

DRAFT

CITY OF SAN DIEGO
DRAFT
FLOOD MITIGATION PLAN

PREPARED FOR:

CITY OF SAN DIEGO

URS PROJECT NO. 27656155.01000

MAY 8, 2007

D R A F T

**CITY OF SAN DIEGO
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FLOOD MITIGATION PLAN**

Prepared for

City of San Diego
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URS Project No. 27656155.01000

Angela Leiba
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May 8, 2007

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Subject: Flood Mitigation Plan – Draft Flood Mitigation Plan
San Diego, CA
URS Project No. 27656155.01000

Dear Ms. Villa:

URS Corporation Americas (URS) is pleased to present this Draft Flood Mitigation Plan (FMP) to the City of San Diego. This FMP includes: an introduction, plan description, community description, planning process, flood hazard profiles, vulnerability analysis, capabilities assessment, mitigation strategy, plan maintenance, references, and appendices.

This Draft FMP will be posted on the City's Website for public review and comment. Once the FMP is finalized it must be approved by City Council prior to submittal to the Federal Emergency Management Agency (FEMA).

Please review and relay your comments to us as soon as possible. Please feel free to call me if you have any questions or comments.

URS appreciates the opportunity to continue to assist you with this important project.

Sincerely,



Angela Leiba
Project Manager

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List of Acronyms and Abbreviations

A Zone	100-year flood plain
BFE	Base Flood Elevation
CFR	Code of Federal Regulations
cfs	Cubic feet per second
COESS	State of California Office of Emergency Services and Security
CRS	Community Rating System
DFIRMs	Digital Flood Insurance Rate Maps
DSOD	California Division of Safety of Dams
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance Program
FMP	Flood Mitigation Plan
HMGP	Hazard Mitigation Grant Program
HUs	Hydrological Units
ICC	Increased Cost of Compliance
NFIP	National Flood Insurance Program
PDM	Pre-Disaster Mitigation Plan
RLP	Repetitive Loss Property
SDF	Special District Facility
SDHR	San Diego Hydrologic Region
SFHAs	Safe Flood Hazard Areas
SRLP	Severe Repetitive Loss Property
UCSD	University of California San Diego
USACE	United States Army Corps of Engineers
USGS	United States Geological Surveys
V Zone	100-year flood plain due to wave velocity

SECTION 1 INTRODUCTION TO PLAN

Across the United States, natural and human-caused disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The impact on families and individuals can be immense and damages to business can result in regional economic consequences. Floods are one of the most common hazards in the United States. Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states. However, all floods are not alike. Some floods develop slowly or sometimes over a period of a day, such as flash floods, that can develop quickly, sometimes in just a few minutes and without any visible signs of rain.

Coastal flooding occurs when there is an increase in tidal elevations (storm surges), wind speed, and erosion. Riverine flooding occurs when excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto a river's bank or to adjacent floodplains. Flooding can also occur when a dam breaks, producing effects similar to flash floods or by wave run-up in conjunction with high tides and strong winds. 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. Flooding can also result from tsunami events. A tsunami is a series of long waves generated in the ocean by a sudden displacement of a large volume of water (e.g. underwater earthquakes, landslides, volcanic eruptions, meteoric impacts, or onshore slope failures) that come ashore and can cause extreme sudden flooding and great damage to coastal communities. Nationwide, floods result in more deaths than any other natural hazard.

This *Flood Mitigation Plan for the City of San Diego, California* (FMP) was prepared with input from City of San Diego staff and residents, responsible officials, URS Corporation consultants, interested parties and the public, and with the support of the State of California Office of Emergency Services and Security (COESS) and the Federal Emergency Management Agency (FEMA). This section of the FMP includes an overview of the FMP, a discussion of the FMP's purpose and authority, and informational background regarding the history of flood mitigation.

1.1 PURPOSE

The FMP has been developed to (1) identify the flooding sources affecting the City of San Diego's Repetitive Loss Properties (RLPs) and Severe Repetitive Loss Properties (SRLPs), (2) provide specific guidance for potential mitigation measures and activities to best address the problems and needs associated with RLPs and SRLPs, (3) establish floodplain management goals that minimize flood damage to areas vulnerable to natural and human-caused flood disasters, (4) ensure the natural and beneficial functions of our floodplains are protected, and (5) promote flood insurance awareness throughout the City of San Diego and neighboring communities. Attainment of these objectives are accomplished through the utilization of existing programs and resources, involving those public agencies responsible for regulating development in special flood hazard areas, and through verifying policies and programs identified in the capabilities assessment are carried out. Supervision of the FMP planning process was provided by the City of San Diego Transportation Engineering Division, Engineering and Capital Projects.

The FMP is intended to facilitate cooperation between state and local authorities, prompting them to work together. It encourages and rewards local and state pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network is intended to enable local and state

governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects.

1.2 ADOPTION BY LOCAL GOVERNMENT

The FMP adoption process consists of several steps. The first step after completion of the Draft FMP is to provide it to the City of San Diego Transportation Engineering Division, Engineering and Capital Projects Department, other interested agencies, and the public for review and comment. In addition to allowing public comments to be provided throughout the planning process, the public will also have the ability to review and comment on the Draft FMP throughout the month of May, 2007, as a final step before adoption by the City Council. City staff and URS Corporation consultants will review all recommendations, and make any necessary changes prior to the June 10, 2007 City of San Diego Council meeting, where adoption of the FMP is scheduled. Once the FMP is adopted, it will be submitted to the Federal Emergency Management Agency (FEMA) for final approval. The Adoption Resolution, once complete, will be included in Appendix A.

1.3 BACKGROUND

During the 1960s, Congress became concerned with problems related to the traditional methods of dealing with floods and flood damage. Construction of structural projects and federal disaster assistance were proving to be expensive and ineffective. Congress concluded that:

- Although Federal flood programs were funded by all taxpayers, they primarily helped only residents in floodplains.
- Flood protection structures were expensive and could not protect everyone.
- People continued to build and live in the floodplains, thus still risking disaster.
- Disaster relief was both inadequate and expensive.
- The private insurance industry could not sell affordable flood insurance because only those at high risk would buy it.

In 1968, to deal with these concerns, the U.S. Congress passed the National Flood Insurance Act which established the National Flood Insurance Program (NFIP). In 1973, The NFIP was modified to include the Flood Disaster Protection Act that required structures built in a 100-year floodplain to carry flood insurance coverage as a condition for receiving federal aid or federally insured loans. In 1994, the Flood Mitigation Assistance (FMA) program was created as part of the National Flood Insurance Reform Act. The FMA is a pre-disaster grant program that provides funding to States and communities to assist in their efforts to reduce or eliminate the risk of repetitive flood damage to buildings, and structures insurable under the NFIP. In addition, the Flood Insurance Reform Act of 1994 also introduced the Community Rating System (CRS) program. This program recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards.

1.3.1 National Flood Insurance Program (NFIP)

The NFIP is a federal program administered by the Federal Emergency Management Agency (FEMA). The NFIP makes Federally-backed flood insurance available in communities that adopt and enforce floodplain management ordinances to help reduce future flood losses. The NFIP transfers costs of private property flood losses from tax payers to floodplain property owners through flood insurance premiums; provides financial aid to flood victims; encourages development away from flood-prone areas; and requires new and substantially improved structures to be constructed in a way that minimizes or prevents flood damage.

FEMA's Federal Insurance Administration and Mitigation directorate manages the NFIP. The Federal Insurance Administration manages the insurance component of the NFIP, and works closely with FEMA's Mitigation Directorate, which oversees the floodplain management aspect of the programs.

1.3.2 Flood Mitigation Assistance (FMA)

In 1994, the Flood Mitigation Assistance program was created as part of the National Flood Insurance Reform Act. The FMA is a pre-disaster grant program that provides funding to States and communities to assist in their efforts to reduce or eliminate the risk of repetitive flood damage to buildings, and structures insurable under the NFIP. The primary goal is to reduce or eliminate insurance claims under the NFIP.

Three types of FMA grants are available to States and communities:

- **Planning Grants** are given to States and communities to develop or update Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project grants.
- **Project Grants** are given to States and communities to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses each with a claim of at least \$1,000 within any ten-year period since 1978.
- **Technical Assistance Grants** are given to States to help administer the FMA program and activities. Up to ten percent (10%) of Project grants may be awarded to States for Technical Assistance Grants.

FEMA distributes FMA funds to states, which in turn provide funds to communities. The State serves as the grantee and program administrator for the FMA. The State:

- Sets mitigation priorities.
- Provides technical assistance to communities applying for FMA funds.
- Evaluates grant applications based on minimum eligibility criteria and State priorities.
- Awards planning grants.
- Works with FEMA to approve projects and awards funds to communities.
- Ensures that all community applicants are aware of their grant management responsibilities.

1.3.3 Community Rating System

The NFIP/CRS was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS:

- Reduce flood losses;
- Facilitate accurate insurance rating; and
- Promote awareness of flood insurance.

The CRS recognizes 18 creditable activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. Accumulation of credit points results in the assignment of a CRS classification. There are a total of ten CRS classes. Class 1 requires the most credit points and gives the largest insurance premium reduction, while a community rated Class 10 receives no reduction in insurance premiums. Table 1-1 below shows the CRS class levels, corresponding credit points, and premium reductions.

**Table 1-1
NFIP Community Rating System – Class Summary**

Credit Points	Class	Insurance Premium Reduction	
		SFHA*	Non-SFHA**
4,500 +	1	45%	5%
4,000 – 4,499	2	40%	5%
3,500 – 3,999	3	35%	5%
3,000 – 3,499	4	30%	5%
2,500 – 2,999	5	25%	5%
2,000 – 2,499	6	20%	5%
1,500 – 1,999	7	15%	5%
1,000 – 1,499	8	10%	5%
500 – 999	9	5%	5%
0 – 499	10	0	0

Notes: * Special Flood Hazard Area

** Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies.

Source: <http://www.fema.gov/business/nfip/fldmanre.shtm>

SECTION 2 PLAN DESCRIPTION**2.1 PLAN DESCRIPTION**

The remainder of this Flood Mitigation Plan consists of the following sections:

2.1.1 Community Description

Section 3 provides a general history and background of the community and historical trends for population, demographic and economic conditions that have shaped the area. Trends in land use and development are also discussed.

2.1.2 Planning Process

Section 4 describes the planning process, identifies Planning Team members, URS Corporation consultants (URS), and the key stakeholders within the community and surrounding region. In addition, this section documents public outreach activities and the review and incorporation of relevant plans, reports, and other appropriate information.

2.1.3 Risk Assessment (Flood Hazard Profile and Vulnerability Analysis)

Section 5 describes the process through which the Planning Team identified and compiled relevant data on all potential flood hazards that threaten the City of San Diego and the immediately surrounding area. Information collected includes historical data on natural and human-caused flood hazard events that have occurred in and around the City of San Diego and how these events impacted residents and their property.

The descriptions of flood hazards that could affect the City of San Diego are based on historical occurrences and best available data from agencies such as FEMA, the U.S. Geological Survey (USGS), the California Geologic Survey, and the National Weather Service. Detailed flood hazard profiles include information on the frequency, magnitude, location, and impact of each hazard as well as probabilities for future flood hazard events. Figures are included to identify known flood hazard areas and locations of previous flood hazard occurrences. See Appendix B.

In addition, Section 6 identifies potentially vulnerable assets such as people, residential dwelling units, critical facilities, infrastructure and lifelines, hazardous materials facilities, and commercial facilities. These data were compiled by assessing the potential impacts from each flood hazard using GIS and FEMA's natural hazards loss estimation model, HAZUS-MH. The resulting information identifies the full range of flood hazards that the City could face and potential social impacts, damages, and economic losses.

2.1.4 Capabilities Assessment

Although not required by the DMA 2000, Section 7 provides an overview of the City of San Diego's resources in the following areas for addressing flood hazard mitigation activities:

- **Legal and regulatory:** Existing ordinances, plans and codes that affect the physical or built environment in a community
- **Administrative and technical:** The staff, personnel, and department resources available to expedite the actions identified in the mitigation strategy
- **Fiscal:** The financial resources to implement the mitigation strategy

2.1.5 Mitigation Strategy

As Section 8 describes, the Planning Team developed a list of mitigation goals, objectives, and actions based upon the findings of the risk assessment and the capability assessment. Based upon these goals and objectives, the Planning Team, supported by URS, reviewed and prioritized a comprehensive range of appropriate mitigation actions to address the risks facing the community. Such measures include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities.

2.1.6 Plan Maintenance Process

Section 9 describes the Planning Team's formal plan maintenance process to ensure that the FMP remains an active and applicable document. The process includes monitoring, evaluating, and updating the FMP; implementation through existing planning mechanisms; and continued public involvement.

2.1.7 References

Section 10 lists the reference materials used to prepare this FMP.

2.1.8 Appendices

The appendices include the Adoption Resolution, Figures, Planning Team and Public Workshop Meeting Summaries, Public Outreach, Flooding Sources in San Diego, List of Critical Facilities, Plan Maintenance Documents, Proposed Mitigation Projects for Repetitive Loss Properties, Proposed Mitigation Projects City-Wide, and the FEMA Region IX – CA OES Local Hazard Mitigation Plan (LHMP) Crosswalk (includes Flood Mitigation Assistance {FMA} Requirements). For the purposes of this document all figures are included in Appendix B.

SECTION 3 COMMUNITY DESCRIPTION**3.1 LOCATION, GEOGRAPHY AND HISTORY****3.1.1 Location**

The City of San Diego is located in southern California, between Los Angeles and the Mexican Border, in the extreme southwest corner of the United States. It is the second largest city in California with an approximate population of 1.3 million and the seventh largest city in the United States. The larger metropolitan area of San Diego has a population approaching 3 million. The city is bordered on the south by the City of Tijuana which lies just south of the Mexican border. To the north San Diego is bordered by Orange County and the coastal cities of Carlsbad and Oceanside. To the east lie Imperial Valley and the City of El Centro.

3.1.2 Geography

The city of San Diego is composed of deep canyons and mesas, and there are small pockets of natural parkland scattered throughout the city. Balboa Park lies on a mesa to the northeast of downtown. It is surrounded by several dense urban communities and extends to Hillcrest to the north. Downtown San Diego is located on San Diego Bay. The Coronado and Point Loma peninsulas serve as a barrier between the San Diego Bay and the Pacific Ocean. The community of Ocean Beach occupies the west side of Point Loma. Mission Bay, a man-made aquatic park, lies to the north of San Diego Bay and is separated from the ocean by the communities of Mission Beach and Pacific Beach. La Jolla is an affluent community to the north of Pacific Beach on the coast. To the east of La Jolla, Mount Soledad offers views that extend from northern San Diego County to Mexico. Mountains loom to the east of the city, and beyond those mountains to the east are the desert areas of Imperial Valley, El Centro and the Chocolate Mountains. Cleveland National Forest, a 460,000 acre recreational park, is located within a half-hour drive to the east of San Diego. Additionally, the vast Anza Borrego Desert State Park lies further to the east of the city. Numerous farms are located in the valleys northeast and southeast of the city. San Diego County has an array of endangered plant and animal species (as determined by US Environmental Protection Agency).

3.1.3 History

Prior to European settlement, the area now comprising San Diego was occupied by the Kumeyaay people and the village of Nipaguay. The first European to sail into San Diego Bay was Juan Rodriguez Cabrillo, in 1542. It was thereafter claimed as a part of the colony of New Spain and the Mission San Diego Alcalá was established in 1769. Colonists started to arrive in 1774, however a rebellion of the native people followed one year later and the mission was burned to the ground. The mission was rebuilt two years later out of fire proof adobe, and became the largest mission in California.

In 1821 Mexican independence was recognized and the mission was secularized and a pueblo formed. However, San Diego became part of the United States province of Alta California after the Mexican American war in 1850. San Diego was designated the seat of the newly-established San Diego County.

San Diego was connected to the rest of the country via railroad by 1885 and reincorporated as a city in 1886.

Significant Naval presence began in 1907 and continues to this day. Military presence continues to play a central role in the economy, and recently San Diego has become a center for the emerging biotech industry and continues to have a strong telecommunications sector.

3.2 DEMOGRAPHICS

According to the San Diego Association of Governments, as of January 1, 2006, the population was estimated to be 1,311,162 with a median age of 34 years. The median income is \$50,710, adjusted for inflation in 1999 dollars. According to the U.S. Census 2004 American Community Survey, San Diego city has the fifth largest median household income among cities with a population of greater than 250,000. There are a total of 1,118,410 housing units available to the population and there is a current vacancy rate of 4.5%.

The San Diego economy is highly dependent on revenue from military expenditures which account for approximately 13% of the regional economy. San Diego's history, social, and economic makeup are inextricably tied to the military's presence in the region. Adding the jobs supported by defense spending to the direct military and related civilian jobs existing in the San Diego region, about one-fourth of total employment locally is due to the military.

San Diego is home to a large biotech industrial cluster, fueled in part by the presence of the University of California, San Diego (UCSD) and other biotech research institutions. The San Diego biotech cluster is consistently ranked among the top biotech industrial clusters in the United States. Additionally, San Diego is home to a robust telecommunications industry, providing a home to telecom giant, Qualcomm, which is also the largest private sector technology employer in San Diego County.

The economy of San Diego is influenced by its port, which includes the only major submarine and shipbuilding yards on the West Coast, as well as the largest naval fleet in the world. The cruise ship industry, which is the second largest in California, generates an estimated \$2 million annually from the purchase of food, fuel, supplies, and maintenance services. Finally, the tourism sector in San Diego is strong due to the climate, coastal location, and variety of recreational activities available in San Diego.

3.3 CLIMATE AND RAINFALL

Due to its coastal location, San Diego enjoys mild weather for most of the year, with a warm winter and cool summer relative to other locations along the same latitude. Average temperatures range from 57° Fahrenheit in January to 72° in July. The overall daily average temperature in San Diego is 70.5° Fahrenheit. Average annual precipitation is less than 12 inches, and is concentrated in the cooler months of December through March. Seasonal rainfall is about 10 inches in the city, however, regional rainfall increases with elevation and distance from the coast. In the mountains to the north and east the average rainfall is between 20 and 40 inches, depending on slope and elevation. Freezing temperatures are very rare however, infrequent measurable amounts of hail do occur in San Diego, while snow is extremely rare. Hot weather is more frequent and during summer temperatures may rise into the 90s and even 100s in the eastern sections of the city and outlying areas.

A particular aspect of San Diego weather is the marked variation in temperatures within short distances. In nearby valleys daytimes are much warmer in the summer and nighttime much cooler in the wintertime. Additionally, these areas experience freezing temperatures more frequently. While daily temperature variation is extremely low, only about 15 degrees between high and low readings, a few miles inland the variation increases to 30 degrees or more. Another marked characteristic of San Diego weather during the spring and summer is the nighttime and early morning cloudiness, which is often referred to as “May Gray and June Gloom.”

3.4 SOILS

San Diego’s soils are dry with high salt content and clays and not well suited to agriculture. The soil is low in iron and phosphorous compared to areas that historically have forests that decomposed and left deep organically rich soil. Overall these types of soils are characteristic of coastal desert regions. Resistant peaks composed of Mesozoic crystalline rocks are rooted at depth to buried Mesozoic crystalline rock terrain. These basement “highs” protrude through younger Cretaceous and Tertiary sedimentary cover and demonstrate the topographic relief of the buried landscape of western San Diego County.

The City of San Diego is underlain by a series of sequential layers of marine and non-marine sedimentary rock units that record 140 million years of earth history. The relationship of land and sea has fluctuated over this time to the extent that there are now deposits of marine rocks at elevations up to 900 feet above sea level and ancient river deposits as high as 1,200 feet. The local La Nacion and Rose Canyon fault zones divide the sedimentary layers into a number of distinct fault blocks. North of La Jolla the effects of faulting are not as great as in the southwestern portion of the City. Exposures of late Cretaceous marine sedimentary rocks occur in the sea cliffs along the west side of the Point Loma Peninsula and in La Jolla from Bird Rock to La Jolla Shores, while the sea cliffs north of Scripps provide exposures of Eocene marine sedimentary rocks.

3.5 DRAINAGE

Topography within the boundaries of the City of San Diego is extremely varied. Elevations in San Diego County range from sea level to the County’s highest peak, Hot Springs Mountain, which rises 6,533 feet above sea level. Hot Springs Mountain is part of the Peninsular ranges which include; the Santa Ana, Agua Tibia, Palomar, Hot Springs, Aguanga, Volcan, Cuyamaca, and Laguna Mountain systems.

The foothills west of the Peninsular Range average 16 – 20 inches of annual rainfall and the western slope of the Peninsular Range receives as much as 45 inches of annual precipitation. The region has a distinct rainy season with the vast majority of precipitation occurring between October and April.

There are a total of 11 hydrological units (HUs) in the San Diego Hydrologic Region (SDHR), which encompasses a land area of nearly 3,000 square miles. Eight major stream systems originate on the western slope of the Peninsular Range and discharge into the Pacific Ocean. From north to south they are San Juan Creek, and the Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tijuana Rivers. In addition, there are three HUs whose headwaters are located between the Peninsular Range and the Pacific Ocean. These include the Carlsbad, Los Penasquitos, and Pueblo San Diego units.

Numerous water reservoirs capture and store surface flows throughout San Diego County. However, the County is unable to satisfy its water supply requirements through the storage of local runoff. The State Water Project also brings water from the Colorado River and Northern California rivers to San Diego County via a network of large-diameter pipelines. The San Vicente Reservoir was the first facility to store water from the Colorado River.

Drainage patterns in San Diego have been altered by urbanization, resulting in increased runoff that poses a greater flood threat than in previous years. To accommodate the increasing runoff, the City of San Diego has developed an extensive system of channels and storm drains. The overall drainage pattern in the county is from east to west, following the direction of local rivers.

3.6 HISTORICAL FLOODING IN SAN DIEGO

The most recent serious flood events affecting the City occurred during tropical storms 1976 and 1977 and winter storms in 1978, 1980, 1987, 1995, 1998, and 2005.

During the September 1976 flood, San Diego was hit by tropical storm Kathleen, and a few inches of rain occurred in a matter of hours. In August 1977, tropical storm Dorren produced intense rain resulting in 1-2 inch accumulations locally. In the winter of 1977-1978, strong El Nino conditions produced intense rainfall and large waves that damaged the entire coastline. In the winter of 1980, approximately 16-20 inches of rain accumulated over a six week period. This slow-moving coastal storm, which at the time was the most severe since the great storm of 1916, led to wide-spread small stream flooding and the evacuation of residents of Mission Valley. The Federal government declared San Diego a disaster area for severe storms and flooding in January-March 1995, February-April 1998, and December 2004-January 2005.

In addition to the major flood events brought on by intense or prolonged rainfall, flooding occurs locally during average seasonal rainstorms due to inadequate stormwater pipes or debris-laden channels. These types of flood claims include maintenance, storm drain malfunction, slope failure, and property damage caused by heavy flooding.

Another type of flooding that has occurred in San Diego in the past are dam Failures. The most devastating dam failure event was actually two events which took place on January 19, 1916, when a massive Pacific storm delivered between 8-32 inches of rain in the County over a five day period. At the Sweetwater Dam, the floodwaters overtopped the spillway. However, the dam had been constructed with enough structural stability that only a section of the south abutment was washed out. The Otay Dam, on the other hand, was a total loss. After the steel core of the structure gave way, 20-foot plus waves stripped the canyon walls of any vegetation, destroyed all infrastructure and buildings in its path, and killed 22 to 30 people.

Finally, historical evidence shows that approximately 40 tsunami events have affected San Diego since the mid 1800s. The majority of the tsunami were generated by distant earthquakes along the Pacific Rim and resulted in little to no wave run-up along the San Diego coast. A few tsunamis, however, did impact the San Diego coast. Eight distant tsunamis and one local tsunami generated wave run-up of six inches or greater along the coast.

3.7 OTHER HAZARDS

Besides flooding and flood related events, several types of hazards could potentially occur within the City of San Diego. A natural or man-made event causes a hazard when it harms people or property. Natural events that could cause hazards to the City would include earthquakes, liquefaction, landslides, structure fires and wildfires that strike populated areas. Natural hazards that have harmed the City in the past are likely to happen in the future.

Human-caused hazard events are caused by human activity and include technological hazards and terrorism. Technological hazards are generally accidental and/or have unintended consequences (for example, an accidental hazardous materials release or structure fire), however, terrorism and other crimes can cause hazards with wide ranging effects. Regardless of the cause of the hazard, mitigation of the effects will be the same.

Hazards are identified for San Diego by reviewing historical data to identify what types of hazard events have happened and are likely to happen in the future. Potential hazards that face the City of San Diego, include the following;

Earthquake – An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth’s tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties.

Hazardous Materials Release – Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. Hazardous material releases can occur at facilities (fixed site) or along transportation routes (off-site). They can occur as a result of human carelessness, technological failure, intentional acts, and natural hazards. When caused by natural hazards, these incidents are known as secondary hazards, whereas intentional acts are terrorism. Hazardous materials releases, depending on the substance involved and the type of release, can directly cause injuries and death and contaminate air, water and soils.

Landslide – Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activity (mining and construction of buildings, railroads, and highways) and natural factors (geology, precipitation, and topography). Frequently they accompany other natural hazards such as floods, earthquakes, and volcanic activity.

Liquefaction – Liquefaction is the phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure; lateral spread and loss of bearing strength. Lateral spreads develop on gentle slopes and entails the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when the soils supporting structures liquefies and causes structures to collapse.

Terrorism – Terrorism is defined in the Code of Federal Regulations as “... the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.” Terrorism can be either domestic or

international, depending on the origin, base, and objectives of the terrorist organization. Terrorists utilize a wide variety of agents and delivery systems.

Wildfire – A wildfire is an uncontrolled fire spreading through vegetative fuels and exposing or possibly consuming structures. They often begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. Wildfires can occur in wildlands or along a wildland/urban interface.

Structure Fire – A structural fire hazard is one where there is a risk of a fire starting in an urban setting and spreading uncontrollably from one building to another across several city blocks, or within hi-rise buildings.

It should be noted, that a complete discussion of hazards affecting the City of San Diego can be found in the County of San Diego’s Hazard Mitigation Plan, officially adopted in 2004, and annually updated with input from all nineteen San Diego County jurisdictions, including the City of San Diego.

3.8 LAND USE AND DEVELOPMENT TRENDS

The City of San Diego is currently experiencing new development in the northern part of the City, namely Pacific Highlands Ranch and Black Mountain Ranch. These two communities are referred to as the North City Future Urbanizing Area. The community plan limits the majority of development in this area to residential use and open space, while a small percentage of land is designated for commercial development.

In the southeastern portion of the City known as Otay Mesa, new development is also occurring. According to the community plan for Otay Mesa, the area will be a major employment center and home to future 32,000 people. As such, development in the community is split between residential and commercial use.

Portions of these developing communities fall into designated floodplains. The City of San Diego serves as the local administrator of FEMA floodplain regulations. To ensure that new structures built will not be impacted by the 100-year flood, the City enforces the local floodplain ordinance and national FEMA floodplain management regulations primarily through the development review process. To date, the City of San Diego has issued no variances to City floodplain regulations.

SECTION 4 PLANNING PROCESS**4.1 PLANNING PROCESS**

In order to develop a more comprehensive approach to reducing the effects of flood disasters, FEMA has developed guidelines for applicants to follow. Primarily, FEMA recommends the planning process involves an opportunity for the public to comment on the plan during the drafting stage and prior to the plan approval; an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and review and incorporation, if appropriate, of existing plans, studies, reports, and technical information. Specifically, FEMA recommends the following elements be included within the planning process of an FMP:

- Narrative description of the process followed to prepare the plan;
- Planning Team participants;
- Public involvement;
- Neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process;
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

The FMP followed all of these FEMA suggestions during the planning process and preparation of the FMP as outlined below.

4.2 PLANNING TEAM

Input for the FMP was gained through a variety of avenues, including gathering input from City of San Diego residents, neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests. Efforts to gather input were primarily handled by a local Planning Team that was established during the planning process. The Planning Team members included, but were not limited to, members of City's Public Works/Engineering & Capital Projects Department staff and members of the URS team,, the consultant hired by the City and funded through a FMA Planning Grant.

Table 4-1 below lists the Planning Oversight Team Participants:

**Table 4-1
Planning Oversight Team Participants**

Name	Agency/Company	Department	Title
Christy Villa	City of San Diego	Engineering & Capital Projects	City of San Diego Project Manager
Jamal Batta	City of San Diego	Engineering & Capital Projects	Flood Plain Manager/Civil Engineer
Angela Leiba	URS Corporation Americas	Environmental Management Division	Consultant Project Manager
Luis Fernandez	URS Corporation Americas	Environmental Management Division	Environmental Management Senior Specialist
Lindsey Trumpy	URS Corporation Americans	Environmental Management Division	Environmental Specialist
Nicholas Miller	URS Corporation Americas	Environmental Management Division	Environmental Specialist

4.2.1 Planning Oversight Team Meeting Minutes and Tasks

The Planning Oversight Team meeting summaries, tasks and sign-in sheets are provided in Appendix C.

4.1.2 Public Involvement

The City of San Diego held a series of public workshops to promote flood hazard awareness and to solicit input from the public. The public workshops included a presentation of the risk analysis of the potential flood hazards that were identified by the City of San Diego and URS. Local agencies, businesses, academia, nonprofits, and other interested parties were encouraged to provide input at these meetings to the development of the FMP. The public workshops were held at various locations throughout the City. The following were public workshop locations, dates, and times:

- *Mission Valley: February 28, 2007: 6:00 p.m.- 7:30 p.m. – Mission Valley Branch Library*
- *San Ysidro: March 1, 2007: 6:00 p.m.- 7:30 p.m. – San Ysidro Community Service Center*
- *La Jolla: March 5, 2007: 6:00 p.m. – 7:30 p.m. – La Jolla/Riford Branch Library*

Public Response Questionnaires were handed out at the public workshops to develop a list of potential mitigation actions by soliciting community input regarding vulnerabilities and potential solutions. Citizens participated by prioritizing the hazards and suggesting possible solutions, which formed the basis for researching alternatives and developing evaluation criteria for selecting mitigation actions. Questionnaires were distributed at the public workshop meetings (see Appendix C for a copy of the questionnaire).

Public workshop meeting summaries, sign-in sheets and comments are also included in Appendix C

4.2.2 Press Release

On February 21, 2007, City of San Diego Mayor Jerry Sanders conducted a live press release conference promoting flood awareness and the kick-off of the FMP. Local and Mexican media were invited to the press release. Mayor Jerry Sanders' speech was broadcasted among local and Mexican television news stations throughout the day. A copy of the Press Release Fact sheet is included in Appendix D.

4.2.3 Website

The City of San Diego has created a website for accessing information regarding the FMP. The website address is as follows:

<http://www.sandiego.gov/engineering-cip/projectsprograms/floodmitigation.shtml>.

This website includes information regarding the preparation of the FMP, press releases, public workshop locations and times, contact information, Final FMP, and additional information regarding other FEMA related hazard mitigation programs. A website snapshot is provided in Appendix D.

In addition, the City of San Diego posted a copy of the Draft FMP on the City's website for public review and comment from May 7, 2007 through June 7, 2007.

4.2.4 Flyers

The City of San Diego, in collaboration with URS Consultants, prepared a Press Release Flyer that was distributed among areas prone to flooding throughout the City of San Diego. The Press Release summarized the goals of the FMP, background information, and pertinent contact information. The Press Release also included a schedule and locations of upcoming public workshop meetings. The Press Release Flyer is provided in Appendix D.

4.2.5 Public Comment Draft

Public comments from all three public workshop meetings have been considered, addressed, and incorporated, if applicable, by the Planning Oversight Team in the preparation of this FMP. During the public workshop meetings, concerns of flooding issues throughout several communities were noted. These communities included: Tijuana River Valley, La Jolla, and Mission Valley. Input from these workshops were used to incorporate and develop the Mitigation Strategy. (See Section 8, Mitigation Strategy and Appendix C2).

In addition to the public workshop meetings, the public will have additional opportunities to review and comment on the Draft FMP. As mentioned in Section 4.2.3., the City will post the Draft FMP on the City's website and accept and review comments during the month of May. Comments to the Draft FMP will be considered and incorporated into the Final FMP.

4.2.6 Incorporation of Existing Plans and Other Relevant Information

The Planning Oversight Team members prior to and during the planning process reviewed several plans, studies, and guides. These plans included FEMA documents, City plans, codes and ordinances, and other similar documents. See Section 7 Capabilities Assessment for a list of plans and other relevant information.

SECTION 5 FLOOD HAZARD PROFILES

5.1 FLOOD HAZARD PROFILES

5.1.1 Overview of Flood Hazard Profiles

The specific flood hazards, including coastal and riverine flooding, dam inundation, and tsunami run-up, have been examined in a methodical manner based on the following factors:

- Nature
- History
- Location
- Extent
- Probability of future events

These flood hazards are presented in Section 5 in alphabetical order. The order of presentation does not signify the level of importance or risk.

5.1.2 Coastal and Riverine Flooding

5.1.2.1 Nature

Flooding is the accumulation of water where usually none occurs or the overflow of excess water from a stream, river, lake, reservoir, or coastal body of water onto adjacent floodplains. Floodplains are lowlands adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected.

Nationwide, floods result in more deaths than any other natural hazard. Physical damage from floods includes the following:

- Inundation of structures, causing water damage to structural elements and contents
- Erosion or scouring of streambanks, roadway embankments, foundations, footings for bridge piers, and other features
- Impact damage to structures, roads, bridges, culverts, and other features from high-velocity flow and from debris carried by floodwaters, which may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater effects
- Destruction of crops, erosion of topsoil, and deposition of debris and sediment on croplands
- Release of sewage and hazardous or toxic materials as wastewater treatment plants are inundated, storage tanks are damaged, and pipelines are severed

Floods also result in economic losses through closure of businesses and government facilities, disrupt communications, disrupt the provision of utilities such as water and sewer service, result in excessive expenditures for emergency response, and generally disrupt the normal function of a community.

In San Diego, two types of flooding occur: riverine flooding, also known as overbank flooding, and coastal flooding. Riverine floodplains range from narrow, confined channels in the steep valleys of mountainous and hilly regions, to wide, flat areas in plains and coastal regions. The amount of water in the floodplain is a function of the size and topography of the contributing watershed, the regional and local climate, and land-use characteristics. Flooding in steep, mountainous areas is usually confined, strikes with less warning time, and has a short duration. Larger rivers typically have longer, more predictable flooding sequences and broad floodplains. Coastal flooding occurs along low-lying areas of the shoreline. Coastal flooding generally occurs as a result of waves generated from winter and summer storms originating in the Pacific.

Localized flooding may occur outside of recognized drainage channels or delineated floodplains due to a combination of locally heavy precipitation, increased surface runoff, and inadequate facilities for drainage and stormwater conveyance. Such events frequently occur in flat areas and in urbanized areas with large impermeable surfaces. Local drainage may result in “nuisance flooding,” in which streets or parking lots are temporarily closed, and minor property damage occurs.

5.1.2.2 History

The most recent serious flood events affecting the City occurred during tropical storms 1976 and 1977 and winter storms in 1978, 1980, 1987, 1995, 1998, and 2005.

During the September 1976, San Diego was hit by tropical storm Kathleen, and a few inches of rain occurred in a matter of hours. A little less than one year later, in August 1977, tropical storm Dorren produced intense rain resulting in 1-2 inch accumulations locally. In the winter of 1977-1978, strong El Niño conditions produced intense rainfall and large waves that damaged the entire coastline. In the winter of 1980, approximately 16 – 20 inches of rain accumulated over a six week period. This slow-moving coastal storm, which at the time was the most severe since the great storm of 1916, led to wide-spread small stream flooding and the evacuation of residents of Mission Valley.

Besides the 1980 flood event, the Federal government declared San Diego a disaster area for severe storms and flooding in January-March 1995, February-April 1998, and December 2004-January 2005.

In addition to the major flood events brought on by intense or prolonged rainfall, flooding occurs locally during average seasonal rainstorms due to inadequate stormwater pipes or debris-laden channels. Table 5-1 summarizes flood insurance claims that have been documented by the City of San Diego from 1996 to 2006. These types of flood claims include maintenance, storm drain malfunction, slope failure, and property damage caused by heavy flooding.

Table 5-1
City of San Diego Flood Claim History

Year	Cause of Flood Claims				
	Maintenance	Storm Drain Malfunction	Slope Failure	Property Damage	Other
1996	1				
1998				1	
1999					
2000		1	1		3
2001	4	11		6	9
2002	2	2	1		3
2003	5	3		1	1
2004	3	3		4	5
2005	2	10	5	3	3
2006	1	2			

Source: Real Estate Assets Department, City of San Diego

5.1.2.3 Location

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies often use historical records from streamflow gages to determine the probability of occurrence for floods of different magnitudes. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in any given year.

The following factors contribute to the frequency and severity of riverine flooding:

- Rainfall intensity and duration
- Antecedent moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount, and type of vegetation, and density of development
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Availability of sediment for transport, and the erodibility of the bed and banks of the watercourse

Additionally, the following factors contribute to the frequency and severity of coastal flooding:

- Astronomical tides
- Storm surge, which is the rise in water from wind stress and low atmospheric pressure
- Waves
- Peak stillwater elevation

The magnitude of flood used as the standard for floodplain management in the United States is a flood having a probability of occurrence of 1 percent in any given year, also known as the 100-year flood or base flood. The most readily available source of information regarding the 100-year flood is the system of Digital Flood Insurance Rate Maps (DFIRMs) prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP). The DFIRMs show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as Special Flood Hazard Areas (SFHAs) and are the basis for flood insurance and floodplain management requirements. The DFIRMs also show floodplain boundaries for the 500-year flood, which is the flood having a 0.2 percent chance of occurrence in any given year. FEMA has prepared a DFIRM for San Diego County and its incorporated areas, dated September 2006. These DFIRMs supersede the original city-specific FIRMs effective August 1983 and revised in September 1989 and September 1991.

All the figures associated with this FMP have been compiled and included in Appendix B. Figure B-1 outlines the City of San Diego boundaries in respect to the entire County of San Diego. Figure B-2 shows the extent of the 100-year and 500-year floodplains due to riverine flooding, as well as the 100-year floodplain due to wave velocity, and specific areas that historically have flooding issues. As such, included in the City limits are 31.15 square miles within the 100-year floodplain (A zones), 0.18 square miles within the 100-year floodplain due to wave velocity (V zones), and 6.23 square miles within the 500-year floodplain. Appendix E, Tables E-1 and E-2, lists the name of these flooding sources. The location and the peak discharges are provided for streams that were studied by detailed (hydrologic and hydraulic) study methods. However, this information is not provided for streams studied by approximate study methods.

In addition, rivers and streams where FEMA has prepared detailed engineering studies may also have designated floodways. The floodway is the channel of a watercourse and portion of the adjacent floodplain that is needed to convey the base or 100-year flood event without increasing flood levels by more than 1 foot and without significantly increasing flood velocities. The floodway must be kept free of development or other encroachments. FEMA has designated floodways within the City for the following sources: Alvarado Creek, Beeler Creek; Carmel Valley Creek; Carroll Canyon Creek; Encanto Branch; Florida Drive Branch; Green Valley Creek; Home Avenue Branch; Kit Carson Park Creek; Las Chollas Creek; Los Penasquitos Creek; Nestor Creek; Otay River; Poggi Canyon Creek; San Diego River; San Dieguito River; Santa Maria Creek; Santa Ysabel Creek; Soledad Canyon; South Las Chollas Creek; Tijuana River; and Wabash Branch.

5.1.2.4 Extent

In order to reduce the Special Flood Hazard Area (SFHA) and contain flooding, United States Army Corps of Engineers (USACE) and several other agencies have constructed graded, trapezoidal, concrete-

lined channel banks, culverts, and pipelines throughout the City to contain the 10-, 50-, 100- and/or the 500-year floods. These flood control projects include the following:

- A flood control project in Mexico for the Tijuana River designed to handle a flow of 135,000 cubic feet per second (cfs), the 100-year flow is estimated to be 75,000 cfs.
- A reinforced concrete box culvert contains the 10- and 50-year floodflows within the Nestor Creek floodplain immediately downstream of Beyer Way.
- A trapezoidal concrete channels located under the Highway 5 – State Highway 52 interchange control floods along the Rose Canyon Creek.
- A concrete-lined trapezoidal channel and double box culvert fully contain the 10- and 50-year flows and partially contain the 100- and 500-year floodflows along Murphy Canyon Creek. In addition to this structure, large corrugated metal pipes along Highway 15 have been installed to restrict the floodflow, thereby acting as a detention pond.
- Sutherland Reservoir provides incidental flood protection for Ysabel Creek.
- Trapezoidal channel, with armored sides, provides 10-year flood protection along the Santa Maria Creek. Alvarado Creek from Alvarado Medical Center Station at the downstream section of the creek to the 70th Street Station in the upstream section. The improvements consisted of the following: Replaced 5,700' of 12 to 20-foot wide concrete-lined trapezoidal channel with approximately; 900' x triple 8' x 11' RCB; 4300' x triple 8' x 8' RCB; 500' x 30' wide channel; 1 junction structure; and upstream and downstream transition structures. In addition, the Creek was cleared, widened, and rip-rap lined 1300' of the upstream earthen channel (widened from 40' to 60') to create a water quality enhancement area.

While the above-mentioned flood control projects are effective in reducing floodflow along several streams, shallow flooding still occurs throughout several areas of the City as a result. The following describes flooding problems within the City limits:

Encanto Branch

The industrial area downstream of 54th street experiences flooding as a result of debris and silting problems. In addition, backwater effects at the confluence with the South Las Chollas Creek create shallow flooding conditions downstream of Euclid Avenue.

Florida Drive Branch

Heavy debris clogging the box culvert at the Florida Place crossing has led to overflow of the 100-year discharge.

Home Avenue Branch

Due to an inadequate culvert, the 100-year discharge is not contained downstream of Auburn Drive and as such shallow flooding conditions with depths of approximately 1-foot exist around a residential neighborhood.

Las Chollas Creek

Backwater effects due to inadequate culverts cause shallow flooding at 54th Street, Euclid Avenue, and Fairmont Avenue. Flooding with depths up to 5-feet also exist at the lined channel of the confluence of South Las Chollas Creek (at National Avenue). The unlined channel reach from National Avenue to the City limits is also subject to inundation from backwater effects.

Las Puleta Creek

Shallow flooding hazards with depths up to 1-foot occur in the residential area between Delta Street and 43rd Street as a result of an undersized underground conduit south of Delta Street. In addition, shallow flooding conditions exist between 43rd Street and Interstate Highway 5 as a result of inadequate conveyance at the bridge crossings.

Murray Canyon Creek

Floods greater than the 50-year flood event, result in flooding at Friars Road and a gravel pit upstream of the creek.

Pacific Ocean, Mission Bay, and San Diego Bay

Open coastal areas, including Ocean Beach, Mission Beach, Pacific Beach, and Imperial Beach, and lagoons, including Los Penasquitos Lagoon and San Dieguito Lagoon, with ground elevations of 3.0-feet or below the 100-year wave runup elevation are subject to wave velocity hazards.

Rose Canyon Creek

Flooding is known to only occur along this creek – at the Interstate Highway 5 bridge and the Mission Bay Bridge – during a 500-year flood event or greater.

San Diego River

Shallow flooding occurs near the Mission Valley Shopping Center as a result of 30 percent of the 100-year discharge breaking out of its channel. Additionally, floodwaters long the North Camino Del Rio Road have resulted in inundation of a nearby underground parking facility.

South Las Chollas Creek

Shallow flooding conditions exist from the beginning of the City limits to Federal Boulevard due to inadequate channel improvements upstream. Shallow flooding also occur at Lenox Drive as a result of debris clogging the culverts. Finally, the reach between Interstate Highway 805 and Imperial Avenue experiences backwater effects as a result of inadequate culvert and bridge conveyance.

Switzer Creek

While much of the 100-year discharge of this reach is conveyed by a lined channel section, shallow flooding of up to 1-foot deep is a problem throughout the eastern downtown business district.

Wabash Branch

Upstream of State Highway 94, backwater effects create shallow flooding with depths up to 3 feet in the right overbank while downstream of State Highway 94 (at Wabash Boulevard), an inadequate culvert does not contain the 100-year flow.

5.1.2.5 Probability of Future Events

As noted above, the City of San Diego is exposed to waves and intense rainfall generated by winter and summer storms originating in the Pacific Ocean. The City can expect to receive significant amounts of rainfall during significant El Nino years, which occur every 7-8 years usually during the months of December through March. In addition, the City is susceptible tropical storms, which generally occur during the summer into early fall. However, these events are rare, and based on previous occurrences, have only made landfall five or six times since 1939 (or every 10 – 12 years).

5.1.3 Dam Failure**5.1.3.1 Nature**

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 human casualties, economic loss, and environmental damage. This type of disaster is dangerous because it can occur rapidly, providing little warning and evacuation time for people living downstream. The flows resulting from dam failure generally are much larger than the capacity of downstream channels and can, therefore, lead to extensive flooding. Flood damage occurs as a result of the momentum of the flood caused by the sediment-laden water, flooding over the channel banks, and impact of debris carried by the flow.

5.1.3.2 History

As shown in Table 5-2, four of California's 45 dam failures have occurred in San Diego County. The most devastating dam failure event was actually two events which took place on January 19, 1916. In early 1916, a massive Pacific storm delivered between 8-32 inches of rain in the County over a five day period. At the Sweetwater Dam, the floodwaters overtopped the spillway. However, the dam had been constructed with enough structural stability that only a section of the south abutment was washed out. The Otay Dam, on the other hand, was a total loss. After the steel core of the structure gave way, 20-foot plus waves stripped the canyon walls of any vegetation, destroyed all infrastructure and buildings in its path, and killed 22 to 30 people.

Table 5-2
Historic Dam Failure Events within the City of San Diego

Dam	Year Constructed	Year Failed	Type	Capacity (Acre-Feet)	Cause of Failure
Morena	1895	1912	ROCK	50,200	Overtopping
Lower Otay	1897	1916	ROCK	38,300	Leakage and overtopping due to inadequate spillway
Sweetwater	1888	1916	GRAV	22,500	Overtopping
Lake Hodges	1918	1918	MULA	33,600	Cracks in pier

Source: UC Davis, Department of Civil and Environmental Engineering 2007, The Journal of San Diego History 2002.
GRAV = gravity, MULA = multiple arch, ROCK = rock fill,

5.1.3.3 Location

There are four dams in the City Limits, including the Chollas Dam, Lake Hodges Reservoir, Miramar Reservoir, and Murray Dam. However, as shown in Table 5-3 and Figure B-3, there are an additional 11 dams that pose a risk of inundation within the City. All of these dams, with the exception of the Rodriguez Reservoir which is located in Mexico, are regulated by the California Division of Safety of Dams (DSOD). The DSOD oversees the construction and inspection of all dams within the State that are 25 feet in height and hold back more than 15 acre-feet of water, or are more than 6 feet in height and hold back more than 50 acre-feet of water.

Table 5-3
Dams Posing a Risk of Inundation within the City of San Diego

Dam	Owner	Year Constructed	Stream	Type	Capacity (Acre-Feet)
Barrett	City of San Diego	1922	Cottonwood Creek	GRAV	44,755
Chet Harritt	Helix Water District	1962	Quail Can Creek	ERTH	9,790
Chollas	City of San Diego	1901	Tr. Chollas Creek	ERTH	310
Cuyamaca	Helix Water District	1887	Boulder Creek	ERTH	112,800
El Capitan	City of San Diego	1934	San Diego River	HYDF	112,800
Lake Hodges	City of San Diego	1918	San Dieguito River	MULA	37,700
Lake Loveland	South Bay Irrigation District	1945	Sweetwater River	ERTH	7,250
Morena	City of San Diego	1895	Cottonwood Creek	ROCK	50,206

**Table 5-3
Dams Posing a Risk of Inundation within the City of San Diego
(Continued)**

Dam	Owner	Year Constructed	Stream	Type	Capacity (Acre-Feet)
Murray	City of San Diego	1918	Chaparral	MULA	6,085
Poway	City of Poway	1971	Warren Canyon	ERTH	3,300
Ramona	Ramona Municipal Water District	1988	Green Valley Road Creek	ERTH	12,200
San Vicente	City of San Diego	1943	San Vicente Creek	GRAV	90,230
Sutherland	City of San Diego	1954	San Ysabel Creek	MULA	29,000
Upper Otay	City of San Diego	1901	Proctor Valley Creek	CORA	2,825
Rodriguez Reservoir	Located in Mexico	---	Las Palmas River	---	---

Source:

California Division of Dam Safety 2007.

CORA = constant radius arch, ERTH = earth fill, GRAV = gravity, HYDF = hydraulic fill, MULA = multiple arch, ROCK = rock fill, VARA = variable radius arch

5.1.3.4 Extent

The DSOD and San Diego Water County Authority dam-breach maps show inundation areas within the northern and western portion of the City limits. All of the dams, with the exception of the Cuyamaca Dam, Upper Otay Dam, and Rodriguez Reservoir, are considered high hazard dams. High hazard dams, as defined by FEMA, store more than 1,000 acre-feet of water, are higher than 150 feet tall, and have potential for downstream property damage and evacuation.

5.1.3.5 Probability of Future Events

Although all 14 dams within the county (excluding the 1 dam in Mexico) are inspected annually by the DSOD to ensure that they are in good operating condition, a dam failure could occur due to structural deterioration, an inadequate spillway, and structural damage as a result of an earthquake. For example, a fault runs beneath the Barrett Dam and the El Capitan and Chollas Dams are located within ½-mile of a fault. However, based on previous occurrences, a dam failure can be expected to occur every 100 years or less.

5.1.4 Tsunami

5.1.4.1 Nature

A tsunami is a series of waves generated in a body of water by an impulsive disturbance along the seafloor that vertically displaces the water. Tsunamis are most frequently caused by subduction earthquakes at plate boundaries. However, tsunamis can be generated by submarine landslides as well as from the collapses of volcanic edifices and violent submarine volcanic eruptions.

A single tsunami event may involve a series of waves, known as a train, of varying heights. In open water, tsunamis have extremely long periods of time (from minutes to hours) for the next wave top to pass a point after the previous one. In addition, a tsunami wavelength can extend up to several hundred miles, very different from typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of 300 feet.

The actual height of a tsunami wave in open water is generally only 1 to 3 feet, often practically unnoticeable to people on ships. The energy of a tsunami passes through the entire water column to the seabed, unlike surface waves, which typically reach only down to a depth of 30 feet or so. The tsunami wave travels across the ocean at speeds up to 700 miles per hour. As the wave approaches land, the sea shallows and the wave no longer travels as quickly, so the wave begins to ‘pile up’ as the wave-front becomes steeper and taller, and distance between crests is less. Therefore, the wave can increase to a height of 90 feet or more as it approaches the coastline and compresses. This steepening process is often compared to the sound of a cracking whip.

A tsunami not only affects beaches that are open to the ocean, but also bay mouths, tidal flats, and shores of large coastal rivers. In addition, tsunami waves can diffract around land masses. And since tsunamis are not symmetrical, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography. However, tsunamis do propagate outward from their source, so coasts in the shadow of affected landmasses are usually fairly safe.

5.1.4.2 History

Historical evidence shows that approximately 40 tsunami events have affected San Diego since the mid-1800s. The majority of these tsunamis were generated by distant earthquakes along the Pacific Rim and resulted in little to no wave run-up along the San Diego coast. A few tsunamis, however, did impact the San Diego coast. As shown in Table 5-4, eight distant tsunamis and one local tsunami generated wave run-up of six inches or greater along the coast.

Table 5-4
Historic Tsunami Events Affecting the City of San Diego

Date	Origin	Cause	Run-Up	Comments
May 27, 1862	Southern California	Landslide	3.9 feet	---
November 11, 1922	Northern Central Chile	Earthquake	0.6 feet	---
February 3, 1923	Kamchatka, Russia	Earthquake	0.6 feet	---
April 1, 1946	Eastern Aleutian Islands	Earthquake, Landslide	0.6 feet	Estimated \$20,000 damages
November 4, 1952	Kamchatka, Russia	Earthquake	1.3 feet	---
March 9, 1957	Central Aleutian Islands	Earthquake	0.6 feet	Estimated \$5,000 damages
May 22, 1960	South Central Chile	Earthquake	2.3 feet - 3.5 feet	260 feet of dock destroyed, bridge damaged, barge sunk, and 8 slip destroyed
March 28, 1964	Gulf of Alaska	Earthquake	1.9 feet	Floating restaurant broke
December 28, 2004	Northern Sumatra	Earthquake	0.6 feet	---

Source: California State Land Commission 2007.

5.1.4.3 Location

As shown in Figure B-4, the Governor's Office of Emergency Services has prepared 40-foot maximum tsunami run-up areas for San Diego. The run-up model incorporates offshore-faults producing the maximum possible earthquake or earthquake-induced landslide events which displace water and create tsunamis. As shown in Figure B-4, everything that falls between sea-level and 40-feet is at risk to a maximum tsunami run-up. Therefore, sandy coastal areas, including Pacific Beach, Mission Beach, Ocean Beach, and Imperial Beach, are areas at highest risk to tsunami run-ups. Areas protected by cliffs, including Point Loma and La Jolla, are at least risk to tsunami run-ups.

5.1.4.4 Extent

San Diego is vulnerable to both distant and local tsunamis. Distant tsunamis could be generated by subduction zone earthquakes in which the plates dive beneath one another and displace large amounts of water. These earthquakes, which are common in Russia, Japan, Alaska, and Chile, and in extreme events, could create large wave run-up reaching heights of 90-feet. However, it is important to note that this type tsunami inevitably loses power as it runs across land masses, such as Hawaii. In addition, in Southern California, ridges and canyons, including the Coronado islands, could also absorb most of a tsunami's energy. As such, distant tsunamis have historically generated less than 3.5-foot wave run-up in San Diego. Local tsunamis, however, could be generated from the San Clemente and San Diego Trough fault systems. These systems are strike-slip sources, moving horizontally, and therefore would be likely to

displace little water. Nevertheless, a local-source earthquake along these fault systems could trigger landslides as the plates “pull apart” along the steep slopes offshore. This type of event could generate small-scale tsunamis (less than 10 feet wave run-up) that “slosh” back and forth from the undersea ridge or slope to the coastline and back again.

5.1.4.5 Probability of Future Events

Large tsunamis have not been common along the Southern California coast. Historical evidence indicates that the majority of observed tsunamis have resulted in little to no wave run-up. However, based on observed previous occurrences, the City of San Diego can expect to experience a tsunami with wave run-up of 0.5 to 3.5 feet every 25 to 40 years.

SECTION 6 VULNERABILITY ANALYSIS

6.1 OVERVIEW OF VULNERABILITY ANALYSIS

This vulnerability analysis predicts the extent of exposure that may result from a dam failure, riverine or coastal flooding, or tsunami event of a given intensity in a given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing the City to focus attention on areas with the greatest risk of flood damage. A vulnerability analysis is divided into five steps: asset inventory, methodology, data limitations and exposure analysis for current assets, and areas of future development.

6.2 VULNERABILITY ANALYSIS

6.2.1 Asset Inventory

Asset inventory is the first step of a vulnerability analysis. Assets within San Diego that may be affected by flood hazard events include population, repetitive loss properties, buildings, and critical facilities and infrastructure. These assets and insured values in San Diego are identified and discussed in detail below.

6.2.1.1 Population and Building Stock

Population data for the City was obtained from the 2000 U.S. Census. Data and were collected at the census block level. San Diego’s total population for 2000 was 1,223,019 (Table 6-1). Population density throughout San Diego is shown on Figure B-5.

**Table 6-1
Estimated Population and Building Inventory**

Population	Residential Buildings		Nonresidential Buildings	
	Total Building Count	Total Value of Buildings ** (x\$1000)	Total Building Count	Total Value of Buildings *** (x\$1000)
2000 Census Population Count*				
1,223,019	309,696	74,504,655	5,229	13,222,888

Source: FEMA HAZUS-MH (residential and nonresidential buildings), Version 2006 and U.S. Census 2000 population data.

* Population count using census blocks within the City limits.

** Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$240,573 per structure).

*** Averaged insured structural value of all nonresidential buildings (including industry, trade, professional and technical services, etc., is \$2,528,760).

Estimated numbers of residential and nonresidential buildings and replacement values for those structures, as shown in Table 6-1, were obtained from HAZUS, FEMA’s hazard identification software program, by census block and the City of San Diego. As shown in Figure, B-6, a total of 309,696 residential buildings were considered in this analysis, including single-family dwellings, mobile homes, multi-family dwellings, temporary lodgings, and institutional dormitory facilities. A total of 5,229

nonresidential buildings were also analyzed, including industry, retail trade, wholesale trade, personal and repair services, professional and technical services, banks, medical offices, religious centers, entertainment and recreational facilities, theaters, and parking facilities.

6.2.1.2 Repetitive Loss Properties

Repetitive Loss (RL) properties are properties that suffer from repeated flooding. FEMA defines a RL property as a property with at least two \$1,000 claims within any 10-year period since 1978. Severe Repetitive Loss (SRL) properties have been identified by FEMA as most at risk for repeat flooding. These properties include every property that since 1978 has experienced: four or more separate building and content claims each exceeding \$5,000 with cumulative claims exceeding \$20,000, or at least two separate building claims with cumulative losses exceeding the value of the property (that is, the value of the structure). Table 6-2 shows the 17 RL and 6 SRL properties and property and flood-related information within the City as of October 31, 2006. These properties are also shown in Figure B-7. Addresses for both RL and SRL properties are not included in this plan, but are kept on file at the City. The information listed in the RL and SRL Table 6-2 and Figure B-7 was obtained from FEMA’s 2006 RL and SRL database.

**Table 6-2
Repetitive Loss – and Severe Repetitive Loss Properties**

Type	ID Number	Occupancy	No. of Losses	Flood Insurance	Insured Structural Value (\$)	Total Claims (\$)*
RL	0111774	Nonresidential	2	No	Unknown	119,088
RL	0111632	Single Family	2	Yes	966,371	19,729
RL	0112090	Single Family	2	No	150,000	19,658
RL	0011059	Single Family	2	Yes	81,000	8,767
RL	0111645	Single Family	2	No	87,388	19,016
RL	0111626	Single Family	2	No	60,000	29,341
RL	0136568	Single Family	2	Yes	169,351	4,637
RL	0094098	Nonresidential	2	No	45,000	37,915
RL	0053032	Nonresidential	2	No	Unknown	5,584
RL	0072560	Nonresidential	2	Yes	179,920	11,486
RL	0091271	Single Family	2	No	135,000	5,493
RL	0137697	Nonresidential	2	Yes	Unknown	13,775
RL	0134864	Condo	2	Yes	Unknown	14,613
RL	0035023	Single Family	3	No	88,000	85,506
RL	0008519	Single Family	3	No	38,775	94,275
RL	0095727	Nonresidential	3	Yes	3,410,000	240,061
RL	0071253	Nonresidential	4	SDF**	321,860	17,913
SRL	0091787	2-4 Family	4	SDF**	286,880	60,769

**Table 6-2
Repetitive Loss – and Severe Repetitive Loss Properties
(Continued)**

Type	ID Number	Occupancy	No. of Losses	Flood Insurance	Insured Structural Value (\$)	Total Claims (\$)*
SRL	0035444	Single Family	4	No	223,300	24,258
SRL	0108244	Nonresidential	4	SDF**	524,442	162,267
SRL	0033828	Single Family	5	No	28,700	42,008
SRL	0054136	2-4 Family	5	No	115,200	53,547
SRL	0013463	Nonresidential	9	No	3,000,240	167,214.23

*Total building and content claims made to insurance company.

** FEMA's Special District Facility (SDF) services these RL properties separately from other NFIP policies, allowing FEMA to verify underwriting and loss information, collect information about ongoing and future flood risks to each property, and provide information about these properties to State and local floodplain officials.

6.2.1.3 Critical Facilities and Infrastructure

A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, such as preserving the quality of life in the City of San Diego and fulfilling important public safety, emergency response, and disaster recovery functions. Similar to critical facilities, critical infrastructure includes infrastructure that is essential to preserving the quality of life and safety in the City. The total number of critical facilities and infrastructure within San Diego is listed in Table 6-3 and shown on Figures B-8 and B-9. A complete list, with facility and infrastructure names and addresses is provided in Appendix F.

**Table 6-3
Critical Facilities and Infrastructure**

Type	Total Number	Total Value (x\$1000)	
Critical Facilities	Local Government (Government Offices and Facilities, Civic Center)	61	122,000
	Emergency Response (EOCs, Police and Fire Stations)	83	166,000
	Care (Long-term Care, Hospitals)	21	2,100,000
	Educational (Public Primary and Secondary Schools)	413	413,000
	Community Gathering Places (Stadiums/Areas, Marinas, Tourist Attractions, Convention Center)	46	4,073,000
	Communication (Radio and Television Towers)	153	306,000
	Power (Electric Power Facilities)	7	90,000
	Potable Water and Wastewater	2	200,000
	Incarceration	3	0

**Table 6-3
Critical Facilities and Infrastructure
(Continued)**

Type		Total Number	Total Value (x\$1000)
Critical Infrastructure	Highways and Major Arterials	201 (miles)	1,248,612
	Bridges	523	100,207
	Railroad Tracks	55 (miles)	76,120
	Light Rail Tracks	39 (miles)	53,797
	Airports	4	800,000
	Rail	17	34,000
	Bus	12	24,000
	Port	62	1,240,000

Source: FEMA HAZUS-MH (estimated values)

6.2.2 Methodology

A conservative exposure-level analysis was conducted to assess the risks of the identified hazards. This analysis is a simplified assessment of the potential effects of the flood hazards on values at risk without consideration of probability or level of damage.

Using GIS, the building footprints of critical facilities were compared to locations where hazards are likely to occur. If any portion of the critical facility fell within a hazard area, it was counted as impacted. Using census block level information, a spatial proportion was used to determine the percentage of the population and residential and nonresidential structures located where hazards are likely to occur. Census blocks that are completely within the boundary of a hazard area were determined to be vulnerable and were totaled. A spatial proportion was also used to determine the amount of linear assets, such as highways, within a hazard area. The exposure analysis for linear assets was measured in miles. For RL and SRL properties, an analysis was completed for the 100-year and 500-year SFHA only.

Replacement values or insurance coverage were developed for physical assets, with the exception of RL and SRL properties. These values were obtained from HAZUS-MH or from the City of San Diego. For facilities that didn't have specific values per building in a multi-building scenario (e.g., schools), the buildings were grouped together and assigned one value. For each physical asset located within a hazard area, exposure was calculated by assuming the worst-case scenario (that is, the asset would be completely destroyed and would have to be replaced). Finally, the aggregate exposure, in terms of replacement value or insurance coverage, for each category of structure or facility was calculated. A similar approach was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

6.2.3 Data Limitations

The vulnerability estimates provided herein use the best data currently available, and the methodologies applied result in an approximation of risk. These estimates may be used to understand relative risk from hazards and potential losses. However, uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning hazards and their effects on the built environment as well as the use of approximations and simplifications that are necessary for a comprehensive analysis.

It is also important to note that the quantitative vulnerability assessment results are limited to the exposure of people, buildings, and critical facilities and infrastructure to the identified hazards. It was beyond the scope of this flood mitigation plan to develop a more detailed or comprehensive assessment of risk (including annualized losses, people injured or killed, shelter requirements, loss of facility/system function, and economic losses). Such impacts may be addressed with future updates of this plan.

6.2.4 Exposure Analysis

The results of the exposure analysis for loss estimations in San Diego are summarized in Tables 6-4, 6-5, 6-6, and 6-7 and in the following discussion.

**Table 6-4
Potential Hazard Vulnerability Assessment: Population and Buildings**

Hazard Type	Methodology	Population	Buildings			
			Residential		Nonresidential	
		Number	Number	Value (\$) ¹	Number	Value (\$) ¹
Coastal and Riverine Flooding	100-year SFHA, Zone A	27,437	6,620	1,530,100	208	548,579
	100-year SFHA, Zone V	326	127	37,018	3	7,576
	500-year SFHA	26,709	5,038	1,297,849	208	595,546
Dam Failure	Inundation Area	84,564	15,779	4,721,853	733	1,945,495
Tsunami	Maximum Run-Up Area	52,906	10,624	3,790,915	350	795,947

¹ Value = Estimated average structural value (x1000)

Zone A = 100-year riverine flood zone

Zone V = 100-year coastal flood zone

**Table 6-5A
Potential Hazard Vulnerability Assessment – Repetitive Loss Properties**

Hazard	Methodology	Repetitive Loss Properties			
		Single Family	Nonresidential	Condo	Total
Coastal and Riverine Flooding	100-year SFHA, Zone A	3	4	0	7
	100-year SFHA, Zone V	0	0	0	0
	500-year SFHA	1	0	0	1
	Outside of SFHA	5	3	1	9

**Table 6-5B
Potential Hazard Vulnerability Assessment – Severe Repetitive Loss Properties**

Hazard	Methodology	Severe Repetitive Loss Properties			
		Single Family	Nonresidential	2-4 Family	Total
Coastal and Riverine Flooding	100-year SFHA, Zone A	0	1	1	2
	100-year SFHA, Zone V	0	0	0	0
	500-year SFHA	0	0	1	1
	Outside of SFHA	2	1	0	3

**Table 6-6A
Potential Hazard Vulnerability Assessment – Critical Facilities**

Hazard	Methodology	Local Government		Emergency Response		Care		Educational		Community Gathering Places	
		No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Coastal and Riverine Flooding	100-year SFHA, Zone A	0	0	0	0	2	200,000	2	2,000	5	442,780
	100-year SFHA, Zone V	0	0	0	0	0	0	0	0	0	0
	500-year SFHA	2	4,000	0	0	0	0	3	3,000	3	265,668
Dam Failure	Inundation Area	5	10,000	10	20,000	3	300,000	18	18,000	22	1,948,232
Tsunami	Maximum Run-Up Area	6	12,000	8	16,000	0	0	10	10,000	0	0

¹ Value = Estimated insured structural value (x1000)

**Table 6-6B
Potential Hazard Vulnerability Assessment – Critical Facilities**

Hazard	Methodology	Communication		Power		Potable Water and Wastewater		Incarceration		Total	
		No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Coastal and Riverine Flooding	100-year SFHA, Zone A	10	20,000	0	0	0	0	0	0	19	664,780
	100-year SFHA, Zone V	0	0	0	0	0	0	0	0	0	0
	500-year SFHA	7	14,000	0	0	1	100,000	0	0	16	386,668
Dam Failure	Inundation Area	21	42,000	2	20,000	1	100,000	0	0	82	510,000
Tsunami	Maximum Run-Up Area	9	18,000	3	30,000	1	100,000	0	0	37	186,000

¹ Value = Estimated insured structural value (x1000)

**Table 6-7A
Potential Hazard Vulnerability Assessment – Critical Infrastructure**

Hazard	Methodology	Highways and Major Arterials		Bridges		Railroad Tracks		Light Rail Tracks	
		Miles	Value (\$)¹	No.	Value (\$)¹	Miles	Value (\$)¹	Miles	Value (\$)¹
Coastal and Riverine Flooding	100-year SFHA, Zone A	12	75	95	18,202	10	14	6	8,276
	100-year SFHA, Zone V	0	0	0	0	0	0	0	0
	500-year SFHA	10	62	38	7,281	3	4	4	5,518
Dam Failure	Inundation Area	34	211	147	28,165	11	15	15	20,691
Tsunami	Maximum Run-Up Area	14	87	50	9,580	7	10	2	2,759

¹ Value = Estimated insured structural value (x1000)

**Table 6-7B
Potential Hazard Vulnerability Assessment – Critical Infrastructure**

Hazard	Methodology	Airports		Rail		Bus		Port	
		No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Coastal and Riverine Flooding	100-year SFHA, Zone A	0	0	3	6,000	1	2,000	46	920,000
	100-year SFHA, Zone V	0	0	0	0	0	0	0	0
	500-year SFHA	0	0	0	0	1	2,000	0	0
Dam Failure	Inundation Area	1	200,000	5	10,000	1	2,000	0	0
Tsunami	Maximum Run-Up Area	1	200,000	3	6,000	1	2,000	19	380,000

¹ Value = Estimated insured structural value (x1000)

6.2.4.1 Coastal and Riverine Floods

Two percent of the City's population (approximately 27,800 people) reside in the 100-year floodplain. Exposed within A zone of the SFHA are 27,437 people, 6,620 residential buildings (worth \$1.5 billion), 208 nonresidential buildings (worth \$548.6 million), and 19 critical facilities (worth \$664.8 million). The majority of the critical facilities located within this hazard area are communication facilities, including radio and cell towers. However, 2 care facilities, 2 schools, and five community gathering places are located within the A zone. Approximately 12 miles of highways, 10 miles of railroad tracks, 6 miles of light rail tracks, 95 bridges, and 3 rail, 1 bus, and 46 port facilities are located in the A zone of the SFHA. There are 7 Repetitive Loss properties (3 single-family and 4 nonresidential buildings) and 2 Severe Repetitive Loss properties (1 nonresidential and 1 2-4 family building) located within this hazard area.

Within V zone of the SFHA are 326 people, 127 residential buildings (worth \$37.0 million), and 3 nonresidential buildings (worth \$7.6 million). No critical facilities, critical infrastructure, or Repetitive Loss properties are located within this hazard area.

There are an additional 26,709 people (approximately 2.2 % of the total population) that reside in the 500-year floodplain. This includes 5,038 residential buildings (worth \$1.3 billion), 208 nonresidential buildings (worth \$595.5 million), and 16 critical facilities (worth \$386.7 million). Approximately 10 miles of highways, 3 miles of railroad tracks, 4 miles of light rail tracks, 38 bridges, and 1 bus facilities are located within the 500-year floodplain. One single-family Repetitive Loss property and 1 2-4 family Severe Repetitive Loss property are located within this hazard area.

6.2.4.2 Dam Failures

84,564 people (nearly 7.0 % of the total population) reside in the dam inundation zones within the City. Exposed within the inundation zones are 15,779 residential buildings (worth \$4.7 billion), 733 nonresidential buildings (worth \$1.9 billion), and 82 critical facilities (worth \$510 million). Community gathering places and communications facilities make up over 50 percent of all critical facilities located in this hazard area. In addition, 5 local government facilities, 10 emergency response facilities, 3 care facilities, 18 educational facilities, 2 power facilities, and 1 potable water and wastewater facility are located in a dam inundation zone.

Approximately 34 miles of highways, 11 miles of railroad tracks, 15 miles of light rail tracks, 147 bridges, and 1 airport, 1 bus, and 5 rail facilities are located within a dam inundation area.

6.2.4.3 Tsunamis

Using a scenario of a 40-foot run-up, approximately 4.3 % of the City's population is vulnerable to a tsunami, including 52,906 people, 10,624 residential buildings (worth \$3.8 billion), 350 nonresidential buildings (worth \$796.0 million), and 37 critical facilities (worth \$186 million). Critical facilities located in this hazard area include: 6 local government facilities; 10 emergency response facilities; 3 care facilities; 18 educational facilities; 22 community gathering places; 21 communication facilities; 2 power facilities; and 1 potable water and wastewater facility.

Approximately 14 miles of highways, 7 miles of railroad tracks, 2 miles of light rail tracks, 50 bridges, and 1 airport, 1 bus, 3 rail, and 19 port facilities are located within the 40-foot tsunami run-up area.

SECTION 7 CAPABILITIES ASSESSMENT

While not required by the Flood Mitigation Assistance program, an important component of a flood mitigation plan is a review of the City of San Diego’s resources to identify, evaluate, and enhance the capacity of those resources to mitigate the effects of flood hazards. This section evaluates City resources in three areas—legal and regulatory, administrative and technical, and financial—and assesses capabilities to implement current and future hazard mitigation actions.

7.1 LEGAL AND REGULATORY CAPABILITIES

The City currently supports flood hazard mitigation through its regulations, plans, and programs. The City of San Diego Municipal Code outlines flood hazard mitigation-related ordinances in four of its Chapters. Additionally, pursuant to State planning laws, the *General Plan and Local Coastal Plan* include a safety element with policies and programs to protect the community from risks associated with bluff, flood, seismic and fire hazards.

In addition to policies and regulations, the City participates in several hazard mitigation programs including the NFIP and Fire Safe Council Fuel Management Projects.

Table 7-1 summarizes the City’s flood hazard mitigation legal and regulatory capabilities.

**Table 7-1
Legal and Regulatory Resources Available for Flood Mitigation**

Regulatory Tool	Chapter or Section	Effect on Flood Mitigation
Plans	General Plan	Establishes policies that will minimize the potential of human injury and property damage to floods.
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods. The City of San Diego joined the NFIP in 1983.
	Community Rating System	Recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.
Regulations	Code Federal Regulation 44 (CFR 4)	The City is obligated to comply with CFR 44 – Emergency Management and Assistance.
Policies (Municipal Code)	Chapter 11, Article 1, Division 1 - General Rules for Land Development Code	The Land Development Code sets for the procedures used in the application of land use regulations, the types of review of development, and the regulations that apply to the use and development of land in the City of San Diego. The intent of these procedures and regulations is to facilitate fair and effective decision-making and to encourage public participation.
	Chapter 12, Article 9, Division 6 – Grading Permit Procedures	The purpose of procedures is to establish the process for review of Grading Permit Applications for compliance with the regulations set forth in Chapter 14, Article 2 and to protect persons, property and the environment.

**Table 7-1
Legal and Regulatory Resources Available for Flood Mitigation**

Regulatory Tool	Chapter or Section	Effect on Flood Mitigation
	Chapter 14, Article 3, Division 1 – Environmentally Sensitive Land Regulations	The purpose of these regulations is to protect, preserve and, where damaged restore the environmentally sensitive lands of San Diego and the viability of the species supported by those lands. These regulations are intended to assure that development, including, but not limited to coastal development in the Coastal Overlay Zone, occurs in a manner that protects the overall quality of the resources and the natural and topographic character of the area, encourages a sensitive form of development, retains biodiversity and interconnected habitats, maximizes physical and visual public access to and along the shoreline, and reduces hazards due to flooding in specific areas while minimizing the need for construction of flood control facilities.
	Council Policy 600-14: Development Within Special Flood Hazard Areas	To promote the public health, safety and general welfare, and to minimize public and private losses due to flooding and flood conditions in specific areas by provisions designed to: Protect human life and health; Provide Environmental Protection consistent with related City requirements; Minimize expenditure of public funds for flood control projects; Minimize prolonged business interruptions; Minimize damage to public facilities and utilities located in areas of special flood hazard.

7.2 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

The administrative and technical capability assessment identifies the staff and personnel resources available within the City of San Diego to engage in flood mitigation planning and carry out flood mitigation projects. These City Departments include: Public Works/Engineering and Capital Projects, Land Use and Economic Development/Development Services, Business and Support Services/Information Technology, and Public Safety and Homeland Security. These administrative and technical capabilities of the City are listed in Table 7-2.

Table 7-2
Administrative and Technical Resources for Flood Mitigation

Staff/Personnel Resources	Department/Division Position
Planner(s) or engineer(s) with knowledge of flood hazards	Public Works/Engineering & Capital Projects/City Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works/Engineering & Capital Projects/Field Engineering/Senior Civil Engineer <i>and</i> Land Use & Economic Development/Development Services/Public Safety & Construction/Building Inspector Supervisor
Planner(s) or engineer(s) with an understanding of human-made or natural hazards	Public Works/Engineering & Capital Projects/Right-of Way Design/Senior Civil Engineer
Floodplain manager	Public Works/Engineering & Capital Projects/City Engineer
Personnel skilled in GIS and/or HAZUS-MH	Business & Support Services/Information Technology/Chief Information Officer/IT Program Management/Program Manager
Director of Emergency Services	Public Safety & Homeland Security/Deputy Chief
Finance (grant writers, purchasing)	Public Works/Engineering & Capital Projects/Project Implementation & Technical Services/Senior Management Analyst
Public Information Officers	Business & Support Services/Information Technology/Chief Information Officer

7.3 FINANCIAL CAPABILITIES

The fiscal capability assessment lists the specific financial and budgetary tools that are available to the City for flood hazard mitigation activities. These capabilities, which are listed in Table 7-3, include both local and Federal entitlements.

**Table 7-3
Financial Resources for Flood Mitigation**

Financial Resources	Effect on Hazard Mitigation
General Funds	If funding is available, can be used for flood hazard mitigation activities.
Authority to levy taxes for specific purposes	Mayor and voter approval are required. These projects will compete with other City projects for funding based on the City's Capital Improvement Project prioritization system.
Development Impact Fee	At this time, the City does not have any development impact fees associated with flood hazard mitigation.
Incur debt through general obligation bonds	Upon Mayor recommendation and City Council approval. These projects will compete with other City projects for funding based on the City's Capital Improvement Project prioritization system.
Incur debt through special tax and revenue bonds	Upon Mayor recommendation and City Council approval. These projects will compete with other City projects for funding based on the City's Capital Improvement Project prioritization system.
Incur debt through private activity bonds	Upon Mayor recommendation and City Council approval. These projects will compete with other City projects for funding based on the City's Capital Improvement Project prioritization system.
Flood Mitigation Assistance (FMA)	The FMA program was created to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP.
Pre-Disaster Mitigation Program (PDM)	PDM funding is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Hazard Mitigation Grant Program (HMGP)	HMGP grant funding is available to local communities after a Presidential declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Increased Cost of Compliance (ICC)	The NFIP includes compliance coverage (Increased Cost of Compliance, or ICC) in all new or renewal flood insurance policies on buildings located in mapped special flood hazard areas. This coverage pays policyholders up to \$30,000 to bring substantially damaged buildings into compliance with local ordinances and building codes.

FMA = Flood Mitigation Assistance
 PDM = Pre-Disaster Mitigation
 HMGP = Hazard Mitigation Grant Program
 ICC = Increase Cost of Compliance

SECTION 8 MITIGATION STRATEGY

8.1 OVERVIEW OF A MITIGATION STRATEGY

As described in Section 2, The Planning Team developed a list of mitigation goals and actions based upon the findings of the hazard profiles, vulnerability analysis, and capability assessment. Based upon these goals and actions, the Planning Team, supported by URS, reviewed and prioritized a comprehensive range of appropriate mitigation actions to address the risks facing the community. Such measures include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities.

8.1.1 Development of Mitigation Goals

During a Planning Team meeting on April 19, 2007, team members reviewed the flood hazard profiles and initial risk assessment results as a basis for developing mitigation goals. Mitigation goals are defined as general guidelines that explain what a community wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing community-wide visions. The Planning Team developed 6 goals to reduce or avoid long-term vulnerabilities to flood hazards. The goals are listed in Table 8-1.

**Table 8-1
Mitigation Goals**

Goal Number	Goal Description
1	Promote flood hazard-resistant development.
2	Build and support local capacity to enable the public to prepare for, respond to and recover from flood hazards.
3	Reduce the possibility of damage and losses due to coastal and riverine flooding.
4	Reduce the possibility of damage and losses due to dam inundation.
5	Reduce the possibility of damage and losses due to tsunamis.
6	Reduce the risk of flood damage to Repetitive Loss properties.

8.1.2 Identification of Potential Mitigation Actions

In addition to developing goals, the Planning Team created a list of potential mitigation actions based on the City's risk assessment, capability assessment, and mitigation goals. Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Mitigation actions are usually grouped into six broad categories: prevention, property protection, public education and awareness, natural resource protection, emergency services and structural projects. Table 8-2 lists a range of cost-effective, environmentally sound, and technically feasible flood hazard mitigation actions to achieve each goal.

**Table 8-2
Mitigation Goals and Potential Actions**

Goals		Potential Actions	
Number	Description	Number	Description
1	Promote flood hazard-resistant development.	1.A	Ensure that properties that sustain substantial damage (damage whereby the cost of restoration to the pre-damage condition would equal or exceed 50% of the market value of the structure before the damage occurred) from a flood event are brought into compliance with local codes, including the City's flood damage/floodplain ordinance for freeboard requirements.
		1.B	Require new development to install drainage facilities to mitigate post-development peak flow.
		1.C	Continue to participate in the NFIP and CRS program by enforcing floodplain management ordinances to reduce future flood damage and participating in community floodplain management activities that exceed the minimum NFIP requirements.
2	Build and support local capacity to enable the community to prepare for, respond to, and recover from flood hazards.	2.A	Develop a sustained public outreach program that encourages consistent flood hazard mitigation content. For example, consider publishing tsunami inundation maps in telephone books and Best Management Practices to keep stormwater drains and culverts free of debris with summer water bills.
		2.B	Develop audience-specific hazard mitigation outreach efforts. Audiences include the elderly, children, tourists, non-English speaking residents, and home and business owners.
3	Reduce the possibility of damage and losses due to coastal and riverine flooding.	3.A	Identify and carry-out minor flood and stormwater management projects, as identified in the City's Proposed Flood Mitigation Projects City – Wide (see APPENDIX H), which would reduce damage to infrastructure and damage due to local flooding/inadequate drainage. These include the modification of existing culverts and bridges, upgrading capacity of storm drains, stabilization of streambanks, and creation of debris or flood/stormwater retention basins in small watersheds.
		3.B	Explore the need for the full or partial removal, breaching, lowering, and/or relocation of artificial stream and tidal levees. Removal serves many purposes including flood hazard risk reduction, habitat restoration, and water quality improvements.
4	Reduce the possibility of damage and losses due to dam failure.	4.A	Review and update San Diego County inundation maps every five years and participate in DSOD mapping updates for dams with inundation areas within the City limits.

**Table 8-2
Mitigation Goals and Potential Actions
(Continued)**

Goals		Potential Actions	
Number	Description	Number	Description
5	Reduce the possibility of damage and losses due to tsunami.	5.A	Participate in the Tsunami Ready Program. This new program, sponsored by the National Weather Service, is designed to provide communities with incentives to reduce their tsunami risks.
6	Reduce the risk of flood damage to Repetitive Loss properties and Severe Repetitive Loss Properties.	6.A	Develop a database to maintain more accurate information regarding Repetitive Loss properties within the City to assist in the grant application process. Information to be collected and updated annually for each Repetitive Loss property includes: NFIP insurance status; market value; flood claims; Base (100-year) Flood Elevation (BFE); lowest floor elevation and the type of construction; and location within the FEMA-designated floodway.
		6.B	Develop a target list of Repetitive Loss properties for mitigation, including properties by location and mitigation action (6 Severe Repetitive Loss properties), including: Grantville: 4 properties; Kensington: 1 property; La Jolla: 4 properties; Midway: 2 properties; Mission Beach: 3 properties; Mission Valley: 1 property; Nestor: 2 properties; Ocean Beach: 1 property; Pacific Beach: 3 properties; Sheltown: 1 property; Tijuana River Valley: 1 property. Explore mitigation opportunities for these properties, and if necessary, carry-out acquisition, relocation, elevation, and flood-proofing measures to protect these properties.
		6.C	Create and implement a Repetitive Loss property mitigation program that identifies property owners interested in on-site (retrofitting or elevation) mitigation, acquisition, or relocation. Elements of the program to include: notify potential Repetitive Loss property candidates; conduct workshops to present specific program information, including requirements for participation and technical information for potential mitigation measures; assemble list of potentially interested property owners; identify feasible projects; conduct preliminary evaluation of potential mitigation measures and cost. For relocation and buyout projects, identify the City or other entity that would assume title for the vacated land; conduct preliminary assessment of cost-benefit ratio through evaluation of risk of damage (BFE vs. floor elevation) and potential cost of mitigation; identify potential sources for funding of local share of grants; and identify the responsible City department(s) for grants management and implementation.

**Table 8-2
Mitigation Goals and Potential Actions
(Continued)**

Goals		Potential Actions	
Number	Description	Number	Description
		6.D	Mitigate Repetitive Loss properties identified on the City's target list and within the City's Repetitive Loss property mitigation program. Grant application steps include: prepare detailed scope of work and cost estimate; prepare detailed cost-benefit analysis; confirm and document compliance with applicable Federal and State regulations and executive orders; and Notify OES of application process and confirm requirements and time frames for submittal.
7	Improve coordination and communication with federal, state, local and tribal governments.	7.A	Establish and maintain closer working relationships with state agencies, local and tribal governments. Encourage other organizations to incorporate flood hazard mitigation activities. Improve the State's capability and efficiency at administering pre- and post-disaster mitigation. Work with local chambers of commerce, trade associations, and employee unions to encourage them to promote flood hazard mitigation as part of safe work practices.

8.1.3 Evaluation and Selection of Mitigation Actions

The Planning Oversight Team evaluated each of the 14 mitigation actions to determine which actions would best help the City fulfill its mitigation goals, thereby reducing or avoiding long-term vulnerabilities to the identified hazards. To complete this task, the Planning Oversight Team members reviewed the Capability Assessment and applied simplified Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE+E) evaluation criteria (shown in Table 8-3) to consider the opportunities and constraints of implementing a particular mitigation action.

**Table 8-3
Evaluation Criteria for Mitigation Actions**

Evaluation Category	Discussion "It is important to consider..."	Considerations
Social	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects segment of population
Technical	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
Administrative	If the City administration has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance / operations
Political	What the community and City feel about issues related to the environment, economic development, safety and emergency management.	Political support Local champion Public support
Legal	Whether the City has the legal authority to implement the action, or whether the City Council must pass new laws and regulations.	Local authority Federal authority Potential legal challenge
Economic	If the action can be funded with current or future internal and external sources of funding, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit of action Cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
Environmental	The impact on the environment because of public desire for sustainable and environmentally healthy communities.	Effect on land/water Effect on Endangered Species Effect on culturally sensitive areas Consistent with community environmental goals Consistent with local, state, and Federal laws

8.1.4 Implementation Plan

As shown below in Table 8-4, Planning Team members selected two mitigation actions to be included in the Implementation Plan. Planning Team members determined these actions are the highest priority to implement as they both represent the most feasible and most appropriate toward reducing flood hazards and future Repetitive Loss property losses. Table 8-4, identifies how each action how the overall benefit-costs of each action was taken into consideration and how each action will be implemented and administered by the Planning Team and the City. Specifics about each of the selected mitigation actions are discussed in further detail in Appendix H.

**Table 8-4
Implementation Plan**

Action Number	Description	Administration	Potential Funding	Timeframe	Benefit-Costs
3A	<p>Identify and carry-out minor flood and stormwater management projects, as identified in the City's Proposed Flood Mitigation Projects City – Wide (see APPENDIX H), which would reduce damage to infrastructure and damage due to local flooding/inadequate drainage. These include the modification of existing culverts and bridges, upgrading capacity of storm drains, stabilization of streambanks, and creation of debris or flood/stormwater retention basins in small watersheds.</p> <p>See Appendix H for more details.</p>	Public Works/Engineering & Capital Projects Department	PDM and HMGP Grants and General Funds	Ongoing	The identification and implementation of minor flood and stormwater management projects will reduce multi-asset (critical facility, critical infrastructure, and residential and nonresidential) losses due to flooding.
6B	<p>Develop a target list of Repetitive Loss properties for mitigation, including properties by location and mitigation action (6 Severe Repetitive Loss properties), including: Grantville: 4 properties; Kensington: 1 property; La Jolla: 4 properties; Midway: 2 properties; Mission Beach: 3 properties; Mission Valley: 1 property; Nestor: 2 properties; Ocean Beach: 1 property; Pacific Beach: 3 properties; Shelton: 1 property; Tijuana River Valley: 1 property. Explore mitigation opportunities for these properties, and if necessary, carry-out acquisition, relocation, elevation, and flood-proofing measures to protect these properties.</p> <p>See Appendix H for more details.</p>	Public Works/Engineering & Capital Projects Department	FMA, PDM and HMGP Grants	Ongoing	The mitigation of repetitively flooded properties is a priority for FEMA grant programs.

**Table 8-4
Implementation Plan
(Continued)**

Action Number	Description	Administration	Potential Funding	Timeframe	Benefit-Costs
1A	Ensure that properties that sustain substantial damage (damage whereby the cost of restoration to the pre-damage condition would equal or exceed 50% of the market value of the structure before the damage occurred) from a flood event are brought into compliance with local codes, including the City's flood damage/floodplain ordinances for freeboard requirements	Public Works/Engineering & Capital Projects Department		Ongoing	Reduce flood insurance claims and flood damage.
1B	Require new development to install drainage facilities to mitigate post-development peak flow.	Public Works/Engineering & Capital Projects Department		Ongoing	Reduce flood insurance claims and flood hazard risks.
1C	Continue to participate in the NFIP and CRS program by enforcing floodplain management ordinances to reduce future flood damage and participating in community floodplain management activities that exceed the minimum NFIP requirements.	Public Works/Engineering & Capital Projects Department		Ongoing	Reduce flood insurance claims and flood hazard risks.
2A	Develop a sustained public outreach program that encourages consistent flood hazard mitigation content. For example, consider publishing tsunami inundation maps in telephone books and Best Management Practices to keep stormwater drains and culverts free of debris with summer water bills.	Public Works/Engineering & Capital Projects Department	PDM and HMGP Grants	Ongoing	Encourage flood awareness throughout the City. Reduce flood insurance claims and flood hazard risk.
3B	Explore the need for the full or partial removal, breaching, lowering, and/or relocation of artificial stream and tidal levees. Removal serves many purposes including flood hazard risk reduction,	Public Works/Engineering & Capital Projects Department	FMA, PDM HMGP Grants, General Funds	Ongoing	Reduces flood hazard risk and improve habitat restoration and water quality.

**Table 8-4
Implementation Plan
(Continued)**

Action Number	Description	Administration	Potential Funding	Timeframe	Benefit-Costs
	habitat restoration, and water quality improvements.				
6C	Create and implement a Repetitive Loss property mitigation program that identifies property owners interested in on-site (retrofitting or elevation) mitigation, acquisition, or relocation. Elements of the program to include: notify potential Repetitive Loss property candidates; conduct workshops to present specific program information, including requirements for participation and technical information for potential mitigation measures; assemble list of potentially interested property owners; identify feasible projects; conduct preliminary evaluation of potential mitigation measures and cost. For relocation and buyout projects, identify the City or other entity that would assume title for the vacated land; conduct preliminary assessment of cost-benefit ratio through evaluation of risk of damage (BFE vs. floor elevation) and potential cost of mitigation; identify potential sources for funding of local share of grants; and identify the responsible City department(s) for grants management and implementation.	Public Works/Engineering & Capital Projects Department	FMA, PDM HMGP Grants, General Funds	Ongoing	Encourage flood awareness throughout the City and reduce flood hazard risks.

SECTION 9 PLAN MAINTENANCE

This section describes a formal plan maintenance process to ensure that the FMP remains an active and applicable document. It includes an explanation of how the City of San Diego intends to organize their efforts to ensure that improvements and revisions to the FMP occur in a well-managed, efficient, and coordinated manner.

The following three process steps are addressed in detail below:

- Monitoring, evaluating, and updating the FMP
- Implementation through existing planning mechanisms
- Continued public involvement

9.1 MONITORING, EVALUATING, AND UPDATING THE FM PLAN

The FMP was prepared as a collaborative effort between the City of San Diego Engineering and Capital Projects Division and URS Consultants. To maintain momentum and build upon previous flood hazard mitigation planning efforts and successes, the City will monitor, evaluate, and update the FMP. In addition to the Engineering and Capital Projects Division, other interested parties, including members of the City Council, Planning Commission, and any other department representatives, can be responsible for implementing the FMP's Implementation Plan. The City's approved FMP Project Manager will serve as the primary point of contact and will coordinate all local efforts to monitor, evaluate, and revise the FMP.

The City of San Diego will conduct an annual review to monitor the progress in implementing the FMP, particularly the Mitigation Action Plan. As shown in Appendix G, the annual review will provide the basis for possible changes in the FMP's Implementation Plan by refocusing on new or more threatening hazards, adjusting to changes to or increases in resource allocations, and engaging additional support for the FMP implementation. The City Project Manager will initiate the annual review 1 month prior to the date of adoption.

The findings from this review will be presented annually to City Council. The review will include an evaluation of the following:

- Participation of City agencies and others in the FMP implementation
- Notable changes in the City's risk of flood hazards
- Impacts of land development activities and related programs on flood hazard mitigation
- Progress made with the Implementation Plan (identify problems and suggest improvements as necessary)
- The adequacy of resources for implementation of the FMP

A system of reviewing progress on achieving goals and implementing activities and projects of the Implementation Plan will also be accomplished during the annual review process. During each annual review, the department and/or agency currently administering a mitigation project will submit a progress report to the Engineering and Capital Projects Division. As shown in Appendix G, the report will include

the current status of the mitigation project, including any changes made to the project, the identification of implementation problems and appropriate strategies to overcome them, and whether or not the project has helped achieved the appropriate goals identified in the plan.

In addition to the annual review, the Engineering and Capital Projects Division will update the FMP every 5 years. To ensure that this update occurs, in the 4th year following adoption of the FMP, the Engineering and Capital Projects Division will undertake the following activities:

- Thoroughly analyze and update the City's risk of flood hazards.
- Provide a new annual review (as noted above), plus a review of the three previous annual reports.
- Provide a detailed review and revision of the mitigation strategy.
- Prepare a new Implementation Plan with prioritized actions, responsible parties, and resources.
- Prepare a new draft FMP and submit it to the San Diego City Council for adoption.
- Submit an updated FMP to the California Office of Emergency Services and FEMA for approval.

9.2 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS

After the adoption of the FMP, the Engineering and Capital Projects Division will ensure that the FMP, in particular the Implementation Plan, is incorporated into existing planning mechanisms. The Engineering and Capital Projects Division will achieve this incorporation by undertaking the following activities:

- Conduct a review of the regulatory tools to assess the integration of the mitigation strategy. These regulatory tools are identified in Section 7 and include:
 - City of San Diego General Plan, particularly the Safety Element
 - City of San Diego's Municipal Codes
- Work with pertinent departments to increase awareness of the FMP and provide assistance in integrating the mitigation strategy (including the Implementation Plan) into relevant planning mechanisms. Implementation of these requirements may require updating or amending specific planning mechanisms.

9.3 CONTINUED PUBLIC INVOLVEMENT

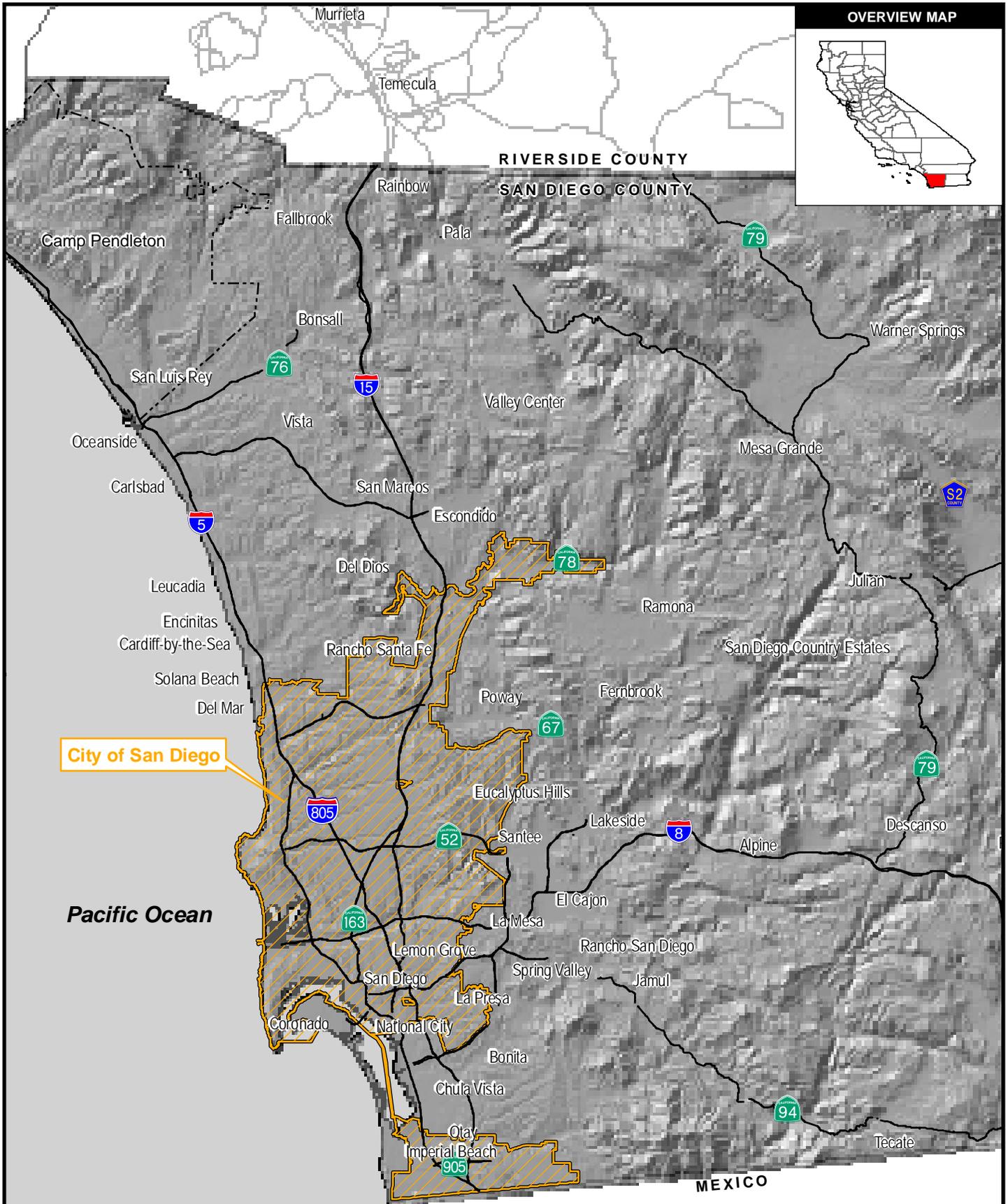
The City of San Diego is dedicated to involving the public directly in the continual reshaping and updating of the FMP. Hard copies of the FMP will be provided to each department. In addition, a downloadable copy of the FMP and any proposed changes will be posted on the City's Web site. This site will also contain an e-mail address and phone number to which people can direct their comments or concerns. The City of San Diego is dedicated to involving the public directly in review and updates of the Plan. During all phases of plan maintenance the public will have the opportunity to provide feedback. Additionally, the public will be informed and invited to any public workshops that are held prior to the 5-year adoption.

The Engineering and Capital Projects Division will also identify opportunities to raise community awareness about the FMP and the City's hazards, which could include attendance and provision of

materials at City-sponsored events. Any public comments received regarding the FMP will be collected by the Project Manager, included in the annual report to the City Council, and considered during future FMP updates.

SECTION 10 REFERENCES

- City of San Diego Flood Mitigation Plan - <http://www.sandiego.gov/engineering-cip/projectsprograms/floodmitigation.shtml>
- FEMA FMA General Information - <http://www.fema.gov/government/grant/fma/index.shtml>
- FEMA 2006. HAZUS – Dam Locations and Hazard Ratings - <http://www.fema.gov/plan/prevent/hazus/>
- FEMA 2006. HAZUS – Population Density - <http://www.fema.gov/plan/prevent/hazus/>
- FEMA 2006. HAZUS – Residential Unit Density - <http://www.fema.gov/plan/prevent/hazus/>
- FEMA 2006. Digital Flood Insurance Rate Maps – DFIRMS
- FEMA NFIP General Information - <http://www.fema.gov/business/nfip/fldmanre.shtml>
- Flood Hazards Topic of Meeting*, The San Diego Union Tribune, <http://www.signonsandiego.com>
- General Flood Information - <http://www.co.lake.il.us/smc/citizens/floodins.asp#history>
- Geology of San Diego County, California, Thomas A. Demere, Ph.D., Curator of Paleontology, San Diego Natural History Museum
- Monterey County Flood Maintenance Plan - <http://www.mcwra.co.monterey.ca.us/Floodplain%20Management/Documents/Floodplain%20Management%20Plan%202003.pdf>
- San Diego Hydrological Region, Project Clean Water - www.projectcleanwater.org
- San Diego County Multi-Jurisdiction Hazard Mitigation Plan, San Diego County, California, URS Corp.
- San Diego Association of Governments, SANDAG - <http://www.sandag.org/>
- San Diego Geographic Information Source Website, SanGIS - <http://www.sangis.org/>



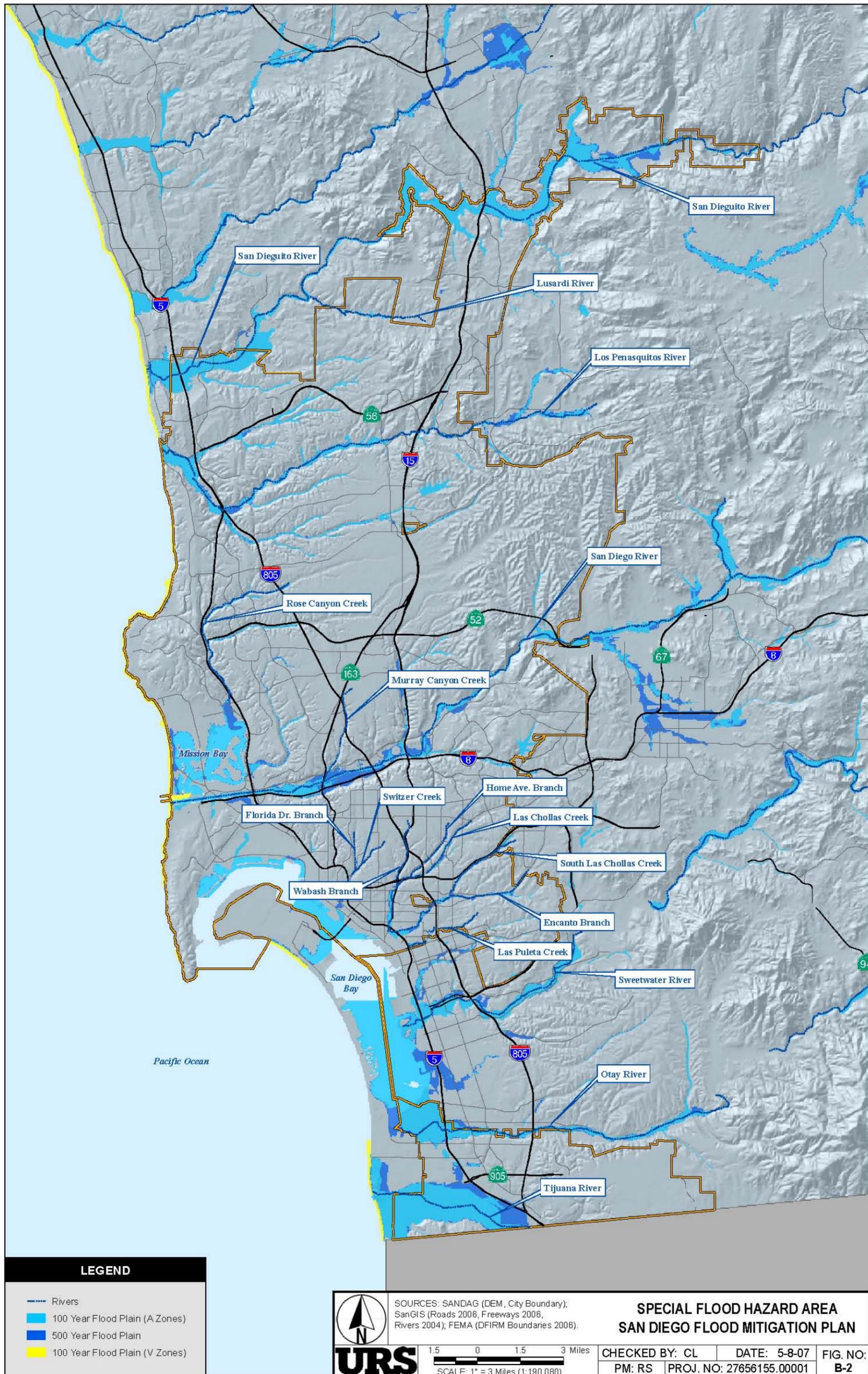
City of San Diego

Pacific Ocean

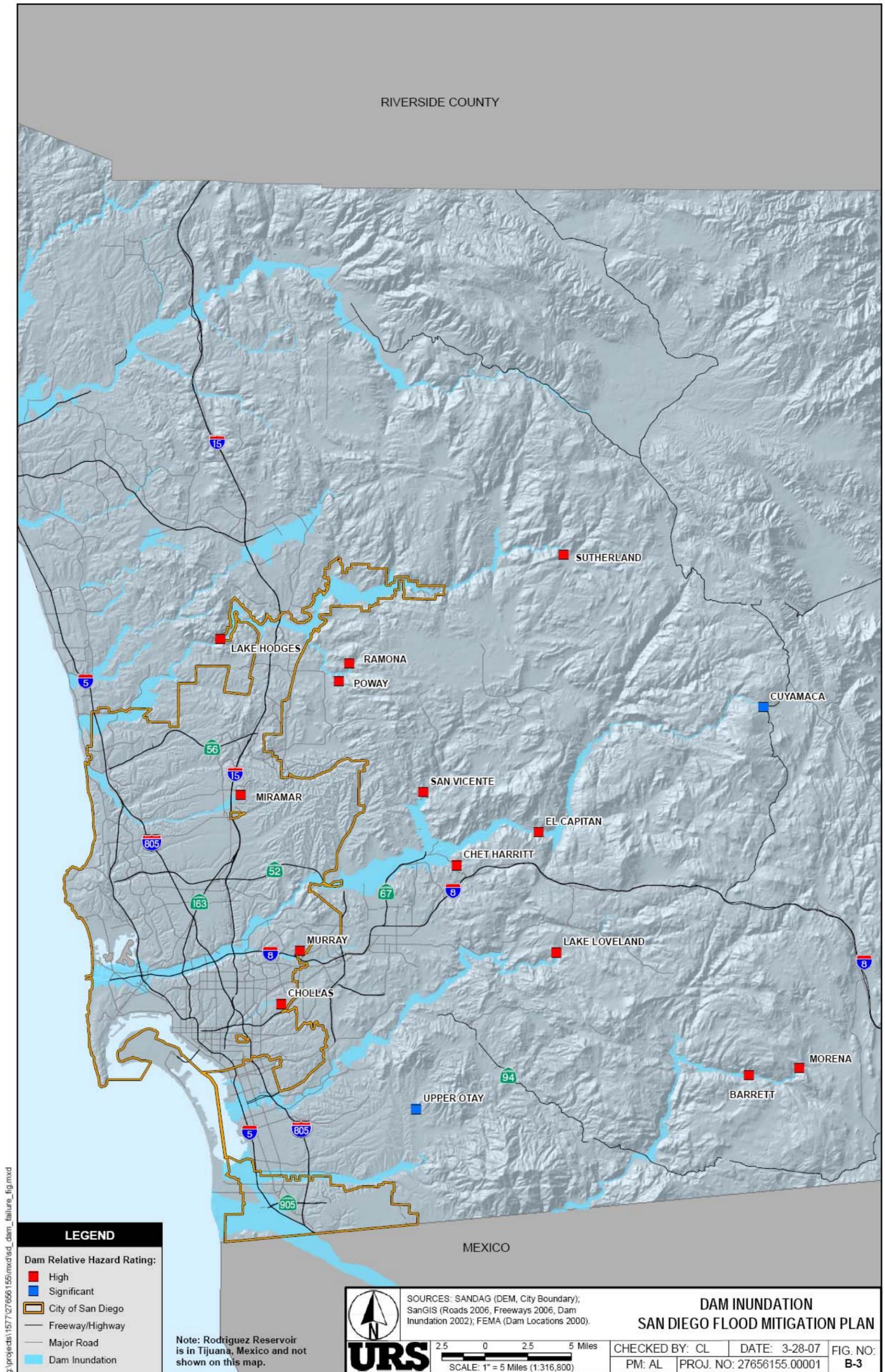
MEXICO

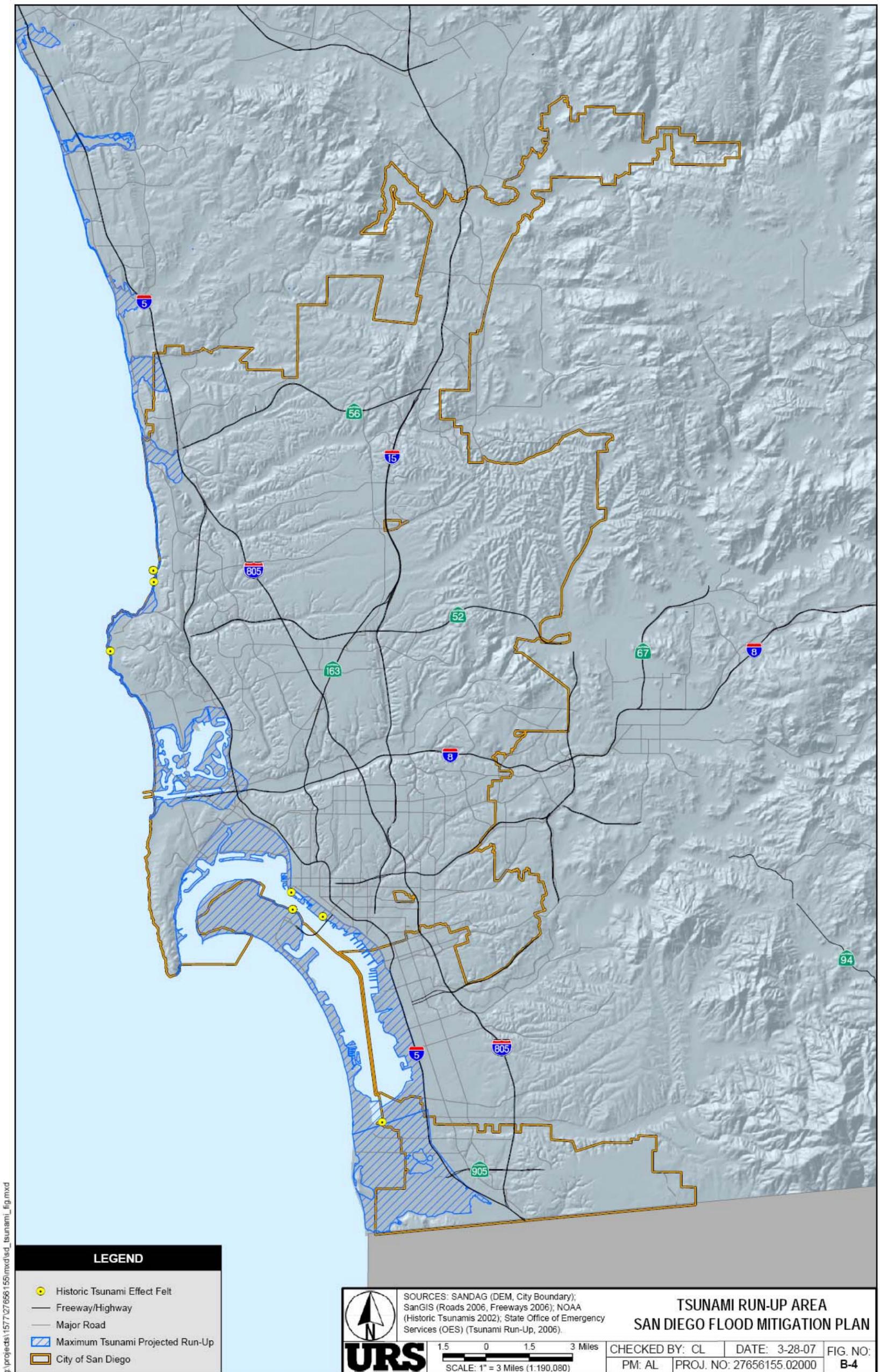
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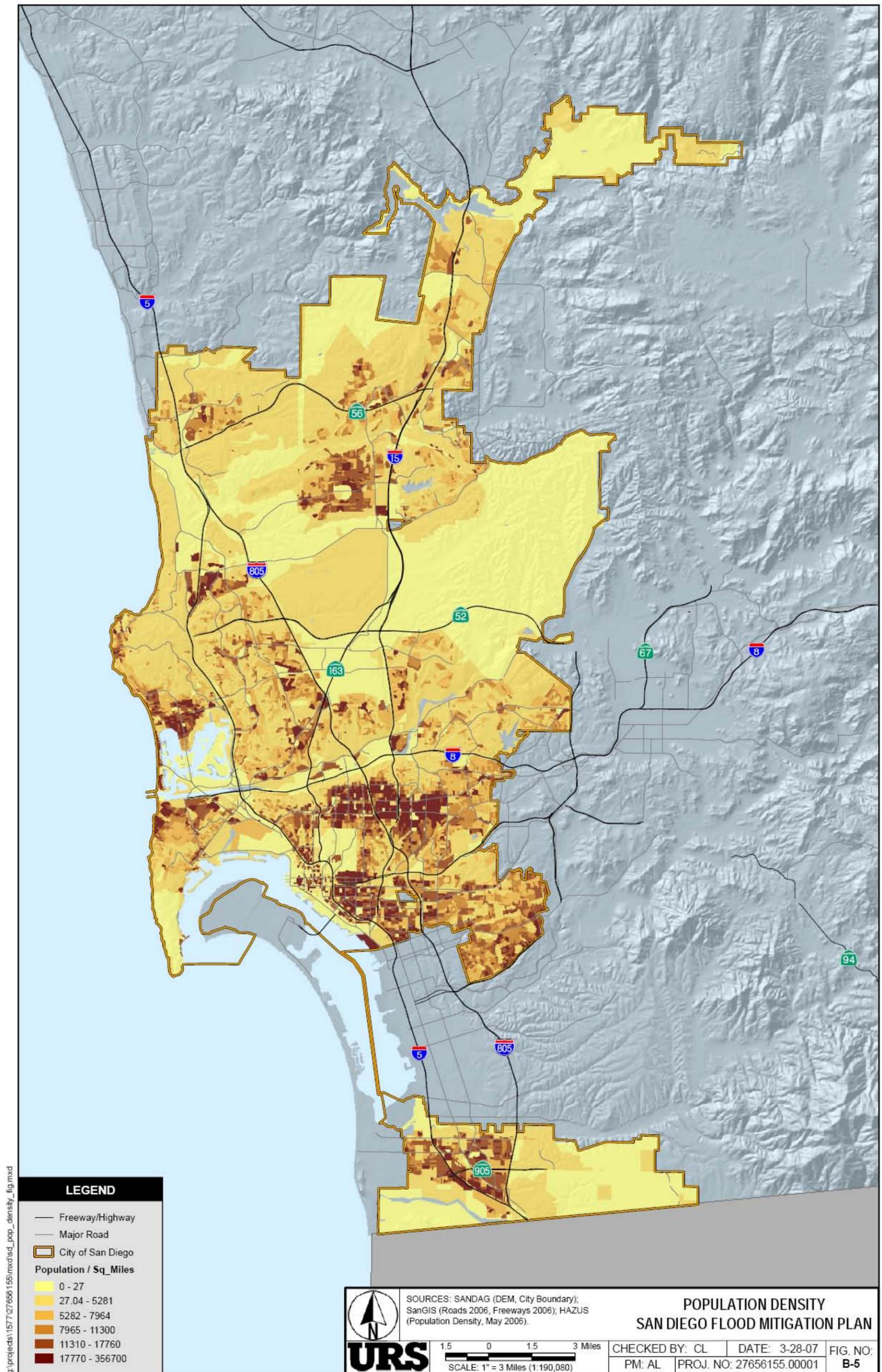


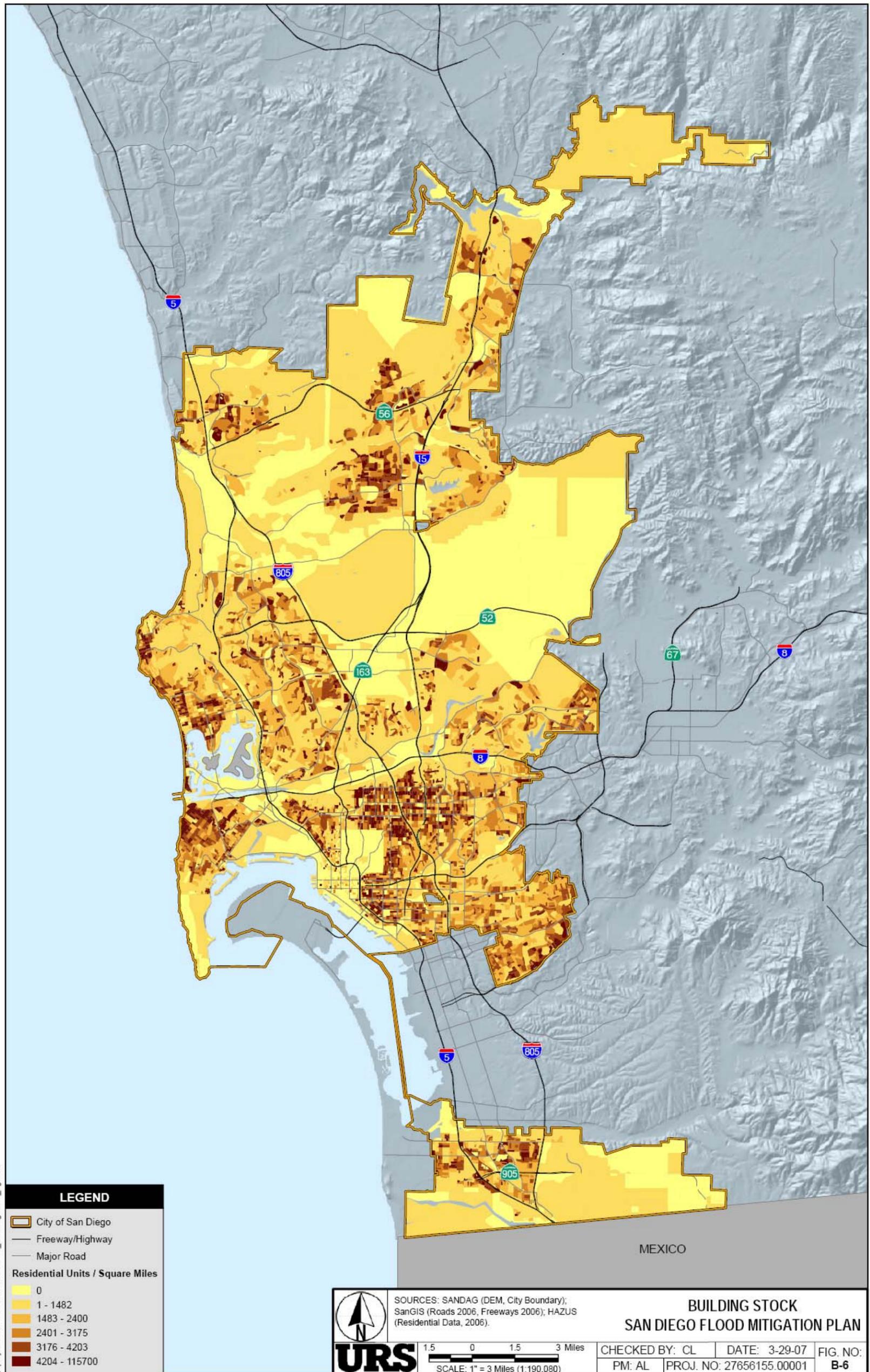
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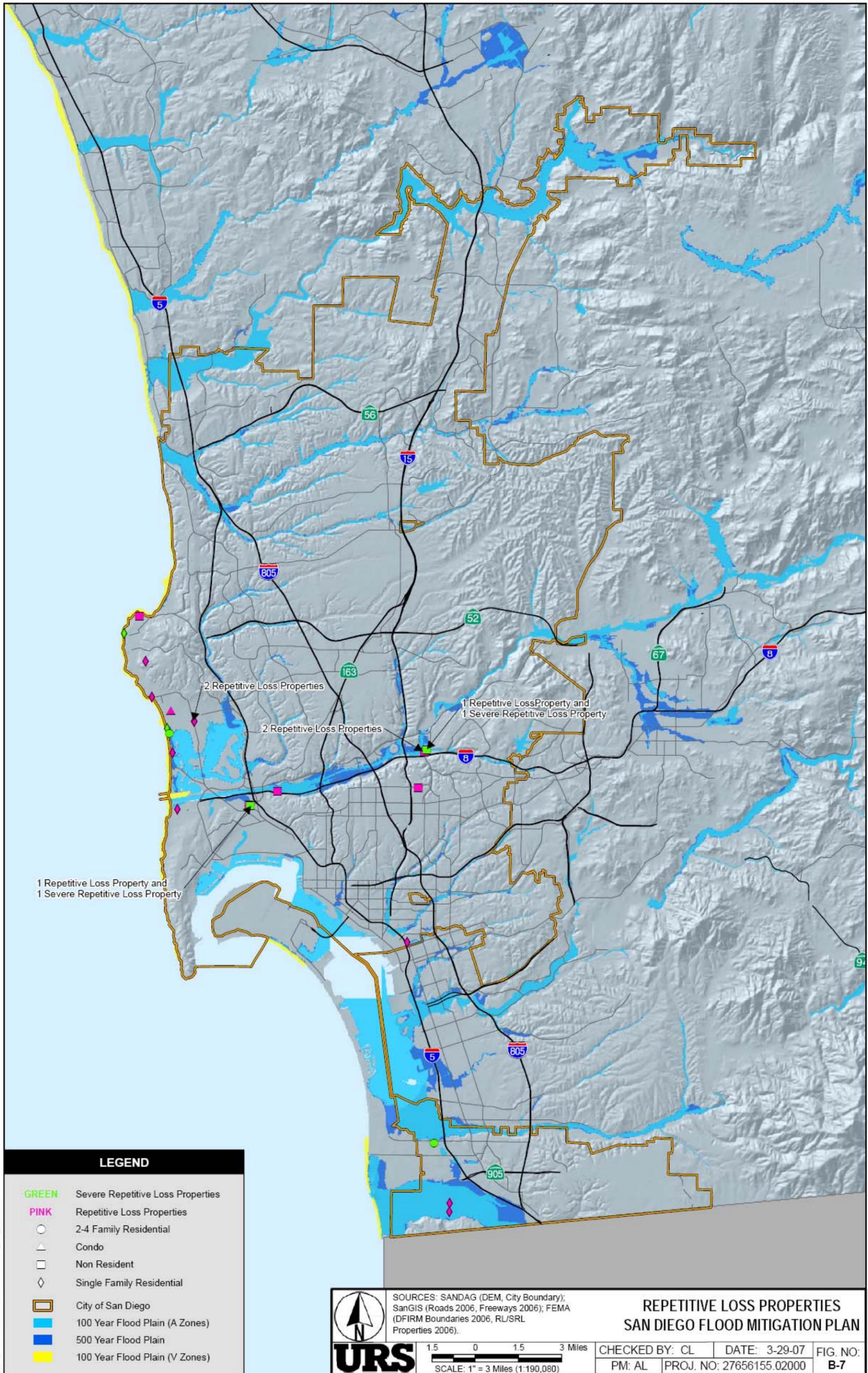


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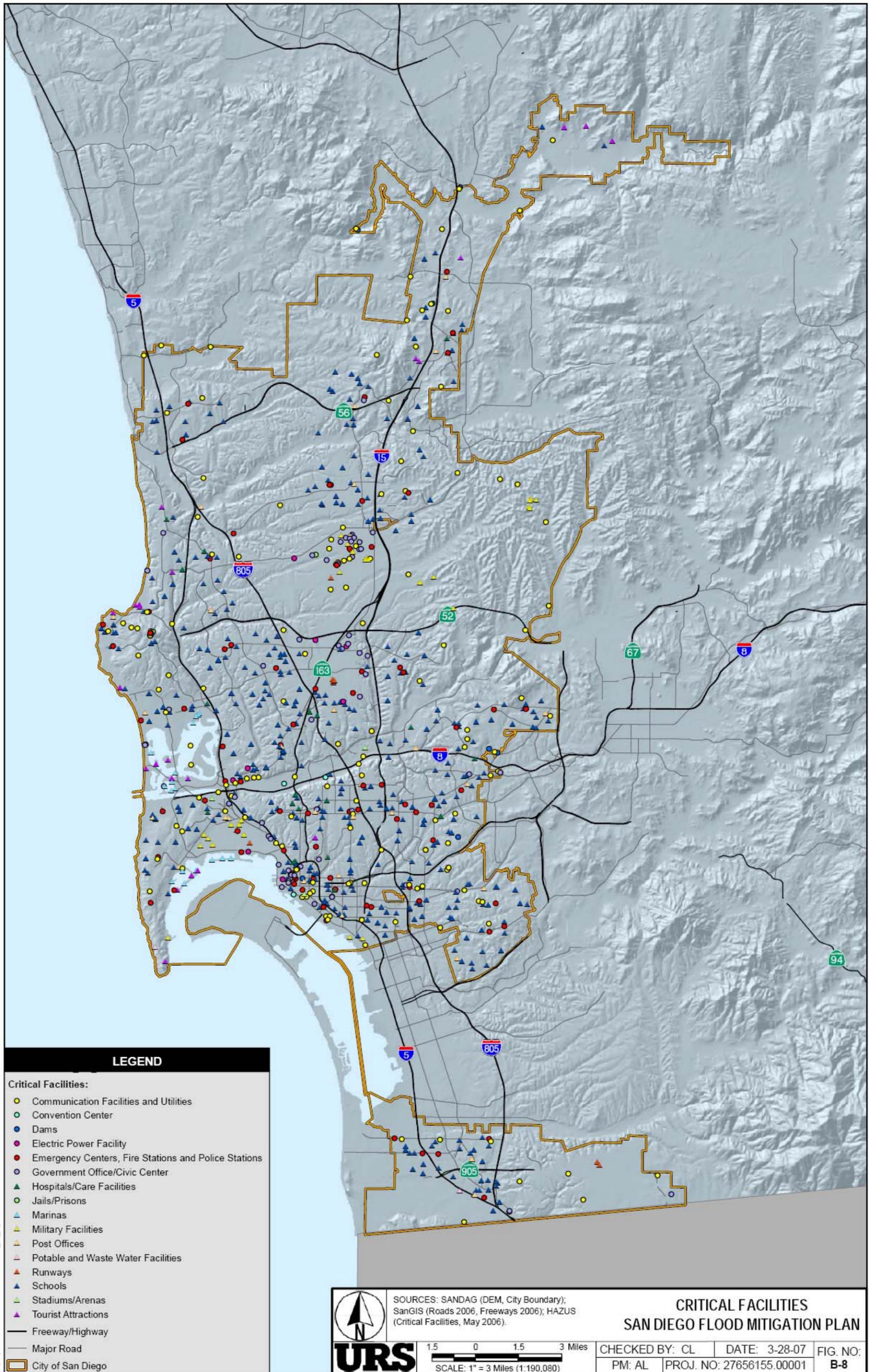


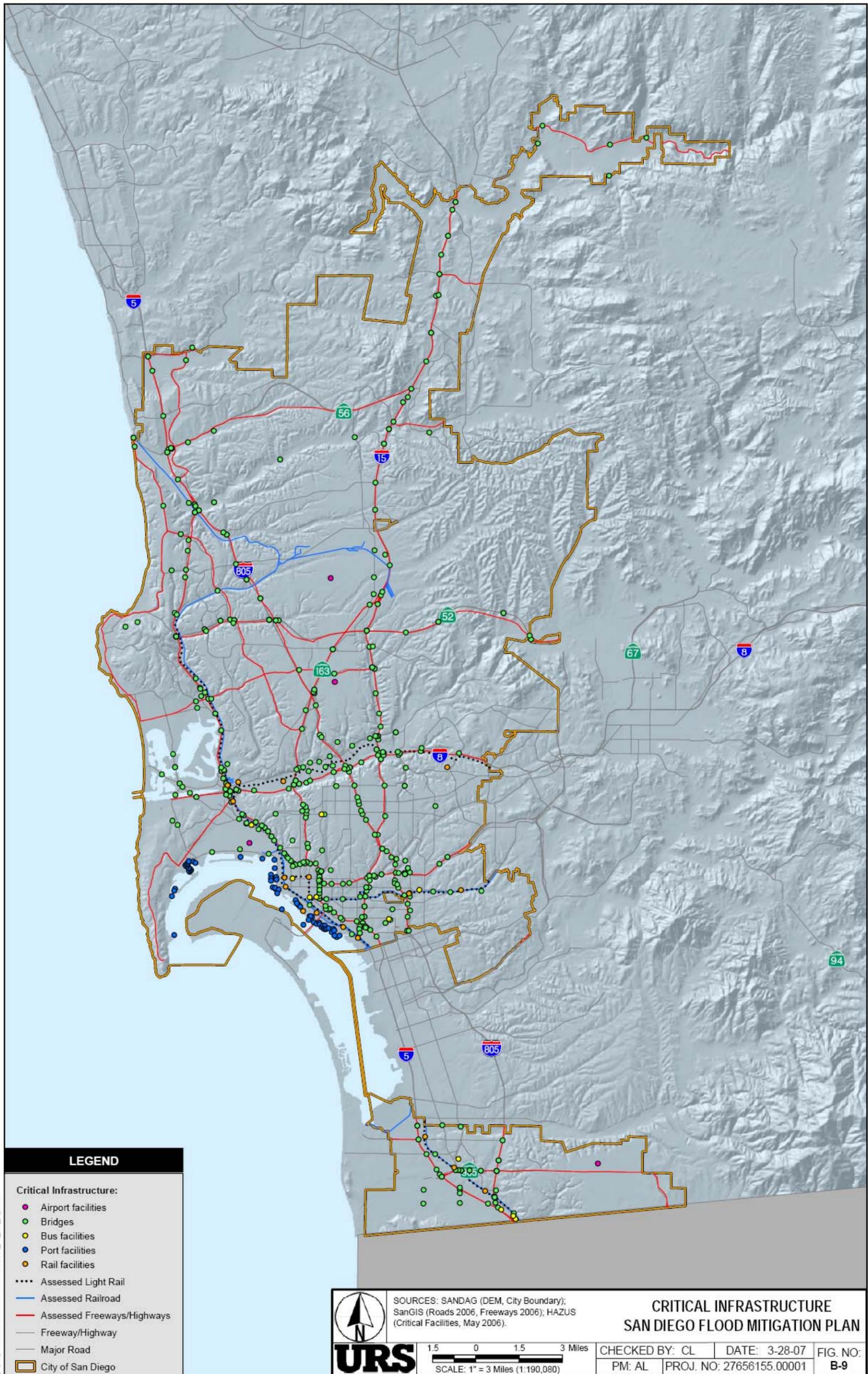


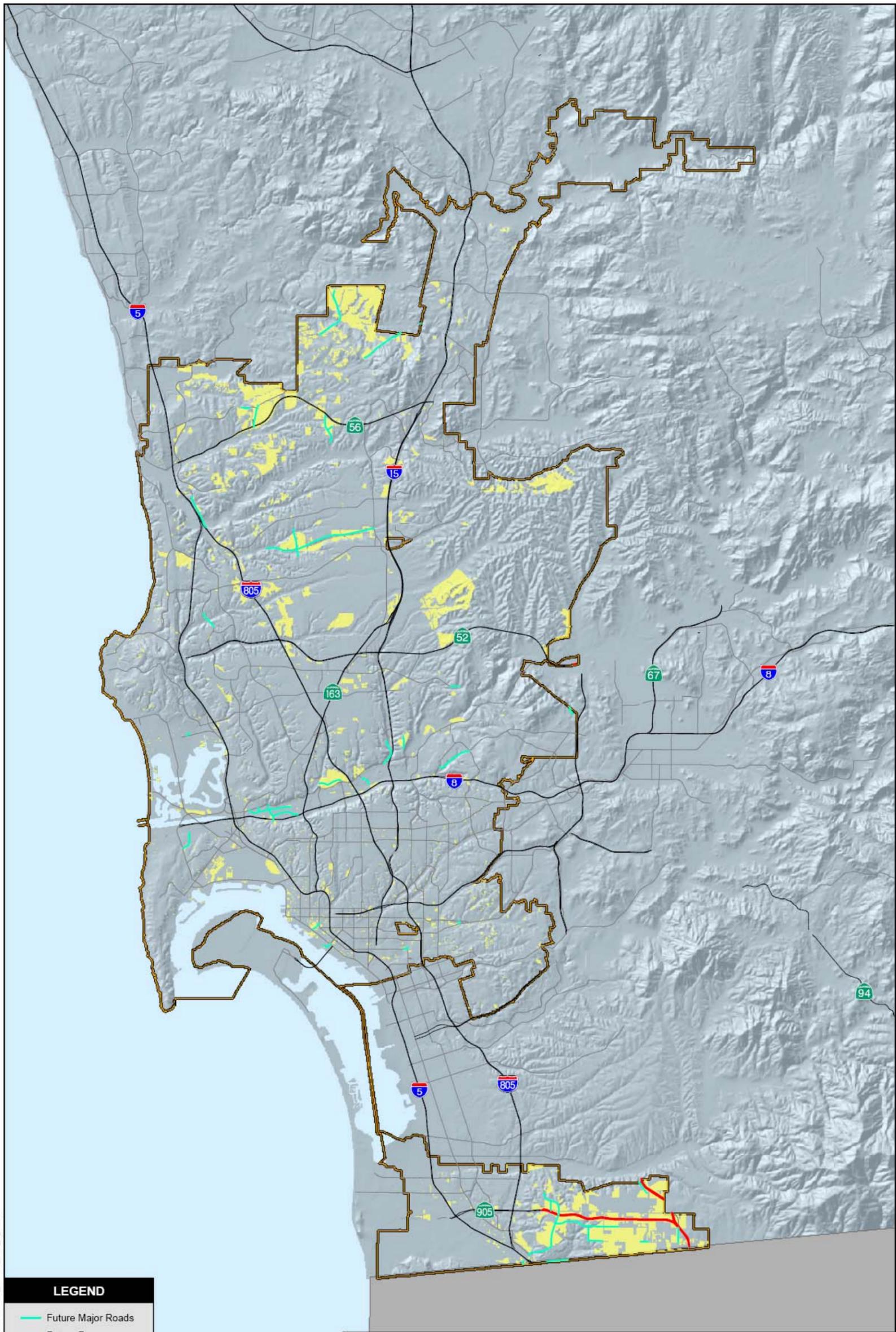
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LEGEND

- Future Major Roads
- Future Freeways
- Freeway/Highway
- Major Road
- Developable Land
- City of San Diego

	SOURCES: SANDAG (DEM, City Boundary); SanGIS (Roads 2006, Freeways 2006); SANDAG (Future Major Roads 2005, Future Freeways 2005, Developable Land 2004).		FUTURE DEVELOPMENT SAN DIEGO FLOOD MITIGATION PLAN	
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Meeting Summary
Thursday, December 28, 2006
1:00 PM – 2:00 PM

The meeting was held at the City of San Diego Office located in downtown San Diego. A list of attendees is included at the end of this meeting summary. The purpose of the meeting was to present an overview of the Flood Mitigation Plan (FMP) to be prepared by URS Corporation for the City of San Diego.

Plan Review Discussion

- Angela Leiba and Luis Fernandez (URS) presented a PowerPoint Presentation outlining an overview of the FMP to be prepared by URS Corporation for the City of San Diego.
- Specific information presented at the Kick-Off Meeting regarding the preparation of the FMP included:
 - Overview of FMP including background history
 - FMP Components/Sample Plan
 - Repetitive Loss Properties
 - Public Involvement
 - Project Schedule
- The following documents were handed out at the Kick-Off Meeting:
 - Agenda
 - PowerPoint Presentation
 - Repetitive Loss Property List
 - CRS Table
 - FEMA Review Checklist
 - FEMA Multi-hazard Crosswalk (FMA included)
 -

Action Items

- Luis Fernandez will forward copies of all Kick-Off Meeting handouts to Christy Villa, including the Monterey County Plan.
- Christy Villa will forward all Kick-Off Meeting handouts to all personnel absent from meeting.
- URS will prepare a Press Release and send it to Christy Villa for distribution.

- City of San Diego will provide a list of current flood protection laws/ordinances/regulations, on-going or in-process flood mitigation projects, and critical flood mitigation projects seeking additional future funding.
- City of San Diego will provide a list of Development Trends within the City's floodplain designation areas.
- URS will provide to the City of San Diego an outline of the FMP.

Meeting Attendees

<u>LAST, FIRST</u>	<u>TITLE</u>	<u>DEPARTMENT, ORGANIZATION</u>	<u>PHONE NUMBER</u>	<u>E-MAIL</u>
Leiba, Angela	Project Manager	URS	619-294-9400	angela_leiba@urscorp.com
Fernandez, Luis	Environmental Specialist	URS	619-294-9400	luis_fernandez@urscorp.com
Batta Jamal	Engineer	City of San Diego	619-533-3769	jbatta@saniego.gov
Villa, Christy	Engineering and Capital Projects	City of San Diego	619-533-3455	villac@saniego.gov
Jung, Jeremy	City Attorney	City of San Diego	619-533-5800	jjung@saniego.gov
Sammak, Mo	City General Services/Street Division	City of San Diego	619-527-7504	mosammak@saniego.gov

Meeting Summary
Thursday, April 19, 2007
11:00 AM – 12:30 PM

The meeting was held at the City of San Diego Office located in downtown San Diego. A list of attendees is included at the end of this meeting summary. The purpose of the meeting was to discuss development trends, flood control projects, and the mitigation strategy.

Discussion Items:

- Luis Fernandez (URS) presented an overview of the FMP to Steve Lindsay, Deputy City Engineer.
- Mr. Lindsay discussed specific potential project areas in which the City has interests in improving flooding issues. Potential project areas included:
 1. Las Chollas Creek
 2. Mission Beach
 3. Tijuana River Valley
- Christy Villa and Jamal Batta opened a discussion regarding the drainage priority list.
- Steve Lindsay discussed the development trends within the City of San Diego.

Action Items

- City of San Diego will provide the Development Trends Section of the FMP to URS.
- City of San Diego will provide a list prioritizing the mitigation projects.
- URS will provide to the City of San Diego information regarding the Development Trends Section. Will text be sufficient to cover this section?
- URS will provide information to the City of San Diego's question regarding whether or not the time frame in Table 8-4 refers to the construction time duration of each mitigation action.

Meeting Attendees

<u>LAST, FIRST</u>	<u>TITLE</u>	<u>DEPARTMENT, ORGANIZATION</u>	<u>PHONE NUMBER</u>	<u>E-MAIL</u>
Fernandez, Luis	Environmental Specialist	URS	619-294-9400	luis_fernandez@urscorp.com
Batta Jamal	Engineer	City of San Diego	619-533-3769	jbatta@saniego.gov
Villa, Christy	Engineering and Capital Projects	City of San Diego	619-533-3455	villac@saniego.gov
Lindsay, Steve	Deputy Civil Engineer	City of San Diego	619-446-5098	slindsay@saniego.gov

Meeting Summary
Wednesday, February 28, 2006
6:00 PM – 7:30 PM

The meeting was held at the Mission Valley Public Library. A list of attendees is included at the end of this meeting summary. The meeting began with a brief overview of the Flood Mitigation Plan. The purpose of the meeting was to then gain community input.

Plan Review Discussion

- Luis Fernandez (URS) presented a PowerPoint Presentation outlining an overview of the FMP to be prepared by URS Corporation for the City of San Diego which strongly emphasized the importance of community input.
- The six main goals of the public workshop were to discuss and address the following:
 1. Overview of Flood Mitigation Plan
 2. Public Awareness
 3. Public Input
 4. Overview of Flood Hazard Profile/Risk Assessment
 5. Mitigation Strategy
 6. Plan Maintenance
- Following the PowerPoint Presentation the attendees were asked to complete a survey.
- The floor was then open for all questions, comments and concerns
- The following documents were handed out at the Public Workshop Meeting:
 - Agenda
 - PowerPoint Presentation
 - FEMA Brochure
 - Level of Concern Survey
 - Flood Plan Flyer

Action Items

- Luis Fernandez will forward copies of all Public Workshop Meeting handouts to Christy Villa.
- Christy Villa will forward all Public Workshop handouts to all personnel absent from meeting.

Public Comments/Concerns

URS and the City of San Diego will discuss and address the following questions and comments:

- In 1980 what structures were damaged that were insurable?
- How much total funding is available, how much for California?

- What cities have been granted “planning” grants?
- What about properties that have not met the threshold, but are close, maybe only one flood away? (from being considered repetitive loss)
 - o Can FEMA provide a list for that?
- How specific will recommendations for mitigation be?
- Were the capabilities of the existing system evaluated (to determine where improvements go and what those improvements are, generally concerned with structures)?
- Were the current programs, designed to relocate people out of flood plains, looked at?
- Important to look at Fire (which leads to soil erosion) and Earthquakes, and their affects on flooding.
- Issue of levy structures, would like to see addressed
- Brown Fill – would like to see addressed
 - o west of Hollister St. Bridge
 - o on Tijuana River
 - o would like to have the fill removed, people not opposed to
 - o would this process potentially provide the funds for this project?
- Make sure the right people are included/ asked for input before drafts are made open to the public (worried about giving the public the wrong impression)
- Issue of property that is not yet developed. But if it were developed it would be considered a repetitive loss property.

Response to Comments/Concerns

In 1980 what structures were damaged that were insurable?

There is no data to let us know how many total insurable structures were damaged in the January-February 1980 flooding event. However, using the BureauNet database, we can tell that there were 5 claims by RL property owners (1 property had 2 claims – one in Jan. the other in February). At the time, not all of these properties were RL properties. For some homeowners, this was their first (of many) claims made against the NFIP.

How much total funding is available, how much for California?

There are 3 types of FEMA mitigation grants available to the City of San Diego. The City is a subgrantee (the State is the grantee) and can apply for the funding (through the State and the State to FEMA). HMGP is available statewide after a disaster occurs within CA. Communities compete for grants. The State chooses who to give the grants to – it is usually to communities involved in the disaster area. HMGP funding is 7% of the total cost of the disaster (so say for example, the disaster was \$100M, then \$7M would be available in grant funding). PDM is nationwide competitive grant – approximately \$50-\$150M is awarded to communities nationally, with a \$3M project grant cap per grant. FMA is the third type of grant. FMA funding is

allocated from FEMA to each Region and then onto each State. Historically, FEMA has allocated about \$1M in planning and project grants to CA (to be used to write the FMA and apply for FMA to reduce RL properties).

What cities have been granted “planning” grants?

Each of FEMA’s mitigation grant programs offers funding for planning grants. FMA grants in California have been given to San Diego, Ventura WPD, and Sonoma, for example. FEMA generally awards each community around \$50K for a FMA planning grant.

To see a list of PDM grants, go to:

http://www.fema.gov/government/grant/pdm/fy06_pdm_grant_recipients.shtm

What about properties that have not met the threshold, but are close, maybe only one flood away? (from being considered repetitive loss)

Can FEMA provide a list for that?

FEMA tracks each and every claim made to the NFIP. However, BureauNet is the only system in place that tracks RL properties once they meet the minimum threshold of 2 claims of \$1,000 or more made within a 10-year period since 1978.

FEMA does track RL properties that are “pending” to be SRL properties. These properties include every property that since 1978 has experienced: four or more separate building and content claims each exceeding \$5,000 with cumulative claims exceeding \$20,000, or at least two separate building claims with cumulative losses exceeding the value of the property (that is, the value of the structure). Severe RL properties are classified as “validated” meaning the property losses and claims have been verified and “pending” meaning that the properties meet the SRL criteria according to the claims records, but were found to have data anomalies when the NFIP insurance data for individual properties was reviewed.

How specific will recommendations for mitigation be?

Specific enough where project locations are identified. And, if we are dealing with a specific flood control project, that project will also be identified. For RL, neighborhoods/areas will be identified, but not specific RL properties. The City will need to work with the property owners at a later date to determine if the property owner is interested and the project is feasible (meets a BCA of 1.0 or greater) under FEMA’s guidelines.

Were the capabilities of the existing system evaluated (to determine where improvements go and what those improvements are, generally concerned with structures)?

FEMA FIS, which was published in Sept. 2006, evaluated the existing flood control systems in order to determine cause of flooding.

Were the current programs, designed to relocate people out of flood plains, looked at?

People can build in the floodplains, according to the local floodplain ordinance (possible freeboard requirement, etc). People cannot build in floodways, however.

Important to look at Fire (which leads to soil erosion) and Earthquakes, and their effects on flooding?

Fire does not have as much to do with flooding as post-fire debris flow (the areas that have been burned and are stripped of vegetation and are susceptible to flow). Post-fire debris flow is not being addressed in this version of the plan. Earthquakes do not lead to flooding – it may lead to landsliding, but not flooding.

Issue of levy structures, would like to see addressed?

It depends on who owns these facilities --- if the facilities are owned by USACE, then it is harder to fund these types of projects because they are outside of the City's jurisdiction.

Brown Fill – would like to see addressed?

- west of Hollister St. Bridge
- on Tijuana River
- would like to have the fill removed, people not opposed to
- would this process potentially provide the funds for this project?

Unless the City can prove that fixing these facilities will reduce flooding on RL properties, then no. However, these projects can possibly be funded under PDM or HMGP funding (again, if not a USACE project).

Issue of property that is not yet developed. But if it were developed it would be considered a repetitive loss property.

RL properties are the structures only. FEMA does not insure land. So, if a property is flooded numerous times, but has no structure, than it is not considered a RL property (because flood insurance claims cannot be made for land compensation).

Meeting Attendees

<u>LAST, FIRST</u>	<u>TITLE</u>	<u>DEPARTMENT, ORGANIZATION</u>	<u>PHONE NUMBER</u>	<u>E-MAIL</u>
Fernandez, Luis	Environmental Specialist	URS	619-294-9400	luis_fernandez@urscorp.com
Trumpy, Lindsey	Homeland Security Intern	URS	619-294-9400	lindsey_trumpy@urscorp.com
Villa, Christy	Engineering and Capital Projects	City of San Diego	619-533-3455	villac@sandiego.gov
Ferguson, David		Union Tribune	619-293-1144	David.ferguson@uniontrib.com
Bowling, Dennis		Rick Engineering	619-291-0707	dcberickeng.com
Peugh, Jim		SD Audubon Society	619-224-4591	peugh@coz.net
Gonzalez, Lisa		Donna Frye	619-236-6616	LGonzalez@sandiego.gov
Hutsel, Rob		SDRPF	619-297-7380	rhutsel@sandiegoriver.org
Sierra, Mario		City of San Diego, General Services	619-525-8686	msierra@sandiego.gov

Meeting Summary
Wednesday, March 1st, 2007
6:00 PM – 7:30 PM

The meeting was held at the San Ysidro Community Center. A list of attendees is included at the end of this meeting summary. The meeting began with a brief overview of the Flood Mitigation Plan (FMP). The purpose of the meeting was to then gain community input.

Plan Review Discussion

- Christy Villa offered the introduction welcome.
- Luis Fernandez (URS) presented a PowerPoint Presentation outlining an overview of the FMP to be prepared by URS Corporation for the City of San Diego which strongly emphasized the importance of community input.
- The six main goals of the public workshop were to discuss and address the following:
 7. Overview of Flood Mitigation Plan
 8. Public Awareness
 9. Public Input
 10. Overview of Flood Hazard Profile/Risk Assessment
 11. Mitigation Strategy
 12. Plan Maintenance
- Following the PowerPoint Presentation the attendees were asked to complete a survey.
- The floor was then open for all questions, comments and concerns
- The following documents were handed out at the Public Workshop Meeting:
 - Agenda
 - PowerPoint Presentation
 - FEMA Brochure
 - Level of Concern Survey
 - Flood Plan Flyer

Action Items

- Luis Fernandez will forward copies of all Public Workshop Meeting handouts to Christy Villa.
- Christy Villa will forward all Public Workshop handouts to all personnel absent from meeting.
- URS and the City of San Diego will consider and address the questions and comments when writing the plan for the City of San Diego.
- URS and the City will look at the Cities Flood Control Management Plan (1992) for other concerns and ideas.

Public Comments/Concerns

- Rodriguez Dam in Mexico, was opened up completely in the 1980 flood, and flooded out the Tijuana River Valley in the US. The potential for this to happen again still exists and the US has no control over the issue. This needs to be considered in any mitigation plans.
- The Tijuana River needs to be kept in its bed.
- Maintenance of any projects or plans needs to be consistent. This is not the case now.
- The lack of the ability to obtain required permits has impeded any flood prevention measures which the citizens of the Tijuana Valley have identified as being critical to flood mitigation.
- The Pilot Channel has not been maintained for 3 years, and has not consistently been maintained since the County obtained the land.
- The Tijuana River Valley, Pilot Channel, Hollister St., and Monument Rd. are the major areas of concern for the South Bay.
- Sewage spills from Mexico, near Hollister St., need to be incorporated into any plans.
- The East/West berms east of the brown-fill CANNOT be removed. If they were to be removed a significant increase in flood severity would occur.
- Collectors need to be placed in order to regulate flow from Mexico. Collectors exist in several areas but not where flow from Mexico may be impeded.
- The Cities Flood Control Management Plan (1992) was developed by citizens in the Tijuana River Valley, to mitigate floods and damaged caused by floods. Recommendations from this plan have not been able to be put into action due to the lack of permitting.
- Monument Road @ Smugglers Gulch:

Monument Road is a two lane street in the Tijuana River Valley; the road crosses Smuggler's Gulch (Cañada El Matadero in Mexico) at approximately 2000 feet west of Hollister Street. Smuggler's Gulch storm flows cross over Monument Road at this intersection during rain events. The existing crossing at Monument Road consists of a concrete dip section with a 42" metal drainage pipe. This crossing floods during major events and becomes impassable. The drainage pipe gets blocked with the flow that comes mostly from Mexico and it is always sediment-laden and trash-laden.

APPENDIX C2

Public Workshop Meeting Summaries

<u>LAST, FIRST</u>	<u>TITLE</u>	<u>DEPARTMENT, ORGANIZATION</u>	<u>PHONE NUMBER</u>	<u>E-MAIL</u>
Fernandez, Luis	Environmental Specialist	URS	(619) 294-9400	luis_fernandez@urscorp.com
Miller, Nicholas	Homeland Security Intern	URS	(619) 294-9400	nichoalas_miller@urscorp.com
Villa, Christy	Engineering and Capital Projects	City of San Diego	(619) 533-3455	villac@sandiego.gov
Batta, Jamal	Engineering and Capital Projects	City of San Diego		
Opel, Don	Citizen		(619) 423-3858	N/A
McElroy, Tony		San Diego Police Department	(619) 424 5886	tmcelroy@pd.sandiego.com
Hicks, Bob	Citizen		(619) 572- 8499	BobbyH7828@aol.com
Martinez, Nick		County Parks and Recreation	(858) 966-1348	Nicholas.Martinez@sdcounty.ca.gov
Nunez, Damien		Bob Filner	(619) 422- 5963	Damien.nunez@mail.house.gov
Gomez, Jesse	Farmer	J&K Earthworks	(619) 424-5886	jkearth@aol.com
Gomez, Kathy	Farmer	J&K Earthworks	(619) 424-5886	jkearth@aol.com
Moriarty, Gale		Tijuana River Valley Equestrian Assn.	(619) 421-4548	gmoria@hypercon.net
Tynan, Richard			(619) 428 - 2214	

**Meeting Summary
Monday, March 5, 2006
6:00 PM – 7:30 PM**

The meeting was held at the La Jolla, Riford Branch Library. A list of attendees is included at the end of this meeting summary. The meeting began with a brief overview of the Flood Mitigation Plan. The purpose of the meeting was to then gain community input.

Plan Review Discussion

- Luis Fernandez (URS) presented a PowerPoint Presentation outlining an overview of the FMP to be prepared by URS Corporation for the City of San Diego which strongly emphasized the importance of community input.
- The six main goals of the public workshop were to discuss and address the following:
 1. Overview of Flood Mitigation Plan
 2. Public Awareness
 3. Public Input
 4. Overview of Flood Hazard Profile/Risk Assessment
 5. Mitigation Strategy
 6. Plan Maintenance
- Following the PowerPoint Presentation the attendees were asked to complete a survey.
- The floor was then open for all questions, comments and concerns

- The following documents were handed out at the Public Workshop Meeting:
 - Agenda
 - PowerPoint Presentation
 - FEMA Brochure
 - Level of Concern Survey
 - Flood Plan Flyer

Action Items

- Luis Fernandez will forward copies of all Public Workshop Meeting handouts to Christy Villa.
- Christy Villa will forward all Public Workshop handouts to all personnel absent from meeting.
- Christy Villa will make sure information about PDM and HMGP issues get posted on the Flood Mitigation website.

Public Comments/Concerns

- URS and the City of San Diego will discuss and address the following questions and comments:
 - Is grant money only available for NFIP properties?
 - Does the City of San Diego carry NFIP insurance on city properties?
(Answer: The city is self insured, the primary goal of this plan is repetitive and severe repetitive loss properties associated with the NFIP. Other grants will be targeted, at which point city structures can be involved)
- Does the vulnerability analysis include drain lines that have been previously damaged and not yet repaired?
 - For example, creeks still carrying flood debris which need to be cleared
 - Specifically these areas: Torrey Lane, Roseland Place, Montero Subdivision (shores), Via Estrada (back of Mt. Soledad)
- Which is a higher priority?
 - Cost and price of insurance, FEMA wanting to save moneyOR
 - Planning to protect lives (specifically brought up issue of protecting egresses)
- Will the Flood Zone map change with mitigation?
 - Gentleman used to pay flood insurance, but with mitigation and a resurvey the property is no longer listed as being in a flood plain
(Answer: Generally the map will not change. In the above example FEMA has documentation stating that the particular structure is no longer in a flood plain, however, the actual property/land remains in a flood plain.
But a change in the flood map is possible with substantial mitigation)
- Is this Flood Mitigation Plan at all associated with the Canyon Plan when it addresses sewers?
- Is there a similar planning process for fires?
- Concern expressed about the issue that those living in flood plains tend to be poor, money going into mitigation generally does not help those people.
 - We should be concentrating on protection of facilities and people.

- San Pasqual Creek Area – Ysabel Creek Road
 - Continual Flooding in this area, which leads to road closures
 - Brings up issue of safety and emergency response time, Station 33
 - What are the chances that this plan will help provide money for this situation?
(Answer: This particular plan only addresses properties that are insured, we cannot insure the road. However, if it can be proven that fixing the road will protect houses FEMA may consider allocating funds to such project.
Everyone at the city is aware of this particular situation and it is a top priority)
- Ysabel Creek Road – Representing San Pasqual School District
 - Extra transportation costs and more importantly time because of road closure
 - When is the next round of city funding and will money be allocated for this road?
- Fox Canyon – Ontario Road
 - In 1920 planners set aside a road as an egress (access to University Ave)
 - Currently occupied by high density housing, rented generally by poor residents
 - Also, children walk to school through this unsafe, polluted area (creek bed)
(Answer: referred to “Safe Route for School,” grants specifically designed for such situations)
- Hazards from floods that were not mentioned, but would like to see mentioned
 - Ground water pollution
 - Bluff and Canyon wall failure
 - Loss of agricultural crops
 - Loss of native habitat (especially in the Tijuana, Sweet Water area)

APPENDIX C2

Public Workshop Meeting Summaries

<u>LAST, FIRST</u>	<u>TITLE</u>	<u>DEPARTMENT, ORGANIZATION</u>	<u>PHONE NUMBER</u>	<u>E-MAIL</u>
Fernandez, Luis	Environmental Specialist	URS	619-294-9400	luis_fernandez@urscorp.com
Trumpy, Lindsey	Homeland Security Intern	URS	619-294-9400	lindsey_trumpy@urscorp.com
Villa, Christy	Engineering and Capital Projects	City of San Diego	619-533-3455	villac@sandiego.gov
Batta, Jamal	Engineering and Capital Projects	City of San Diego	619-533-3769	jbatta@sandiego.gov
Kozminska, Pamela			619-284-8787	
Kozminska, Ted		Euclid Ave, Improvement Sub Committee	619-282-3679	Tque80@hotmail.com
Kozminska, Helen		Euclid Ave,	619-282-3679	
Buis, Terry		7890 Torrey Lane	858-459-5621	bisontl@aol.com
Grimes, Ellen Lykos		2145 Paseo Dorado	858-454-6094	egrimes@san.rr.com
Konyn, Frank		San Pasqual, Lake Hodges Planning Group	760-644-3400	Konyn@SBCGlobal.net
Klemm, Ernest H		San Pasqual, Lake Hodges Planning Group	760-789-5556	
Hanson, Darlene		San Pasqual School Board	760-480-6320	jandfam@aol.com
Forbes, Gail		La Jolla Town Council	(858) 454-5561	lajollatowncncl@san.rr.com

Public Questionnaire Survey



Level of Concern for Flood Hazards in the City of San Diego

(circle the corresponding number for each hazard)

Natural Disaster	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Coastal and Riverine Flooding	5	4	3	2	1
Dam Failure	5	4	3	2	1
Tsunami	5	4	3	2	1
List Others (Optional)					
	5	4	3	2	1
	5	4	3	2	1
	5	4	3	2	1
	5	4	3	2	1

Website Snapshot

Flood Mitigation Plan | Engineering and Capital Projects

Page 1 of 1



Flood Mitigation Plan

The City of San Diego has begun preparing a city-wide Flood Mitigation Plan to meet the requirements of the Disaster Mitigation Act of 2000. The Flood Mitigation Plan will be incorporated into the multi-jurisdictional, multi-hazard plan currently being prepared by the County of San Diego, and the Office of Emergency Services (OES) as the flood element. The Flood Mitigation Plan must also meet the requirements for plans prepared under the FMA Program and will address options for reducing flood hazards to repetitive loss properties and other properties insured under the NFIP.

Press Releases

02/20/07 [New Plan makes City Eligible for Project Funding from Federal Emergency Management Agency](#) (PDF: 26k)

Draft Flood Mitigation Plan

To be posted in April of 2007.

Submit a question or comment

E-mail: villac@sandiego.gov

Additional Information

[Workshop Information](#) (PDF: 104K)
[Pre-Disaster Mitigation Program \(PDMP\)](#)
[Hazard Mitigation Grant Program \(HMGP\)](#)

Learn more about [FEMA's Mitigation Planning Program](#) and the [Disaster Mitigation Act of 2000](#).

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<http://www.sandiego.gov/engineering-cip/projectsprograms/floodmitigation.shtml>

4/20/2007

Mayor Gerry Sander's Press Release



FOR IMMEDIATE RELEASE
February 20, 2007

Contact: Fred Sainz
858-442-8914

FACT SHEET

**MAYOR'S NEW FLOOD CONTROL PLAN SETS STAGE
FOR ENDING CHRONIC FLOOD DAMAGE IN CITY**

**NEW PLAN MAKES CITY ELIGIBLE FOR PROJECT FUNDING
FROM FEDERAL EMERGENCY MANAGEMENT AGENCY**

Mayor Jerry Sanders is leveraging existing grant funding to help end repeated damage to properties in the City's flood prone areas. The Mayor has directed staff to complete the City's long-awaited Flood Mitigation Plan as part of his effort to gain additional funding from the Federal Emergency Management Agency (FEMA). The City is using grant funding provided last year from FEMA to complete the plan, the last step in meeting San Diego's requirements under the Federal Disaster Mitigation Act of 2000.

NEW PLAN WILL MAKE CITY ELIGIBLE FOR MORE FEMA FUNDING

Completing the new plan is a requirement for receiving future federal money to build flood mitigation projects in the City. The City's plan will augment the multi-jurisdictional hazard mitigation plan prepared by local agencies and the County of San Diego's Office of Emergency Services. The City plan will assist FEMA in allocating future funding to appropriate and necessary flood mitigation projects throughout San Diego.

The new plan will identify specific risks and possible mitigation efforts in the City's three most vulnerable flood zones – Mission Valley, La Jolla and the City portion of the Tijuana River Valley. Each of these areas has sustained considerable and repeated damage from flooding over many years.

In addition, the new plan will address options for reducing flood hazards for properties that sustain repetitive losses and are insured under the National Flood Insurance Program. It will give the City the information it needs to request federal funding for specific projects aimed at preventing further losses in these areas.

PUBLIC INPUT AND EDUCATION AT FOREFRONT OF MAYOR’S EFFORT

As part of the Mayor’s effort, the City will be holding a series of workshops to solicit input from the public affected by flooding throughout the city. The workshops will also be used to provide the public with a risk analysis and description of potential flood hazards identified as part of the planning effort. Comments raised during the workshop sessions will be included as part of the final plan report filed with the County’s Office of Emergency Services and FEMA.

The workshops are scheduled for the following locations and times:

MISSION VALLEY	February 28, 2007 - 6:00-7:30pm Mission Valley Branch Library 2123 Fenton Parkway San Diego, CA 92108-4739 (858) 573-5007
SAN YSIDRO	March 1, 2007 - 6:00-7:30pm San Ysidro Community Service Center 663 E. San Ysidro Blvd. San Diego, CA 92173 (619) 424-0230
LA JOLLA	March 7, 2007 - 6:00-7:30pm La Jolla/Riford Branch Library 7555 Draper Avenue La Jolla, CA 92037-4802 (858) 552-1657

CITY PROVIDES ACCESS TO FLOOD MITIGATION INFORMATION

As part of his continuing effort to provide all San Diegans with important information about disaster preparedness, Mayor Sanders has posted a new update page for flood mitigation planning effort on the City’s website. The website address listed below includes contact information for City staff involved in the planning effort and links to additional details about FEMA’s Mitigation Planning Program and the Disaster Mitigation Act of 2000.

The information can be found at:

<http://www.sandiego.gov/engineering-cip/projectsprograms/floodmitigation.shtml>

FMP Public Flyer



Workshops to be held at the following locations:

MISSION VALLEY: February 28, 2007: 6:00 p.m. – 7: 30 p.m.
Mission Valley Branch Library
2123 Fenton Parkway, San Diego, CA 92108
(858) 573-5007

SAN YSIDRO: March 1, 2007: 6:00 p.m. – 7:30 p.m.
San Ysidro Community Service Center
663 E. San Ysidro Blvd. San Diego, CA 92173
(619) 424-0230

LA JOLLA: March 5, 2007: 6:00 p.m. – 7:30 p.m.
La Jolla/Riford Branch Library
7555 Draper Avenue, La Jolla, CA 92037
(858) 552-1657

We need to hear from you. Your participation at the workshop and your input is crucial to the success of San Diego’s Flood Mitigation Plan!

The goals of the plan include:

- Minimize flood damage to areas that are vulnerable to flooding throughout the City of San Diego
- Promote extended flood insurance awareness throughout the City of San Diego and neighboring communities.

Contact: **Christy Villa**
at the City of San Diego
(619) 533-3455 or go to the City’s Website:
<http://www.sandiego.gov/engineering-cip/projectsprograms/floodmitigation.shtml>

Background: The City of San Diego is currently preparing a citywide plan that will bring forth floodplain management goals by identifying risks posed by natural and human-caused flood disasters and propose methods to reduce flooding and flood related hazards. A grant from the Federal Emergency Management Agency (FEMA) has allowed the City to hire a consultant, URS Corporation Americas, to assist in the creation of the City of San Diego Flood Mitigation Plan.

The adoption of a Flood Mitigation Plan document will assist FEMA in allocating funds to appropriate and necessary flood mitigation projects within areas vulnerable to flooding throughout the City of San Diego. These mitigation projects will minimize flood damage to historically repetitive flood areas and prevent further flood damage to these areas in the future. The plan, once complete must go to the City Council for adoption.

The City of San Diego, assisted by its consultant, is holding a series of workshops to solicit input from the public. The workshops will include a presentation of the risk analysis prepared for the potential flood hazards that were identified. These public workshops will be held at various locations throughout the City of San Diego during the month of February 2007.

Public participation at these workshops is important and encouraged for the development of the plan. Public input regarding concerns or mitigation activities will be incorporated into the Final Flood Mitigation Plan.



San Diego Union-Tribune Newspaper Article

Flood hazards topic of meeting | The San Diego Union-Tribune

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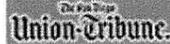
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Flood hazards topic of meeting

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UNION-TRIBUNE

March 1, 2007

SAN YSIDRO – San Diego city officials will hold a meeting at 6 p.m. tonight at the San Ysidro Community Service Center, 663 E. San Ysidro Blvd., to discuss potential flood hazards in the Tijuana River Valley.

Information gathered will be used to design a flood plan. The proposal will be used to apply for federal funding to build projects that address flooding problems in the city's most vulnerable flood zones.

A meeting was held yesterday in Mission Valley and a meeting is scheduled in La Jolla on Wednesday. Each of these areas has received significant and repeated damage from flooding over the years.

For more information on the San Ysidro meeting, call (619) 424-0230.

»Next Story»

Sponsored Links

**Table E-1
Flooding Sources within San Diego**

Flooding Source	Location	100-Year Peak Discharges (cfs)
Alvadero Canyon Creek	At Lake Shore Dr.	2,300
	At downstream side of College Ave.	3,900
	At San Diego River	5,100
Beeler Creek	U.S. Geological Survey Gage on Downstream side of Pomerado Road	3,600
Cadman Street Tributary		
Carmel Valley Creek	Above the confluence with Soledad Canyon	9,800
Carroll Canyon Creek	At Atchison, Topeka, and Santa Fe Railway	6,700
	At Interstate Highway 805	5,600
	Carroll Canyon Rd.	4,500
Chicarita Creek	---	---
Chollas Reservoir Branch	---	---
Commercial Basin	---	---
Curlew Creek	---	---
Cypress Canyon Creek	---	---
De Anza Cove	---	---
Deer Canyon Creek	---	---
Encanto Branch	Above confluence with South Las Chollas Creek	3,500
	At 64 th St.	3,000
	Above confluence with Jamacha Branch	1,700
Fiesta Bay	---	---
Florida Drive Branch	Above confluence with Switzer Creek	1,350
Goat Canyon	---	---
Gonzales Canyon Creek	---	---
Green Valley Creek	At Corporate Limits with City of San Diego	2,700
Hidden Anorage	---	---
Hollins Lake	---	---
Home Avenue Branch	At confluence with Las Chollas Creek	1,200
	0.8 mile above Fairmont Ave.	730
	At Euclid Ave.	630
	At Auburn Ave.	450
Jamacha Branch	---	---
Kit Carson Park Creek	At Mouth	4,400
La Zanja Canyon	---	---
Lake Hodges	---	---
Las Chollas Creek	At Main St.	10,000
	Above confluence with South Las Chollas Creek	7,900

**Table E-1
Flooding Sources within San Diego**

Flooding Source	Location	100-Year Peak Discharges (cfs)
	At Market St.	7,100
	Above confluence with Wabash Branch	4,700
	Above confluence with Home Avenue Branch	3,500
Las Puleta Creek	At 47 th St.	470
	0.6 mile upstream of Cervantes Ave.	60
Little Sycamore Canyon	---	---
Los Penasquitos Creek	Above confluence with Soledad Canyon	16,800
Lusardi Creek	At Mouth	5,680
Maple Street Canyon Tributary	---	---
Mariners Basin	---	---
McGonigle Canyon Creek	Downstream of Camino Ruiz Road---	---853
	Upstream of Camino Ruiz Road	571
	Approximately 1,400 feet upstream of Camino Ruiz Road	537
McGonigle Canyon Creek Tributary A	Approximately 200 feet upstream of Confluence with McGonigle Canyon Creek	57
Miramar Reservoir	---	---
Murray Canyon Creek	Upstream of Friars Rd.	3,500
	Downstream of Aero Dr.	2,300
	Upstream of Aero Dr.	3,000
	Downstream of Balboa Blvd.	1,700
	Upstream of Balboa Blvd.	1,700
Murray Creek	---	---
Murray Reservoir	---	---
Nestor Creek	At Palm Ave.	1,093
	At 19 th St.	864
	At Elm Ave.	796
	At Hollister St.	496
	At 25 th St. and Interstate Highway 5	456
	At San Diego and Arizona Easter Railroad	1,015
Oak Canyon	---	---
Old Tijuana River	---	---
Opato Creek	---	---
Otay River	At Mouth	22,000
Paradise Creek North Branch	---	---
Paradise Creek North Branch Tributary	---	---

**Table E-1
Flooding Sources within San Diego**

Flooding Source	Location	100-Year Peak Discharges (cfs)
Paradise Creek Paradise Valley Road Branch	---	---
Pershing Drive Branch	---	---
Poggi Canyon Creek	At Confluence with Otay River	1,280,400
Quivira Basin	---	---
Radio Drive Branch	---	---
Rose Canyon Creek	At Mouth	12,000
	Downstream of confluence with San Clemente Creek	11,000
	Upstream of confluence with San Clemente Creek	6,200
	Downstream of Genesee Ave.	5,000
	Downstream of Interstate Highway 805	4,100
San Clemente Canyon Creek	Upstream of confluence with Rose Canyon Creek	6,900
	Upstream of Genesee Ave.	5,600
	Upstream of Interstate Highway 805	4,900
San Diego River	At confluence with Murphy Canyon Creek	36,000
San Dieguito River	Upstream of Atchison, Topeka, and Santa Fe Railway Bridge	41,800
	Upstream of Jimmy Durante Bridge	42,400
Santa Maria Creek (San Pasqual Valley Area)	At confluence with Santa Ysabel Creek	19,000
Santa Ysabel Creek	Below the confluence with Santa Maria Creek	55,000
	Above the confluence with Santa Maria Creek	37,000
Shaw Valley Creek	---	---
Shepherd Canyon	---	---
Smugglers Gulch	---	---
Soledad Canyon	At Mouth	23,000
	Downstream of confluence with Los Penasquitos Creek	19,000
South Las Chollas Creek	Above the confluence with Las Chollas Creek	5,300
	Above the confluence with Encanto Branch	1,900
	At Kelton Rd.	1,500
Spring Canyon	---	---
Sunrise Overflow	At Hollister St.	700
	At Iris Ave.	550
Switzer Creek	At Harbor Dr.	2,600
	Upstream of Russ Blvd.	1,870
	Above the Confluence with Florida Drive Branch	510
Sycamore Creek	---	---

**Table E-1
Flooding Sources within San Diego**

Flooding Source	Location	100-Year Peak Discharges (cfs)
Tecolote Creek	At Interstate 5	4,900
	Downstream of Balboa Ave.	1,600
	Upstream of Balboa Ave.	1,700
	Downstream of Genesee Ave.	1,400
	Upstream of Genesee Ave.	1,500
Telegraph Canyon Creek	Overflow	800
Tijuana River	At Mouth	75,000
Wabash Branch	Above confluence with Las Chollas Creek	1,600
	Above confluence with Wabash Tributary	1,380
Wabash Tributary		

Source: FEMA Flood Insurance Study 2006.

--- Approximate methods used to study flood sources. No hydrologic analysis conducted to establish peak discharges.

In addition to the riverine flooding, the DFIRM shows that 100-year flood events occur along the open coast, Mission Bay, and San Diego Bay as a result of deep-water wave attack (See Table E-2).

**Table E-2
100-Year Flood Elevations for Coastal Areas in San Diego**

Flooding Source	Location	100-Year Elevation (Feet)
Pacific Ocean	From Mouth of the San Dieguito River to 500 feet south of 18 th St.	8.10
	From 500 feet south of 18 th St. to the Intersection of Ocean Ave. and 15 th St.	8.90
	At the Intersection of Ocean Ave. and 15 th St. to 10 th St.	9.60
Mission Bay	At Mariners Point	4.1
Rose Inlet	---	---
Sail Bay	---	---
San Diego Bay	Shelter Island	5.0
San Dieguito River Slough	---	---
San Juan Cove	---	---
Santa Barbara Cove	---	---
Santa Clara Cove	---	---
Tijuana Slough National Wildlife Refuge	---	---
Yatch Harbor	---	---

Source: FEMA Flood Insurance Study 2006.

--- Approximate methods used to study flood sources. No hydrologic analysis conducted to establish peak discharges.

Critical Facility Type	Count
Airport facilities	4
Bridges	523
Bus facilities	12
Communication facilities and Utilities	153
Convention Center	3
Dams	7
Electric Power facility	9
Emergency Centers, Fire Stations and Police Stations	83
Government Office/Civic Center	61
Hospitals/Care facilities	21
Jails/Prisons	3
Marinas	17
Military facilities	31
Port facilities	62
Post Offices	31
Potable and Waste Water facilities	2
Rail facilities	17
Runways	8
Schools	413
Stadiums/Arenas	3
Tourist Attractions	23

Annual Review Questionnaire

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS
PLANNING PROCESS	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action project implementation that should be represented on the Planning Team?			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done more efficiently?			
	Has the Planning Team undertaken any public outreach activities regarding the HMP or implementation of mitigation actions?			
RISK ASSESSMENT	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this LHMP and should be?			
	Are additional maps or new hazard studies available? If so, what have they revealed?			
	Has the critical facilities list changed?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
MITIGATION STRATEGY	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?			
	Are the goals still applicable?			
	Should new mitigation actions be added to the Mitigation Action Plan?			
	Do existing mitigation actions need to be reprioritized?			
	Are the mitigation actions appropriate for available resources?			

Community	Proposed Mitigation
Grantville	In Floodplain (Alvarado Creek) - Channel Improvements
Grantville	In Floodplain (Alvarado Creek) - Channel Improvements
Grantville	In Floodplain (Alvarado Creek) - Channel Improvements
Grantville	In Floodplain (Alvarado Creek) - Channel Improvements
Kensington	Storm Drains
La Jolla	Storm Drains
Midway	Storm Drains
Midway	Storm Drains
Mission Beach	Storm Drains/Pump Stations
Mission Beach	Storm Drains/Pump Stations
Mission Beach	Storm Drains/Pump Stations
Mission Valley	In Floodway (SD River) - Elevate/Buy Out/Floodproof
Nestor	In Floodplain (Otay River)- Buy out property/elevate/improve TJ River Valley per TJ River Flood Control Plan
Nestor	In Floodway (TJ River) - Buy out property/elevate/improve TJ River Valley per TJ River Flood Control Plan
Ocean Beach	Storm Drains
Pacific Beach	Storm Drains
Pacific Beach	Storm Drains
Pacific Beach	Storm Drains
Shelltown	In Floodplain (Las Puleta Creek) - Elevate/Buy Out
TJ River Valley	In Floodway (TJ River) - Buy out property/elevate/improve TJ River Valley per TJ River Flood Control Plan

Proposed Flood Mitigation Projects City-wide

Location	Proposed project	Reason
Home Avenue Branch	Channel improvements, buy-out/elevate properties in floodplain	Area of high population density and historically known for flooding
Las Chollas Creek	Channel improvements, buy-out/elevate properties in floodplain	Area of high population density and historically known for flooding
Mission Beach	Upgrades to existing storm drain system, storm drain extensions, pump stations	Inadequate storm drain system to convey run-off
Ocean Beach	Upgrade existing storm drain systems, storm drain extensions	Inadequate storm drain system to convey run-off
Otay Mesa	Provide a primary drainage channel from Otay Mesa Rd to the boarder that will accommodate runoff from existing and future development in the watershed.	Due to development, magnitude of stormwater runoff will increase because of anticipated higher amounts of impervious area.
San Ysidro	Construction of sediment basins, improve drainage facilities in San Ysidro.	Quantity of flood flows, sediment load
Sorrento Valley	Construct earthen berms along Sorrento Creek and Estuary Way; drainage improvements; pump stations; watertight barriers in buildings	Access to sites difficult due to flooding
Sorrento Valley	Clear/maintain low-flow channel; clear vegetation and sediment in channel; clear and grade a more extensive channel	Major floods from Sorrento Creek/Los Peñasquitos Creek, local flooding from minor storms that are unable to drain properly
TJ River Valley	Removal of ex berms, channelization of 25-year flood, protection from 100-year flood to all properties outside floodway, annual clearing	River floods

Instructions for using the plan review crosswalk single/multi-jurisdiction local hazard mitigation plans (LHMPs) as well as FMA.

Attached is a Plan Review Crosswalk based on the *Multi-Hazard Mitigation Planning Guidance Under the Disaster Mitigation Act of 2000*, dated March 2004. This Plan Review Crosswalk is consistent with the *Disaster Mitigation Act of 2000* (P.L. 106-390), enacted October 30, 2000 and *44 CFR Part 201 – Mitigation Planning, Interim Final Rule* (the Rule), published February 26, 2002.

Explanation of the Rule “shall” and “should” language. Planning criteria with the word “*shall*” means that the information is required to be included in the mitigation plan in order to receive FEMA approval. Planning criteria that have the words “*should*” indicates information that supports comprehensive local and State planning, but is not required at this time.

SCORING SYSTEM

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer’s comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer’s comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated “Satisfactory” in order for the requirement to be fulfilled and receive a summary score of “Satisfactory.” **All planning elements must be included; however, a “Needs Improvement” score in the gray shaded areas will not preclude the plan from being approved by FEMA.** When reviewing Single Jurisdiction Plans (SJP), reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, reviewers may want to put an N/A in the prerequisite box for single jurisdiction plans.

States that have additional requirements can add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements. *As part of a jurisdiction’s participation in California’s local hazard mitigation planning program, California requests completion of a local capabilities assessment as indicated in Section 2.2 of this Crosswalk.*

Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

Please Note: Prior to submission and as illustrated in the example below, jurisdiction(s) submitting the plan for review and approval are required to complete the 2nd column of the crosswalk titled “Location in the Plan”.

This example box is provided to illustrate how the local jurisdiction needs to complete the second column and further provides an example of how the FEMA review will be completed. Assessing Vulnerability: Overview - Requirement §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A. Does the plan include an overall summary description of the jurisdiction’s vulnerability to each hazard?	Section II, pp. 4-10	The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		X
B. Does the plan address the impact of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. Required Revisions: • Include a description of the impact of floods and earthquakes on the assets.	X	

FEMA Region IX – CA OES Local Hazard Mitigation Plan (LHMP) Crosswalk (includes Flood Mitigation Assistance {FMA} Requirements)

Jurisdiction:

Date of Plan:

Recommended Revisions:

This information can be presented in terms of dollar value or percentages of damage.

SUMMARY SCORE

X

Single Jurisdiction, Local Hazard Mitigation Plan (LHMP) & Multi-Jurisdictional, LHMP Review and Approval Status

Single/Lead Jurisdiction:	Title of MJP Plan:	Date of Plan:
Local Point of Contact:	Address:	
Title:		
Agency:		
Phone Number:	E-Mail:	

State Reviewer:	Title:	Date:
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FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Approved		
Date Approved		

FEMA Region IX – CA OES Local Hazard Mitigation Plan (LHMP) Crosswalk (includes Flood Mitigation Assistance {FMA} Requirements)

Jurisdiction:

Date of Plan:

List single jurisdiction or, If MJP, list Participating Jurisdictions, including the "Lead Jurisdiction":	NFIP Status*			
	Y	N	N/A	CRS Class
1.				
2.				
3.				
4. [ATTACH PAGE(S) WITH ADDITIONAL JURISDICTIONS]				

* Notes: **Y = Participating** **N = Not Participating** **N/A = Not Mapped**

FEMA Region IX – CA OES Local Hazard Mitigation Plan (LHMP) Crosswalk (includes Flood Mitigation Assistance {FMA} Requirements)

Jurisdiction:

Date of Plan:

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not formally been adopted.

Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk.

All planning elements must be included, however a "Needs Improvement" score in the gray shaded areas will not preclude the plan from being approved by FEMA. Reviewer's comments must be provided for requirements receiving a "Needs Improvement" score.

SCORING SYSTEM - Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

1.0 Prerequisite(s) (Check Applicable Box)	LHMP		FMA	
	NOT MET	MET	NOT MET	MET
1.1 Adoption by the Local Governing Body: §201.6(c)(5) & §78.5(f) OR				
1.2 Multi-Jurisdictional Plan Adoption: §201.6(c)(5) & §78.5(f) AND				
1.3 Multi-Jurisdictional Planning Participation: 201.6(a)(3) & §78.5(a)				

2.0 Planning Process	N	S	N	S
2.1 Documentation of the Planning Process: §201.6(b) and §201.6(c)(1) & §78.5(a)				
2.2 Local Capabilities Assessment §201.4(c)(ii) and §201.6(c)(1) [This section is reviewed and scored by OES.]				

3.0 Risk Assessment	N	S	N	S
3.1 Identifying Hazards: §201.6(c)(2)(i) & §78.5(b)				
3.2 Profiling Hazards: §201.6(c)(2)(i) & §78.5(b)				
3.3 Assessing Vulnerability: Overview: §201.6(c)(2)(ii) & §78.5(b)				
3.4 Assessing Vulnerability: Identifying Structures: 201.6(c)(2)(ii)(A) & §78.5(b)				

3.5 Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)				
3.6 Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)				
3.7 Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii) & FEMA 299				

4.0 Mitigation Strategy	N	S	N	S
4.1 Local Hazard Mitigation Goals: §201.6(c)(3)(i) & §78.5(c)				
4.2 Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii) & §78.5(d)				
4.3 Implementation of Mitigation Actions: §201.6(c)(3)(iii) & §78.5(d)(e)				
4.4 Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv) & FEMA 299				

5.0 Plan Maintenance Process	N	S	N	S
5.1 Monitoring, Evaluating, and Updating the Plan: 201.6(c)(4)(i) & §78.5(e)				
5.2 Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)				
5.3 Continued Public Involvement: §201.6(c)(4)(iii)				

STATE OES REVIEW STATUS OF THE LHMP OR FMP:

STATE OES REVIEW COMPLETED on DATE: _____

FORWARDED TO FEMA FOR REVIEW/APPROVAL DATE: _____

FEMA REVIEW STATUS OF THE LHMP OR FMP:

FEMA REVIEW COMPLETE, PLAN RETURNED DATE: _____

FEMA REVIEW COMPLETE, PLAN APPROVED DATE: _____

FEMA Region IX – CA OES Local Hazard Mitigation Plan (LHMP) Crosswalk (includes Flood Mitigation Assistance {FMA} Requirements)			
Jurisdiction:		Date of	
Plan:			
10.1.1.1	1.0	PREREQUISITE(S)	

1.1 Adoption by the Local Governing Body						
<i>Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).</i>						
<i>FMA Requirement §78.5(f): Documentation of formal plan adoption by the legal entity submitting the plan (e.g., Governor, Mayor, County Executive, etc.).</i>						
Element	Location in the Plan (section or annex and page #) [This column to be completed by the submitting jurisdiction(s)]	Reviewer's Comments	LHMP		FMA	
			NOT MET	MET	NOT MET	MET
A. Has the local governing body adopted the plan?						
B. Is supporting documentation, such as a resolution, included?						
SUMMARY SCORE						

1.2 Multi-Jurisdictional Plan Adoption						
<i>Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.</i>						
<i>FMA Requirement §78.5(f): Documentation of formal plan adoption by the legal entity submitting the plan (e.g., Governor, Mayor, County Executive, etc.).</i>						
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			NOT MET	MET	NOT MET	MET
A. Does the plan indicate the specific jurisdictions represented in the plan?						
B. For each jurisdiction, has the local governing body adopted the plan?						
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?						
SUMMARY SCORE						

1.3 Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.*

FMA Requirement §78.5(a): *Description of the planning process and public involvement. Public involvement **may** include workshops, public meetings & hearings.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			NOT MET	MET	NOT MET	MET
A. Does the plan describe how each jurisdiction participated in the plan's development?						
SUMMARY SCORE						

2.0 PLANNING PROCESS: §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

2.1 Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*

- (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

FMA Requirement §78.5(a): *Description of the planning process and public involvement. Public involvement **may** include workshops, public meetings & hearings.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE			
			LHMP		FMA	
			N	S	N	S
A. Does the plan provide a narrative description of the process followed to prepare the plan?						
B. Does the plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee,						

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Jurisdiction: _____ **Date of** _____
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provided information, reviewed drafts, etc.?)						
C. Does the plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)						
D. Was there an opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
SUMMARY SCORE						

2.2 Local Capabilities Assessment (State OES Requested Information)

Requirement §201.4(c)(3)(ii): – *Of the Federal Register Interim Final Rule 44 CFR Parts 201 and 206 states, “[The State mitigation strategy shall include] a general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.*

The following elements should be covered as they provide information that assists the State to meet the required planning element in the State’s mitigation plan. More importantly, providing this information benefits the local community in their planning efforts. A “Needs Improvement” score will not preclude either plan from being recommended for approval by OES or approved by FEMA.

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE			
			LHMP		FMA	
			N	S	N	S
A. Does the plan provide a description of the human and technical resources available within this jurisdiction to engage in a mitigation planning process and to develop a local hazard mitigation plan?						
B. Does the plan list local mitigation financial resources and funding sources (such as taxes, fees, assessments or fines) which affect or promote mitigation within the reporting jurisdiction?						
C. Does the plan list local ordinances which affect or promote disaster mitigation, preparedness, response or recovery within						

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Jurisdiction:

Date of

Plan:

the reporting jurisdiction?						
D. Does the plan describe the details of in-progress, ongoing or completed mitigation projects and programs within the reporting jurisdiction?						
STATE OES SUMMARY SCORE						

3.0 RISK ASSESSMENT: §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

3.1 Identifying Hazards <i>Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type ... of all natural hazards that can affect the jurisdiction.</i> <i>FMA Requirement §78.5(b): Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.</i>						
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			N	S	N	S
<p>A. Does the plan include a description of the types of all natural hazards that affect the jurisdiction?</p> <p>If the hazard identification omits (without explanation) any hazards commonly recognized as threats to the jurisdiction, this part of the plan cannot receive a Satisfactory score.</p> <p>Consult with the State Hazard Mitigation Officer to identify applicable hazards that may occur in the planning area.</p>						
SUMMARY SCORE						

3.2 Profiling Hazards <i>Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.</i> <i>FMA Requirement §78.5(b): Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.</i>						
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE			
			N	S	N	S
<p>A. Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the plan?</p>						
<p>B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the plan?</p>						
<p>C. Does the plan provide information on previous occurrences of each hazard addressed in the plan?</p>						
<p>D. Does the plan include the probability of future events (i.e., chance of occurrence) of each hazard addressed in the plan?</p>					5	
SUMMARY SCORE						

3.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

FMA Requirement §78.5(b): *Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan include an overall summary description of the jurisdiction’s vulnerability to each hazard?						
B. Does the plan address the impact of each hazard on the jurisdiction?						
SUMMARY SCORE						

3.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area*

FMA Requirement §78.5(b): *Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan describe vulnerability in terms of the types and numbers of existing buildings (including repetitive loss structures), infrastructure, and critical facilities located in the identified hazard areas?		Note: A “Needs Improvement” score on this requirement will not preclude the LHMP plan from passing.				
B. Does the plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?		Note: A “Needs Improvement” score on this requirement will not preclude either plan from passing.				
SUMMARY SCORE						

3.5 Assessing Vulnerability: Estimating Potential Losses <i>Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate</i> <i>[The information in the following planning elements must be included, however a “Needs Improvement” score will not preclude either plan from being approved by FEMA.]</i>						
Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan estimate potential dollar losses to vulnerable structures?						
B. Does the plan describe the methodology used to prepare the estimate?						
SUMMARY SCORE						

3.6 Assessing Vulnerability: Analyzing Development Trends <i>Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.</i> <i>[The information in the following planning element must be included, however a “Needs Improvement” score will not preclude either plan from being approved by FEMA.]</i>						
Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan describe land uses and development trends?						
SUMMARY SCORE						

3.7 Multi-Jurisdictional Risk Assessment - Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment must assess each jurisdiction’s risks where they vary from the risks facing the entire planning area FMA FEMA 299 Guidance: <i>The Plan should be coordinated with, and ideally developed in cooperation with, all of the local jurisdictions within the geographical area.</i>						
Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan include a risk assessment for each		<i>Note: A “Needs Improvement” score on this requirement</i>				

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Jurisdiction: _____ **Date of** _____
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participating jurisdiction as needed to reflect unique or varied risks?		<i>will not preclude the FMA plan from passing.</i>				
SUMMARY SCORE						

4.0 MITIGATION STRATEGY: §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

4.1 Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards*

FMA Requirement §78.5(c): *The applicant’s floodplain management goals for the area covered by the plan.*

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	LHMP		FMA	
			N	S	N	S
A Does the plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards? (GOALS are long-term; represent what the community wants to achieve, such as “eliminate flood damage”; and are based on the risk assessment findings.)						
SUMMARY SCORE						

4.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

FMA Requirement §78.5(d): *Identification and evaluation of cost-effective and technically feasible mitigation actions considered.*

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?						
B Do the identified actions and projects address reducing		<i>Note: A “Needs Improvement” score on this requirement</i>				

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Jurisdiction: _____ **Date of** _____
Plan: _____

the effects of hazards on new buildings and infrastructure?		<i>will not preclude the FMA plan from passing.</i>				
C. Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?						
SUMMARY SCORE						

4.3 Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

FMA Requirement: §78.5(d): Identification and evaluation of cost-effective and technically feasible mitigation actions considered

FMA Requirement: §78.5(e): Presentation of the strategy for reducing flood risks and continued compliance with the NFIP, and procedures for ensuring implementation, reviewing progress, and recommending revisions to the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			N	S	N	S
A. Does the mitigation strategy include how the actions are prioritized ? (For example, is there a discussion of the process and criteria used?)		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
B. Does the mitigation strategy address how the actions will be implemented and administered ? (For example, does it identify the responsible department, existing and potential resources, and timeframe?)						
B1 Does the mitigation strategy address continued compliance with the NFIP?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the LHMP plan from passing.</i>				
C. Does the prioritization process include an emphasis on the use of a cost-benefit review (see page 3-36 of <i>Multi-Hazard Mitigation Planning Guidance</i>) to maximize benefits?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
C1 Does the mitigation strategy emphasize cost-effective and technically feasible mitigation actions?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the LHMP plan from passing.</i>				
SUMMARY SCORE						

4.4 Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

FMA FEMA 299 Guidance: The Plan should be coordinated with, and ideally developed in cooperation with, all of the local jurisdictions, within the geographical area.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			N	S	N	S
A Does the plan include at least one identifiable action item for each jurisdiction requesting FEMA approval of the plan?						
SUMMARY SCORE						

5.0 PLAN MAINTENANCE PROCESS

5.1 Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

FMA Requirement §78.5(e): Presentation of the strategy for reducing flood risks and continued compliance with the NFIP, and procedures for ensuring implementation, reviewing progress, and recommending revisions to the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	LHMP		FMA	
			N	S	N	S
A. Does the plan describe the method and schedule for monitoring the plan? (For example, does it identify the party responsible for monitoring and include a schedule for reports, site visits, phone calls, and meetings?)						
B. Does the plan describe the method and schedule for evaluating the plan? (For example, does it identify the party responsible for evaluating the plan and include the criteria used to evaluate the plan?)						
C. Does the plan describe the method and schedule for updating the plan within the five-year cycle?		<i>Note: A "Needs Improvement" score on this requirement will not preclude the FMA plan from passing.</i>				

SUMMARY SCORE		
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5.2 Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): [The plan *shall* include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

	Location in the Plan (section or annex and page #)		LHMP		FMA	
			N	S	N	S
A. Does the plan identify other local planning mechanisms available for incorporating the requirements of the mitigation plan?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
B. Does the plan include a process by which the local government will incorporate the requirements in other plans, when appropriate?		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
SUMMARY SCORE						

5.3 Continued Public Involvement

Requirement §201.6(c)(4)(iii): [The plan maintenance process *shall* include a] discussion on how the community will continue public participation in the plan maintenance process.

	Location in the Plan (section or annex and page)]		LHMP		FMA	
			N	S	N	S
A. Does the plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)		<i>Note: A “Needs Improvement” score on this requirement will not preclude the FMA plan from passing.</i>				
SUMMARY SCORE						