from sea level to about 6,500 feet.

The County of San Diego is comprised of 18 incorporated cities and 17 unincorporated communities. The County's total population in 2000 was approximately 2.8 million with a median age of 33 years (Census 2000). The population of the unincorporated areas of the county in 2006 was estimated at 465,553 (SANDAG). San Diego is the third most populous county in the state.



The physical, social, and economic development of the region has been influenced by its unique geography, which encompasses over 70 miles of coastline, broad valleys, lakes, forested mountains, and the desert. The County can be divided into three basic geographic areas, all generally running in the north-south direction. The coastal plain extends from the ocean to inland areas for 20 to 25 miles. The foothills and mountains, rising in elevation to 6,500 feet, comprise the middle section of the county. The third area is the desert, extending from the mountains into Imperial County, 80 miles east of the coast.

The County's climate is classified as subtropical Mediterranean. Annual rainfall averages range from 3 inches in the desert portion of the County to a high of 30 inches in the mountainous region of the County. The majority of precipitation occurs from December to March. In the summer, rainless periods may extend for as long as 4 months. Temperatures range from an average summer temperature of 75 degrees Fahrenheit (°F) to an average winter temperature of 65°F. Figure 2.1 depicts the County's average annual rainfall amounts.

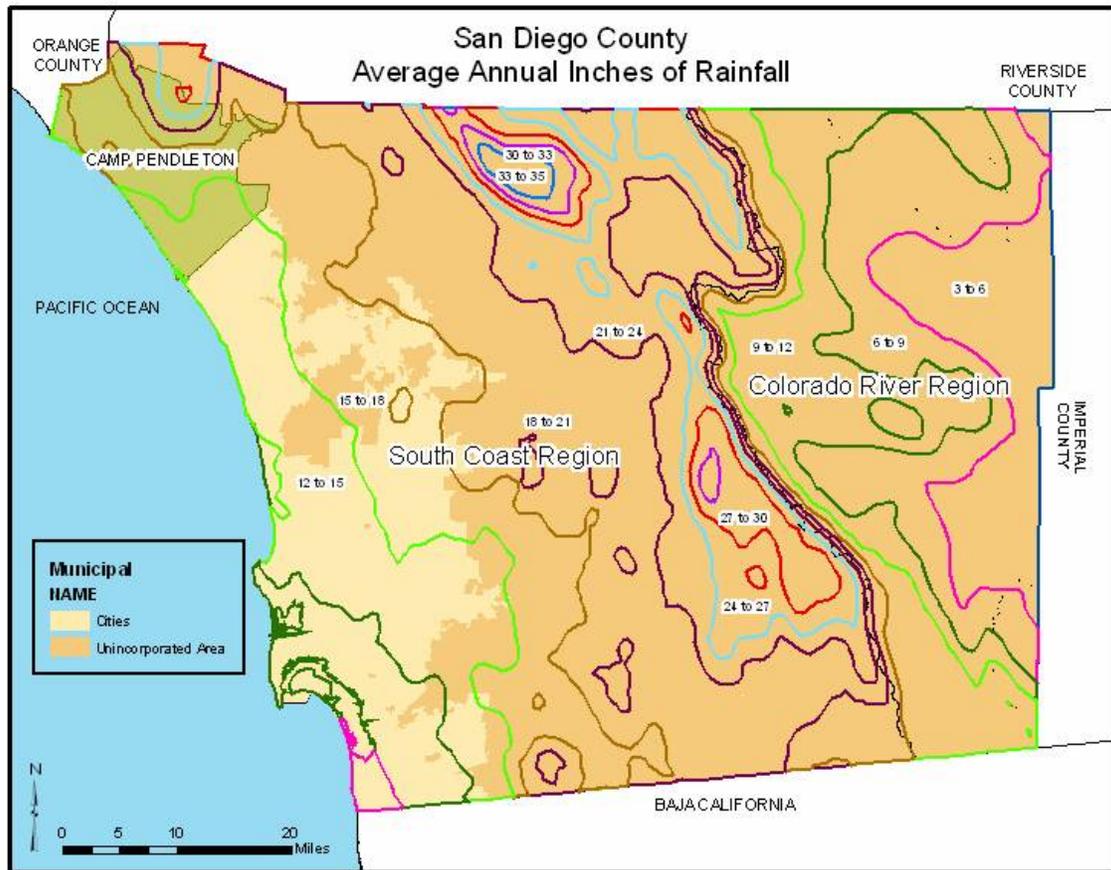


Figure 2-1. Average Annual Rainfall Amounts

The County of San Diego experiences climatic diversity due to its varied topography. Traveling inland, temperatures tend to be warmer in the summer and cooler in the winter. In the local mountains, the average daily highs are 77 degrees and lows are about 45 degrees. The mountains get a light snowfall several times a year. East of the mountains is the Anza Borrego Desert, where rainfall is minimal and the summers are hot.

2.2 PLANNING AREA

The unincorporated County consists of approximately 34 Community Planning⁹ and Subregional Areas. Many of the communities in the Unincorporated County jurisdiction are located in the mountains, desert,

⁹ Community planning areas are municipalities within the unincorporated areas of the county of San Diego that do not have individual land use authority or services but rather are subject to county regulations and authorities and receive county services.

North County, or on the border of Mexico. Rancho Santa Fe, an affluent residential and resort community, is one of the exceptions, located within the urban core area. The community of Julian is located in the central mountains along a principal travel route between the desert and Metropolitan San Diego, and is a common tourist destination. Alpine is located east of El Cajon on Interstate 8 and is considered a gateway to the County's wilderness areas of mountains, forests, and deserts.

The Subregional Planning Areas are Central Mountain, County Islands, Mountain Empire, North County Metro, and North Mountain. Communities within the Central Mountain Subregion are Cuyamaca, Descanso, Guatay, Pine Valley, and Mount Laguna. The County Islands Community Plan area consists of Mira Mesa, Greenwood, and Lincoln Acres. The North Mountain Subregion is mostly rural and includes Santa Ysabel, Warner Springs, Palomar Mountain, Mesa Grande, Sunshine Summit, Ranchita, and Oak Grove. The Mountain Empire Subregion contains Tecate, Potrero, Boulevard, Campo, Jacumba, and the remainder of the plan area. The Community Planning Areas are Alpine, Bonsall, Borrego Springs, Boulevard, Crest/Dehesa/Granite Hills/Harbison Canyon, Cuyamaca, Descanso, Desert, Fallbrook, Hidden Meadows, Jacumba, Jamul/Dulzura, Julian, Lake Morena/Campo, Lakeside/Pepper Drive-Bostonia, Otay, Pala-Pauma, Palomar/North Mountain, Pendleton/Deluz, Pine Valley, Portrero, Rainbow, Ramona, San Dieguito (Rancho Santa Fe), Spring Valley, Sweetwater, Tecate, Twin Oaks, Valle De Oro, and Valley Center.

2.3 INFRASTRUCTURE

The County of San Diego has a well-developed highway system. There are about 600 miles of state highways and 300 miles of freeways and expressways within the San Diego region. The County also encompasses more than 7,185 miles of maintained city streets and county roads.

The Metropolitan Water District of Southern California supplies most of the water for the San Diego area. The local wholesaler is the San Diego County Water Authority (SDCWA). Each of the SDCWA's 23 member agencies is responsible for the water supply within its jurisdiction, and rates vary for each of these agency areas. The 23 member agencies are comprised of six cities, four water districts, three irrigation districts, one public utility district, and one federal agency (military base). Approximately 700,000 acre-feet (AF) of water were utilized in the year 2000. Water demand is expected to increase to about 813,000 AF by 2020. Typically 75 to 95% of San Diego County's water is imported. For the year 2000, 84% of the County's water was imported from the following sources: Colorado River Aqueduct (73%), State Water Project (27%), and other local water sources (16%). The Metropolitan Water District of Southern California imports Colorado River water via the two-mile Colorado River Aqueduct. Water from northern California Rivers is imported to Metropolitan Water District via the State Water Project's 444-mile California Aqueduct. Residents place the highest demand on water, consuming roughly 57% of all water in San Diego County. Industrial/Commercial is the second largest consumer of water (21%), followed by Agriculture at 16% of the total water demand.

2.4 HYDROLOGY

The County of San Diego is an area of great climatic variation. The map of San Diego County, Figure 2-2, shows the major rivers and the divide that separates the western and eastern watersheds. This divide follows the mountain ridgeline and elevations that vary from 3000 to 5000 feet above sea level. Precipitation that falls east of the divide flows down the eastern slope to the Salton Sea Basin, while runoff from precipitation west of the divide flows down the western slope to the Pacific Ocean. Most storms come from the Pacific Ocean toward the mountain ridge. The higher altitude and lower temperature cause the moisture to condense and form rain as it is forced up and over the divide. The effect of this condensation is demonstrated in Figure 2-1. The north/south lines of equal average annual

precipitation vary from west to east. The coast receives an average 10 inches in a year, the mountains over 30 inches, and the eastern valley floor about 3 inches.

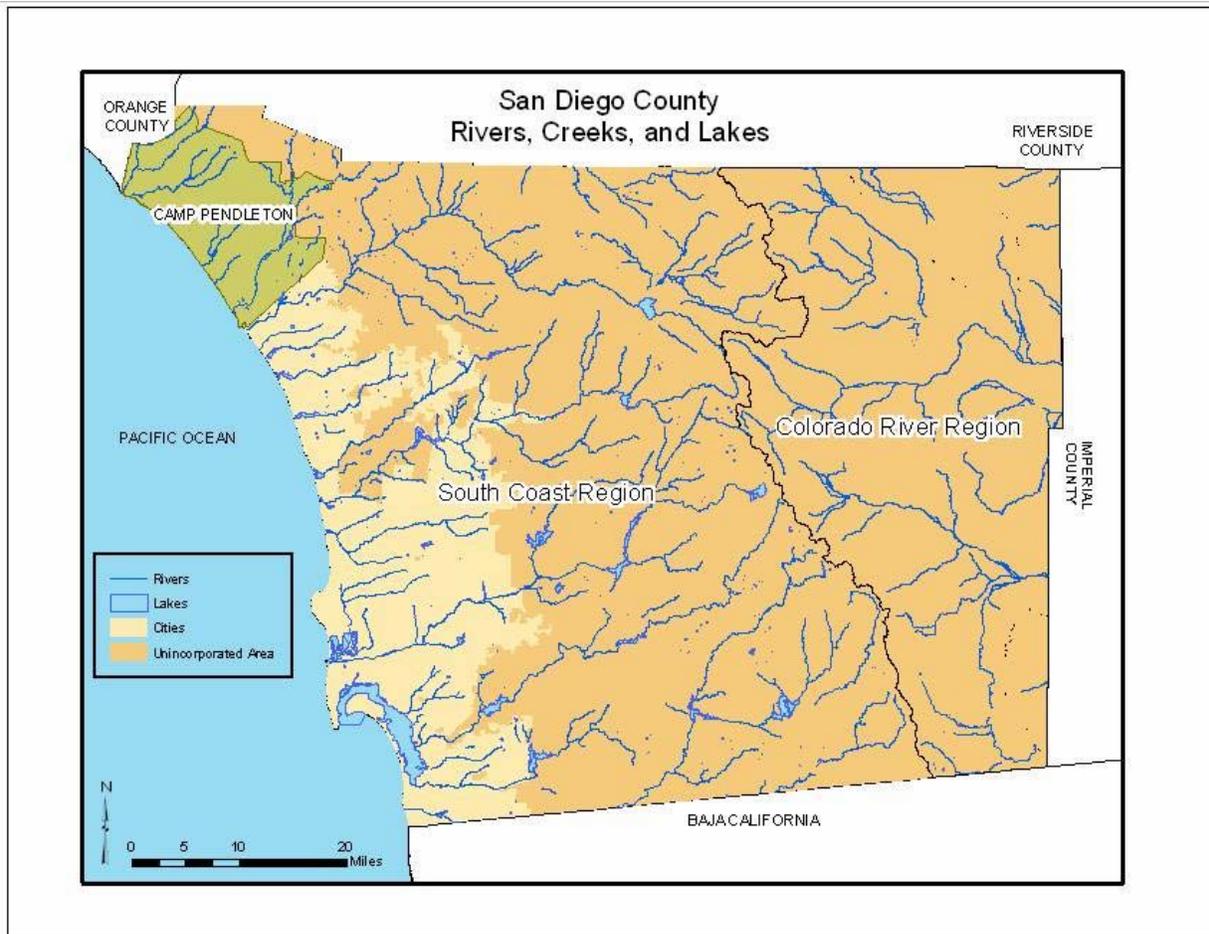


Figure 2-2 Major Rivers

The Department of Public Works Flood Control Hydrology (DPWFCH) data collection and analysis unit has documented the character of the major storms. Widespread flooding on the western slope is caused by large weather systems that are generated in the Pacific Ocean. However, the most severe local floods, especially in urban areas, are caused by localized, intense thunder storms. Thunder storms, usually in late summer and fall, are also the major source of flood events on the eastern slopes. Tropical storms that come from the Tropical Pacific, such as Doreen (1977) and Kathleen (1976), result in flood flows over relatively large areas in the eastern slope desert climate.

In addition to spatial variation, climate varies with time. There are years with much less and years with much more than the typical annual rainfall. The 1916 flood resulted from a 2-week period during which the area received about 20% more precipitation than the total average precipitation of the area for a whole year. This resulted in the largest flood of that century. At the end of that 2-week flood period, every bridge over every river and creek between San Diego and Orange County in the area was destroyed, and the only way to Los Angeles was by boat.

Both the 1980 and 1983 rain seasons were about 80% above average. More flood damage occurred in 1980 because the major storms occurred in February after the reservoirs were full from rain in January

and the previous fall. Further discussion of the history of flooding in the County of San Diego is included in Section 4.

2.5 WATERSHEDS

The County of San Diego is divided into 11 major watersheds, the majority of which are located either completely within incorporated communities within the County or within undeveloped unmapped areas of the eastern part of the County. The major watersheds affecting the unincorporated areas of the county include: Santa Margarita, Otay, San Luis Rey, Sweetwater, San Diego, San Dieguito, and Tijuana. The characteristics of each of these watersheds are described in the sections that follow. Figure 2-3 depicts each watershed's location.

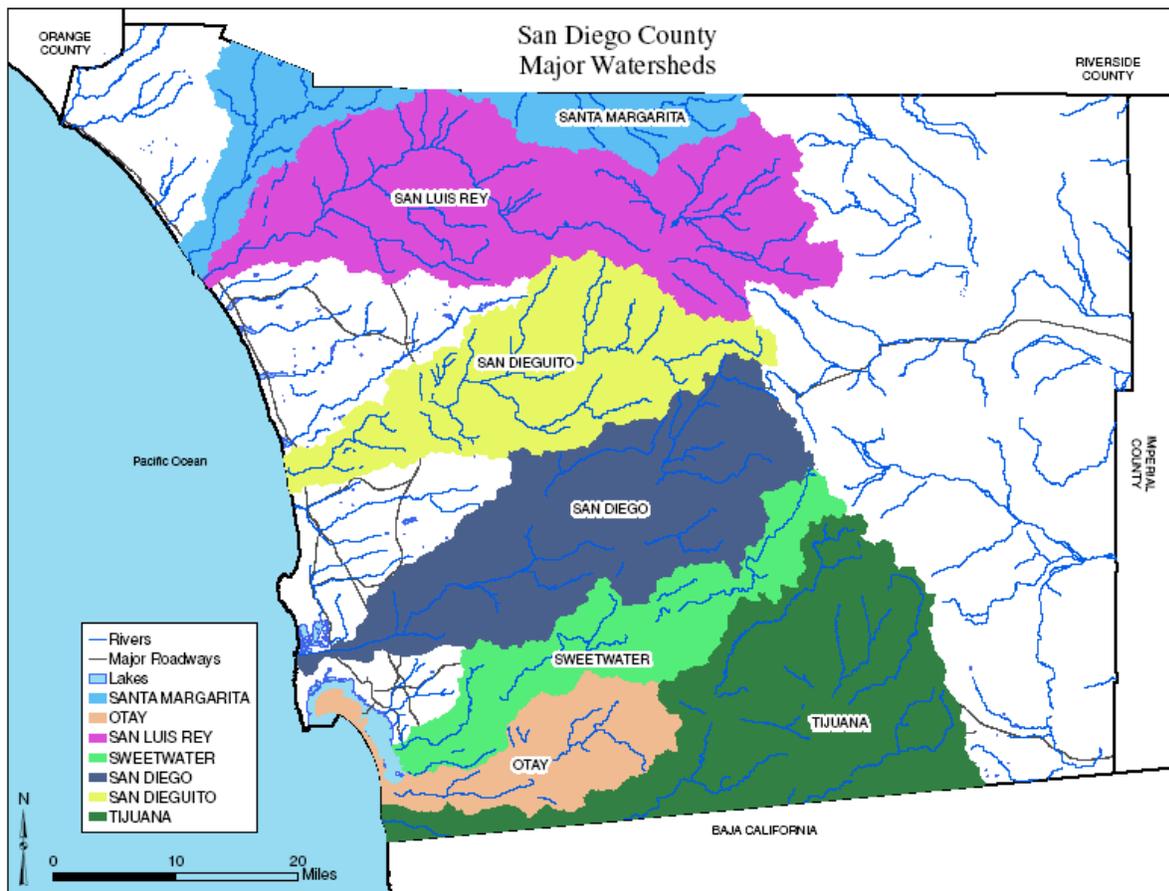


Figure 2-3. County of San Diego Watersheds

2.5.1. Otay River Watershed

The Otay River watershed encompasses approximately 160 square miles in southwest San Diego County and is one of the three county watersheds that discharge to San Diego Bay. The watershed consists largely of unincorporated area, but also includes portions of the cities of Chula Vista, Imperial Beach, Coronado, National City, and San Diego. The predominant land uses in the watershed are open space (67%) and urban/ residential (20%). The major inland hydrologic features, Upper and Lower Otay Lakes, are two water supply reservoirs that also provide important habitat and recreational opportunities.

Approximately 36 square miles of the watershed is part of the Multiple Species Conservation Plan effort that provides habitat for a wide range of endangered plant and animal species. Other important conservation areas within the watershed include the San Diego National Wildlife Refuge, the Rancho Jamul Ecological Reserve, and the vernal pool lands in the region.

The current population in the Otay River watershed is approximately 150,000 people. The expected population increase of 88% from 1998 – 2015 is anticipated to substantially increase the volume of urban runoff in the watershed.

2.5.2. San Luis Rey Watershed

The San Luis Rey River watershed is located east of the City of Oceanside in the northwestern portion of San Diego County. The 558 square mile drainage is the largest watershed affecting the San Diego region. The watershed drains to the Pacific Ocean to the west and is bounded by the Moserate Mountains to the north, the Cleveland National Forest and Camp Pendleton to the northwest, and Escondido, San Diego, and other cities to the south. The basin is roughly 50 miles long by 16 miles wide, and is divided into two drainage areas by Henshaw Dam. The areas above and below the dam encompass 206 and 354 square miles, respectively (USACOE, 1977).

Approximately 92.5% of the San Luis Rey River watershed is located in unincorporated areas of San Diego County. Roughly one-fourth of the land area in the watershed is located west of Interstate 15 including portions of the cities of Oceanside and Vista, the communities of Fallbrook and Bonsall, and the southwestern portion of Camp Pendleton. The land west of I-15 has multiple uses including open space/ undeveloped, residential, commercial/ industrial, and agricultural. East of Interstate 15, most of the land is owned and managed by government agencies (county, state, and federal), special districts, and Native American bands. The predominant land uses are open space/ undeveloped and agricultural.

Unlike most major rivers in Southern California, the San Luis Rey River has undergone relatively little channelization. The only significant segment of the river that has been channelized is within the City of Oceanside. However, the cumulative impacts of various land use practices in the basin appear to be degrading the river's environmental value. For example, an increased rate of bed erosion attributable to sand mining operations has been observed in the upper reaches of the river.

2.5.3. Santa Margarita Watershed

The Santa Margarita River watershed encompasses approximately 750 square miles in northern San Diego and southwestern Riverside counties. The watershed contains a variety of nearly intact habitats including chaparral-covered hillsides, riparian woodlands, and coastal marshes. Of the total watershed area, approximately 27% is within San Diego County. The Santa Margarita River is formed near the City of Temecula in Riverside County at the confluence of the Temecula and Murrieta creek systems. Once formed, the majority of the Santa Margarita River main stem flows within San Diego County through unincorporated areas, the community of Fallbrook, and the Marine Corps Base Camp Pendleton. The lower river and estuary have largely escaped the development typical of other regions of coastal Southern California, and are therefore able to support a relative abundance of functional habitats and wildlife.

The upper watershed basin lies in Riverside County, one of the fastest growing areas in California. In the absence of effective planning measures, this rapid development will likely lead to serious water quality and environmental concerns in the watershed including excessive sedimentation from development and agricultural areas, groundwater degradation and contamination with nitrates and other salts, habitat loss, channelization, flooding and scour (San Diego County Basin Plan).

2.5.4. San Dieguito Watershed

The San Dieguito River watershed is a drainage area of approximately 346 square miles in west-central San Diego County. The watershed includes portions of the cities of Del Mar, Escondido, Poway, San Diego, and Solana Beach, and unincorporated San Diego County. In terms of land area, the majority of the watershed (79.8%) is within the unincorporated jurisdiction. The San Dieguito River watershed is presently divided into vacant/ undeveloped (54%), parks/ open space (29 %), and urban (18%) land uses. Nearly half of the vacant land area is open to future development, most of which is zoned for residential usage. The current watershed population is approximately 125,000 however; this level is projected to increase to over 210,000 residents by 2015.

The watershed extends through a diverse array of habitats from its eastern headwaters in the Volcan Mountains to the outlet at the San Dieguito Lagoon and the Pacific Ocean. There are several important natural areas within the watershed that sustain a number of threatened and endangered species. Among these are the 55-mile long, 80,000 acre San Dieguito River Park, the 150 acre San Dieguito Lagoon, and five water storage reservoirs including Lake Hodges, Lake Sutherland, and Lake Poway.

2.5.5. Sweetwater River Watershed

The Sweetwater River watershed along with the Otay and Pueblo San Diego watersheds combine to form the San Diego Bay watershed area. The Sweetwater River watershed is the largest of the three encompassing 230 of the approximately 415 square mile total. Over 86% of the watershed is within unincorporated jurisdictions. The dominant land uses in the Sweetwater River watershed are urban (29%), open space/ agriculture (22%), and undeveloped (49%). Approximately two-thirds of the land area categorized as urban is composed of residential communities. Approximately 300,000 people currently reside within the Sweetwater River watershed, and this amount is projected to increase to 365,000 by 2015. The most important watershed issues are related to the protection of municipal water supplies, and the protection and restoration of sensitive wetland and wildlife habitats.

Between the headwaters and the outlet to San Diego Bay, the watershed contains a variety of habitat types including oak and pine woodlands, riparian forest, chaparral, coastal sage scrub, and coastal salt marsh. The upper watershed contains large undeveloped areas within the Cleveland National Forest and Cuyamaca Rancho State Park, the unincorporated communities of Pine Valley, Descanso, and Alpine, and the Viejas Indian Reservation. Unincorporated rural and suburban communities characterize the central part of the watershed. The urbanized lower portion of the Sweetwater watershed contains portions of several cities including San Diego, National City, Chula Vista, La Mesa, and Lemon Grove. Of the cities within the watershed, Chula Vista is the most important in terms of land area.

2.5.6. San Diego Watershed

With a land area of approximately 440 square miles, the San Diego River watershed is the second largest in San Diego County. It also has the highest population (~475,000) of the County's watersheds and contains portions of the cities of San Diego, El Cajon, La Mesa, Poway, and Santee and several unincorporated jurisdictions. Important hydrologic resources in the watershed include five water storage reservoirs, a large groundwater aquifer, extensive riparian habitat, coastal wetlands, and tidepools. Approximately 58.4% of the San Diego River watershed is currently undeveloped. The majority of this undeveloped land is in the upper, eastern portion of the watershed, while the lower reaches are more highly urbanized with residential (14.9%), freeways and roads (5.5%), and commercial/ industrial (4.2%) land uses predominating.

The five reservoirs in the San Diego River watershed supply water to as many as 760,000 residents in the region. Other areas including the Cleveland National Forest, Mission Trails Regional Park, and the river flood plain near Lakeside represent three important undeveloped areas that host a wide variety of intact habitats and endangered species. In addition, Famosa Slough, near the mouth of the San Diego River contains extremely productive wetlands habitat.

2.5.7. Tijuana Watershed

The Tijuana River watershed encompasses a region of approximately 1,750 square miles on either side of the California – Baja California border. Twenty-seven percent of the watershed area is within California and the river discharges to the Tijuana Estuary and Pacific Ocean on the U.S. side of the international border. On the U.S. side of the border, the cities of Imperial Beach and San Diego, and County of San Diego have portions of their jurisdictions within the watershed. The cities of Tijuana and Tecate are the most important urban centers on the Mexican side. The current population of the entire watershed is approximately one million people.

The Tijuana River watershed is classified as a Category I (impaired) watershed by the State Water Resources Control Board due to a wide variety of water quality problems. These problems are largely a result of non-point agricultural sources on the U.S. side of the border and a large variety of point and non-point sources on the Mexican side. The Tijuana Estuary, a National Estuarine Sanctuary that supports a variety of threatened and endangered plants and animals, is threatened by inflows from the Tijuana River containing high concentrations of coliform bacteria, sediment, trace metals (copper, lead, zinc, chromium, nickel, and cadmium), PCBs, and other urban, agricultural, and industrial pollutants.

2.6 DEVELOPMENT TRENDS

The County of San Diego is made up of large arid areas not suitable for development. Land usage in the County is made up of the following: 76% parks, recreation, and undeveloped areas; 10% urban uses (homes, offices, commercial and industrial projects); 7% agriculture; and 7% public facilities.¹⁰ There are approximately 132,000 new homes proposed for San Diego's future. These housing units range in status from those with no approvals to those that have recorded a final map and have begun grading. This development is largely anticipated to occur in the urban core areas and in outlying bedroom communities such as Lakeside and Fallbrook. The current San Dieguito watershed population of approximately 125,000 is projected to increase to over 210,000 residents by 2015. Similarly, the current population in the Otay River watershed is anticipated to increase from approximately 150,000 people to 282,000 people in 2015.¹¹ The expected population and growth in development is anticipated to substantially increase the volume of runoff in several of the County watersheds. Careful planning of development is essential to minimizing risk and losses throughout the County. Section 8 discusses many of the approaches used by the County to encourage prudent land use management and development, while promoting responsibility, fairness, community involvement, and planning.

¹⁰ Source: Building Industry Association of San Diego County

¹¹ Source: Building Industry Association of San Diego County

3.0 PLANNING PROCESS AND PUBLIC PARTICIPATION

3.1 BACKGROUND

The County of San Diego has experienced significant flooding and losses since its establishment as a county in 1850. The County recognizes the consequences of flooding and the importance of floodplain management in reducing its impacts. Since the early 1970s, the County has taken an aggressive approach to identifying areas at risk, developing floodplain studies beyond those areas studied by FEMA and regulating development in high risk areas. In 2003, the County led in the development of the Multi-Jurisdictional Multi-Hazard Mitigation Plan (MJMHM Plan) discussed throughout this document and most recently has prepared this FMP to specifically address flood risk in the unincorporated areas of the County.

Current CRS guidelines require the involvement of the public, other agencies, and stakeholders in the formation of Mitigation and Floodplain Management Plans. This FMP has been developed according to CRS guidelines and followed the CRS ten step process:

1. Organize to prepare the plan
2. Involve the public
3. Coordinate with other agencies
4. Assess the hazard
5. Assess the problem
6. Set goals
7. Review possible activities
8. Draft an action plan
9. Adopt the plan
10. Implement, evaluate, and revise the plan

The sections that follow discuss the efforts undertaken to involve the public, neighboring communities, and local and regional agencies involved in hazard mitigation activities in the development of the FMP.

3.2 FMP WORKING GROUP

A core working group was established to facilitate the development of the FMP. The working group members included staff from the County’s Department of Public Works, Flood Control Engineering and Hydrology, a member of the County’s Flood Control District Commission, and the consultants hired by the County to assist in preparation of the FPM and County’s CRS application. The working group assisted in identifying the specific hazards/risks and programs and capital improvement projects aimed at reducing flood risk, and in proposing and prioritizing hazard mitigation measures. The working group also participated in outreach efforts to involve the public, local and regional agencies, and adjacent municipalities. Table 3-1 lists the working group participants.

Table 3-1. Working Group Participants

Name	Agency/Company	Title/Department
Cid Tesoro, P.E.	County of San Diego	Flood Control District Manager
Gitanjali Shinde	County of San Diego	Flood Control Engineering
Rand Allan	County of San Diego	Flood Control Hydrology Section
Sara Agahi, P.E., CFM	County of San Diego	Watershed Protection Program
Hung Tran, P.E.	Flood Control	Flood Control Engineering

Name	Agency/Company	Title/Department
Dennis Bowling, P.E.	County of San Diego Flood Control District Commission Rick Engineering Company	Commissioner Principal-in-Charge
Maggie Mathis, CFM	Dewberry	Consultant- Project Manager
Berry Williams, CFM	Berry A. Williams LLC	Consultant
Brendan Hastie, P.E.	Rick Engineering Company	Consultant

3.3 PUBLIC INVOLVEMENT

The focus of this FMP is the unincorporated areas of the County that have been subject to repetitive flood losses. While the work group welcomed information and participation from all interested residents and stakeholders in the community, the team specifically targeted repetitive loss property owners and renters and neighboring properties facing similar flood risk. The specific areas targeted were located in Johnstown, Rainbow/Fallbrook, southwest Ramona, downtown Ramona, Lakeside, Moreno, and Borrego Springs (Section 14 describes each of the targeted areas).

The County’s efforts to solicit input and involve the public included:

- Press Release
- Target mailing to repetitive loss property owners and lessees
- Public meeting
- Target mailing to neighboring property owners in repetitive loss neighborhoods
- Survey sent to federal, state, local, and regional agencies/organizations
- Survey sent to adjacent municipalities

Each of these documents and activities is discussed below.

3.3.1 Press Release

On April 20, 2007, and April 28, 2007, the County of San Diego published notice of the commencement of the FMP and invited the public to attend a public meeting to discuss the plan development and solicit input (see Appendix A for a copy of the press release).

3.3.2 Repetitive Loss Property Owners and Lessee Mailings

There are 17 repetitive flood loss properties on the list for the unincorporated areas of San Diego provided by Department of Homeland Security (DHS) – FEMA. Because of the past flood damages sustained by these 17 properties, the County sent out specific invitations to the public meeting to these property owners and renters. Copies of the invitation letter and the survey that accompanied the letter are included as Appendix B and C, respectively.

3.3.3 Public Meeting

The County of San Diego work group conducted a public meeting on May 3, 2007, at the Lakeside Community Center. The Lakeside Community Center was selected as the location for the public meeting because the greatest number of flood insurance claims, both repetitive loss and non-repetitive loss, have been experienced in the Lakeside and Moreno area. The meeting served several purposes: it explained the County's efforts to join the CRS and develop the FMP; involved attendees in identifying issues; and briefly touched on mitigation options available to attendees. The work group also focused on getting community input into the local goals, objectives, and mitigation actions. Copies of the public participation survey (Appendix C) were handed out and completed by residents during the meeting.

Feedback given during the public meeting helped to focus the consultants' attention on at-risk areas of Lakeside and Moreno, and give the work group a better idea of the scope and frequency of the flooding problems and the concerns of residents.

3.3.4 Repetitive Loss Neighborhood Mailings

A focus solely on the repetitive loss list provided by DHS – FEMA understates the magnitude of the flood hazard problem in the County. Most buildings in the County with flood insurance claim payments are not repetitive loss properties. This may be because the building has had only one flood event, or the claim payments have been less than \$1,000, including some so small that the claim did not exceed the policy deductible. Many properties that have flooded in the past do not have flood insurance claims only because they are not covered by flood insurance. To capture properties facing similar risks as those identified and tagged as repetitive loss properties by FEMA, the County's consultants conducted field work to identify the source of the flooding problem, meet with neighbors to discuss past flooding problems they had observed, and to delineate the extent of the local flood problem affecting each neighborhood where repetitive loss properties are located. Using the data collected in the field, the consultants delineated boundaries of the repetitive loss neighborhoods and integrated the boundaries with County parcel data to create a mailing list of at-risk properties. The final mailing list included over 500 addresses, the owners and renters of which were asked to complete the public participation survey (Appendix C). The public participation survey was mailed on May 18, 2007, with a letter (Appendix D) that explained the County's efforts to develop the FMP and seek the input and recommendations of its citizens.

Public responses were invaluable to the formation of the FMP. A summary of the responses to the public participation survey are included in Section 3.4.

3.3.5 Federal, State, Local, and Regional Agencies/organizations Survey

Surveys were also distributed to federal, state, local, and regional agencies and organizations to solicit information on projects and activities that may affect the County's floodplain management program. The agency survey (Appendix E), along with a cover letter (Appendix F) inviting participation in the planning process, was sent to the following entities, in accordance with Section 510 of the CRS Coordinators Manual on May 31, 2007.

- California State Water Resources Agency
- U.S. Army Engineer
- State of California Office of Emergency Services
- California Department of Fish and Game
- National Oceanic and Atmospheric Administration
- San Luis Rey Watershed Council
- California Department of Forestry and Fire Protection
- California Water Science Center
- Caltrans-Environmental Stewardship Branch
- US Geological Survey
- Center for Earth Systems and Analysis Research (CESAR), Department of Geography, San Diego State University
- Natural Resources Conservation Service
- Resource Conservation District of Greater San Diego County
- American Red Cross
- Sierra Club

3.3.6 Survey of Adjacent Municipalities

During the preparation of the MJMHM Plan, the County identified common goals and programs to enhance mitigation efforts in coordination with the adjacent communities. The FMP is building on that effort, but with a focus on flooding issues. Each municipality was encouraged to share information on floodplain management projects or programs that they have implemented or plan to implement, especially if they have an impact on flood hazards within the County. A copy of the letter sent to the adjacent municipalities on May 31, 2007, is included as Appendix G. The adjacent municipalities include:

- Carlsbad
- Coronado
- El Cajon
- Escondido
- Imperial Beach
- Lemon Grove
- Oceanside
- Poway
- San Marcos
- Solana Beach
- County of Riverside
- Chula Vista
- Del Mar
- Encinitas
- La Mesa
- National City
- San Diego(City)
- Santee
- Vista
- County of Imperial

The City of San Diego released a draft Flood Mitigation Plan for review on May 8, 2007. That plan has been reviewed by County of San Diego consultant staff and consideration given to flooding issues that traverse community boundaries and the mitigation goals and actions proposed.

3.4 PUBLIC COMMENTS

There were several opportunities during the planning process for the public to provide input and participate in the development of the FMP. One open public meeting was held on May 3, 2007 to allow the general public an opportunity to meet with the planning consultants and committee members, ask questions, and provide comments and input on the draft plan. A meeting agenda and attendance list are provided in Appendix H. Table 3-2 summarizes public participation throughout the planning process.

Table 3-2 Public Participation in the Planning Process

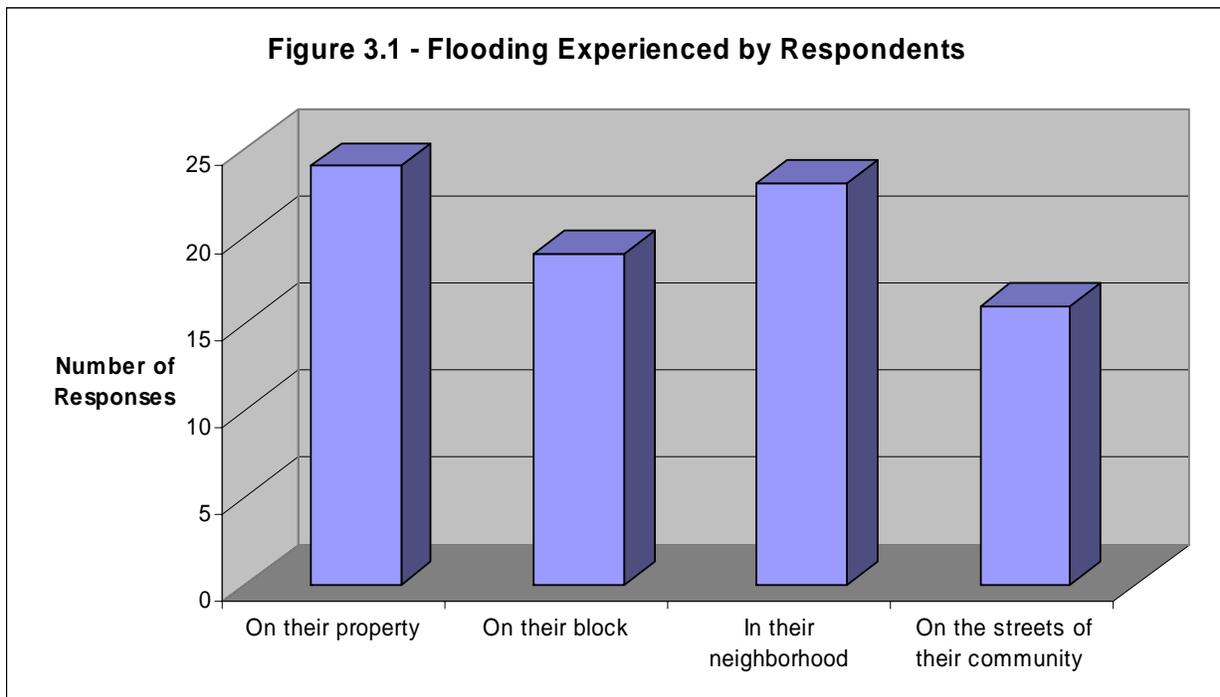
Dates	Summary of Methods
4/20 and 4/28/07	Notice of Upcoming Public Meeting in <i>The San Diego Union - Tribune</i>
4/24/07	Invitation letter sent to the property owners and lessees of the 17 repetitive loss properties identified by FEMA-DHS advising them of the date of first public kick off meeting.
5/3/07	During the first public participation meeting, a brief presentation summarizing the CRS program, the County's efforts to prepare the FMP, and repetitive loss area analysis being conducted was given to attendees. Seven residents, one college research student, and one private consultant for the San Diego County Water Authority were in attendance.
5/22/07	Survey Distributed to over 500 floodplain residents (see summary below and Appendix C for sample form)
5/31/07	Survey Distributed to adjacent jurisdictions, federal and state agencies and special interests
Planned for Aug 07	Announcement of upcoming Public Meetings posted on County of San Diego website
Planned for Aug 07	Notice of Upcoming Public Meeting in <i>The San Diego Union - Tribune</i>
Planned for September 07	Meeting to discuss the FMP findings including the results of the public and agency surveys and recommendations. Meeting open to all residents but targeted invitations to be sent to all residents within the repetitive loss neighborhoods identified in this plan (see Chapter 14 for a discussion of the repetitive loss neighborhood analysis)
Planned for September 07	Board of Supervisors Review meeting
Planned for September 07	Board of Supervisors Public Meeting to Adopt the Plan

This plan was developed with input from meetings, telephone conversations, and survey input received from residents and business owners from the County of San Diego FEMA designated floodplain and residents in repetitive loss neighborhoods. Agencies such as the Natural Resources Conservation Service

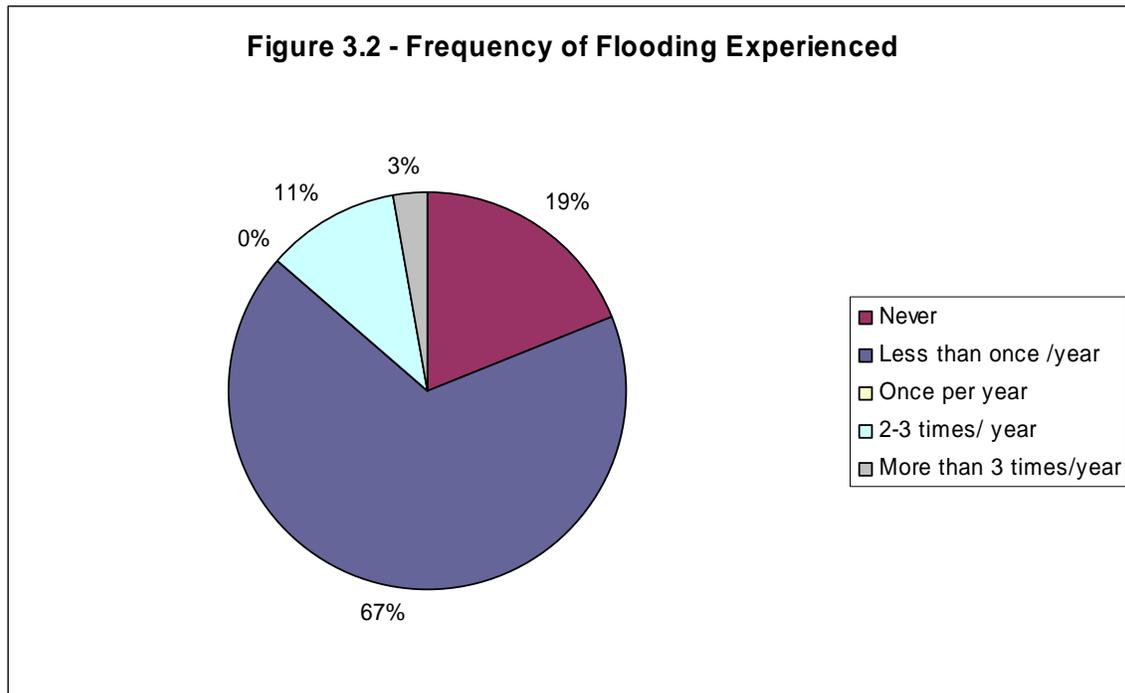
(NRCS) and the National Oceanic and Atmospheric Administration, National Weather Service, as well as, the City of Del Mar Engineering Department and the Riverside County Flood Control and Water Conservation District also provided input regarding the floodplain management and hazard issues in the County.

3.4.1 Public Survey Responses

The surveys were distributed to home or business owners and lessees of property located in the FEMA designated floodplain or in an area where local drainage problems have resulted in repetitive flood losses. 52 completed surveys were returned. Of the respondents, 48% of the people replied that they are either extremely or somewhat concerned about flood hazards. This percentage seems low given that 70% of the respondents stated that they had experienced flooding on or near their property in the past. In the questionnaire residents were asked to indicate whether they had been directly affected (flooding on their property) or indirectly (e.g. flooding on the streets of their neighborhood) impacted by a flood event. A breakdown of the replies related to where flooding has occurred as it relates to their property is included as Figure 3.1. It should be noted that respondents marked all flooding that had occurred on or near their property that applied and thus the chart reflects more than one answer per respondent.



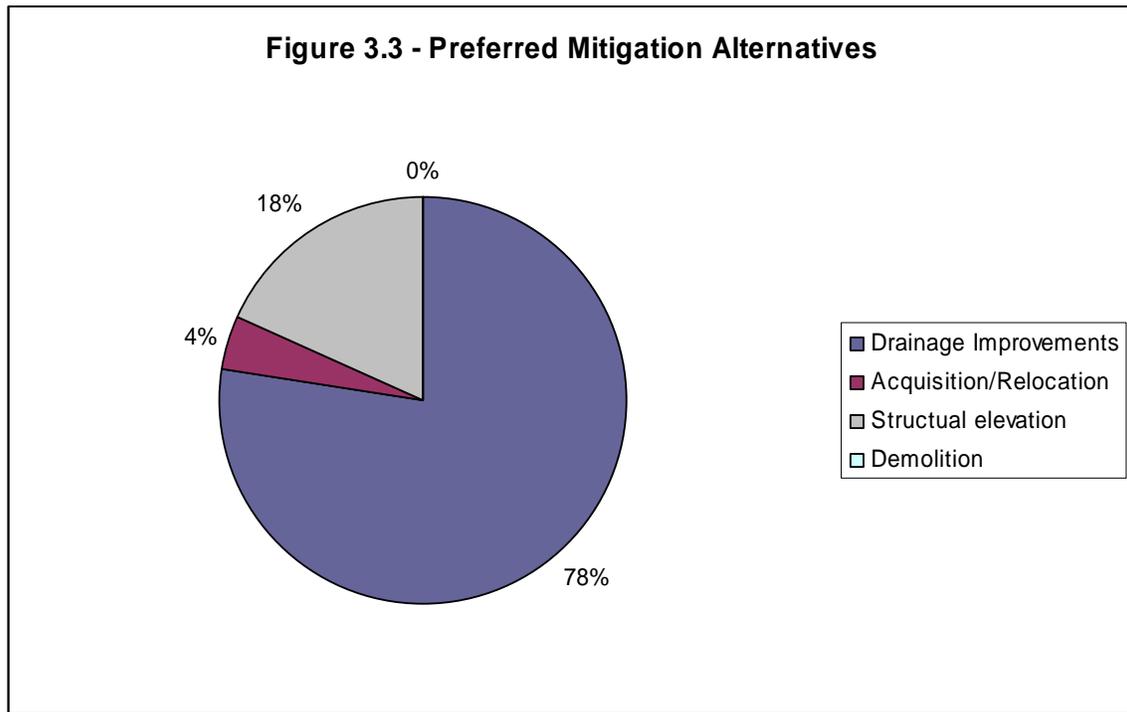
When asked about the frequency of the flooding experienced, respondents provided the information presented in Figure 3.2.



Twelve percent of the people surveyed responded they were not located in the floodplain, 43% were not sure if they were located in the floodplain, and 45% of the people surveyed knew they are located in the floodplain. Nevertheless, only 35% of the respondents have flood insurance.

Approximately half of the people surveyed (51%) have taken precautions by making their homes and businesses more resistant to hazards. Many of the respondents have taken some of the following flood precautions, performed creek or channel maintenance, such as removing dead trees or limbs and cutting brush; rebuilt creek walls; installed drains and sump pumps in their yard; cleaned storm drains; had structures elevated; installed diversion structures; completed drainage improvements; and maintain a supply of sand bags. Fifty-eight percent of the people surveyed were interested in making their homes and businesses more resistant to flood hazards.

The public was also asked their preference for mitigation alternatives for hazard reduction. The mitigation alternatives included 1) drainage system improvements (i.e., channel modification, culvert resizing, storm drain improvements); 2) property protection (i.e., acquisition or relocation); 3) structural retrofits (i.e., elevation); 4) Building demolition. Figure 3-3 summarizes public input for hazard mitigation alternatives.



Administrative or regulatory actions that influence the way land is developed and buildings are built, such as planning, zoning, building codes, open space preservation, and floodplain regulations were also considered a high priority by public respondents. Replies and concerns related to new development in the floodplain, the placement of fill, and diversion of flood waters by their neighbors were common to all localities. These comments were also a central theme of comments received during the May 3, 2007 public meeting. Many comments were also noted on the survey and during the public meeting regarding overflow from the San Vicente dam during high rainfall periods.

Many respondents noted the importance of routine maintenance of channels including removal of debris and overgrowth vegetation. Emergency actions that protect people and property during and immediately after a hazard event, such as the county's warning systems, were of interest to respondents. Only 24% of the respondents were aware of the County's existing ALERT system, the majority of which were residents of Borrego Springs. When asked if they were interested in receiving alerts as flooding occurs in their locality, 6% responded that they currently receive such notification and 74% responded that they would like to receive notification in the future.

Finally, the public was asked if they would like to receive information from the County on flood protection. Seventy percent of the respondents replied that they would be interested.

A summary table containing survey responses can be found in Appendix I. The public's input was greatly appreciated and was considered and incorporated into this FMP.

A similar survey was distributed to local, state and federal agencies with the potential to address hazard mitigation or emergency response in the County of San Diego. The agencies were asked similar questions as the members of the public. Most notably, the agency respondents advocated continuous management of watershed vegetation and debris to ensure unobstructed flow and restriction of land grading and construction in floodplain areas.

3.5 EXISTING PLANS OR STUDIES REVIEWED

The work group reviewed several plans, studies, and guides prior to and during the planning process. These plans included FEMA documents, emergency services documents as well as County and local general plans, community plans, local codes and ordinances, and other similar documents. These included:

- County of San Diego/City General Plans
- Various Local Community Plans
- Various Local Codes and Ordinances
- NFIP Community Rating System Coordinator's Manual, FIA 15/2006
- State and Local Mitigation Planning How-to Guide, FEMA 386-2, August 2001
- Interim Hazard Mitigation Planning Guidance for California Local Governments
- FEMA CRS-DMA 2000 Mitigation Planning Requirements
- Crosswalk Reference Document for Review and Submission of Local Mitigation Plans to the State Hazard Mitigation Officer and FEMA Regional Office
- Unified San Diego County Emergency Services Organization Operational Area Emergency Plan

Further details of public involvement are provided in Section 14 – Repetitive Flood Analysis.

4.0 FLOODING HISTORY

From 1770 until 1952, 29 floods were recorded in the County of San Diego. Between 1950 and 2006, flooding prompted 12 Proclaimed States of Emergency in the County of San Diego. Several very large floods have caused significant damage in the County. The Hatfield Flood of 1916 destroyed the Sweetwater and Lower Otay Dams, and caused 22 deaths and \$4.5 million in damages. Most of the deaths were attributed to the failure of Lower Otay Dam. The flood of 1927 caused \$117,000 in damages and washed out the Old Town railroad bridge¹². The floods of 1937 and 1938 caused approximately \$600,000 in damages.¹³

The most recent serious floods affecting the County occurred during tropical storms Kathleen (1977) and Doreen (1978) and during winter storms in 1980, 1987, 1998, and 2005. In the 1980 flood, approximately 16-20 inches of rain accumulated over a six week period. This slow moving storm, which was the most severe since the Hatfield Flood of 1916, lead to wide-spread small stream flooding and evacuations of residents in Mission Valley. The San Diego River at Mission Valley peaked at 27,000 cubic feet per second (cfs) and caused \$120 million in damage¹⁴.

Table 4-1 displays a history of flooding in the County of San Diego, as well as the loss estimation associated with each flood event where available.

Table 4-1. Historical Records of Large Floods in the County of San Diego

Date	Description
1862	6 weeks of rain
1891	33 inches in 60 hours
1916	Destroyed 2 dams, 22 deaths. \$4.5 million in losses (County of San Diego Sanitation and Flood Control)
1918	Heavy rains – subtropical in nature
1927	Washed out railroad bridge Old Town \$117,000 in damages (County of San Diego Sanitation and Flood Control)
1937/1938	\$600,000 in flood losses (County of San Diego Sanitation and Flood Control)
1965	6 killed. Primary area affected was Spring Valley
1969	All of state declared disaster area
1974	Short duration heavy rainfall in the Urban San Diego River Basin
1976	Tropical Storm Kathleen. Desert flooding
1976	Jamul Valley Storm. Short duration heavy rainfall during thunderstorm

¹² Bainbridge, 1997

¹³ Source: County of San Diego Sanitation and Flood Control, 1996

¹⁴ Bainbridge, 1997

Date	Description
1977	Tropical Storm Doreen. Desert flooding
1978	Fallbrook. One of heaviest short-duration rainfalls recorded in County, subtropical origin
1978	Lakeside. Long-duration heavy rainfall (60 days) leading to flooding in Lakeside region
1979	Cities of La Mesa, Lemon Grove, National City, San Marcos, San Diego and unincorporated areas. Relatively short-duration high-intensity rainfall, low snow levels to 3000', highly unstable weather. Losses totaled \$2,766,268 (County OES)
1980	San Diego River topped out in Mission Valley. The most severe storm season to date after the 1916 & 1927 seasons. \$120 million in losses (County of San Diego Sanitation and Flood Control; Earth Times)
1983	March 1983 storms. First year of the ALERT flood warning system
1991	The "Miracle March" storms that saved the County from one of its worst recorded drought years in recent history
1992	Extreme high-intensity short-duration rainfall at Palomar Observatory and Laguna Mountain
Jan 1993	Heavy rain. Caused some flooding of small streams and several road and intersection closures
7-Feb 1993	Isolated showers. Flooding affecting Fallbrook and Lakeside areas
20-Feb 1993	Rain in scattered areas. Shallow flooding experienced in Lakeside and Bonita
1994	Extended-period heavy rainfall – subtropical origin
1995	San Diego County declared disaster area. Moderately-heavy one- to two-hour rainfall. Tens of Millions in losses (County OES)
1995	Flooding in North County. 1% annual chance (100-year)+ short-duration flooding
1995	San Felipe Valley Region. Thunderstorm in San Felipe Valley that produced localized minor flooding
2-Feb 1998	Streamflow on Spring Valley Creek. Rising waters briefly stranded motorists
23-Feb-1998	Widespread flooding led to a Presidential Disaster Declaration that covered four counties. The San Diego River peaked on the 24 th at 15.1 feet, which is 3.8 feet above flood stage. 200 people were evacuated from three mobile home parks in Oceanside.
28-Mar-1998	Flooding in the El Cajon area.

Date	Description
29-Aug-2000	Much of Borrego Springs was inundated with 12 inches of water, mud and rocks. Along County Road S-22 leading from Borrego Springs down to the Salton Sea, floodwaters carried five foot boulders onto the road surface and washed out several sections, trapping motorists on the higher sections of the roadway.
10-Sep-2004	70 to 90 homes were damaged in the Sun Gold and De Anza areas of Borrego Springs. In the Sun Gold community some residents had as much as 2 feet of mud rush into their homes. The wall of water and mud was observed to be 8-10 feet high and 150 yards wide at times as it came down Borrego Palm Canyon.
27-Oct-2004	The Cedar Fire of October 2003 burned watershed throughout San Diego County Estates (Ramona), Harbison Canyon, and others. Sizeable rainfall on October 27 and subsequent storms resulted in sediment-laden runoff flooding a number of homes, with large amounts of deposition occurring within natural streams. Federal assistance through the Natural Resources Conservation Service resulted in Emergency Watershed protection projects and Damage Survey Reports.
Jan 2005	Continuous rains caused similar damage as the October 27, 2004 rains did throughout the same areas including Forrester Creek at La Cresta Road and San Vicente Creek in Ramona. Federally declared disaster. Federal assistance resulted in Emergency Watershed Protection projects and Damage Survey Reports and Hazard Mitigation proposals.
23-Feb-05	San Diego River rose above flood stage flooding areas around the Fashion Valley Mall and washing out a low water crossing in the Mission Valley area. A 20 foot section of State Route 6 was washed out. Several homes were flooded in the El Cajon area.

In addition to the major flood events identified above brought on by intense or prolonged rainfall, flooding has been known to occur in localized areas of the County during average seasonal rainstorms. This flooding is typically the result of inadequate storm drain pipes, debris-laden channels, or slope failure.

5.0 FLOOD HAZARD IDENTIFICATION AND RISK ASSESSMENT

This section summarizes and builds upon the flood hazard identification and risk assessment for the Unincorporated Areas of San Diego County that was prepared for the MJMHM Plan. The MJMHM Plan included a methodical, qualitative examination of the vulnerability of important facilities, systems, and neighborhoods to the impacts of future disasters. GIS data and modeling results were used to identify specific vulnerabilities that could be addressed by specific mitigation actions. The MJMHM Plan also reviewed the history of disasters in the County and assessed the need for specific mitigation actions based on the type and location of damage caused by past events. The assessment of community vulnerabilities also included a review of existing codes, plans, policies, programs, and regulations used by local jurisdictions to determine whether existing provisions and requirements adequately address the hazards that pose the greatest risk to the community.

The risk assessment included in the MJMHM Plan has assisted the County of San Diego with measuring the potential for loss of life or personal injury, economic losses and property damage resulting from floods and has shaped mitigation measures and programs implemented since its completion. The following sections identify the types of flooding the County is vulnerable to and areas of the County that may be affected, as well as specific “hot spot” areas that have experienced repeated flooding.

5.1 DEFINITION OF FLOOD

A flood occurs when excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto a river’s bank or adjacent floodplains. Floodplains are lowlands adjacent to rivers, lakes, and oceans that are subject to recurring floods. Most injury and death from floods occur when people are swept away by flood currents, and property damage typically occurs as a result of inundation by sediment-filled water.

Several factors determine the severity of floods, including rainfall intensity and duration. A large amount of rainfall over a short time span can result in flash flood conditions. A sudden thunderstorm or heavy rain, dam failure, or sudden spills can cause flash flooding. The National Weather Service’s definition of a flash flood is a flood occurring in a watershed where the time of travel of the peak of flow from one end of the watershed to the other is less than six hours. There are no watersheds in the County that have a longer response time than six hours. Flash floods in the County range from the stereotypical wall of water to a gradually rising stream. The central and eastern portions of the County of San Diego are most susceptible to flash floods where mountain canyons, dry creek beds, and high deserts are the prevailing terrain.

The County is also subject to shallow flooding. Shallow flooding occurs in flat areas where a lack of channels means water can not drain away easily. Shallow flooding problems fall into three categories: sheet flow, ponding, and urban drainage.

Sheet flow occurs where there are inadequate or no defined channels, floodwater spreads out over an area at a somewhat uniform depth. Sheet flow flooding is common after intense or prolonged rainfall during which the rain can not soak into the ground.

In some flat areas, runoff collects in depressions and can not drain out, creating a ponding effect. Ponding floodwaters do not move or flow away. Floodwaters will remain in the temporary ponds until they can infiltrate, evaporate, or are pumped out.

An urban drainage system comprises the ditches, storm pipes, retention ponds and other facilities constructed to store runoff or carry it to a receiving stream, lake, or ocean. Other constructed features in such a system include swales that collect runoff and direct it to storm drains and ditches. Most systems are designed to handle the amount of water expected during a 10-year storm. Larger storms overload them and the resulting backed-up storm drains and ditches produce shallow flooding.

Dam failures can result in severe flood events. When a dam fails, a large quantity of water is suddenly released with a great potential to cause human casualties, economic loss, lifeline disruption, and environmental damage. A dam failure is usually the result of age, poor design, or structural damage caused by a major event such as an earthquake or flood.

5.2 FLOOD HAZARD RISK

Seven principal watersheds originate or traverse through the unincorporated area. From north to south, they are the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tijuana Rivers. (Unified San Diego County Emergency Services Organization Operational Area Emergency Plan, 2000).

The most common flooding types in the County of San Diego are riverine flooding and flash flood events. Table 5-1 outlines the various types of flooding to which the County is subject.

Table 5-1. County of San Diego Flooding Hazards

Flooding Type	Characteristics	Hazard to County
Overflow of streams	<ul style="list-style-type: none"> • Flooding occurs in response to heavy rainfall events. Streams, rivers, creeks, and drainage channels overtop their banks, and low-lying areas with poor drainage become inundated. • Factors such as fires in the watersheds, structures or fill materials in flood-prone areas, debris build-up, and development of impervious surfaces (roads, parking lots, rooftops) increase an area's vulnerability to flooding. • A common measure of an area's susceptibility to flooding is the calculation of the 1% annual chance flood (often referred to as the "100-year flood"). Statistically, this flood event has a 1% chance of being equaled or exceeded in any given year. 	<ul style="list-style-type: none"> • Portions of the County are subject to flooding due to flash flooding, urban flooding, river channel overflow, and downstream flooding. • The County historically has also been vulnerable to tropical storms. • The county is subject to uncertain flow paths associated with alluvial fans in the Borrego Springs area. Uncertain flow path floodwaters carry a large amount of sediment which often results in high damage costs. The sediment laden floodwaters can also fill in a channel and move it to a new location.

Flooding Type	Characteristics	Hazard to County
Tsunami/ Coastal Surge	<ul style="list-style-type: none"> Large waves generated by earthquakes or volcanic eruptions. 	<ul style="list-style-type: none"> There are several offshore geological faults along the coast of California. These faults have been active in the past and can subject the entire area to seismic action at any time. Because the County of San Diego has no ocean front areas the County is less vulnerable to this hazard than the local ocean front incorporated communities.
Dam/Levee Breach Inundation	<ul style="list-style-type: none"> Flooding that occurs as a result of structural failure. Sources of dam failure include erosion of face or foundation of the dam, rapidly rising floodwater, structural design flaws, landslides flowing into a reservoir, earthquakes, or terrorist actions. Inundation can also be caused by seismic activity. A seismically induced wave can overtop the dam. Will cause loss of life, damage to property, and displacement of people residing in the inundation path. Damage to electric generating facilities and transmission lines could impact life support systems in communities outside the immediate hazard area. 	<ul style="list-style-type: none"> The Community of Lakeside is subject to potential dam failure. There are 11 major dams in the San Diego region that could potentially impact County residents The San Vicente dam has the largest concern of failure because floodwaters from this dam would affect a densely populated area. Failure of the remaining dams, would affect portions of populated cities and communities, forest and agricultural lands, roads, and highways could be inundated.

Areas identified as vulnerable to flooding are depicted on FEMA’s Flood Insurance Rate Maps (FIRMs), which were developed through the NFIP, and on flood maps developed by the County.

The FEMA flood zones represent the areas susceptible to the 1% annual chance flood (often referred to as the “100-year flood”), and the 0.2% annual chance flood (“500-year flood”). The 1% annual chance flood, also known as the “base flood,” has at least a 1% chance of occurring in any given year, and at least a 26% chance of occurring over the life of a typical 30-year mortgage. FEMA designates this area as the Special Flood Hazard Area (SFHA) and requires flood insurance for properties in this area as a condition of a mortgage backed by federal funds. The County’s rivers, 1% annual chance floodway¹⁵, and 1% and 0.2% annual chance flood areas are shown in Figure 5-1.

¹⁵ The 1% annual chance floodway is the area identified on a FIRM or a Flood Boundary Floodway Map that represents the portion of the floodplain that carries the majority of the flood flow and often is associated with high velocity flows and debris impact.

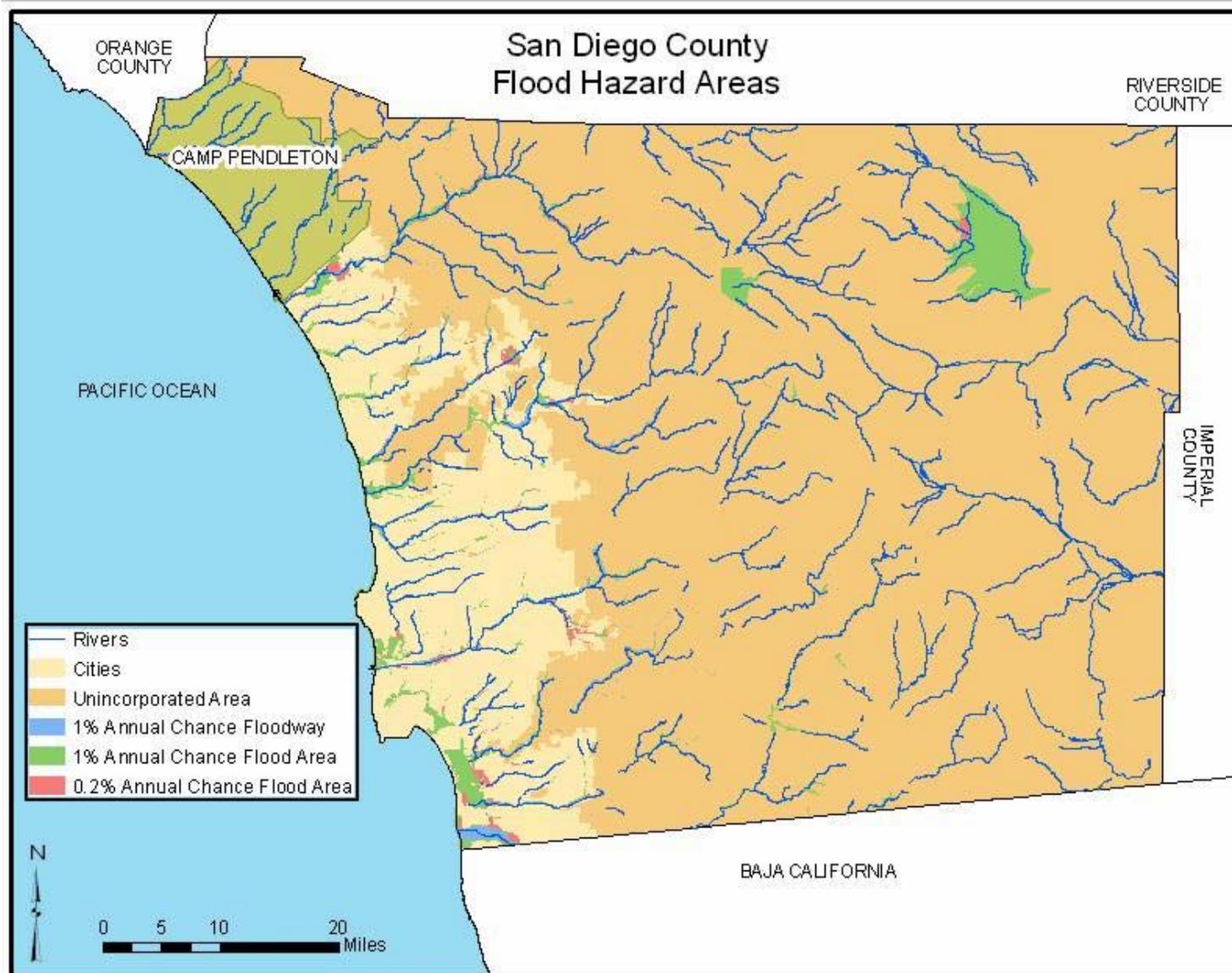


Figure 5-1. County of San Diego Flood Hazard Areas

5.3 FLOOD INSURANCE RATE MAPS AND THE COUNTY OF SAN DIEGO FLOOD MAPS

FEMA is the federal entity responsible for producing FIRMs. The flood risk information presented on the FIRM is based on historic, meteorological, hydrologic, and hydraulic data, as well as open-space conditions, flood-control works, and development within the study area.

Information found on a flood map includes:

- Common physical features, such as major highways, secondary roads, lakes, railroads, streams, and other waterways
- SFHAs
- Base (1% annual chance) Flood Elevation (BFE) depths
- Flood insurance risk zones
- Areas subject to inundation by the 0.2% annual chance (500-year) flood

FIRMs provide the information so that users can:

- Identify SFHAs
- Identify the location of a specific property in relation to the SFHA
- Identify the BFE at a specific site
- Identify the magnitude of flood hazards in a specific area
- Locate regulatory floodways

FIRMs are the mapped product of engineering studies, called Flood Insurance Studies (FISs). The effective date of the first FIS for the Unincorporated Areas of San Diego County was June 15, 1984. Since that time, the FIS for the County has been updated multiple times, the most recent revision being September 28, 2006.

In addition to the FEMA FIRMs, the County of San Diego has developed its own flood maps that account for additional areas of known risk. The County flood maps provide 1% annual chance (100-year) riverine flood elevations for areas beyond those studied by FEMA, and are used in addition to the FIRM in regulating development. The flood hazard information, including FEMA floodplain boundaries and flood zones as well as areas at risk of dam failure, are depicted on the website for SanGIS (<http://www.sangis.org>). SanGIS is a cooperative endeavor between the City and County of San Diego. Its GIS data and map creation tools are available free of charge for online use or for purchase for download access and use with other applications.

5.4 LOCALLY IDENTIFIED “HOT SPOT” FLOOD AREAS

More specific areas of localized flooding (or “hot spots”) were determined using data collected from the County Flood Control and input from the public. “Hot spots” are highlighted in Table 5-2, below by location and in Table 5-3 by the name of the proposed project or project currently underway to mitigate flood damage.

Table 5-2. Local “Hot Spot” Areas

Flooding Source	Location and /or Description
Santa Margarita River	Sandia Creek Drive and Rock Mountain Drive affecting Fallbrook and DeLuz
Upper San Luis Rey River	Between Lake Henshaw and La Jolla Indian Reservation; Cole Grade Road; and Shearer Crossing (San Luis Rey River at I-15); Pauma Valley Drive: Wiskon Way; Valley Center Road (Rincon Casino)
Escondido Creek	El Camino Del Norte near Rancho Santa Fe and Olivenhain
Escondido Creek	At Country Club Road; Elfin Forest
Borrego Springs	Local flash flooding; DeAnza Country Club
San Felipe Valley	Area east of Julian subject to flash flooding
Ocotillo Wells	Flash flooding
Agua Caliente Region	Flash flooding
San Dieguito River	Downstream from Lake Hodges to Del Mar
Hatfield Creek	Magnolia Avenue in Ramona
Santa Maria Creek	In Ramona; Rangeland Road
Spring Valley Creek	Quarry Road at Spring Valley Creek
San Diego River	Mission Valley and Fashion Valley Mall; Fashion Valley Road; Avenida del Rio; Camino del Este
Tijuana River Valley	Tijuana River Regional Park; Hollester Street; Dairy Mart Road
San Vicente Creek	Below San Vicente Reservoir, Moreno Valley
Sweetwater River	Singing Hills Country Clug
Cottonwood Creek	Trailer Park at Barret Junction
Campo Creek	Campo Valley flash flooding
Wildoats Lane off Central Avenue	Yearly flooding problem identified by Flood Control staff
Lemon Crest (Lakeside)	Local flooding problem identified during the May 3, 2007 public meeting by attendees
Dulene Drive (Lakeside)	Local flooding problem identified during the May 3, 2007 public meeting by attendees
Adlai Drive (East Lakeview)	Local flooding problem identified during the May 3, 2007 public meeting by attendees

Table 5-3. Proposed Projects and Projects Currently Underway in “Hot Spot” Areas

Location and Project Name	Description
Woodside Ave. Drainage Improvements	Capital Improvement Project to upgrade drainage facilities and alleviate flooding to properties between Woodside Avenue and Highway 67. Project limits are from Woodside Ave. to the San Diego River in the community of Lakeside.
Brookside Creek Drainage Improvements	5-Year Capital Improvement Program
Wing Ave. Channel Improvement	Capital Improvement project to upgrade drainage facilities along the flood control channel at Wing Avenue and Gillespie Field.
Ruxton Ave. Channel Improvement	Environmental mitigation project involving the removal of 400 feet of concrete channel in Spring Valley, and replacing it with a low flow meandering grass lined channel.
Hart Drive Drainage Improvement	5-Year Capital Improvement Project
6th Ave Drainage Improvements, Ramona	5-Year Capital Improvement Project
Pala Temecula Road Drainage Improvements	5-Year Capital Improvement Project
Tavern Road Drainage Improvements	Capital Improvement Project to replacement undersized culvert at Tavern Road and Arnold Way
Idaho Ave Drainage Improvements	5-Year Capital Improvement Project
Central Avenue Channel Improvements	Capital Improvement Project to upgrade the existing drainage facilities and alleviate flooding up to and including a 1% annual chance runoff event in the vicinity of Central Avenue. The Central Avenue project is scheduled for completion in the fall of 2007.

The hot spot issues identified above, share some communality with areas where repetitive flood losses have been experienced which are the primary focus of this plan and sections of this report that follow.

The sections that follow discuss vulnerable structures, estimated losses as presented in the comprehensive MJMHM Plan completed for San Diego County in 2004.

5.5 VULNERABLE STRUCTURES

The MJMHM Plan included an examination of natural (flood, earthquake, wildfire, etc.) and human (technological and terrorism) hazards that threaten all or portions of the County and an assessment of the County's vulnerability to each. The Plan was prepared with input from County residents, responsible officials, and URS consultants, and with the support of the State of California Office of Emergency Services and Security (COESS) and FEMA. The process to develop the Plan included nearly a year of coordination with representatives from all of the jurisdictions in the region.

GIS, digitized FEMA FIRMs, FEMA's HAZUS-MH, and other modeling tools were used during the preparation of the MJMHM Plan to identify structures in the County at risk including those affected by flooding and dam failure inundation hazards. While the MJMHM Plan developed estimates of the total number of buildings at risk for the 1% annual chance and 0.2% annual chance, it focused additional attention on critical facilities¹⁶ and structures at risk of inundation due a dam failure. The key findings of the MJMHM Plan are summarized in the sections that follow. All estimates of population, buildings, and infrastructure at risk, as well as, loss estimates that follow in Section 5.6 are based on data collected in 2003/2004 for the MJMHM Plan. Due to population growth and increased development all estimates of the numbers of vulnerable structures and losses may under-estimate risk at the present time.

1% Annual Chance Flood

Approximately 21,146 people are at risk in the unincorporated areas of San Diego County from a 1% annual chance flood. In addition, 6,656 residential buildings and 67 commercial buildings are at risk. Other critical facilities at risk include: 3 airports, 53 bridges, 10 communication facilities, 9 emergency response facilities, 41 infrastructure facilities¹⁷, and 14 schools.¹⁸

0.2% Annual Chance Flood

Approximately 24,051 people are at risk in the unincorporated areas of San Diego County from a 0.2% annual chance flood. In addition, 7,582 residential buildings and 72 commercial buildings are at risk. Other facilities at risk include: 3 airports, 54 bridges, 14 communication facilities, 9 emergency response facilities, 44 infrastructure facilities, and 15 schools.¹⁹

¹⁶ San Diego County defines a critical facility as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response, and/or disaster recovery functions.

¹⁷ Infrastructure facilities include oil/gas pipelines, railroad tracks, and highways

¹⁸ Source: MJMHM Plan

¹⁹ Source: MJMHM Plan

Dam Failure Inundation Risks

A dam failure is the structural collapse of a dam that releases the water stored in the reservoir behind the dam. A dam failure is usually the result of the age of the structure, inadequate spillway capacity, or structural damage caused by an earthquake or flood. The sudden release of water has the potential to cause casualties, economic loss, and environmental damage. This type of disaster is particularly dangerous because it can occur quickly, providing little warning and evacuation time to people living downstream. The flows resulting from dam failure generally are much larger than the capacity of downstream channels and therefore lead to extensive flooding. Flood damages occur as a result of the momentum and debris carried by the flow.

Dam inundation map data were used in the preparation of the MJMHM Plan to profile dam failure risk levels. These maps were created by agencies that own and operate dams, and purchased from SanGIS and/or provided by the San Diego County Water Authority for the MJMHM Plan analysis. The areas lying within dam inundation zones are considered at high risk. A dam is characterized as high hazard if it stores more than 1,000 acre-feet of water, is higher than 150 feet tall, has potential for downstream property damage, and potential for downstream evacuation. Ratings are set by FEMA and confirmed with site visits by engineers. A simple way to define high risk of dam failure is if failure of the dam is likely to result in loss of human life. Most dams in the County are more than 50 years old and are characterized by increased hazard potential due to downstream development and increased risk due to structural deterioration and/or inadequate spillway capacity (Unified San Diego County Emergency Services Organization Operational Area Emergency Plan, 2000).

Approximately 41,424 people are at risk in the unincorporated areas of San Diego County from dam failure hazards. In addition, 10,968 residential buildings and 141 commercial buildings are at risk. Other critical facilities at risk include: 3 airports, 105 bridges, 31 communication facilities, 16 emergency response facilities, 100 infrastructure facilities, and 49 schools.²⁰

Figure 5-2 displays the location and extent of dam failure hazard areas for the County of San Diego.

²⁰ Source: MJMHM Plan

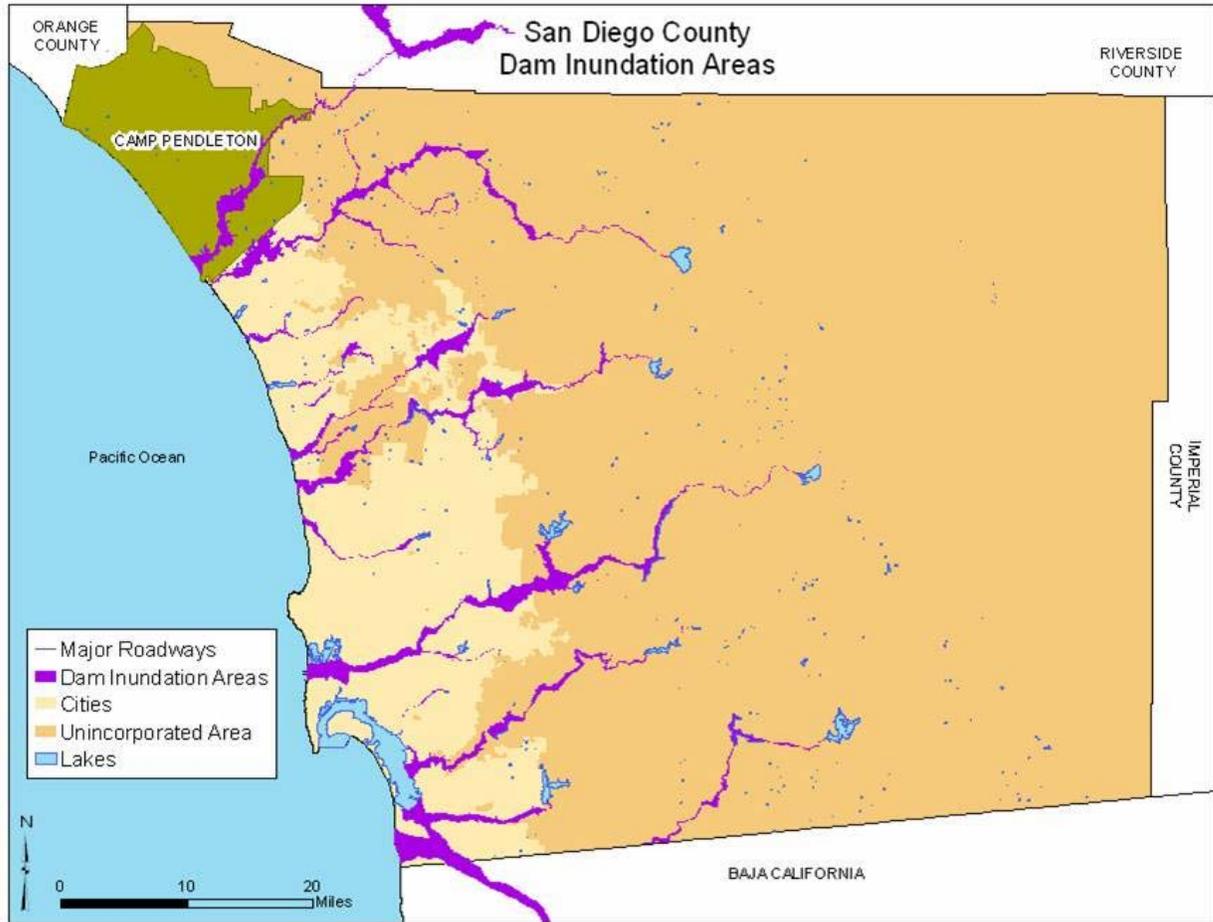


Figure 5-2. County of San Diego Dam Inundation Areas

Critical Facilities

The County of San Diego defines a critical facility as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response, and/or disaster recovery functions. The critical facilities identified for the unincorporated areas of San Diego County include 3 hospitals and other health care facilities; 117 emergency operations facilities, fire stations, and police stations; 194 schools, 3,732 hazardous material sites, 37 airport facilities, 344 bridges, 2 bus facilities, 166 rail facilities, and 827 highways; utility systems that include 3 electric power facilities, natural gas facilities, crude and refined oil facilities, 1 potable and waste water facility, and 312 communications facilities and utilities; 3 dams, 8 government office/civic centers, jails, prisons, military facilities, religious facilities, and post offices²¹.

²¹ Numbers as obtained from HAZUS

While critical facilities are included generally in this FMP, they are focused on in much more detail in the 2004 MJMHM Plan. This FMP focuses on general loss reduction strategies and more specific strategies for Repetitive Loss properties.

5.6 LOSS ESTIMATES

The MJMHM Plan estimated loss for flood hazards in the County, in addition to exposure. Loss is that portion of the exposure that is expected to be lost to a hazard. Loss is estimated by referencing frequency and severity of previous hazards. Hazard risk assessment methodologies embedded in HAZUS-MH, FEMA's loss-estimation software, were applied to flood hazards in the County of San Diego. HAZUS-MH is a loss-estimation software that integrates with a GIS to provide estimates for the potential impact of flood hazards by using a common, systematic framework for evaluation. This software contains economic and structural data on infrastructure and critical facilities, including replacement value costs with 2002 square footage and valuation parameters to use in loss estimation assumptions. This approach provides estimates for the potential impact by using a common, systematic framework for evaluation. The HAZUS-MH risk assessment methodology is parametric, in that distinct hazard and inventory parameters (e.g., building types) were modeled to determine the impact (damages and losses) on the built environment. The HAZUS-MH models were used to estimate losses from flood hazards to critical facilities, infrastructure, and residential/commercial properties, as well as economic losses on several return period events and annualized levels. Loss estimates used available data, and the methodologies applied resulted in an approximation of risk. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (such as incomplete inventories, demographics, or economic parameters).

The amount of damage flood-prone structures sustain depends on a variety of factors. A description of each of these factors and the relative impact of each to the county is included below.

Event-Specific Factors

Flood depth: The height flood waters reach is an important consideration affecting flood losses. Structures are more susceptible to damage as flood depths increase. Generally, the coastal plains areas of the County are subject to lower flood depths and more mountainous regions where narrow floodplains and step terrain along the stream corridor prevails are subject to greater flood depths during flood events.

Flood duration: The longer flood waters are in contact with building components (such as structural members, interior finishes, and mechanical equipment), the greater the potential for damage. The duration of flooding is very specific to the nature of an event. However, the structures closest to a flooding source (such as a river, bay, or canal) are more likely to sustain longer durations of flooding and be more vulnerable to flood damage. As flood waters recede, these structures will remain flooded for longer durations than structures located along the edge of the floodplain, increasing the potential for damage.

Velocity: The velocity of flood waters is an important factor impacting potential flooding damage. Flowing water exerts forces on the structural members of a building, increasing the likelihood of significant damage. In addition, flowing waters can increase erosion and scour around the foundation of a structure, which can further increase the vulnerability of a building to

damage. Any structure located along the channel of a river, stream, or creek will be more susceptible to damage due to moving floodwaters. Areas at most risk in the County include areas subject to flash floods and alluvial fan flooding, including Borrego Springs, San Felipe Valley east of Julian, Ocotillo Wells, and the Agua Caliente region.

Flood

Digitized 1% and 0.2% annual chance flood maps with BFEs from the FEMA FIRM were utilized to estimate loss in the 2004 mitigation plan. For the areas that did not include BFE information, a BFE was estimated for the final purpose of computing the flood depth at different locations of the County.

Table 5-4 reflects the estimated risk exposure as calculated by the MJMHM Plan in both the urban and rural areas of the County of San Diego.

Table 5-4. Potential 1% and 0.2% Flood Exposure and Losses

Flood Hazard	Population at Risk			Commercial Buildings at Risk		Critical Facilities & Infrastructure at Risk	
		Building Count	Potential exposure (x \$1,000)	Building Count	Potential exposure (x \$1,000)	Count	Potential Exposure (x \$1,000)
1% Annual Chance (100 Year)	21,146	6,656	\$1,661,980	67	\$283,320	130	840,363.00
0.2% Annual Chance (500 Year)	23,051	13,730	\$1,893,579	72	\$304,590	139	855,106.00

Dam Inundation Risks

Although the dams within the County are inspected annually to ensure they are in good operating order, a dam failure could occur. A dam failure is, however, consider a “low-probability, high-loss” events and has potential for significant loss of life and property damage. As noted above, approximately 41,424 people are at risk in the unincorporated areas of San Diego County from dam failure hazards. Table 5-5 reflects the estimated risk exposure as calculated by the MJMHM Plan of residential, commercial, critical facilities and Infrastructure in the County of San Diego.

Table 5-5. Potential Dam Failure Exposure and Losses

Population at Risk	Residential Buildings at Risk		Commercial Buildings at Risk		Critical Facilities & Infrastructure at Risk	
	Building Count	Potential Exposure (x \$1,000)	Building Count	Potential Exposure (x \$1,000)	Count	Potential Exposure (x \$1,000)
41,424	10,968	\$3,113,313	141	\$543,392	304	\$1,231,109

This section focused on the flood aspects of the hazard and risk assessment prepared for the MJMFM Plan in 2004. However, the central focus of this FMP is an analysis of the County's repetitive loss problem. This analysis is a requirement for the County's CRS enrollment. Section 14 presents the analysis of the County's repetitive loss problem.

6.0 CAPABILITIES ASSESSMENT

6.1 GOVERNMENT STRUCTURE

The capabilities assessment identifies the staff and personnel resources available within the County who will play a role in implementation of this plan and subsequent updates. The identified departments will play leading roles in mitigation planning and carry out mitigation projects. Table 6-1 below lists the administrative and technical capabilities of the County.

Figure 6-1. San Diego County Agencies with Possible Roles in Implementation of FMP

Staff/Personal Resources	Department/Division Position
Planner(s) or engineer(s) with knowledge of flood hazards	Public Works/Flood Control Section & Capital Projects/County Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works/Engineering & Capital Projects/Field Engineering/Civil Engineer and Land Use & Planning Department/Development Services/Public Safety & Construction/Building Inspector
Planner(s) or engineer(s) with an understanding of human-made or natural hazards	Public Works/Engineering & Capital Projects/Right-of Way Design/Civil Engineer
Floodplain manager	Public Works/Engineering & Capital Projects/County Engineer
Personnel skilled in GIS	GIS Department of Land Use & Planning Department/Information Technology
Director of Emergency Services	Public Safety & Homeland Security/Deputy Chief
Finance (grant writers, purchasing)	Public Works/Engineering & Capital Projects/Project Implementation & Technical Services
Public Information Officers	Business & Support Services/Information Technology/Chief Information Officer

Many of the programs and plans of these departments, with applicability and links to flood loss reduction efforts, are detailed in subsequent sections below.

6.2 COUNTY FACILITIES

Every community in San Diego County has a potential to experience flooding, erosion, overflow, or debris problems, and the communities are only habitable to the extent that the flood protection system is working. Construction of flood control and drainage system facilities has been taking

place throughout the County for over fifty years. The Flood Control District (under the Watershed Protection Department of the Public Works Department) maintains an extensive number of storm drains, channels, dams, and debris basins.

Urban Drainage

The County is equipped with an urban drainage system that consists of several hundred drainage inlets. The inlets discharge into many miles of underground storm drain pipes, which carry the water safely into a major channel. If these inlets become blocked, floodwaters will accumulate in buildings, streets, schools, and homes. Keeping the system in operation and repairing or replacing worn or damaged facilities is a major ongoing obligation.

Major Channels

Hundreds of miles of major channels carry any peak flood runoff from the hills and upland areas safely through the developed communities in the valley and coastal plain, and they provide an outlet for the extensive urban drainage system extending throughout urbanized areas. Wherever possible, the District encourages the preservation of natural creek channels as open-space green belts. These generally require more maintenance than modified channels. Maintenance and repair of the channels is a major ongoing obligation.

6.3 FLOODPLAIN MANAGEMENT PROGRAM

The objective of the Floodplain Management Program is to prevent future flood hazards, created in developing areas subject to flooding, and to reduce the necessity of constructing expensive flood control facilities in the future. Benefits derived from this program include the prevention of losses in flood-prone areas and reduced need for public emergency response during storm activity. Activities associated with the Floodplain Management Program include reviewing new development permit applications for elevation at or above the base (1% annual chance) flood elevation, proper setback from watercourses, and adequate drainage plans. The County's Floodplain Management Ordinance meets the minimum requirements for participation in the NFIP.

6.4 OPERATION AND MAINTENANCE PROGRAM

The County maintains channels, debris basins, and storm drain facilities to prevent flooding. The Operation and Maintenance Program includes normal operation and inspection of the District's channels, and other flood protection facilities; and the routine and emergency maintenance and repair of these facilities. As part of its Floodplain Management Program, the County conducts routine stream maintenance. The routine maintenance program occurs annually typically prior to the winter rainy season. The routine maintenance includes selective brush removal, de-silting, channel shaping, bank stabilization, bank protection, herbicide spraying, and channel clearing activities in most creeks and streams throughout the County. These activities are applied individually or in combination to address the specific requirements of the affected drainage. The routine maintenance program also addresses the maintenance and repair of concrete lined channels.

The main objective of the routine maintenance program is to reduce flood hazard and damage to life, public property, and infrastructure by maintaining the capacity of key channels in the County. All routine maintenance activities are conducted in a manner that minimizes environmental impacts.

6.5 DAM SAFETY

No dams are owned or operated by the County of San Diego. There are 52 dams in the greater San Diego County region that come under the regulatory jurisdiction of the State of California including the San Vicente Dam. Four additional dams in the region are owned by a Federal Agency and do not come under state of California authority. In addition to the above dams, other dams in the county are owned by municipalities, water districts, neighborhood associations, and private companies. The primary responsibility of the owners and operators of the major dams in the County and their reservoirs is to ensure a safe and reliable water supply to the region. However, dam owners are also responsible for ensuring the safety and effective operation of such structures and ensuring against catastrophic losses that could occur in the event of a dam failure. While the County does not have a responsible role in ensuring dam safety, it does help in disseminating general information, maps of potential inundation areas, and proposed evacuation route information to the public.

6.6 DEBRIS CONTROL PROGRAM

The County operates and maintains a number of debris basins, which constitute the primary debris control system. Flood runoff from the hillsides, particularly from those hillsides denuded by fires, landslides, or developments, is heavily laden with rock, sand, silt, mud, and debris. Berms and debris basins restrain the rock, sand, silt, mud, and debris that would otherwise clog and damage channels, which could result in flooding of adjacent property and downstream floodplains.

Basin maintenance is conducted on an as-needed basis to ensure the proper functioning of the basin prior to each winter. Basins are inspected during the winter after significant rain events. Routine maintenance includes keeping the outlet works clear of vegetation and maintenance of the channel capacity. Long-term maintenance of the basins involves the removal of sediment once the design capacity has been significantly reduced (or when there is a significant wildfire).

6.7 EMERGENCY STORM RESPONSE

During flood events, the DPW staff immediately transforms into an emergency response team. DPW staff work around-the-clock and are deployed to flood-fighting and support activities. Staff from the DPW office perform a variety of emergency tasks such as answering phone calls, storm monitoring, radio dispatching, field patrolling, and computer modeling for flood flow forecasting. Emergency operations also include pre-planned routines such as the monitoring of all flood facilities and equipment; the operation of dams and channel gates; and the provision of logistics support, field operations headquarters, and responses to emergency situations.

6.9 ALERT FLOOD WARNING SYSTEM

The County maintains a comprehensive Flood Warning System (or Automated Local evaluation in Real Time [ALERT] system) that assesses flood risk and provides advance warning of impending flooding. The Flood Warning System consists of “real time” rainfall and stream flow gages located throughout San Diego County and a base station located at the DPW office that collects and processes the incoming data. There is an extensive network of gage stations and sensors that collect hydrologic parameters such as rainfall intensity, stream flow, reservoir levels, wind speed and direction, temperature, barometric pressure, relative humidity, and soil moisture.

Once a predefined significant change in any of the parameters has occurred a transmission is sent from the sensor to the base station. The data is used in conjunction with computer models to determine the location and timing of potential flooding. Flood Control staff coordinate with the National Weather Service (NWS) and other emergency services to advise the public and reduce the damages to life and property from flooding. In addition, the ALERT network has been instrumental in guiding reservoir operations to maximize both flood control and water supply benefits. Further information on the County's emergency management capabilities and its ALERT system is included in Chapter 12 of this plan.

7.0 GOALS AND OBJECTIVES

Hazard mitigation goals are broad in scope and far-reaching in application. This part of the plan presents the vision of the County and other jurisdictions that participated in the 2004 MJMHHM Plan for mitigation in the region. The goals also serve to set the community's priorities.

Objectives are developed as a means of realizing a community's hazard mitigation goals. Objectives are more specific and tangible than goals. Rather than being long-term and general, objectives should be achievable in a finite period of time, and the results should be measurable against benchmarks and indicators. Since objectives need to be attainable, they should be soundly based on the background studies used in preparing the MJMHHM Plan and FMP. The MJMHHM Plan set the following goals and objectives. These goals and objectives are at the heart of, and form the basis for the strategies, recommendations, and Mitigation Action Plan presented in Chapter 15.

Goal 1: Promote disaster-resistant future development.

Objective 1.A: Facilitate the development or updating of general plans and zoning ordinances to limit development in hazard areas.

Objective 1.B: Facilitate the adoption of building codes that protect existing assets and restrict new development in hazard areas.

Objective 1.C: Facilitate consistent enforcement of general plans, zoning ordinances, and building codes.

Action: Develop and coordinate permits for all agencies.

Objective 1.D: Limit future development in hazardous areas.

Action: Development patterns should respect environmental characteristics.

Action: Development in floodplains shall be limited to protect lives and property.

Objective 1.E: Address identified data limitations regarding the lack of information about new development and build-out potential in hazard areas.

Action: Coordinate existing Geographic Information Systems (GIS) capabilities to identify hazards.

Action: Develop the data sets that are necessary to test hazard scenarios and mitigation tools.

Action: Utilize the Internet as a communication tool, as well as an educational tool.

Objective 1.F: Increase public understanding, support and demand for hazard mitigation for new developments.

Action: Gain public acceptance for avoidance policies in high hazard areas.

Action: Publicize and adopt the appropriate hazard mitigation measures.

Action: Help create demand for hazard resistant construction and site planning.

Goal 2: Increase public understanding and support for effective hazard mitigation.

Objective 2.A: Educate the public to increase awareness of hazards and opportunities for mitigation actions.

Action: Publicize and encourage the adoption of appropriate hazard mitigation actions.

Action: Provide information to the public on the County website.

Action: Heighten public awareness of hazards by using the County Media & Public Relations Office.

Action: Gain public acceptance for avoidance policies in high hazard areas.

Action: Help create demand for hazard resistant construction and site planning.

Objective 2.B: Promote partnerships between the state, counties, local and tribal governments to identify, prioritize, and implement mitigation actions.

Objective 2.C: Promote hazard mitigation in the business community.

Action: Increase awareness and knowledge of hazard mitigation principles and practices.

Action: Encourage businesses to develop and implement hazard mitigation actions.

Objective 2.D: Monitor and publicize the effectiveness of mitigation actions implemented countywide.

Action: Use the County website to publicize mitigation actions.

Action: Create marketing campaign.

Action: Determine mitigation messages to convey.

Action: Establish budget and identify funding sources for mitigation outreach.

Action: Develop and distribute brochures, CDs and other publications.

Objective 2.E: Provide education on hazardous conditions.

Action: Support public and private sector symposiums.

Coordinate production of brochures, informational packets and other handouts.

Develop partnerships with the media on hazard mitigation.

Goal 9: Reduce the possibility of damage and losses to existing assets, including people, critical facilities/infrastructure, and public facilities due to floods.

Objective 9.A: Develop a comprehensive approach to reducing the possibility of damage and losses due to floods.

Action: Review and compare existing flood control standards, zoning and building requirements.

Action: Identify flood-prone areas by using GIS.

Action: Adopt policies that discourage growth in flood-prone areas.

Objective 9.B: Protect existing assets with the highest relative vulnerability to the effects of floods within the 1% annual chance (100-year) floodplain.

Action: Assure adequate funding to restore damaged facilities to 1% annual chance (100-year) flood design.

Action: Update storm water system plans and improve storm water facilities in high-risk areas.

Action: Ensure adequate evacuation time in case of major hazard event.

Objective 9.C: Coordinate with and support existing efforts to mitigate floods (e.g., US Army Corps of Engineers, US Bureau of Reclamation, California Department of Water Resources).

Action: Develop a flood control strategy that ensures coordination with Federal, State and local agencies.

Action: Improve hazard warning and response planning.

Objective 9.D: Minimize repetitive losses caused by flooding.

Action: Identify those communities that have recurring losses.

Action: Develop project proposals to reduce flooding and improve control in flood prone areas.

Action: Acquire properties on floodway to prevent development.

Action: Seek pre-disaster mitigation funding.

Objective 9.E: Address identified data limitations regarding the lack of information about the relative vulnerability of assets from flooding.

Action: Encourage the public to prepare and maintain a 3-day preparedness kit for home and work.

Action: Increase participation and improve compliance with the National Flood Insurance Program (NFIP).

Action: Develop and implement hazard awareness program.

8.0 PREVENTION MEASURES

Community officials recognize the importance of protecting their citizens from the devastation floods and other natural disasters can bring. For example, the County has recognized that meeting the minimum requirements for participation in the NFIP alone does not provide the level of protection its citizens need and deserve. Therefore, the County Board of Supervisors has adopted enhancements to the County's floodplain management standards in order to decrease its vulnerability to floods.

To increase the level of protection from natural hazards, additional approaches are recommended. These recommended safer standards are explained in detail in this section. The standards encourage prudent land use management and development, while promoting responsibility, fairness, community involvement, and planning. This section discusses the current and proposed prevention measures in the County of San Diego.

8.1 CURRENT PREVENTION MEASURES

8.1.1 General plan

Comprehensive plans identify how a community should be developed and where development should not occur. They govern the rate, intensity, form, and quality of physical development. A thorough comprehensive plan will also address economic development, environmental, social, and hazard mitigation concerns.

The typical elements of a comprehensive plan include land use, transportation, economic development, environmental protection, dedication of open space, provision of infrastructure, and other municipal functions. Their main advantage as a hazard planning tool is that they guide other local measures, such as capital improvement programs, zoning ordinances, and subdivision ordinances.

Comprehensive plans are useful for creating a body of information about local hazard risks. They help identify hazard areas. The appropriate land uses and building (or retrofitting) standards can then be applied to those areas. They identify areas that are less vulnerable to hazards, where development should be directed. Integrating mitigation into comprehensive planning can improve its effectiveness in four important ways.

1. It institutionalizes the process of addressing hazards. This may help make mitigation a habit for community officials.
2. It can create a constituency for mitigation by making it a part of the public discussion of community goals that should be a part of any comprehensive planning process.
3. It allows communities to integrate mitigation with other community objectives. An example of this would be acquiring flood prone properties to achieve both mitigation and open space goals.
4. Integrating mitigation planning makes it easier for communities to address multiple hazards at once, a process known as cross-mitigation.

Comprehensive planning requires local governments to collect and analyze information about land's suitability for development. This process helps ensure land use is tailored to the hazard risk, typically by reserving dangerous areas for less intensive, hazard-compatible uses such as

parks, golf courses, backyards, wildlife refuges, or natural areas. The objective of these plans is to preclude inefficient or hazardous land use by coordinating the development of adjacent properties. Developers have an incentive to submit proposals that meet the policies of the comprehensive plan since appropriate designs ensure a fast track for approval.

Current Practice in San Diego County:

One of the goals of the General Plan is to conserve resources and natural processes. Objectives identified to achieve this are:

- Encourage the preservation of the significant natural features of the County, including lakes, basins, river banks and waterways.
- Encourage only those uses and activities that are compatible with the marine ecosystem along the shoreline. Designate appropriate areas as underwater or water-related wildlife preserves.
- Discourage any use of the lagoons that would be incompatible with their natural ecosystems.
- Encourage the conservation of vegetation and trees needed to prevent erosion, siltation, flood, and drought, and to protect air and water quality.

Objectives under the health and safety goal include:

- Protect life and property by regulating uses in areas subject to flooding.
- Reduce the need for the construction of major flood control improvements.
- Control development to assure a minimal adverse polluting effect on reservoirs, lakes, streams, rivers and groundwater supplies.

Policies and Regulations to Achieve the Objectives

Existing policies, particularly the land use regulations, have been directed towards preventing the misuse of the floodplain and to qualify the County for federal flood insurance.

The County has determined:

- That flood control is regional in nature and does not respect political boundaries.
- That land use planning is highly sensitive to flood control requirements and detailed consideration of flood control methods are essential in the land use decision-making process.
- That flood control projects involve the expenditure of very significant amounts of district, Federal and State funds.
- That failure of flood control systems may result in property damage and loss of life.

The County has adopted a Water Course Ordinance which provides minimum regulations on all development that is traversed by a river or a stream. It has also adopted a Floodplain Overlay Zone and a Flood Channel Overlay Zone. These zones severely restrict the uses in the floodway, but permit regulated development in the floodplain fringe in accordance with the San Diego County Code.

8.1.2 Zoning

A zoning ordinance regulates development and existing uses by dividing the community into zones or districts and setting development criteria for each district. The floodplain can be designated as one or more separate zoning districts that prohibit development or allow only development that is not susceptible to damage by flooding. For example, new commercial development can reasonably be precluded or dissuaded from hazardous areas in the interest of protecting these major contributors to the tax base.

Appropriate zoning districts include public use, conservation, and cluster or planned unit developments that keep buildings out of the floodplain, wetlands, and other areas that are not suitable for intensive development.

Current Practice in San Diego County:

The Zoning Ordinance was adopted by the Board of Supervisors to regulate land uses in the unincorporated portions of the County of San Diego. The unincorporated area is divided into zones according to the present and potential uses of the land. By zoning land, citizens ensure that new growth and development will take place according to an orderly plan.

To fulfill the requirements of state law, the County has also prepared a General Plan as discussed above. The Plan is an outline for the future. To be effective and to conform to state law, the Zoning Ordinance and zoning maps must be consistent with the General Plan, because they are the primary methods for achieving the objectives of the Plan.

Most of the County's zoning districts are traditional residential and commercial zones. In both cluster and non-cluster projects, the actual parcel size may be increased and the number of dwelling units decreased for reasons of environmental protection or for neighborhood compatibility or for other reasons necessary to protect the public health, safety, or welfare.

Special Area Regulations

The purpose of the Special Area Regulations is to set forth special regulations which have limited applications, such as floodplains, and ensure that consideration is given to areas of special interest or unusual value.

Special area regulations include the following districts:

Environmentally Constrained Areas (ECA) District: The ECA includes floodplains, lagoons, areas with construction quality sand deposits, rock quarries, agricultural preserves, areas containing rare and endangered plant and animal species, and all private land-holdings within the Cleveland National Forest. Development in these areas, while guided by the County General Plan, is preceded by thorough environmental review and implementation of appropriate measures to mitigate adverse impacts.

- Uses and densities are those permitted by the applicable community and Sub-regional plan map; the County Zoning Ordinance; the Groundwater Policy; and, for private land-holdings in the Cleveland National Forest and outside of CT designated National Forest and State Parks (23), a 40-acre minimum parcel size shall apply and a one (1) unit per parcel maximum density.

- The resource responsible for the designation of an ECA shall be identified and appropriate mitigation measures included in any project approval.
- Flood-prone areas that are not planned for stabilization will be retained in natural, open, and other non-urban uses.
- Areas designated Agricultural Preserve shall be designated “ECA.”

Resource Conservation Areas (RCA): Are identified as lands requiring special attention in order to conserve resources in a manner best satisfying public and private objectives. The appropriate implementation actions will vary depending upon the conservation objectives of each resource but may include: public acquisition, establishment of open space easements, application of special land use controls such as cluster zoning, large lot zoning, scenic or natural resource preservation overlay zones, or by incorporating special design considerations into subdivision maps or special use permits.

Resource Conservation Areas include but are not limited to groundwater problem areas, coastal wetlands, native wildlife habitats, construction quality sand areas, littoral sand areas, astronomical dark sky areas, unique geologic formations; and significant archaeological and historical sites.

8.1.3 Building Codes

Building codes are laws, ordinances, or governmental regulations that set forth standards and requirements for the construction, maintenance, operation, occupancy, use or appearance of buildings, premises, and dwelling units.

One way to require non-conforming structures to come up to code is to establish passive or active code triggers, such as a change in use. In order to qualify for a change in use, the building must meet or approach current code. A different kind of code trigger requires that buildings that have suffered a certain degree of damage be renovated to a higher level of natural hazards resilience. Another approach to code enforcement is to establish financial incentive or voluntary compliance programs.

Current Practices in San Diego County:

The County of San Diego currently enforces the 1997 edition of the Uniform Building Code, the 1997 editions of the Uniform Plumbing Code and Uniform Mechanical Code and the 1996 edition of the National Electric Code. In addition, the County also enforces the standards set forth in the California Building Code (Title 24 of the California Administrative Code), the San Diego County Zoning Ordinance, San Diego County Grading Ordinance, the County Code and various departmental policies.

A building permit is required to construct, enlarge, alter, repair, move, improve, remove, convert, or demolish a building or structure. Permits are also required for plumbing, electrical and mechanical work. If a property is in a floodplain, Department of Public Works (DPW) approval is required before a building permit can be issued.

Adherence to existing codes and standards is essential to maintaining public safety and promoting an effective local mitigation program—so much so that the insurance industry has moved to rate communities according to their ability to enforce the building code and by the qualifications and

training of their staff. San Diego County currently has a 99/99 rating under the Building Code Effectiveness Grading Schedule (BCEGS).

8.1.4 Floodplain Construction Standards

Zoning and open space preservation work to keep damage-prone development *out* of hazardous or sensitive areas. Building construction and special use regulations impose construction standards on what is allowed to be built *in* the floodplain.

The NFIP operates through a partnership between the federal Government, the states, and individual communities. Participation in the NFIP is voluntary. In participating communities, affordable, federally backed flood insurance is made available to property owners and renters. In return, each community adopts and enforces a floodplain management ordinance or law, which it uses to define regulatory floodplains and control floodplain development, including new construction, substantial improvement of existing buildings, and repairs of substantially damaged buildings.

FEMA's NFIP sets minimum requirements for participating communities' building construction regulations. The NFIP minimum requirements are summarized in the box on the next page.

Current Practice in San Diego County:

The Legislature of the State of California has in Government Code Sections 65302, 65560, and 65800 conferred upon local governmental units authority to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. These sections serve as the authority for the adoption of the Flood Damage Prevention Ordinance.

San Diego County's ordinance meets the minimum NFIP requirements spelled out in the box on the next page.

The Director of Public Works has been designated to administer and implement the flood damage prevention ordinance by granting or denying development permits in accordance with its provisions. Floodplain regulation enforcement is shared with the County's Building Department. The Department reviews permit applications and site plans, conducts field inspections, reviews elevation certificates, engineering certifications and other documentation to determine compliance with federal, state and local regulations.

Minimum Regulatory Requirements Imposed by Communities Participating in the NFIP

Newly Constructed, Substantially Damaged, and Substantially Improved Buildings in the SFHA:

- Building sites must be reasonably safe from flooding.
- Buildings must be:
 1. Designed (or modified) and anchored to prevent flotation, collapse, and lateral movement of the building resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,
 2. Constructed with materials resistant to damage from immersion in flood waters,
 3. Constructed with methods and practices that minimize flood damage, and
 4. Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent flood water from entering or accumulating within their components.

Subdivisions and Other New Development in the SFHA:

- All proposals for subdivisions and other new development in the SFHA must be consistent with the need to minimize flood damage within the flood-prone area.
- All public utilities and facilities must be located and constructed to minimize or eliminate flood damage.
- Adequate drainage must be provided for all such subdivisions and new developments in order to reduce exposure to flood hazards.

Additional Minimum Requirements for Buildings in A Zones:

Building Elevation in Zones AE and A1-A30. The top of the lowest floor, including the basement floor, of all newly constructed, substantially damaged, and substantially improved buildings must be at or above the BFE.

Enclosures Below the Lowest Floor in Zones AE, A1-A30, AO, and A. Enclosed space below the lowest floors of newly constructed, substantially damaged, and substantially improved buildings may be used only for parking of vehicles, access to the building, or storage. The walls of such areas must be equipped with openings designed to allow the automatic entry and exit of flood waters.

Additional Minimum Requirements for Buildings in V Zones:

The additional minimum requirements regarding newly constructed, substantially damaged, and substantially improved buildings in Zones VE, V1-V30, and V pertain to **Siting** : All newly constructed buildings must be located landward of the reach of mean high tide. **Building Elevation:** All newly constructed, substantially damaged, and substantially improved buildings must be elevated on pilings, posts, piers, or columns so that the bottom of the lowest horizontal structural member of the lowest floor is at or above the BFE. **Foundation Design:** A registered engineer or architect must develop or review the structural design, construction specifications, and plans for construction and must certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the building elevation and foundation design standards described above. **Use of Fill:** Fill may not be used for the structural support of any building within Zones VE, V1-V30, and V.

8.1.5 Alluvial Fan Regulations

Alluvial fan flows are subject to lateral migration and sudden relocation during the course of a flood, and may not even follow the same path in subsequent floods; in any flood event, however, a part of the fan will always be subject to flood hazards. Thus, it is generally not appropriate to utilize the location of past flow paths in the prediction of future hazards.

The full range of hazards that may be encountered on fans include:

- high-velocity flow (as high as 15-30 feet per second), producing significant hydrodynamic forces (pressure against buildings caused by the movement of flowing water)
- erosion/scour (to depths of several feet)
- deposition of sediment and debris (depths of 15-20 feet have been observed)
- debris flows/impact forces
- mudflows
- inundation, producing hydrostatic/buoyant forces (pressure against buildings caused by standing water)
- flash flooding (little, if any, warning times)

Current Practice in San Diego County:

On October 17, 1989, the Board of Supervisors accepted the Boyle Engineering Report, Borrego Valley Flood Management Report, which specifically deals with flood protection on alluvial fans in Borrego Springs.

Box Canyon, Unnamed Canyon, Coyote Canyon, El Vado Canyon, Henderson Canyon, Borrego Palm Canyon, Fire Canyon, Hellhole Canyon, Dry Canyon, and Culp-Tubb Canyon complexes have been analyzed and mapped by the County to assist in designing flood protection on these alluvial fans. These areas are shown on the FEMA FIRM.

The NFIP identifies alluvial fan hazards on FIRMs as Zone AO and provides information on flood depths and velocities. AO zones are Special Flood Hazards Areas (SFHA) subject to inundation by 1% annual chance (100-year) sheet-type flow, which are sometimes associated with high velocities.

The community's FIRM identifies AO zones with depths and velocities, construction within those alluvial fan areas are subject to certain regulations (in addition to those which apply to *all* SFHA's) found in Chapter 44 of the Code of Federal Regulations, Part 60.3:

- Elevate lowest floor (including basement) above the highest adjacent grade to at least as high as the depth number specified on the FIRM. (It is recommended, however, that the depth of flow assumed for a particular site should take into consideration local topographic anomalies when determining the elevation of any flood protection measure.)
- Mechanical and utility equipment must also be placed above the depth of flooding.
- Provide adequate drainage paths around structures on slopes, to guide floodwater around and away from proposed structures.
- Do not deflect flood flow onto adjacent properties.

The provisions of Section 60.3 are *minimum* requirements; buildings constructed according to these rules alone will not provide adequate protection against high velocities or debris loads unless additional measures are undertaken.

When the zoning provides for one-half acre lots or larger and where the alluvial fan depths are two feet or less, new construction and substantial improvement of any structure in Zone AO or within the alluvial fan boundaries shown on the Borrego Valley Alluvial Fans map and FIRM, shall have the lowest floor elevated above the highest adjacent grade at least as high as the depth number specified in feet on the Borrego Valley Alluvial Fans map and FIRM. Depths of one foot and velocity of 8 feet/second are to be used unless more specific information is available.

A special engineering analysis is required for areas which have greater alluvial fan depths or more intense land use. In case of conflict(s) between the Borrego Valley Alluvial Fans map and FIRM, the more stringent of restrictions shall prevail and be deemed to govern.

Projects which impact alluvial washes must carry the flow from the wash around any structure or obstruction and redistribute the flow without adversely affecting adjoining property.

Projects in fan terminus alluvial washes must be designed so that any obstruction to flow will not cause a cumulative increase in the 1% annual chance (100-year) water surface of more than 0.5 feet.

A preliminary approval of the flood insurance rating should be obtained before construction approval.

Single structure protection is usually provided by one or more of the following methods. Each of these methods has advantages, disadvantages and design provisions that should be considered during the planning stage of a project:

- Piles, Columns, or Posts
 - Minimize the structure's exposure to flood hazards
 - Eliminate obstructions to natural flow paths
 - Do not significantly affect flood flow hydraulics
 - Size and number of piles must be adequate to provide structural support to building; must be embedded to sufficient depth, and be adequately anchored to both the structure and to subsoil/bedrock to withstand scour and erosion

- Fill
 - Should only be used in low to moderate velocity/depth conditions
 - Must be armored above and below grade to withstand scour, erosion, and debris impact and to protect the structure's foundation
 - Should be oriented parallel to expected flood flow to reduce debris damage, to avoid deflecting flow to adjacent or downstream property, and to minimize obstruction to flow
 - Can be landscaped

- Floodwalls or Berms
 - Should only be used in very low velocities/depths (sheet flow velocity of less than 5 feet per second/depth of less than 3 feet); should only be used near toe of fan or where large sedimentation and debris loads are not likely
 - Should be able to resist erosion at base and below grade
 - Should be oriented to avoid diversion of hazards to adjacent or down stream property
 - Can be effective when used as supplemental protection for elevated structures

8.1.6 Floodplain Mapping/Data Maintenance

Identifying the floodplain is the first step in preventing flood problems. Most of the preventive and public information mitigation measures rely on a map to designate the areas affected and to help set appropriate protection standards.

The term “mapping” includes both a spatial display that shows the properties affected by flooding and the background data, such as discharges and flood elevations that are used as the basis for the map.

The nation’s primary floodplain mapping program is conducted by the DHS - FEMA for the NFIP. FIRMs and their accompanying Flood Insurance Studies provide data on the areas affected by the base or 1% annual chance (100-year) flood, the 0.2% annual chance (500-year) flood²², and the regulatory floodway.

Current Practice in San Diego County:

In addition to the FEMA FIRMs, the County of San Diego has developed its own flood maps that account for additional areas of known risk. The County flood maps delineate 1% annual chance (100-year) riverine flood boundaries and elevations for areas not studied by FEMA, and are used in addition to the FIRM in regulating development. The flood hazard information, including FEMA floodplain boundaries and flood zones as well as areas at risk of dam failure, are depicted on the website SanGIS (<http://www.sangis.org>). The online GIS data is available free of charge for online use or for purchase for download access and use with other applications.

The County participates in FEMA’s Cooperating Technical Partner (CTP) program. Under the CTP agreement with FEMA, the County is currently assisting in the development of updated countywide Digital FIRMs.

8.1.7 Floodplain Open Space Preservation

Keeping the floodplain free from development is the best approach to preventing flood damage. Preserving vacant natural areas also has recreational benefits and preserves these areas’ natural and beneficial functions. These functions include:

- Storage of flood waters

²² Also referred to as the 1% and 0.2% floodplains, respectively

- Lowering peak flood flows by slowly releasing storm water over time
- Absorbing overland flood flow through infiltration
- Recharging aquifers through infiltration
- Filtration of hazardous materials and excessive nutrients
- Habitat for riparian species

Open space can be preserved through a variety of methods, including:

- Establishing parks in the floodplain
- Acquiring vacant flood-prone land
- Enacting restrictive zoning requirements to prevent construction of buildings
- Requiring buffers or setbacks from a waterway
- Purchasing or dedicating easements

The simplest method is to acquire lands and preserve them as parks. There are several alternatives to public acquisition and ownership of open space lands. One is a public-private partnership that shares the load of purchasing, developing, and managing the property. Often the financial and legal responsibility can be easier to manage through a public entity and the management is conducted by private non-profit or volunteer organizations.

Easements are another alternative to preserving open space. There are various types, including:

- Conservation (the owner agrees to keep it in a natural state)
- Public access (the owner agrees to allow public access across the land)
- Drainage (the owner agrees to keep the area open for flood flows)
- Maintenance (the owner agrees to allow maintenance crews on the property)

In all of these, the owner keeps possession of the land but benefits by a reduction in property taxes. The community benefits by increasing the amount of open space that can be preserved without paying for the full property value and being responsible for maintaining the land. Often a local land trust legally "holds" the easement and is responsible for the annual oversight.

Open space lands and easements do not always have to be purchased. Developers can be required to dedicate park land and flood flow, drainage, or maintenance easements. Maintenance easements also can be donated by existing streamside property owners in return for a community channel maintenance program.

Current Practice in San Diego County:

San Diego County has adopted an Open Space Element as part of its General Plan pursuant to Section 65560 through 65570 of the Government Code, which requires that "every city and county shall prepare, adopt and submit to the Secretary of the Resources Agency a local open space plan for the comprehensive and long-range preservation and conservation of open space land within its jurisdiction".

8.1.8 Low-Density Zoning

Density ordinances can be applied within floodplains, in the surcharge area along the coast, or any other area that can be demonstrated as a high-risk zone. Local governments lower the

allowable intensity of development in hazardous areas to prevent intense private development within areas delineated as high-hazard.

There are two primary ways to regulate residential development density: set maximum housing density or set minimum lot size. In terms of floodplain development, both approaches are complemented by limits on the percentage of impervious surface within parcels.

Current Practice in San Diego County:

Most of San Diego County's zoning districts are traditional residential and commercial zones that do not require lots larger than 10,000 square feet for single-family residential use.

8.1.9 Subdivision Regulations

Subdivision regulations govern the division of land for development or sale. In addition to controlling the configuration of parcels, they set standards for developer-built infrastructure. Many communities include developer exactions and impact fees/system development charges in their subdivision regulations.

Subdivision regulations can be used for mitigation purposes in several ways. They primarily prohibit the subdivision of land subject to flooding. When hazard zones can be identified on a map of the parcel, communities may require minimum distances between those zones and development. If land dedications are required as part of the subdivision regulation, they can be used to reserve hazard-prone land for non-intensive uses.

Subdivision regulations may also set a standard for public infrastructure that ensures it is adequate for the assessed risk. For example, the installation of adequate drainage and stormwater management facilities should be required in flood-prone areas. If local governments are responsible for managing of developer-built infrastructure, they should require that all improvements be built to hazard-resilient standards. This may help reduce the public cost of post-disaster reconstruction.

Subdivision regulations can require that developments be built in a hazard-resilient manner. In order to reduce fire risk, for example, subdivision ordinances may require wide building spacing, fire breaks, on-site water storage, and multiple access points. They should require "deep" lots in shorefront areas. These lots allow homes to be moved inland on the same parcel in the case of shoreline erosion.

The site plan review stage is another time at which it is possible to require developers to site buildings away from hazard-prone portions of the area. Local governments may require mitigation actions, such as the protection or creation of wetlands, dunes or natural vegetation, as a condition of subdivision approval.

Some experts recommend establishing land use restrictions for each property before it is subdivided. After a property is subdivided, the various owners may demand compensation for the loss of use of their property. As a result, the County might have to acquire land that it could have otherwise regulated without a purchase.

Subdivision regulations are not as broad as zoning and only indirectly affect the quality and type of development that occurs on subdivided land. Since these regulations apply only when land is subdivided and sold, they do not address development of small or undivided parcels of land.

Current Practice in San Diego County:

The San Diego County Subdivision Regulation establishes procedures and rules to provide for the timely provision of required streets, utilities and stormwater management facilities; and for the separation of buildings for fire safety and open space.

The San Diego County code requires the areas subject to inundation by a 1% annual chance (100-year) flood to be shown on the preliminary plat.

8.2 PROPOSED PREVENTION MEASURES IN SAN DIEGO COUNTY

As indicated in Chapter 2 current programs and regulations do not address all of the issues that can cause property losses and business interruption. These additional measures address some of the remaining property loss issues.

8.2.1 Design/Regulatory Flood Elevation (Freeboard)

The NFIP requires “all new construction and substantial improvements of residential structures within AE zones on the community’s FIRM, have the lowest floor (including the basement) elevated to or above the base (1% annual chance) flood level” (44 CFR 60.3I(2)). Within riverine special flood hazard areas, commercial structures may be floodproofed in lieu of elevation.

San Diego County requires new construction and substantial improvement of all structures to have the reference floor elevation at or above the 1% annual chance flood elevation. Elevating above to the regulatory flood elevation is known as “freeboard.” This freeboard is a buffer zone to provide added protection for the structure to help prevent the entrance of floodwaters during a flood event.

The amount of freeboard a community adopts depends on local considerations. Factors that may contribute to the selection of freeboard include the desired level of additional protection, the potential rise due to future development, how sensitive the flood level is to changes in flow, the amount of insurance rate reduction that is available through the NFIP’s CRS program, and economic impacts on development. Another major deciding factor may be development height limitations within a community.

Background of the Higher Standard – Some structures that are built to the minimum NFIP standards will be partially inundated during a 1% annual chance flood. With the reference floor elevated at the BFE, floodwater will be literally at door level under ideal conditions during a base flood. Any conditions that could increase flood levels such as debris accumulation at bridges and culverts, or channel sedimentation will cause further flood damage of the structure. Many communities discovered this in recent floods, especially in areas that have shown high development since their current FIRM was actually published. The impervious surface areas added by these new developments increased runoff, possibly causing structures to be flooded even though they were constructed in compliance with minimum NFIP standards.

Recommendation

It is recommended that the County adopt a one-foot freeboard requirement. The increased freeboard will result in safer construction as well as result in reduced flood insurance costs. Also, if a community enforces freeboard, disaster recovery efforts and costs will be reduced, and

the community could receive recognition for this regulation as part of the 430 Series of the CRS, which in turn would further reduce flood insurance rates. Each foot of freeboard provides up to 100 credits for a maximum of 300 points. The Flood insurance premium rate reductions under CRS are made in 5% increments related to 500-point credits.

8.2.2 Cumulative Substantial Improvement and Substantial Damage Regulations

The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements. Over the years, a community may issue a succession of permits for different repairs or improvements to the same structures. This can greatly increase the overall flood damage potential within a community as well as the insurance liability to the Federal Insurance Administration.

This proposed requirement has the effect of requiring more structures to come into compliance after a disaster because damage repair is included in "improvements" under the NFIP rules. Since the County participates in the NFIP it already has a substantial improvement threshold; therefore, it is only necessary to change the number of years specified in its ordinance that are to be used to calculate substantial improvements.

The CRS provides credit to a community that ensures that the total value of all improvements or repairs permitted over the years does not exceed 50% of the value of the structure. When the total value does exceed 50%, the original building must be protected according to the ordinance requirements for new buildings.

Under some circumstances the NFIP flood insurance policy may pay part of the cost of bringing a substantially flood-damaged building into compliance with the community's floodplain management ordinance. This Increased Cost of Compliance coverage is described in Figure 8.1.

Increased Cost of Compliance

On June 1, 1997, the NFIP began offering “Increased Cost of Compliance” (ICC) coverage for buildings covered under the Standard Flood Insurance Policy (SFIP). ICC coverage provides for the payment of a claim to help pay for the cost to comply with community floodplain management ordinances after a flood event in which a building has been declared substantially damaged or repetitively damaged.

When an insured building is damaged by a flood and the community declares the building to be substantially or repetitively damaged, ICC will help pay for the cost to elevate, floodproof, demolish, or relocate the building up to a maximum of \$30,000. This coverage is in addition to the building coverage for the repair of actual physical damage from flood under the SFIP. An ICC claim can be filed whether or not a community has received a Presidential disaster declaration.

The following conditions must be met for a substantially damaged building to be eligible for an ICC claim: A building is eligible for an ICC claim payment if it is in a Special Flood Hazard Area and if the community determines it has been damaged by a flood whereby the cost of restoring the building to its before-damaged condition would equal or exceed 50% of the market value of the building before the damage occurred, as determined by the community. All NFIP communities must have, at a minimum, a substantial damage provision in their floodplain management ordinance in accordance with the NFIP criteria.

CRS NOTE: By statute, an ICC claim can only be paid upon a substantial damage determination based on the NFIP's 50% damage criteria. An ICC claim will not be paid if the damage is less than 50% of the market value, even if the local ordinance declares the building substantially damaged. Communities receiving credit for lower substantial improvement thresholds need to be aware that there may be times when their higher regulatory standard will not trigger an ICC claim payment for their residents.

The following conditions must be met for a repetitively damaged building to be eligible for an ICC claim payment: A building is eligible for an ICC claim payment if it is in a Special Flood Hazard Area and is a repetitive loss structure and is subject to a community floodplain management ordinance. Two conditions must be met for an ICC claim to be paid under the SFIP for a repetitive loss structure:

1. The state or community must have adopted and be currently enforcing a repetitive loss provision or a cumulative substantial damage provision requiring action by the property owner to comply with the community's floodplain management ordinance, and
2. The building must have a history of NFIP claim payments that satisfies the statute's definition of “repetitive loss structure”. A repetitive loss structure means “a building covered by a contract for flood insurance that has incurred flood-related damage on 2 occasions during a 10-year period ending on the date of the event for which a second claim is made, in which the cost of repairing the flood damage, on the average, equaled or exceeded 25% of the market value of the building at the time of each such flood event.” *Note that this statutory ICC definition is not the same as the CRS definition of a repetitive loss property.*

The date on which the first loss occurred, even if the loss occurred before June 1, 1997, is immaterial to eligibility for an ICC claim payment, as long as the state or community enforced a repetitive loss or cumulative substantial damage requirement on the building and the insured building satisfies the definition of the “repetitive loss structure” defined above.

CRS NOTE: Communities receiving CSI credit for a “cumulative substantial improvement” regulation must be aware that there may be instances in which the community's criteria may require compliance with its floodplain management ordinance, but the building may not qualify for an ICC claim payment (e.g., if a building is damaged three times, with each flood averaging 20% damage).

Source: DHS – FEMA CRS Coordinator's Manual, 2002

8.2.3 Critical Facilities Regulations

Current Minimum Standard – The NFIP regulations only require elevation of structures located in SFHAs to the BFE, regardless of the function they serve. Facilities belonging to agencies of the Federal Government are subject to Executive Order 11988, which requires rigorous alternative site evaluations before funding, leasing, or building any facility in the 1% annual chance (100-year) floodplain. The guidelines for implementing Executive Order 11988 set the 0.2 % annual chance (500-year) flood as the standard for protecting “critical actions.”

Background of the Higher Standard – Many public and commercial facilities serve vital functions for communities, which, if interrupted due to flooding, would severely impact citizens. Also, some facilities house large numbers of people who would experience difficulty if required to evacuate before or during a severe flood. Special consideration should be given to requiring a higher level of protection from flooding for such facilities.

Since flooding can prevent access to a critical facility even if the facility is elevated or floodproofed above the flood level, primary consideration should be given to locating critical facilities where the risk of flooding is minimal.

Statistically, a facility located in a SFHA stands a 26% chance of experiencing the 1% annual chance (100-year) flood in a 30-year period. On the other hand, a facility located outside a 0.2% annual chance (500-year) floodplain (i.e., in a C Zone or “unshaded X Zone” as shown on the FIRM) stands less than a 6% chance of being flooded over a 30-year period.

The critical facilities identified for the unincorporated areas of San Diego County include 3 hospitals and other health care facilities; 117 emergency operations facilities, fire stations, and police stations; 194 schools, 3,732 hazardous material sites, 37 airport facilities, 344 bridges, 2 bus facilities, 166 rail facilities, and 827 highways; utility systems that include 3 electric power facilities, natural gas facilities, crude and refined oil facilities, 1 potable and waste water facility, and 312 communications facilities and utilities; 3 dams, 8 government office/civic centers, jails, prisons, military facilities, religious facilities, and post offices²³.

Recommendation

The County could prohibit siting of critical facilities in areas subject to flooding by the 1% annual chance flood (SFHAs) and should discourage siting of critical facilities in areas subject to flooding by the 0.2% annual chance (500-year recurrence interval) flood.

If no feasible alternative site is available for a newly constructed facility, or if an existing critical facility located in a SFHA or 0.2% annual chance (500-year) floodplain is substantially damaged or improved, it should be elevated to at least the 200-year flood elevation and be accessible by road during the 200-year flood event.

²³ Numbers as obtained from HAZUS

If a proposed critical facility site is in or near a SFHA for which water surface elevations have not been determined, a flood study should be performed to determine this information before the facility is sited.

If locating critical facilities outside of 0.2% annual chance (500-year) or even 1% annual chance (100-year) floodplains is not an option, elevation to the level of the 200-year provides an additional level of protection. For some facilities, floodproofing to the same elevation will provide a similar level of protection. However, since all-weather access is generally necessary either to maintain operations or to evacuate the occupants, it will be necessary to provide an elevated access road to facilities located inside the 1% annual chance (100-year) floodplain. When evaluating where to locate a critical facility, the additional cost to elevate or floodproof and to provide all-weather access if the facility is located in a floodplain should be fully considered.

The County should consider requiring that the following categories of facilities be subject to these requirements:

- Emergency response facilities, including rescue/emergency medical services, police departments, fire departments, hospitals, health clinics, emergency shelters, emergency management operations, and communication facilities.
- Facilities housing vulnerable occupants, such as nursing homes, prisons, jails, centers and group homes for the mentally and physically handicapped, and day-care centers.
- Public utilities, including power generating plants and transfer stations, public water supply plants, solid waste incinerators and waste transfer stations, and wastewater treatment plants.
- Facilities housing irreplaceable public documents, such as libraries, museums, courthouses, colleges, and schools.
- Hazardous material facilities, such as liquid and gas fuel tanks, petrochemical facilities, chemical manufacturing and storage facilities, research laboratories testing infectious biological agents, explosive manufacturing and warehousing, toxic waste facilities, and landfills.

Benefits – Adoption of this higher standard may prevent loss of life and property during flood events by ensuring that services provided by critical facilities are not interrupted during and after major flood events. In addition, adoption of the standard will provide CRS credit points as a 430 Series activity. Communities that prohibit siting critical facilities in the 0.2% annual chance (500-year) floodplain receive 100 CRS credit points; communities that only require protection from damage (i.e., elevation or floodproofing) and loss of access as a result of the 0.2% annual chance (500-year) flood or the flood of record, whichever is higher, receive 50 CRS credit points.

Cost Impacts – Restricting critical facility sites to locations outside of SFHAs and 0.2% annual chance (500-year) floodplains may increase costs if land prices are higher in non-floodprone areas. Requiring elevation or floodproofing and all-weather access for new and substantially improved structures built in SFHAs and 0.2% annual chance (500-year) floodplains may significantly increase facility costs.

9.0 PROPERTY PROTECTION

Property protection measures are used to modify buildings or other facilities subject to flood damage rather than to keep floodwaters away. Often they are implemented by (or cost-shared with) property owners. There are a variety of flood protection measures that can be implemented to protect individual buildings from flooding, as discussed in the sections below:

- | | |
|--------------------------------|---------------------|
| 9.1 Acquisition and Demolition | 9.4 Floodproofing |
| 9.2 Acquisition and Relocation | 9.5 Flood insurance |
| 9.3 Building Elevation | |

9.1 ACQUISITION AND DEMOLITION

A local government can buy land outright, referred to as acquiring a property “in fee simple.” This method of acquisition provides a local government with the greatest level of control over the use and disposition of a parcel.

Fee simple acquisition can be used to meet several community objectives at once. One example would be the purchase of properties to ensure recreational access and reduce hazard risk. Acquisition can also be used where general land-use regulations are not sufficient or where environmental objectives are sought. Acquiring properties in the floodplain and converting them to open space can restore the natural function of the floodplain or wetlands. Similar gains can be made if parks and recreation areas replace flood-prone buildings.

9.1.1 Implementation Policies

1. The power of acquisition can be a useful tool for pursuing mitigation goals. The County may find the most effective method for completely hazard-proofing a particular piece of property is to remove it from the private market, thereby eliminating or reducing the possibility of inappropriate development. Given its cost, this technique should be used only for property in the most hazardous areas, where property and life is subject to repeated damage or extreme risk.
2. Acquisition, followed by demolition, is most appropriate for buildings that are too expensive to move – such as larger, slab foundation, or masonry structures – and for dilapidated structures that are not worth protecting.
3. Properties subject to repeated damage or extreme risk should not be returned to the marketplace.
4. The County should consider acquisition opportunities where it may not need to pay full price for damaged structures acquired in the wake of a disaster. Sometimes a property can be purchased for the difference in value between its full price and payments already made to the landowner, such as insurance settlements and Small Business Administration loans.
5. Checkerboard purchases should be avoided whenever possible since dispersed properties are more costly and difficult to maintain.

9.1.2 Acquisition Disadvantages

Fee-simple purchase is usually the most expensive method of land acquisition. In addition to the cost of buying the property, a local government must delete the property from its property tax rolls and assume its maintenance costs.

9.1.3 Acquisition Advantages

Acquisition ensures that buildings in a flood-prone area will cease to be subject to damage. Acquisition is undertaken by a government agency, so the cost is generally not borne by the property owner, and the land is converted to public use, such as a park. Acquiring and clearing buildings from the floodplain is not only the best flood protection measure available, it is also a way to convert a problem area into a community asset and obtain environmental benefits.

9.1.4 Recommendations

The County should develop a post-disaster recovery program that establishes policies and procedures that will be used to administer acquisition and demolition grants. Priority for the allocation of these funds should go first to acquire and demolish the most severe repetitive loss buildings in the highest flood hazard areas. The second priority should be buildings that suffer substantial damage and are in high hazard areas. The policy should identify the criteria to be used to determine the remaining priority categories for the use of these funds.

Some grant programs require a reuse plan for the vacant land to be submitted with the grant application. Programs like FEMA's Hazard Mitigation Grant Program require flood-prone land acquired through the grant program to remain as open space. The County should consider how these acquisitions can assist in achieving other County objectives such as additions to parks, expanding natural areas, and developing walking trails.

9.2 ACQUISITION AND RELOCATION

Moving a building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost goes up for heavier or rigid structures, such as those made of brick, and for large or irregularly shaped buildings.

Mobile homes and manufactured housing have been shown to be highly vulnerable to floods and should not be located in the floodplain. Where such housing can be relocated, this step should be taken.

9.2.1 Implementation Policies

Issues that need to be addressed in the planning stage include: cost-benefit comparisons of relocating structures intact or rebuilding, and whether buildings can be relocated on the same property or if new property must be acquired.

While acquisition and relocation work against any type of flood hazard, it is more cost-effective in areas subject to flash flooding, deep waters, or other severe flood hazards where other property protection measures are not feasible. They are also often justified for properties that repetitively flood, are substantially damaged, and/or where the occupants are kept out of the building for extended periods.

Relocation is also preferred for large lots with portions outside the floodplain or where the owner has a new flood-free lot available.

9.2.2 Acquisition and Relocation Disadvantages

The costs of a new lot, a new foundation, new utility connections, landscaping, moving fees, and mitigation of the former site (including the removal of foundations, utility connections, concrete, and asphalt) may outweigh the value of the structure. Adding to these costs is the fact that prices for lots outside the floodplain are often more expensive.

In addition to the cost of buying the building lot, the local government must delete the property from its property tax rolls and assume its maintenance costs.

9.2.3 Acquisition and Relocation Advantages

Relocation allows the County to remove a building from a hazard area, place it on a safer site, and keep the building on the property tax rolls. The vacant lot may be converted to public use, such as a park. Like acquisition and demolition projects, acquiring and relocating buildings from the floodplain or other hazard areas is one of the most effective protection measures available; it is also a way to convert a problem area into a community asset and obtain environmental benefits.

9.2.4 Recommendations

The County should develop a post-disaster recovery program that establishes policies and procedures that will be used to administer acquisition and relocation grants. Priority for the allocation of these funds should go first to acquire and demolish the most severe repetitive loss buildings in the highest flood hazard areas. The second priority should be buildings that suffer substantial damage and are in high hazard areas. The policy should identify the criteria to be used to determine the remaining priority categories for the use of these funds.

9.3 BUILDING ELEVATION

Raising a house above the flood level is the best property protection method short of getting the building entirely out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Another alternative is to raise the building and place fill under it before the building is lowered back down, although sometimes buildings on fill look safe and people may feel encouraged to stay in them during a flood.

Elevating a structure will change its appearance. If the house is raised two feet, the front door would be three steps higher than before. If the house is raised eight feet, codes will usually allow the lower area to be wet floodproofed for use as a garage and for limited storage of items not subject to flood damage.

Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. When the property owner wants to stay in the floodplain, this protection technique is required by law for new and substantially damaged residences if the lowest floor is below the base flood elevation. Building elevation is commonly practiced in flood-prone areas nationwide, and house-moving contractors know the necessary techniques.

9.3.1 Implementation Policies

FEMA has developed a set of criteria that may be used to evaluate whether a building can be elevated. The building must be accessible below the first floor for placement of jacks and beams, it must be light enough to be lifted, and it must be strong enough to survive the elevation process.

Elevation of a building increases its vulnerability to high winds and earthquakes. Thus, there is a need to incorporate wind and seismic protection measures to ensure that the flood protection project does not increase the building's vulnerability to other hazards.

9.3.2 Elevation Disadvantages

Some think regulatory restrictions, such as the Americans with Disabilities Act (ADA), pose a problem for elevating structures. However, the regulatory requirements of the Americans with Disabilities Act and historic preservation programs do not affect single-family homes.

9.3.3 Elevation Advantages

Elevation is one of the best techniques for protecting buildings that are, or for some reason must be, located in areas prone to flooding. Elevation is cheaper than relocation and is less disruptive to the neighborhood.

Where funds are not available to elevate a building, one less expensive way to reduce flood damage is to elevate only a structure's heating, ventilating, and cooling (HVAC) equipment, such as furnaces and hot water heaters. This equipment can often be moved to an upper floor or attic. However, relocating HVAC systems is likely to involve plumbing and electrical changes. A less desirable method of floodproofing this equipment is to build a concrete or masonry block floodwall around it in its existing location. This kind of floodwall must be strong enough and high enough to protect the equipment.

Electrical system components, including service panels (fuse and circuit breaker boxes), meters, switches, and outlets should also be elevated at least 1 foot above the base flood level. These components suffer water damage easily and could short and cause fires. Elevating electrical and mechanical equipment should allow buildings to recover more quickly and less expensively.

9.3.4 Recommendations

The County should develop a post-disaster recovery program that establishes policies and procedures that will be used to administer elevation grants. Priority for the allocation of these funds should go first to elevate the most severe repetitive loss buildings in the highest flood hazard areas. The second priority should be buildings that suffer substantial damage and are in high hazard areas. The policy should identify the criteria to be used to determine the remaining priority categories for the use of these funds.

9.4 FLOODPROOFING

If a building cannot be removed from harm's way, it can be protected on site. In areas of low flood threat, such as infrequent shallow flooding, barriers, and dry and wet floodproofing, can be efficient approaches. These approaches can also be less disruptive to a neighborhood. However, floodproofing a residential building does not qualify for an insurance premium reduction and is not allowed if the project is a substantial improvement or repair of substantial damage.

Dry floodproofing: Through dry floodproofing, a building on a slab foundation is sealed against floodwaters. All areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows, sewer lines, and vents, are closed, either permanently with removable shields or with sandbags.

The flood protection level should be no more than 2 or 3 feet above the top of the slab because the building's walls and floors may not withstand the pressure of deeper water. If a nonresidential building is dry floodproofed to one foot above the base flood elevation, there is a flood insurance rate reduction.

Wet floodproofing: This term means intentionally letting floodwaters into an area, but modifying the area to eliminate or minimize water damage. Wet floodproofing techniques can be as simple as moving a few valuable items or as involved as rebuilding the floodable area.

This is the preferred approach for crawlspaces and garages. If damageable items, such as furnaces, air conditioning units, and ductwork, are removed or elevated above the flood level, a crawlspace can be flooded and be damage free.

For other areas, wet floodproofing is usually considered a measure of last resort, because the modifications needed severely limit use of an inhabited area.

9.4.1 Floodproofing Implementation Policies

Barriers or dry floodproofing are more appropriate for buildings on slab foundations subject to shallow flooding and local drainage problems. There are several commercial buildings in the County that could benefit from these approaches. However, for this approach to be effective the property owners must receive adequate warning of an upcoming flood event.

9.4.2 Floodproofing Disadvantages

Floodproofed buildings in the flood zone are still subject to damage from floating debris and may not provide shelter during flood events. Floodproofing a residential building does not qualify for an insurance premium reduction.

Dry floodproofing cannot extend more than two or three feet above the foundation of the building because the pressure exerted by deeper water would collapse most walls and floors.

It must be remembered that during a flood, the building may be isolated and without utilities, and, therefore, unusable. The streets, utilities, and other infrastructure that serve the property will still be exposed to flood damage. This is also a risk to the occupants who may try to get in and out of the building during a flood.

9.4.3 Floodproofing Advantages

Although floodproofing raises construction retrofit costs, it is an effective mitigation tool and provides a high level of protection from water damage. Simply moving utilities, contents, and electrical appliances out of the flood-prone area can prevent thousands of dollars in damage.

9.4.4 Recommendations

Due to its disadvantages, floodproofing should be used as a last resort.

9.5 FLOOD INSURANCE

The requirement for non-compliant buildings to achieve compliance after substantial damage is sustained has been part of the NFIP regulations since 1974. Standard NFIP flood insurance policies issued or renewed since May 1997 include coverage called “Increased Cost of Compliance” (ICC) This coverage is intended to help bear at least a substantial part of the cost of bringing a flood damaged building into compliance with the flood resistant provisions of the community’s codes and regulations.

Most buildings insured under the NFIP that are declared “substantially damaged” by the community will qualify for an additional insurance claim payment of up to an amount stated in the flood insurance policy. This additional claim payment may also be used as part of the non-federal cost-share for certain federally funded flood mitigation grants.

ICC claim payments may also be available for insured buildings that sustain “repetitive flood losses,” but only if the community has adopted a specific cumulative substantial damage provision that either meets or exceeds the definition in the standard flood insurance policy.

If eligible, a flood insurance policyholder can collect up to \$30,000 to help cover the cost of bringing their home or business into compliance with floodplain management ordinances. For a policyholder to be eligible to file for ICC the County’s floodplain administrator must determine one of the following:

- The property is "substantially damaged." This means the cost to repair the flooded building is 50% or more of its pre-disaster market value.
- The property sustained "repetitive damage." This term applies to homes or businesses that were damaged by flooding twice in the past 10 years, where the cost of repairing the flood damage, on average, equaled or exceeded 25% of the property market value at the time of each flood. Also, there must have been flood insurance claim payments for each of the two flood losses. To access the ICC flood policy benefit using this provision, the County's floodplain management ordinance must have a repetitive loss provision.

To help property owners comply with these provisions in the County's building codes and floodplain ordinances, ICC can be used to help pay for any of these mitigation solutions:

- Elevating above the flood protection level required by the County code.
- Relocating to a new site.
- Demolishing the building.
- Floodproofing (non-residential properties only).

Recommendation

The County should undertake a study to see how many property owners would potentially benefit from the addition of a repetitive loss provision in the floodplain management ordinance.

10.0 NATURAL RESOURCE PROTECTION

Preserving or restoring natural areas or the natural functions of floodplain and watershed areas produces flood loss reduction benefits as well as improves water quality and habitats. These activities are usually implemented by parks, recreation, or conservation agencies or organizations. In addition to the four measures listed here, other measures such as zoning and preservation of open space (discussed in Section 8) can protect natural resources.

The natural resource protection measures discussed in the sections below are:

10.1 Wetland protection

10.3 Best management practices

10.2 Erosion and sediment control

10.4 Dumping regulations

10.1 WETLANDS PROTECTION

Wetlands are often found in floodplains or depression areas in the watershed. Many can store large amounts of floodwaters, slowing and reducing downstream flows. They also filter water and provide habitats for fish and wildlife. Most development projects in wetlands are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. USACE "404" permits are required for projects that will place fill or dredged materials in a wetland. Before a permit is issued, the plans are reviewed by several agencies, including the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency.

Generally, these agencies want to protect wetlands by preventing development that will adversely affect them. However, sometimes the negative impact can be mitigated by preserving or developing an equivalent or larger wetland on another site, although it takes many years for a new wetland to approach the same quality as an existing one and many never do. Another drawback is that a new wetland in a different location (especially if it is in a different drainage basin) will not have the same flood protection benefits as the original one did.

Implementation in the County of San Diego:

Multiple Species Conservation Program Land Acquisition. The County's Multiple Species Conservation Program (MSCP) is the result of six years of intense planning and review by a diverse group of private conservationists and property owners as well as a number of public agencies, including the U. S. Fish and Wildlife Service and the California Department of Fish and Game (Wildlife Agencies). The County of San Diego entered into an Implementing Agreement with the Wildlife Agencies for the MSCP on March 17, 1998.

The goals of the MSCP are to maintain and enhance biological diversity in the region; to maintain viable populations of endangered, threatened, and key sensitive species and their habitats; and to promote regional economic viability through streamlining the land use permit process, which is also a significant benefit to landowners.

The first properties acquired under the County-approved portion of the MSCP were the Ham and Yunis properties in the Lakeside Archipelago area in January 1999. The two properties totaled nearly 60 acres. County-approved MSCP properties now total more than 4,500 acres in various parts of the County. Of the \$39.0 million spent on the acquisitions, \$24.0 million came from federal and state grants. The remaining \$15.0 million came from the County's General Fund. The Fiscal Year 2006-07 Capital Program includes \$5.0 million for potential land acquisitions.

Stormwater Management and Discharge Control Ordinance. The "County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance" requires measures to control flow rates and velocities so that flows and flow patterns do not disrupt downstream wetlands or riparian habitats. Diversion of runoff to regional facilities is not allowed if it will deprive immediate downstream habitats of the minimum flows and /or over-bank flow events they need.

10.2 EROSION AND SEDIMENT CONTROL

Because construction sites are usually bare, stormwater runoff can erode soil, sending sediment into downstream waterways. Sediment tends to settle where a river or stream slows down, such as when it enters a lake. Sedimentation will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters. This affects channel capacity and the sediment in the water reduces light, oxygen and water quality, which affects water supply treatment, habitat and fishing.

Implementation in the County of San Diego:

The "County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance" requires a Stormwater Pollution Prevention Plan submitted to the County to describe the Best Management Practices (BMPs) to be implemented to prevent soil particles from detaching and becoming transported in the storm water runoff.

Soil stabilization BMPs protect the soil surface by covering and/or binding the soil particles. BMPs must be deployed in a sequence to follow the progress of grading and construction. As the locations of soil disturbance change, erosion and sedimentation controls must be adjusted accordingly to control storm water runoff at the downgrade perimeter and drain inlets.

Sufficient soil stabilization materials may be required to be maintained on-site to allow deployment before the onset of rain.

10.3 BEST MANAGEMENT PRACTICES

Point source pollutants come from clearly identified locations such as the outfall of a municipal wastewater treatment plant. Nonpoint source pollutants come from non-specific locations. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, and other farm chemicals; animal wastes; oils from street surfaces and industrial areas; and sediment from agriculture, construction, mining, and forestry.

BMPs are measures that reduce nonpoint source pollutants that enter the waterways. Unlike erosion and sediment controls, which focus on problems created during construction, BMPs can also be implemented as part of a project's design to permanently address nonpoint source pollutants.

There are two general categories of BMPs:

1. Those that prevent runoff that conveys excessive sediment and other water-borne pollutants, such as planting proper vegetation and conservation tillage, and
2. Those that stop pollutants after they are en-route to a stream, such as grass drainage ways that filter the water, and retention and detention basins that let pollutants settle to the bottom before they are drained.

Implementation in the County of San Diego:

Federal regulations for controlling discharges of pollutants from municipal separate storm drain systems, construction sites, and industrial activities, were brought under the National Pollutant Discharge Elimination System (NPDES) permit process by the 1987 amendments to the Clean Water Act (CWA) and the subsequent 1990 promulgation of federal storm water regulations issued by the U.S. Environmental Protection Agency (EPA). The EPA regulations require municipal and industrial storm water discharges to comply with an NPDES permit. In California, the EPA delegated authority to issue NPDES permits to the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs).

In the County of San Diego, these requirements are met, in part, through the process of preparing a Storm Water Pollution Prevention Plan (SWPPP) for development projects. The SWPPP is required under the "County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance (WPO)." A SWPPP submitted to the County must describe the BMPs to be implemented and other steps to be taken by the discharger to meet the requirements of the ordinance.

All new development and significant redevelopment projects that fall into one of the priority project categories set out in the Municipal Permit are subject to the Standard Urban Storm Water Mitigation Plan (SUSMP) requirements in the WPO.

The County's programs for managing its own facilities and activities, including its capital improvement projects, are set out in the County's Jurisdictional Urban Runoff Management Plan (JURMP). JURMP requirements that parallel County regulatory requirements for private projects and activities are mandatory for County projects and activities.

The purposes of this SUSMP and the procedures and requirements it contains are:

1. To identify potential stormwater quality impacts from land development, and to develop and evaluate options to avoid, reduce, or minimize the potential for stormwater quality impacts where practical;
2. To provide design guidance on effective structural and non-structural BMPs for development sites and County capital improvement projects;
3. To ensure the long-term performance of these BMPs;
4. To ensure that BMPs put in place at land development projects and capital improvement projects meet or exceed applicable regulatory requirements; and
5. To fulfill the state requirement that the County adopt a SUSMP for imposing specific additional regulatory requirements on "Priority Development Projects."

This SUSMP is intended for use on both large and small projects processed through the County's Department of Planning and Land Use (DPLU) or through the Department of Public Works (DPW) Land Development section. It is not limited to Priority Development Projects, but distinguishes those projects from other development projects.

The SUSMP is mandated only for significant new development and significant redevelopment projects ("Priority Development Projects" or "Priority Projects" as defined in the Municipal Permit). The County program tracks these definitions exactly.

For priority projects, the Municipal Permit mandates that the County require the capture and the treatment or infiltration of a certain volume or flow of stormwater from defined storm events.

The devices put in place to achieve this are referred to as Structural Treatment BMPs. Numeric sizing criteria define how much water must be managed in this way.

Priority project categories are:

- Residential development of 10 or more units
- Commercial developments with a land area for development of greater than 1 acre
- Heavy industry with land area for development of greater than 1 acre
- Automotive repair shops
- Restaurants, where the land area for development is greater than 5,000 square feet
- Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface
- Projects within or adjacent to an Environmentally Sensitive Area
- Parking lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff
- Streets, roads, highways, and freeways that would create a new paved surface that is 5,000 square feet or greater.
- Retail gasoline outlets

10.4. DUMPING REGULATIONS

Floodplain regulations and building codes control major development projects. However, debris can be accidentally or intentionally dumped into the channels or wetlands, obstructing even low flows and reducing their ability to retain or clean stormwater.

Dumping regulations are one approach to preventing intentional placement of trash or debris in channels and other water bodies. Many cities and counties have nuisance ordinances that prohibit dumping garbage or other “objectionable waste” on public or private property. Some prohibit the discharge of polluted waters into natural outlets or storm drains. Waterway dumping regulations need to also apply to “non-objectionable” materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard not realizing that it is needed to drain street runoff. Similarly, they may not understand how regrading their yard, or discarding leaves or branches in a watercourse can cause a problem. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Regular inspections to catch violations also should be scheduled. Finding dumped materials is easy; locating the source of the refuse is hard. Usually the owner of property adjacent to a stream is responsible for keeping the stream clean. This may not be fair for sites near bridges and other public access points.

Implementation in the County of San Diego:

Throwing, depositing, leaving, abandoning, maintaining, or keeping materials or wastes on public or private lands in a manner and location where they may enter the drainage system is prohibited under County regulations.

11.0 STRUCTURAL MEASURES

Structural flood control projects are used to prevent floodwaters from reaching properties. These measures are “structural” because they involve construction of structures to control water flows. They can be grouped under the following four measures, as discussed below:

11.1 Levees/floodwalls

11.3 Retention ponds

11.2 Drainage Facilities

11.4 Channel and basin maintenance

11.1 LEVEES/FLOODWALLS

A barrier of earth (*levee*) or steel or concrete (*floodwall*) can be erected between the watercourse and the property to provide flood protection. Levees require considerable room between the river and the area to be protected. If space is a constraint, more expensive floodwalls are used.

Levees and floodwalls should be set back out of the floodway so they will not push floodwater onto other properties. Their design also should compensate for the flood storage that they will displace and for access through or over the barrier.

Current Practice in the County of San Diego:

No levees in the unincorporated area of the County have been recognized by FEMA in the current Flood Insurance Study.

11.2 DRAINAGE FACILITIES

Drainage facilities include constructed ditches and culverts that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive. Particularly appropriate for depressions and low spots that will not drain naturally, drainage and storm pipe projects usually carry the runoff from smaller, more frequent storms.

Storm pipe improvements include installing new storm drains, enlarging small pipes, improving streets, and preventing back flow.

Current Practice in the County of San Diego:

The following are some of the recent projects that have been undertaken within the County to reduce flood hazards including:

- A reinforced concrete trapezoidal channel has been constructed on Broadway Creek from just west of Victor Street to Oro Street.
- An improved flood control channel for Escondido Creek was constructed from 1,300 feet upstream of Rose Street to 1,300 feet upstream of Harmony Grove Road. This channel has the capacity to contain the base (1% annual chance) flood.
- As part of the Interstate-15 bridge crossing over the San Luis Rey River, the California Department of Transportation lined the river with 2,000 feet of riprap for bank protection.

- Central Avenue Project. Central Avenue has a history of flooding problems during moderate and large storm events. Approximately 46 homes would be inundated or would sustain flood damage during the base flood. Hydraulic analysis of the existing triple reinforced concrete box under Central Avenue indicates that it can convey peak runoff from a 5-year to 10-year return frequency storm. Hydraulic calculations indicate that the runoff from a 1% annual chance storm generates a flow rate of approximately 3,650 cubic feet per second in the existing channel between Central Avenue and Dawsonia.

The Central Avenue project is under construction and will be finished in the fall of 2007. The flood control improvements will upgrade the existing drainage facilities and alleviate flooding up to and including a 1% annual chance runoff event in the vicinity of Central Avenue.

- Mooses Canyon Creek. For floodplain management purposes, the County has identified the floodplain for the lower 4 miles of Mooses Canyon Creek as an erosion/sedimentation hazard area. The County may require special studies be performed before development is allowed in this area.

11.3 DETENTION PONDS

Detaining or detention ponds are basins designed to catch surface runoff and prevent its flow directly into a stream or river.

Detention ponds are a relatively inexpensive way to prevent localized flooding provided that ample undeveloped land is available, and they have the added advantage of not altering the character of the streams they protect. These ponds can act as groundwater recharge sites and reduce water pollution through soil filtering.

Current Practice in the County of San Diego:

The purpose of the "County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance" is to protect water resources and to improve water quality. Best Management Practices in the County also include but are not limited to treatment practices, operating procedures, and practices to control site runoff.

Two of the methods used to achieve these objectives within the County are detention and retention ponds. "Detention" means the temporary storage of storm runoff in a manner that controls peak discharge rates and provides some gravity settling of pollutants. "Retention" ponds, basins, or surface impoundments confine stormwater to the site.

Regulatory Inspections. Authorized Enforcement Officials and Authorized Enforcement Staff may inspect facilities, activities, and residences subject to the Ordinance at reasonable times and in a reasonable manner to carry out the purposes of the Ordinance. If entry for a regulatory inspection is refused by the facility owner or operator, or by the occupant of a residence, an inspection warrant shall be obtained prior to inspection.

Access Easements. When any new structural BMP is installed on private property as part of a project that requires a County permit in order to comply with the Ordinance, the property owner shall grant to the County an easement to enter the property at reasonable times and in a reasonable manner to ensure that the BMP is working properly. This includes the right to enter the property without prior notice once per year for routine inspections, to enter as needed for

additional inspections when the County has a reasonable basis to believe that the BMP is not working properly, to enter for any needed follow-up inspections, and to enter when necessary for abatement of a nuisance or correction of a violation of the Ordinance.

Scope of Inspections. Inspections may include all actions necessary to determine whether any Illegal Discharges or Illicit Connections exist, whether the BMPs installed and implemented are adequate to comply with this Ordinance, whether those BMPs are being properly maintained, and whether the facility or activity complies with the other requirements of the Ordinance. This may include but may not be limited to sampling, metering, visual inspections, and records review.

11.4 CHANNEL AND BASIN MAINTENANCE

Clogged or broken drainage systems can seriously impair stormwater management efforts. Flood channels, storm drains, detaining ponds, and erosion basins can become blocked by overgrowth, debris, sedimentation, or components that fail with age.

Channel and detention basin maintenance is an ongoing program to clean out blockages caused by overgrowth or debris. These activities normally do not affect the shape of the channel or basin, but they do affect how well they can perform.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard not realizing that it is needed to drain street runoff. They may not understand how regrading their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Individual actions can add up to big problems. Therefore, the County of San Diego drainage system maintenance program includes regulations that prevent dumping in or altering watercourses or storage basins.

Current Practice in the County of San Diego:

The County DPW conducts a physical inspection of its open drainage system. The inspectors visit each bridge or culvert crossing and note what action if any is needed to clear the crossing of debris. Inspectors also travel along the bank wherever possible, or obtain a line-of-sight view of the ditch between each crossing.

The results of the inspection are recorded on a daily inspection report sheet, called the Daily Diary. A work order is completed for each location requiring action. The work orders provide a brief description of the work required and list all equipment, employees, and the time spent to accomplish the work.

Experience has revealed that certain culverts are more likely to get obstructed by debris during a storm. These problem sites are inspected whenever heavy rains warrant an inspection or if reports of problems are received at the DPW.

The County also has an inspector dedicated to watercourse enforcement activities. The individual monitors County watersheds for illegal development in the SFHA such as un-permitted grading, filling, excavation, and storage of hazardous materials. Inspections are primarily done in response to complaints received by DPW.

11.5 RECOMMENDATIONS

1. Increase the number of road crew members available to maintain the drainage system so that inspections and maintenance can be completed on all system streams and ditches annually.
2. Complete drainage maintenance projects identified in Section 14, Repetitive Flood Losses.
3. Increase the staffing resources available for watercourse enforcement activities.

12.0 EMERGENCY MANAGEMENT

People at risk from disasters, whether natural or human in origin, can take actions that save lives, reduce losses, speed response, and reduce human suffering when they receive accurate warnings in a timely manner. Warnings are becoming much more useful to society as lead-time and reliability are improved and as society devises ways to respond effectively. For example, computers are being programmed to respond to warnings automatically, shutting down or appropriately modifying transportation systems, lifelines, manufacturing processes, and such. Effective dissemination of warnings provides a way to reduce disaster losses that have been increasing as people move into areas at risk and as our infrastructure becomes more complex and more valuable.

Effective warnings should reach, in a timely fashion, every person at risk who needs and wants to be warned, no matter what they are doing or where they are located. Such broad distribution means utilizing not only government-owned systems such as NOAA Weather Radio and local sirens, but all privately owned systems such as radio, television, pagers, telephones, the Internet, and printed media.

Emergency management measures that protect people during and after disasters are described in local emergency operations plans and Standard Operating Procedures (SOPs). These plans should cover the following four areas:

12.1 Flood Threat Recognition

12.3 Response and Mitigation Operations

12.2 Emergency Warning Dissemination

12.4 Post-disaster Recovery and Mitigation

12.1. FLOOD THREAT RECOGNITION

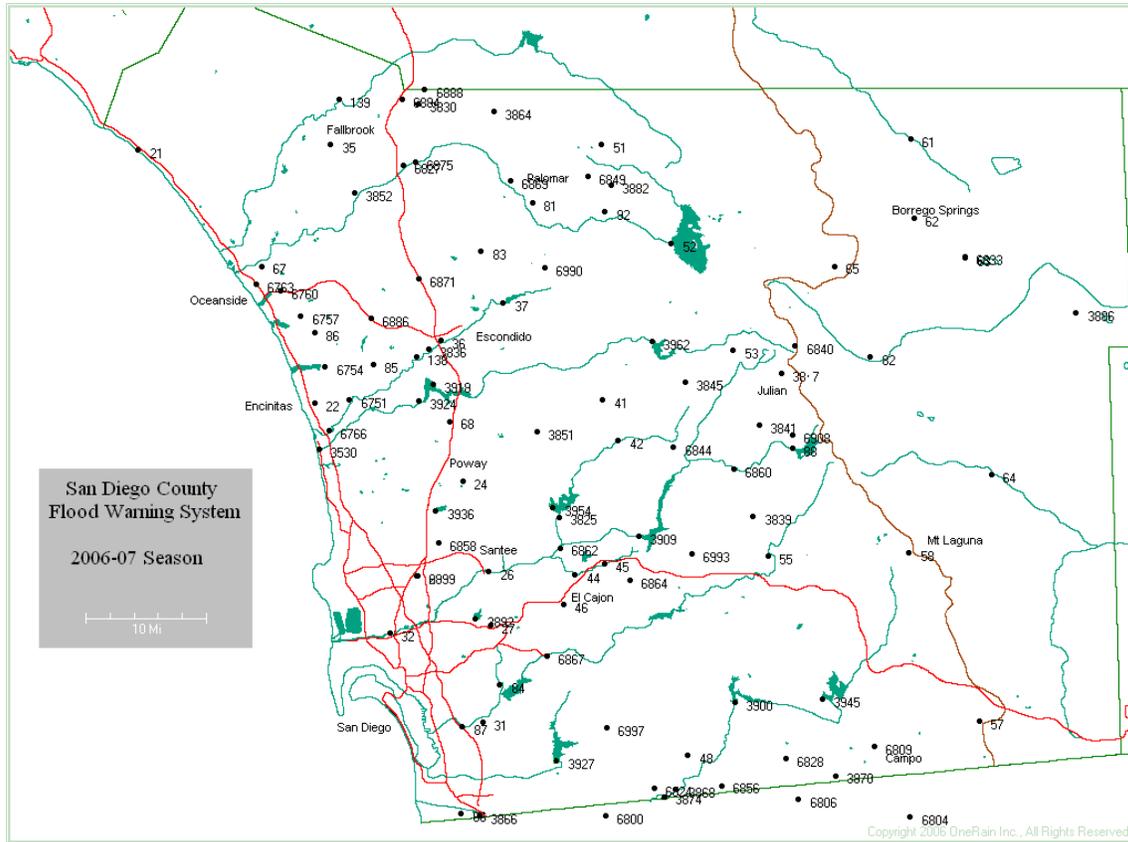
Hazard analysis is the basis for both mitigation efforts and Emergency Operations Plans (EOPs). From an emergency operations planning perspective, hazard analysis helps a planning team decide what hazards merit special attention, what actions must be planned for, and what resources are likely to be needed.

The first step in responding to a disaster is knowing that one is coming. Scientists are developing more accurate and more numerous warnings as they deploy better sensors to measure key variables, employ better dynamic models, and expand their understanding of the causes of disasters. Warnings can now be made months in advance, in the case of El Niño, to seconds in advance of the arrival of earthquake waves at some distance from the earthquake. The new NWS Doppler radar systems are providing the capability to diagnose the potential for severe thunderstorms, tornadoes, and flood-producing rainfall. As a result, warnings are becoming predictive in nature rather than reactive.

Local plans should describe how natural hazard threats are identified. The plan should include information on each of the hazards identified for the community. Of particular interest are the hazard's **frequency** of occurrence (both historical and predicted or probable, as available), **magnitude** and **intensity**, **location** (if the hazard is associated with a facility or landscape feature) and **spatial extent** (either around the known location of the hazard or as an estimate for non-localized hazards like tornadoes), **duration**, **seasonal pattern** (based on month-by-month historical occurrence), **speed of onset**, and **availability of warning**.

Implementation in the County of San Diego:

The ALERT Flood Warning System in San Diego County was established in 1982 in response to a series of damaging flood years that began in the mid 1970s, culminating in the floods of 1982/83. Known formally as Automatic Local Evaluation in Real-Time (ALERT), the County ALERT Flood Warning system currently consists of a base station (2 computers, 1 radio antenna, 1 radio receiver, and 1 ALERT decoder), 6 mountaintop radio repeaters, 1 desert radio repeater, and over 100 ALERT rain gage stations, which include 14 stream gages, 10 reservoir level sensors, and 13 weather stations.



12.2 EMERGENCY WARNING DISSEMINATION

Local disaster warnings are issued in conjunction with the NWS and can be administered in a number of ways, including via sirens, radio, television, cable TV, mobile public-address systems, telephone trees, and even door-to-door contact. Posted signs can be used to identify risks at a particular site. Multiple or redundant warning systems are most effective, as they ensure that a message will be received even if one part of the warning system is not heard.

The plan should describe the warning systems in place in the jurisdiction and the responsibilities and procedures for using them. All components of the system should be identified and the provisions that have been made to implement warnings should be described.

Implementation in the County of San Diego:

Notification methods include the Emergency Alert System, use of the local media through television and radio, Internet, and Reverse 9-1-1.

Real-time informational updates regarding evacuation routes, evacuation points, shelter capacities, and other essential information will be provided to evacuees en-route through emergency radio stations, 5-1-1 (Nationwide Travel Information), and Changeable Message Signs.

12.3 RESPONSE AND MITIGATION OPERATIONS

Warnings are effective only if they are accurate and result in appropriate action. Appropriate response to warning is most likely to occur when people have been educated about the hazard and have developed a plan of action well before the warning.

EOPs developed using the functional approach consist of a Basic Plan, functional annexes, and hazard-specific appendices. These are supplemented by the SOPs and checklists necessary for implementation of the EOP.

The Basic Plan is an overview of the jurisdiction's emergency response organization and policies. It should:

- Provide the legal authority for emergency operations
- Summarize the situations addressed by the EOP
- Explain the general concept of operations
- Assign responsibilities for emergency planning and operations
- Describe how people and property will be protected in emergencies and disasters
- Identify steps to address mitigation concerns during response activities

Implementation in the County of San Diego:

OES coordinates the overall County response to disasters. OES is responsible for alerting and notifying appropriate agencies when disaster strikes, coordinating all agencies that respond, ensuring resources are available and mobilized in times of disaster, developing plans and procedures for response to and recovery from disasters, and developing and providing preparedness materials for the public. OES staffs the Operational Area Emergency Operations Center (a central facility that provides regional coordinated emergency response) and also acts as staff to the Unified Disaster Council (UDC), a joint powers agreement between all 18 incorporated cities and the County of San Diego. The UDC provides for the coordination of plans and programs countywide to ensure protection of life and property.

The Evacuation Annex outlines strategies, procedures, recommendations, and organizational structures that can be used to implement a coordinated evacuation effort in the San Diego areas. In addition, the Annex provides general estimates on the number of residents within each jurisdiction of the area that may potentially be impacted by specific hazards and need to evacuate, the number of residents that may require sheltering or transportation assistance, and the estimated number of pets that may need to be accommodated in an evacuation effort to assist in decision-making processes. The Annex also provides hazard-specific considerations, general evacuation

transportation routes and capacities, county-wide shelter capacities, resources available locally and through mutual aid, and special needs considerations.

12.4 POST-DISASTER RECOVERY AND MITIGATION

After a disaster, communities should undertake activities that can prepare people and property for the next one. Measures implemented during recovery to keep people from immediately going “back to normal” (i.e., the same way they were before the disaster) include:

- Regulating reconstruction to ensure that it meets all code requirements, including the NFIP’s substantial damage regulations²⁴
- Public information to advise residents about mitigation measures they can incorporate into their reconstruction work
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs
- Acquiring substantially or repeatedly damaged properties from willing sellers
- Planning for long-term mitigation activities
- Applying for post-disaster mitigation funds

Requiring permits, making inspections, and enforcing the substantial damage regulations can be very difficult for local, understaffed offices after a disaster. If not done right, not only does a community miss a tremendous opportunity to redevelop or clear out a hazardous area, but also it may be violating its obligations to the NFIP.

Post-disaster reconstruction plans

A hazard mitigation plan specifies actions a community will take to reduce its vulnerability to natural hazards or to minimize the impact of a hazard event. Post-disaster reconstruction plans outline the policies or planning instruments that community officials will rely on for post-disaster decision-making. The two are often linked because the post-disaster window is considered an opportune time to make a community more disaster resilient.

Post-disaster mitigation planning allows for redevelopment in a less hazard-prone manner. Reconstruction plans should be designed to be in concert with the long-range goals of the community (as measured by the comprehensive plan). In particular, they should outline the rules and priorities for any post-disaster acquisition of damaged properties. Two typical targets are buildings that have suffered damage amounting to a certain percentage of their value or properties that lie within the hazard area. The degree of damage that would qualify a building for public acquisition should be identified in the plan, as should any other criteria for prioritizing purchases.

A reconstruction plan should also outline a post-disaster permitting process that facilitates repairs but remains steadfast to the need to mitigate against future disasters. One element of the plan should emphasize the need to obey the building code. One way to create time to assess the damage and plan for recovery is to institute a short-term building moratorium. Another is to do much of the planning in advance and create an overlay zone that is triggered by the hazard event.

²⁴ substantial damage regulations require that if the cost to repair the damage to a building exceeds 50% of the pre-damage market value of the building it must be brought up to current floodplain management standards.

Hazard mitigation and post-disaster plans allow for a substantial amount of decision-making to occur prior to a disaster event and aid in better decision-making after the event.

Moratorium

A moratorium is a short-term suspension of the right to develop, usually accomplished by not issuing permits. Moratoria can play an important role following a disaster. They give officials time to assess the damage and set priorities for response, planning, and mitigation efforts. They are often used to prevent property owners from repairing damaged structures before an acquisition program can go into effect. They can also allow officials to expand high-hazard designated areas to reflect the actual damages from a hazard event.

Since moratoria are frequently subject to legal and political challenges, the County must be prepared to show adequate justification for taking this action. With such justification, a moratorium is likely to withstand legal scrutiny.

12.5 RECOMMENDATIONS

- For maximum credit under the NFIP CRS, a community must have at least one stream gage for each major developed drainage basin or one gage every 10 square miles. The County of San Diego should establish an ongoing program to add new gages to its ALERT system each year.
- As new areas are included in the ALERT system, flow rating curves will be needed for an effective warning program. The County should expand its capability to develop flow rating curves and model streams so that flood warning stages can be established up and downstream of the gage sites.
- The ALERT system staff should be expanded so the County can undertake a more aggressive maintenance program for the existing and proposed gage network.
- The overall effectiveness of flood warning in the County of San Diego would be improved by the active participation of all municipalities in a countywide system.
- Flood response actions in the Emergency Operations Plan should be tied to flood stages. The resources needed to complete each of the major actions should be identified in the plan or in SOPs. The plan should also identify how these resources will be provided.
- The County should prepare an application for designation by the NWS as a StormReady community.
- The County should continue to develop public education campaigns and materials to improve preparedness and awareness; and cooperate with local educational institutions, hospitals, media outlets, and libraries in distributing these materials.
- The County should continue to conduct the awareness campaign with the trademark slogan "Preparedness Starts with You."
- Quarterly drills should be conducted to test Emergency Operations Center Activation procedures.
- Two exercises should be conducted annually (tabletop or functional) to test the County's Interoperable Communications plan.
- The County should develop emergency operations and mitigation plans for each critical facility. These plans should identify tasks to be implemented by the facilities, the amount of warning time needed to complete operational and mitigation tasks, and the resources necessary to complete their assigned missions.

13.0 PUBLIC INFORMATION

Strong community floodplain management programs emphasize outreach and education, as well as identifying and minimizing risk. The most effective programs reach the general public, decision makers, developers, and design professionals with messages that help them know the hazards, know how to protect themselves, and understand how their actions affect others.

The CRS highly encourages and rewards public information activities in the following areas:

13.1 Map Information

13.4 Library

13.2 Outreach Projects

13.5 Technical Assistance

13.3 Real Estate Disclosure

13.6 Education Programs

13.1 MAP INFORMATION

There are many benefits to providing map information to the public. Residents and businesses who are aware of the potential flooding hazards can take steps to avoid problems and/or reduce their existing exposure. Real estate agents and house hunters can find out if a property is flood-prone and whether flood insurance may be required.

Communities are the best source of map information because they can often supplement what is shown on the FIRM with maps that complement and clarify the FIRM and with information on additional hazards, flooding outside mapped areas, and zoning.



Current Practice in the County of San Diego: The County has the most recent FIRM available for review on line at http://www.sangis.org/sangis/IntMapping_main.htm as well as at the Department of Public Works (DPW)-Land Development Division Survey Records Counter. The County's on-line GIS noted above, SanGIS puts hazard information at the fingertips of community residents and stakeholders through an easy to use application. It allows users to determine their FIRM zone, dam inundation area information and other property information. FIRMs can also be viewed on FEMA's website: <http://msc.fema.gov>

The DPW-Land Development Division Survey Records Counter provides map information to inquirers and all builders, developers, or property owners seeking to develop or improve flood-prone property. When the property information is provided, County staff are available to explain flood insurance, property protection measures, and mitigation options that are available to property owners.

The County of San Diego believes providing map or FIRM information is a valuable public information service, which can be the first step to educating developers and residents of the risks, sound building practices, and how to protect themselves from flooding and other natural disasters.

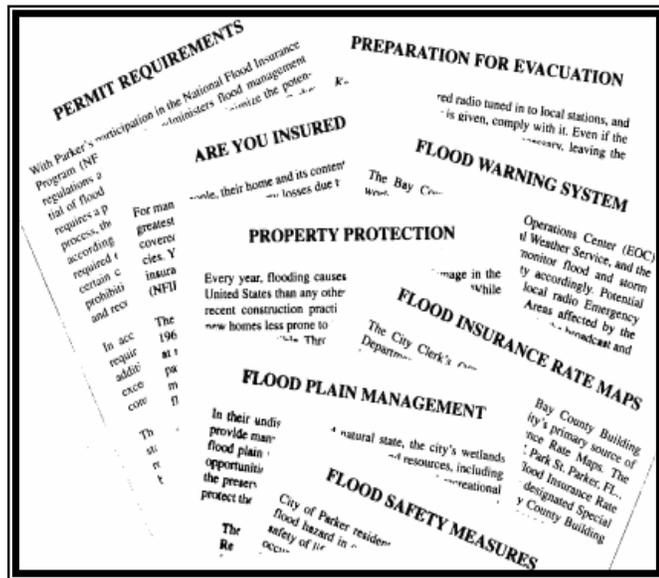
13.2 OUTREACH PROJECTS

Information can be presented in a number of ways, including pamphlets, brochures, and other literature; workshops; and radio and TV ads. Marking historical disasters, such as flood levels, in prominent places can be an effective way of increasing community awareness of natural hazards.

Important topics to cover with a general awareness program include: things to consider when purchasing a home or business, means of identifying hazards, and ways to limit exposure and reduce future property damages. Awareness programs that are specifically targeted at new home buyers should educate them on mitigation techniques and features to look for when considering the purchase of a home in a hazard area.

Both education and regulation are more effective when they are paired than when they stand alone. Planning could be considered a community awareness program, since participation in the planning process can help communities establish a feeling of “ownership” over mitigation measures. This, in turn, may help generate public support for mitigation.

Awareness and outreach programs should be targeted at people who are directly affected by mitigation activities, such as acquisition programs, to address their concerns and to explain the importance and consequences of these actions.



Outreach projects are a proactive approach to public information. They educate individual residents about various topics and are designed to encourage people to seek more detailed information in order to take action to protect property. They can cover a variety of topics, such as the flood hazard, flood insurance, mitigation measures, flood warning procedures, and local regulations.

Research has proven that outreach projects work. In addition to educating residents, they make local decision makers more aware of the hazards and ways to reduce their impact. However, awareness of the hazard is not enough. People need to be told what they can do about it; therefore, outreach projects should include information on property protection measures. Research has also shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Current Practice in the County of San Diego: The Office of Emergency Services has developed awareness campaigns designed to increase emergency preparedness at home, in the community, at work, and at school. OES' Emergency Survival Program (ESP) is an awareness campaign that highlights a different hazard each month and is designed to increase emergency preparedness. The monthly campaigns feature floods, landslides, tsunamis, earthquakes, and wildfires, just to name a few and include guidance on what to do before, during and after the event. In the summer of 2006, OES mailed its *Family Disaster Plan and Personal Survival Guide* to the 1.4 million residents in the County. The guide is an easy-to-use document that provides helpful tips for families and individuals. The following brochures are available on line and available widely throughout the County at community centers and libraries:

- Be Weather Wise
- Floods and Flash Floods
- Winter Driving Tips
- Sandbag Fact Sheet

Other measures that should be considered by the County:

- Mass mailings on flood hazards to all flood-prone residents and businesses
- Add a flood-focused component to the County's "National Preparedness Month" campaign which is launched each September
- Conduct presentations at meetings of civic and neighborhood groups
- Prepare displays or conduct special sales in home improvement stores
- Produce newspaper articles and special editions or sections that focus on natural hazards
- Produce radio and TV news releases and interview shows
- Prepare detailed property owner handbook tailored for local conditions

13.3 REAL ESTATE DISCLOSURE

Federally regulated lending institutions must advise mortgage or other loan applicants that the property is in a floodplain as shown on the FIRM. Because this requirement has to be met only ten days before closing, often the applicant is already committed to purchasing the property when he or she first learns of the flood hazard.

State laws and practices by local real estate boards can overcome this deficiency and advise newcomers about the hazard earlier. They may also require disclosure of past flooding or storm drain problems, regardless of whether the property is in a mapped floodplain.

In some areas, state or local real estate disclosure laws require that the buyer be notified if property is located in a hazard-prone area. Advocates argue that a better-informed marketplace should result in better decision-making: well-informed consumers will choose to avoid purchase in hazard areas, demand a lower price, or pursue mitigation actions after purchase. Some examples of the hazard conditions that may require disclosure include: settling from any cause; flooding, drainage, or grading problems; flood insurance requirements; and property or structural damage from fires, hurricanes, earthquakes, or floods.

Local practices by local real estate boards can make notification practices effective by requiring that newcomers be advised about hazard risks thoroughly and early in the home-buying process. Real estate boards may also require prospective homeowners to disclose past disaster events, regardless of whether the property is in a mapped high-risk zone.

Current Practice in the County of San Diego: California state law AB 920 requires disclosure of whether a property is in a floodplain or an area of potential flooding shown on a map as an area that will be inundated if a dam fails. The standard form notes that these hazards areas – Special Flood Hazard Areas, areas of potential flooding from a dam failure, wildland areas that may contain substantial forest fire risks and hazards, earthquake fault zones, and seismic hazard zones – may limit the buyers' ability to develop the real property, to obtain insurance, or to receive assistance after a disaster. Further, the seller or seller's agent has a duty to disclose material facts that she or he knows or reasonably should know.

At least one of the major local real estate firms operating in the County provides natural hazard look-up services via their website.

13.4 LIBRARY

The community library is an obvious place for residents to seek information on flooding, flood protection, and protecting natural resources. Libraries are usually the first place people turn to when they want to research a topic.

Libraries also have their own public information campaigns with displays, lectures, and other projects, which can augment the activities of the community.

Current Practice in the County of San Diego: The County maintains and updates an extensive catalog of floodplain management related publications in its library system. In addition to the Flood Insurance Study and Flood Insurance Rate Maps, the library collection has books and resources on flood damage prevention, including state, regional, and locally pertinent documents, as well as flood damage reduction publications in the Spanish language.

13.5 TECHNICAL ASSISTANCE

As identified in the public survey, several property owners have implemented property protection measures. Local governments can encourage and assist owners with identifying and implementing mitigation measures through technical assistance provided in one-on-one sessions with property owners. Community officials can provide advice and information on matters such as identifying flood hazards at the site, correcting local drainage problems, floodproofing, dealing with contractors, and funding.

Current Practice in the County of San Diego: The DPW has given and can give advice to inquirers on flood protection measures appropriate for the inquirer's situation. The DPW also makes site visits upon request to address local drainage problems.

13.6 EDUCATIONAL PROGRAMS

Several respondents to the mitigation questionnaire identified workshops and public meetings as the best way to provide information on actions citizens can take to protect their property. Workshops can play a valuable role in preparing communities for a disaster. These

workshops should include education regarding the potential hazards, possible mitigation steps that can be taken, and instructions on how to respond after a disaster occurs.

Specialized workshops are often aimed at those who will be implementing mitigation efforts, including members of the building and development industries.

Environmental education programs can teach children about flooding; the forces that cause it, the factors that cause flood problems, and the significance of protecting the natural and beneficial functions of watersheds and floodplains. These programs can be undertaken by schools, park and recreation departments, conservation associations, and youth organizations, such as the Boy Scouts, Campfire Girls, and summer camps.

Current Practice in the County of San Diego: In coordination with the federal Ready.org program, the County of San Diego OES has launched ReadySanDiego.org. The program, accessible on the County's website provides education resources for families, kids, pet owners, and the business community. The kids' site has fun games and age specific educational tips. The business links site includes site emergency response plans, continuity of operations planning guides, and a variety of resources to help businesses plan ahead and increase the likelihood that their business will be back in business quickly after a disaster event.

Education and training to generate awareness of hazards, mitigation steps, and disaster response should be targeted to public employees, agencies, public officials, the general public, and the private sector, especially developers and property owners.

13.7 PUBLIC INFORMATION PROGRAM STRATEGY

Some communities develop public information strategies as part of their floodplain management program. Preparation of a Public Information Program Strategy is encouraged by Activity 330 of the Community Rating System. These credits (100-points) are designed to encourage communities to develop their own public information program and to design outreach projects specifically tailored to their own needs. It also encourages public participation in the development of a strategy and outreach projects that address multiple hazards.

The benefit of the public information program strategy is that the outreach projects are better thought out and are more appropriate locally than would be the case if the community simply copied national models or designed projects based purely on CRS credit points. This approach assumes that a properly prepared strategy that reviews the problem, identifies the target audiences, determines how to best reach the target audiences, and coordinates with other information programs will produce the best outreach projects for that community.

The thing that is important for a strategy is the PROCESS that is followed. It is vital that people outside the community's government be involved in order to provide a different perspective and input on how to effectively reach residents and business owners.

Strategy Team: For CRS credit, the community must establish a public information outreach strategy team. It need not be a formal organization. The team must have at least three members. At least one team member must be someone familiar with the community's floodplain management program, such as the CRS Coordinator. At least one member must be a representative from outside community government. This could be someone from the

public schools, a neighborhood association, the Red Cross, insurance agencies, utilities, or other offices involved in education or floodplain management.

Other candidates for the strategy team could be:

- The local emergency manager
- The community public information officer
- Floodplain residents
- Representatives of utilities or other companies that conduct their own public information programs and are concerned about public safety
- A motel or restaurant owner, since the County is dependent on tourism, and because explaining flood warning and evacuation procedures to tourists would be important.

The strategy team can be a very informal group and need meet only once or twice a year. Existing committees or advisory boards may fulfill the role if they include at least the representation noted above to ensure coordination with groups outside the local government.

13.8 RECOMMENDATIONS

1. Public information activities should cover the following flood protection topics.
 - Causes and extent of flooding
 - What is being done about flooding
 - What to do during a flood
 - How people can protect their homes
 - Flood insurance
 - Taking care of drainage ways
 - Status of implementing this FMP
2. The County should continue to implement and publicize the following services that will inform and assist property owners who want to protect themselves from flooding.
 - Providing flood elevation, flood zone, and dam inundation information to inquirers
 - Making site visits to review flooding and drainage problems, and providing advice to owners
3. Continue providing the library and other offices with a list of appropriate flood protection references, government publications, Internet websites, and maps. The list should include ordering or contact information for each item.
4. Provide updates on implementation of this FMP, announce upcoming events, and celebrate successful mitigation projects.

5. News releases and news articles on flood protection measures and the progress of implementing this FMP should be prepared for the local newspapers at least once every quarter.
6. A homeowner's property protection manual should be prepared and made available for interested residents and businesses.
7. Meetings with selected groups, including schools and teachers, should be held so their members will become familiar with flooding, flood protection measures, natural floodplain and wetland functions, and County services.
8. The County Flood Control staff should meet with the San Diego County Association of Realtors® to discuss and promote greater understanding of flood risks, flood insurance, available resources, and the importance of disclosure of flood risk information to prospective renters and buyers.
9. The County should develop and implement an outreach strategy.
10. The County should continue to develop public education campaigns and materials to improve preparedness and awareness; and cooperate with local educational institutions, hospitals, media outlets, and libraries in distributing these materials. This recommendation was also included in the Emergency Management Section of this FMP.
11. The County should continue to conduct the awareness campaign with the trademark slogan "Preparedness Starts with You." This recommendation was carried forward from the Emergency Management Section of this FMP.

14.0 REPETITIVE FLOOD LOSS ANALYSIS

A "repetitive loss property" is one for which two flood insurance claim payments of at least \$1,000 have been paid by the NFIP within any 10-year period since 1978 (e.g., two claims during the periods 1978–1987, 1979–1988, etc.). These properties are important to the NFIP because they cost \$200 million per year in flood insurance claim payments. Repetitive loss properties represent only one percent of all flood insurance policies, yet historically they account for nearly one-third of the claim payments (over \$4.5 billion to date). Mitigation of the flood risk to these repetitive loss properties will reduce the overall costs to the NFIP as well as to individual homeowners.

FEMA programs encourage communities to identify the causes of their repetitive losses and develop a plan to mitigate the losses. The County of San Diego will be applying for participation in the NFIP's CRS. Since there are more than 10 repetitive loss properties on the list provided by FEMA, the County must complete specific tasks to be eligible for CRS participation. These include:

- Review and describe its repetitive loss problems
- Prepare a map of the repetitive loss area(s)
- Undertake an annual outreach project to the repetitive loss area(s) and submit a copy of the outreach project with each year's recertification
- Prepare a floodplain management plan for its repetitive loss area(s).

This section details the data collected and analyzed in the repetitive loss areas in the unincorporated portion of the County. Using GIS and flood insurance claims data, repetitive loss areas and properties have been prioritized for attention and analysis. This "area analysis" follows FEMA guidelines to determine whether acquisition, elevation, or other flood protection measures are appropriate and feasible for the repetitively flooded buildings.

Terminology

Area Analysis: An approach to identify repetitive loss areas, evaluate mitigation approaches, and determine the most appropriate alternatives to reduce future repetitive losses.

Hazard Mitigation: Defined by FEMA as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

Repetitive loss: An NFIP-insured property where two or more claim payments of more than \$1,000 have been paid within a 10-year period since 1978. To focus resources on those properties that represent the best opportunities for mitigation, a subcategory has been defined: the Severe Repetitive loss Properties.

Severe Repetitive Loss Properties: As defined by the Flood Insurance Reform Act of 2004, 1-4 family residences that have had four or more claims of more than \$5,000 or at least two claims that cumulatively exceed the reported building's value. The Act creates new funding mechanisms to help mitigate flood damage for these properties.

14.1 DESCRIPTION OF THE REPETITIVE LOSS PROBLEM

There are 21 repetitive flood loss properties on the County of San Diego list provided by DHS – FEMA. The County has requested that one be removed from the list because insufficient information was provided to the County to identify its location. Four of the properties were found to be located in another jurisdiction, and the County has asked DHS-FEMA that these be removed from the County list. Another seven properties are no longer considered repetitive loss properties because they have been mitigated by the removal of the structure or by the construction of a drainage improvement project. With the removal of these 12 buildings from the list, nine buildings remain on the County of San Diego repetitive loss list.

Focusing on the repetitive loss list understates the magnitude of the flood hazard problem in the County. Most buildings in the County with flood insurance claim payments are not repetitive loss properties. This may be because the building has had only one flood event, or the claim payments have been less than \$1,000, including some so small that the claim did not exceed the policy deductible. Many properties that have flooded in the past do not have flood insurance claims only because they are not covered by flood insurance.

Conducting an area analysis helps the County get a better picture of the flooding problems associated with the repetitive loss buildings. It also helps identify a wider range of mitigation options and determine the most cost effective option.

14.2 AREA ANALYSIS PROCESS

This area analysis followed a FEMA-prescribed five step process:

Step 1: Advise all property owners in the repetitive loss study area that the analysis will be conducted.

Step 2: Collect data on each building and determine the cause(s) of the repetitive damage.

Step 3: Review alternative approaches and determine whether any property protection measures or drainage improvements are feasible.

Step 4: Contact agencies or organizations that may have plans that could affect the cause or impacts of the flooding.

Step 5: Document the findings, including a map showing all parcels in the area.

14.2.1 Neighborhood Notification

The first step in the area analysis process was to advise the general public and the repetitive loss neighborhoods about the project. On April 24, 2007, letters were sent to each of the repetitive loss property owners. The letters described the project and invited them to a public meeting at the Lakeside Community Center.

During the last week of April and the first week of May, field surveys were conducted to facilitate identifying the study boundaries for each neighborhood. Once the proposed boundaries were established, the names and addresses of property owners and renters were identified using the County GIS.

On May 22, 2007, the Flood Control District Manager sent a letter to property owners notifying them of the work. (See Appendix D for a copy of the notice). The letter included a survey, which is shown in Appendix C. The survey was also made available for completion online. Of the over 500 property owners to whom a letter was sent, 52 responded.

At the public meeting on May 3, 2007 (See Appendix H for a copy of the agenda), the Flood Control District Manager described the past efforts of the County to address flooding issues, gave an overview of the planning project, and asked for assistance from those present. A Power Point presentation describing the project and the planning process was given by the consultant from Dewberry. Citizens in the audience then asked questions and offered suggestions.

14.2.2 Data Collection

The second step in the analysis process was to collect relevant data on the problem and the properties exposed to flooding. Six sources of information were used for this: flood studies and other studies and reports, flood insurance records, County data, the MJMHM Plan, property owner comments, and on-site surveys.

Flood Studies and Other Studies and Reports: The Project Team obtained and reviewed the following studies:

- FIS, 2006
- FIRM, 2006
- Central Avenue Drainage Study

Flood Insurance Records: The Privacy Act of 1974 (5 U.S.C. 522a) restricts the release of certain types of data to the public. Flood insurance policy and claims data are included in the list of restricted information. FEMA can release such data only to state and local governments, and only if the data are used for floodplain management, mitigation, or research purposes. Therefore, this report does not identify the repetitive loss properties or include claims information for any individual property.

Table 14-1 shows the dates of flooding for repetitive loss buildings in the County. As the table indicates, flood claims have occurred quite often. The remaining nine repetitive loss structures still need mitigation to eliminate or reduce future losses from flooding.

Table 14-1. Dates of Floods for Repetitive Loss Properties

Dates of Loss	Event Description	Impact
January 15, 1978	1978 Storm. Sixty days of long-duration heavy rainfall.	Widespread flooding, particularly in the Encinitas, Fallbrook, Lakeside, La Jolla, La Mesa, Poway, Santee, and Spring Valley areas.
March 4, 1978	1978 Storm	Flooding, particularly in the Lakeside area.
March 5, 1978	1978 Storm	Flooding, particularly in the Lakeside area.

Dates of Loss	Event Description	Impact
January 31, 1979	Rain in scattered areas.	Flooding in the El Cajon, La Mesa, Lakeside, Santee, and Spring Valley areas.
January 29, 1980	1980 Storm with 15 to 20 inches of precipitation over a six week period.	Countywide
February 12, 1980	1980 Storm	Countywide
February 15, 1980	1980 Storm	Countywide
February 19, 1980	1980 Storm	Countywide
February 20, 1980	1980 Storm, Heaviest rains fell on February 20 and 21.	Countywide
February 21, 1980	1980 Storm. Heaviest rains fell on February 20 and 21.	Evacuations were needed in several neighborhoods, particularly in Lakeside and San Diego-Mission Valley.
March 6, 1980	1980 Storm	County reservoirs peaked.
March 2, 1983	Rain in scattered areas.	Shallow flooding in Alpine, Lakeside, Poway, Ramona, Ranch Santa Fee, Santee, Spring Valley, and Bonita areas.
November 28, 1985	Isolated showers.	Flooding, particularly in the Fallbrook, Lakeside, and Spring Valley areas.
February 28, 1991	Beginning of the “Miracle March” storm.	Saved the County from a severe drought.
January 21, 1993	Heavy rain.	Caused some flooding of small streams. Several roads and intersections closed.
February 7, 1993	Isolated showers.	Flooding, particularly in the Fallbrook and Lakeside areas.
February 20, 1993	Rain in scattered areas.	Shallow flooding in the Lakeside and Bonita areas.
January 3, 1995	Heavy rain.	Loma Alta Creek overflowed its banks flooding nearby mobile home parks and prompting the evacuation of residents. Escondido Creek overflowed and washed out portions of adjacent roads.

Dates of Loss	Event Description	Impact
February 14, 1995	Three inches of rain.	San Diego River overflowed onto streets in Santee forcing some residents to evacuate. A woman drowned in her basement in San Diego when it filled with five feet of water.
March 5, 1995	Torrential rains.	Los Penasquitos Creek flooded train tracks. Amtrak passengers were forced to ride buses to their destination. Low-lying bridges were also under water.
March 11, 1995	Isolated showers.	Flooding in the Ramona area.
February 2, 1998	Moderate to locally heavy rains with high winds.	Rising waters briefly stranded motorists
February 23, 1998	A powerful Pacific storm fed by warmer than normal El Nino conditions in the eastern Pacific. Locally, two to five inches of rain fell.	Widespread flooding led to a Presidential Disaster Declaration that covered four counties. The San Diego River peaked on the 24 th at 15.1 feet, which is 3.8 feet above flood stage. 200 people were evacuated from three mobile home parks in Oceanside.
March 28, 1998	Isolated showers.	Flooding in the El Cajon area.
August 29, 2000	Slow moving thunderstorms over east central and northeast County of San Diego dropped 1.6 inches of rain in less than 45 minutes.	Much of Borrego Springs was inundated with 12 inches of water, mud, and rocks. Along County Road S-22 leading from Borrego Springs down to the Salton Sea, floodwaters carried five-foot boulders onto the road surface and washed out several sections, trapping motorists on the higher sections of the roadway.
September 10, 2004	Flash flooding in Borrego Palm Canyon and Coyote Canyon.	70 to 90 homes were damaged in the Sun Gold and De Anza areas of Borrego Springs. In the Sun Gold community, some residents had as much as 2 feet of mud rush into their homes. The wall of water and mud was observed to be 8-10 feet high and 150 yards wide at times as it came down Borrego Palm Canyon.

Dates of Loss	Event Description	Impact
January 11, 2005	Heavy rains beginning December 27, 2004	Countywide flooding. Bonita was especially hard hit. Federally declared disaster.
February 23, 2005	Heavy rains.	San Diego River rose above flood stage flooding areas around the Fashion Valley Mall and washing out a low water crossing in the Mission Valley area. A 20-foot section of S6 was washed out. Several homes were flooded in the El Cajon area.

County Data: Readily available data from the County were accessed including addresses, streets, building values, and hazard locations. These data are summarized in Chapter 2.

County of San Diego Hazard Mitigation Plan: According to the County's 2004 *Hazard Mitigation Plan*, there were 12 Proclaimed States of Emergency between 1950 and 2006 for floods in San Diego County. Flash floods and other flood events occur regularly during rainstorms due to the terrain and hydrology of the County.

Property Owner Comments: Fifty-two of the property owners returned completed copies of the survey shown in Appendix C. This response rate is considered excellent for this type of mailing, indicating a high degree of interest in flooding and flood protection in the affected neighborhoods. Many homeowners provided extensive comments during field visits, and some expressed a desire to speak to team members and share their experiences.

The results from the survey are summarized in Section 3. They show that flooding is seen as a significant problem by many residents in the County.

On-Site Surveys: During the month of May 2007, a crew from Rick Engineering Company visited properties in each repetitive loss neighborhood (although it should be noted that some properties were inaccessible due to growth or fences). Basic information was collected for each property including the following:

- Whether or not the property was occupied
- Type of residence
- Type of foundation
- Condition of foundation
- Type of structure
- Condition of structure
- Number of stories
- Estimate of the height of the first floor above grade
- Estimate of the height of the grade above the street
- Presence of appurtenant structures (detached garage, outbuildings, etc)
- A photograph was taken of each building

Based on the data collected, the following conclusions about the repetitive loss problems in the study area were drawn:

- The Lakeside, and downtown Ramona Repetitive Loss areas are subject to local drainage problems as opposed to being affected by flooding from a FEMA or County identified SFHA.
- Most of the buildings (principally homes) in the neighborhoods where SFHAs have been designated appear not to be elevated above flood levels.
- Most floodplain residents do not have flood insurance.²⁵
- Most of the residential buildings are constructed on slab foundations.

14.2.3 Review Alternative Mitigation Approaches

After determining the flooding problem and the types and condition of the buildings in the area, the third step in the area analysis procedure can be undertaken: a review of alternative approaches to protect properties from future flood damage. Property owners should look at these alternatives but understand none are guaranteed to work 100%. Ten approaches were analyzed, as discussed below. Each approach has its pros and cons. The first eight of these measures are considered “property protection” approaches, which are usually recommended when structural approaches, such as drainage improvements, are not feasible. More detailed discussions of flood mitigation measures including “non-structural” property protection approaches and “structural” approaches such as drainage improvements and barriers can be found in Section 9 and Section 11, respectively. Except for flood insurance, all of these measures require a permit from the County.

1. Acquiring and clearing properties in the hazardous area: This measure involves buying one or more properties and clearing the site. If FEMA funds are to be used for buyouts, the following three requirements apply:

- The applicant for FEMA funds must demonstrate that the benefits exceed the costs, using FEMA’s benefit/cost software.
- The owner must be a willing seller. The high number of vacancies, both from demolished properties and owners who have yet to return, may mean that some owners are indeed willing to sell.
- The parcel would be deeded to a public agency that agrees to keep it in open space.

The County of San Diego has not sponsored acquisition projects in the past except as needed for public works projects.

2. Elevating the houses above the base flood level: Raising the structure above the flood level is generally viewed as the best flood protection measure short of removing the building from the floodplain. Most of the cost to elevate a building is in the setting up and foundation construction.

²⁵ There are an estimated 6,656 Housing units in the SFHA (1% annual chance floodplain) in the County of San Diego (MJMHH, March 2004). The total number of flood insurance policies in effect in the County as of January 31, 2007 was 1,569. Of this number, 1015 are for buildings located within a FEMA designated SFHA and 554 are for buildings located outside the SFHA (FEMA Community Information System).

Raising the structure to the 1% annual chance (100-year) flood level costs little more than elevating to the 10-year level.²⁶

Elevation is usually cost-effective for buildings on crawlspaces or piles/piers because it is easiest to get lifting equipment under the floor and disruption of the habitable part of the house is minimal.

Elevating a house constructed with a slab foundation is another matter. The structural issues are more complicated and the cost is higher. Federal funding support for an elevation project requires a study that shows that the benefits of the project exceed the cost. The applicant for funds must show that the ratio of the benefits to the costs is greater than 1.0.

For planning purposes, if one uses \$75 per square foot to estimate the cost of elevating a house on a slab foundation, a house with a 1,000-square-foot first floor would cost \$75,000 to elevate above flood levels. The actual cost of elevating a particular building depends on factors such as its condition, whether it is masonry or brick faced, and whether additions have been added on over time.

While the cost of elevating a home on a slab can be high, there are funding programs that can help. The usual arrangement is for a FEMA grant to pay 75% of the cost while the owner pays the other 25%. In the case of elevation, this could be as high as \$25,000 or more. In some cases, assistance can be provided by Increased Cost of Compliance²⁷ Funds.

3. Reconstruction (replacing a damaged house with one protected from flooding): FEMA has recently experimented with a different approach. Formerly called “demo/rebuild,” “Pilot Reconstruction Grants” have been used in Florida, Mississippi, and Louisiana to demolish a flood-prone house and replace it on site with a hazard resistant one that meets all current earthquake and flood code requirements. Certain rules must be followed if the owner wants to qualify for federal funds for a reconstruction project. After Katrina, the following rules were used:

- Pursuing this option is only possible after a structural engineer concludes that it is not feasible to elevate the existing building.
- Funds are available only to the people who owned the property before the disaster.
- It must be demonstrated that the benefits exceed the costs.
- The new building must be elevated to the base flood elevation.
- The new building must not exceed the old building’s square footage by more than 10%.

²⁶ Source: Homeowners Guide To Retrofitting – Six Ways To Protect Your House From Flooding, FEMA 312, June 1998

²⁷ ICC coverage provides for the payment of a claim to help pay for the cost to comply with community floodplain management ordinances after a flood event in which a building has been declared substantially damaged or repetitively damaged.

- The new building must meet all flood and earthquake protection codes.
- There must be a deed restriction that states the owner will buy and keep a flood insurance policy.
- The maximum federal grant is 75% of the cost up to \$150,000. FEMA is developing a detailed list of eligible costs to ensure that disaster funds are not used to upgrade homes.

The County of San Diego should examine the value of this approach if funds become available following a Presidential Disaster Declaration.

4. Development regulations: There are two ways to prevent flooding problems from being aggravated by new construction:

- Require new development to hold or infiltrate their excess runoff on site, so it will not overload the existing drainage ways. Unfortunately, although this is a very viable mitigation measure in much of the United States, it is not viable in San Diego County due to poor soil conditions.
- Set construction standards so buildings are protected from floodwaters.

Modern subdivision regulations require new development to ensure that the post-development peak runoff will not be greater than under pre-development conditions. This is usually done by constructing retention or detention basins to hold the runoff for a few hours or days, until flows in the system have subsided and the downstream channels can accept the water without flooding.

5. Purchasing flood insurance coverage on the building and contents: Although not a mitigation measure that reduces property damage from a flood, a NFIP policy has the following advantages:

- A policy will cover damage caused by any surface flooding from any source. It is an excellent “backup” for a floodwall or elevation project where the flood is higher than the protection level.
- Repetitive, highly localized flooding is unlikely to reach conditions severe enough for a disaster declaration. Therefore, flood insurance may be the only source of assistance to help owners of damaged property pay for cleanup and repairs.
- A policy is always in effect, although new policies do have a 30 day waiting period – there is no need for human intervention.
- Coverage is available for the contents of a home as well as for the structure.
- Renters can buy contents coverage, even if the building owner does not buy coverage for the structure itself.

Cost: The table to the right shows the rates for a policy with \$150,000 coverage on the building. Pre-FIRM buildings are those constructed prior to the first FIRM for the area, i.e., before June 15, 1984 in the unincorporated areas of San Diego County. These pre-FIRM buildings are eligible for “subsidized” flood insurance premium rates. The table shows that a post-FIRM building, such as one built in 1985 or later, is subject to actuarial rates. Rates vary depending on the building’s elevation.

Example Flood Insurance Premiums	
Policy/Building Exposure	Premium
Pre-FIRM (“subsidized”) rate	\$1,491
Post-FIRM (actuarial) rates	
2 feet above BFE	\$400
1 foot above BFE	\$569
At BFE	\$989
1 foot below BFE	\$3,550
Annual premium is for \$150,000 in building coverage and \$60,000 in contents coverage for a one-story house with no basement and a \$500 deductible.	
<i>Oct. 1, 2006, Flood Insurance Agent’s Manual.</i>	

If a pre-FIRM house is elevated, the owner can benefit from the much lower post-FIRM rates. It should be noted that the rates are based on the lowest floor, not the first floor. Therefore, owners of pre- FIRM buildings with finished elevated basements pay less with pre-FIRM rates.

6. Drainage Maintenance:

Even if the drainage system were large enough to collect and convey storm flows, it will not perform to its capacity if trash and debris are allowed to clog storm drain inlets, the drain lines, or the canals.

The County’s program identifies and removes obstructions in the streams and rivers. However, it can be made more effective through frequent inspections by residents. An “adopt an inlet or stream” type of program can make an inspector of every resident adjacent to a storm drain inlet. If they find vegetation, trash or similar debris, they can remove the problem to ensure that the inlet will work during the next storm. If they find bigger problems, such as broken pipes, they can report them to the County’s Department of Public Works. The surveys returned by the public revealed that these types of activities are occurring around the County.

7. Dry Floodproofing: This measure is intended to prevent floodwaters from entering a building. Walls are coated with waterproofing compounds or plastic sheeting. Openings (doors, windows, and vents) are closed, either permanently, with removable shields, or with sandbags. Because it employs the building itself as part of the barrier to the passage of floodwaters, dry floodproofing is generally only recommended for buildings with slab foundations.

Even if the building is in sound condition, tests by the U.S. Army Corps of Engineers (USACE) have shown that dry floodproofing should not be used for depths greater than 3 feet over the floor level; water pressure on the structure can collapse the walls and/or buckle the floor.

Most of the buildings in the repetitive loss areas are on slab foundations. Dry floodproofing can be quite effective *to its design level* and *when constructed properly*. This measure can be used effectively to protect against shallow flooding, but will *not* be effective against deeper flooding.

Accordingly, it is only recommended for slab homes and for protection against local drainage problems.

A floodproofing project has three components:

- Make the walls watertight. This is easiest to do for masonry or brick faced walls, which can be covered with a sealant. Wood, vinyl, or metal siding needs plastic sheeting to make them watertight. The most effective approach is to apply a sealant and plastic sheeting and then cover the job with brick facing to protect the waterproofing from punctures.
- Provide closures for the openings, including doors, windows, dryer vents, and weepholes.
- Account for drainage backup and other sources of water entering the building. For shallow flood levels, this can be done with a floor drain plug; however, a valve system is more secure.

Not all of the building needs to be floodproofed. It is difficult to floodproof a garage door, for example, so many owners let the water in and waterproof the walls between the garage and the rest of the house. Appliances, electrical outlets, and other damage-prone materials can be elevated above the expected flood levels.

Floodproofing has the following shortcomings as a flood protection measure:

- It usually requires human intervention; i.e., someone must be home to close the openings.
- Its success depends on the building's condition. It is very difficult to tell if there are cracks in the slab under the floor covering.
- Periodic maintenance is required to check for cracks in the walls and to ensure that the waterproofing compounds do not decompose.
- The NFIP insurance rate tables do not recognize dry floodproofing for residences.

The cost for a floodproofing project can vary according to the building's construction and condition. It can range from \$5,000 to \$20,000, depending on how secure the owner wants to be. Owners can do some of the work themselves, although an experienced contractor provides greater security.

Because neither FEMA nor the USACE funds floodproofing projects for residential properties, there is no requirement for a formal benefit/cost analysis. However, each property owner can determine how much of their own labor they want to contribute and whether the cost and appearance of a project is worth the protection from flooding that it provides.

8. Wet Floodproofing: The wet floodproofing approach allows water to enter the building. Everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace and water heater are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Wet floodproofing has one advantage over the other approaches: no matter how little is done, flood damage is reduced. Thousands of dollars in damage can be prevented simply by moving furniture and electrical appliances upstairs.

The major disadvantage of wet floodproofing is that the lower area of the structure cannot be finished. While the area can still be used, there should be no carpeting, furniture, insulation, and other materials subject to water damage that cannot be removed in time.

9. Drainage Improvements: *Drainage improvements* include constructed ditches and storm drains that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive. These types of improvements are particularly appropriate for depressions and low spots that will not drain naturally

Typical improvements include installing new storm drain systems, swales, or channels; enlarging existing systems, culverts, or channels; adding street improvements such as curb and gutter; and preventing back flow where tail water conditions exist. These projects are typically designed to convey runoff for the 1% annual chance (100-year storm) event without affecting property adjacent to the right of way, per the County of San Diego Drainage Design Manual.

Examples of successful drainage improvement projects are scattered throughout San Diego County. Drainage improvements were designed and constructed to protect homes from silt-laden runoff from areas burned by wildfires. A total of 22 individual projects included both minor and major improvements. Minor drainage improvements included grass and concrete channels, pipes, walls, and other structures, all designed to maintain a cleansing velocity to prevent siltation and clogging by sediment (many throughout Ramona). Major improvements included culvert replacement and repairs and channel restoration along Harbison Canyon and Forrester Creek, a 600-linear-foot floodwall along San Vicente Creek, and abandoning and replacing an entire roadway storm drain system in Casa De Oro.

Other large scale examples include the large concrete channel constructed along Los Coches Creek in the early 1980s, the large underground box culvert system and concrete channel constructed along Spring Valley Creek from the intersection of Sweetwater and Jamacha Boulevard to just upstream of Tyler Street in Spring Valley in the 1999, the Central Avenue Drainage Improvement project (to be completed in late 2007), and others. Each of these large scale drainage improvement projects contributed to relieving known flooding problems for large areas which had affected numerous residential and commercial properties.

10. Barriers: Small berms or floodwalls could be constructed around one or more properties. Such barriers are not recommended for flood depths greater than three feet. For some areas of the County, the depth of flooding is less than this and thus barriers might be an alternative.

One concern is the amount of space available for the barrier. Levees and berms are not appropriate for some neighborhoods, as there is not enough room to construct an earthen barrier. An earthen barrier needs 6 feet of ground space for each foot in height. Small floodwalls may be more appropriate where there is enough room on the lots for walls around a house.

A second concern is the permeability of the soil. Permeable soil will allow floodwaters to seep under the barrier or through a levee made of local material. This is a particular problem when floodwaters stay up for a long time.

The cost of a local floodwall depends on the depth of flooding and the amount of engineering put into the design. Where flooding is only inches deep, almost any barrier of concrete or earth will work.

The longer the water stays up, the more likely it will seep through or under the wall, so the design must account for seepage and for rain water that falls inside the floodwall. Drain tiles to collect this water and a sump pump to discharge it are necessary. Because power is likely to be lost during a storm a generator is needed for a continuous supply of electricity.

The most conservative cost estimate for this mitigation method is based on a two foot high engineered cantilevered concrete floodwall. A cantilevered wall has a footing to provide stability and keep the water pressure from pushing it over.

The budget shown in Table 14-2 is for a 40-foot x 40-foot home with a wall one foot outside the building wall. Labor accounts for about half the price in the cost estimate.

Table 14-2. Floodwall Cost Estimate

ITEM	COST
Two foot high reinforced concrete cantilever wall, 168 feet @ \$200/foot	\$33,600
Internal drainage and sump pump system	\$5,000
Sewer backup valve	\$4,500
Generator for power outages	\$900
TOTAL	\$44,000

Because neither FEMA nor the USACE fund individual floodwalls for residential properties, no formal benefit/cost analysis is required. However, each property owner can determine how much of their own labor they want to contribute and whether the cost of a wall is worth the protection from flooding that it provides.

In summary, floodwalls have certain disadvantages as they require:

- A method to close openings, such as the garage door. Generally, this requires “human intervention,” meaning someone needs to be available and have enough time to take action.
- Relatively impervious soils to minimize seepage under the floodwall.
- A system to prevent sanitary sewer backup from flowing into the building.
- A system of drain tile (perforated pipes) that collects water that falls or seeps into the protected area and sends it to a collecting basin or “sump.”
- A sump pump to send the collected water outside the barrier.
- Power to operate the sump pump around the clock during a storm.

Summary

Table 14-3 summarizes the advantages and disadvantages of the ten alternative mitigation measures discussed above.

Table 14-3. Summary of the Alternative Mitigation Measures

MITIGATION MEASURE	ADVANTAGES	DISADVANTAGES
Acquisition	<ul style="list-style-type: none"> • 100% flood protection • FEMA mitigation funds available for some properties 	<ul style="list-style-type: none"> • High cost • Need source of non-FEMA cost share • Need interested public agency to take over the land
Elevation	<ul style="list-style-type: none"> • More secure flood protection • Flood insurance rate reduction • FEMA mitigation funds available for some properties 	<ul style="list-style-type: none"> • High cost • Need source of non-FEMA cost share
Reconstruction	<ul style="list-style-type: none"> • More secure flood protection • Flood insurance rate reduction • FEMA mitigation funds available for some properties 	<ul style="list-style-type: none"> • High cost • Need source of non-FEMA cost share
Development Regulations	<ul style="list-style-type: none"> • Provide property protection measures during construction at a lower cost • Provide a mechanism to avoid future flood losses 	<ul style="list-style-type: none"> • May add some initial cost to a development project
Flood Insurance	<ul style="list-style-type: none"> • Always in effect • Works for all flood levels • Under ICC, can be a source of funds for buyout or elevation 	<ul style="list-style-type: none"> • Does not prevent flood damage (but does provide funds for repairs)
Drainage Maintenance	<ul style="list-style-type: none"> • A cost-effective way for communities to avoid future flood losses from small storms • An effective way to avoid future repetitive flood losses 	<ul style="list-style-type: none"> • Requires regular monitoring and maintenance
Dry Floodproofing	<ul style="list-style-type: none"> • Low cost • Effective for shallow flooding on slab foundations and raised basements 	<ul style="list-style-type: none"> • Not appropriate for lots that are subject to deeper flooding • Not allowed for substantially damaged homes
Wet Floodproofing	<ul style="list-style-type: none"> • Low cost • Effective for raised basement homes not using the basement as living space 	<ul style="list-style-type: none"> • Contents need to be raised or removed • Cleanup required following each flood • Not allowed for substantially damaged homes
Drainage Improvements	<ul style="list-style-type: none"> • Protects yards and streets as well as buildings • Recent projects appear to have had a positive impact 	<ul style="list-style-type: none"> • High cost
Barriers	<ul style="list-style-type: none"> • Effective for shallow flooding 	<ul style="list-style-type: none"> • Subject to seepage if water stays up for a long time • Not appropriate for lots that are subject to deeper flooding

14.2.4 Identification of Repetitive Loss Areas

The County has mapped the locations of repetitive loss properties (Appendix I) and identified seven repetitive loss areas as part of the FMP. These areas are shown in snap shot images throughout this Section of the FMP. Larger images of the repetitive loss neighborhoods are included in Appendices J – P.

Borrego Springs Repetitive Loss Area

The Borrego Valley is surrounded on three sides by steep, rocky mountains—the Santa Rosas to the north, the San Ysidros to the west, and the Grapevine Hills to the south. To the east, the mud hills of the Borrego Badlands stretch off towards the Salton Sea.

The valley was settled primarily because it offers an abundant water supply. At several places in the valley, water is found four feet below the surface. Drillings in other places have shown that it is not necessary to go deeper than thirty-five feet to get a liberal flow.

Twenty-five properties with flood insurance policies in the Borrego Springs area have had flood losses that totaled \$571,388 for an average loss of \$22,856 per building. Altogether 27 individual claim payments were paid for an average of \$21,163 per claim. All of the claims were paid since 2000 except for one paid in 1999, four paid in 1980, and one in 1977.

The team identified 91 buildings that are subject to the same flooding conditions and risks as the targeted repetitive loss properties identified by FEMA. Those properties are reflected in the area map shown above and in Appendix J. The mitigation options and recommendations presented below are as applicable to the repetitive loss properties as they are to the other properties at risk in the vicinity.



Recent Flood Events:

August 29, 2000 - Slow moving thunderstorms over east the central and northeast part of the County dropped over 1.6 inches of rain in less than 45 minutes. Flash flooding was observed in Hellhole and Palm Canyons in the San Ysidros Mountains just west of Borrego Springs and in most of the washes located in the Anza Borrego Desert State Park. Much of the town of Borrego Springs was inundated with six to 12 inches of water, mud, and rocks. Along County Road S-22 leading from Borrego Springs down to the Salton Sea, flood waters carried five-foot boulders onto the road surface and washed out several sections, trapping motorists on the higher sections of the roadway.

August 27, 2003 - Flash flood covered several streets in Borrego Springs and caused \$10,000 in property damage.

September 4, 2003 - Flash floods covered main roads and highways with mud and water from Santa Ysabel to east of Borrego Springs. \$60,000 in property damage was reported.

September 10, 2004 - Flash flooding began around 4:30 PM in Borrego Palm Canyon and rushed into Borrego Springs. Flash Flooding also occurred in Coyote Canyon. An empty campground was obliterated by a wall of mud and water. An estimated 70 to 90 homes were damaged when the flash flood tore into the Sun Gold and De Anza areas of town. In the Sun Gold community, some residents had as much as 2 feet of mud rush into their homes. The wall of water and mud was observed to be 8-10 feet high and 150 yards wide at times as it came down Borrego Palm Canyon. Property damage was estimated at \$1 million.

Regulations: Regulations for Borrego Springs are described in Chapter 8. These regulations address the special hazards posed by the alluvial fans in this area

The Drainage System: The area is very flat with no drainage improvements such as curb and gutter, storm drain, or channels.

Mitigation Options:

Acquisition: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Elevation: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Reconstruction: Demolition and rebuild is not a cost-effective mitigation option at this time. If reconstruction occurs for economic reasons or because the buildings are substantially damaged due to fire or some other disaster, property owners should be encouraged to elevate the structures and rebuild per established regulations.

Mapping and Regulation: Mapping of this area and a FMP specific to this area has already been completed. Enforcement of these regulations is an important mitigation option, for both existing and new development.

Flood Insurance: While not a mitigation measure, property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: This is not an option for single story residential structures, which are the primary structures located throughout the area.

Dry Floodproofing: Since the area has experienced mud and debris flows in the past, dry floodproofing is not as desirable an option as compared to barriers.

Drainage Improvements: Due the very flat grades throughout this area, drainage improvements are not thought to be a viable option since adjacent systems and/or channels are not present to tie into. Since most structures and lots are at grade with the adjacent street, curb and gutter improvements would trap flows behind any newly established curb.

Barriers: Some of the lots in the neighborhood already contain barriers, some contain them but are not in compliance with existing regulations, and others have no barriers at all. Barriers are an option on a lot by lot basis throughout the neighborhood, however, they would likely need to be

constructed concrete walls to withstand potential mud and debris flows that have occurred in recent flooding events.

Recommendations:

1. Enforcement of current regulations on both new development and existing properties is essential for this area. New homes need to be elevated and/or protected by concrete flood and debris barriers per current requirements.
2. Encourage all property owners in the area to carry a building and contents flood insurance policy.
3. Provide technical assistance to property owners with identifying actions they can take to reduce flood losses, including installation of concrete barriers in accordance with current regulations.

Johnstown Repetitive Flood Loss Area

This area includes the El Dorado Mobile Home Park off of I-8 Business. It is partially protected by a levee along Los Cochis Creek.

There is one repetitive loss property in this area. In 1995, it had two flood losses that totaled \$20,389 for an average loss of \$10,195 per claim. Another building in the neighborhood had one flood loss of \$19,955 in 1980. Together the three claims total \$40,344.

The team identified 12 buildings that are subject to the same flooding conditions and risks as the targeted repetitive loss properties identified by FEMA. Those properties are reflected in the area map shown above and in Appendix K. The mitigation options and recommendations presented below are as applicable to the repetitive loss properties as they are to the other properties at risk in the vicinity.



Recent Flood Events:

November 29, 2002 - A thunderstorm produced heavy rain with street flooding.

Regulations: This neighborhood is in the SFHA on the FIRM. Floodplain management regulations require building sites to be reasonably safe from flooding. They also require newly constructed, substantially damaged, and substantially improved buildings in the SFHA to be:

1. Designed (or modified) and anchored to prevent flotation, collapse, and lateral movement of the building resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy
2. Constructed with materials resistant to damage from immersion in flood waters
3. Constructed with methods and practices that minimize flood damage

4. Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent flood water from entering or accumulating within their components.

Additionally, minimum standards for buildings in A-zones require the top of the lowest floor, including the basement floor, of all newly constructed, substantially damaged, and substantially improved buildings must be at or above the base flood elevation (BFE).

The Drainage System: The Johnstown neighborhood is located along a natural portion of Los Coches Creek. The creek passes along the northern edge of the El Dorado Mobile Home Park and through a bridge crossing at El Dorado Parkway. The creek continues downstream with single family homes immediately to the south, two businesses to the north, and passes through two additional bridge crossings with a second Mobile Home Park located along the south bank. Along this second Mobile Home Park, a constructed berm appears to function similarly to a levee between the channel and the adjacent mobile homes.

An existing drainage system along El Dorado Parkway has been constructed in phases over many years and provides some conveyance of local runoff towards the channel.

Residents report that during past flooding events, which have occurred within the neighborhood, water first threatened homes by exiting Los Coches Creek upstream of the El Dorado Mobile Home Park and flowing down the streets within the Mobile Home Park. Runoff flows across El Dorado Parkway and into the front of several low-lying structures on the downstream side of El Dorado Parkway. These homes were not seeing water breach the creek banks at the El Dorado Parkway bridge crossing, as one may typically expect. Storm flows that were conveyed through these low-lying properties continue west until surface grades eventually direct the flows back towards Los Coches Creek.

Mitigation Options:

Acquisition: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Elevation: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Reconstruction: Demolition and rebuild is not a cost-effective mitigation option at this time. If reconstruction occurs for economic reasons or because the buildings are substantially damaged due to fire or some other disaster, property owners should be encouraged to elevate the structures.

Mapping and Regulation: The neighborhood is currently shown as Zone A. Consideration should be given to researching if any detailed studies are available for this portion of the Los Coches Creek, and if no BFEs are available or thought to be accurate, prepare a detailed study to establish BFEs. Elevation Certificates could be prepared for all structures throughout the area, or at the least, for all structures not already elevated.

Flood Insurance: While not a mitigation measure, property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: This option would cause longer-term disruption to residents and businesses than dry floodproofing or the drainage improvement option. Homeowners would also be disrupted and need to find other lodging for several days while cleanup and home repairs are made.

Dry Floodproofing: Since several of the homes and the few businesses within the area may only experience shallow flooding, dry floodproofing is an option that could be considered for some structures, especially by the commercial establishments. While dry floodproofing is also an option for the residential building owners, a structural investigation should be conducted before implementing this option. Results of a detailed study would better establish if this were an appropriate mitigation option.

Drainage Improvements: Street and drainage improvements have been made several times over the years since reported flooding has occurred. The bridge crossing along El Dorado Parkway was improved in the early 1980s, and a series of inlets and storm drains have been installed along El Dorado Parkway along the frontage of several low-lying homes in the area. The extent to which these improvements have helped is unknown at this time. Despite the local drainage improvements, the current FIRM suggests the area will remain inundated by the 1% annual chance (100-year) floodplain unless more substantial improvements are made within and/or along Los Coches Creek. Channel improvements could include widening portions of the channel both upstream and downstream of El Dorado Parkway, constructing a floodwall or berm along the south edge of the channel upstream, and/or improving the existing berm located downstream between the second Mobile Home Park and the channel.

Barriers: Some homes may benefit with barriers installed between their structure and Los Coches Creek, however, it was reported by residents that much flooding may overflow the channel

upstream of the neighborhood, making such barriers ineffective without additional channel improvements upstream. Constructing barriers on a per lot basis is the responsibility of the homeowner, and not typically successful in obtaining Hazard Mitigation Grants.

Recommendations:

1. If BFEs are not already determined in the area, prepare a detailed study of the flood hazard area, and prepare Elevation Certificates for structures throughout the repetitive loss neighborhood boundary.
2. Encourage all property owners in the area to carry a building and contents flood insurance policy.
3. Conduct channel maintenance to remove excess vegetation within Los Coches Creek in this vicinity.
4. Investigate the costs of channel improvements to Los Coches Creek from upstream of the Mobile Home Park to downstream beyond the end of an existing berm that lies between the channel and a second Mobile Home Park.
5. Provide technical assistance to property owners with identifying actions they can take to reduce flood losses, including on-site barriers for some structures not already elevated.

Rainbow Repetitive Flood Loss Area

There are two repetitive loss properties in this area. The first repetitive loss building had its initial claim of \$64,012 in 1980. In 1993, two additional flood losses totaled \$140,818 for an average loss of \$70,409 per claim. The fourth claim in 2005 was for \$41,151. The four claims total \$247,981 for an average of \$61,995 per claim.

The second repetitive loss building had one flood loss of \$8,557 in 1985 and a second loss of \$4,035 in 1993. A third building in the area had a flood loss of \$960 in 1978 and a second loss of \$50,074 in 1993. Although the second loss was 46% of the value of the structure, it is not on the repetitive loss lost list because the two losses were more than 10 years apart and because one of the losses was less than \$1,000.



Altogether, the flood losses on the three buildings total \$311,607. Six buildings were identified as being subject to the same flooding conditions and risks as the targeted repetitive loss properties identified by FEMA. Those properties are reflected in the area map shown above and in Appendix L. The mitigation options and recommendations presented below are as applicable to the repetitive loss properties as they are to the other properties at risk in the vicinity.

Recent Flood Events:

January 11, 1995 - About 15 businesses in Fallbrook sustained damages when two feet of water flowed through them.

February 6, 1998 - An exceptionally strong westerly jet-stream aloft and a deep upper-level trough of low pressure off the coast steered a barrage of weather systems through southern California for several days. The action started off with high winds and then heavy rain on the sixth. Rainfall up to three inches caused widespread flooding, stranding motorists, and resulting in sporadic road closures.

July 8, 1999 - Heavy rain from thunderstorms caused standing water on Interstates 15 and 5 and flooded intersections in Hemet and San Jacinto with a half to two feet of water. Several motor vehicle accidents occurred resulting in one death, four injuries, and \$125,000 property damage.

November 29, 2002 - Frequent lightning, heavy rain, and small hail were observed at many locations as a band of thunderstorms moved north and west across Southwest California. North of Fallbrook, 15 vehicles were stuck in mudslides.

December 16, 2002 - Almost two inches of rain fell in a two hour period, causing low lying roads and most creeks to flood. Mudslides closed roads in Fallbrook and Lakeside.

Regulations: This neighborhood is in the SFHA on the FIRM.

Floodplain management regulations require building sites to be reasonably safe from flooding. They also require newly constructed, substantially damaged, and substantially improved buildings in the SFHA to be:

1. Designed (or modified) and anchored to prevent flotation, collapse, and lateral movement of the building resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy
2. Constructed with materials resistant to damage from immersion in flood waters
3. Constructed with methods and practices that minimize flood damage
4. Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent flood water from entering or accumulating within their components.

Additionally, minimum standards for buildings in A-zones require the top of the lowest floor, including the basement floor, of all newly constructed, substantially damaged, and substantially improved buildings must be at or above the base flood elevation (BFE).

The Drainage System: The Rainbow neighborhood is located immediately downstream of the confluence between Sandia Creek and an Unnamed Tributary to Sandia Creek. A low point along Huffstatler Street represents the confluence location and point of frequent flooding within the roadway. Ponding along Huffstatler Street would eventually flow over the small driveway hump (northwest of the channel crossing) into the adjacent property. Evidence of previous sandbagging along this driveway entrance was evident during May 2007 field visits.

The channel is very overgrown downstream of this roadway crossing, with the majority of at risk structures located along the northern bank of the channel. Several structures are located within the repetitive loss property, with at least two structures located within the established Floodway. The property is surrounded by a large concrete wall, which may provide some level of protection to structures within the property.

Further downstream just beyond the limits of the repetitive loss neighborhood, the channel has a bend of approximately 45-degrees that may further impact this upstream neighborhood.

Mitigation Options:

Acquisition: Based on the flood loss history for the area and the presence of at least two (2) structures within the established floodway, this may meet the cost/benefit requirements of Federal grant programs.

Elevation: Based on the location of structures in the floodway, this is not a desirable option.

Reconstruction: Demolition and rebuild may be a cost-effective mitigation in the future. If reconstruction occurs for economic reasons or because the buildings are substantially damaged due to fire or some other disaster, property owners should be encouraged to elevate the structures and relocate them outside of the floodway.

Mapping and Regulation: The area is shown as a Zone AE with an established floodway on the June 19, 1997 FIRM.

Flood Insurance: Property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: This option is not typically considered for residential structures, and homeowners would also be disrupted and need to find other lodging for several days while cleanup and home repairs are made following flood events.

Dry Floodproofing: Since at least two structures are within the floodway which is not characteristic of shallow flooding, dry floodproofing is not an appropriate option.

Drainage Improvements: Typical street and drainage improvements would not be sufficient to help alleviate flooding in this neighborhood. Channel modifications such as widening, constructing a berm, levee, or improving the existing floodwall may help the flooding situation. Of these options, widening the channel to the south within undeveloped portions of adjacent properties may be the only way to adjust the floodway to no longer include existing structures.

Barriers: Some of the more elevated lots in the neighborhood may benefit from construction of barriers, but this would not be a solution for the most at risk structures.

Recommendations:

1. Prepare Elevation Certificates for structures throughout the repetitive loss neighborhood boundary
2. Encourage all property owners in the area to carry a building and contents flood insurance policy.
3. Investigate the possibility of FMA grant funding for Acquisition mitigation. The large losses previously reported on the property may provide this as a relevant opportunity, specifically for the structures located within the established floodway.
4. Conduct channel maintenance to remove excess vegetation within Sandia Creek in this vicinity.

Lakeside Repetitive Flood Loss Area

This area is bounded by Lakeshore Drive on the north. The western boundary runs along Channel Road to Roberts Way, which is the southern boundary.

There is one repetitive loss property on the FEMA list in this area. This property has had 2 flood insurance claims with payments totaling \$6,081(1980, 1983) for an average payment of \$3,040 per claim. A second property in the neighborhood has had one flood insurance claim payment of \$2,069 (1983).

The team identified 12 buildings in the Lakeside area that are subject to the same flooding conditions and risks as the targeted repetitive loss properties identified by FEMA. Those properties are reflected in the area map shown above and in Appendix M. Mitigation options and recommendations applicable to the repetitive loss properties as well as the additional properties at risk are presented below.



Regulations: The Lakeside study area is outside the SFHA mapped by FEMA. It is designated as an “X Zone,” which means that there are no floodplain management regulations that would require new construction or substantial improvements to buildings to be protected from the base (1% annual chance) flood.

The drainage system: Lakewood is very flat, so stormwater runoff moves relatively slowly, and it takes quite a while to drain. The repetitive loss building is situated lower than the adjacent roadway with the driveway sloping towards the building. The finished floor elevations for parts of the building are only about four inches above parking lot level. Other buildings are also constructed at grade.

Channel Road has a shallow swale on the eastside. No drainage facilities within the property were observed. During a major storm, runoff from the surrounding area will collect on the parking lot and is likely to enter the building. There is no drainage inlet near the lot to connect to the storm drain across the street.

Mitigation Options:

Acquisition: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Elevation: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Reconstruction: Demolition and rebuild is not a cost-effective mitigation option at this time. If reconstruction occurs for economic reasons or because the buildings are substantially damaged due to fire or some other disaster, property owners should be encouraged to elevate the structures.

Mapping and Regulation: Consideration should be given to mapping this neighborhood as an area of shallow flooding and requiring new and substantially improved buildings to be elevated two feet above the highest adjacent grade. This would not require a change to the Flood Insurance Rate Map. It would be regulated as a freeboard requirement in an X-zone.

Flood Insurance: While not a mitigation measure, property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: This option would cause longer term disruption to businesses than dry floodproofing or the drainage improvement option. Homeowners would also be disrupted and need to find other lodging for several days while cleanup and home repairs are made.

Dry Floodproofing: Since the area experiences shallow flooding and is outside the special flood hazard area shown on the Flood Insurance Rate Map, dry floodproofing is an option that should be considered, especially by the commercial establishments. While dry floodproofing is also an option for the residential building owners, a structural investigation should be conducted before implementing this option.

Drainage Improvements: Street and drainage improvements with curb and gutter are an option for solving the shallow flooding problems in this neighborhood. The neighborhood is near the confluence of the San Diego River and Los Coches Creek. A study would be needed to determine where to send the water once collected by the new drainage system.

Barriers: Some of the lots in the neighborhood are paved for parking at commercial establishments. Other lots are so small that they offer little opportunity for yard improvements, levees or flood walls to address these flooding issues.

Recommendations:

1. Map the flood hazard in the area, possibly as an area of shallow flooding and adopt X-zone freeboard regulations.
2. Encourage all property owners in the area to carry a building and contents flood insurance policy.
3. Investigate the costs of installing street and drainage improvements in the neighborhood.
4. Provide technical assistance to property owners with identifying actions they can take to reduce flood losses.

Moreno Repetitive Loss Area

This neighborhood is in the Lakeside area. It is located south of the confluence of the San Vicente Creek and Slaughterhouse Canyon. Its western boundary is Highway 67 and the eastern portion of the neighborhood is just west of Rocky Lane. Most of the buildings in this area are located within the regulatory floodway.

Twenty-two properties with flood insurance policies in the Moreno neighborhood have had



flood losses that totaled \$267,016 for an average loss of \$12,137 per building. Altogether 26 individual claim payments were paid for an average of \$10,270 per claim. All of the claims were paid in the 1980s except for three which were paid in 1993.

The team delineated an area including 213 buildings that are subject to the similar flooding conditions and risks as the targeted repetitive loss properties identified by FEMA. Those properties are reflected in the area map shown above and in Appendix N. Nineteen buildings were surveyed in the neighborhood. The neighborhood is predominately residential, with wood frame homes constructed on slab foundations. Some are elevated on foundation walls or fill. Property owners in the area report flooding in the 1980's from overflow of the San Vicente Dam and debris in the stream channel. Some property owners have used sandbags or small earthen berms to protect their homes from flooding.

Recent Flood Events:

February 6, 1998 - An exceptionally strong westerly jet-stream aloft, and a deep upper-level trough of low pressure off the coast steered a barrage of weather systems through southern California for several days. The action started off with high winds and then heavy rain on the sixth. Rainfall up to three inches caused widespread flooding, stranding motorists, and resulting in sporadic road closures.

December 16, 2002 - Almost two inches of rain fell in a two hour period, causing low lying roads and most creeks to flood. Mudslides closed roads in Fallbrook and Lakeside.

San Vicente Dam:

Dam failures can result in severe flood events. When a dam fails, a large quantity of water is suddenly released with a great potential to cause human casualties, economic loss, lifeline disruption, and environmental damage. A dam failure is usually the result of age, poor design, or structural damage caused by a major event such as an earthquake or flood.

The San Vicente Dam was finished in 1943 and is characterized as a high hazard dam because its failure would threaten life and property. The inundation map for the dam shows the Moreno neighborhood lies within the dam inundation zone. It is considered at high risk because it stores more than 1,000 acre-feet of water, is higher than 150 feet tall, has potential for downstream property damage, and potential for downstream evacuation.

Currently, San Vicente Reservoir is approximately 220 feet high. The dam will be raised 54 feet as part of the Emergency Storage Project to increase the reservoir's storage capacity by 52,000 acre-feet over the present 90,000 acre-feet.

With the Carryover Storage Project it will be raised to about 340 feet with 242,000 acre-feet of water storage. The existing dam is a conventional concrete gravity dam, but the raised portion of the dam will be made of roller-compacted concrete, which is rolled out in layers like asphalt and is more economical. Construction is scheduled to begin in 2009 but depends on the completion of the San Vicente Pumping Facilities and the San Vicente Pipeline. It is scheduled to be completed in fall 2012, but the reservoir will take from two to five years to fill up again.

Regulations: Almost this entire neighborhood is in the SFHA on the FIRM. Most of the properties in this area are also in the regulatory floodway.

Floodplain management regulations require building sites must be reasonably safe from flooding. They also require newly constructed, substantially damaged, and substantially improved buildings in the SFHA to be:

1. Designed (or modified) and anchored to prevent flotation, collapse, and lateral movement of the building resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,
2. Constructed with materials resistant to damage from immersion in flood waters,
3. Constructed with methods and practices that minimize flood damage, and
4. Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent flood water from entering or accumulating within their components.

Additionally, minimum standards for buildings in A-zones require the top of the lowest floor, including the basement floor, of all newly constructed, substantially damaged, and substantially improved buildings must be at or above the BFE.

Mitigation Options:

Acquisition: Twenty-two properties in the neighborhood have had flood claims paid by the National Flood Insurance Program. Additional data on the structures in this area should be collected to determine if they meet the cost/benefit requirements for acquisition under Federal grant programs.

Elevation: This neighborhood is in the dam break inundation area of the San Vicente Dam. Elevation should be considered a low priority for public funds.

Reconstruction: This neighborhood is in the dam break inundation area of the San Vicente Dam. Demolition and reconstruction should be considered a low priority for public funds.

Mapping and Regulation: The dam break inundation map and the flood insurance rate map should be compared to determine if there are areas beyond the special flood hazard area that should be regulated as if they are in the regulatory floodplain.

Flood Insurance: While not a mitigation measure, property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: Following a flood this option would cause longer term disruption to businesses than dry floodproofing. Homeowners would also be disrupted and need to find other lodging for several days while cleanup and home repairs are made.

Dry Floodproofing: While dry floodproofing is an option for building owners, more data is needed on the depth of flooding in the area. A structural investigation of each building should be conducted before implementing this option.

Drainage Improvements: Investing in channel improvements might encourage additional development within the dam break inundation area.

Barriers: One concern is the amount of space available for the barrier. Levees and berms need 6 feet of ground space for each foot in height. Small floodwalls may be more appropriate where there is enough room on the lots for walls around a house. The cost of a local floodwall depends on the depth of flooding and the amount of engineering put into the design. Where flooding is only inches deep, almost any barrier of concrete or earth will work.

The longer the water stays up, the more likely it will seep through or under the wall, so the design must account for seepage and for rain water that falls inside the floodwall. Drain tile to collect this water and a sump pump to discharge it are necessary. Because power is likely to be lost during a storm a generator is needed for a continuous supply of electricity.

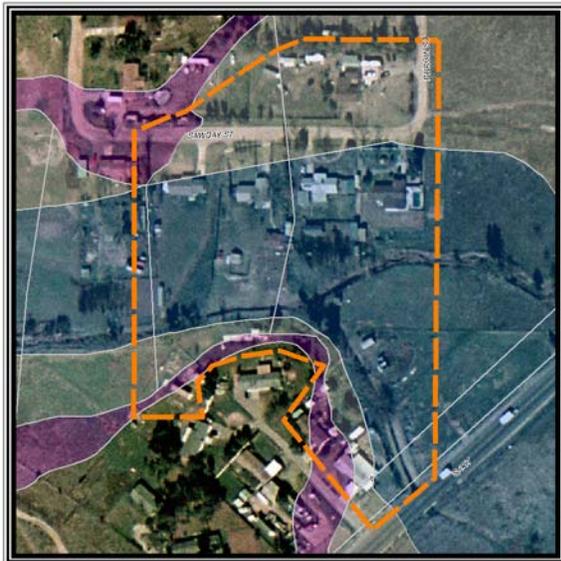
Recommendations:

1. Review the County's Emergency Action Plan to ensure adequate warning systems are in place and maintained. A full scale exercise should be conducted annually. This should include regular communications checks between the dam operator and the County Emergency Operations Center. At a minimum these communications checks should be completed on a monthly basis.
2. Encourage all property owners in the area to carry a building and contents flood insurance policy.

Southwest Ramona Repetitive Flood Loss Area

There are two repetitive loss properties in this area. The first repetitive loss building had its initial claim of \$6,200 in 1983. In 1991 a second flood loss totaled \$10,000. The third claim in 1995 was for \$2,223. Altogether the three claims total \$18,423 for an average of \$6,141 per claim.

The second repetitive loss building had one flood loss of \$19,000 in 1991 and a second loss of \$1,000 in 1993. Three additional buildings in the area had flood losses totaling \$16,282 in the 1980s. Losses to the five buildings with flood insurance policies totaled \$54,705 with an average loss of \$10,941.



Eleven buildings were surveyed in the area. This is a low-density neighborhood of single family homes generally built at grade on slab foundations with no more than 1 foot of fill. One owner reported that the Sheriff had directed property owners to clean the channel in the mid-80's. Property owners believe the lack of maintenance is the reason homes flood periodically.

Recent Flood Events

April 2, 2004 - Heavy rain showers caused flash flooding in the areas southwest of Ramona.

Regulations: This neighborhood is in the SFHA on the FIRM. Four of the properties in this area are in the regulatory floodway.

Floodplain management regulations require building sites to be reasonably safe from flooding. They also require newly constructed, substantially damaged, and substantially improved buildings in the SFHA to be:

1. Designed (or modified) and anchored to prevent flotation, collapse, and lateral movement of the building resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,
2. Constructed with materials resistant to damage from immersion in flood waters,
3. Constructed with methods and practices that minimize flood damage, and
4. Constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent flood water from entering or accumulating within their components.

Additionally, minimum standards for buildings in A-zones require the top of the lowest floor, including the basement floor, of all newly constructed, substantially damaged, and substantially improved buildings must be at or above the BFE.

Mitigation Options:

Acquisition: Additional data on the structures in this area should be collected to determine if they meet the cost/benefit requirements for acquisition under Federal grant programs.

Elevation: Since these properties are in the regulatory floodway, the acquisition and relocation option should receive higher priority for funding.

Reconstruction: This neighborhood is in regulatory floodway. The buildings appear to be in good condition, therefore, demolition and reconstruction is not likely to meet the benefit cost requirements of Federal programs.

Flood Insurance: While not a mitigation measure, property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: This option would cause longer term disruption to businesses than dry floodproofing or the drainage improvement option. Homeowners would also be disrupted and need to find other lodging for several days while cleanup and home repairs are made.

Dry Floodproofing: While dry floodproofing is an option for building owners, more data is needed on the depth of flooding in the area. A structural investigation of each building should be conducted before implementing this option.

Drainage Improvements: Channel improvements should be investigated as a way to reduce the level of flooding in the area. Channel improvements could remove the buildings from the floodway.

Barriers: One concern is the amount of space available for the barrier. Levees and berms need 6 feet of ground space for each foot in height. Small floodwalls may be more appropriate where there is enough room on the lots for walls around a house. The cost of a local floodwall depends

on the depth of flooding and the amount of engineering put into the design. Where flooding is only inches deep, almost any barrier of concrete or earth will work.

The longer the water stays up, the more likely it will seep through or under the wall, so the design must account for seepage and for rain water that falls inside the floodwall. Drain tile to collect this water and a sump pump to discharge it are necessary. Because power is likely to be lost during a storm a generator is needed for a continuous supply of electricity.

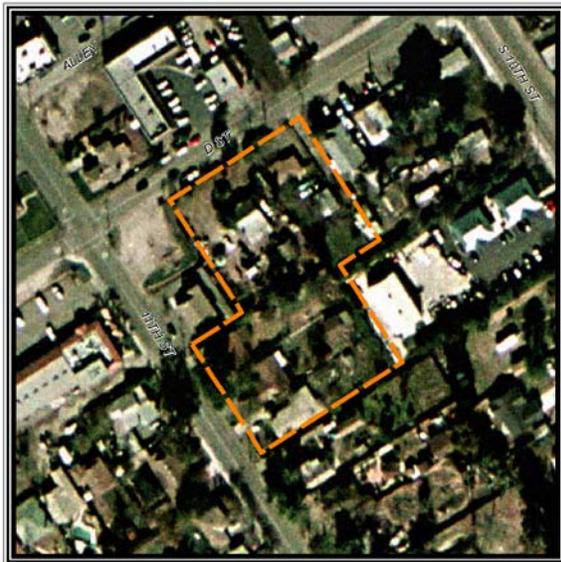
Recommendations:

1. Survey the buildings in the area to determine the lowest and highest adjacent grades, and the lowest floor elevations.
2. Investigate the costs of installing street and drainage improvements in the neighborhood and compare those cost the elevation and acquisition costs.
3. Encourage all property owners in the area to carry a building and contents flood insurance policy.
4. Provide technical assistance to property owners with identifying actions they can take to reduce flood losses.

Downtown Ramona Repetitive Flood Loss Area

There is one repetitive loss property in this area. It had two flood insurance claims in 1980 with losses that totaled \$18,906. A second property in the area had a flood loss of \$3,520 in 1995.

The team identified 6 buildings in the Downtown Ramona area that are subject to the same flooding conditions and risks as the targeted repetitive loss properties identified by FEMA. Those properties are reflected in the area map shown to the right and in Appendix P. Mitigation options and recommendations applicable to the repetitive loss properties as well as the additional properties at risk are presented below.



Local Drainage: Flooding in this area is due to a local drainage problem. Fill has been placed in a ditch behind the homes.

Regulations: The Downtown Ramona study area is outside the SFHA mapped by FEMA. It is designated as an “X Zone,” which means that there are no floodplain management regulations that would require new construction or substantial improvements to buildings to be protected from the 1% annual chance (100-year), or base, flood.

Mitigation Options:

Acquisition: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Elevation: Based on the flood loss history for the area, this would not meet the cost/benefit requirements of Federal grant programs at this time.

Reconstruction: Demolition and rebuild is not a cost-effective mitigation option at this time. If reconstruction occurs for economic reasons or because the buildings are substantially damaged due to fire or some other disaster, property owners should be encouraged to elevate the structures.

Mapping and Regulation: Consideration should be given to mapping this neighborhood as an area of shallow flooding and requiring new and substantially improved buildings to be elevated two feet above the highest adjacent grade. This would not require a change to the Flood Insurance Rate Map. It would be regulated as a freeboard requirement in an X-zone.

Flood Insurance: While not a mitigation measure, property owners in the area should be encouraged to purchase flood insurance. A policy will provide funds for repairs and will cover damage caused by any surface flooding from any source. Contents coverage can also be purchased.

Wet Floodproofing: Homeowners would be disrupted and need to find other lodging for several days while cleanup and home repairs are made.

Dry Floodproofing: Since the area experiences shallow flooding and is outside the special flood hazard area shown on the Flood Insurance Rate Map, dry floodproofing is an option that could be considered. While dry floodproofing is an option, a structural investigation should be conducted before implementing this alternative.

Drainage Improvements: Channel improvements to the ditch that runs behind the properties appears to be the most effective neighborhood solution. A local study should be completed.

Barriers: One concern is the amount of space available for the barrier. Levees and berms need 6 feet of ground space for each foot in height. Small floodwalls may be more appropriate where there is enough room on the lots for walls around a house. The cost of a local floodwall depends on the depth of flooding and the amount of engineering put into the design. Where flooding is only inches deep, almost any barrier of concrete or earth will work.

The longer the water stays up, the more likely it will seep through or under the wall, so the design must account for seepage and for rain water that falls inside the floodwall. Drain tile to collect this water and a sump pump to discharge it are necessary. Because power is likely to be lost during a storm a generator is needed for a continuous supply of electricity.

Recommendations:

1. Map the flood hazard in the area, possibly as an area of shallow flooding and adopt X-zone freeboard regulations.
2. Encourage all property owners in the area to carry a building and contents flood insurance policy.
3. Investigate the costs of installing drainage improvements in the neighborhood.
4. Provide technical assistance to property owners with identifying actions they can take to reduce flood losses.

15.0 MITIGATION ACTION PLAN

A fundamental premise of the mitigation plan is that current dollars invested in mitigation will significantly reduce the demand for future dollars by reducing the amount needed for emergency recovery, repair and reconstruction following a disaster. Mitigation also calls for conservation of natural and ecologically sensitive areas (such as wetlands, floodplains, dunes), which enables the environment to absorb some of the impact of hazard events. In this manner, mitigation programs can help the County attain a level of *sustainability*, ensure long-term economic vitality and promote the environmental health for the community as a whole.

Hazard mitigation requires that we build, rebuild and plan for today's development while considering the impact of natural hazards yet to come on inhabitants in the years ahead.

The Hazard Mitigation Action Plan included as Table 5.1 identifies mitigation activities and the priority assigned to implementing each activity. Several factors were considered when assigning a priority to an activity including the:

- value of the property loss reduction benefit likely to be achieved by the activity
- potential economic recovery benefit
- cost of implementing the activity
- level of public support

For each action item a lead Department or staff position has been identified. Each action item also has a deadline listed. Deadlines are either "ongoing" (for programs that should continue) or a date for the action to be completed. Additionally, for each action item general categories of expenditure have been identified along with potential sources of funding.

Revisions to the hazard mitigation plan to correct flaws that are discovered will be undertaken on an as-needed basis. There are always some contingencies that cannot be foreseen, or events which cannot be predicted. Revisions incorporate those changes necessary to better fit the plan to real-life situations. Periodic revision of mitigation plans will also help to ensure that local mitigation efforts include the latest and most effective mitigation techniques. Periodic revision of the mitigation plan will also keep it in compliance with state and local statutes and regulations.

Keeping the plan current will be a shared responsibility among elected officials and County staff.

TABLE 15.1

Action Item	Responsible Office	Priority	Deadlines	Budget	Funding Sources
5-year Plan review and update	Flood Control District Mitigation Planning Committee	High	September 2012 June 2012	Staff time and contractor	Flood Control District Funds and HMGP or FMA grant
Monitor Mitigation Plan actions and report progress annually	Flood Control District County Departments	High	Sept. 1 annually August 1 annually	Staff time and contractor Staff time	General Fund Agency Funds
Maintain adequate Building Inspection staff and provide training and resources needed for a Building Code Building Code Effectiveness Grading Schedule (BCEGS) Class 3/3.	Department of Planning and Land Use	Very High	Ongoing	Staff time	Permit Fees
Enforce the International Building Codes	Department of Planning and Land Use	High	Ongoing	Staff time	Permit Fees
Draft freeboard regulations	Department of Public Works	Moderate	January 2009	Staff time	Flood Control District Funds

Action Item	Responsible Office	Priority	Deadlines	Budget	Funding Sources
Hold hearing and consider adoption of Freeboard Regulations	Department of Public Works	Moderate	July 2009	Staff time	Flood Control District Funds
Maintain Flood Maps and Data	Department of Public Works	High	Ongoing	Staff time	Permit Fees
Draft Critical Facility Regulations	Department of Public Works	High	January 2010	Staff time	Flood Control District Funds
Hold hearing and consider adoption of Critical Facility Regulations.	Board of Supervisors	High	July 2010	Staff time	Flood Control District Funds
Draft Cumulative Substantial Improvement Regulations	Department of Public Works	Moderate	June 2009	Staff time	Flood Control District Funds
Hold hearing and consider adoption of Addition and Cumulative Substantial Improvement Rules	Board of Supervisors	Moderate	September 2009	Staff time	Flood Control District Funds
Conduct a study on the benefits of adding a Repetitive Loss Provision to the Flood Ordinance	Department of Public Works	Moderate	September 2009	Staff time and consultant	Flood Control District Funds

Action Item	Responsible Office	Priority	Deadlines	Budget	Funding Sources
Ensure Erosion and Sedimentation Permits are obtained	Department of Public Works	Moderate	Ongoing	Staff time	Permit Fees
Continue to enforce Stream Dumping Regulations	Department of Public Works	Moderate	Ongoing	Staff time	General Funds
Continue to maintain the Drainage System	Department of Public Works	High	Ongoing	Staff time and equipment	Flood Control District Funds
Continue to enforce the County's Stormwater Regulations	Department of Public Works	High	Ongoing	Staff time	General Funds
Study of the drainage system and make recommendations on needed improvements	Department of Public Works	High	Ongoing	Staff time and consultant	Flood Control District Special Drainage Area Fees
Document damages from inadequate drainage and develop a Capital Improvements program to eliminate problem sites.	Department of Public Works	High	Ongoing	Staff time	Flood Control District Special Drainage Area Fees

Action Item	Responsible Office	Priority	Deadlines	Budget	Funding Sources
Adopt an updated Emergency Operations Plan that includes Hazard Mitigation Actions and identifies resources needed to accomplish response and mitigation Tasks	Office of Emergency Services and the Board of Supervisors	High	January 2009	Staff time and printing	Flood Control District Special Drainage Area Fees
Conduct an annual exercise of the Emergency Operations Plan	Office of Emergency Services	High	Ongoing – Annually	Staff time	Flood Control District Funds
Prepare an application for designation as a StormReady Community.	Office of Emergency Services and Department of Public Works	Low	October 2009	Staff time	Flood Control District Funds
Provide adequate maintenance for ALERT system components	Department of Public Works	High	Ongoing	Staff time and equipment	Flood Control District Funds
Continue the public awareness program “Preparedness Starts with You”	Office of Emergency Services	High	Ongoing	Staff time	General Fund
Incorporate updated FEMA digital FIRM data into SANGIS	Department of Public Works	High	2008	Staff time	General Fund and Permit Fees

Action Item	Responsible Office	Priority	Deadlines	Budget	Funding Sources
Provide Flood Map Information to the public (residents, business owners, developers, realtors, insurance agents, lenders)	Department of Land Use and Planning and Department of Public Works	High	Ongoing	Staff time	General Fund and Permit Fees
Send Flood Mitigation Brochures to the public (residents, business owners, developers, realtors, insurance agents, lenders)	Department of Land Use and Planning and Department of Public Works	High	Annually	Staff time and printing	Flood Control District Funds
Prepare News Releases on Property Protection Measures and progress made in implementing the Mitigation Plan	Department of Public Works	Moderate	Quarterly	Staff time	Flood Control District Funds
Prepare a Public Outreach Strategy	Department of Public Works	Moderate	October 2009	Staff time	Flood Control District Funds
Continue to provide mitigation materials in the library.	Department of Public Works and Department of Land Use and Planning	Low	Update Annually	Staff time and printing	Flood Control District Funds

16.0 PLAN MONITORING

Monitoring and evaluation involve the ongoing processes of compiling information on the outcomes that result from implementation of the hazard mitigation strategies contained in the plan. In other words, monitoring and evaluation measure how successfully the County is implementing each mitigation strategy.

Monitoring and evaluation also provide the County with an opportunity to make necessary revisions as local conditions change. Changes in development, technology or the capability of the County to implement mitigation actions may necessitate changes to the plan itself.

The primary issue that monitoring and evaluation should address is whether the County's vulnerability has decreased as a result of the plan. Where vulnerability has decreased, the County should determine why and consider implementing successful mitigation measures in other locations.

Where vulnerability has increased, or remained constant, the County should identify whether additional measures might be more successful, or whether revisions should be made to existing measures.

Other issues that should be assessed include:

- The adequacy of the County's resources to implement the mitigation strategies.
- Any redundancy among strategies that can be eliminated to free-up resources.
- Whether adequate funding is available.
- Any technical, legal or coordination problems associated with implementation.
- Whether mitigation actions are being implemented according to schedule.

Leading the evaluation effort for the County of San Diego will be the Flood Control District Advisory Committee, which has been requested by the County Board of Supervisors to prepare and present an annual evaluation report on the *Floodplain Management Plan* by August 15 of each year. The report will cover the following points:

- A review of the original plan.
- A review of any floods, hurricanes or other natural disasters that occurred during the previous calendar year.
- A review of the action items in the original plan, including how much was accomplished during the previous year.
- A discussion of why any action items were not completed or why implementation is behind schedule.
- Recommendations for new projects or revised action items.

The following table will help the committee and the County as they track and evaluate mitigation actions identified in the *FMP*.

Action Item	Description	Milestones	Evaluation Measures
Plan Monitoring, Evaluation and Update			
5-year Plan Review and Update	5-year evaluation, progress report and revised plan are required by DMA 2000. 5-year Plan Review and Update following 10 Step process used for the current Plan is required for participation in CRS.	September 2012 September 2012	Update is completed on schedule. Update is completed on schedule.
Monitor Mitigation Plan Actions and Report Progress Annually	An annual report on the progress of implementing mitigation actions identified in the Plan is required for continued participation in the CRS Program.	August 15 each year.	Annual reports are completed on schedule.
Adopt a Resolution to Appoint floodplain residents to the County Flood Control District Commission	Commission should include floodplain residents who make up at least 50% of the membership.	October 2009	Commission composition meets CRS requirements for planning credit.
Publicize and recruit floodplain resident commission members	Invite participation	New Commission members are appointed before February 1, 2010	Commission composition meets CRS requirements for planning credit.
Prevention Measures			
Maintain Adequate Building Inspection Staff and Provide Training and Resources Needed to Maintain a BCEGS Class 3/3.	Add building code plan review and inspections staff. Ensure adequate training time and resources are provided so the staff can maintain their certifications.	Additional staff is authorized in the next budget.	The County improves its BCEGS rating.
Enforce the International Building Codes	Includes the IBC and IRC.	State and County adopt the International Codes by October 2008	Buildings constructed to the recent code perform better during natural disasters.

Action Item	Description	Milestones	Evaluation Measures
Adopt Freeboard Regulations	Regulation to increase the freeboard requirement to 1 foot above the BFE.	Adoption by March 2009	Measure the effect on flood losses.
Maintain Flood Maps and Data	<p>Maintain a floodplain overlay map in the County's GIS.</p> <p>Participate in new FEMA digital FIRM development and contribute topographic and LIDAR data.</p>	<p>Ongoing</p> <p>Ongoing</p>	<p>Improved awareness of flood hazards and effectiveness of enforcement.</p> <p>Flood hazard data is more accurate.</p>
Adopt Critical Facility Regulations.	Unless a feasible alternative is available, regulations would prohibit critical facilities from being located in the 1% annual chance (100-year) floodplain. In the absence of alternative site, the regulations would require elevation to the 200-year flood level.	Adoption by March 2010	Measure the effect on flood losses at critical facilities in NMB.
Adopt Addition and Cumulative Substantial Improvement Rules	Clarify building addition rules and adopt rules to track building improvements over the life of the structure.	Adoption by September 2009	Number of buildings achieving better property protection at an accelerated rate.
Property Protection			
Conduct a Study on the Benefits of Adding a Repetitive Loss Provision to the Flood Ordinance	This study would examine past flood claims to determine how many property owners might benefit from the addition of this provision to the ordinance. It would also describe local administrative procedures to be followed so property owners would be eligible for this assistance.	Complete the study in 2009	

Action Item	Description	Milestones	Evaluation Measures
Natural Resource Protection			
Enhance biological diversity	Continue to fund the Multiple Species Conservation Land Acquisition Program	Annual Funding	Habitats for endangered and threatened species are enhanced.
Protect streams from sedimentation and pollution.	Ensure Erosion and Sedimentation Permits are Obtained	Ongoing	All permits issued by the County meet the design manual requirements.
Continue to Enforce the County's Stormwater Regulations	Requires development runoff not to exceed predevelopment runoff.	Ongoing	All permits issued by the County meet the design manual requirements.
Structural Projects			
Continue to Maintain the County's Drainage System	<p>Inspect the drainage system at least annually and maintain when needed.</p> <p>An inspection is conducted after each storm that could adversely impact the drainage system.</p> <p>Inspections are conducted in response to citizen's complaints.</p>	Inspections and maintenance are completed in accordance with the County's maintenance plan.	Property losses from flooding are reduced.
Drainage Improvements	Develop and construct projects in the 5-year master plan in accordance with available funding.	Ongoing	Measure the effect on flood losses.
Emergency Services			
Conduct an Annual Exercise of the Emergency Operations Plan with a Scenario that Test Policies and Procedures	The exercise may be a table top exercise, drill, or response to an actual disaster to meet the CRS flood warning credit prerequisite.	Annual Exercise	Document improvements made to the plan or operating procedures as a result of the exercise.

Action Item	Description	Milestones	Evaluation Measures
Provide adequate maintenance for the ALERT system components	Add staff to maintain the gage system, prepare flow rating curves and model streams so flood stages can be identified both up and downstream of gage sites.	Annual appropriations	Flood forecast capability is expanded so warning times are reduced and lives are saved
Prepare an application to the National Weather Service for designation as a StormReady Community.	The application requires documentation on the communications, training and operational capabilities if the County's emergency response.	Complete by January 2009	Training and coordination offered by the NWS enhances the County's emergency response capability
Public Information			
Send Flood Mitigation Brochures to the Public	The brochures address topics identified by the Community Rating System	Ongoing	People who receive the information undertake mitigation projects.
Prepare News Releases on Property Protection Measures and Progress made in Implementing the Flood Mitigation Plan	At least one article should be provided to the press each quarter.	Ongoing	Public is more aware of mitigation actions taken by the County and the kinds of actions they can take to protect their lives and property.
Prepare a Public Outreach Strategy	The strategy should be prepared by a committee and include representatives from outside County government.	Committee appointed by January 2008 Strategy is completed by October 2009	Mitigation messages from the County are consistent and effective.

17.0 REFERENCES

County of San Diego Drainage Design Manual

County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance

Flood Insurance Study, San Diego County, California and Incorporated Areas, FEMA, September 29, 2006.

Digital Flood Insurance Rate Map, San Diego County, California and Incorporated Areas, FEMA, September 29, 2006

Multi-Jurisdictional Hazard Mitigation Plan, San Diego, CA, March 2004

Multiple Species Conservation Program, County of San Diego, October 22, 1997

National Flood Insurance Program Community Rating System Coordinator's Manual, FIA-15/2006

Project Clean Water – <http://www.projectcleanwater.org>

San Diego County Hydrology Manual, County of San Diego Department of Public Works, Flood Control Section, June 2003

San Diego Geographic Information System Website, SanGIS – <http://www.sangis.org/>

Water Quality Control Plan for the San Diego Basin (9), California Regional Water Quality Board, San Diego Region, September 8, 1994