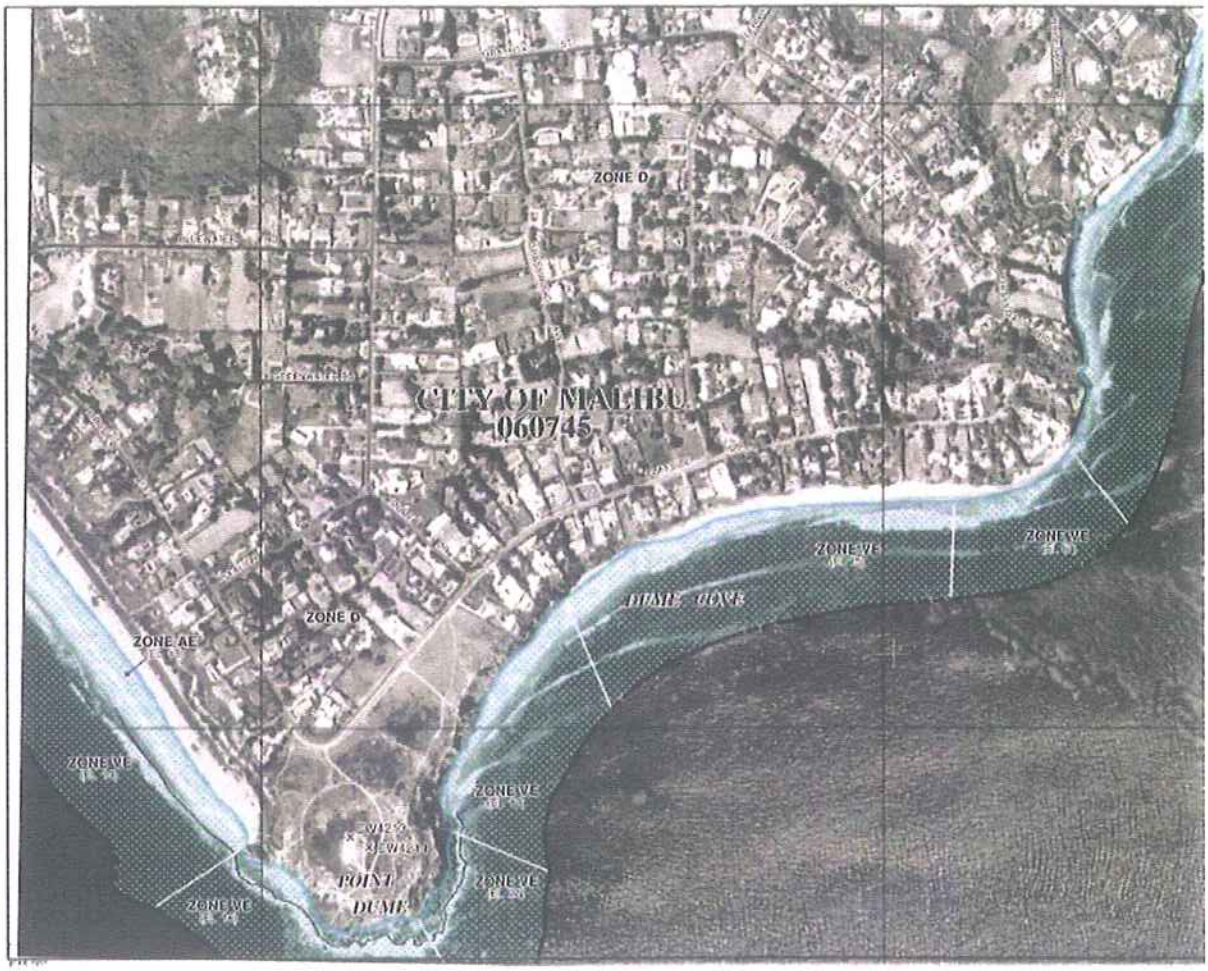
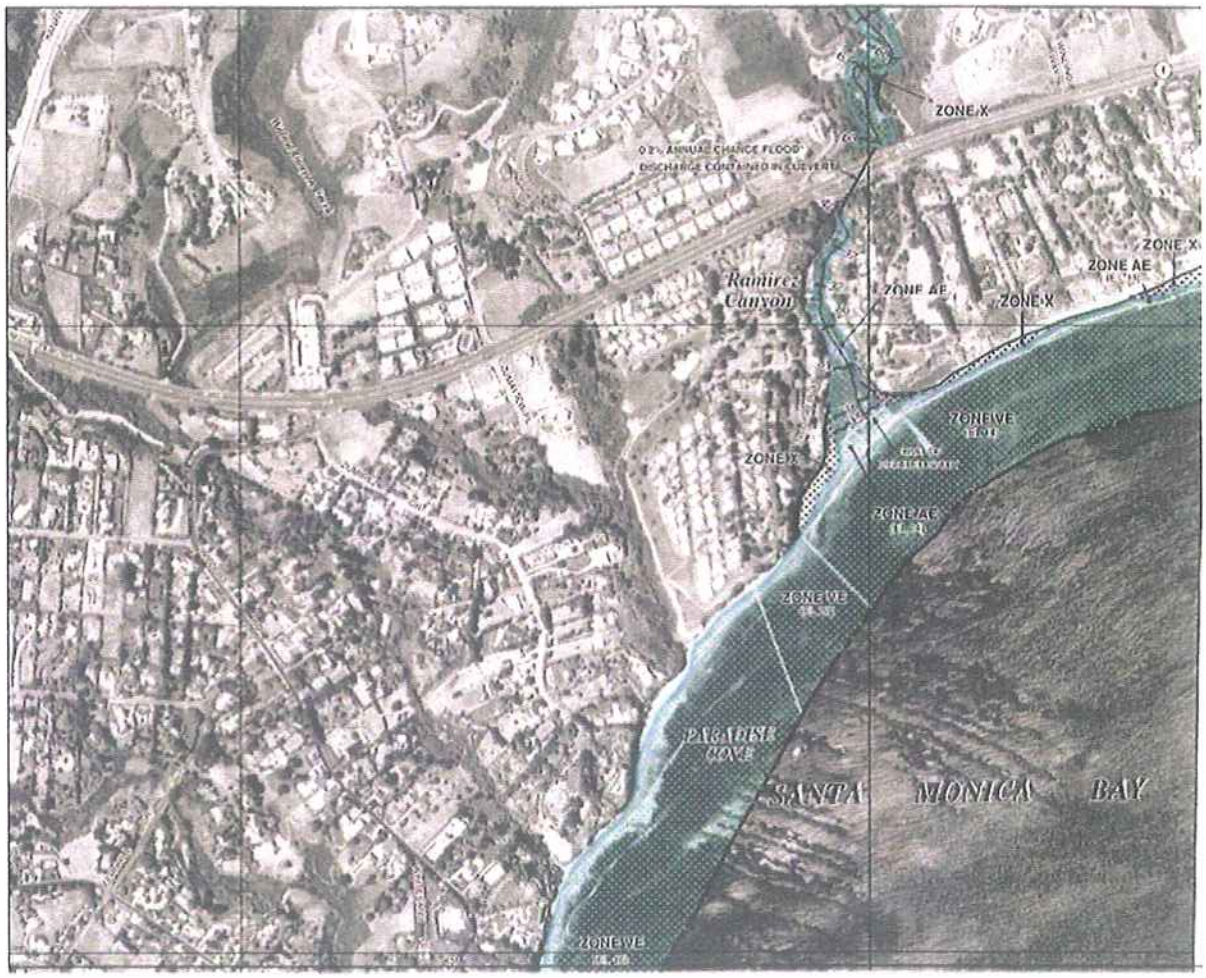
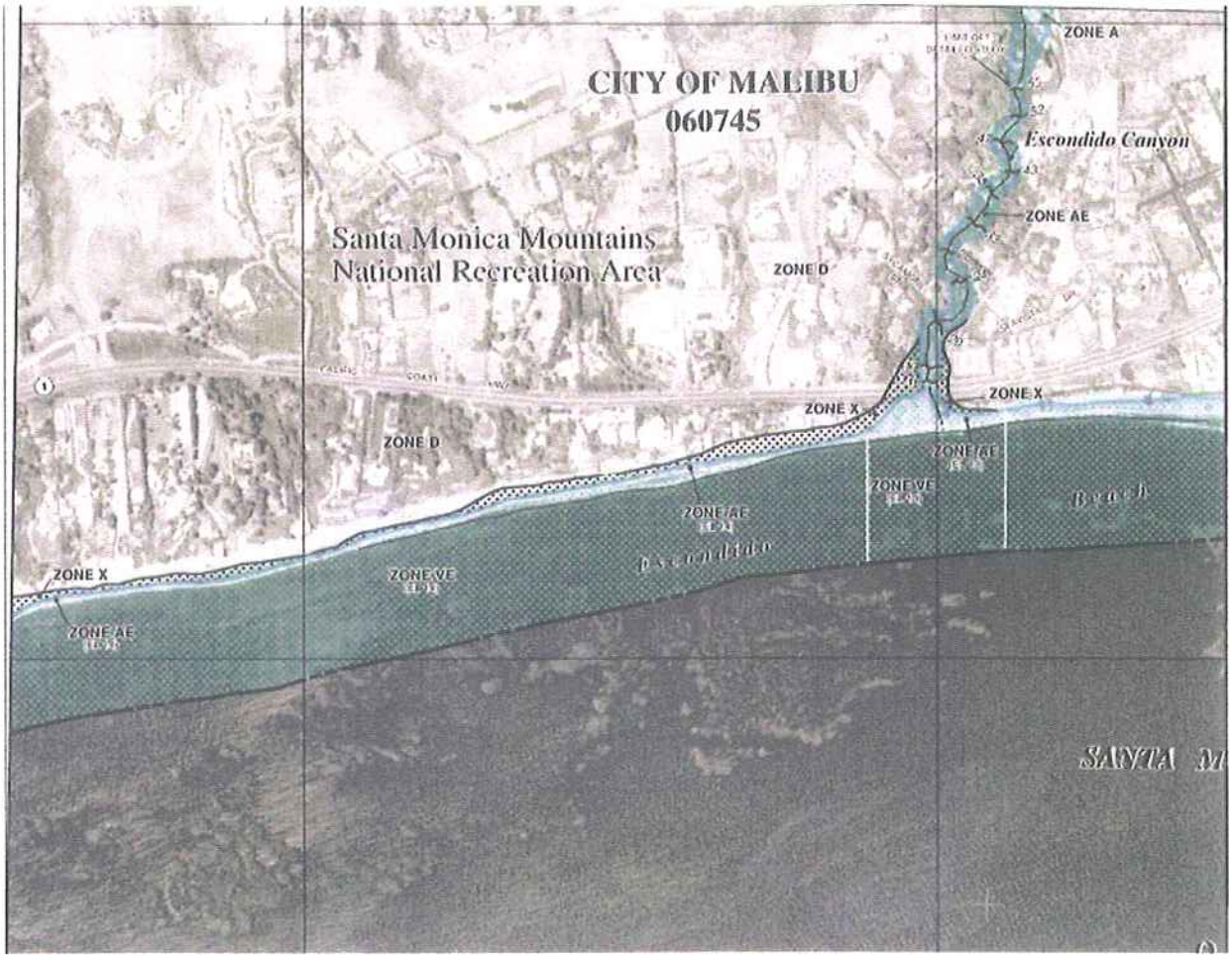


Map 79: Malibu FIRM Panel 1518 (1)



Map 80: Malibu FIRM Panel 1518 (2)



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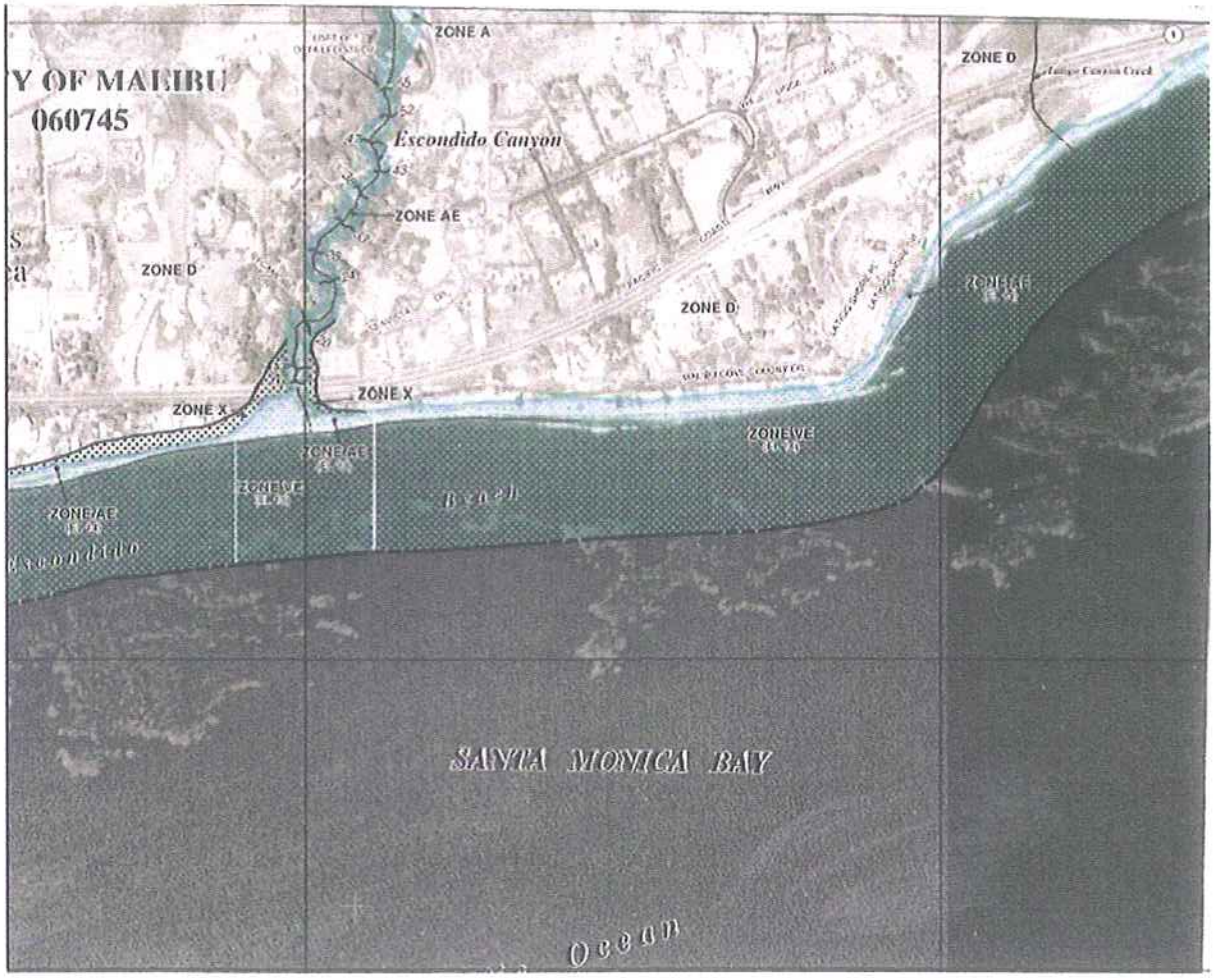
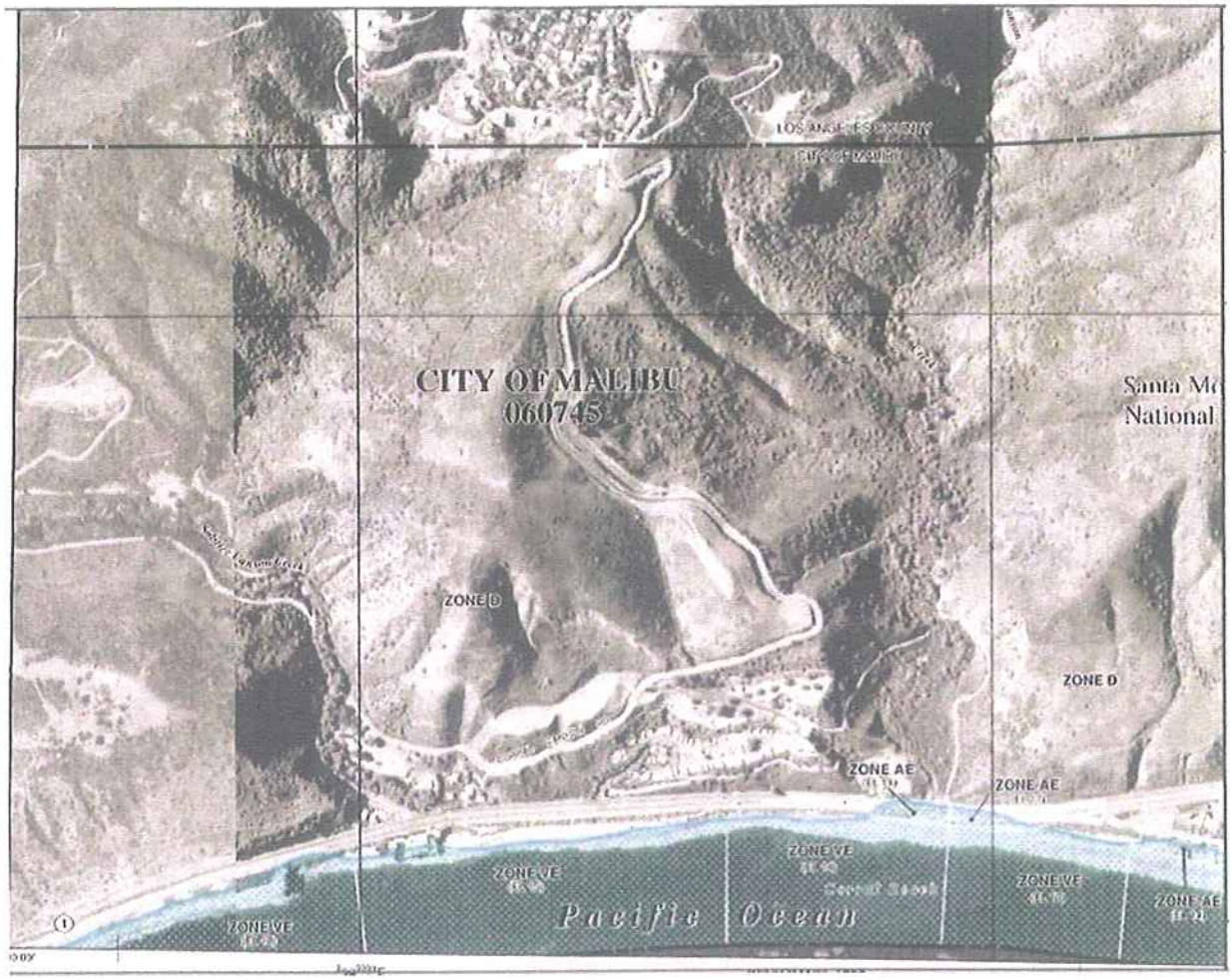
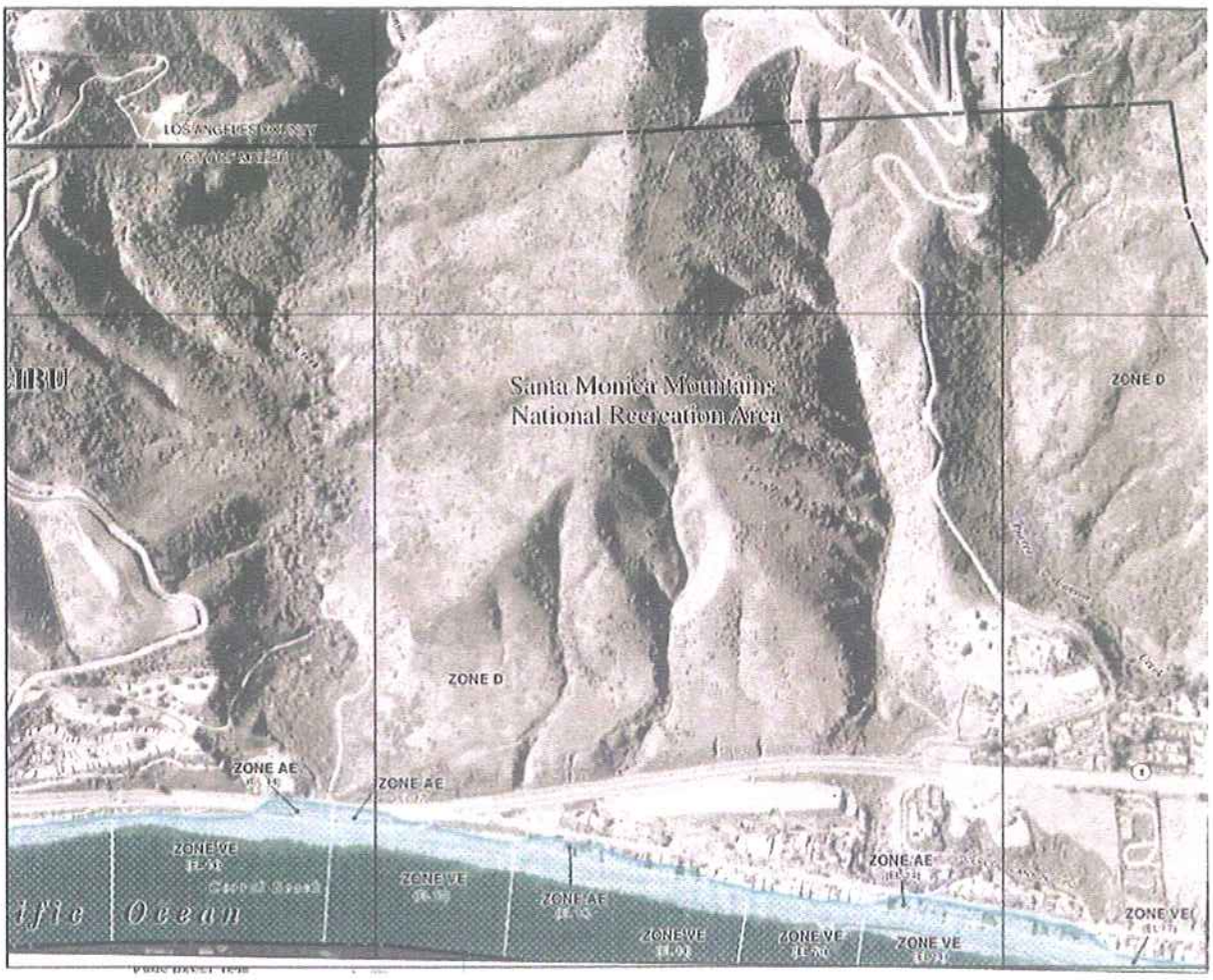


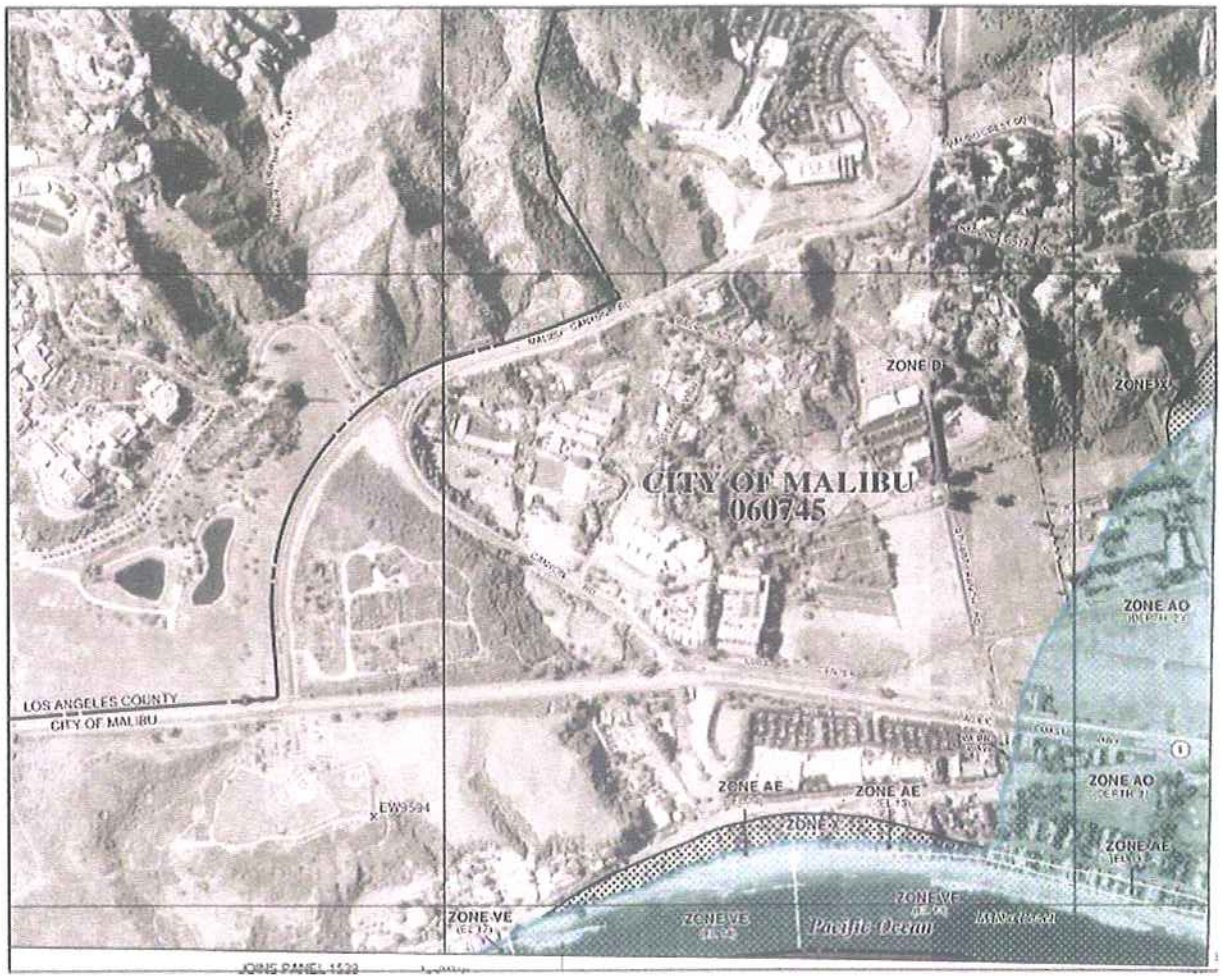
Map 82: Malibu FIRM Panel 1519 (2)



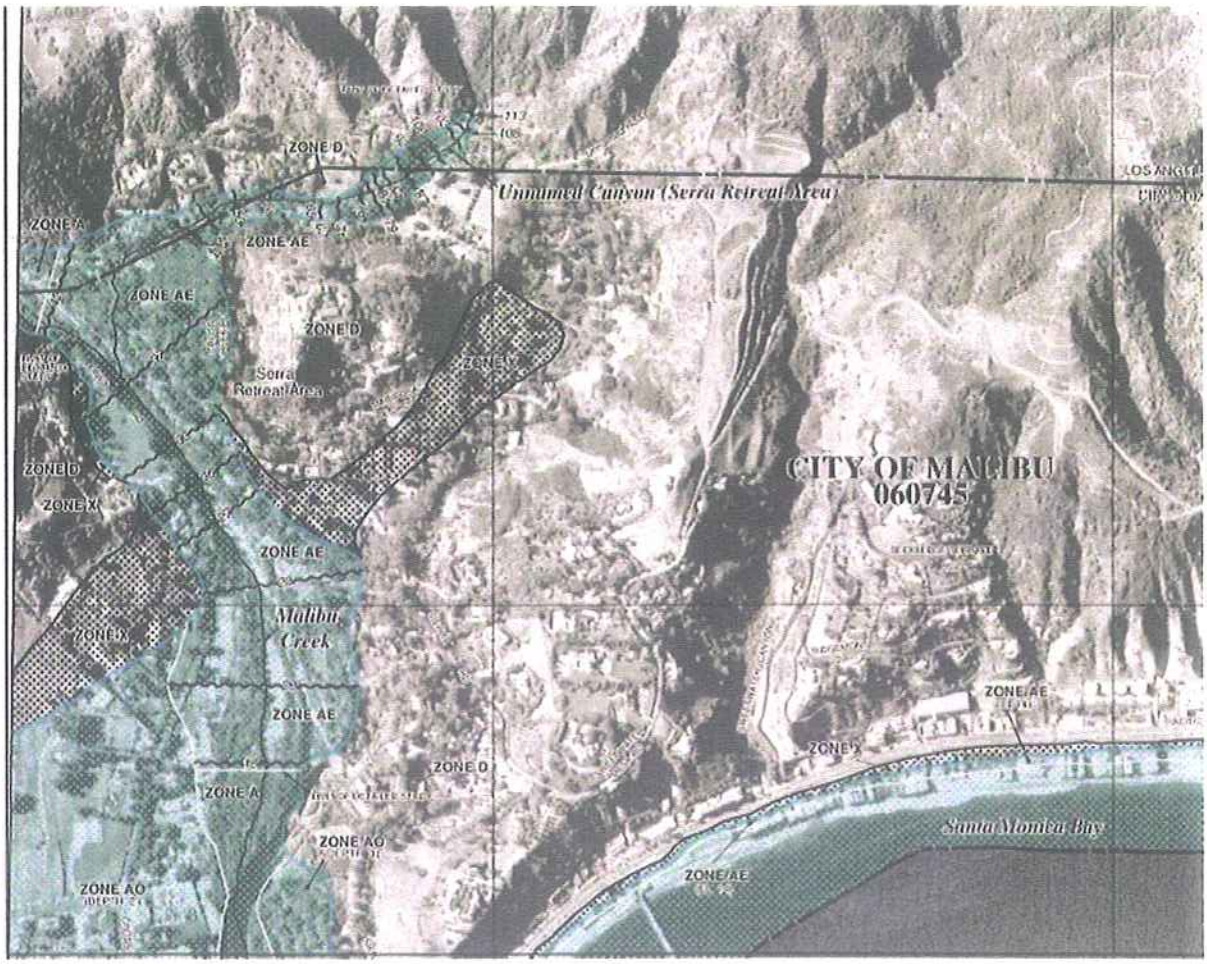
Map 83: Malibu FIRM Panel 1536 (1)



Map 84: Malibu FIRM Panel 1536 (2)



Map 85: Malibu FIRM Panel 1537



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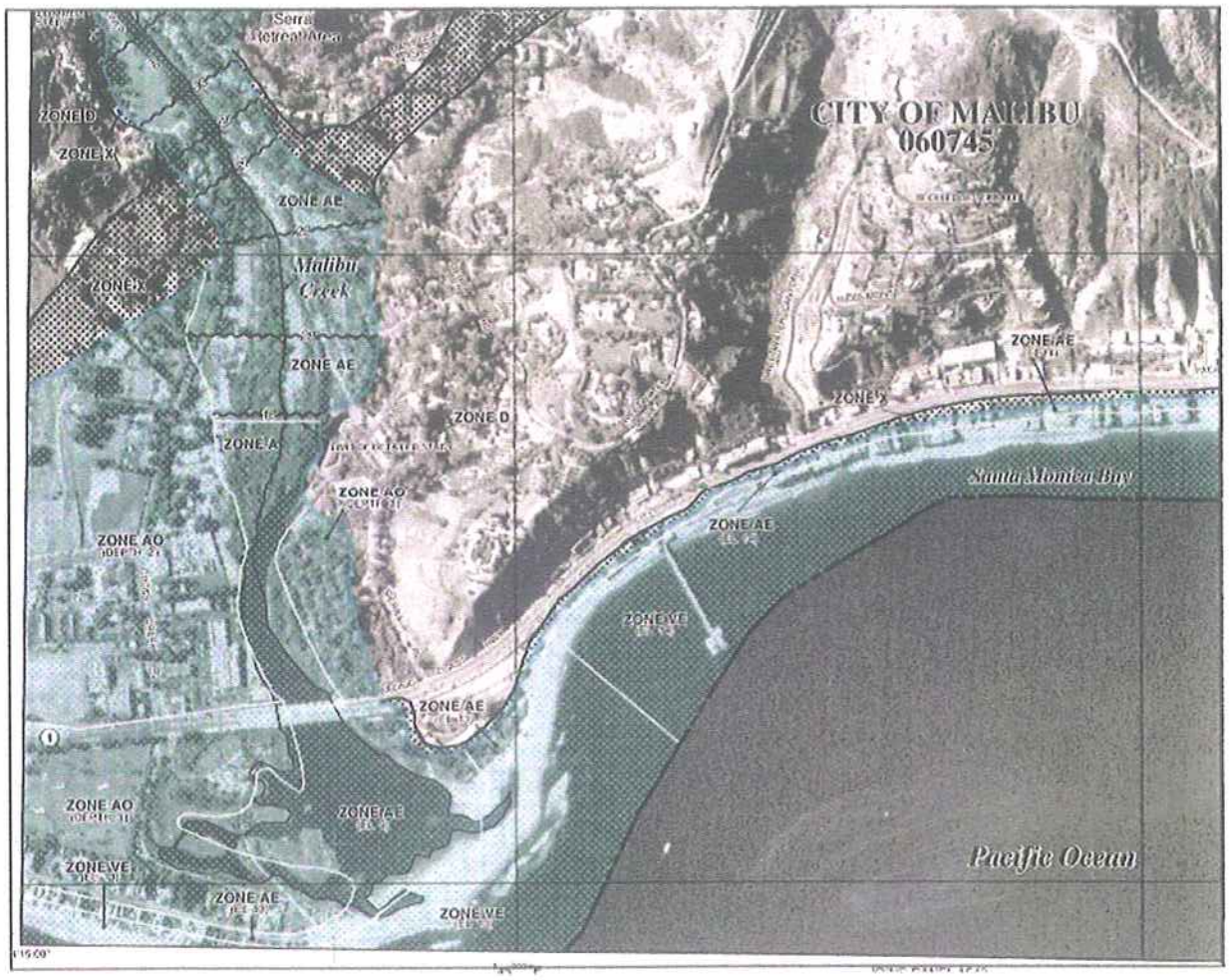
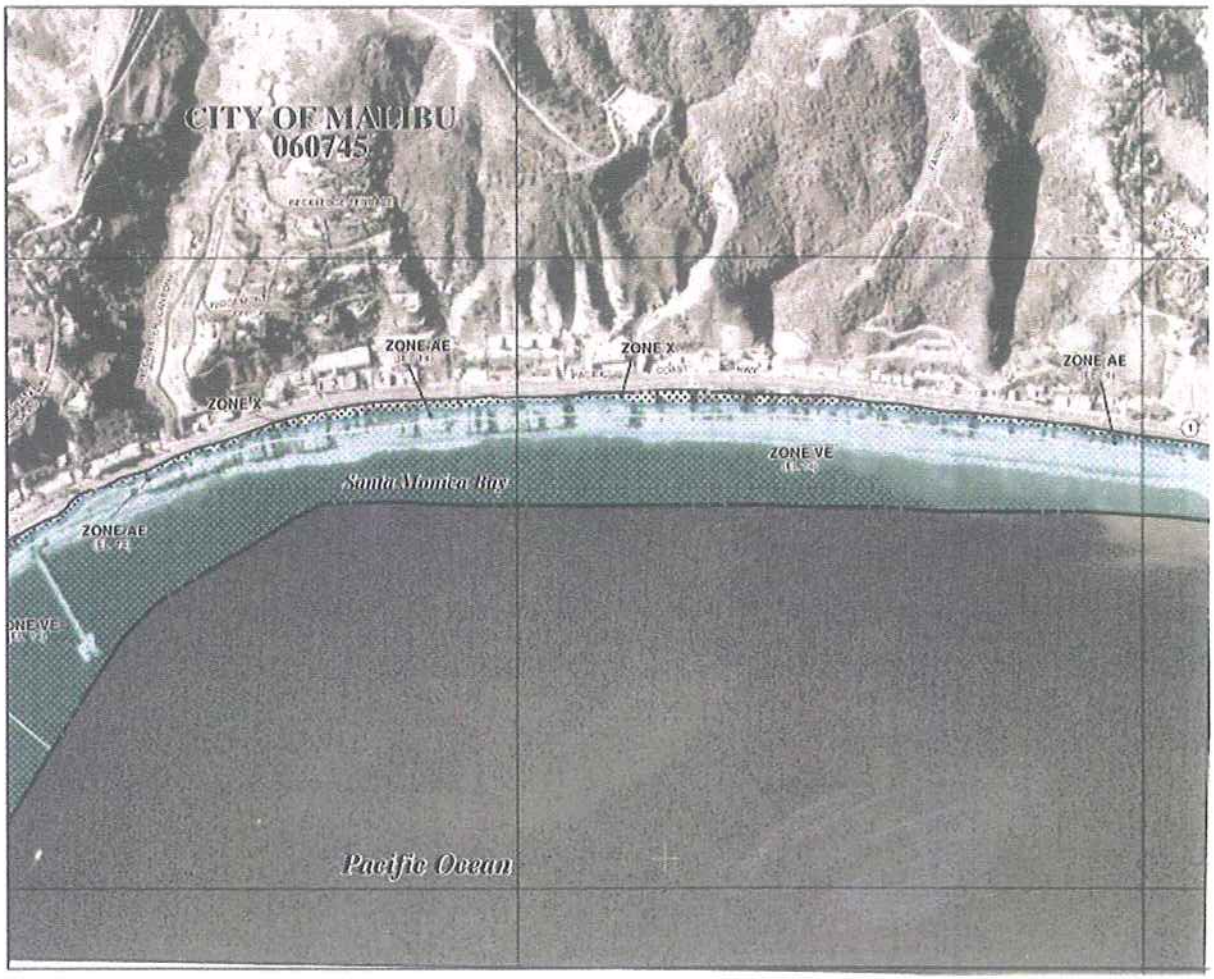
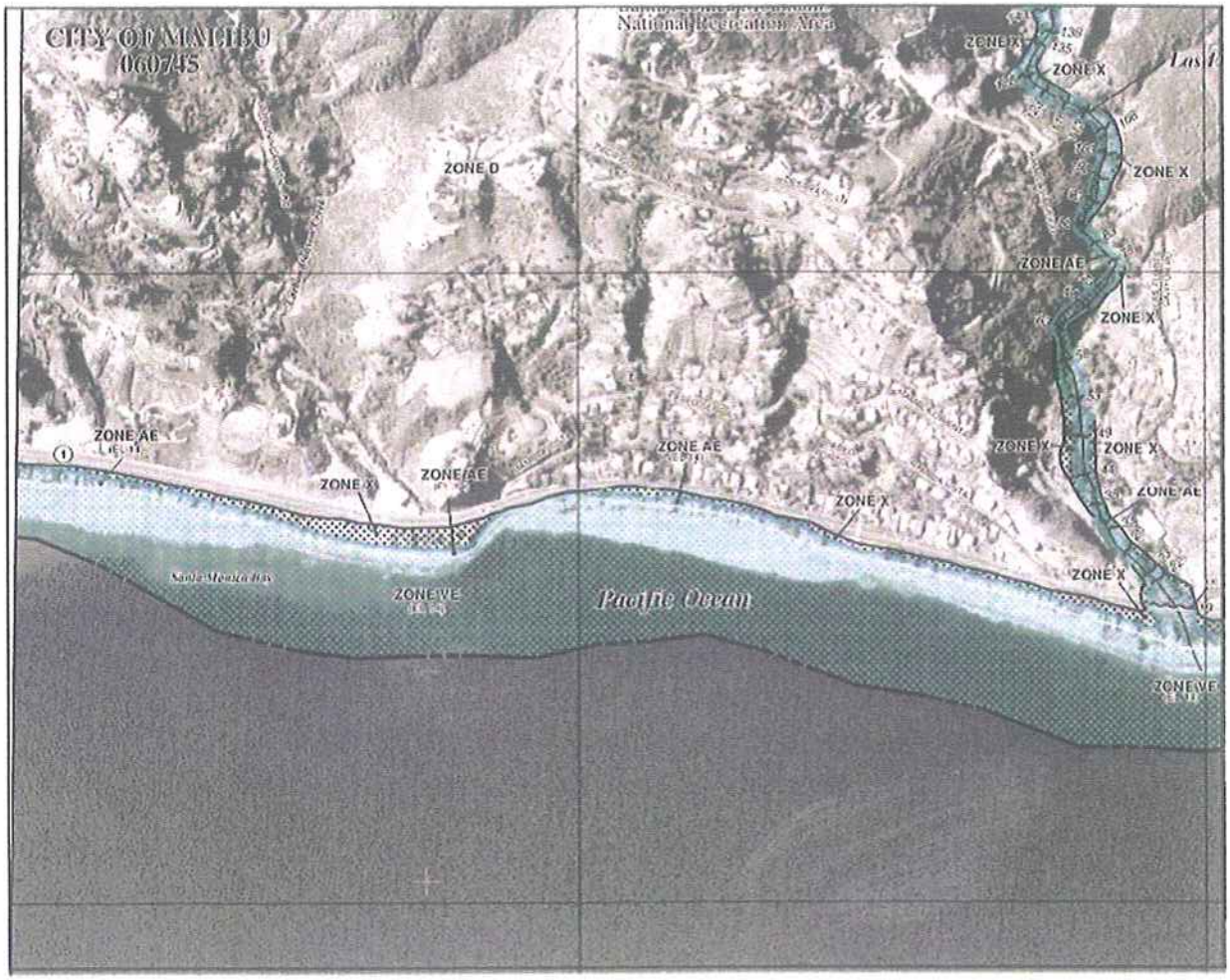


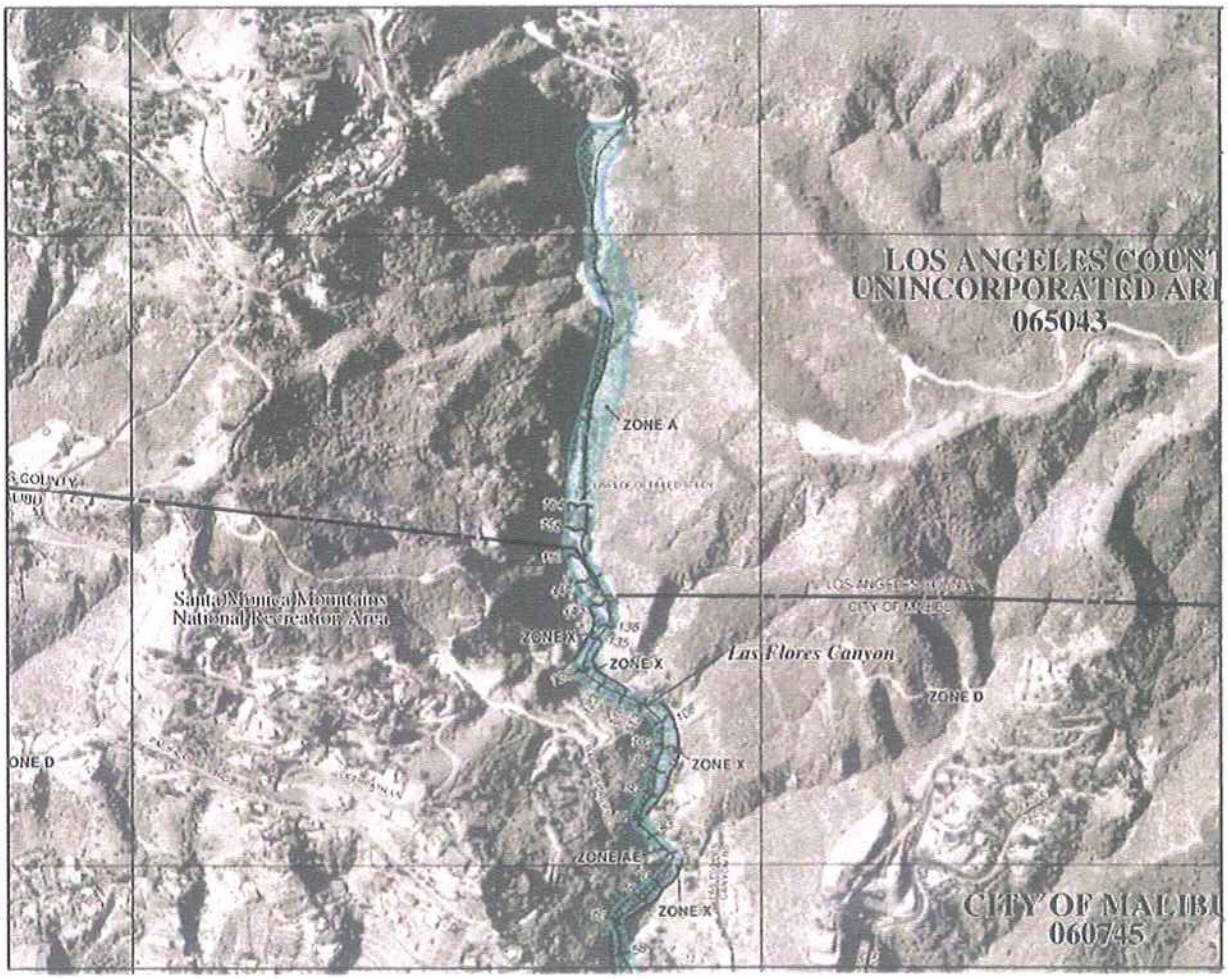
Map 87: Malibu FIRM Panel 1541 (2)



Map 88: Malibu FIRM Panel 1541 (3)



Map 89: Malibu FIRM Panel 1542 (1)



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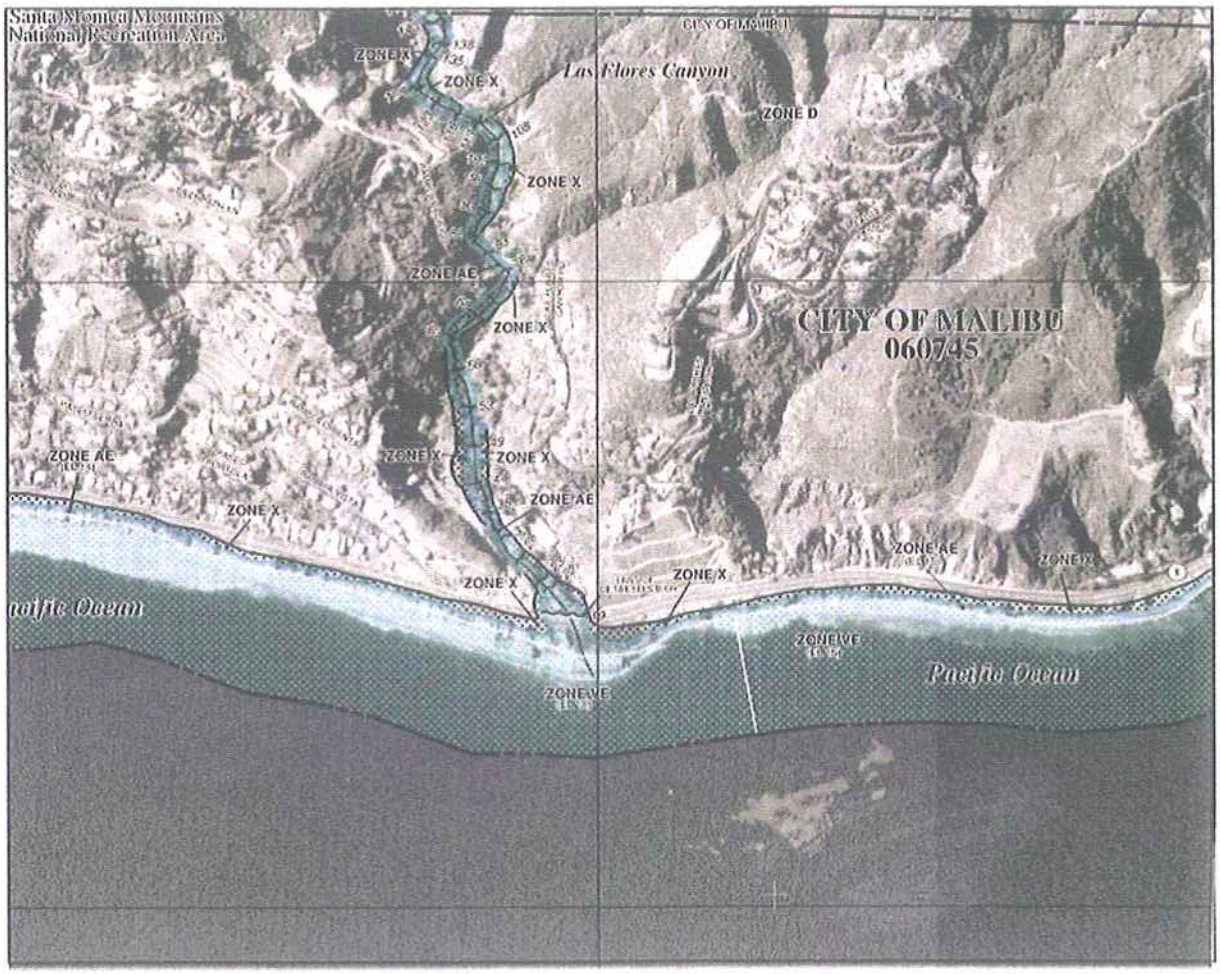

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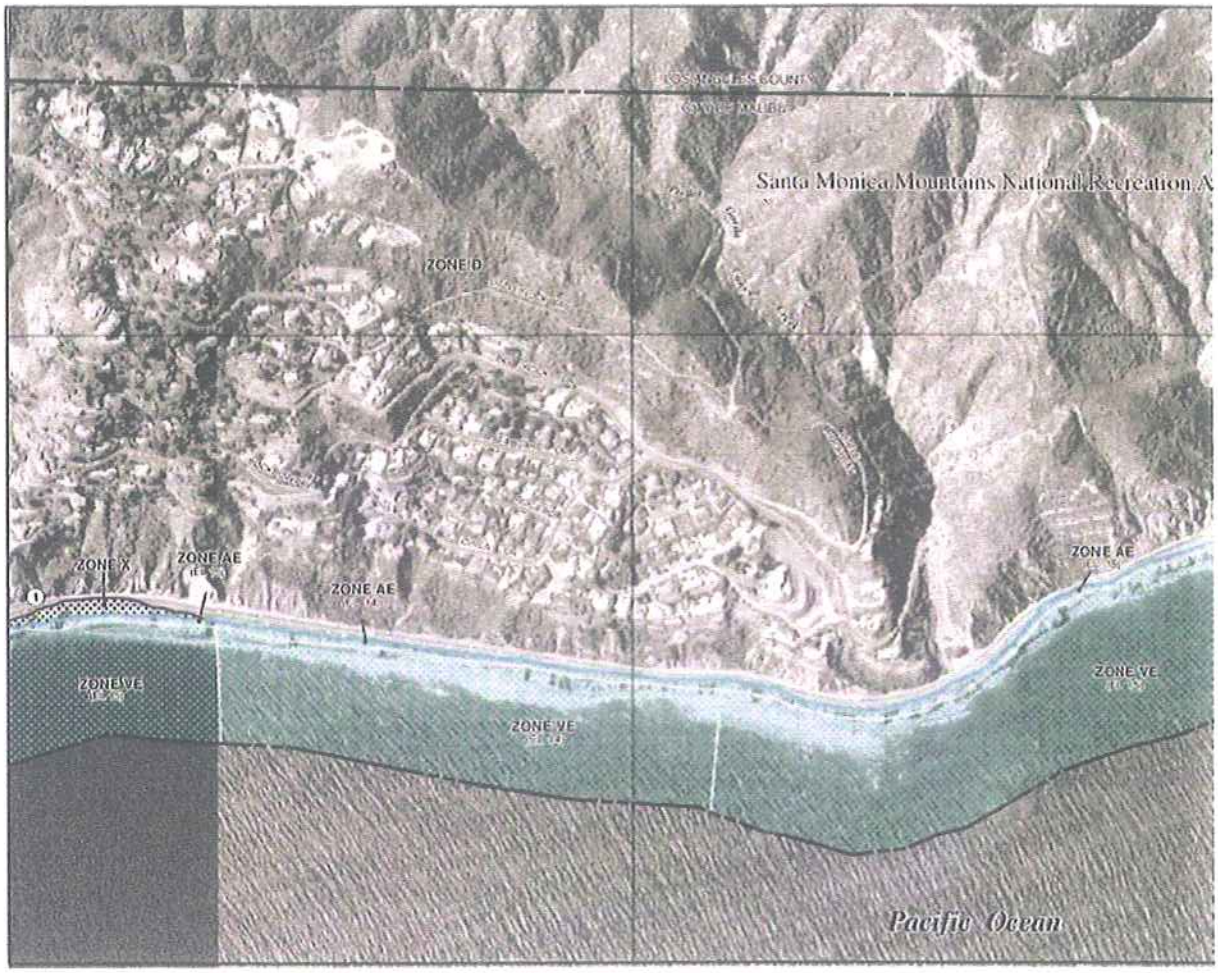
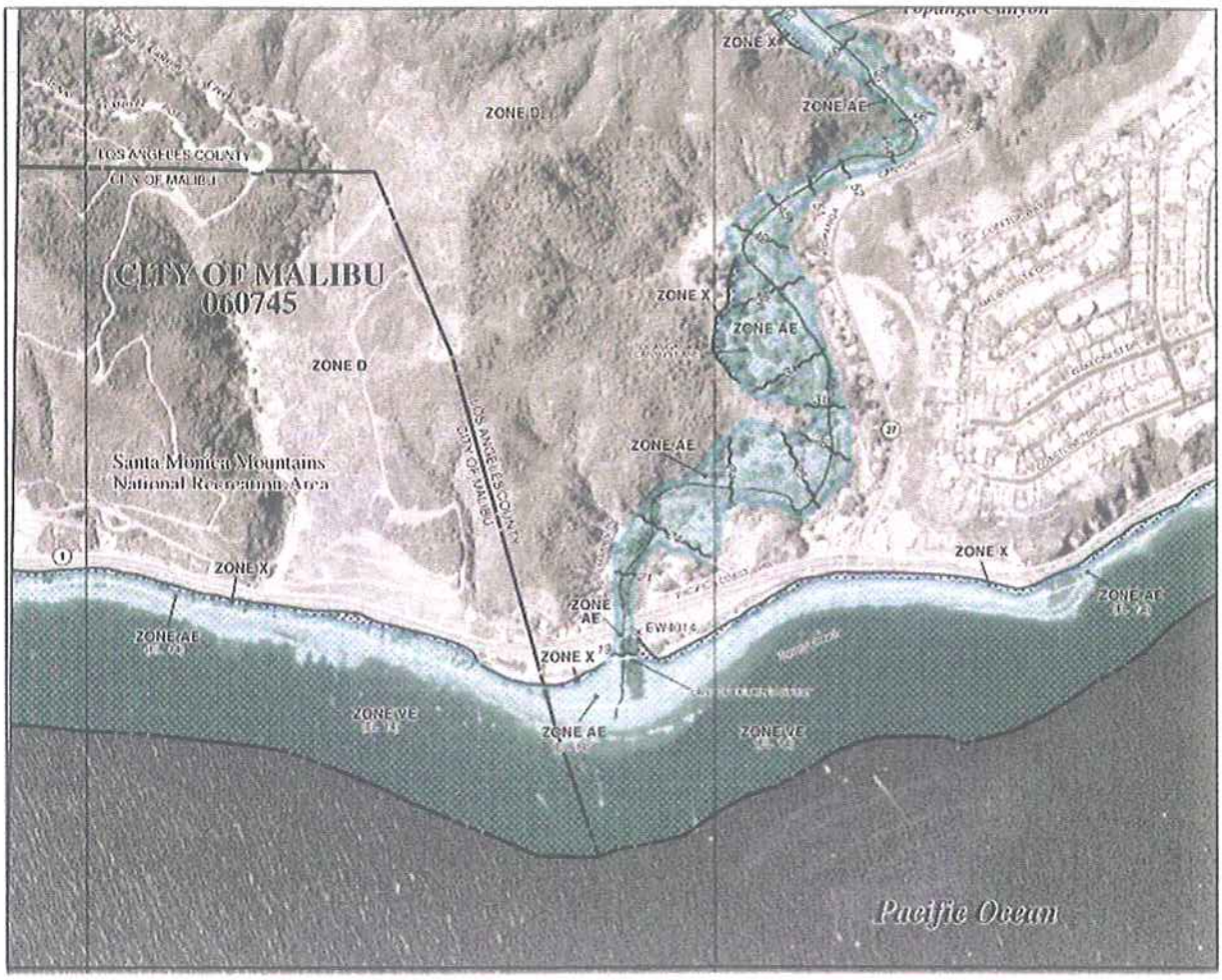
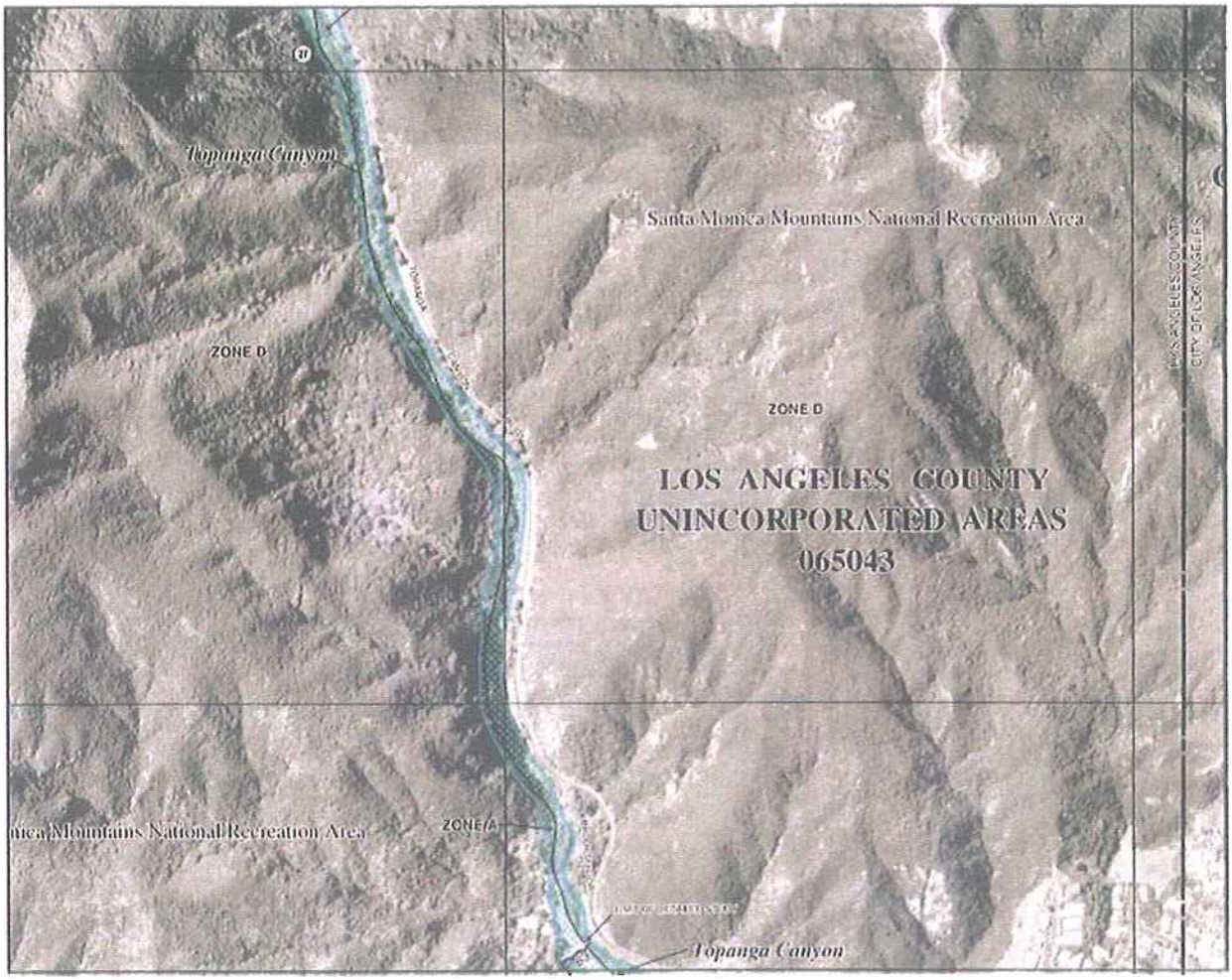


Map 92: Malibu FIRM Panel 1561 (1)

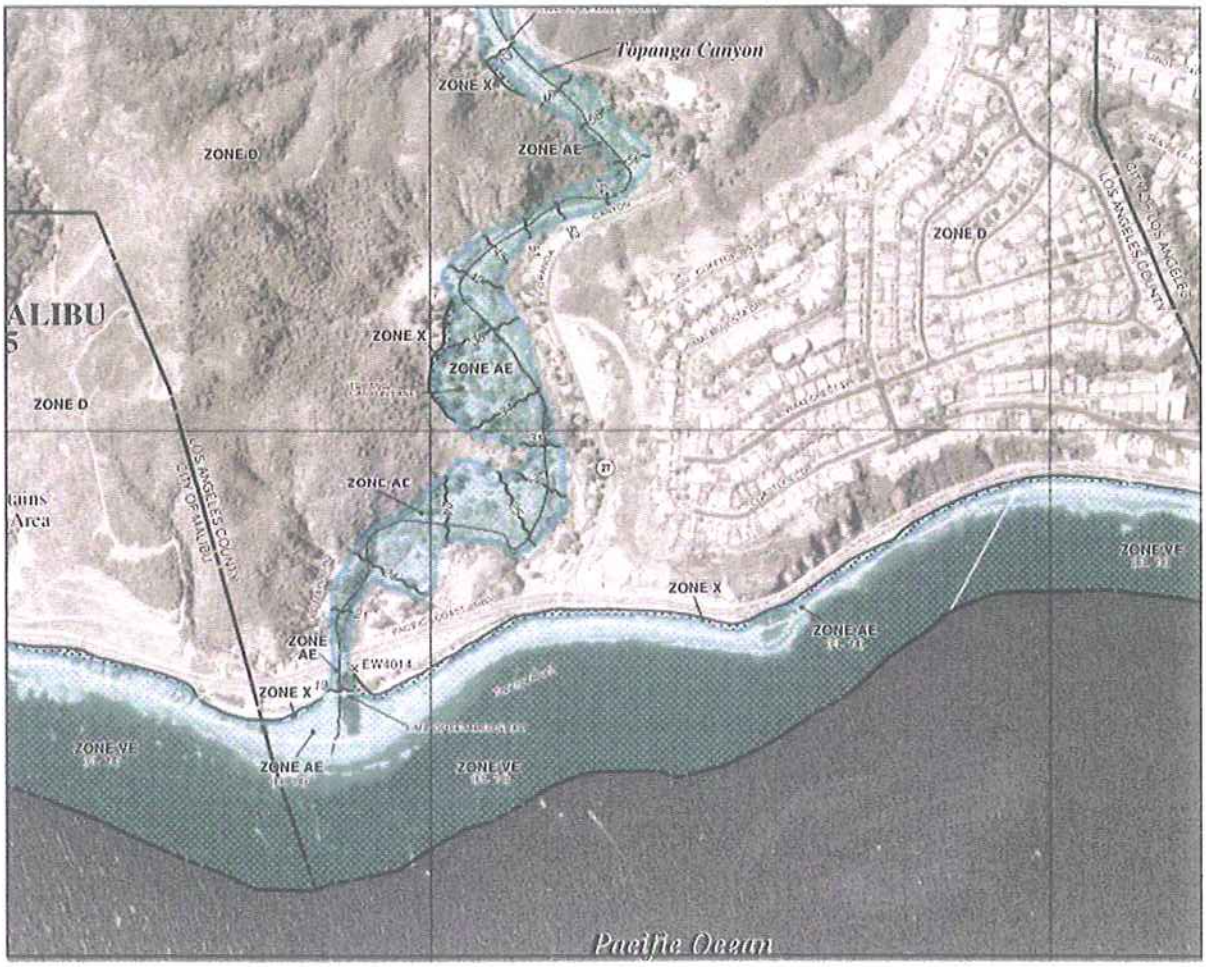
Map 93: Malibu FIRM Panel 1561 (2)



Map 94: Malibu FIRM Panel 1562 (1)



Map 95: Malibu FIRM Panel 1562 (2)



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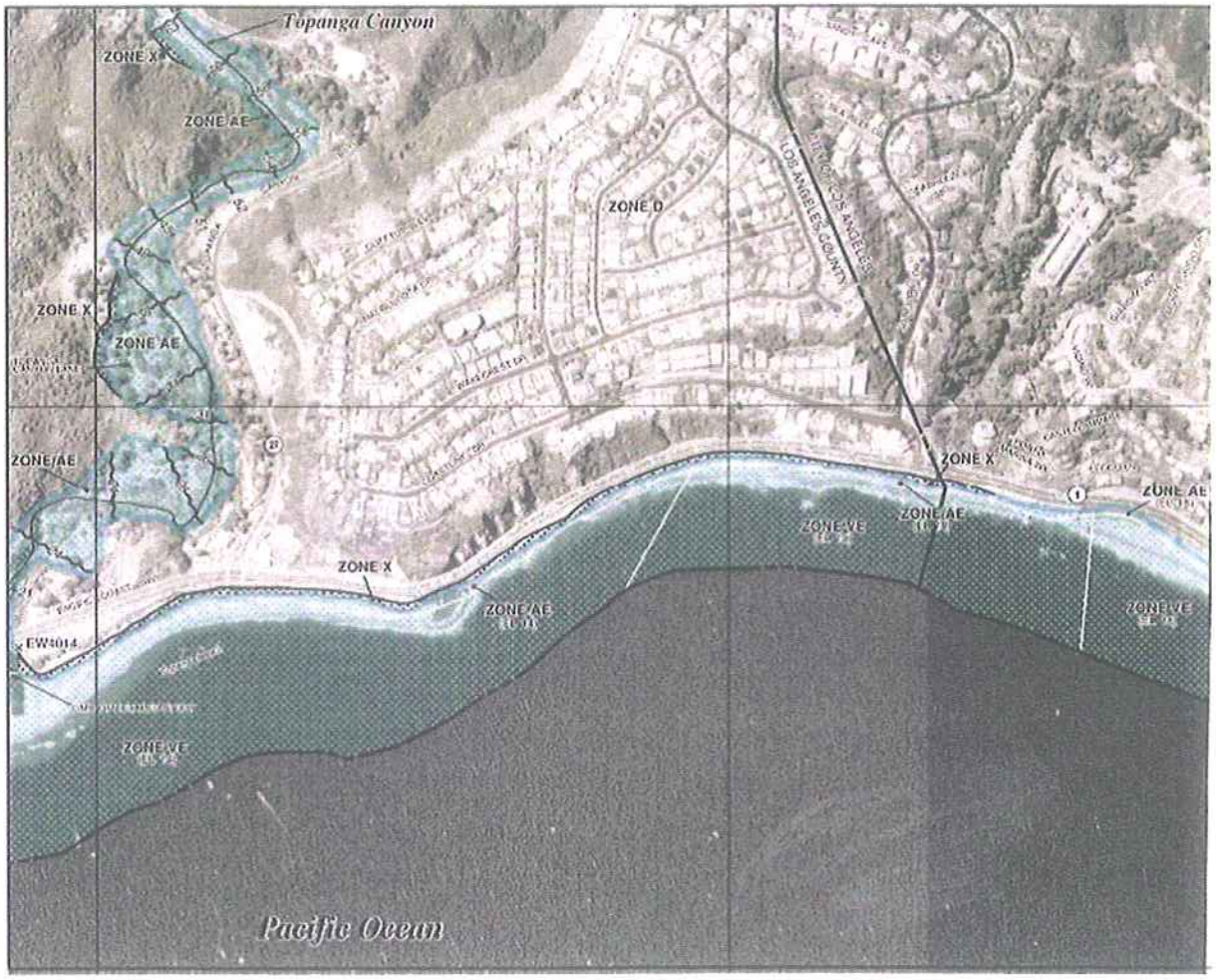
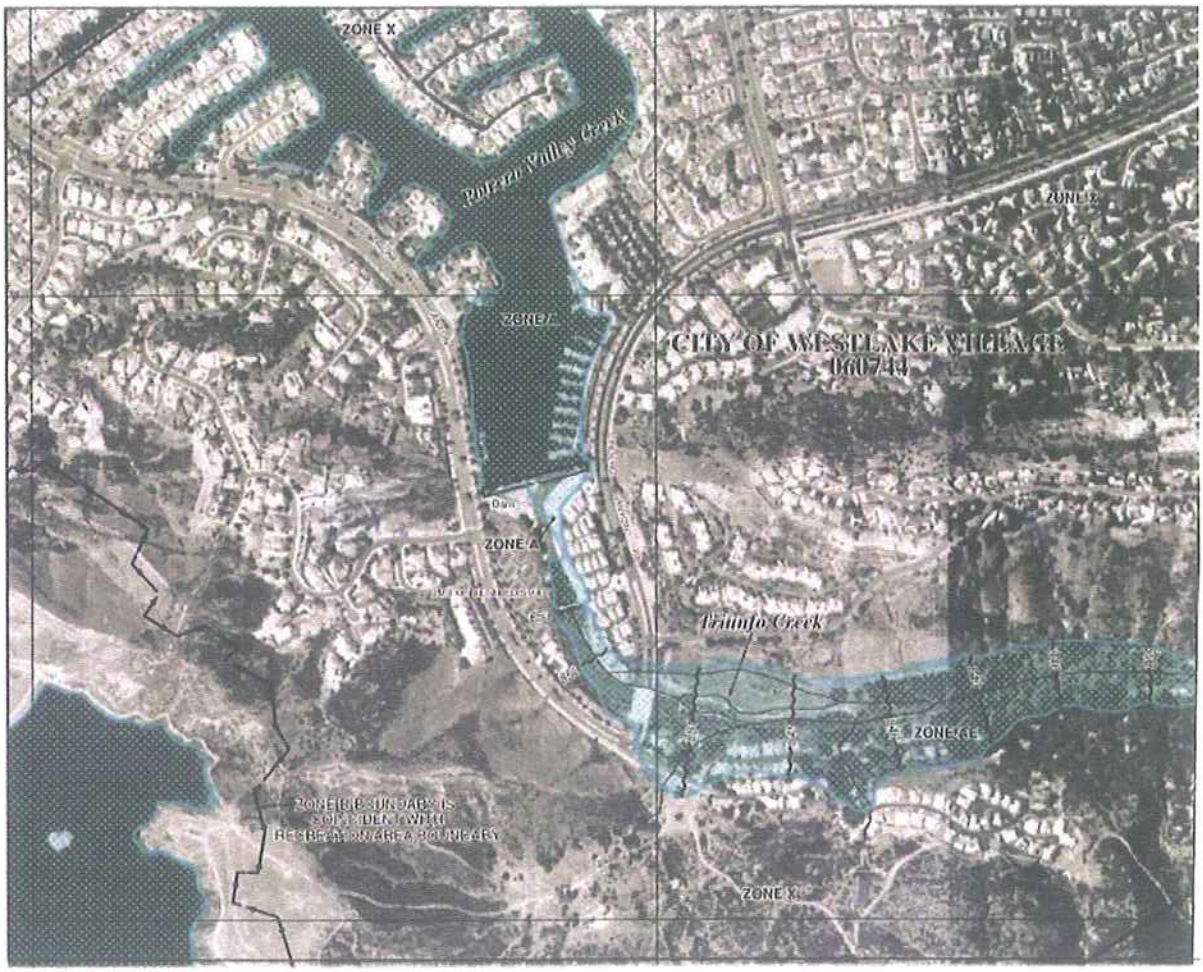
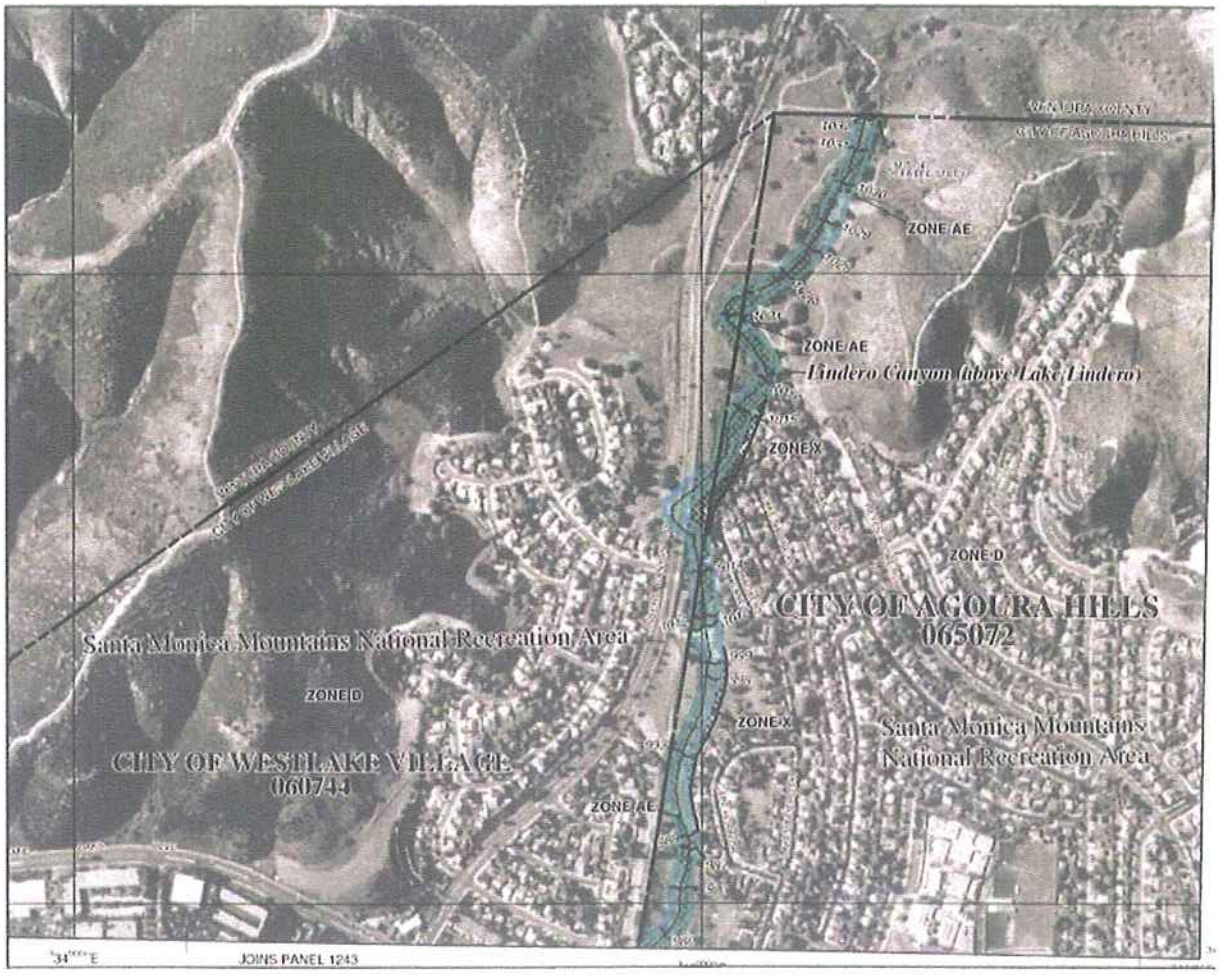


Map 97: Malibu FIRM Panel 1562 (4)

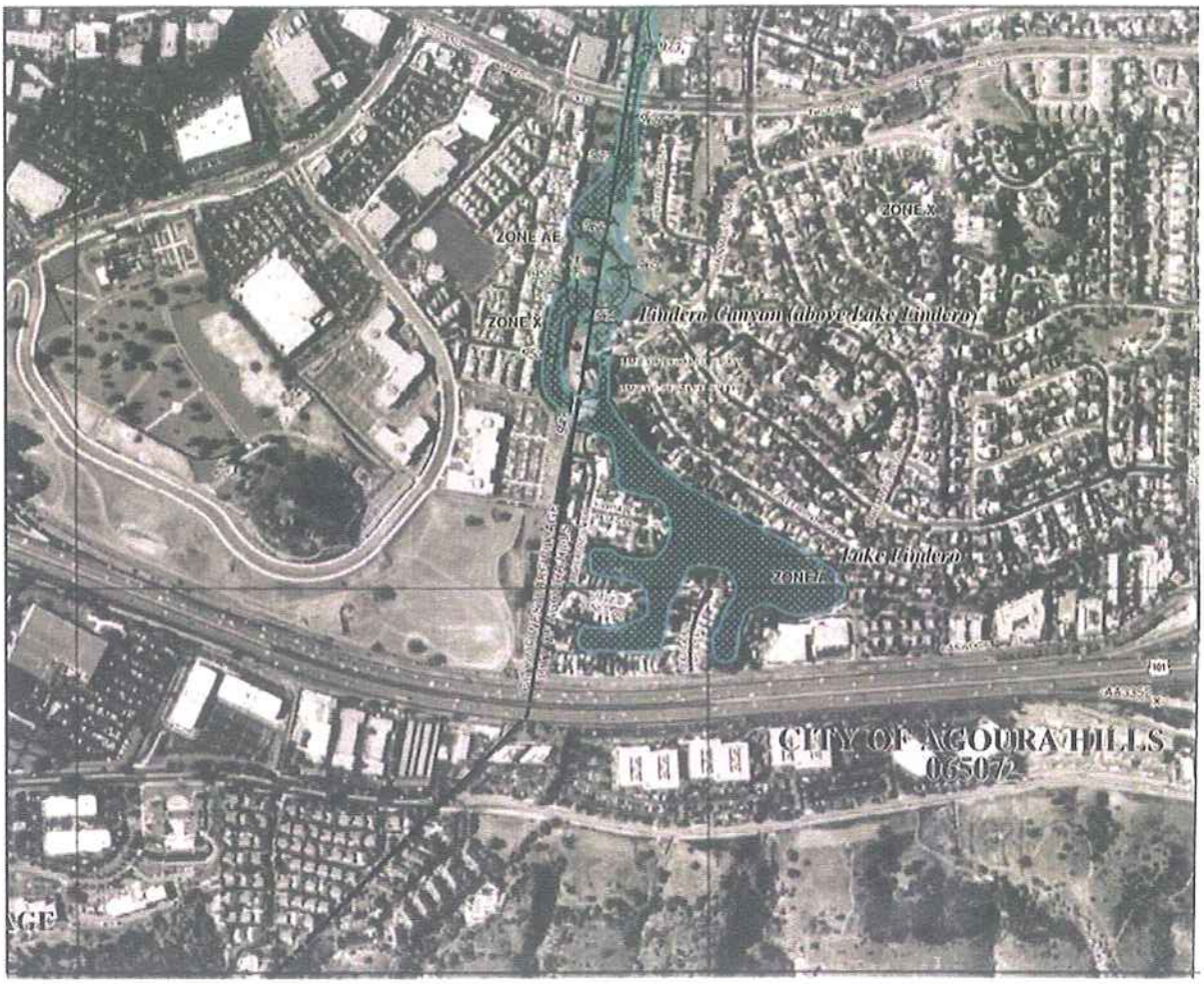
Map 98: Westlake Village FIRM Panel 1239 (1)



Map 99: Westlake Village FIRM Panel 1239 (2)

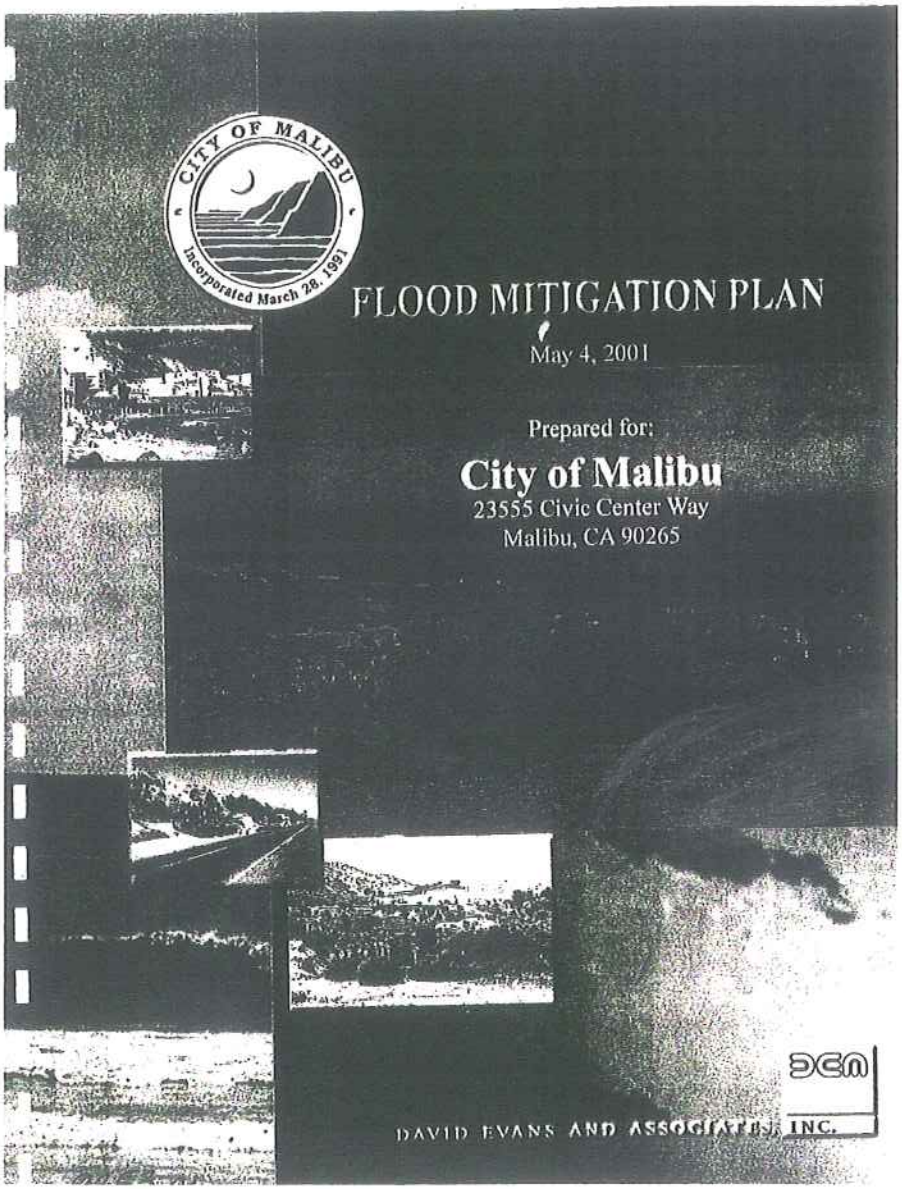


Map 100: Westlake Village FIRM Panel 1241



Map 101: Westlake Village FIRM Panel 1243

SECTION 18. ANNEX G: MALIBU FLOOD MITIGATION 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-

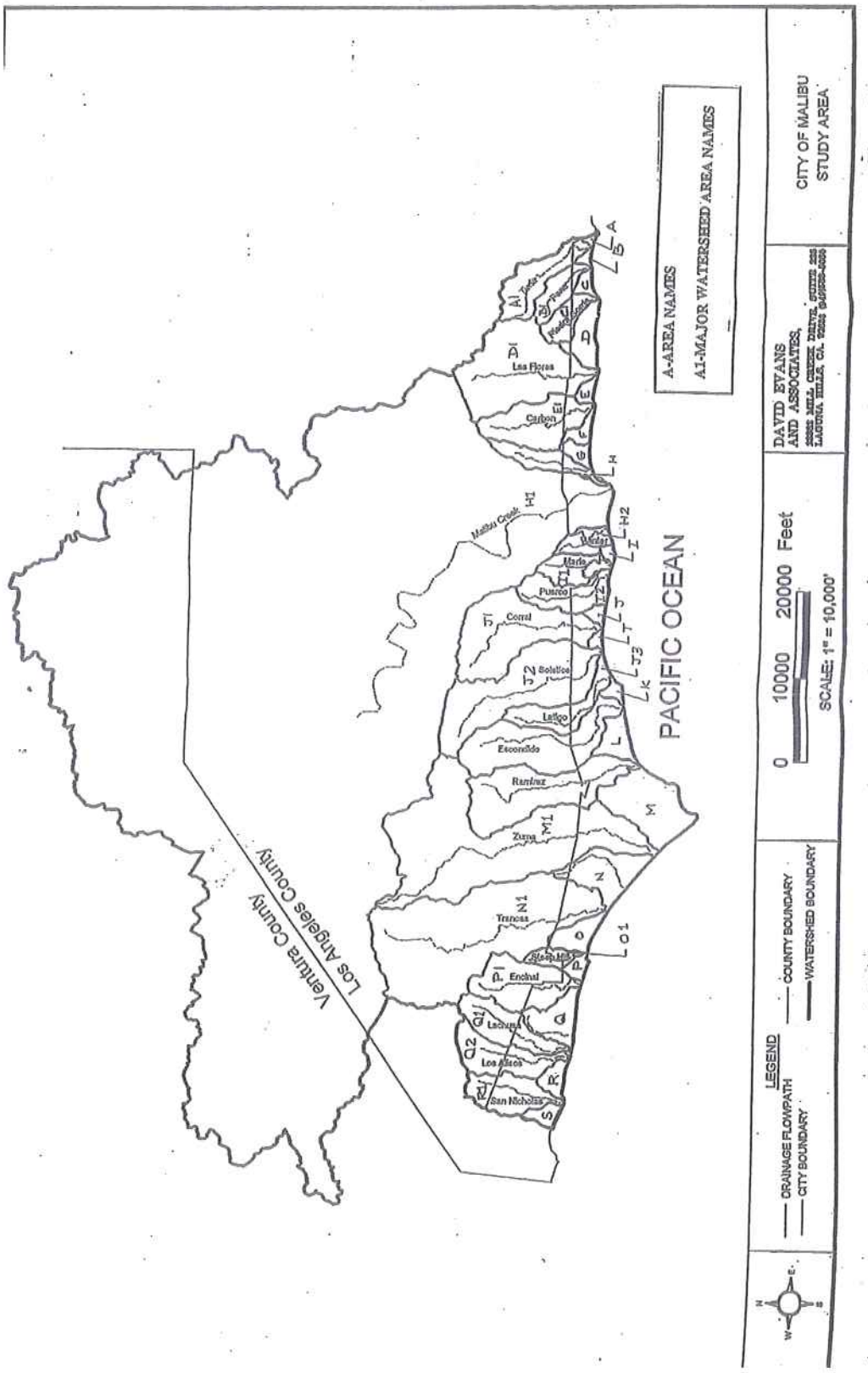
A-AREA NAMES
A1-MAJOR WATERSHED AREA NAMES
CITY OF MALIBU
STUDY AREA
DAVID EVANS
AND ASSOCIATES,
PACIFIC OCEAN
Malibu Creek
Las Flores
Carbon
Malibu
Marie
Puerco
Corral
Solstice
Latigo
Escondido
Ramirez
Zuma
Trancas
Encinal
Lechuza
Los Alisos
San Nicholas
Ventura County
Los Angeles County
0 10000 20000 Feet
SCALE: 1" = 10,000'
LEGEND
DRAINAGE FLOWPATH
CITY BOUNDARY
COUNTY BOUNDARY
WATERSHED BOUNDARY

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 f 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:

Canyon	Area (Acres)
• Trancas Canyon:	5,440
• Zuma Canyon:	22,600
• Ramirez Canyon:	4,360
• Escondido Canyon:	5,360
• Solistica 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_{50} 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 24th, 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 it's 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 then 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 (Plat 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 ACTIVITES

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.