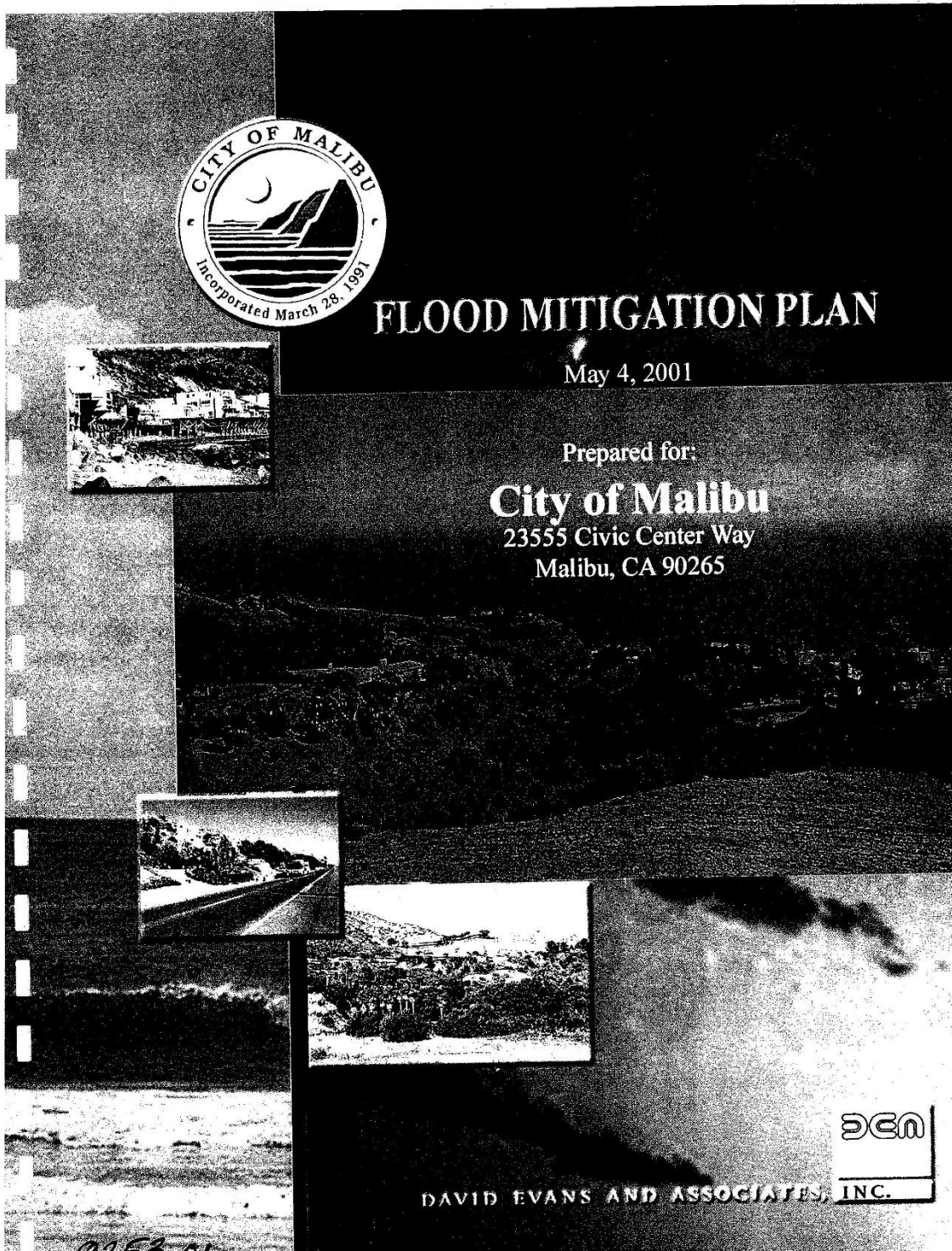


## SECTION 20. ANNEX G: MALIBU FLOOD PLAN



**CITY OF MALIBU  
FLOOD MITIGATION PLAN**

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## 1.0 INTRODUCTION AND PURPOSE

The City of Malibu has a history of repetitive flooding caused by a variety of conditions. In fact, the City of Malibu has been ranked second in the State of California in terms of the amount of repetitive loss properties claims. A repetitive loss property is defined as one that has two or more claims of \$1,000 or more that has been paid by the National Flood Insurance Program (NFIP) within any given 10-year period. For the City of Malibu, the Federal Emergency Management Agency (FEMA) has recorded 161 repetitive losses and 380 single-loss claims for properties in its file as of May of 2000.

The primary purpose of the preparation of the Flood Mitigation Plan (FMP) is to identify the causes of flooding, develop policies and flood mitigation measures in order to reduce the impacts of flooding, harm and hazard to life and properties in the City of Malibu (City). The loss properties, field assessment and their flooding problems are presented in the technical appendix. These documents can be used as a planning tool for the formulation of policies and mitigation efforts. Additionally, the FMP will also address measures that can be implemented to prevent future disasters and to guide the construction and development of the City. It can also assist in state and federal mitigation planning and funding efforts. This document can be used as a "Flood Management Plan" for the Community Rating System (CRS) of the NFIP. The mitigation measures would include both structural and non-structural improvements.

The FMP planning process was developed using a framework within which planners, local officials, residents, hydrologists and engineers, maintenance personnel, flood control experts and others reached a consensus on what should be done. This process included compilation, review, and analysis of available data followed by discussion, debate, and consensus. It entailed obtaining information from everyone who could provide pertinent information and data relevant to the flooding in the City.

This plan was drafted by a team of professional planners and engineers with input from the Flood Mitigation Committee, Public Works Commission, Planning Department, Public Works Department, Office of the Emergency Services (OES, State of California) and FEMA. The members included in the preparation of this planning documents are listed below:

- Flood Mitigation Plan Committee
  - ✓ Chairman, Public Works Commission
  - ✓ Chairman, Planning Commission
  - ✓ Member from Public At-Large
  - ✓ Planning Director
  - ✓ Building and Safety Director
  - ✓ Public Works Director
- Public Works Commission
- One member from OES
- One member from FEMA
- City Engineer
- Senior Professional Planner

- Consulting Engineering Firm

The FMP committee held two public meetings during the preparation of the draft FMP. In addition, five working sessions were conducted with the Committee focusing on hazard assessment, problem identification, mitigation goals, possible activities and review of the draft report.

As a part of the preparation of the FMP the consulting drainage engineers visited all of the 161 repetitive- loss properties and clusters of selected single-loss properties to:

- Assess the flood hazard
- Identify the flooding source
- Determine the proposed mitigation activities

The FMP preparation consisted of the following major steps:

- Identify areas of historic flooding and problem areas
- Determine existing hydrologic and hydraulic characteristics of the watersheds
- Develop goals for the FMP
- Consider possible mitigation activities to the flooding problems
- Evaluate and prioritize the potential mitigation activities
- Identify funding sources
- Prepare the Draft Flood Mitigation Plan
- Address and/or incorporate public comments
- Adopt and implement the policies and plans

One of the primary purposes of the FMP is to enable the City to apply for the NFIP's Community Rating System (CRS) program under Activity 500 "Flood Damage Reduction Activities" and Activity 510 "Floodplain Management Planning" at a later date. The CRS program allows reduction in flood insurance premiums for the preparation within the City based on the number of credit points.

## 2.0 DESCRIPTION OF STUDY AREA

The City of Malibu, with a population of approximately 15,000, encompasses an area of approximately 20 square miles, within relatively steep, rugged and unstable coastal slopes of the Santa Monica Mountains at the Pacific Ocean. The City stretches between the City of Santa Monica on the east and the Ventura County line on the west. Elevations within the City limits range from 2,650 feet above Mean Sea Level (MSL) to sea level through 21 major canyons and watershed areas along approximately 20 miles of shoreline. The watershed areas are shown on Figure 1.

The City averages less than a mile wide and is less than 2.5 miles at its widest point with the coastal length of 19 miles. Pacific Coast Highway (PCH), State Route 1, is the major four-



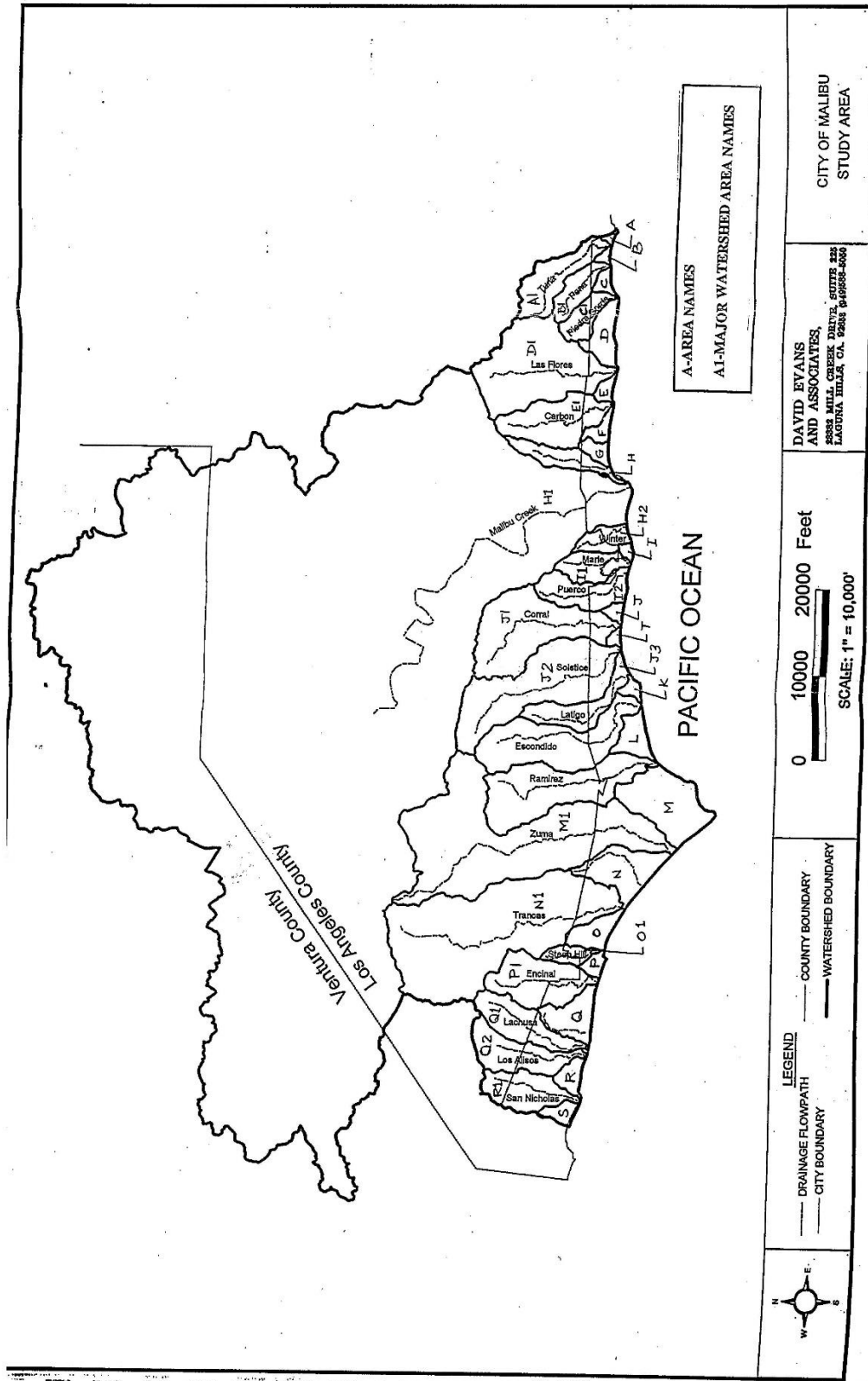


Figure 1

lane arterial roadway traversing the City, which provides access through the City for approximately 40,000 daily commuters. Beach traffic substantially increases the traffic congestion along PCH during the summer months. PCH and its facilities are owned and maintained by the Department of Transportation.

The City was incorporated in March 1991. Residential use comprises a majority of urbanized land use within the City. There are 6,753 parcels of land within the City, of which nearly 5,500 are developed. Generally, the developed portions of the City are situated in close proximity to the coast with direct access to the beach or a view of the ocean. About 20 percent of the parcels of land within the City falls in the undeveloped category. However, some of this acreage has already been planned for development and/or is currently under construction.

## 2.1 Watershed Characteristics

There are 21 major water courses that cross PCH within the City's boundaries. It is important to note that the contributing watershed areas extend far beyond the City's boundaries. The City's Master Plan of Drainage (MPD), prepared by Hawks & Associates, has identified a study area of approximately 172 square miles reflecting both watershed characteristics and City boundaries. This is depicted on hydrology maps that were prepared as a part of MPD. The watershed boundaries thus approximately encompass more than eight times the incorporated City area of 20 square miles. Most of the contributing watersheds are outside the direct control of the City. The design of drainage and flood control facilities is not only dependent upon the corporate boundaries but also the characteristics at the upstream watershed.

Malibu Creek has the largest watershed area of 110 square miles. Wildfires over the years in canyon areas destroyed most of native vegetation, increased runoff, erosion and sedimentation and caused heavy flooding in 1993, 1994, 1995 and 1998. Flood flows in all of the 21 canyon watersheds are conveyed by major drainage facilities at and through PCH. The major seven canyon areas, draining through the City are shown below:

<u>Canyon</u>	<u>Area (Acres)</u>
• Trancas Canyon:	5,440
• Zuma Canyon:	22,600
• Ramirez Canyon:	4,360
• Escondido Canyon:	5,360
• Solistrica Canyon:	4,280
• Malibu Creek:	70,470
• Las Flores Canyon:	8,440

The runoff for various frequencies using County's methodology and Army Corps of Engineers methodology are presented on Table 1.



**TABLE 1**

**SUMMARY OF 50-YEAR FLOWS (CFS) IN CANYONS**

NAME	LACFCD (B & B)	LAD		AREA (AC)
		Q <sub>50</sub> Clear	B & B	
San Nicholas		987	1,668	845
Los Alisos	1580	1,153	2,252	948
Lachusa		1,126	2,187	922
Encinal		1,586	3,090	1,277
Steep Hill		410	709	241
Trancas	11,900	6,812	13,875	6,314
Zuma	11,600	7,715	14,117	5,687
Ramirez	4,360	2,813	4,835	2,150
Escondido	5,360	3,023	5,206	2,085
Latigo	1,600	962	1,593	786
Solstice	7,280	3,899	7,358	2,836
Corral		2,954	5,248	2,272
Puerco		1,163	1,902	918
Marle		820	1,464	595
Winter		535	832	352
Malibu	40,800			70,400
Carbon		1,931	3,695	1,288
Las Flores	8,440	4,051	8,351	2,646
Piedra Gorda		626	1,513	432
Pena		678	1,539	480
Tuna		1,347	2,665	932

B & B = burned and bulked watershed flows

Serious flooding and associated damage has also occurred along PCH at Las Flores and the smaller Pena Canyon (515 acres), Tuna Canyon (107 acres), and Piedra Gorda Canyon at Big Rock (464 acres). As indicated earlier, the maximum elevation within the City limits is about 2,650 feet MSL at Simi Peak north of Highway 101 and in the Santa Monica Mountains. Generally, north-south ground slopes are adequate to permit stormwater runoff to flow to the canyons, from which it is conveyed to the ocean. The steep slopes are primarily responsible for excessive velocities and associated surface erosion, sediment deposition during storms which contributes to frequent problem areas along PCH. However, the coastal plain areas at the mouth of Malibu Creek in the vicinity of the City Civic Center, the Malibu Colony, and the Cross Creek Shopping Center have relatively milder slopes. These areas have been subjected to frequent flooding in the past.

Additional details of meteorologic, hydrologic and hydraulic characteristics, along with design of drainage facilities are presented in the City's MPD.

### 3.0 BENEFITS OF PLANNING

The objective of planning is to produce a program of activities that will best tackle the City's flood problems and meet other community needs. The basic steps of planning are:

- Set goals and facilitate development of solutions
- Formulate policies that all possible activities are reviewed and implemented so that the local flood problem is addressed by the most appropriate and efficient solutions
- Coordinate flood management policies to specific activities
- Coordinate the FMP goals with each other and with other City's goals and activities, preventing conflicts and reducing the costs of implementing each individual activity
- Educate residents on the flood hazard, flood loss reduction measures, and the natural and beneficial functions of their floodplains
- Build public and political support for projects that prevent new flood problems; reduce flood losses, and protect the natural and beneficial functions of floodplains
- Coordinate with the state and/or federal assistance programs
- Facilitate implementation of floodplain management activities through an action plan that has specific tasks, staff assignments, and deadlines
- Allow the City to apply for, and receive, certification for CRS credits

This plan will guide the City's flood, stormwater, and related activities so that they are implemented more economically and in ways more attuned to the needs and objectives of the City and its residents to reduce the impacts of flooding.



#### 4.0 PUBLIC INVOLVEMENT

At the beginning of this Plan, a Flood Mitigation Plan Committee was formed which included the public, City, OES and FEMA.

The first of two public meetings regarding the FMP was held at 7:00 PM, Thursday, June 29, 2000, at Hughes Research Labs. Prior to the first public meeting, notices were prepared for publication and advertisement along with the plan agenda. Notices and questionnaires were mailed to the County of Los Angeles, Caltrans, City of Calabasas, City of Agoura Hills, Sierra Club, Heal the Bay, repetitive loss property owners and single-loss property owners. Specifically, notices were mailed to the multiple-losses property owners as well as single-loss property owners, and homeowners associations. Questionnaires were also distributed to the repetitive-loss property owners requesting them to identify the flooding situations and issues and suggestions for solutions. It was emphasized at the meeting that public input is an extremely important ingredient of the planning process. This meeting was organized to provide orientation to the formulation of the FMP and review existing flood data.

The City presented an overview of the FMP, the need for the study, the formation of the FMP Committee, and the need for volunteer(s) to serve on the Committee. FEMA presented the background of the NFIP, benefits to the communities, ranking of Malibu as second in the State in terms of the amount of disaster-related claims, the overall process an FMP study, and the purpose of the public meeting(s).

The City's consultant, David Evans and Associates, Inc., presented a City-wide map with the location of multiple and single-loss properties in different colors for each number of claims.

The focus of the meeting was for the public to:

- Provide input on existing conditions
- Identify problem areas regarding flooding
- Discuss the cause(s) of the flooding problems
- Review possible activities
- Discuss the steps involved in the preparation of the Draft FMP

The second meeting was held on August 24<sup>th</sup>, 2000, which was devoted to an overall discussion of the general goal, specific goals and mitigation activities within the frame work of the six categories as suggested by the FEMA guidelines. Copies of Draft of Public Notice, Notes of two Meetings and Report to the City Council are included in Appendix A.

## 5.0 COORDINATION WITH OTHER AGENCIES

The City is cognizant of the importance of involving numerous other government agencies as well as private organizations in its planning efforts. Should these entities be implementing or planning to implement activities that may potentially impact flood damage and related concerns within the City, then the City would coordinate the activities to make sure that its efforts are not going to be in conflict with another government program or duplicate the efforts of another organization. Although such planning initiatives by other state, regional, and federal agencies may not address all local issues, this kind of collaboration between the agencies will facilitate a thorough evaluation of flood mitigation alternatives with mutual benefits to residents of these communities.

Involving other agencies and organizations would facilitate acquisition of available flood hazard data, technical information regarding mitigation measures, and their implementation, guidance pertaining to regulatory requirements, advice and assistance in the planning effort, and/or financial assistance in the implementation of a recommended mitigation measure.

Currently, the City's planning effort includes collaboration with the Los Angeles County Department of Public Works (LACDPW), Caltrans, FEMA, Los Angeles District U.S. Army Corps of Engineers (COE), California Department of Water Resources (DWR), Governor's OES, City of Calabasas, City of Agoura Hills, and other regulatory agencies. These agencies have been contacted to attend the FMP Committee Meetings and public meetings. Notices have been mailed out to not only request their participation in these meetings, but also for providing a written response and any pertinent data for the City's planning process. The City believes that collaboration of this kind will continue on an on-going basis throughout the duration of the FMP process and its implementation.

## 6.0 PLAN ORGANIZATION

The FMP was organized to concentrate on the planning process rather than focusing on the specific detail of the mitigation measures. Hence the planning functions and the public involvement and consensus building with the public was important for the successful formulation of this Plan. This draft mitigation plan was prepared using the guidelines stated in the "Flood Management Plan", a CRS planning process by FEMA.

The following representatives were involved in the mitigation planning process:

- Planning and Community Development – planning direction, coordination with other plans or programs to help resident and businesses
- Engineer, Hydrologist or Flood Control Specialist – flood data, analysis, and evaluation, design of mitigation measures
- Public Safety/Police/Fire – emergency services including evacuation plans
- Public Works/Streets/Highways – channel maintenance and structural measures
- Building/Zoning/Code Enforcement – regulations, building and property protection



- Public Information/Community Relations – public involvement and property protection measures
- Parks, Recreation, Forest Preservation – acquisition and protection of natural areas
- Governing Board/City Council – political and institutional acceptance and adoption

## 7.0 FLOOD HAZARD ASSESSMENT

This section identifies the flood hazard for the single-loss and the repetitive-loss properties and flooding problem areas where properties had no claims.

In accordance with the FEMA's NFIP requirements, floodplain management and mitigation programs deal with the "base flood" which is defined as a 100-year frequency flood. The magnitude of the base flood thus will be equaled or exceeded, on the average, once every hundred years. This statistical concept considers both the severity of a flood and the likelihood of its occurrence. Most of the nation's base floodplains have been mapped by FEMA on Flood Insurance Rate Maps (FIRMs).

The City's FIRMs were used to delineate the base flood plain(s) for major watersheds, including Malibu Creek, Trancas Creek, Ramirez Canyon, Las Flores Canyon, Escondido Canyon, and Zuma Canyon. The FEMA flood insurance study identifies floodways for some major watercourses. A floodway is defined by FEMA as the minimum area, with encroachment, needed to convey the 100-year flood without raising the flood levels by more than one foot. FEMA did not define floodways, but Los Angeles County has delineated floodways for the 50-year burned and bulked floods in Malibu Canyon, Zuma Canyon, Trancas Canyon and Las Flores Canyon. They have not been adopted by the City to regulate the development of the flood hazard areas. Even though the County's 50-year burned and bulked discharge would be considerably higher than FEMA's 100-year clear discharge, it would be beneficial to the City to adopt flood plain and flood ways until the City develops its own floodplain and floodways. Also it should be noted that the discharges rates with respect to the frequencies and burned and bulked conditions will be inconsistent (FEMA and County of Los Angeles) if two sets of criteria are used within the City. FIRM generally does not include floodplains for smaller watersheds that drain less than one square mile area. The latter watersheds are under local jurisdiction. It should be noted that most of the existing drainage facilities were constructed by Caltrans and LACDPW prior to incorporation of the City in March 1991.

The FIRM designated two types of floodplains for most of the areas in the City as A Zone and V Zone. The A Zone is the regular floodplain due to the inland watersheds. The V Zone is the "Coastal high hazard area" which is subjected to flooding due to the inland watersheds and coastal high hazards. In this combination of A and V Zones, V Zone will be shown on the map.

In addition to the major 21 watersheds discussed earlier, there are numerous "triangle-shaped" areas that are located between the major watersheds. These "triangle-shaped" watershed areas did not have any hydrologic data. As a part of the FMP preparation,

hydrology calculations were performed for a few of these triangle areas to determine representative hydrologic data for all other areas. These “triangle” areas were designated alphabetically starting from “A” through “R” and were located in the City-wide watershed map (Plate 1) and in Figure 1 of this report. In addition, the major watersheds have been assigned with new alphanumeric names such as “A1” for consistency and easier reference which are shown in the City-wide watershed map (Plate 1) and in Figure 1.

For this assessment, all available flood data was obtained from MPD and other agencies such as LACDPW, COE and FEMA. No detailed modeling and hydrologic/hydraulic analyses were performed for major watersheds.

The City-wide watershed map/Geographic Information System (GIS) map was divided into watershed boundaries and each repetitive-loss property and single-loss property was located within the watershed boundaries on the map. This facilitated organization of loss areas in accordance with the runoff corresponding to base flood hazard for the particular watershed. A color-coding scheme was used to clearly identify the number of losses for the single-loss and repetitive- loss properties on the City-wide map (Plate1).

As a technical back-up to the preparation of this FMP, a spreadsheet was created with data for each single-loss and repetitive-loss properties within the watershed. The spreadsheets were modified to show the following data in a tabular format:

- Date of Inspection
- Photograph
- Watershed Name
- Street Address
- Flood Zone
- Number of Losses
- Description of Existing Conditions
- Potential Flooding Source(s)
- Recommendations and Comments

## 8.0 ASSESSMENT OF THE FLOODING PROBLEM

Each multiple-loss property was observed to integrate the field condition and potential cause of the flooding that was documented. Photographs for these properties were added in to the property data sheets which are presented in the Appendix.

This assessment included comparison of the building pad elevation versus the water surface elevation, type of structure, existing drainage structure, condition of the structure, size of the drainage facility and observation of maintenance of the drainage structure, potential damage area within the lot, etc. After identifying the appropriate discharges and capacities of the existing facilities and street capacities, flood risk areas were determined based on available data.



Assessment included the nearby infrastructure facilities such as bridges, roads, conditions of roads, off-site and on-site drainage, type of damage and nature of damage during the past floods with year, potential velocities, low points within the lot, secondary outlets, sewer back ups, roof drainage and type of upstream conditions, flood control facilities and developments, and proposed development in the upstream watershed. Future flooding due to the change in the runoff coefficient in the upstream watershed was considered. Any construction or proposed new flood protection measure was noted during the field reconnaissance.

Our experience indicates that the properties located adjacent to the repetitive loss properties needed to be reviewed for potential flooding.

Also, some new property owners who acquired the property next to a repetitive loss property may not know the extent and the magnitude of flooding. This needed to be documented during the field visit.

New buildings must be elevated above the base flood elevation in A and V Zones of the FIRM. In A Zone, commercial buildings can be flood proofed. In the V Zone, the new buildings must be elevated on pilings or piers so that the waves do not batter the building walls.

Critical facilities and business facilities such as the Civic Center area have been closely observed. The backflow conditions from Malibu Creek into Cross Creek Road via the existing culvert were noted. The impacts due to the potential development in the Civic Center area and the required mitigation activities including a future on-site detention basin were reviewed. Enlargement of the existing drainage facilities across PCH by Caltrans were reviewed.

## 9.0 SETTING GOALS

This task depends upon the extent of consensus within the community. It is imperative that an agreement regarding overall goals as well as specific goals for each watershed area be achieved. Prior to setting the goals, mutual agreement among the affected parties with the result of the flood assessment needs to be achieved. Consensus among the participants needs to be achieved. During the public meetings, the public was asked to identify their goals, which were shared with all participants. Excluding fatal flaws, the goals were scrutinized to reach a common goal, which would be agreed upon by everyone on common ground.

Presented below are proposed FMP main and general goals as well as specific goals for each of the watershed area.

### FMP Goals

**MAIN GOAL:** Reduce repetitive flood losses to NFIP insured and insurable structures and reduce exposure to flood damages and future flooding throughout the City.

**GENERAL GOAL:** The general goal of this FMP is to implement state-of-the-art technology and engineering practices using structural and non-structural solutions as a long range planning mechanism to reduce the impacts of flooding, harm and hazard to life and properties in the City.

**SPECIFIC GOALS:** In general, there are common goals for these areas such as: 1) reduce coastal flooding which is a combination of A and V Zones for the areas located along the shoreline; 2) improve and maintain existing drainage facilities' and 3) reduce runoff and debris flow. The other specific goals are listed below:

- AREA A:**
1. Reduce flood damage to Topanga Beach Drive and reduce the overflow from PCH.
  2. Contain and reduce spill over from Tuna Canyon at PCH.
  3. Reduce runoff and debris from Tuna Canyon watershed.
  4. Improve and maintain existing drainage facilities.
- AREA B:**
1. Contain and reduce spill over from Tuna Canyon at PCH.
  2. Reduce runoff and debris from Tuna Canyon watershed.
  3. Establish new standards for new buildings and substantial improvements.
  4. Improve and maintain culverts crossing at PCH.
  5. Improve existing low point drainage facilities.
- AREA C:**
1. Contain and improve Big Rock Road "Piedra Gorda" crossing PCH and reduce spill over.
  2. Reduce runoff and debris for Piedra Gorda.
  3. Reduce runoff and provide erosion control within local Area C.
  4. Improve existing low point drainage facilities.
- AREA D:**
1. Reduce runoff and debris within Area D.
  2. Reduce spill over from Piedra Gorda.
  3. Improve local drainage facilities.
- AREA E:**
1. Reduce Las Flores Creek spill over PCH and Rambla Pacifica.
  2. Reduce runoff and debris from Las Flores watershed.
  3. Improve and maintain local drainage facilities.
- AREA F:**
1. Reduce runoff and debris within Area F.
  2. Improve and maintain debris basin and storm drain at Fanning.
  3. Reduce spill over across Fanning and PCH.

4. Improve and maintain storm drain crossing PCH.
5. Improve local low point drainage facilities.

- AREA G:**
1. Improve and maintain debris basin.
  2. Improve and maintain storm drain crossing at PCH.

- AREA H:**
1. Improve and maintain debris basin near Sweetwater Canyon.
  2. Maintain catch basin and storm drain north of PCH.

**Malibu Canyon (H1):**

1. Keep the flow in Malibu Road to avoid spilling into Malibu Colony Road.
2. Improve and maintain existing storm drain facilities.

**Winter Canyon (H2):**

1. Reduce runoff and debris within watershed area of Winter Canyon.
2. Improve and maintain Winter Canyon drain.

- AREA I:**
1. Reduce spill over from Marie Canyon Creek at Malibu Road.

**Marie Canyon (I 1):**

1. Reduce spill over from Marie Canyon Creek across Malibu Road.
2. Reduce runoff and debris.

**Puerto Canyon (I 2):**

1. Improve and maintain storm drain across Malibu Road.
2. Improve local low point drainage facilities.

- AREA J:**
1. Reduce spill over along the north of PCH.
  2. Reduce runoff and debris from Area J.

**Latigo Canyon (J3):**

1. Reduce spill over along Corral Canyon Road from Solstice Creek.

- AREA K:**
1. Reduce spill over from Escondido Creek at PCH.
  2. Reduce runoff and debris from Escondido Creek.
  3. Improve local drainage facilities.

**Escondido Canyon (K1):**

1. Reduce spill over at Escondido Canyon and PCH.
2. Reduce runoff and debris from Escondido watershed.

- AREA L:**
1. Reduce spill over from Meadows Drive at PCH.
  2. Reduce spill over from Winding Way and PCH.
  3. Reduce runoff and debris within Area L.
  4. Improve and maintain storm drain across PCH.



**Ramirez Canyon (L1):**

1. Reduce outlet spill over of 10' x 10' Reinforced Concrete Barrier (RCB).

**AREA M:** 1. Improve property entrance and drainage.

**Zuma Canyon (M1):**

1. Improve entrance and street for Heathercliff Road and Bonsall Drive.
2. Improve drainage system.
3. Improve and maintain catch basin in Bonsall Drive.

**AREA N:** 1. Improve property entrance and street drainage.

**Trancas Canyon (N1):**

1. Improve entrance and street for Sea View Drive and El Sueno Drive.

**AREA O:** 1. Remove the bottleneck storm drain at Broad Beach Road.  
2. Reduce spill over from Steep Hill Creek.  
3. Improve and maintain storm drain system at low points in Broad Beach Road.

**AREA P:** 1. Reduce spill over at Broad Beach Road.  
2. Reduce runoff and debris in Area P north of PCH.  
2. Improve property entrance and local street.

**AREA Q:** 1. Improve local drainage.

**Lachusa Canyon (Q1):**

1. Improve outlet across PCH.
2. Reduce runoff and debris in Lachusa Canyon.

**AREA R:** 1. Improve entrance.  
2. Reduce spill over at PCH and Los Alisos Canyon Creek.

## 10.0 REVIEW POSSIBLE ACTIVITIES

All possible flood mitigation activities need to be evaluated. The mitigation measures are:

1. Preventive activities
2. Property protection
3. Natural resources protection
4. Emergency services
5. Structural projects

## 6. Public Information activities

The mitigation activities have been identified within the frame work of the above shown six categories. Budget, cost and funding resources will constitute the selection criteria. No measures were discarded without further investigation. These alternative mitigation activities were compared with the goals. The alternative mitigation activities were identified based on innovative ideas, cost-benefits, disadvantages, public opinions, and ease or difficulty of implementation, environmental impacts, environmental compliance, compliance to City and County codes, ordinances and regulations, and potential source of money for implementation and maintenance.

Presented below are the proposed mitigation activities for all of the watersheds based on the six categories for public review.

### 1. Preventive Activities

- Enforce floodplain regulations and zoning ordinances for new structures, new developments or substantial improvements to the existing structure/property.
- Incorporate landscape and pavement improvements that generate lower runoff and improve percolation for all new developments.
- Prepare a specific Storm Water Management Plan for Malibu Creek, Zuma Creek, Trancas Canyon and Los Flores Creek.
- Establish drainage fee based on the additional runoff generated due to improvements/developments.
- Modify the zoning ordinances of A Zone areas to locate building elevation a minimum of one foot above base flood elevation.
- Modify the zoning ordinances to require a minimum of one foot free board above base flood elevation for depth/height requirements for all flood hazard areas.
- Enforce permit requirements for all new developments in the floodplain and prohibit developments within floodway
- Modify the zoning ordinances of special flood hazard areas such as V Zones to require a minimum of one foot-free board above base flood elevation for lowest horizontal member of structures
- Review development policies for public buildings, utilities and private properties for open space preservation. Acquire easements in floodplain areas. Review City's policies to dedicate open space, park areas for large development projects.
- Review subdivision regulations, building codes and floodplain ordinances to regulate any developments within floodplain.
- Develop storm water management policies to maintain or reduce the runoff from existing conditions for all new developments using detention basins, retention basins and other natural barriers to reduce runoff.
- Review and update Storm Facility Maintenance System (including PCH/State/County and Federal facilities) and establish reports for annual maintenance and each major storm event.

- Implement storm drain master plan.

**2. Property Protection Activities**

- Request to elevate existing structures as a part of any proposed development to the existing properties in special flood hazard areas.
- Recommend flood proofing of existing non-residential buildings that have repetitive losses.
- Prioritize properties to: A) Acquire B) elevate and C) relocate with FMA grant, Disaster Relief Grant Program (DRGP) for those that have had numerous NFIP losses claims. Use these properties for parks and recreation.
- Assist to acquire/elevate/relocate properties and buildings with aid from FEMA's Hazard Mitigation Grant Program (HMGP) for those properties that suffered losses or future flood loss.
- Assist in retrofitting non-residential properties with flood proofing.

**3. Natural Resource Protection Activities**

- All structural projects shall start with a project study report. This project study report shall include a comprehensive approach that will include:
  - ✓ Upstream and downstream watershed impacts
  - ✓ Water quality impact in relation to the proposed improvement
  - ✓ Reduction in peak flow
  - ✓ Addition of detention and filtration basins
  - ✓ Impact to endangered plant and animal
  - ✓ Impact of erosion and scour
  - ✓ Incorporation of soft engineering such as reduction of use of concrete and riprap and increase in use of channel grass lining and channel vegetation at various stages with different species in accordance with the depth of water and frequency of flood
  - ✓ Bioengineering solutions
  - ✓ Integration of treatment BMPs
  - ✓ Sediment reduction and mitigation measures
  - ✓ Watershed management
  - ✓ Concept level design of the proposed improvements
  - ✓ Integrate watershed improvement ideas without fatal flaws from local interest groups
- The project study report shall be submitted to the Environmental Review Board (ERB) for review and comments prior to the start of any preliminary design of any facilities.
- Enforce Best Management Practices (BMPs) within the watershed.
- Provide technical assistance to select appropriate BMPs.
- Review the Environmentally Sensitive Habitat Area(ESHA)) in relation to the repetitive loss map for integration of the design solutions and enhancement of the environment. All ESHA are to be identified in the repetitive loss map.



4. **Emergency Services Activities**
  - Provide flood forecasting, warning systems and emergency plans for potential flooding.
  - Prepare an emergency evacuation plan, and health and safety plan during flood event.
  - Develop flood emergency measures, disaster preparedness, flood recovery plans.
5. **Structural Project Activities**
  - Recommend future and existing roof drainage systems for the properties located along the shoreline to be designed to drain towards the ocean side rather than to the front of buildings.
  - Encourage runoff entrapment within the site with filtration system for reusing the storm water for irrigating landscape areas without creating public health hazards and degradation of geologic conditions.
  - Prepare structural mitigation plans for site-specific areas with priorities based on the extent of damage to life and property.
6. **Public Information Activities**
  - Participate in FEMA's CRS program to reduce flood insurance premium rates.
  - Create a computerized tracking system to follow up on multiple loss properties and improvements and other pertinent information with a database.
  - Advise and assist property owners on retrofitting buildings with multiple losses.
  - Request and maintain FEMA's elevation certification for all new buildings and for existing buildings with proposed substantial improvements.
  - Provide information and education about flooding and protection measures in a public forum.
  - Create a GIS map and maintain the repetitive loss areas and floodplain zones.
  - Continue to provide map information and formulate a regular outreach program.
  - Provide technical assistance for locating properties within the floodplain.
  - Maintain flood data, FIRM and relevant information in the library.

## 11.0 ACTION PLAN

Based on the review of the six categories, it is recommended that the City implement the following floodplain management activities.

- **Floodplain regulations:** For the properties along the coastal areas, enforce the zoning ordinances of special flood hazard areas such as V Zones to require a minimum of one-foot free board above base flood elevation for lowest horizontal member of structures for new structures or substantial improvement to the existing structure. Enforce permit

requirements for all new developments in the floodplain. Prohibit developments within floodway and prepare a specific Storm Water Management Plan for Malibu Creek, Zuma Creek, Trancas Canyon and Los Flores Creek. Implement storm drain master plan.

- **Flood Mapping:** For major watersheds that do not have floodway delineation's, the City shall prepare comprehensive floodway delineations using NFIP standards recognizing the fact that the County standards that include the burn and bulked condition would yield conservative results. Since the flood insurance program is based on the FIRM maps, NFIP standard should be followed. Until the comprehensive floodway mapping and preparation is completed for a specific watershed, any encroachment or construction activities within the floodplain area shall have its own hydrology/ hydraulics studies to prove that the proposed improvement within the flood plain does not increase the flood elevation by more than one foot which would follow the definition of the floodway. The City shall monitor and review the proposed improvements within the floodplain on a case by case basis until the preparation of a comprehensive floodway mapping for a specific watershed. The City shall adopt the new floodway delineations for the major watersheds after the review and approval of the new comprehensive floodway studies by FEMA.
- **Flood Protection Assistance:** City should obtain grants from OES and FEMA through programs such as DRGP and HMGP to assist to acquire/elevate/relocate properties and buildings that have had numerous NFIP loss claims. Also City should assist in retrofitting non-residential properties with flood proofing through low interest loans in coordination with the County, State and Federal government.
- **Flood Protection Materials:** City should mail FEMA's book, "Repairing Your Flooded Home" to all of the single- and multiple-loss property owners and other property owners that have potential of flooding. Copies of these books and other FEMA's publications should be available for distribution at the City Hall as well as the local library. City should provide technical assistance in understanding of the books and BMPs.
- **Flood Protection Activities:** For new buildings and proposed substantial improvements of the existing buildings, City should pass an ordinance that roof drainage systems for the properties located along the shoreline to be designed to drain towards the ocean side rather than to the front of buildings. City should encourage or provide incentives to entrap runoff within the property/site with filtration system for reusing the storm water for irrigating landscape areas without creating public health hazards and degradation of geologic conditions. City should prepare a long term and short term budgets with priorities to implement projects as stated in the Master Plan of Drainage.

- **Emergency Manager Training:** City should set up a task force comprising of the Building and Safety, Fire Department, Sheriff's Department and Public Works Department and provide training for coordinated effort for flood warning, evacuation and response to emergencies. City should assign a lead person such as Emergency Manager for this task force to coordinate these training and planning. The Emergency Manager should attend appropriate training on flood warning and flood response planning.
- **Flood Warning and Preparedness:** After the training, the Emergency Manager and the City Engineer in coordination with other departments should prepare a flood warning system and emergency flood preparedness systems for Trancas Canyon, Zuma Canyon, Ramirez Canyon, Escondido Canyon, Solistica Canyon, Malibu Creek and Las Flores Canyon. City should explore the possibility of installing level control system with telemetry devices with audio and video signals that could be connected to the City Hall, Emergency Manager's office and other Task Force members.



Mitigation Activities for Specific Areas

Watershed Name (see Figure 4)	Location (see Figure 4)	Medium Priority	Low Priority	Comments
Area A	Triangular area at southeast end of the City Limits in between Topanga Canyon Blvd and Tuna Canyon Road.	<ol style="list-style-type: none"> <li>Increase height of the AC berm at Topanga Beach Drive with a vertical curve along PCH to keep the PCH runoff within PCH.</li> <li>Re-profile Topanga Beach Drive to drain the street flow along the gutter adjacent to the retaining wall along the north side of the street.</li> </ol>	<ol style="list-style-type: none"> <li>Improve existing 1-18" and 1-24" storm drain(SD) and inlets that are inadequate to discharge runoff from 24 acres.</li> </ol>	
Area B	Triangular area between Tuna Canyon (Area B1) and PCH (Area B1).	<ol style="list-style-type: none"> <li>Construct levees along Tuna Canyon Road</li> <li>Profile and elevate Tuna Canyon Road for approximately 500' from PCH</li> <li>Enlarge the Tuna Canyon culvert</li> </ol>	<ol style="list-style-type: none"> <li>Replace existing three Storm Drains (1-18" Dia and 2-24" Dia) that are inadequate to discharge runoff from 49 acres ( 109 cfs for 10-year, 12.5 cfs for 1-year)</li> <li>Construct relief drain for the spill over of Tuna Canyon Creek</li> <li>Improve drainage system at the low point between 160336 and 19040 PCH including up-pizing the inlet and storm drain pipe</li> </ol>	
Area C	Triangular area between PCH (Area B1) and PCH (Area C1).	<ol style="list-style-type: none"> <li>Construct levees and increase the headwall of the 84" pipe inlet at the "hairpin" bend location</li> <li>Re-profile and elevate Big Rock Drive at this location</li> <li>Enlarge the 6X4' existing RCB which is under capacity to discharge the runoff across PCH.</li> </ol>	<ol style="list-style-type: none"> <li>Consider rolled curb to keep the PCH runoff away from the garage level - reroute the roof drain to the back of the building</li> </ol>	1) Caltrans to enlarge the 6' X 4' Reinforced Concrete Box(RCB) under drain order
Area D	Triangular area between PCH (Area C1) and Las Flores (Area D1).	<ol style="list-style-type: none"> <li>Enlarge the 6X4' existing RCB which is under capacity to discharge the runoff across PCH.</li> </ol>		
Area Las Flores (Area D1)	Area bounded by E1, E, D, C1, B1, and A1 (minimal coastal frontage)	<ol style="list-style-type: none"> <li>Elevate the Las Flores Canyon Road and adding Las Flores Mesa storm drain</li> </ol>	<ol style="list-style-type: none"> <li>Remove "bottle-neck" storm drain and replace or add a relief drain at 20330 to 20340 PCH areas</li> <li>Replace the 18" storm drain with larger size storm drain at the area in front of garage to eliminate local ponding and positive drainage for 19019 PCH</li> <li>Prepare a specific emergency plan for Las Flores Canyon at PCH crossing until completion of construction of the proposed enlargement of the flow area by Caltrans. Include evacuation of the nursery and the premises in the plan.</li> </ol>	
Area E	Triangular area between Las Flores (Area D1) and Carbon Canyon (Area E1).	<ol style="list-style-type: none"> <li>Provide a SD system to pick up the flows across PCH at 21400 PCH to 21422</li> <li>Construct a new SD system at the low point in front of 21640 PCH to pick up the flows across PCH from the 24" outlet</li> </ol>	<ol style="list-style-type: none"> <li>Provides storm drain system with inlets at the intersection of Rambla Vista and PCH to drain across PCH.</li> <li>Improve the existing 16" SD system at 21330 PCH.</li> </ol>	
Area F	Triangular area between G and Carbon Cyn (Area E1)	<ol style="list-style-type: none"> <li>Provide inlets at the intersection of PCH and direct the runoff in to Carbon Canyon creek east of PCH to prevent runoff crossing over PCH to the said low point.</li> </ol>	<ol style="list-style-type: none"> <li>Replace the deficient existing inlet and 14" SD at 21602 PCH</li> <li>Construct inlet at the "T" intersection of Fanning and PCH and connect to the existing 30" SD</li> </ol>	
Area G	Triangular area bounded by H, F and E1		<ol style="list-style-type: none"> <li>Consider a new inlet at the low point of 22522 PCH and a storm drain system connecting to existing 48" storm drain</li> </ol>	

Mitigation Activities for Specific Areas

Watershed Name	Location (see Figure #)	Low Priority	Medium Priority	Comments
Area Malibu Canyon (Area H1)	Large area that includes Malibu Creek drainage area (H1)	<p>1) Breach the sand dune/bar during a major storm event with early warning system such as telemetry attached to the upstream stream gauge to prevent backup of Malibu Creek</p>	<p>1) Upgrade the sump pump and storm drain within the gated community area of Malibu Colony</p> <p>2) Create a 6" gutter and change the street cross slope for Malibu Colony Drive to keep the runoff flowing in the gauges</p>	
Area Winter Canyon (Area H2)	Winter Creek (H2)			
Area I	Triangular area bounded by H2 and Marie Cyn (I)		<p>1) Extend the 60" storm drain system across Malibu Road and add inlet north of 23558 Malibu Road</p>	
Area Marie Canyon (Area I1)	Area bounded by H1, H2, I and I2			
Area Puerto Canyon (Area I2)	Area bounded by H1, I1, I and J1			
Area J	Triangular area bounded by I2 and J1			
Area K	Triangular area bounded by J3 and Escondido Cyn			
Area L	Triangular area bounded by Escondido Cyn and Ramirez Cyn			

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Mitigation Activities for Specific Areas

Watershed Name	Location (See Figure 1)	Medium Priority	Low Priority	Comments
Area Ramirez Canyon	Area bounded by Escobedo Cyn., L, M, and M1	1) Replace the two CMPs with one large arch culvert or RCB at ocean outlet	1) Schedule regular maintenance at the outlet to remove sand buildup.	
Area M	Triangular area (on point) bounded by Ramirez Cyn and M1		1) Consider a storm drain system at the end of the cul-de-sac	
Area Zuma Canyon (Area M1)	Area bounded by M, Ramirez Cyn, H1, N, and N1		1) Remove and replace the existing grate inlets and storm drain line with larger sizes at the property 28221 Heathercliff Road (private project) 2) Construct an opening in the perimeter screen wall for secondary flows at the property 28221 Heathercliff Road (private project)	
Area O	Triangular area bounded by N1 and O1	1) Perform a project study for the Broad Beach Road diversion drain project, project No.7 as stated in the Master Plan of Drainage. Evaluate all impacts such as environmental, structural and physical to the Francis Canyon creek and watershed. 2) Prepare plans, specifications and estimate and construct the project	1) Remove the "bottleneck" (8" connector pipes) and replace with large connector pipes. Construct a 30" SD westerly of PCH to easterly of Broad Beach Drive. Connect the inlet connector pipe in to the proposed 30" SD at 31094 Broad Beach Drive. 24" dia and 30" (up to end) at this low point at 31310 Broad Beach Road. Replace with larger storm drain system at the downstream end easterly of Broad Beach Road. Replace the existing 10" catch basin connector pipes with larger pipes. Construct inlets east of Broad Beach Road between 31302 and 31310 Broad Beach Road.	
Area P	Triangular area bounded by O1 and P1	1) Remove the existing "bottleneck" Sleep Hills Canyon 18" SD and replace with larger size. Remove the existing connector pipes and replace with larger size.	1) Replace existing 6" X 6" culvert across PCH which is under capacity with larger size. X 6" culvert across PCH. This will avoid spill over along the westerly side of PCH at Emerald Canyon.	
Area Q	Triangular area bounded by P1 and Q1	1) Re-profile the access road at 31974 PCH to the gate to higher elevation at gate to keep off the PCH runoff (private)		
Area R	Triangular area bounded by Q2 and R1	1) Re-profile the access road in to the property at 33306 PCH to higher elevation at the entrance to keep off the PCH runoff		

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## 12.0 PLAN ADOPTION

Following assessment of flooding problem, setting goals, and reviewing all possible solutions, the draft FMP is being presented in a public forum so that the most appropriate actions can be selected for final implementation. The draft plan will also be made available to the FMP Committee, LACDPW, FEMA, OES, and various departments and organizations. Following discussion, debate, and common agreement, a written, final plan will emerge in the form of a series of recommendations. The Final FMP will be submitted to the City Council for adoption.

## 13.0 IMPLEMENTATION, EVALUATION AND REVISIONS

This is a relatively long process. The City's planning staff will be involved in this effort on a day to day basis. Inexpensive projects could be implemented quickly. Policy changes and Ordinances are inexpensive and take a longer time due to the procedural requirements.

Some of the structural and non-structural mitigation measures require close monitoring and periodic revisions based on the performance. The City's project manager will be responsible for overall implementation of the plan and presentation of the annual update to the City Council. This update will provide an overview of the plan and the progress made over the previous 12 months towards implementing the mitigation activities.

The City will use the CRS work sheets to claim credits for the FMP. Close coordination with FEMA and their involvement from the beginning will help the City get the maximum credit. The City will also provide a model annual evaluation report on progress that will be used for CRS re-certification.

**APPENDIX**

## DRAFT OF PUBLIC NOTICE

The City of Malibu will hold a public meeting to discuss the preparation of a Comprehensive Flood Mitigation Plan.

Date: Thursday, June 29, 2000  
Time: 7-9 p.m.  
Location: HRL Laboratory Auditorium  
3011 Malibu Canyon Road

There are 21 major canyon water courses that cross the Pacific Coast Highway (PCH) within the City's boundary. The watershed areas extend far beyond the City's boundaries. The City of Malibu has a history of repetitive flooding caused by a variety of conditions. The City is preparing a Flood Mitigation Plan to take measures to reduce and eliminate repetitive losses of property due to flooding. Possible mitigation could include non-structural and structural improvements.

The focus of the June 29<sup>th</sup> meeting is for the public to:

- Provide input on existing conditions
- Identify problem areas
- Discuss the cause(s) of the problem

### Project Background

The project, which is partially funded by the Federal Emergency Management Agency (FEMA), consists of the following steps:

- Identify areas of historic flooding and problem areas
- Determine existing hydrologic conditions in the watersheds
- Develop goals and objectives for the Flood Mitigation Plan
- Consider possible solutions to the problems
- Evaluate and prioritize the potential solutions
- Identify funding sources
- Prepare the Draft Flood Mitigation Plan
- Adopt the Flood Mitigation Plan

***Public input is extremely important!*** Please attend to provide your input. If you are unable to attend the meeting but would like to provide input, please contact Claudio Sanchez at (310) 456-2489 Ext. 237.





Harry Barovsky  
Honorary Mayor 2000-2001  
In Memoriam

## City of Malibu

23555 Civic Center Way - Malibu, CA 90265  
(310) 456-2489 FAX (310) 456-3356

### FLOOD MITIGATION PLAN

PUBLIC MEETING  
THURSDAY, JUNE 29, 2000 7-9PM

1. Introductions
2. Existing Conditions and Explanation of Problem
  - Problem and Risk Areas
  - Repetitive Loss
  - Watershed Areas
  - Floodplain and Floodway
  - National Flood Insurance Program
3. Flood Mitigation Plan
  - Reasons for a flood mitigation plan
  - Steps
4. Public Comment
  - Reports of Flood Problems
  - Suggested Solutions
  - Questions and Answers
5. Summary
  - Schedule and Public Meetings
  - Flood Mitigation Plan Committee

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## Area R

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the San Nicholas Canyon Watershed and Area Q.
- Prevent spillover from the PCH

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garage at 33306 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation along the westerly side of PCH.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

The existing inadequate 8” catch basin connector pipes in PCH located north of 33306 PCH are under capacity to drain the PCH runoff. There is a 3” AC berm along PCH in the frontage of this property. The height of adjacent AC berm along PCH is 6”. The property slopes downwards from PCH. The depth of flow could exceed 3” in PCH and runoff could spill over in the property.

- Replace the existing catch basin and 18” connector pipe with large storm drain system north of 33306 PCH to reduce the depth of flow in PCH.
- Replace the existing berm with 6” berm to match the existing AC berm along PCH.
- Re-profile the access road in to the property at 33306 PCH to higher elevation at the entrance to keep off the PCH runoff.

#### **6. Public information activities**

## AGENCY LETTER

June \*, 2000

The City of Malibu has a history of repetitive flooding caused by a variety of conditions. There are 21 major canyon water courses that cross the Pacific Coast Highway (PCH) within the City's boundary. The watershed areas extend far beyond the City boundaries. The City of Malibu is beginning to prepare a Flood Mitigation Plan to identify mitigation measures to protect the community from flooding.

The objective of the FMP is to identify and implement measures to reduce and eliminate repetitive losses of property due to flooding. We would like to request assistance and input from your agency regarding our efforts. Specifically:

- Does your agency have any information on past flood studies and any possible solutions to flooding in the City of Malibu or the surrounding area?
- Is your agency planning or implementing any flood mitigation projects of which we should be aware?
- Does your agency have any financial or technical assistance programs that could help the City of Malibu?
- Do you have any suggestions on types of activities we should review that would reduce flood damage in Malibu?

City will hold a public meeting to discuss the preparation of Flood Mitigation Plan:

Date: Thursday, June 29, 2000  
Time: 7-9 p.m.  
Location: HRL Laboratory Auditorium  
3011 Malibu Canyon Road

You are invited to attend this meeting. If your agency is unable to attend the meeting please send your response to the above questions to the City Manager, City of Malibu.

We appreciate your response to this letter. If you have any questions or need additional information concerning the City's efforts in this regard, please contact Claudio Sanchez at (310) 456-2489 Ext. 237.



## COVER LETTER TO REPETITIVE LOSS PROPERTIES

August \*, 2000

As you know, the City of Malibu is preparing a Flood Mitigation Plan to identify ways to mitigate the flooding in the City because of the repetitive flooding losses that have historically occurred. The objective of the Flood Mitigation Plan is to identify and implement measures to reduce and eliminate repetitive losses of property due to flooding. Enclosed is a public notice for the second public meeting to be held on August 24, 2000.

Based on the FEMA's records, we believe that your property is located in an area that has experienced losses due to flooding. Therefore, the City would again like to invite you to participate in the public meeting so that you may provide your input on goals, objectives and mitigation regarding this issue. If you are unable to attend the meeting, but have information that may be helpful, please contact Claudio Sanchez at (310) 456-2489 Ext. 237 or send your comments in writing to the address above.

## Area A

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Improve maintenance frequencies of the existing inlets and the 18" and 24" storm drain at this low point.
- Improve existing 1-18" and 1-24" storm drain(SD) and inlets that are inadequate to discharge runoff from 24 acres.
- Increase the "n" value with additional landscaping and planting within the watershed
- Prevent Tuna Canyon spill over across PCH.

#### **2. Property protection activities**

- Consider an offer for relocation or request to elevate the building at 18814 Topanga Beach Dr.
- Elevate the buildings at 18856 PCH, 18862 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.
- Enforce the temporary and permanent Best Management Practices (BMPs) and to improve and to maintain the water quality within the watershed for substantial improvements to the property.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

- Increase height of the AC berm at Topanga Beach Drive with a vertical curve along PCH to keep the PCH runoff within PCH.
- Re-profile the Topanga Beach Drive to drain the street flow along the gutter adjacent to the retaining wall along the north side of the street.
- Construct local SD and catch basin to collect and discharge the runoff
- Consider rolled curb to keep the PCH runoff away from the garage level
- Reroute the roof drain to the back of the buildings

- From 18922 PCH to north end of area A, regarding the Tuna Canyon spill over consider the following:
  - a) clean the creek area and maintain low “n”.
  - b) construct levee along Tuna Canyon Road
  - c) re-profile and elevate Tuna Canyon Road for approximately 500’ from PCH
  - d) enlarge the Tuna Canyon culvert
  - e) add additional inlet at north side of PCH south of Tuna Canyon Rd
  - f) construct relief drain for the spill over of the Tuna Canyon Creek
  - g) enlarge the 4” dia pipe outlets and increase the size of the grate inlet.
  - h) encourage flood proofing the garage and provide a secondary drain from the garage to the ocean with flap gate for emergencies.

**6. Public information activities**



## **Area B**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Provide regular maintenance of the existing inlets and the three storm drains at the low point. Existing three Storm Drains (1-18" Dia and 2-24" Dia) are inadequate to discharge runoff from 49 acres ( 109 cfs for 10-year, 128 cfs for 25-year).
- Increase the "n" value with additional landscaping and planting within the watershed.
- Prevent Tuna Canyon Spillover flows across PCH

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Consider offer for relocation of the building at 19028 PCH
- Elevate the buildings at 19028 PCH, 19034 PCH, 19126 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.
- Enforce the temporary and permanent Best Management Practices (BMPs) and to improve and to maintain the water quality within the watershed for substantial improvements to the property.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

- From 19130 PCH to north end of Area B regarding the Tuna Canyon Spill over consider the following:
  - a) clean the creek area and maintain low "n".
  - b) construct levee along Tuna Canyon Road
  - c) re-profile and elevate Tuna Canyon Road for approximately 500' from PCH
  - d) enlarge the Tuna Canyon culvert
  - e) add additional inlet at north side of PCH south of Tuna Canyon Rd

- f) construct relief drain for the spill over of the Tuna Canyon Creek
- g) enlarge the 4" dia pipe outlets and increase the size of the grate inlet.
- h) encourage flood proofing the garage and provide a secondary drain from the garage to the ocean with flap gate for emergencies
- Repave the area in front of garage to eliminate local ponding and positive drainage at 19016 PCH
- Improve the drainage system at the low point between 19036 and 19040 PCH including the upsizing the inlet and storm drain pipe
- Improve the existing 4" dia storm drain and inlet at 19324 PCH
- Consider rolled curb to keep the PCH runoff away from the garage level

**6. Public information activities**

## Area C

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Perform regular maintenance of the existing inlet and storm drain at southwesterly curb return of Big Rock Drive and the storm drain; perform regular maintenance of the three storm drains and inlets starting from 19700 PCH.
- Increase the “n” value with additional landscaping and planting within the watershed.
- Prevent Peidra Gorda Spillover at Big Rock Drive crossing “hairpin” bend. Existing 84” pipe and the culvert 6’ X 4’ is under capacity to discharge the runoff.

#### **2. Property protection activities**

- Provide floodproofing with secondary outlets through the garages
- Elevate the buildings for 19728 PCH and 19848 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

- Prevent the spill over of Peidra Gorda Creek at Big Rock Dr crossing and spill over at 6’ X 4’ RCB at PCH
  - a) clean the creek area and maintain low “n”.
  - b) construct levees and increase the headwall of the 84” pipe inlet at the “hairpin” bend location
  - c) re-profile and elevate Big Rock Drive at this location
  - d) Add additional relief drain per the master plan
  - e) add additional inlets at southwesterly curb return of Big Rock Tuna Canyon Rd and increase the size of the existing 24” drain



g) enlarge the 6'X4' existing RCB which is under capacity to discharge the runoff across PCH.

- Encourage flood proofing the garage and provide a secondary drain from the garage to the ocean with flap gate for emergencies.
- Repave the area in front of garage to eliminate local ponding and positive drainage for 19848 PCH. Improve the drainage system at this low point with larger grate inlet
- Consider rolled curb to keep the PCH runoff away from the garage level
- Reroute the roof drain to the back of the building

**6. Public information activities**

## Area D

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Regular maintenance of the existing inlets and the storm drains are required at the low point.
- Increase the "n" value with additional landscaping and planting within the watershed.
- Prevent Peidra Gorda Spillover flows across PCH at 19932 PCH

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Consider offer for relocation or elevating the building for 19028 PCH
- Elevate the repetitive loss buildings in V zone especially 20848 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

- Prevent the spill over at 1) Peidra Gorda Creek at Big Rock Dr crossing and at 2) spill over at 6' X 4' RCB at PCH ( see Area C)
- Remove "bottleneck" storm drain and replace or add a relief drain at 20330 to 20340 PCH areas. Replace the 18" SD with larger size storm drain (36" SD) at the area in front of garage to eliminate local ponding and positive drainage for 19016 PCH
- Replace the existing grate inlet with larger size at 20832 and 20848 PCH
- Repave and replace the undersized grate inlet and storm drain at 20806 PCH
- Add additional inlets at eastside of PCH and storm drain at 20648 to 20654 PCH
- Elevate 20866 PCH and replace existing 24" SD with a larger SD

- Provide storm drain system at 21056 to 21070 PCH
- Consider rolled curb to keep the PCH runoff away from the garage level
- Reroute the roof drain to the back of the building.

**6. Public information activities**



## **Area Los Flores**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the watershed.

#### **2. Property protection activities**

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

- Close the nursery during the heavy rainfall and evacuate the premises. Prepare a specific emergency plan for 21201 PCH and 3945 Las Flores Canyon until the completion of the construction of the new project by Caltrans.

#### **5. Structural projects activities**

- Add an additional culvert or a new bridge to convey 50 year frequency flow. This will be designed by Caltrans.
- Consider elevating the Las Flores Canyon Road and add Las Flores Mesa storm drain

#### **5. Public information activities**

## Area E

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Regular maintenance of the existing inlets and the storm drains are required at the low point.
- Prevent spill over from Rambla Vista Dr across PCH

#### **2. Property protection activities**

- Elevate the repetitive loss buildings in V zone especially 21422 PCH, 21506 PCH and 21596 PCH

#### **2. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **3. Emergency services activities**

#### **4. Structural projects activities**

There are two existing 18" SD discharge at east of PCH . But there is no other SD system to pick up this runoff to transport across PCH in to the ocean. The runoff crosses the crown of PCH and floods 21400 to 21422 PCH

- Provide a SD system to pick up the flows across PCH at 21400 PCH to 21422
- Provide storm drain system with inlets at the intersection of Rambla Vista and PCH to drain across PCH. Improve the existing the 18" SD system at 21330 PCH.
- Upgrade the existing inlet size of 18" SD at 21506 PCH  
An existing 24" SD located across 21640 PCH terminates east of PCH. There is no SD system to pick up the said flow and transport across PCH. There is low point at 21640 PCH in the street profile. Existing inlet located east of PCH at 21658 PCH is undersized to pick up spill over from Rambla Vista .  
Consider the following:
- Upsize the inlet and SD system at 21658 PCH

- Add a new SD system at the low point in front of 21640 PCH to pick up the flows across PCH from the 24" outlet
- Reroute the roof drain to the back of the building.

**5. Public information activities**

## Area F

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Require regular maintenance of the inlets and the storm drains after major storm events and regular scheduled maintenance.
- Prevent Carbon Canyon Creek Spillover flows across PCH

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Consider offer for relocation and elevating the building for 19028 PCH
- Elevate the repetitive loss buildings in V zone especially 20848 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

There are no inlets at the "T" intersection of Carbon Canyon Road and PCH. The street flow crosses the PCH and traverses towards the low point in the street at 21848 PCH. Consider the following:

- Provide inlets at the intersection and direct the runoff in to the Carbon Canyon creek east of PCH to prevent the runoff crossing over the PCH to the said low point.
- Construct new inlet and SD at the low point
- Perform flood proofing 21848 PCH

Replace the deficient existing inlet and 14" SD at 21962PCH  
Local low point due to the flat profile of PCH contributed to the flooding of 22126 PCH, 22144 PCH, 22040 PCH and 22062 to 22104 PCH



- Replace the existing inlet and 15" SD at 22202 PCH with larger size
- Construct inlet at the "T" intersection of Fanning and PCH and connect to the existing 30" SD
- At 22306 PCH and 22338 PCH replace the inlets with larger sizes
- Reroute the roof drain to the back of the building.

**6. Public information activities**

## Area G

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Provide maintenance of the existing inlets, debris basin and the 48" dia storm drain at 22522 PCH after major storm event and regularly scheduled maintenance.

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Elevate the repetitive loss buildings in V zone especially 22522 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

The surface flooding at 22522 PCH appears to be due to the low point and under capacity inlet connected to 48" dia SD

- Enlarge the size of the inlet at 22528 PCH
- Consider a new inlet at the low point of 22522 PCH and a storm drain system connecting to existing 48" storm drain
- Consider adding or upsizing inlets west side of PCH at the existing storm drain locations

#### **6. Public information activities**

## **Area Malibu Canyon**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Incorporate the mitigation activities in the Watershed Management Area Plan ( WMAP ) for the Malibu creek with the participation of Cities of Agoura Hills and Calabasas and County of Los Angeles.
- Participate the discussions for the upstream watershed development with the County of Ventura and County of Los Angeles.
- Prepare an City ordinance restricting any increase in runoff and setting the minimum water quality standards such as TMDLs at the upstream end of the City boundary
- Formulate a Malibu Creek Watershed committee and facilitate regularly scheduled meeting. (once a month or once in two months). Encourage participation from the Malibu Colony Home owners group and local businesses that are located within the floodplain.
- Discourage any construction activities within the floodplain area including any interim activities
- Prepare specific ordinance for the properties within the floodplain area to use Best Management Practices to improve the water quality
- Maintain and upgrade the sump pumps within the Colony area
- Maintain the local storm drain system
- Add the maintenance fee for the storm drain system in the Association fee within the Malibu Colony area
- Create a section under City's web page about the Malibu Creek watershed management
- Adopt set of requirements for detention basin along with the water quality control for developments within the Malibu Watershed especially near the Civic Center areas.

## 2. Property protection activities

- Provide flood proofing with secondary outlets through the garages
- Consider offer for relocation and elevating the buildings in V zones

## 3. Natural resource protection activities

- Prevent scour, debris and sediment loading from the upstream end of Malibu Creek

## 4. Emergency services activities

- Consider a telemetry system at the stream gauge station in relation to the depth of flow at the upstream end to provide flood warning and the quantity of runoff. Connect the telemetry system to the City hall and the maintenance personnel for evacuation. Post the related quantity of runoff in the Internet under City's web page.

## 5. Structural projects activities

- Consider construction of a structural levee south of the Malibu Colony Drive along the Creek. Disturbance to the environment need to be considered also.
- Remove the sand dune in the lagoon during a major storm event with early warning system to prevent backup of Malibu Creek
- Consider schedule periodic removal of sand dune.
- Construct a flap gate for the 13.5' W X 5.5'H RCB outlet in to Malibu Creek to prevent "bubbling" of Malibu Creek in to the Civic Center area.
- Perform a detailed design study for detention basin and year around wetland creek improvement near the Civic center. Expand the master plan concept study.
- Add a new storm drain system with inlets in Malibu Road to eliminate ponding and flow diversion in to Malibu Colony Road.
- Secure easement along the side yard of 23736 Malibu Colony Road for the new storm drain
- Re-profile Malibu Road to eliminate the flat slope and low points along with new rolled curb and gutter
- Upgrade the sump pump and storm drain within the gated community area of Malibu Colony



- Request the property owners to reroute the roof drains to the back of the buildings
- Consider new storm drain in Malibu Colony Drive to drain towards the south end of the street in to the ocean.( easement along the sideyard will not be needed)
- Create a "V" gutter and change the street cross slope for Malibu Colony Drive to keep the runoff flowing in the garages
- Consider upgrading of the existing storm drain in Web Way
- Replace the existing grate inlet and storm drain with larger sizes within Colony
- Consider rolled curb to keep the Malibu Road runoff away from the garage level

**6. Public information activities**

## **Area Winter Canyon**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Provide maintenance of the existing inlets, 18" and 24" storm drains north of 23936 Malibu Road.
- Increase the "n" value with additional landscaping and planting within the watershed.

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

- Extend the 60" storm drain system across Malibu Road and add inlets north of 23936 Malibu Road
- Construct rolled curb and gutter along the east of Malibu Road to keep the runoff within street
- Request the property owners to reroute the roof drains to the back of the buildings

#### **6. Public information activities**

## Area I

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Provide maintenance of the inlets, 18" storm drain at 24246 Malibu Road and 48" storm drain at 24320 Malibu Road.
- Increase the "n" value with additional landscaping and planting within the watershed.

#### **2. Property protection activities**

- Provide flood proofing and secondary outlets through the garages

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

In general the street level is higher than the garage level and there is no gutter to contain the street runoff. Most of the local inlets are owned by the property owners. Storm drain systems with inlets, 18" storm drain and 48" storm drain pick up flows.

- Add additional inlets to the storm drain system and replace the existing inlets with larger inlets.
- Encourage local property owners to enlarge the grate inlets and replace the existing 4" and 8" storm drains with larger size pipes.
- Construct rolled curb and gutter along the east of Malibu Road to keep the runoff within street
- Existing system is inadequate to carry the bulked flows. Remove and replace all the existing 12" storm drains and inlets with larger sizes.
- Remove and replace the existing corroded 12" CMP at 24460 Malibu Road.

- Request the property owners to reroute the roof drains to the back of the buildings

**6. Public information activities**



**Area MARIE CYN**  
**SPECIFIC AREA**  
**MITIGATION ACTIVITIES**

**1. Preventive activities**

- Prevent Marie Canyon Creek Spillover flows from 6' H X 10'W RCB across Malibu Road
- Increase the "n" value with additional landscaping and planting within the area west of Malibu Road.
- Clean and maintain the 6'H X 10'W RCB outlet at the ocean

**2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages

**3. Natural resource protection activities**

- Prevent erosion control and slope protection at the downstream of the Arch Culvert at PCH

**4. Emergency services activities**

**5. Structural projects activities**

The flooding at 24608 Malibu road is due to the spill over from 6' H X 10'W RCB and inlet located at 24604 Malibu Road. The RCB outlet has plugged conditions at the ocean.

- Add a relief drain to the existing 6' H X 10'W RCB to provide additional capacity.
- Encourage local property owners to enlarge the inlet at 24604 Malibu Road.
- Construct rolled curb and gutter along the east of Malibu Road to keep the runoff within street
- Request the property owners to reroute the roof drains to the back of the buildings

**6. Public information activities**

## **Area PUERCO CYN**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the area east of PCH and west of Malibu Road. Runoff from the large lots could be reduced considerably to prevent local flooding in Malibu Road.
- Clean and maintain the numerous private drains west of Malibu road.
- Clean and maintain numerous drains that drain across Malibu Road in to the ocean.

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Elevate or relocate the repetitive loss buildings in V zone at 25154 Malibu Road

#### **3. Natural resource protection activities**

- Prevent erosion control and slope protection along the westerly side of Malibu Road.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

There are numerous small 18” drains at the westerly side of Malibu Road from the large private lots. These drains discharge in to the street. There are only few storm drains that pick up these flow and drain across Malibu Road in to the ocean. Hence, there is surface overflow across the street. Malibu Road has very minimum to zero cross fall at these locations. Along the easterly side of the street, the runoff spills over the inlets and floods the adjacent property.

- Construct additional inlets and storm drain system along easterly side of Malibu Road to capture the flows from the private drains.
- Encourage local property owners to enlarge the local inlets and 4” drains especially at 24712 Malibu Road.

- Remove and replace the existing inlets and 18" storm drain with larger size at 25154 Malibu Road
- Construct rolled curb and gutter along the east of Malibu Road to keep the runoff within street
- Re-profile Malibu Road to create cross fall and prevent spillover across the Road
- Construct a natural swale along the westerly side of the Malibu Road without creating any public driving hazard. This will increase the depth of low at inlets and will increase the capacity of inlets.
- Request the property owners to reroute the roof drains to the back of the buildings

**6. Public information activities**

## **Area J**

### **SPECIFIC AREA** **MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the area east of PCH and west of Malibu Road. Runoff from the large lots could be reduced considerably to prevent local flooding in Malibu Road.
- Clean and remove the silt in order to maintain the private drain at 25438 Malibu road that drains in to the ocean.

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Elevate or relocate the repetitive loss buildings in V zone at 25342 Malibu Road

#### **3. Natural resource protection activities**

- Prevent erosion control and slope protection along the westerly side of Malibu Road.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

There are numerous small 18” drains at the westerly side of Malibu Road from the large private lots. These drains discharge in to the street. There are only few storm drains that pick up these flow and drain across Malibu Road in to the ocean. Hence, there is a potential for surface overflow across the street. Malibu Road has very minimum to zero cross fall at these locations. Along the easterly side of the street, the runoff spills over at the inlets and floods the adjacent property.

- Construct additional inlets and storm drain system along easterly side of Malibu Road to capture the flows from the private drains.
- Encourage local property owners to enlarge the local inlets and 6” drains especially at 25438 Malibu Road.
- Remove and replace the existing inlets and 18” storm drain with larger sizes



- Construct rolled curb and gutter along the east of Malibu Road to keep the runoff within street
- Re-profile Malibu Road to create cross fall and prevent spillover across the Road
- Construct a natural swale along the westerly side of the Malibu Road without creating any public driving hazard. This will increase the depth of low at inlets and will increase the capacity of inlets.
- Request the property owners to reroute the roof drains to the back of the buildings

**6. Public information activities**

## **Area K**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the area east of PCH and west of Malibu Cove Colony Drive. Runoff from the large lots could be reduced considerably to prevent local flooding in Malibu Cove Colony Drive.
- Clean and remove the silt in order to maintain the storm drains that drain in to the ocean.

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Elevate or relocate the building in V zone at 27012 Malibu Cove Colony Drive

#### **3. Natural resource protection activities**

- Prevent erosion control and slope protection along the westerly side of Malibu Cove Colony Drive

#### **4. Emergency services activities**

#### **5. Structural projects activities**

Malibu Cove Colony Drive is relatively very flat. There are limited number of existing small drains lines 1 through 6 that drains from the westerly side of Malibu Cove Colony Drive in the ocean. There are no inlets along the easterly side of Malibu Cove Colony Drive.

- Construct a storm drain system across Malibu Cove Colony Drive to pick up the flows from the 10' X 10' culvert outlet located west of the Malibu Cove Colony Drive at 26642 Latigo Shore Drive.
- Construct additional inlets and storm drain system to capture the flows from the westerly side of Malibu Cove Colony Drive.
- Replace the existing 12” grate inlets at low points and storm drain at 27002 Malibu Cove Colony Drive.

-

- Remove and replace the inlets and storm drain lines 4, 5 and 6 with larger sizes
- Re-profile Malibu Road to create cross fall and prevent spillover across the Road
- Construct rolled curb and gutter along the east of Malibu Road to keep the runoff within street
- Request the property owners to reroute the roof drains to the back of the buildings

**6. Public information activities**

## Area L

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the gated community area
- Clean and remove the silt in order to maintain the storm drain at the ocean outlet

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages

#### **3. Natural resource protection activities**

- Prevent erosion control and slope protection along the side slopes of the access road

#### **4. Emergency services activities**

#### **5. Structural projects activities**

Runoff from the V gutter exceeds the V gutter capacity and cascades along the side before reaching the curb opening catch basin. In addition, at the catch basin, there is no local depression to build up depth. Runoff cascades to the driveway along the side and floods the property. The original design was not done correctly for the quantity of discharge.

- Raise the profile of the Sea Lane at PCH to prevent PCH runoff spillover in to Sea Lane.
- Redesign the storm drain system at the inlet. Revise the grade at inlet and add grate inlets before the the curb opening catch basin.
- Reduce the velocity of the flow across the street
- Remove and replace the inlets and storm drain line with larger sizes

#### **6. Public information activities**



## **Area Ramirez Cyn**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Clean and remove the silt in order to maintain the two existing CMP storm drain at the ocean outlet. One large 72" CMP outlet is fully plugged at the outlet. The other outlet is partially open.

#### **2. Property protection activities**

#### **3. Natural resource protection activities**

#### **4. Emergency services activities**

#### **5. Structural projects activities**

The two pipe capacities at the outlet in to the ocean are inadequate.

- Replace the two CMPs with one large arch culvert or RCB at ocean outlet
- Schedule a regular maintenance at the outlet to remove sand buildup.

#### **6. Public information activities**

## **Area M**

### **SPECIFIC AREA** **MITIGATION ACTIVITIES**

**1. Preventive activities**

**2. Property protection activities**

- Review the local drainage system within the large lot

**3. Natural resource protection activities**

**4. Emergency services activities**

**5. Structural projects activities**

There is an existing asphalt berm 6" high along the frontage of the property. Property has two unpaved entrances. Street has very mild cross slope. There is no drainage system at the end of the cul-de-sac of Greenwater Road. Street flow could top the berm for larger storms.

- Re-profile the property entrance to keep off the street runoff.
- Add local drainage within the lot if needed (private)
- Consider a storm drain system at the end of the Cul-de-sac

**6. Public information activities**

## **Area ZUMA CYN**

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Clean and remove the silt in order to maintain the on site local storm drain
- Remove the flap gate and attach a down drain system at the outlet in the alley for the property at 29221 Heathercliff Road.

#### **2. Property protection activities**

- Provide flood proofing and secondary outlets

#### **3. Natural resource protection activities**

#### **4. Emergency services activities**

#### **5. Structural projects activities**

Runoff in the street is generated by small local area. Heathercliff Road has steep longitudinal slope and standard cross slope. The property at 29221 Heathercliff Road is a condominium complex. Driveway highpoint is along the property line at the street and the driveway drops to 4-5' feet at the entrance gate from the street level. Pedestrian access is the same way. The street highpoint is located at the "T" intersection of Wandermere. Street has considerable capacity due to the steep slope. The complex is landlocked and no secondary outlet due to the perimeter wall.

- Remove and replace the existing onsite inlets and storm drain line with larger sizes at the property 29221 Heathercliff Road. (private)
- Construct a drainage system with long grate inlets in front of the gate at the property 29221 Heathercliff Road. (private)
- Construct a opening in the perimeter screen wall for secondary flows at the property 29221 Heathercliff Road. (private)

#### **6. Public information activities**

## Area O

### **SPECIFIC AREA MITIGATION ACTIVITIES**

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the Steep Hills Canyon Watershed , Trancas Canyon Watershed and Area O.
- Prevent spillover from the Trancas Canyon Creek at PCH
- Prevent spillover from Trancas Canyon Creek at Principal Drive
- Prevent spillover from Steep Hills Canyon at PCH

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garages
- Elevate the repetitive loss buildings in V zone at 30962 Broad Beach Road.

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

Within Broad Beach Drive, there are three low points. There is only one inlet along the easterly side of Broad Beach at one low point. The existing inlet and 8” connector pipes are under capacity to drain the street runoff. The runoff from Trancas Canyon Road could cross PCH and traverse in to Broad Beach Road. At 31400 Broad Beach Road, there is an existing 18” storm drain that is designated to carry 709 cfs for 50 year frequency storm. The existing storm drain capacity is inadequate to drain the quantity of flow. At the outlet, the pipe is enlarged into 4.75’ X 4.75’ RCB. This “bottleneck” across PCH and Broad Beach Drive need to be removed. Due to this “bottleneck” runoff spills over at Broad Beach Drive and traverses south to the low point.

- Replace existing grate inlets and storm drains with larger system at 30804 Broad Beach Drive.
- Replace existing grate inlets and 3” storm drain with larger system at 31220 Broad Beach Drive. (Garage level lower than the top of inlet)



- Replace the existing catch basins and 8" connector pipes with large storm drain system along PCH
- Remove the "bottleneck" (8" connector pipes) and replace with large connector pipes. Construct a storm drain 30" SD westerly of PCH to easterly of Broad Beach Drive. Connect the inlet connector pipe in to the proposed 30" SD at 31034 Broad Beach Drive.
- Replace existing grate inlets and 3" storm drain with larger system at 30962 Broad Beach Drive. (Garage level lower than the top of inlet)
- Remove the existing "bottleneck" ( 24" d/s end 30" up/s end)at this low point 31310 Broad Beach Road. Replace with larger storm drain system at the downstream end easterly of Broad Beach Road. Replace the existing 10" catch basin connector pipes with larger pipes. Construct inlets east of Broad Beach Road between 31302 and 31310 Broad Beach Road.
- Remove the existing "bottleneck" Steep Hills Canyon 18" SD and replace it with larger size at 31400 Broad Beach Road. Remove the existing connector pipes and replace with larger size.
- Construct a storm drain system at 31372 Broad Beach Road with the at the low points

#### 6. Public information activities

## Area P

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Prevent spillover from the Steep Hills Canyon storm drain “bottleneck”
- Prevent spillover from Encinal Canyon at PCH

#### **2. Property protection activities**

- Provide flood proofing with secondary outlets through the garage at 31450 Broad Beach Road

#### **3. Natural resource protection activities**

#### **4. Emergency services activities**

#### **5. Structural projects activities**

At 31430 Broad Beach Road, there is an existing 18” storm drain that is designated to carry 709 cfs for 50 year frequency storm. The existing storm drain capacity is inadequate to drain the quantity of flow. At the outlet, the pipe is enlarged into 4.75’ X 4.75’ RCB. This “bottle neck across PCH and Broad Beach Drive need to be removed. Due to this “bottleneck” runoff spills over at Broad Beach Drive and traverses south to the low point in area O.

- Replace the existing catch basin and 8” connector pipe with large storm drain system north of 31611 PCH to reduce the depth of flow in PCH.
- Construct a storm drain system at 31450 Broad Beach Drive.
- Replace existing 6’ X 6’ culvert across PCH which is under capacity to drain 3,090 cfs for 50 year storm. This will avoid the spill over along the westerly side of PCH at Encinal Canyon.
- Remove the existing “bottleneck” Steep Hills Canyon 18” SD and replace it with larger size at 31430 Broad Beach Road. Remove the existing connector pipes and replace with larger size.

#### **6. Public information activities**

## Area Q

### SPECIFIC AREA MITIGATION ACTIVITIES

#### **1. Preventive activities**

- Increase the “n” value with additional landscaping and planting within the Encinal Canyon Watershed and Area Q.
- Prevent spillover from the PCH

#### **2. Property protection activities**

- Provide flood proofing and with outlets through the garage at 31974 PCH

#### **3. Natural resource protection activities**

- Prevent Bluff erosion by slope stabilizing with vegetation along the westerly side of PCH.

#### **4. Emergency services activities**

#### **5. Structural projects activities**

The existing inadequate 8” connector pipes in PCH located north of 31974 PCH are under capacity to drain the PCH runoff. There is a 6” AC berm along PCH in the frontage of this property. The driveway slopes up to 6” at the gate location and slopes down from the gate towards the house. The depth of flow could exceed 6” in PCH and runoff could spill over in the property.

- Replace the existing catch basin and 8” connector pipe with large storm drain system north of 31974 PCH to reduce the depth of flow in PCH.
- Re-profile the access road at 31974 PCH to the gate to higher elevation at gate to keep off the PCH runoff. (private)

#### **6. Public information activities**

## SECTION 21. ANNEX H: PLAN APPROVAL DOCUMENTATION

The following pages provide copies of Hazard Mitigation Plan approval documentation from each city.



## **CITY OF AGOURA HILLS**

\*\*\*To be inserted after City Council approval of the 2018 HMP Update\*\*\*

## CITY OF CALABASAS

\*\*\*To be inserted after City Council approval of the 2018 HMP Update\*\*\*

## **CITY OF HIDDEN HILLS**

\*\*\*To be inserted after City Council approval of the 2018 HMP Update\*\*\*

## CITY OF MALIBU

\*\*\*To be inserted after City Council approval of the 2018 HMP Update\*\*\*

## CITY OF WESTLAKE VILLAGE

\*\*\*To be inserted after City Council approval of the 2018 HMP Update\*\*\*



## SECTION 22. ANNEX I: LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA’s evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan’s strengths as well as documents areas for future improvement.
- The Multi-Jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

<b>Jurisdiction:</b> Las Virgenes-Malibu Council of Governments (comprised of): <ul style="list-style-type: none"> <li>• City of Agoura Hills, CA</li> <li>• City of Calabasas, CA</li> <li>• City of Hidden Hills, CA</li> <li>• City of Malibu, CA</li> <li>• City of Westlake Village, CA</li> </ul>	<b>Title of Plan:</b> LVMCOG Multi-Jurisdictional Hazard Mitigation Plan	<b>Date of Plan:</b> 9/30/2018
<b>Local Point of Contact:</b> Terry Dipple	<b>Address:</b> LVMCOG c/o City of Hidden Hills 6165 Spring Valley Road Hidden Hills, CA 91302	
<b>Title:</b> LVMCOG Executive Director	<b>E-Mail:</b> terry@lvmcog.org	
<b>Agency:</b> Las Virgenes-Malibu Council of Governments (LVMCOG)		
<b>Phone Number:</b> (818) 968-9088		

<b>State Reviewer:</b>	<b>Title:</b>	<b>Date:</b>
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<b>FEMA Reviewer:</b>	<b>Title:</b>	<b>Date:</b>
<b>Date Received in FEMA Region (insert #)</b>		
<b>Plan Not Approved</b>		
<b>Plan Approvable Pending Adoption</b>		
<b>Plan Approved</b>		

**SECTION 1:  
 REGULATION CHECKLIST**

**INSTRUCTIONS:** The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been ‘Met’ or ‘Not Met.’ The ‘Required Revisions’ summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is ‘Not Met.’ Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

<b>1. REGULATION CHECKLIST</b>		<b>Location in Plan</b> (section and/or page number)	<b>Met</b>	<b>Not Met</b>
<b>ELEMENT A. PLANNING PROCESS</b>				
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	<b>1. INTRODUCTION</b> Acknowledgements 1-1 Multi-Jurisdictional Plan 1-3 Plan Participants 1-6 Plan Adoption and Coordinating Body 1-8 Plan Description 1-10 Plan Update Process 1-11 Internal Input 1-13 <b>14. ANNEX B</b> Area B Meetings 15-1 to 15-23 HMP Kick-off Meeting 15-25			
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	<b>1. INTRODUCTION</b> Multi-Jurisdictional Plan 1-3 Los Angeles County DMA 1-4 Coordination with Existing Programs 1-9 Plan Update Process 1-11 <b>5. PLAN MAINTENANCE AND MONITORING</b> Coordinating Body 5-3 Implementation Through Existing Programs 5-4 <b>14. ANNEX B: MEETING AGENDAS</b> Area B Meetings 15-1 to 15-23 <b>18. ANNEX E: PLANNING AND PUBLIC INVOLVEMENT</b> Planning 18-1			

<b>1. REGULATION CHECKLIST</b>			
<b>Regulation (44 CFR 201.6 Local Mitigation Plans)</b>	<b>Location in Plan (section and/or page number)</b>	<b>Met</b>	<b>Not Met</b>
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	<p><b>1. INTRODUCTION</b>                      Plan Participants 1-6                      Plan Implementation, Monitoring, and Evaluation 1-8                      Public and Community Process 1-14</p> <p><b>3. RISK ASSESSMENT</b>                      Local Input and Surveys Community and Public Participation 3-7</p> <p><b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b>                      Public Mitigation Planning Input 4-13</p> <p><b>5. PLAN MAINTENANCE AND MONITORING</b>                      Continued Public Involvement 5-3</p> <p><b>16. ANNEX C: COMMUNITY DISASTER PREPAREDNESS AND RISK SURVEY</b>                      16-1 to 16-23</p> <p><b>18. ANNEX E: PLANNING AND PUBLIC INVOLVEMENT</b>                      Public Participation and Involvement 18-1                      Community Disaster Preparedness and Risk Survey 18-1                      City Council Meetings 18-2                      Public Emergency Preparedness and Mitigation Workshops 18-2 to 18-6                      Workshop Sign-in Sheet 18-4</p>		

<b>1. REGULATION CHECKLIST</b>			
<b>Regulation</b> (44 CFR 201.6 Local Mitigation Plans)	<b>Location in Plan</b> (section and/or page number)	<b>Met</b>	<b>Not Met</b>
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	<b>1. INTRODUCTION</b> Executive Summary 1-2 Plan Implementation, Monitoring, and Evaluation 1-8 External Input 1-9 Coordination with Existing Programs 1-9 Multi-Jurisdictional HMP 1-10 Plan Update Process 1-11 <b>3. RISK ASSESSMENT</b> Incorporation of Existing Plans 3-7 Tsunami Study 3-12 Sea Level Rise Study 3-14 <b>5. PLAN MAINTENANCE AND MONITORING</b> Coordinating Body 5-3 Implementation Through Existing Programs 5-4 <b>6. EARTHQUAKE</b> ShakeMap Scenarios 6-8 6-20 TO 6-27 <b>7. WILDFIRE</b> 7-18 TO 7--26 <b>8. CLIMATE CHANGE</b> 8-12 TO 8-22 <b>10 LANDSLIDE</b> 10-12 TO 10-13 <b>12. FLOOD</b> 12-9, 12-13 TO 12-25 <b>18. ANNEX E: PLANNING AND PUBLIC INVOLVEMENT</b> Planning 18-1		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	<b>1. INTRODUCTION</b> Plan Participants 1-6 Continued Public Involvement 1-9 Coordinating Body 1-9 Public/Community Process 1-13 Public and Community Process 1-14 <b>5. PLAN MAINTENANCE AND MONITORING</b> Continued Public Involvement 5-3 <b>18. ANNEX E: PLANNING AND PUBLIC INVOLVEMENT</b> Public Participation and Involvement 18-1 Public Emergency Preparedness and Mitigation Planning Workshops 18-2		

<b>1. REGULATION CHECKLIST</b>			
<b>Regulation</b> (44 CFR 201.6 Local Mitigation Plans)	<b>Location in Plan</b> (section and/or page number)	<b>Met</b>	<b>Not Met</b>
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	<b>1. INTRODUCTION</b> Mitigation Strategy Five-Year Action Plan 1-6 Plan Implementation, Monitoring, and Evaluation 1-8 Why Develop a Mitigation Plan? 1-10 <b>5. PLAN MAINTENANCE AND MONITORING 5-1</b> Plan Monitoring, Evaluation, Updates, and Formal Review Process 5-8		
<b><u>ELEMENT A: REQUIRED REVISIONS</u></b>			



<b>ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT</b>			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Risk Assessment 3-1 to 3-63 Earthquake 6-1 to 6-27 Wildfire 7-1 to 7-26 Climate Change 8-1 to 8-22 Energy Disruption 9-1 to 9-10 Landslide and Debris Flows 10-1 to 10-13 Windstorm 11-1 to 11-7 Flood/Severe Winter Storm 12-1 to 12-5 Terrorism and Mass Violence 13-1 to 13-13 Community Disaster Preparedness and Risk Survey 16-1 to 16-23 Steering Committee / Planning Group HMP Risk Survey 17-1 to 17-2 Annex F: Flood Insurance Rate Maps 19-1 to 19-45 Annex G: Malibu Flood Plan 20-1 to 20-66		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Risk Assessment 3-1 to 3-19 Earthquake 6-1 to 6-7 Wildfire 7-1 to 7-7 Climate Change 8-1 to 8-6 Energy Disruption 9-1 to 9-4 Landslide and Debris Flows 10-1 to 10-10 Windstorm 11-1 to 11-2, 11-5 Flood/Severe Winter Storm 12-1 to 12-10 Terrorism and Mass Violence 13-1 Community Disaster Preparedness and Risk Survey 16-8 Steering Committee / Planning Group HMP Risk Survey 17-1 to 17-2 Annex F FIRM 19-1 to 19-45		
B3. Is there a description of each identified hazard’s impact on the community as well as an overall summary of the community’s vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Risk Assessment 3-1 to 3-63 Earthquake 6-8 to 6-15 Wildfire 7-7 Climate Change 8-7 Energy Disruption 9-7 Landslide and Debris Flows 10-11 Windstorm 11-3 Flood/Severe Winter Storm 12-10 Terrorism and Mass Violence 13-8		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Flood / Severe Winter Storm 12-5 to 12-6		
<b><u>ELEMENT B: REQUIRED REVISIONS</u></b>			

<b>ELEMENT C. MITIGATION STRATEGY</b>			
C1. Does the plan document each jurisdiction’s existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	<b>1. INTRODUCTION</b> Executive Summary 1-2 Multi-Jurisdictional Plan 1-3 Plan Goals 1-7 Plan Implementation, Monitoring, and Evaluation 1-8 Coordination with Existing Programs 1-9 Plan Description 1-10 Internal Input 1-12 <b>5. PLAN IMPLEMENTATION AND MONITORING</b> Implementation Through Existing Programs 5-4		
C2. Does the Plan address each jurisdiction’s participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	<b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b> Floodplain Management and Participation in the NFIP 4-2 to 4-3 <b>12. FLOOD / SEVERE WINTER STORM</b> Flood Maps and Flood Insurance Studies 12-9 to 12-10 <b>19. ANNEX F: FIRMS</b> 19-1 to 19-45 <b>20. ANNEX G: MALIBU FLOOD PLAN</b> 20-1 to 20-66		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	<b>1. INTRODUCTION</b> Plan Goals 1-7 <b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b> Hazard Mitigation Plan Goals 4-1 General Plans – Flood Mitigation and Planning 4-3 to 4-11 Hazard Mitigation Strategies 4-12 to 44-83		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	<b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b> Hazard Mitigation Strategies 4-12 to 44-83		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	<b>1. INTRODUCTION</b> Economic Analysis of Mitigation Projects 1-9 <b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b> Hazard Mitigation Strategies 4-12 to 44-83 <b>5. PLAN MAINTENANCE AND MONITORING</b> Economic Analysis of Mitigation Projects 5-6 to 5-8		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	<b>1. INTRODUCTION</b> Coordination with Existing Programs 1-9 <b>5. PLAN MAINTENANCE AND MONITORING</b> 5-1 Implementation Through Existing Programs 5-4 to 5-5		

## ELEMENT C. MITIGATION STRATEGY

### ELEMENT C: REQUIRED REVISIONS

<b>ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION</b> (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	<b>1. INTRODUCTION</b> Internal Input 1-12 <b>2. COMMUNITY PROFILE</b> 2-1 to 2-89 (see individual city Land Use and Housing Characteristics sections) <b>3. RISK ASSESSMENT</b> Vulnerability and Loss Estimates 3-20 to 3-63 <b>5. PLAN MAINTENANCE</b> Future Development Trends 5-1 to 5-2		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	<b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b> Hazard Mitigation Strategies 4-12 to 44-83		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	<b>4. HAZARD MITIGATION GOALS AND STRATEGIES</b> Hazard Mitigation Strategies 4-12 to 44-83  Also added the following sections: Section 8: Climate Change 8-1 Section 9: Energy Disruption 9-1 Section 13: Mass Violence (added to Terrorism Section) 13-1  <u>Priority Changes Listed in:</u> Community Disaster Preparedness and Risk Survey 16-8 Steering Committee / Planning Group HMP Risk Survey 17-2		
<b><u>ELEMENT D: REQUIRED REVISIONS</u></b>			
<b>ELEMENT E. PLAN ADOPTION</b>			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	<b>SECTION 21 PLAN APPROVAL DOCUMENTATION</b> 21-1  TO BE INSERTED		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	<b>SECTION 21 PLAN APPROVAL DOCUMENTATION</b> TO BE INSERTED City of Agoura Hills 21-2 City of Calabasas 21-3 City of Hidden Hills 21-4 City of Malibu 21-5 City of Westlake Village 21-6		

**ELEMENT E: REQUIRED REVISIONS**

**ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)**

F1.			
F2.			

**ELEMENT F: REQUIRED REVISIONS**