

Repetitive Loss Properties



COUNTY OF LOS ANGELES Floodplain Management Plan

Malibu Lake Area

WRC Consulting Services, Inc.

July, 2007

Revised December 2009



County of Los Angeles

Floodplain Management Plan
for
Repetitive Loss Properties
in Los Angeles County

Malibu Lake Area

July 2007
Revised December 2009

Prepared for
County of Los Angeles
900 S. Fremont Avenue
Alhambra, California 91803-1331

Prepared by
WRC Consulting Services, Inc.
1800 E, Garry Avenue, Suite 213
Santa Ana, California 92705
(949) 833-8388

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ACKNOWLEDGEMENTS

Repetitive Loss Properties (RLP) are most susceptible to flood damages; therefore, they have been the focus of flood hazard mitigation. Unlike a countywide program, the floodplain management plan for RLPs involves highly diversified property profiles, drainage issues, and property owner's interest. It also requires public involvement processes unique to each RLP area. This FMP intends to serve as a living document for future reference to the flooding problems and mitigation potentials, and as implementation guidelines for all mitigation activities. The ultimate goal of this FMP is to protect flood-prone residences, reduce flood hazards, and eliminate future flood insurance claims.

The 2007 FMP, an update to the 2002 FMP, was prepared under the direction of the Los Angeles County (County) Watershed Management Division (Division). Assistance from the County Project Manager, Mr. Geoffrey Owu, P.E. MSC. as well as the participation of other County Departments, the State Office of Emergency Services (OES), and Malibou Lake Mountain Club are highly appreciated.

Lan Weber, P.E, Ph.D.
WRC Consulting Services, Inc.
Project Manager

1. INTRODUCTION

1.1 Project Objectives

The objective of this Floodplain Management Plan (FMP) is to provide specific mitigation measures and activities with continued compliance with the National Flood Insurance Program (NFIP) to best address the community's flood problems and needs associated with repetitive loss properties (RLPs). An RLP is one for which two or more claims of \$1,000 or more have been paid by the National Flood Insurance Program (NFIP) within a given ten-year period since 1978.

The prior FMP identified 19 RLPs within the unincorporated Malibu Lake area of Los Angeles County. Since that time, RLP No. 9 has been mitigated and another RLP has been identified, resulting in the total number of RLPs in the Malibu Lake area remaining at 19. Two additional properties (and) were included in the Hazard Mitigation Grant Program (HMGP) funding evaluation, but were not listed in the RLP database for this study (the RLP database used was current through the 2004-2005 rainy season). Figure 1.1 shows the location of the project study area within Los Angeles County, and Figure 1.2 shows the location of each RLP in relation to Malibu Lake. Table 1.1 provides a list of the RLPs and a summary of the flood insurance claims filed for each property. The FMP is also applicable to other "high risk properties" adjacent to the RLPs, which are subject to similar flood hazards.

The FMP was developed following the general requirements of the National Floodplain Insurance Program (NFIP) and specific procedures outlined in the Community Rating System (CRS) Coordinator's Manual (2006). Implementation of this plan will result in lower flood losses and improved protection of natural and beneficial floodplain functions. This plan will assist the community and repetitive loss property owners in understanding the flood hazards, identifying the problems, and deriving cost-effective and integral solutions for flood protection, stormwater management, and environmental protection.

As follow up to our Community Assistance Visit on June 8, 2005, we will continue to coordinate our floodplain management activities with the Federal Emergency Management Agency, State Department of Water Resources, and State Office of Emergency Services to provide better flood protection and mitigation measures to those homes located within flood hazard areas and identified RLPs. In addition, we will closely monitor and evaluate those properties identified during your visit and will continue to pursue any corrective actions necessary for the County to remain in good standing within the NFIP.

1.2 Previous Repetitive Loss Property Plan

Since October 1990, the County has been a voluntary participant in the CRS established by FEMA (Federal Emergency Management Agency). This program provides a discount on flood insurance premiums for property owners who are participating in the flood insurance program including those properties located within the designated Special Flood Hazard Areas defined by the Flood Insurance Rate Maps (FIRMS).

On March 31, 1992, the Los Angeles County Board of Supervisors adopted the "Repetitive Loss Plan for the National Flood Insurance Program CRS" for Los Angeles County, Community No. 065043. The plan was approved by FEMA for CRS Activity No. 510. The development and implementation of a "Floodplain Management Plan" is one of many recommended activities under the CRS.

FEMA requires that FMPs be updated every five years. This plan provides an update of the prior version, which was approved by FEMA on March 8, 2002.

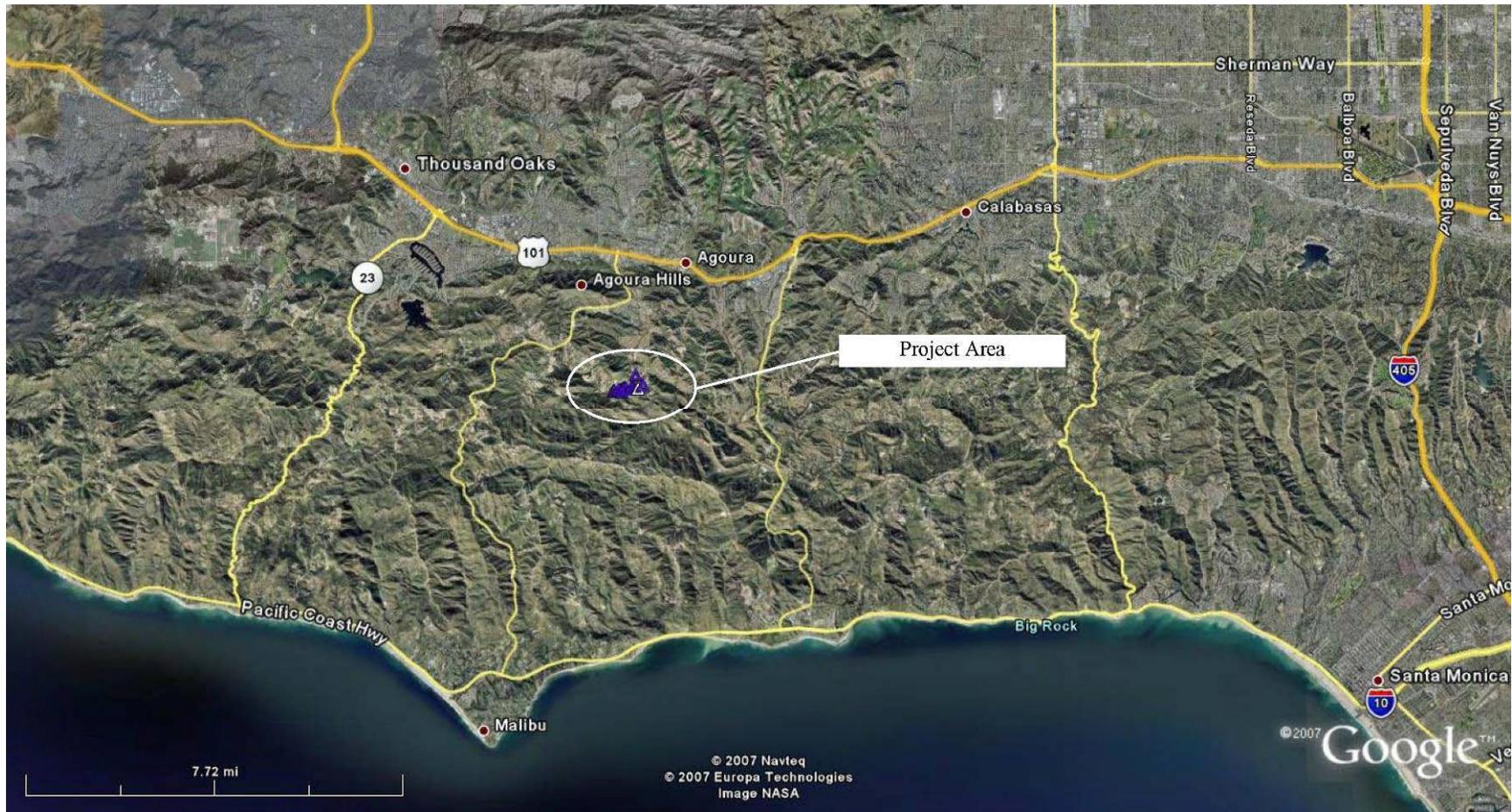


Figure 1.1
Malibu Lake Project Area

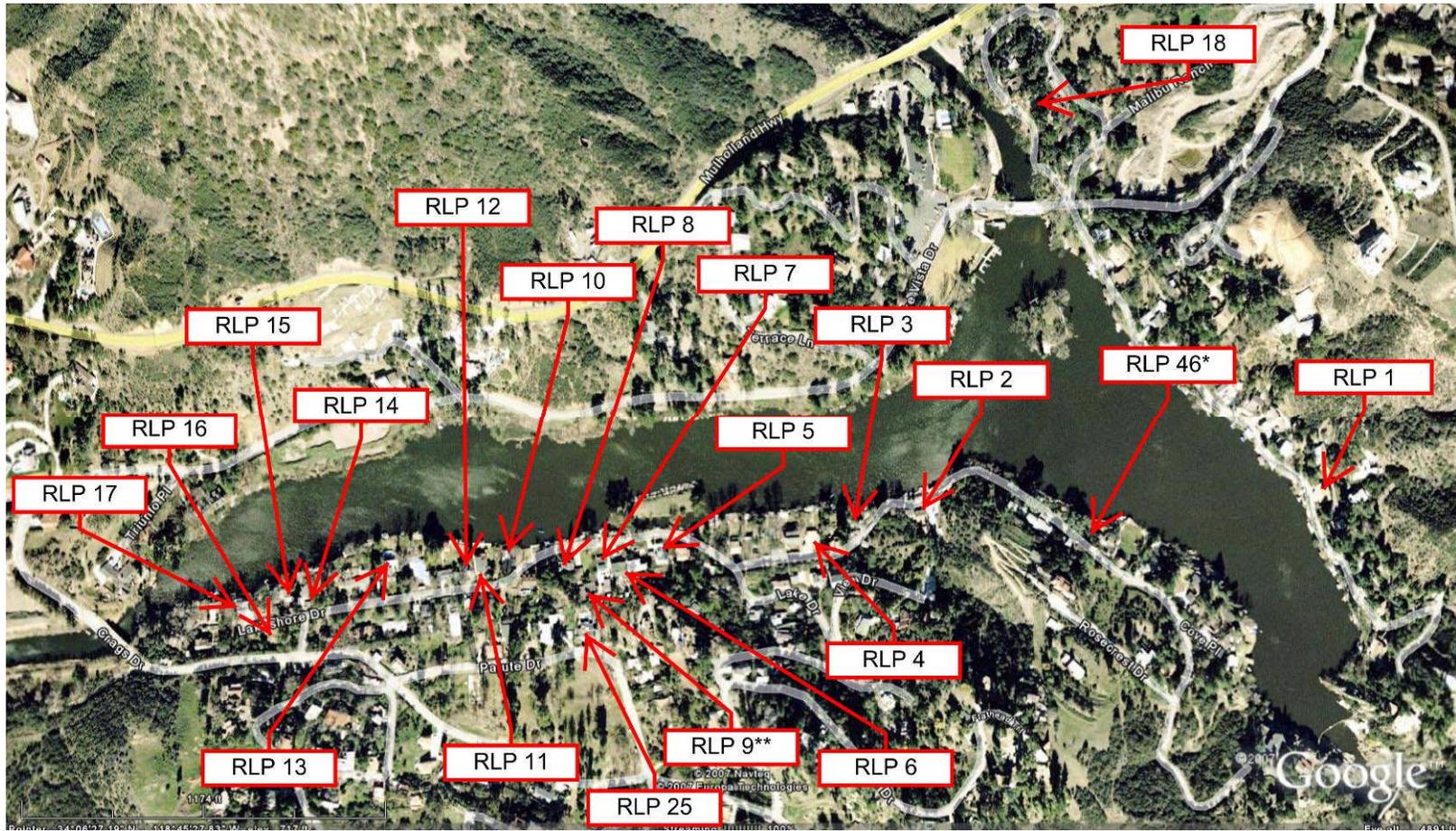


Figure 1.2
Location of RLPs – Malibu Lake Area

Key: * New RLP for 2007 FMP
** Mitigated RLP

**Table 1.1
 Repetitive Loss Properties Malibu Lake**

| RLP ID | Repetitive Loss # | City/Area | Flood History | Total Claims Paid |
|---------------|--------------------------|------------------|--|--------------------------|
| 1 | 0046576 | Agoura | 2/80, 3/83, 2/92, 2/93, 1/95, 3/95, 2/98 | \$47,441 |
| 2 | 0047197 | Agoura | 2/80, 3/83, 2/92 | \$16,615 |
| 3 | 0001165 | Agoura | 1/95, 3/95, 2/98, 1/01, 3/01, 2/03, 2/04, 1/05, 2/05 | \$125,521 |
| 4 | 0039962 | Agoura | 2/80, 2/92, 3/95, 2/98 | \$11,437 |
| 5 | 0028487 | Agoura | 3/78, 2/80 | \$18,796 |
| 6 | 0040087 | Agoura | 2/80, 3/83 | \$31,672 |
| 7 | 0012820 | Agoura | 2/92, 2/93, 1/95, 2/98, 3/01, 12/04, 1/05 | \$403,523 |
| 8 | 0049496 | Agoura | 3/82, 2/92, 1/95, 2/98 | \$39,168 |
| 9** | 0014896 | Agoura | 3/78, 2/80 (Mitigated) | \$45,587 |
| 10 | 0028444 | Agoura | 3/78, 2/80, 1/83, 3/83, 1/95, 3/95, 2/98 | \$111,010 |
| 11*** | 0071413 | Agoura | 2/92, 1/95, 3/95 | \$48,791 |
| 12 | 0073653 | Agoura | 2/92, 1/95 | \$130,462 |
| 13 | 0072406 | Agoura | 2/93, 1/95 | \$8,782 |
| 14 | 0071417 | Agoura | 2/92, 1/95, 2/98, 2/01 | \$14,639 |
| 15 | 0035727 | Agoura | 2/80, 1/83, 3/83, 2/92, 1/95, 2/98 | \$151,633 |
| 16 | 0052974 | Agoura | 2/80, 1/83, 2/83, 2/92, 1/95, 3/95, 2/98, 1/05 | \$104,106 |
| 17 | 0093872 | Agoura | 1/95, 2/98 | \$11,789 |
| 18 | 0057971 | Agoura | 3/83, 2/92, 1/95 | \$27,451 |
| 25 | 0091232 | Agoura | 2/98, 2/98, 1/05 | \$43,820 |
| 46* | 0137792 | Agoura | 3/01, 1/05 | \$3,114 |

* New RLP for 2007 FMP
 ** Mitigated RLP (based on FEMA records)
 *** Structure has been elevated based on 2002 FMP investigation but is still identified as an RLP.

1.3 Review of NFIP and CRS Community Participation

The NFIP provides federally supported flood insurance in communities that regulate developments in their floodplains. The CRS was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. The CRS reduces flood insurance premiums in those communities that do more than implement the minimum regulatory requirements.

The CRS encourages comprehensive planning to address the community's flooding problems and provides credit for preparing, adopting, implementing, evaluating, and updating a comprehensive FMP. The CRS does not specify what activities the FMP must recommend, but rather the process used to prepare the FMP.

Depending on the credit points received during CRS certification, a community can fall into one of ten classes: Class 1 requires the most credit points and gives the largest premium reduction, while Class 10 receives no premium reduction. The County's current CRS classification is 8. For Class 8, the credit points earned are 1,000 to 1,499 and the premium reduction is 10 percent. Preparation of the FMP will help the community to retain or improve the CRS classification.

Community application for the CRS is voluntary. Communities apply for a CRS classification and are given credit points that reflect the impact of their activities on reducing flood losses, improving the insurance rating, and promoting the awareness of flood insurance. Floodplain management planning is a principal activity of the County's compliance with the CRS. The CRS encourages programs and projects that preserve or restore the natural state of floodplains and protect these functions. The CRS also encourages communities to coordinate their flood loss reduction programs with Habitat Conservation Plans and other public and private activities that preserve and protect natural and beneficial floodplain functions. CRS credit criteria, scoring, and documentation requirements are described in the CRS Coordinator's Manual.

1.4 Overview of the FMP Procedure and Process

The FMP for the RLPs located within the Malibu Lake area of unincorporated Los Angeles County was prepared according to the process described in Activity 510 (Floodplain Management Planning) of the CRS Coordinator's Manual (2006 Edition). The FMP planning process involves review, research, investigation, discussion, interview, and consensus building. It includes receiving input from all parties involved and collaborating with existing and future regional programs that relate to flood hazard mitigation, such as land use plans, capital improvement plans, neighborhood redevelopment plans, floodplain ordinances, and environmental preservation/enhancement plans. The FMP for RLPs intends to address the site-specific problems and possible resolutions, under the authority of individual homeowners and/or their homeowner associations.

CRS credit is provided for preparing, adopting, implementing, evaluating, and updating a comprehensive floodplain management plan. Credit is not based on the activities the FMP recommends, but rather on the process that is used to prepare the FMP. To ensure compliance with the CRS program for flood reduction and to achieve the flood insurance premium credits, the subject FMP was prepared following the ten-step planning process described in Section 511, Credit Points, of the CRS Coordinator's Manual. A credit point summary, including the

maximum credit points for a full FMP (community-wide and RLP FMPs), is provided in Figure 1.3 for reference. Note that the FMP for RLPs only will receive 25% of the maximum credits shown below.

1.5 FMP Committee

The development, modification, and revision of the FMP are accomplished through the direction and oversight of an FMP Committee. FEMA places a high priority on the establishment of a committee that consists of residents, businesses, and property owners that are most affected by flood hazards. The County has maximized the involvement of the public throughout the FMP process.

The internal FMP Committee members are composed of various divisions of the Los Angeles County Department of Public Works including Water Resources, Watershed Management, Land Development, Regional Planning, Building and Safety, and Program Development.

Mr. Frank Williams, a civil engineer P.E. of the Los Angeles County Public Works Department, chaired the FMP Committee in 2002. The 2007 FMP update was prepared by senior planners and engineers of WRC Consulting Services, Inc. under the guidance of Dr. Lan Weber, the “Qualified Planner”. Dr. Weber provides expertise in watershed analysis, floodplain management, and flood hazard mitigation. She has more than 25 years of related project experience. The FMP process was supervised by Mr. Geoffrey Owu of Los Angeles County Watershed Management Division, who is currently the NFIP coordinator of the County. Mr. Owu has participated in the 2002 FMP development and implementation and has served as the liaison between the County FMP Committee members and the RLP owners and communities.

511 Credit Points. Up to 359 points are provided for three elements.

- a. Up to 294 points are provided for adopting and implementing a floodplain management plan (FMP) that was developed using the following standard planning process. There must be some credit for each of the 10 planning steps.

| <u>Step</u> | <u>Max points</u> |
|-------------------------------------|-------------------|
| 1. Organize to prepare the plan | 10 |
| 2. Involve the public | 85 |
| 3. Coordinate with other agencies | 25 |
| 4. Assess the hazard | 20 |
| 5. Assess the problem | 35 |
| 6. Set goals | 2 |
| 7. Review possible activities | 30 |
| 8. Draft an action plan | 70 |
| 9. Adopt the plan | 2 |
| 10. Implement, evaluate, and revise | 15 |

- b. Up to 50 points are provided for conducting repetitive loss area analyses (RLAA).
c. Up to 15 points are provided for adopting and implementing a Habitat Conservation Plan (HCP).

Figure 1.3 Credit Summary

Source: 2006 CRS Coordinator’s Manual

2. BACKGROUND

2.1 Watershed and Drainage

Malibu Lake is located in the western area of Los Angeles County near the Ventura County/Los Angeles County line (Figure 2.1). The contributing watershed starts in Hidden Valley in Ventura County, approximately 10 miles northwest of Malibu Lake. Storm runoff enters the ungated Lake Sherwood and flows through Potrero Valley Creek, Westlake Lake, Triunfo Canyon Creek, and empties into Malibu Lake. Westlake Lake is located approximately 4.7 miles northwest of Malibu Lake and is in both Ventura County and Los Angeles County (as shown in Figure 2.1). Malibu Lake also receives runoff from Medea Creek, a major tributary located to the north of the lake. The total drainage area at the spillway of Malibu Lake is approximately 64 square miles.

The lake has a surface area of approximately 20 acres at spillway elevation. The contributing watershed covers portions of Los Angeles County and Ventura County and crosses three city boundaries - Thousand Oaks, Agoura Hills, and Westlake Village. The watershed basin map and drainage studies conducted by the County of Los Angeles are included in Appendix A of the 2002 FMP.

2.2 Population and Land Use Cover

The community of Malibu Lake lies within the western portion of Los Angeles County in the Agoura Hills area. There are 19 residences (Figure 1.2 and Table 1.1) that have records of repetitive flood insurance loss claims and are unmitigated. Except for Property Nos. 25 and 18, all properties are located along Lakeshore Drive, which encircles the lake. Malibu Lake is a private lake owned by the "Malibu Lake Mountain Club," a California corporation, hereinafter referred to as the "Mountain Club". The Mountain Club licenses building lots to individual license holders, who can then construct homes, which they can own, but they cannot hold title to the land. All RLPs are on Mountain Club property except for property No. 25, which belongs to the Malibu Lakeside Club.

The land use in this area consists of undeveloped mountain ranges and developed urban areas near the lake. According to estimates by the Mountain Club, this area has a population of 9,000.

3. HAZARD ASSESSMENT

3.1 Sources of Flooding

Triunfo Canyon Creek and Medea Creek are major sources of Malibu Lake flooding. There are 16 RLPs (Nos. 1, 3-8, 10-17 and 46) located within the low-lying areas surrounding the lake. The lake elevation could rise to 734 feet for a 100-year flood according to both FEMA and the County of Los Angeles, which is up to 10 feet higher than the base floor elevations of these properties. The lake elevation was estimated at 736.19 feet by the County considering debris blocking due to fire burn in the watershed.

RLP No. 2 is located by the lake but is at higher elevations than the 100-year flood level. This property is subject to local runoff flooding from the hillside in the back of the house. RLP No. 18

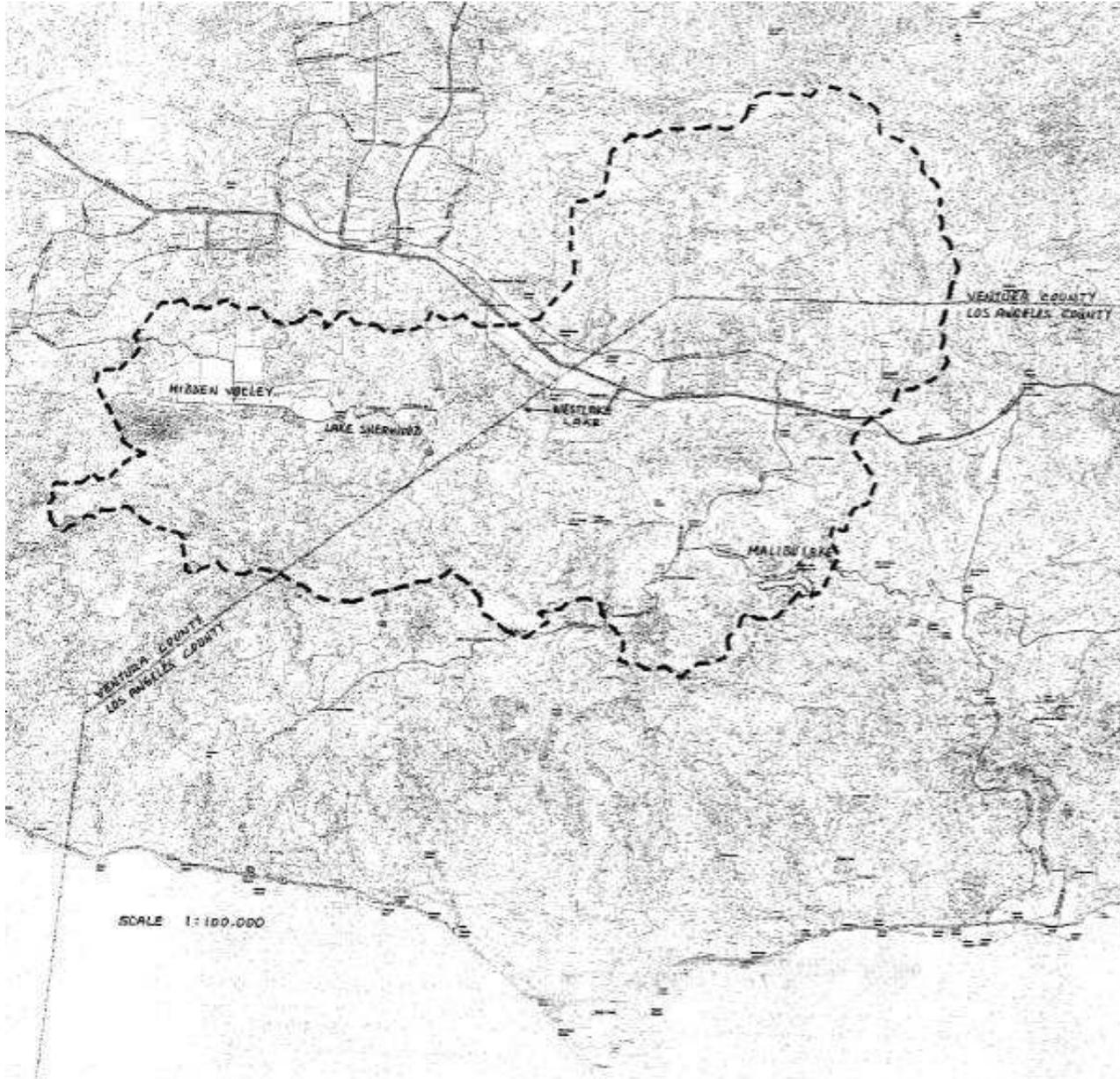


Figure 2.1
Malibu Lake Watershed Map

is located along Medea Creek, and the flooding sources could be the backwater from Malibu Lake and/or floodwater overflow from Medea Creek. The flooding source for RLP No. 25 is the storm runoff generated from the hillside areas south and east of the residence. This runoff is collected by an undersized storm drain ditch and pipe culvert under the street, which can cause overflow to the property immediately adjacent to the drain. In addition to being located in a low-lying area surrounding the lake, RLP No. 46 receives runoff from the adjacent street and properties to the south.

3.2 Flooding History

There has been a history of flooding in the Malibu Canyon area. Table 1.1 shows the flooding events (with insurance claims) since the 1977/78 rainy season. Between the 1977/78 and 2004/05 rainy seasons, flooding to one or more properties has occurred in 12 of the years. Every property has been flooded at least twice during this time frame with RLP No. 3 having been flooded nine times.

Flood frequency analysis for historical floods occurring in Los Angeles County was conducted using United States Geological Survey (USGS) gaging station data. A USGS gaging station is located at Malibu Canyon at Crater Camp near Calabasas area (Station No.11105500), but only maintains streamflow records from 1931 to 1979. The USGS gaging station at Arroyo Seco near Pasadena (Station No.11098000) has been in operation since 1914. Since this gaging station is the only nearby station in the project vicinity which has long-term and recent flood measurements, the annual peak data of this station was used to identify the return periods of the past flood events shown in Table 1.1. Log Pearson Type III method was applied. The flood frequency analysis is included in Appendix A.

Table 3.1 provides a summary of the flood frequency for the peak discharge during the relevant flooding incidents and the number of properties that claimed flood damages. Note that the number of claims did not correspond to the magnitude of the flood.

| Table 3.1 – Flood Frequencies for RLP Claims | | |
|--|---------------------|-----------------------------------|
| Rain Season | Flooding Frequency* | No. of RLP Claims / No. of RLPs** |
| 1977/78 | 20-yr storm | 3 / 3 |
| 1979/80 | 10-yr storm | 9 / 9 |
| 1982/83 | 9-yr storm | 10 / 7 |
| 1991/92 | 5-yr storm | 11 / 11 |
| 1992/93 | 5-yr storm | 3 / 3 |
| 1994/95 | 5-yr storm | 19 / 14 |
| 1997/98 | 18-yr storm | 12 / 11 |
| 2000/01 | 2-year storm | 5 / 4 |
| 2002/03 | 2-year storm | 1 / 1 |
| 2003/04 | 3-year storm | 2 / 2 |
| 2004/05 | 13-year storm | 6 / 5 |
| 1978/79, 80-82, 83-91, 93/94, 95-97, 99-00 | Below 3-yr storm | 1 |
| * Based on USGS Gaging Station 11098000 (1914 to 2006 data) | | |
| ** Some of RLPs filed multiple claims within the same rainy season (See Table 1.1) | | |

3.3 Recent Problems

According to the insurance claims filed by the RLP owners, the most recent flood event was in 2004/05 when 6 claims were filed. Table 1.1 shows flooding events experienced by each RLP in the Malibu Lake area.

4. PROBLEM IDENTIFICATION

4.1 FEMA Floodplains/County Capital Floodplain

Most RLPs are located within the Special Flood Hazard Zone "A-11" as shown on FEMA's Flood Insurance Rate Map (FIRM) No. 065043-0757B (Effective December 2, 1980). The 100-year water surface at the lake is shown at elevation 734 feet. Reproduction of the FEMA map is presented as Figure 4.1.

According to the Flood Insurance Study (FIS), published by FEMA, the Flood Insurance Zone "A-11" is the Special Hazard Area, inundated by the 100-year flood, with base flood elevations determined by the detailed study. The Flood Hazard Factor (FHF) of the area is determined to be 11, which is the difference between water surface elevations of the 10-year and 100-year floods, multiplied by 10.

The County of Los Angeles conducted two separate hydrology studies on the Malibu watershed that were incorporated into the previous FMP for the Malibu Lakes area. The first (April 2000) study assumed a clear (unburned) inflow hydrograph to the lake. The second (June 2001) study assumed a 'burned' watershed condition with 'bulked' flow downstream of Lake Sherwood (upstream hydrology model study performed by Ventura County assumed clear water flow). Both studies and a complete watershed map for Malibu Lake are included in Appendix A of the 2002 FMP.

As part of the hydrology study, the County of Los Angeles conducted a reservoir routing analysis in April 2000 to determine water surface elevations under the 100-year and Capital Flood conditions. The estimated water surface for the FEMA 100-year flood and Capital Flood are 733.83 feet and 734.93 feet, respectively. The estimated 100-year flood elevation of 733.83 feet is approximately the same as the 734 feet determined by FEMA. Reservoir routing was performed based on the top of Malibu Lake dam spillway elevation of 722.18 feet (based on NGVD 1929 Datum). Copies of the reservoir routing conducted by Los Angeles County and its survey datum description are included in Appendix A of the 2002 FMP. The flooding boundaries under the Capital Flood conditions, as determined by the County of Los Angeles using the prior studies, are presented in Figure 4.2.

Table 4.1 summarizes the clear and bulked flow rates of Malibu Lake and the water surface elevations resulting from reservoir routing performed by the Water Resources Division of the Los Angeles County, Department of Public Works. The spillway modification data were provided by Carl Day, AIA and Associates. The County applied the Modified Rational Method to the Malibu Lake watershed in order to determine flow rates for the 10-, 50-, 100-, and 500-yr frequency design storms (see Appendix A and Table 4.1). Comparing the flow rates generated by

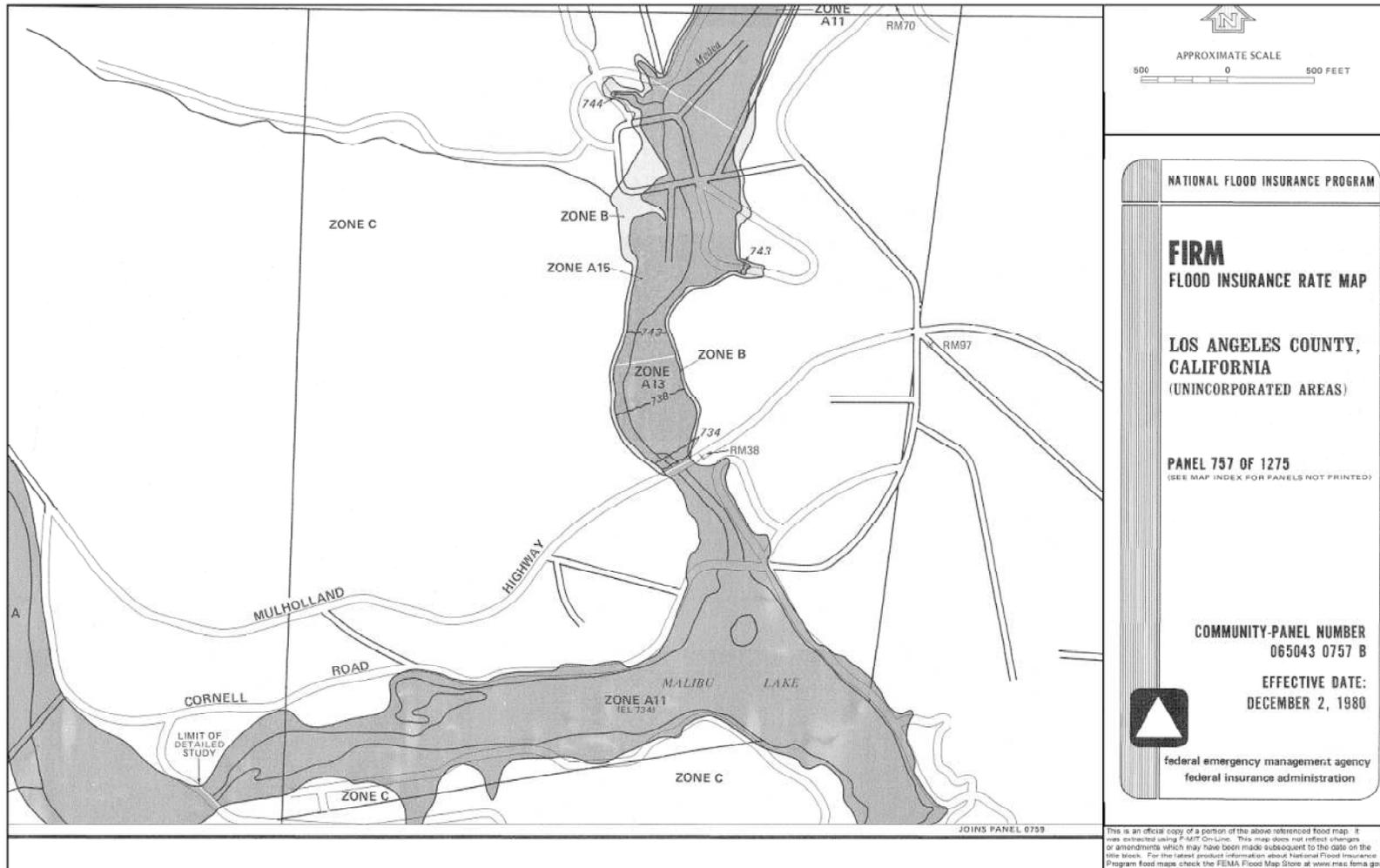


Figure 4.1
FEMA FIRM – Malibu Lake Area

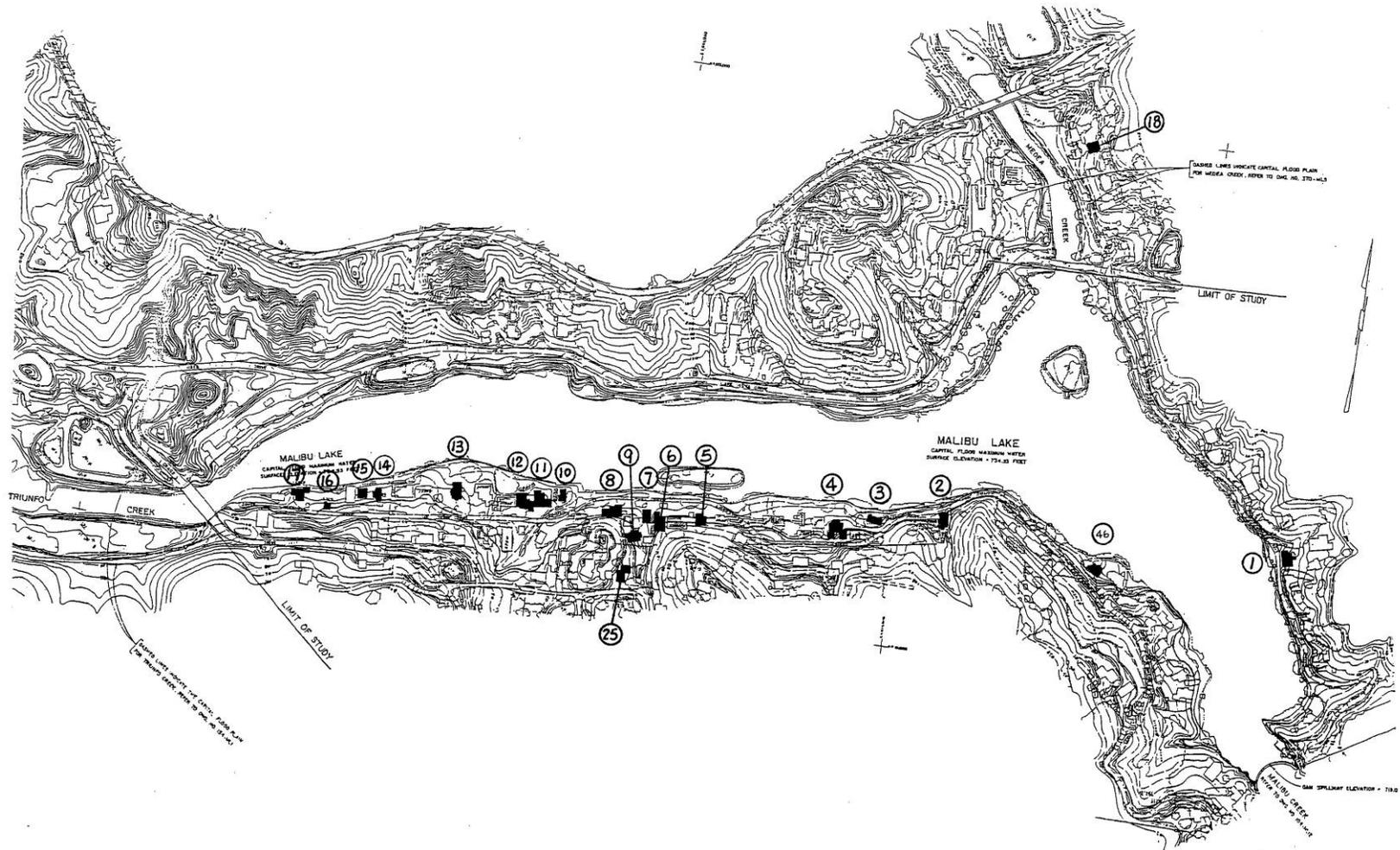


Figure 4.2
Location of RLPs Relative to Capital Flood Boundaries

Table 4.1
Los Angeles County and FEMA Flow Rates

| Los Angeles County Department of Public Works Clear Flow Rates | | | | |
|---|-------------------|--------------------|--|-----------------------------|
| Design Storm Frequency | Peak Inflow (cfs) | Peak Outflow (cfs) | Maximum Water Surface Elevation (feet) | Maximum Storage (acre-feet) |
| 10-year | 18,800 | 16,000 | 730.72 | 438.42 |
| 50-year | 33,900 | 29,000 | 734.55 | 758.32 |
| 100-year | 40,500 | 34,300 | 735.94 | 894.69 |
| 500-year | 57,000 | 47,300 | 739.04 | 1,253.29 |
| Los Angeles County Department of Public Works Burned Watershed Condition Flow Rates | | | | |
| Design Storm Frequency | Peak Inflow (cfs) | Peak Outflow (cfs) | Maximum Water Surface Elevation (feet) | Maximum Storage (acre-feet) |
| 10-year | 22,200 | 19,300 | 731.77 | 516.48 |
| 50-year | 38,200 | 33,000 | 735.61 | 862.00 |
| 100-year | 45,000 | 38,500 | 736.98 | 1,009.56 |
| 500-year | 63,100 | 52,900 | 740.29 | 1,413.05 |
| FEMA Flow Rates | | | | |
| Design Storm Frequency | Peak Inflow (cfs) | Peak Outflow (cfs) | Maximum Water Surface Elevation (feet) | Maximum Storage (acre-feet) |
| 10-year | 11,900 | 10,200 | 728.59 | 291.39 |
| 50-year | 26,600 | 23,200 | 732.93 | 612.43 |
| 100-year | 34,000 | 29,600 | 734.72 | 774.63 |
| 500-year | 53,700 | 46,300 | 738.81 | 1,224.72 |

the Modified Rational Method to those published by FEMA (for the Malibu Lake location) shows that the Capital Flood peak discharges generated by the Modified Rational Method (using County 2002 Hydrology Manual 50-year storm rainfall data) are generally larger than the 100-year flood discharges estimated by FEMA. Table 4.1 shows that the County clear water and watershed burned condition flow rates are typically higher than the FEMA flow rates for a given flood event. The lake water surface elevation for Capital Flood estimated in 2004 (734.55 msl) with spillway modification is slightly lower than the previously estimated elevation (734.93 msl) mentioned in the 2002 FMP. The lower lake elevations will benefit most RLPs in reducing potential flood damages and mitigation.

4.2 Field Investigation

To identify specific flood problems associated with each RLP, the 2002 RLPs (RLP Nos. 1-25 and 25) were visited in 2000 and 2001 and documented in Appendix B of the 2002 FMP for the Malibu Lake area. RLP No. 18, located along Medea Creek, and RLP No. 1 were unreachable, and their information was provided by the Mountain Club. RLP No. 46 was investigated on March 26, 2007. Field photographs, topographic features, and key findings of the field investigation are documented in Appendix B of this FMP. RLP No. 14 was visited and documented previously and was revisited on March 26, 2007. This property is in the process of mitigation implementation.

The following issues were investigated during the field visits: location of each property, contributing drainage area, grading and drainage pattern, problems contributing to previous damages, physical conditions of the structures, and surrounding environments. The elevation of structures relative to inflows (including those from neighboring properties and streets) was investigated in detail. Appendix B provides field photographs, topographic features, adjacent creeks/channels, and key findings of the field investigation.

During the 2001 and 2007 field visits, it was found that most of the RLPs on South Lakeshore Drive were built on the low-lying lakefront, which is very vulnerable to floodwater from the lake during rainstorms. There are a few pipe culverts that discharge stormwater toward existing properties, but the problems are limited, and the Mountain Club has committed to fixing these local problems. RLP Nos. 2 and 25 are much higher than the lakefront properties, and their flooding problems are not associated with lake flooding. RLP No. 11 has been elevated and the flood damage risk has been significantly reduced. The elevation certificates for this property (Appendix B.2) shows the first habitable floor has been elevated above the Capital Flood elevation under the burned watershed condition. Flood problems are considered "fixed" and no further notification is required.

The buildings have been modified several times, since most of the houses were built prior to the 1960s. Most houses visited have different parts of the house on concrete slabs at various elevations. Several houses have shown significant deterioration in the structural component. Elevating structures above the base flood elevation, as typically suggested by FEMA for retrofitting the flood-damaged properties, may be difficult.

The owner of RLP No. 46 was interviewed during the field investigation and the interview results were incorporated to update and supplement the information obtained from field observations. This property's damage was related to street runoff. The property elevation is

relatively low compared to the nearby streets which collect flows from the local area.

4.3 Causes of Flood Damages

Causes of flood damages to the Malibu Lake area RLPs were analyzed based on field investigation, data review, interviews with homeowners and the Mountain Club, and engineering analysis. The results of the findings are presented in Table 4.2 and described in the following paragraphs.

Most of the RLPs in this area are damaged by rising water of Malibu Lake during floods. Malibu Lake lies at the confluence of Triunfo Canyon and Medea Creek. The terrain in this area is steep and rocky, causing rainwater to concentrate at the lake quickly. In addition, upstream urbanization has caused a higher discharge at the lake for a given rainstorm event due to the increase in impervious areas. The existing lake has an estimated surface area of 20 acres and a total storage volume of 250 acre-feet at the current spillway elevation (722.184 feet NGVD 1929 datum). The storage area below the spillway is ineffective for flood peak attenuation during normal times since the water level is maintained at the spillway elevation at all times. During flood events, the lake is partially filled with sediments, reducing its recreational functions. No formal hydrology and hydraulic reports were found regarding the lake effect on the flood level. It was reported by the Mountain Club that the lake storage volume is simply too small to provide flood attenuation compared to the estimated runoff volume entering the lake.

The original spillway was 120 feet wide with significant embankment at 722 feet mean sea level. In 1969, the Mountain Club widened the spillway to 155 feet to increase the spillway outflow capacity. The spillway was again widened to 188.2 feet in 1997. In addition, a 31-foot wide auxiliary spillway was constructed in 1997 to release floodwater in excess of 8 feet over the main spillway. The County lowered inundation elevation estimates slightly in 2004, as shown in Appendix A and Table 4.1, based on the spillway modification data provided by Carl Day, AIA and Associates. These modifications helped to lower the water surface; however, the improvement is not sufficient to reduce the flood inundation risk for the RLPs.

RLP No. 18 was damaged by floodwater from Medea Creek. The high water along Medea Creek could be a result of backwater at Malibu Lake. RLP No. 2 is on high ground and was flooded by the storm runoff from the surrounding hills. RLP No. 25 was flooded by overflows from a deficient storm drain ditch east of the house. The storm runoff from the ditch could not pass the undersized pipe culvert located under the street immediately southeast of the house. The overflow from the storm drain ditch could enter the property and damage the house. RLP No. 46 was damaged from storm flows entering the property from the street, which at a much higher elevation than the house.

4.4 Hydrology Related to Flood Damaged Properties

Peak discharge rates for the RLPs are shown in Table 4.3. The 100-year flood peak discharge was once estimated by the state as 20,900 cfs (State of California Department of Public Works, Division of Water Resources, 1930, see Appendix A of 2002 FMP). This discharge value has been significantly increased to 34,000 cfs as estimated by FEMA. The County of Los Angeles

**Table 4.2
 Flooding Causes – Malibu Lake Area RLPs**

| RLP ID | Causes | Problem | No Problem |
|---------------|--|----------------------------|-------------------|
| 1 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 2 | Hillside backyard drainage | X | |
| 3 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 4 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 5 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 6 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 7 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 8 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 9 | Inundated by a rising water of Malibu Lake during the storm | Mitigated per FEMA records | |
| 10 | Inundated by a rising water of Malibu Lake during the storm | Mitigation in progress | |
| 11 | Inundated by a rising water of Malibu Lake; The house has been elevated above 736.19 ft msl (Capital Flood Elevation, 2002). | | X |
| 12 | Inundated by a rising water of Malibu Lake during the storm | Mitigation in progress | |
| 13 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 14 | Inundated by a rising water of Malibu Lake during the storm | Mitigation in progress | |
| 15 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 16 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 17 | Inundated by a rising water of Malibu Lake during the storm | X | |
| 18 | Floodwater from Medea Creek | X | |
| 25 | Capacity of storm drain culvert located near the property is undersized and causes overflow to the street and property privacy protection; this information is available from the County NFIP representative | X | |
| 46 | Storm flows from street in front of house | X | |

Table 4.3
100-yr FEMA and County Capital Discharges

| RLP ID | Watershed Area | | FEMA 100-yr Q | Capital Q (clear/burned) | 50-yr Capital Storm |
|--------|----------------|----------------------|---------------|--------------------------|---------------------|
| | (acres) | (mile ²) | | | |
| 1 | | | 34,000 | 33,900 / 38,200 | |
| 18 | 1.5 | 0.0024 | N/A | N/A | 7.8 |
| 3 | | | 34,000 | 33,900 / 38,200 | |
| 4 | | | 34,000 | 33,900 / 38,200 | |
| 5 | | | 34,000 | 33,900 / 38,200 | |
| 6 | | | 34,000 | 33,900 / 38,200 | |
| 7 | | | 34,000 | 33,900 / 38,200 | |
| 8 | | | 34,000 | 33,900 / 38,200 | |
| 9 | | | 34,000 | 33,900 / 38,200 | |
| 10 | | | 34,000 | 33,900 / 38,200 | |
| 11 | | | 34,000 | 33,900 / 38,200 | |
| 12 | | | 34,000 | 33,900 / 38,200 | |
| 13 | | | 34,000 | 33,900 / 38,200 | |
| 14 | | | 34,000 | 33,900 / 38,200 | |
| 15 | | | 34,000 | 33,900 / 38,200 | |
| 16 | | | 34,000 | 33,900 / 38,200 | |
| 17 | | | 34,000 | 33,900 / 38,200 | |
| 2 | | | 34,000 | 33,900 / 38,200 | |
| 25 | 17.1 | 0.03 | N/A | N/A | 88 |
| 46 | 7.3 | 0.011 | N/A | N/A | 29 |

NOTES:

- FEMA Discharge rates & County's Capital Qs were provided by the County of Los Angeles and prorated based on the drainage areas, if necessary.*
- 50-yr & 100-yr Q for the concentration points near the RLP sites were determined based on the Rational Method of the Los Angeles County Department of Public Works Hydrology Manual. The TC values for RLP Nos. 40 and 42 were determined using the maximum applicable drainage area of 40 acres.*
- Hydrology estimates presented in this table are for mitigation needs assessment only and can not be used for design or other study documentation without consultation with WRC and the County.*

estimated the Capital Flood (50-year design storm) discharges as 33,900 cfs for clear water conditions and 38,200 cfs for the "burned" watershed conditions (see Table 4.1).

In order to assess the magnitude of flows at properties which are not related to the Malibu Lake flood level, 100-year peak discharges for RLP No. 2 and RLP No. 25 were estimated and are shown in Appendix A of the 2002 FMP. The estimated 100-year local runoff for RLP No. 2 is 8.6 cfs, which appears to cause drainage problems at the property site. The estimated 100-year peak discharge for the storm drain near RLP No. 25 is 96 cfs, which exceeds the hydraulic capacity of the existing pipe culvert/ditch, thus causing significant overflow.

For this FMP update, the discharge rate affecting RLP No. 46 was estimated by applying the Rational Method as described in the Hydrology Manual of the Los Angeles County Department of Public Works. The methodology primarily depends on three factors: total drainage area, runoff coefficient of the area, and rainfall intensity. The runoff coefficient and rainfall intensity were determined from the Hydrology Manual, drainage map, and data gathered from field visits. The drainage area was obtained using the topographic features of the area, the existing street conveyance, and storm drain interception.

4.5 Buildings

Of the two main roads that encircle Malibu Lake, South Lakeshore Drive has been impacted the most from the lake overflow. During storms, homes on the shore side of South Lakeshore Drive are most vulnerable to flooding. The buildings are either one- or two-story residential houses on concrete slab, raised foundation, or a combination of the two. Since this is a rural area, no critical facilities or buildings are located here.

In addition to RLPs, there are other residential properties that may have been affected by past floods or are subject to future flooding. Although these properties did not file claims more than twice within any given 10-year period since 1978 as the RLPs did, the potential for flood damage should be noted. These will be included as "high risk properties" to be monitored by the County of Los Angeles for future flood damage reduction (see Section 10).

There are 16 RLPs that have been damaged by Malibu Lake flooding. Figure 4.2 shows these RLPs and other "high risk properties" within the Capital Floodplain boundaries of Malibu Lake. For comparison, Figure 4.1 shows the FEMA 100-year floodplain. Approximately thirty-one (31) "high risk properties" could be partially affected by the inundation of Malibu Lake in addition to the current RLPs.

The "high risk properties" near the Malibu Lake area were approximated by analyzing the topographic maps and aerial photos of the Lake which show the locations of building structures. FEMA's FIRM shows the 100-year flood elevation of the lake to be 734 feet, while the County's 2006 study identifies the Capital Flood to be 735.61 feet for burned conditions and 734.55 for clear conditions. Floodplain boundaries and "high risk properties" are similar for all these elevations.

A similar analysis was conducted for the floodplain boundaries for Medea Creek, a tributary to the lake. This analysis indicates approximately three more properties in addition to RLP No. 18 could be affected by flooding in Medea Creek.

One other property in the vicinity of RLP No. 25 near Paiute Drive may have been affected by the same flooding source from the hillside. RLP No. 2 was previously damaged by backyard hillside erosion. The source of the problem was specific to this RLP, and no other "high risk properties" were identified nearby, based on the current information available.

Three properties, which are not on the current FEMA's list of RLPs, suffered damages from the most recent flood event in 1995 (see Section 3.3). Two of those properties (ID Nos. 26 and 28) were identified to be among the "high risk properties".

A summary of the numbers of "high risk properties" in the Malibu Lake area, including Medea Creek area, which may have been affected by the same problem sources as the current RLPs, is shown in Table 4.4.

| RLP ID | Localized Source of Problem | | Number of Other Properties Possibly Affected by Same Problem | Description of Problem (non-localized problem sites only) |
|------------|-----------------------------|----|--|---|
| | Yes | No | | |
| 1 & 3 - 17 | | X | 31 | Malibu Lake flooding |
| 2 | X | | 0 | |
| 18 | | X | 3 | Medea Creek flooding |
| 25 | | X | 1 | Flooding from hillside |
| 46 | X | | 0 | |

4.6 Insurance Claims and Disaster Assistance Applications

The flood insurance claim history has been presented and summarized in Table 1.1. The County of Los Angeles obtained federal funding under the category of Hazard Mitigation Grant Program (HMGP). The County requires the construction of a new sewer system before modification and elevating of the RLPs along the low-lying area. Existing septic tanks must be abandoned and a new sewer system must be constructed prior to any structural retrofit or new construction for these RLPs in the low-lying areas. The Mountain Club has committed to funding the sewer construction and is obtaining the County's approval for construction.

Six RLPs were approved for grants, as listed in the table for HMGP Grant Status in Appendix D. RLP Nos. 10, 12, and 14 were the first phase grant recipients. These owners have been approved for building and grading permits and their sewer connection and services are in place. Mitigation implementation is underway with completion expected by the end of 2007 to receive the funding. RLP Nos. 3 and 6 (together with the property at) received phase two grant approval. However, the delay in establishing sewer service for these properties may jeopardize their funding eligibility. The County plans to reapply for grant funding to assist these and other RLP owners who are interested in future funding.

4.7 Flood Warning and Emergency Management

Neither the County nor Mountain Club has any current device or program for flood warning and emergency management.

4.8 Critical Facilities

There are no critical facilities in the Repetitive Loss Area of Malibu Lake.

4.9 Development (Land Use) and Growth Trends

As stated above, upstream development has increased significantly in past decades. Developments are expected to continue in the metropolitan areas of Agoura Hills, Thousand Oaks, and Westlake. Within the County jurisdiction, there has been very limited current or proposed land development upstream of or near Malibu Lake. The County has been enforcing environmental policy, which requires the upstream developments to identify potential impacts such as the runoff increase to the downstream properties.

No new lakefront lots have been developed since 1980. Any new developments are away from the shoreline and are all single-family residences. Since 1980, the County has required that the finished floor elevation of any new homes in Malibu Lake be specified to be a minimum of one foot above the Capital Flood Elevation. The minimum first habitable floor elevation was 736 feet msl based on the April 2000 hydrology study, which is equal to 2 feet above the 100-year base flood elevation). In consideration of the "bulked" flow Capital Flood elevation (736.19 msl based on the 2001 hydrology study and 735.61 msl based on the 2004 estimates, see Section 4.1), the County decided to waive the one-foot freeboard criteria above the Capital Flood and maintain the new Capital Flood elevation for building control.

4.10 Community and Economic Impact Assessment

The economic impacts associated with the RLPs are to individual homeowners and the Mountain Club. The impacts to individual owners include sediment/trash removal after the flood, non-useable living spaces, and health problems caused by sediment-laden and contaminated floodwater. The impact to the Mountain Club is the need to remove sediments from the lake after each major flood event. The overall community economic impacts are considered significant due to the excessive flooding conditions with many homes, high costs, and technical difficulties involving flood mitigation, and the subsequent effect of real estate value reduction typically expected in a flood problem area.

5. ENVIRONMENTAL SETTING AND HABITAT CONSERVATION PLAN

Per the CEQA Guidelines, an initial study was prepared for the RLP area and is attached here for reference. The environmental issues investigated for modifications to RLP properties are listed below. Note that this FMP is not a construction document and specific architectural, engineering, and construction plans for RLPs are not available for CEQA review. This section only provides an overview of the environmental conditions and identifies the check list items which deserve attention for CEQA compliance prior to actual construction of flood mitigation measures within the individual RLP properties. Related to flood hazard mitigation, permits have been acquired for sediment dredging from the lake by the Mountain Club. Environmental clearance for sewer and stormdrain improvement projects will be obtained by the Mountain Club. As part of any future Hazard Mitigation Grant Program for RLPs, FEMA will prepare a NEPA document prior to funding release.

- Aesthetics
- Air quality
- Cultural resources
- Hazards & hazardous materials
- Land use and planning
- Noise
- Public services
- Transportation/traffic
- Mandatory findings of significance
- Agriculture resources
- Biological resources
- Geology and soils
- Hydrology and water quality
- Mineral resources
- Population and housing
- Recreation
- Utilities and service systems

The CEQA Guidelines and the summary of findings are presented in Appendix C. The environmental impacts were categorized into four levels of significance: "Potentially significant impact", "Less than significant with mitigation", "Less than significant", and "No impact".

Surrounding land uses are residential development and open space. The general setting is a low-density residential development centered on Malibu Lake. Although construction within each RLP may be exempted, the cumulative impacts that may be caused by flood mitigation measures within RLPs include:

- Aesthetics - The proposed improvements require raising the houses. This may affect the visual character and quality of the various home sites and the neighborhood in general.
- Cultural - The proposed improvements could result in the alteration of potentially historical homes or archaeological resources.

Evaluation of the actual impacts will require site-specific environmental baseline data and detailed architectural and engineering design. For example, historical values of some RLPs need to be confirmed in order to evaluate the potential impacts. For Malibu Lake RLPs that receive funding through the Flood Hazard Grand Programs, the protection activities will have to comply with NEPA. In addition, modification to RLPs will need to comply with CEQA prior to the County's issuance of building and occupancy permits.

6. PUBLIC INVOLVEMENT

6.1 Public Involvement Process and Procedure

In addition to flood hazard assessment and problem identification, public involvement is an essential step to understanding site-specific issues, promoting flood awareness and assisting RLP owners in flood mitigation. For the Malibu Lake area, the County and WRC conducted public surveys and public meetings; interviewed RLP owners; visited properties for field investigation; provided general recommendations for improvements; and assisted in grant funding. Appendix D provides comprehensive documentation of the public involvement efforts and results.

6.2 2002 FMP Process and HMGP Funding Assistance

County and WRC staff have been working with Malibu Lake RLP owners since 2000. As part of the 2002 FMP process, nineteen properties were visited and several property owners were interviewed (see Appendix B of 2002 FMP). Additionally, three public meetings were hosted (see Appendix D of 2002 FMP). These meetings were supported by the County Building and

Safety Division (Calabasas Office), Ms. Susan Nissman (3rd District Board Senior Field Deputy) and the Malibu Lake Mountain Club.

County and WRC staff further assisted the public with participation in the HMGP, which provides funding from FEMA. Meetings with state representatives were held and both mitigation alternatives and benefit-cost analyses were presented. This process resulted in an increase in the total funding amount available to all eligible RLP owners.

The County continued to work with both the state and Malibu Lake Mountain Club, and obtained the final funding approval. FEMA funding approval in the amount of \$1,404,658 to elevate 18 homes was received by the County in January 2005. Board of Supervisors, Third District Field Supervisor, Ms. Susan Nissman, made a significant contribution to the funding approval process. Total costs were estimated at \$1,872,877, with \$900,000 appropriated in the County 2004-2005 Flood Control District budget and an additional \$504,658 in 2005-2006 budget. The remaining 25% of the eligible costs (or \$468,219) will be funded by the homeowners.

In addition, the County has provided extensive support to RLP owners who expressed an interest in receiving HMGP funding. The interested RLP owners are identified in Table 1, Appendix D. Two properties () were not listed in the FEMA RLP database, but participated in the HMGP grant application.

6.3 Public Meeting Invitation

WRC developed a questionnaire designed to understand each RLP owner's concerns, damages, causes of damages, and improvements made to reduce damages. The questionnaire was mailed to all 19 RLPs on December 27, 2006. Table 2 of Appendix D provides further details and shows that the mail for RLP Nos. 2, 10, 13, 15, and 16 were returned as "unable to deliver." The questionnaire was mailed again on January 16, 2007 and addressed to "Owner/Current Resident" in lieu of the owner name on file. Table 2 of Appendix D provides further details and shows that the mailings for RLP Nos. 2, 10, 13, 15, 16, and 17 were returned as "unable to deliver." Three RLP owners responded to the questionnaire and the responses are included in Appendix D.

6.4 Meeting Attendance and Public Input

Individual meetings were intended to allow the RLP owners to voice their concerns and to volunteer to participate in the County's floodplain management planning efforts. WRC's Project Manager and Engineer met with the owners of RLP Nos. 14 and 46 on March 26, 2007. WRC successfully interviewed the owner of RLP No. 46 and identified the historical flood problems and the improvements made to date for flood reduction. This property owner believes that he has fixed the flood problems. However, the property is still subject to future flood damages based on WRC's investigation and technical analysis (see Table 4.2). Additional measures are needed to avoid future claims (see Section 10). WRC also met with the owner of RLP No. 14 to review and verify the proposed mitigation plan, which is being implemented. Additional street runoff control at the property entrance was recommended by WRC.

A public meeting was held on March 26, 2007 at the Malibu Lake Mountain Club. Notices for the meeting were emailed by Mr. John Medina on March 12, 2007 and mailed by WRC on

March 21, 2007. These efforts resulted in the attendance of more than 20 owners in the general session and nine owners in the RLP discussion session. The meeting notices, attendee sign-in record, and meeting minutes are included in Appendix D.

Some property owners indicated their appreciation for HMGP and County assistance, but others were concerned that the delay of sewer service had affected their eligibility to receive funding. Several RLP owners were not interested in funding due to the long process involved and the contingency upon sewer construction. Consistency of eligibility requirements and approval standards by the County and FEMA (OES) were also requested by the owners for future funding. The County has committed to reapply for HMGP funding for interested property owners.

7. AGENCY COORDINATION

Since this FMP does not involve actual implementation or construction, no permit coordination was performed during plan preparation. Correspondences and telephone logs between WRC Consulting Services, Inc., and State of California Department of Water Resources, FEMA, State of California Department of Fish and Game, Los Angeles Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and NFIP Coordinator are included in Appendix D. When the FMP is complete, copies will be sent to these agencies.

8. GOAL SETTING

8.1 Floodplain Management Goal Definition

Goals were established to define the floodplain management plan based on the specific needs of Malibu Lake communities. The overall goal for this FMP is to create a safe environment for individual owners or lessees by reducing flood hazards without significantly impacting the environment. Based on information presented above, the Malibu Lake Communities include the lakeside properties which are subject to floodwater from the lake and non-lake side properties which are not affected by the flooding level of the lake. The goal setting considered both lakeside and non-lakeside properties. Specifically, the following goals were defined for development of this FMP:

- Review past mitigation efforts and flood damage concerns.
- Conduct site investigation to evaluate the physical conditions of each relationship with the flood risk and potential of elevating the structures.
- Conduct site investigation and data research to identify drainage problems for each non-lakeside RLPs.
- Identify the environmental settings for the lakeside residents and other RLPs.
- Formulate structural and non-structural alternatives.
- Evaluate feasibility of each alternative.
- Evaluate environmental impacts and mitigation requirements.
- Outreach property residents to increase flood awareness and assist in flood hazard mitigation measures.
- Continue funding efforts initiated by the County of Los Angeles Public Works and Malibu Lake Mountain Club.

- Promote coordination among the RLPs to find effective ways to address common concerns and achieve common interests for flood hazard reduction.

8.2 Compatibility with Other Community FMP Goals

This FMP is in concurrence with the goals and objectives set forth in the County of Los Angeles Repetitive Loss Plan for Community No. 065043 (reviewed in March 1992 and reconfirmed in March 2007). Additionally, it is compatible with the current Hazard Mitigation Grant Program funding efforts.

9. REVIEW OF POSSIBLE MITIGATION ACTIVITIES

9.1 Floodplain Management Objective Overview

The flood hazard to the Malibu Lake area RLPs is principally related to the rising of lake levels during large storm events. This very specific hazard association between damage and lake level for the area as a whole differs from most other FMPs for RLPs where the hazard-damage relationship varies with RLPs. Repetitive Loss Properties manifest a unique separation between public and private hazard mitigation. Recurrent damages to these properties carry public concern and cost; yet the damage forces and solutions are of a private nature and financial responsibility. Thus, the FMP for RLPs is of a dual character, requiring the attention of both public agencies and private RLP owners. It must first identify the problem(s) associated with each RLP, assess solutions that can be provided by RLP owners and public agencies, and, at the same time, communicate to RLP owners the critical information and awareness to encourage the voluntary participation in private solutions. The following discussion centers on the private programs, measures, and activities to address the problems and needs associated with RLPs.

In keeping with the goals of the FMP to ensure that all possible mitigation measures are explored, the review of possible mitigation activities starts with the six activities presented in Section 511-g of the CRS Coordinators Manual and its six categories. These activities are (1) preventive, (2) property protection, (3) natural resource protection, (4) emergency services, (5) structural projects, and (6) public information.

The following sections detail the application of these six activities to the affected RLPs by a division between essentially public versus private activities. Note that the division between private versus public activities is for easy reference only. Implementation responsibility may be shared by both parties as shown in Section 10.1. Property protection activities are discussed under "Private Activities" since most protection measures will be implemented within the private property rights-of-way. Major structural improvements such as elevating the entire house may be costly and may be qualified for governmental funding assistance. Under these circumstances, the private owners may participate in the protection measures, NFIP administrator (County), and other entities involved in funding application approval and reimbursement. Conversely, natural resources protection activities are primarily through the watershed management efforts of the public agencies and are listed under "Public Activities". However, the private owners are encouraged to apply environmentally friendly materials and to provide environmental protection during design and construction of property protection measures.

9.2 Public Activities

Of the six activities of the CRS Coordinators Manual, five are essentially governmental in nature. These five are preventive, natural resource protection, emergency services, structural projects, and public information. Implementation of any activity contained in these categories is dependent upon the priorities and funding capabilities of the responsible governing agencies.

9.2.1 Preventive Activities

The list below identifies potential preventive activities that have the potential to reduce flood damage potential for RLPs and "high risk properties" and aid in the mitigation of damages to RLPs and in many instances to non-RLP properties.

- 1.a Designate staff from planning, building/safety, development, and environmental divisions who will be responsible for working with RLPs during the permitting process.
- 1.b Update the RLP list and annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs.
- 1.c Maintain the County's Emergency Operations Master Plan and Procedures.
- 1.d Maintain regular coordination efforts with surrounding cities, the Los Angeles County Department of Public Works, State and Federal agencies regarding flood hazard mitigation, and the National Flood Insurance Program.
- 1.e Participate in organizations such as the Association of State Floodplain Managers, Floodplain Management Association of California, and the National Association of Flood and Stormwater Management Agencies to network with other agencies and remain current in the field of floodplain management.
- 1.f Conduct annual National Flood Insurance Program seminars for County personnel responsible for applying and enforcing floodplain management regulations.
- 1.g Update operational procedures and training materials for staff that apply and enforce floodplain management regulations and provide annual training.
- 1.h Post "No Dumping" signs at points of entry to the stormwater system.
- 1.i Refine the use of the Plan Check and Inspection System (PCIS) to track "high risk properties" and ensure that flood safety is adequately addressed through the plan check process.
- 1.j Incorporate floodplain management information into the Zoning Information and Map Access System (ZIMAS).
- 1.k The Flood Hazard Mitigation Coordinator shall flag repetitive loss properties in the PCIS database for review and approval of building permit applications.
- 1.l Identify and maintain a list of "high risk properties" that could be acquired for conversion into open space.

- 1.m Establish standards and/or incentives for the use of structural and non-structural techniques that mitigate flood hazards and manage stormwater pollution.

9.2.2 Natural Resource Protection Activities

The guidance of the CRS Coordinators Manual typically places natural resource protection activities within the scope of a broad watershed, which is well beyond the scope of an individual RLP. Typically, ecosystem restoration activities benefit from stormwater volume reduction through infiltration and flood peak decrease through increased ground cover density and resistance. However, these large-scale restoration activities can be performed through the coordinated efforts of the County with Ventura County and the cities of Thousand Oaks, Agoura Hills, and Westlake Village, all of which contribute to the runoff that enters Malibu Lake. Limited mitigation measures are also available to the RLP through the use of bioengineering solutions within the RLP right-of-way. The implementation and financing of these measures within the private properties are normally the property owner's responsibility. Potential natural resource protection activities identified are as follows.

- 2.a Continue to require environmental review in the development process to provide for the protection of natural resources.
- 2.b Encourage the application of biological resource measures for the control stormwater and erosion to the best of their applicable limits with regards to other safety factors such as fire control.
- 2.c Establish standards and/or incentives for the use of structural and non-structural techniques that mitigate flood-hazards and manage stormwater pollution.
- 2.d Ensure awareness of RLP owners on environmental sensitivities specific to their area.
- 2.e Establish standards and procedures for mitigation of temporary construction impacts.
- 2.f Develop and implement a watershed ecosystem restoration program.
- 2.g Develop a joint land use agreement to control future increases in runoff and sediment to Malibu Lake.

9.2.3 Emergency Services Activities

Emergency services activities are taken during a flood to minimize its impacts. These measures are normally the responsibility of city or county emergency management staff. Under some special circumstances, private entities, including homeowner associations, can undertake emergency services activities. A highly organized and committed private entity, like a homeowners association, may be capable of providing limited emergency services activities.

- 3.a Identify flood-warning systems for properties situated where such systems can benefit.
- 3.b Routinely check and evaluate the safety and readiness of Emergency Operations and Procedures.

- 3.c Make sand and sand bags available to flood risk property owners during the wet season, provide notifications of the availability of these materials, and track the distribution of the materials.

9.2.4 Structural Activities

Section 510 of the CRS Coordinators Manual employs this category for large-scale projects providing protection to groups, rather than the more individually based category of Property Protection Activities. Large-scale projects are, by their nature, public facilities and are thus designed and maintained by public works staff. In the examination of RLPs, a limited number of large-scale projects are potentially suited for controlling the hazards of RLPs. These potential structural activities are as follows.

- 4.a Storm sewer improvements.
- 4.b Channel modifications.
- 4.c Street drainage modifications.
- 4.d Levee or floodwall construction to divert lake runoff.
- 4.e Dam removal with lake modifications.

9.2.5 Public Information Activities

Information transfers to RLP owners, potential property owners, and visitors about the hazards and ways to protect people and property from the hazards are effective activities that can lead to the mitigation of the hazards. The following public information activities have been identified for RLPs.

- 5.a Identify possible sources of funding including Cost of Compliance funds and mitigation grant funds among others and provide this information to RLP owners.
- 5.b Continue to investigate RLPs as they are identified by FEMA and update the RLP and high-risk property list. Annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs.
- 5.c Develop and distribute flood protection information and materials to property owners and developers in high-risk areas.
- 5.f Provide public education about maintaining the stormwater system free of debris.
- 5.g Maintain the County's web page to provide emergency preparedness information to the general public and media.
- 5.h Distribute information regarding flood prevention and flood insurance at emergency operations and emergency preparedness events.
- 5.i Continue implementing the County's Annual Emergency Preparedness Fair.

9.3 Private Property Protection Activities

Property protection activities for RLP are generally in the nature of small-scale measures undertaken by property owners on a structure-by-structure or parcel basis. As these measures are usually carried out by the property owner, implementation and financing of these measures are normally at the discretion of the property owner.

- 6.a Construct or modify retaining walls with proper drainage and trash capacity.
- 6.b Construct berms to divert water flows.
- 6.c Install debris fences or traps.
- 6.d Install yard inlets to drain water flows to the street.
- 6.e Construct on-site detention basins.
- 6.f Improve headwalls for water conveyance.
- 6.g Floodproof structures and retaining walls.
- 6.h Floodproof entrances.
- 6.i Add sump pump to drainage systems and drain to nearest storm drain.
- 6.j Construct terrace drain and plant slope to reduce erosion.
- 6.k Plant slopes to reduce erosion and water flows.
- 6.l Improve on-site grading and add french-drain.
- 6.m Convert flood-prone living space and replace with new story.
- 6.n Lift entire house including floor slab and build a new foundation to elevate the house.
- 6.o Waterproof lower level.
- 6.p Extend the walls of the house upward and raise the lowest floor.

10. ACTION PLAN

Section 9 concluded with the identification of alternatives that have the potential to mitigate the flood hazards experienced by the RLPs of the Malibu Lake Communities. In this section, where the goal is to identify actions to be taken by RLPs, the alternatives were examined for their technical appropriateness, affordability, ability to be implemented, and their regulatory compliance by local, state, and federal regulations at the RLP level.

10.1 Final Alternative Activity Plans

The alternatives carried forward from Section 9 can be divided into two: (1) activities requiring action at the "public" level; i.e., they require a governmental action and (2) actions that can be pursued by the individual property owner. The basic responsibility for each activity is presented in Table 10.1, with the possible exceptions being noted. As noted earlier, the main focus of the FMP for RLPs is the identification of hazard mitigation activities that the property owner can

undertake. Given this focus, the activity categories that are basically governmental are left to the appropriate governmental entities to be implemented, with the noted exceptions of Table 10.1 being applied to RLPs where applicable.

| Table 10.1 Mitigation Activity Basic Responsibility | |
|--|--|
| Category | Basic Responsibility |
| Preventive Activities | Public |
| Natural Resource Protection Activities | Public (primary) and Private (secondary) |
| Emergency Services Activities | Public |
| Structural Activities | Public |
| Public Information Activities | Public |
| Proper Protection Activities | Private (primary) and Public (funding assistance) |

10.2 Selection Factors for RLPs

The selection factors to be carried out by the RLP owners are focused on alternatives that are economically, environmentally, and technically (from an engineering perspective) feasible for the RLP owners. Specifically, this selection factor directs the focus of activities to those actions that can be carried out by the individual property owner.

10.3 RLP Action Plan for Property Protection Activities

The survey of properties in the Malibu Lake area indicated that 19 properties meet the criteria of an RLP. These 19 RLPs have potential solutions based on preliminary hydrologic and hydraulic data and engineering analysis as shown in Table 10.2. In general, the primary solution for any one of these RLPs falls into one of four property protection activities as outlined in Section 9.3. Sixteen of the RLPs have a hazard potential related to a rising lake elevation during a flood. A uniform public activity in the form of a dike or levee would not be a viable solution on many grounds including environmental, aesthetics, and economic. The highly active homeowners association in the area does offer the potential to institute a flood warning system, but a flood warning system is greatly constrained in limiting the damages from a flood. For these RLPs, property protection activities are restricted to a single general option of the relocation of active living space from the flood zone. This general option of relocating living space has three specific options as shown in Figures 10.1 to 10.3.

As shown in Tables 10.2 and 10.3, one property (RLP 25) requires governmental action to fully mitigate flood hazards. All other RLPs will require private voluntary actions to mitigate the flood hazard.

Table 10.2
Los Angeles County
Malibu Lake Area RLPs

| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|---------------|---|-----------------|-------------------|---|--|
| 1 | Inundated by a rising water of Malibu Lake during the storm | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 2 | Hillside backyard drainage | X | | Hillside problem, possibly with grading/drainage and retaining wall at the toe (6a) | Property acquisition |
| 3 | Inundated by a rising water of Malibu Lake during the storm | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 4 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 5 | | X | | Previous owner already raised the house; however, the current first habitable floor elevation relative to BFE remains unknown | Extend the walls of the house upward and raise the lowest floor. |
| 6 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 7 | | X | | Lift the entire house with the floor slab attached and build a new foundation to elevate the house (6n) | Property acquisition |
| 8 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 9 | | N/A – Mitigated | | X | N/A – Mitigated |

Table 10.2
Los Angeles County
Malibu Lake Area RLPs

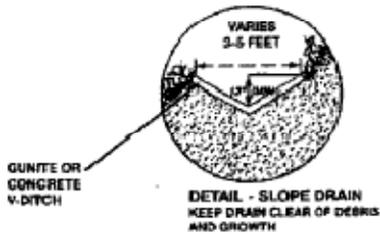
| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|---------------|---|----------------|-------------------|--|--|
| 10 | Inundated by a rising water of Malibu Lake during the storm | X | | Convert flood prone living space and replace with new story (6m) | Lift the entire house with the floor slab attached and build a new foundation to elevate the house |
| 11 | | | X | Has been elevated to above 736.19 feet msl (Capital Flood elevation) | Property acquisition |
| 12 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 13 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 14 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 15 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 16 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 17 | | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |
| 18 | Floodwater from Medea Creek | X | | Convert flood prone living space and replace with new story (6m) | Property acquisition |

Table 10.2
Los Angeles County
Malibu Lake Area RLPs

| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|--|--|----------------|-------------------|---|---|
| 25 | Capacity of storm drain culvert located near the property is undersized and causes overflow to the street and property | X | | Confine upstream inflow. Upsize the pipe opening. Improve stormdrain. Add a truss-rack at the inlet (4a) | Property acquisition |
| 46 | Storm runoff from streets surrounding the property. | X | | (1) Install perimeter diversion ditches, walls, and berms to prevent street runoff entering the property (6a, 6b) (2) Raise and pave planting areas with ditches to drain flows away from the structure (6d) (3) Provide a ditch crossing the driveway to divert flows away from the structure (6d) (4) Monitor the repaired foundation cracks | Build a cutoff wall to prevent seepage. |
| *Properties require public agency participation. | | | | | |



A retaining wall at the bottom of slope to prevent slope failure

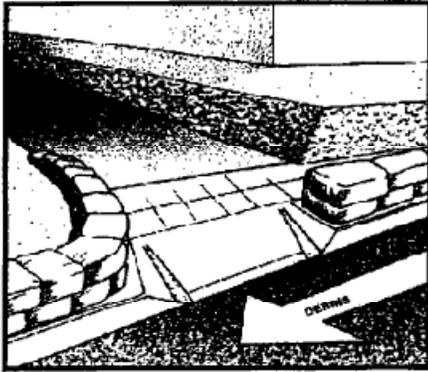


A small ditch close to the upper edge of the property to drain into a natural water course or onto street pavement or to a well-vegetated area

ON-SITE GRADING/DRAINAGE PROBLEM
NFIP REPETITIVE LOSS CORRECTION WORKSHEET
6a. Construct/Modify Retaining Wall and V-Ditch to Drain

Figure 10.1
Retaining Wall and Drainage Layout

Source: *County of Los Angeles Floodplain Management Plan for Santa Monica Mountains, San Gabriel Mountains and Quartz Hill, September 2001.*



Construct berm at driveway

Divert surface water away

SUBMERSIBLE SUMP PUMPS

In cases where water has flooded a basement, garage, or any low-lying area, a submersible sump pump is recommended. If flooding is a recurring problem, a permanent pump should be installed in a sump with a floatation device for automatic on/off operation (see Fig.13).

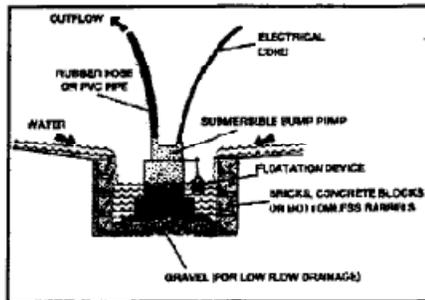


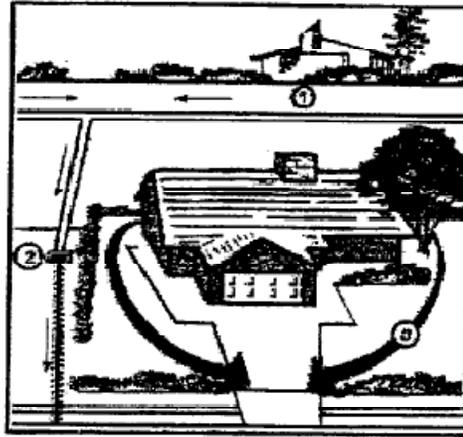
Fig.13 SUBMERSIBLE SUMP PUMP

PROPERTY LOWER THAN STREET OR SURROUNDING
NFIP REPETITIVE LOSS CORRECTION WORKSHEET

6b. Construct Berm at Driveway and Sump Pump at Low Point

Figure 10.2 Berm and Sump Layout

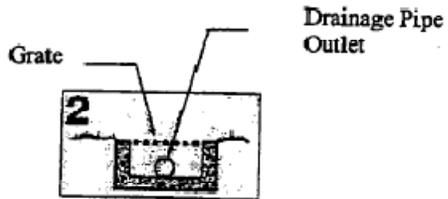
Source: County of Los Angeles Floodplain Management Plan for Santa Monica Mountains, San Gabriel Mountains and Quartz Hill, September 2001.



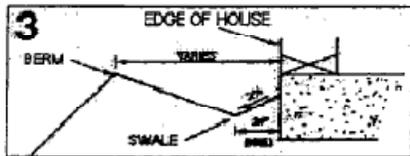
General property drainage flow direction



Paved Terrace Drain



Side Swale Directing Water around the House



BACKYARD – HILLSIDE PROBLEM
 NFIP REPETITIVE LOSS CORRECTION WORKSHEET
 6d. Install Inlets/French Drain and Drain to Street

Figure 10.3
Inlet/French Drain and Drainage Layout

Source: *County of Los Angeles Floodplain Management Plan for Santa Monica Mountains, San Gabriel Mountains and Quartz Hill, September 2001.*

| Table 10.3 Summary of Recommended Solutions for RLPs | | |
|---|--|--|
| Activities | Recommended Solution | RLP IDs |
| 6.a, 6.b, 6.d | Hillside problem, possibly grading/drainage and retaining wall at the toe | 2, 46 |
| 6.m | Convert flood prone living space and replace with new story | 1, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16, 17, and 18 |
| 6.n | Lift the entire house with the floor slab attached and build a new foundation to elevate the house | 7 |
| 4.a | Stormdrain system improvements | 25 |

Environmental Considerations

The implementation of the potential primary solution at a given RLP has been analyzed according to CEQA Guidelines. Implementation of the primary solution has been found to potentially have the following less-than-significant-with-mitigation impacts as indicated in Appendix C.

- Substantially degrade the existing visual character or quality of the site and its surroundings.
- Cause a substantial adverse change in the significance of a historic resource as defined in § 15064.5.
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5.

However, evaluation of the actual impacts will require site-specific environmental baseline data and detailed architectural and engineering design. For example, historical values of some RLPs need to be confirmed in order to evaluate the potential impacts. For RLPs that receive federal funding through the Flood Hazard Grand Programs, the protection activities will have to comply with NEPA. In addition, modification to RLPs will need to comply with CEQA prior to the county's issuance of building and occupancy permits.

Financial Viability

The recommended solutions have been analyzed for their technical appropriateness, ability to be implemented, and their regulatory compliance.

Economic analysis was conducted to assess the annual damages. Damages are governed by the guidelines and regulations for Federal water resources projects as expressed in the U.S. Army Corps of Engineers' Planning Guidance Manual (Engineering Regulation [ER] 1105-2-100). The underlying purpose of the analytical procedures outlined in ER 1105-2-100 is to convert the

random nature of flood related damages to an expression of equivalent annual damage for comparison to the amortized cost of flood mitigation. The fundamental factors behind determinations of structural related damages under the Federal guidance are (1) depreciated structure replacement value, (2) content-to-structure value relationships, (3) inundation levels, (4) inundation depth-to-damage functions, (5) emergency costs relationships to structure inundation, and (6) cleanup cost relationship to the amount of inundated surface. The results of the analysis of these factors are ultimately incorporated into the USACOE Hydrologic Engineering Center's (HEC) Flood Damage Analysis Package, HEC-FDA, for the determination of equivalent annual damages.

The final factor for their possible implementation is their affordability. Every recommended solution was economically analyzed on a Benefit-to-Cost (B/C) basis (see Table 10.4) and on an investment recovery period method to check if implementation made financial sense (complete details are presented in Appendix E). Implementation costs ranged from \$10,000 to \$180,000 for the recommended solutions. B/C ratios for the RLPs varied from approximately 0.3 to 4.4, with nine of the eighteen proposed solutions being justified on a B/C ratio basis. These data shown in Table 10.4 and Appendix E were provided based on the best information available to WRC Consulting Services regarding flood problems, structure types and conditions, and local construction statistics. These should be updated as property-specific information becomes available.

Public Participation in Funding Assistance

The County has been working with the OES to assist the Mountain Club and RLPs in obtaining funding under the Hazard Mitigation Grant Program. The Mountain Club will implement a new sewer system in preparation for raising the RLPs' structures. A maximum funding of \$1.2 million is allocated for RLP structure modifications and public stormdrain improvements, pending review of additional cost data.

10.4 RLP Action Plan Related to Public Activities

Table 10.5 displays the Action Plan and its activities that are or will be implemented in order to meet the Goals, Objectives, and Policies outlined in Chapter 9. The primary responsible agencies and schedule for each activity are listed in Table 10.5. Monitoring, evaluating, and updating steps and schedule for the Action Plan in Table 10.5 are listed in Table 10.6.

| RLP # | 100-Year Event Damage | | | Equivalent Annual Damage | Mitigation Cost | B/C Ratio |
|--------------|------------------------------|----------------|----------------|---------------------------------|------------------------|------------------|
| | Structure | Content | Cleanup | | | |
| 1 | \$55,684 | \$43,289 | \$9,610 | \$11,645 | \$100,000 | 1.54 |
| 2 | \$16,158 | \$10,586 | \$3,199 | \$2,867 | \$10,000 | 3.79 |
| 3 | \$42,720 | \$32,623 | \$8,103 | \$10,715 | \$100,000 | 1.42 |
| 4 | \$32,700 | \$27,055 | \$4,052 | \$3,323 | \$150,000 | 0.29 |
| 5 | \$25,709 | \$21,679 | \$3,062 | \$3,378 | \$65,000 | 0.69 |
| 6 | \$60,423 | \$50,952 | \$4,413 | \$7,623 | \$180,000 | 0.56 |
| 7 | \$24,711 | \$20,500 | \$1,843 | \$4,428 | \$100,000 | 0.59 |
| 8 | \$41,387 | \$32,175 | \$7,143 | \$8,696 | \$100,000 | 1.15 |
| 9 | Mitigated | | | | | |
| 10 | \$33,533 | \$27,164 | \$3,252 | \$5,968 | \$40,000 | 1.97 |
| 11 | - | - | - | - | - | - |
| 12 | \$22,877 | \$19,124 | \$2,936 | \$3,729 | \$100,000 | 0.49 |
| 13 | \$37,418 | \$31,042 | \$4,486 | \$6,787 | \$100,000 | 0.90 |
| 14 | \$25,019 | \$19,834 | \$4,570 | \$3,311 | \$90,000 | 0.46 |
| 15 | \$21,576 | \$17,105 | \$4,570 | \$4,735 | \$70,000 | 0.89 |
| 16 | \$39,843 | \$31,587 | \$8,439 | \$8,607 | \$100,000 | 1.14 |
| 17 | \$33,872 | \$27,438 | \$3,285 | \$6,027 | \$75,000 | 1.06 |
| 18 | \$18,732 | \$14,851 | \$3,968 | \$4,132 | \$65,000 | 0.84 |
| 25 | \$21,553 | \$13,634 | \$7,446 | \$4,024 | \$12,000 | 4.44 |
| 46 | \$15,379 | \$11,311 | \$5,840 | \$1,874 | \$15,000 | 1.65 |

Table 10.5
Action Plan of the FMP for RLPs

| Activity | Responsible Department | | | | | | | | | | | Schedule | |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|----------|------------------------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | | Homeowners Association |
| Secure appropriate FEMA Hazard Mitigation Funds | X | | | X | | | X | X | | | | X | Ongoing |
| Maintain Emergency Operations Master Plan and Procedures | X | | | X | | | | X | | | | | Ongoing |
| Designate staff responsible for working with RLPs during the permitting process from planning, building/safety, development, and environmental divisions | | | | X | X | | | | | | | | Completed |
| Ensure awareness of RLP owners on environmental sensitivities specific to their area | | X | | X | | | | | | | | X | Ongoing |
| Establish standards and procedures for mitigation of temporary construction impacts | | X | | X | X | | | | | | | | Completed |
| Develop and implement a joint watershed ecosystem restoration program | | X | | X | | | | | | | | | Ongoing |
| Develop a joint land use agreement to control future increases in runoff and sediment to Malibu Lake | | X | | X | | | | | | | | | Ongoing |
| Identify flood-warning systems for properties situated where such systems can be beneficially employed | X | X | | X | | | X | X | X | | | X | Ongoing |
| Conduct a stormwater facilities condition assessment program to identify the physical and hydraulic condition of the system and to support infrastructure management needs | | | | X | | | X | | X | | | | Ongoing |

**Table 10.5
Action Plan of the FMP for RLPs**

| Activity | Responsible Department | | | | | | | | | | | | Schedule |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|------------------------|----------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | Homeowners Association | |
| Develop and maintain a list of priority maintenance-related flood problem sites | | | | X | | | | | | | | | Ongoing |
| Conduct annual maintenance at priority maintenance-related flood problem sites prior to the wet season | | | | X | | | | | | | | | Ongoing |
| Refine the use of the Plan Check and Inspection System (PCIS) to track "high risk properties" and ensure that drainage is adequately addressed through the plan check process | | | | X | X | | | | | | X | | Ongoing |
| The Flood Hazard Mitigation Coordinator shall flag Repetitive Loss Properties in the PCIS database for review and approval of building permit applications | | | | X | | | | | | | | | Ongoing |
| Investigate RLPs and annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs | | | | X | X | | | | | | | | Ongoing |
| Identify and maintain a list of "high risk properties" that could be acquired for conversion into open space | | X | X | X | | | | | | | | | Ongoing |
| Establish standards and/or incentives for the use of structural and non-structural techniques that mitigate flood-hazards and manage stormwater pollution | | | | X | | | | | | | | | Ongoing |

Table 10.5
Action Plan of the FMP for RLPs

| Activity | Responsible Department | | | | | | | | | | | Schedule | |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|----------|------------------------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | | Homeowners Association |
| Continue to require environmental review in the development process to provide for the protection of natural resources | | X | | X | | | X | | | | | | Ongoing |
| Encourage the application of biological resource measures for the control of stormwater and erosion to the best of their applicable limits with regards to other safety factors such as fire control | | X | | X | | | X | | | | | | Ongoing |
| Make sand bags available to flood risk property owners during the wet season, provide notifications of the availability of these materials, and track the distribution of the materials | X | | | X | | | | | | | | | Ongoing |
| Storm drain, open channel, and flood retention basin improvements | | | | X | | X | X | | X | | X | | Ongoing |
| Identify possible sources of funding and provide this information to RLP owners | | | X | X | | | | | | | X | | Ongoing |
| Continue to investigate RLPs as they are identified by FEMA and update the RLP and high-risk property list. Annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs. | | | | X | | | | | | | X | | Ongoing |

Table 10.5
Action Plan of the FMP for RLPs

| Activity | Responsible Department | | | | | | | | | | | | Schedule |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|------------------------|----------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | Homeowners Association | |
| Develop and distribute flood protection information and materials to property owners and developers in high-risk areas. | | | | X | | | | | | | | X | Ongoing |
| Provide public education about maintaining the stormwater system free of debris. | | | | X | | | | | | | | X | Ongoing |
| Maintain the County's web page to provide emergency preparedness information to the general public and media | | | | X | | | | | | | | X | Ongoing |
| Distribute information regarding flood prevention and flood insurance at emergency operations and emergency preparedness events. | X | | | X | | | | | | | | X | Ongoing |
| Continue implementing the County's Annual Emergency Preparedness Fair. | X | | | X | | | | | | | | X | Annual |

| Table 10.6 Monitoring, Evaluating, and Updating the Plan | |
|---|--|
| Monitoring | |
| Public Works Department | <ul style="list-style-type: none"> • Send out RLP outreach letters annually prior to October 15 • Visit RLP sites annually by end of October • Meetings and phone calls to RLPs to be conducted on an as needed basis • Prepare quarterly monitoring reports |
| Evaluating | |
| Public Works Department | <ul style="list-style-type: none"> • Evaluate any change in the nature or magnitude of risk outcomes that have occurred annually prior to October 15 • Check for changed watershed characteristics affecting hydrology and hydraulics annually prior to October 15 • Assess review of goals and objectives for continued applicability by the end of October • Prepare evaluation reports annually by the end of October |
| Updating | |
| Public Works Department | <ul style="list-style-type: none"> • Collect monitoring and evaluation reports annually at the end of October • Determine effectiveness and revise as needed • Update Plan and initiate monitoring and evaluation as needed |

COUNTY OF LOS ANGELES

MALIBU LAKE
REPETITIVE LOSS PROPERTIES

APPENDIX A

Hydrology

JULY 2007
Revised December 2009

HYDROLOGY

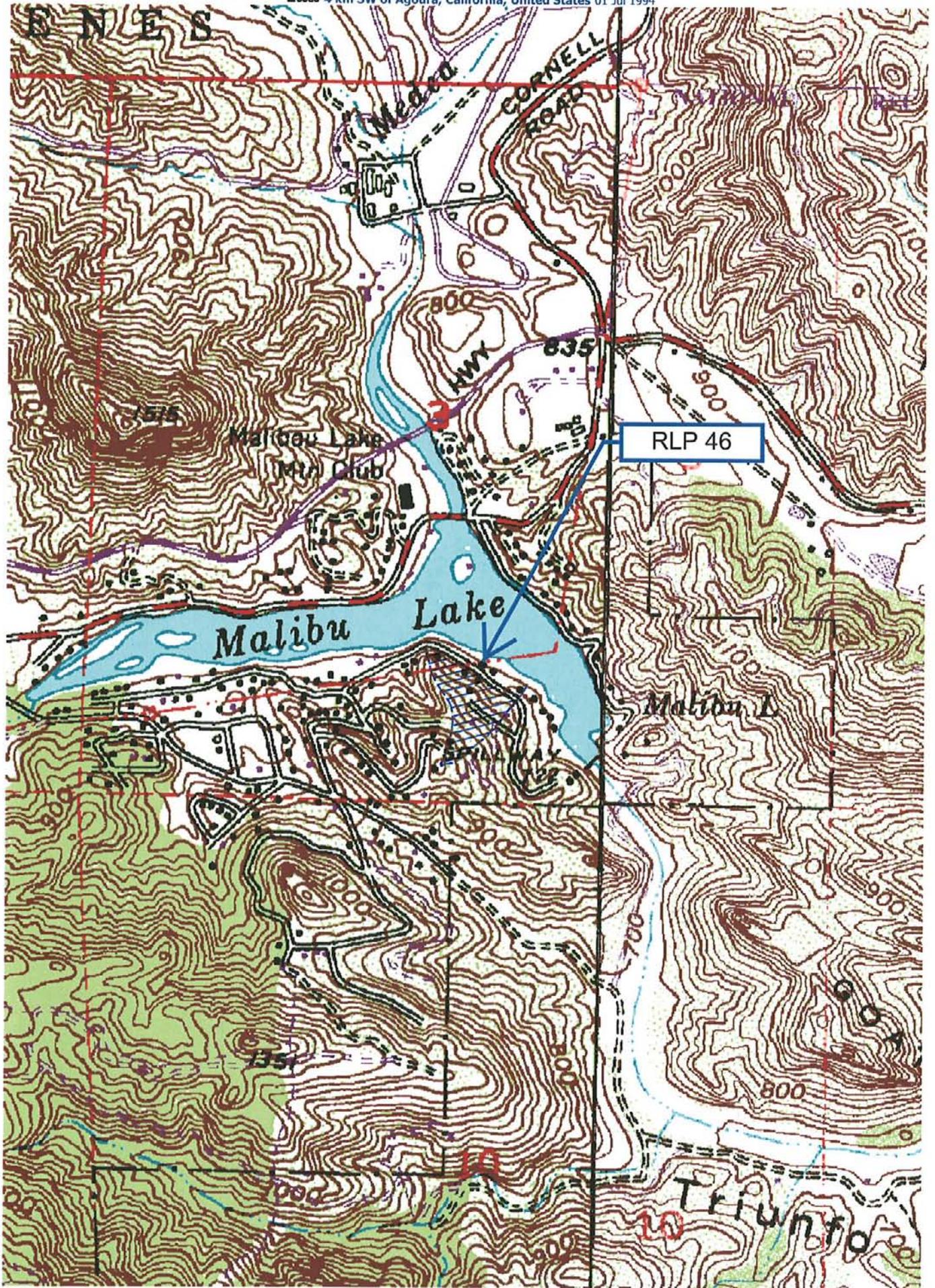
To support the FMP update, WRC conducted a hydrology analysis for RLP 46. The other RLPs have been analyzed and included in the 2002 FMP Appendix A for the Malibu Lake area of Los Angeles County.

The primary purpose of the analysis was to determine the County of Los Angeles Capital Flood discharge in the RLP 46 watershed sub-area (drainage area). The methodology used primarily depends on three factors: (1) drainage area, (2) runoff coefficient of the area and (3) rainfall intensity. The drainage area was delineated on the United States Geological Survey (USGS) topographic map of the area. The runoff coefficient and rainfall intensity were determined from the Hydrology Manual of the Los Angeles County Department of Public Works, drainage area map and data gathered from field visits. The results of the analysis are included in Table 4.2 of the FMP update.

Additionally, a flood flow frequency analysis was performed for RLP 46 using the methodology described in USGS Bulletin #17B, Guidelines for Determining Flood Flow Frequency. Data from the USGS gaging station at Arroyo Seco (Station No. 11098000) was used to support the analysis. The results of the flood frequency analysis were used to relate the flood events that damages occurred in the Malibu Lake area as shown in Table 3.1 of the FMP update.

The following analysis results and interim results are included in the remainder of this appendix:

1. Drainage Map
2. 50-year, 24-hour Isohyet Map
3. Tc (Time of Concentration) Calculation Result for RLP 46
4. Flood Flow Frequency Analysis
5. County 2004 Malibu Lake Hydrology and Water Surface Estimates



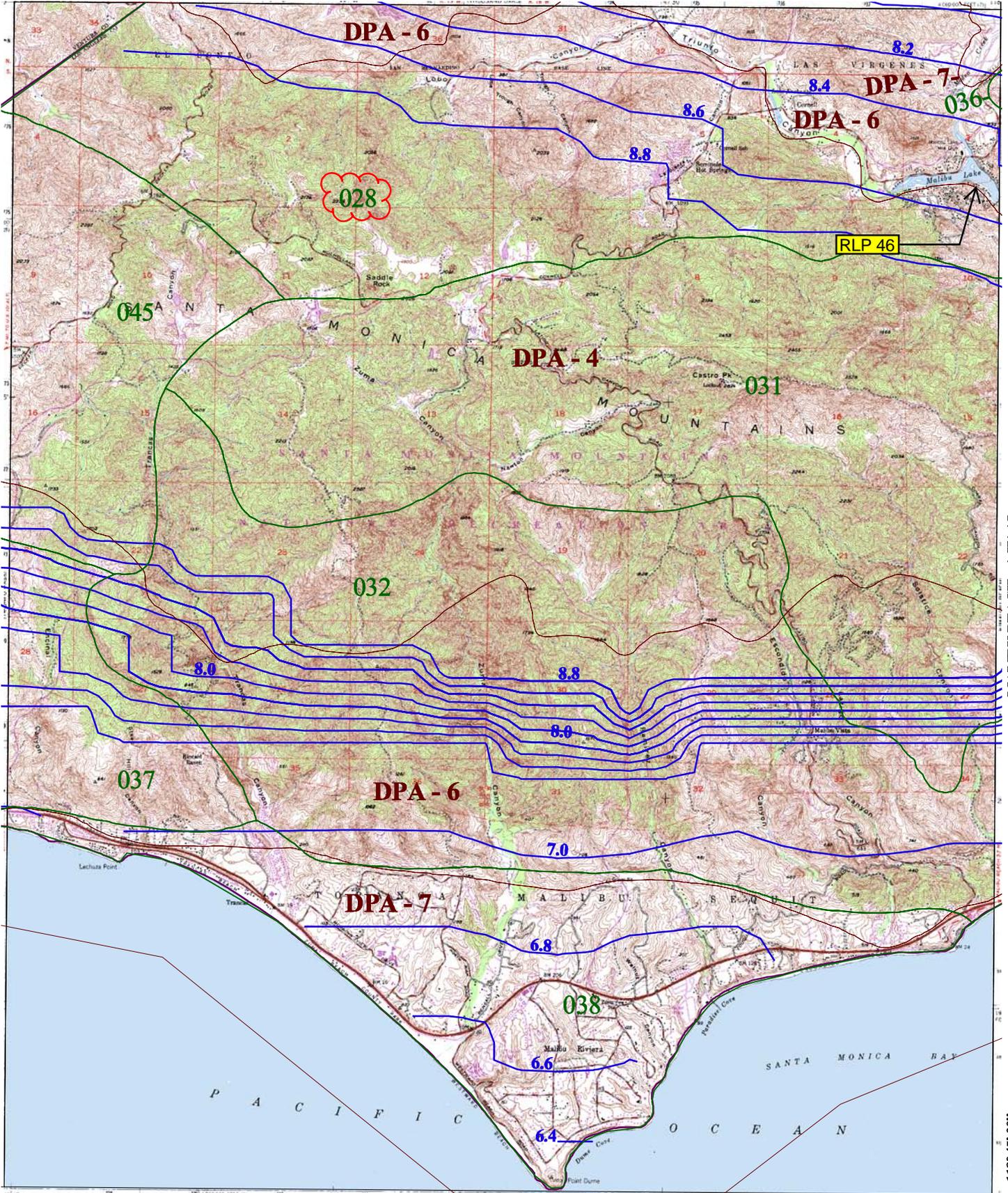
34° 07' 30"

THOUSAND OAKS 1-H1.24

-118° 52' 30"

TRIUNFO PASS 1-H1.13

MALIBU BEACH 1-H1.15



-118° 45' 00"

34° 00' 00"



016

SOIL CLASSIFICATION AREA

7.2

INCHES OF RAINFALL

DPA - 6

DEBRIS POTENTIAL AREA

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

POINT DUME 50-YEAR 24-HOUR ISOHYET

1-H1.14



Tc Calculator

Subarea Parameters Manual Input

Subarea Number:

| | | |
|-----------------------------------|----------------------------------|------------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="7.3"/> | <input type="text" value=".21"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="8.73"/> | <input type="text" value="800"/> | <input type="text" value=".2813"/> |

Subarea Parameters Selected

Subarea Number:

| | | |
|-----------------------------------|-----------------------------------|-------------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="7.3"/> | <input type="text" value="0.21"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="8.73"/> | <input type="text" value="800"/> | <input type="text" value="0.2813"/> |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Calculate Single Tc From Subarea Parameters Provided In Input File

Calculate Tc's For Multiple Subareas And Create Tc Results File

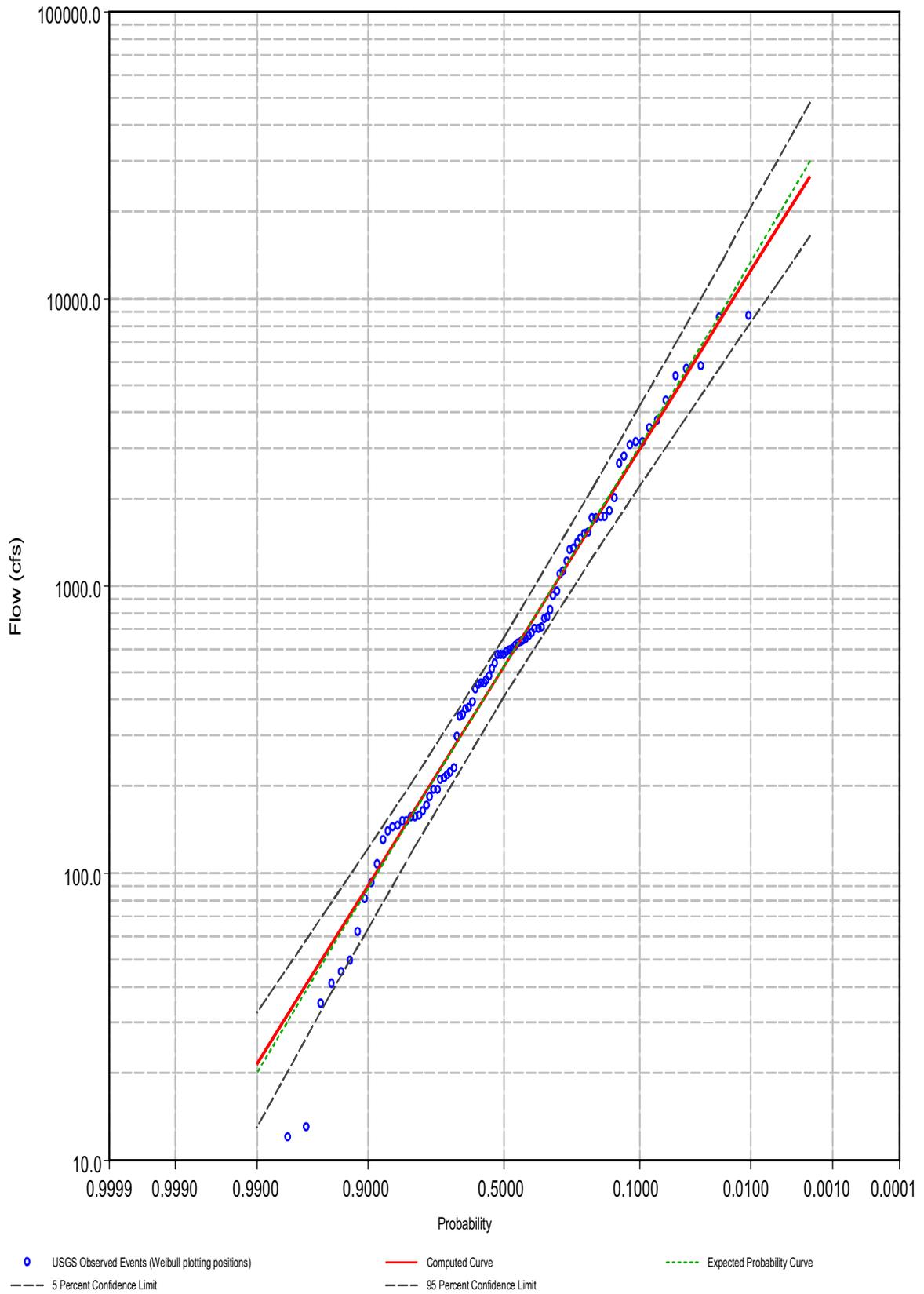
Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|----------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
| <input type="text" value="46b"/> | <input type="text" value="5.21"/> | <input type="text" value="0.72"/> | <input type="text" value="0.76"/> |

Tc Equation:

Tc Value (min.): Flowrate (cfs):

Exceedance Probability for Arroyo Seco



 Bulletin 17B Frequency Analysis
 06 Jul 2007 08:08 AM

--- Input Data ---

Analysis Name: Arroyo Seco
 Description:

Data Set Name: Arroyo Seco
 DSS File Name: X:\WRC\LA RLP\FFF 11098000\FFF 11098000.dss
 DSS Pathname: /ARROYO SECO/PASADENA CA/FLOW-ANNUAL PEAK/01jan1900/IR-CENTURY/USGS/

Report File Name: X:\WRC\LA RLP\FFF 11098000\Bulletin17bResults\Arroyo_Seco\Arroyo_Seco.rpt
 XML File Name: X:\WRC\LA RLP\FFF 11098000\Bulletin17bResults\Arroyo_Seco\Arroyo_Seco.xml

Skew Option: Use Weighted Skew
 Regional Skew: 0.0
 Regional Skew MSE: 0.302
 Round adopted skew to nearest tenth

Plotting Position Type: Weibull
 Upper Confidence Level: 0.05
 Lower Confidence Level: 0.95

Round ordinate values to 3 significant digits
 Display ordinate values using 0 digits in fraction part of value

--- End of Input Data ---

--- Preliminary Results ---

Note: Adopted skew equals station skew and preliminary frequency statistics are for the conditional frequency curve because of zero or missing events.

<< Frequency Curve >>

Arroyo Seco

| Computed Curve FLOW-ANNUAL PEAK, CFS | Expected Probability | Percent Chance Exceedance | Confidence Limits | |
|---|----------------------|---------------------------|-------------------------------|-------------------------------|
| | | | 0.05 FLOW-ANNUAL PEAK, CFS | 0.95 FLOW-ANNUAL PEAK, CFS |
| 16,700 | 18,200 | 0.2 | 28,600 | 10,700 |
| 12,200 | 13,100 | 0.5 | 20,200 | 8,110 |
| 9,370 | 9,930 | 1.0 | 15,000 | 6,370 |
| 6,960 | 7,280 | 2.0 | 10,800 | 4,860 |
| 4,380 | 4,520 | 5.0 | 6,450 | 3,180 |
| 2,860 | 2,910 | 10.0 | 4,020 | 2,140 |
| 1,660 | 1,680 | 20.0 | 2,240 | 1,280 |
| 554 | 554 | 50.0 | 702 | 437 |
| 168 | 166 | 80.0 | 217 | 125 |
| 87 | 84 | 90.0 | 117 | 61 |
| 49 | 47 | 95.0 | 69 | 33 |
| 16 | 15 | 99.0 | 25 | 9 |

<< Conditional Statistics >>

Arroyo Seco

| Log Transform: FLOW-ANNUAL PEAK, CFS | | Number of Events | |
|---|---------|------------------|---|
| Mean | 2.7150 | Historic Events | 0 |
| Standard Dev | 0.5941 | High Outliers | 0 |
| Station Skew | -0.2846 | Low Outliers | 0 |
| Regional Skew | 0.0000 | Zero Events | 0 |
| Weighted Skew | --- | Missing Events | 1 |

| | | | |
|--------------|---------|-------------------|----|
| Adopted Skew | -0.2846 | Systematic Events | 93 |
|--------------|---------|-------------------|----|

<< Conditional Probability Adjusted Ordinates >>

<< Frequency Curve >>

Arroyo Seco

| Computed Curve FLOW-ANNUAL PEAK, CFS | Expected Probability PEAK, CFS | Percent Chance Exceedance | Confidence Limits | |
|---|-----------------------------------|------------------------------|-------------------------------|-------------------|
| | | | 0.05 FLOW-ANNUAL PEAK, CFS | 0.95 PEAK, CFS |
| 16,600 | --- | 0.2 | --- | --- |
| 12,200 | --- | 0.5 | --- | --- |
| 9,330 | --- | 1.0 | --- | --- |
| 6,930 | --- | 2.0 | --- | --- |
| 4,360 | --- | 5.0 | --- | --- |
| 2,840 | --- | 10.0 | --- | --- |
| 1,650 | --- | 20.0 | --- | --- |
| 543 | --- | 50.0 | --- | --- |
| 160 | --- | 80.0 | --- | --- |
| 79 | --- | 90.0 | --- | --- |
| 41 | --- | 95.0 | --- | --- |
| --- | --- | 99.0 | --- | --- |

--- End of Preliminary Results ---

--- Final Results ---

<< Plotting Positions >>

Arroyo Seco

| Events Analyzed | | | | Ordered Events | | | |
|-----------------|-----|------|-------------|----------------|---------------|-------------|---------------------|
| Day | Mon | Year | FLOW CFS | Rank | Water Year | FLOW CFS | Weibull Plot Pos |
| 20 | Feb | 1914 | 5,800 | 1 | 1938 | 8,620 | 1.06 |
| 03 | Feb | 1915 | 634 | 2 | 1969 | 8,540 | 2.13 |
| 17 | Jan | 1916 | 3,150 | 3 | 1914 | 5,800 | 3.19 |
| 24 | Dec | 1916 | 760 | 4 | 1943 | 5,660 | 4.26 |
| 10 | Mar | 1918 | 570 | 5 | 1978 | 5,360 | 5.32 |
| 11 | Feb | 1919 | 92 | 6 | 1998 | 4,380 | 6.38 |
| 02 | Mar | 1920 | 450 | 7 | 1973 | 3,740 | 7.45 |
| 13 | Mar | 1921 | 650 | 8 | 2005 | 3,540 | 8.51 |
| 19 | Dec | 1921 | 2,800 | 9 | 1966 | 3,160 | 9.57 |
| 13 | Dec | 1922 | 370 | 10 | 1916 | 3,150 | 10.64 |
| 26 | Mar | 1924 | 81 | 11 | 1980 | 3,080 | 11.70 |
| 04 | Apr | 1925 | 210 | 12 | 1922 | 2,800 | 12.77 |
| 07 | Apr | 1926 | 1,450 | 13 | 1983 | 2,640 | 13.83 |
| 16 | Feb | 1927 | 1,400 | 14 | 1935 | 2,000 | 14.89 |
| 04 | Feb | 1928 | 298 | 15 | 1944 | 1,800 | 15.96 |
| 04 | Apr | 1929 | 155 | 16 | 1995 | 1,730 | 17.02 |
| 03 | May | 1930 | 143 | 17 | 1968 | 1,720 | 18.09 |
| 03 | Feb | 1931 | 151 | 18 | 1993 | 1,710 | 19.15 |
| 28 | Dec | 1931 | 480 | 19 | 1992 | 1,710 | 20.21 |
| 19 | Jan | 1933 | --- | 20 | 1967 | 1,530 | 21.28 |
| 01 | Jan | 1934 | 950 | 21 | 1962 | 1,500 | 22.34 |
| 17 | Oct | 1934 | 2,000 | 22 | 1926 | 1,450 | 23.40 |
| 12 | Feb | 1936 | 706 | 23 | 1927 | 1,400 | 24.47 |
| 06 | Feb | 1937 | 640 | 24 | 1941 | 1,340 | 25.53 |
| 02 | Mar | 1938 | 8,620 | 25 | 1971 | 1,330 | 26.60 |
| 18 | Dec | 1938 | 375 | 26 | 1945 | 1,210 | 27.66 |
| 08 | Jan | 1940 | 452 | 27 | 2006 | 1,120 | 28.72 |
| 20 | Feb | 1941 | 1,340 | 28 | 1952 | 1,090 | 29.79 |
| 10 | Dec | 1941 | 146 | 29 | 1934 | 950 | 30.85 |
| 23 | Jan | 1943 | 5,660 | 30 | 1991 | 921 | 31.91 |
| 22 | Feb | 1944 | 1,800 | 31 | 1956 | 815 | 32.98 |
| 11 | Nov | 1944 | 1,210 | 32 | 1961 | 769 | 34.04 |
| 30 | Mar | 1946 | 680 | 33 | 1917 | 760 | 35.11 |
| 25 | Dec | 1946 | 600 | 34 | 1958 | 715 | 36.17 |
| 29 | Apr | 1948 | 45 | 35 | 1936 | 706 | 37.23 |

| | | | | | |
|-------------|-------|----|------|-----|-------|
| 20 Jan 1949 | 35 | 36 | 2004 | 705 | 38.30 |
| 10 Nov 1949 | 150 | 37 | 1946 | 680 | 39.36 |
| 29 Apr 1951 | 12 | 38 | 1970 | 668 | 40.43 |
| 16 Jan 1952 | 1,090 | 39 | 1921 | 650 | 41.49 |
| 02 Dec 1952 | 49 | 40 | 1937 | 640 | 42.55 |
| 24 Jan 1954 | 571 | 41 | 1915 | 634 | 43.62 |
| 30 Apr 1955 | 107 | 42 | 1981 | 627 | 44.68 |
| 26 Jan 1956 | 815 | 43 | 1982 | 615 | 45.74 |
| 23 Feb 1957 | 158 | 44 | 1947 | 600 | 46.81 |
| 03 Apr 1958 | 715 | 45 | 1976 | 590 | 47.87 |
| 16 Feb 1959 | 351 | 46 | 1996 | 584 | 48.94 |
| 12 Jan 1960 | 170 | 47 | 1954 | 571 | 50.00 |
| 06 Nov 1960 | 769 | 48 | 1918 | 570 | 51.06 |
| 11 Feb 1962 | 1,500 | 49 | 1997 | 569 | 52.13 |
| 09 Feb 1963 | 464 | 50 | 1975 | 535 | 53.19 |
| 21 Jan 1964 | 182 | 51 | 2000 | 509 | 54.26 |
| 09 Apr 1965 | 194 | 52 | 1932 | 480 | 55.32 |
| 22 Nov 1965 | 3,160 | 53 | 1963 | 464 | 56.38 |
| 06 Dec 1966 | 1,530 | 54 | 1988 | 457 | 57.45 |
| 19 Nov 1967 | 1,720 | 55 | 1940 | 452 | 58.51 |
| 25 Jan 1969 | 8,540 | 56 | 1920 | 450 | 59.57 |
| 28 Feb 1970 | 668 | 57 | 2003 | 433 | 60.64 |
| 29 Nov 1970 | 1,330 | 58 | 1974 | 390 | 61.70 |
| 24 Dec 1971 | 222 | 59 | 1939 | 375 | 62.77 |
| 11 Feb 1973 | 3,740 | 60 | 1923 | 370 | 63.83 |
| 08 Mar 1974 | 390 | 61 | 1959 | 351 | 64.89 |
| 06 Mar 1975 | 535 | 62 | 2001 | 348 | 65.96 |
| 09 Feb 1976 | 590 | 63 | 1928 | 298 | 67.02 |
| 09 May 1977 | 230 | 64 | 1977 | 230 | 68.09 |
| 04 Mar 1978 | 5,360 | 65 | 1972 | 222 | 69.15 |
| 21 Feb 1979 | 193 | 66 | 1984 | 217 | 70.21 |
| 16 Feb 1980 | 3,080 | 67 | 1986 | 213 | 71.28 |
| 29 Jan 1981 | 627 | 68 | 1925 | 210 | 72.34 |
| 17 Mar 1982 | 615 | 69 | 1965 | 194 | 73.40 |
| 02 Mar 1983 | 2,640 | 70 | 1979 | 193 | 74.47 |
| 25 Dec 1983 | 217 | 71 | 1964 | 182 | 75.53 |
| 16 Dec 1984 | 139 | 72 | 1960 | 170 | 76.60 |
| 30 Jan 1986 | 213 | 73 | 1990 | 163 | 77.66 |
| 05 Jan 1987 | 13 | 74 | 1957 | 158 | 78.72 |
| 29 Feb 1988 | 457 | 75 | 1989 | 155 | 79.79 |
| 16 Dec 1988 | 155 | 76 | 1929 | 155 | 80.85 |
| 17 Feb 1990 | 163 | 77 | 1931 | 151 | 81.91 |
| 01 Mar 1991 | 921 | 78 | 1950 | 150 | 82.98 |
| 11 Feb 1992 | 1,710 | 79 | 1942 | 146 | 84.04 |
| 17 Jan 1993 | 1,710 | 80 | 1930 | 143 | 85.11 |
| 07 Feb 1994 | 129 | 81 | 1985 | 139 | 86.17 |
| 10 Jan 1995 | 1,730 | 82 | 1994 | 129 | 87.23 |
| 21 Feb 1996 | 584 | 83 | 1955 | 107 | 88.30 |
| 22 Dec 1996 | 569 | 84 | 1919 | 92 | 89.36 |
| 23 Feb 1998 | 4,380 | 85 | 1924 | 81 | 90.43 |
| 09 Feb 1999 | 62 | 86 | 1999 | 62 | 91.49 |
| 20 Feb 2000 | 509 | 87 | 1953 | 49 | 92.55 |
| 13 Feb 2001 | 348 | 88 | 1948 | 45 | 93.62 |
| 28 Jan 2002 | 41 | 89 | 2002 | 41 | 94.68 |
| 12 Feb 2003 | 433 | 90 | 1949 | 35 | 95.74 |
| 26 Feb 2004 | 705 | 91 | 1987 | 13 | 96.81 |
| 09 Jan 2005 | 3,540 | 92 | 1951 | 12 | 97.87 |
| 02 Jan 2006 | 1,120 | 93 | 1933 | 0 | 98.94 |

<< Outlier Tests >>

<< Low Outlier Test >>

Based on 92 events, 10 percent outlier test value $K(N) = 2.989$
0 low outlier(s) identified below test value of 9

Based on statistics after 0 zero events and 1 missing events were deleted.

<< High Outlier Test >>

Based on 92 events, 10 percent outlier test value $K(N) = 2.989$
0 high outlier(s) identified above test value of 30,953

<< Skew Weighting >>

 Based on 93 events, mean-square error of station skew = 0.071
 Default or input mean-square error of regional skew = 0.302

<< Frequency Curve >>

Arroyo Seco

| Computed Curve FLOW-ANNUAL PEAK, CFS | Expected Probability PEAK, CFS | Percent Chance Exceedance | Confidence Limits | |
|---|--------------------------------------|---------------------------------|----------------------------------|-------------------|
| | | | 0.05 FLOW-ANNUAL PEAK, CFS | 0.95 PEAK, CFS |
| 26,600 | 30,100 | 0.2 | 48,300 | 16,500 |
| 17,600 | 19,300 | 0.5 | 30,400 | 11,300 |
| 12,500 | 13,500 | 1.0 | 20,700 | 8,300 |
| 8,610 | 9,100 | 2.0 | 13,600 | 5,910 |
| 4,920 | 5,100 | 5.0 | 7,320 | 3,540 |
| 2,990 | 3,060 | 10.0 | 4,230 | 2,230 |
| 1,640 | 1,660 | 20.0 | 2,200 | 1,270 |
| 519 | 519 | 50.0 | 656 | 410 |
| 164 | 162 | 80.0 | 212 | 123 |
| 90 | 88 | 90.0 | 120 | 64 |
| 55 | 53 | 95.0 | 76 | 37 |
| 22 | 20 | 99.0 | 32 | 13 |

<< Conditional Statistics >>

Arroyo Seco

| Log Transform: FLOW-ANNUAL PEAK, CFS | | Number of Events | |
|---|---------|-------------------|----|
| Mean | 2.7150 | Historic Events | 0 |
| Standard Dev | 0.5941 | High Outliers | 0 |
| Station Skew | -0.2846 | Low Outliers | 0 |
| Regional Skew | 0.0000 | Zero Events | 0 |
| Weighted Skew | -0.2301 | Missing Events | 1 |
| Adopted Skew | 0.0000 | Systematic Events | 93 |

November 15, 2004

TO: Rod Kubomoto
Watershed Management Division

Attention Geoffrey Owu

FROM: Fred M. Rubin
Fred M. Rubin
Water Resources Division

**MALIBU LAKE
RESERVOIR ROUTING ANALYSIS
FOR REVISED CAPITAL FLOOD**

In response to your request, we have conducted a reservoir routing analysis for the Malibu Lake reservoir based on a revised hydrology study to determine the maximum water surface elevation. The maximum water surface elevation, based on National Geodetic Vertical Datum (NGVD) of 1929, for the Malibu Lake reservoir using the revised Capital Flood is indicated in the table below.

| Capital Flood | Maximum Water Surface Elevation |
|---------------|---------------------------------|
| 38,200 cfs | 735.61 feet |

The hydrologic analysis was based on the methods and procedures described in the 1991 Public Works Hydrology/Sedimentation Manual and the 2002 Hydrology Manual Addendum. The Capital Flood is the runoff resulting from a 50-year frequency design storm adjusted to account for the effects of a burned watershed.

The reservoir routing analysis is based on the most current available data for the Malibu Lake reservoir. The analysis is based on the spillway modification detailed on plans prepared by Carl Day A.I.A and Associates. The modification was completed in 1997 and consisted of parapet walls approximately five feet and seven feet above the spillway.

The elevation storage curve used in the reservoir routing analysis for the Malibu Lake reservoir was provided by Survey Division and is based on map number 154-T37. The date of survey for this map is October and November 1980 and is based on NGVD 1929.

The reservoir routing analysis assumes that the reservoir is full with an initial water surface elevation at spillway elevation of 722.18 feet (NGVD 1929).

If you have any questions, please contact Martin Araiza at 458-6152.

MA
MA:jac
P:\HYDDEV\USERS\MARTIN\MEMOS\MALIBU_LAKE_RESERVOIR_WSE.DOC

bc: Building and Safety (Pestrella, Kalhor)
Programs Development (Galang)
Water Resources (Walden, Araiza, Files)

Regards,

Oliver Galang

Federal Coordination Unit | FS&RR Section
Programs Development Division
Los Angeles County Department of Public Works

-----Original Message-----

From: Araiza, Martin
Sent: Monday, September 20, 2004 7:16 AM
To: Galang, Oliver; Owu, Geoffrey; Daleo, Sam
Subject: Malibu Lake - Explanation of Flow Rates

It is understood that FEMA employs the 100-yr flood event to delineate flood zones. A Log Pearson Type III runoff frequency analysis is an appropriate method to determine this 100-yr flood event or any other desired frequency flood event. Unfortunately, most of the watersheds in the Los Angeles County area are either ungaged or those that are gaged have insufficient data. For these areas, the Modified Rational Method is used as the hydrologic model. The Modified Rational Method is a hydrologic model used to estimate flow rates for ungaged watersheds. It is a model that uses a design rainfall event as input (i.e. 10-, 25-, 50-, or 100-yr frequency storm) and generates runoff based on model parameters such as subarea size, landuse type, and soil type. The hydrologic method is a modified version of the widely known Rational Method, $Q=C*I*A$, and in general employs the same methodology. The only difference is that the Modified Rational Method generates a hydrograph and can route flows. Flow rates computed can also be adjusted to account for the effects of burned watersheds or the inclusion of sediment. This is referred to as "burning" and "bulking" the flows.

It needs to be understood that for the Modified Rational Method a rainfall event of a certain frequency doesn't necessarily produce a runoff event of the same frequency. For example, when using a 50-yr design storm, the flow rate generated does not translate into a 50-yr flood event. The same can be said for all the other frequency design storms (i.e. 10-, 25-, 50-, or 100-yr frequency storm). Comparison studies have shown that the Modified Rational Method produces flow rates that are consistently higher than those from a Log Pearson Type III analysis. For example, using a 50-yr design storm may generate flow rates comparable to a 100-yr flood event or greater.

For the Malibu Lake watershed, the Modified Rational Method was used to determine flow rates for the 10-, 50-, 100-, and 500-yr frequency design storms. Upon comparing the flow rates generated by the Modified Rational Method to those published by FEMA for the Malibu Lake location, it can be seen that flow rates from the Modified Rational Method produce flood events greater than those from FEMA. The flowrate resulting from a 50-yr design storm translates to a flood event slightly larger than FEMA's 100-yr. See attached file.

Hopefully this explains the hydrologic method used to determine flows for the Malibu Lake area and how the results translate in terms of flood events. If there are any additional questions or if further explanation is required, please let me know.

Martin Araiza, P.E.
Los Angeles County
Department of Public Works
Water Resources Division

**WATER RESOURCES DIVISION
Hydrologic Engineering Section**

WORK ASSIGNMENT SUMMARY

Conclusions:

LACDPW Clear Flowrates

| Design Storm Frequency | Peak Inflow (cfs) | Peak Outflow (cfs) | Maximum Water Surface Elevation (feet) | Maximum Storage (acre-feet) |
|------------------------|-------------------|--------------------|--|-----------------------------|
| 10-year | 18,800 | 16,000 | 730.72 | 438.42 |
| 50-year | 33,900 | 29,000 | 734.55 | 758.32 |
| 100-year | 40,500 | 34,300 | 735.94 | 894.69 |
| 500-year | 57,000 | 47,300 | 739.04 | 1253.29 |

LACDPW Burn Flowrates

| Design Storm Frequency | Peak Inflow (cfs) | Peak Outflow (cfs) | Maximum Water Surface Elevation (feet) | Maximum Storage (acre-feet) |
|------------------------|-------------------|--------------------|--|-----------------------------|
| 10-year | 22,200 | 19,300 | 731.77 | 516.48 |
| 50-year | 38,200 | 33,000 | 735.61 | 862.00 |
| 100-year | 45,000 | 38,500 | 736.98 | 1009.56 |
| 500-year | 63,100 | 52,900 | 740.29 | 1413.05 |

FEMA Flowrates

| Design Storm Frequency | Peak Inflow (cfs) | Peak Outflow (cfs) | Maximum Water Surface Elevation (feet) | Maximum Storage (acre-feet) |
|------------------------|-------------------|--------------------|--|-----------------------------|
| 10-year | 11,900 | 10,200 | 728.59 | 291.39 |
| 50-year | 26,600 | 23,200 | 732.93 | 612.43 |
| 100-year | 34,000 | 29,600 | 734.72 | 774.63 |
| 500-year | 53,700 | 46,300 | 738.81 | 1224.72 |

COUNTY OF LOS ANGELES

MALIBU LAKE
REPETITIVE LOSS PROPERTIES

APPENDIX C

Environmental Overview - CEQA Checklist

JULY 2007
REVISED DECEMBER 2009

Environmental Checklist Form

- 1 Project title: The County of Los Angeles Floodplain Management Plan for Repetitive Loss Properties
- 2 Lead agency name and address:
The County of Los Angeles - Department of Public Works
900 S. Fremont Ave.
Alhambra, CA 91803
- 3 Contact person and phone number: Lan Weber
WRC Consulting Services, Inc.
1800 E. Garry Avenue, Suite 213
Santa Ana, California 92705
(949) 833-8388
- 4 Project location: Malibu Lake, Agoura, CA
- 5 Project sponsor's name and address:
The County of Los Angeles - Department of Public Works
900 S. Fremont Ave.
Alhambra, CA 91803
- 6 General plan designation:
- 7 Zoning:
- 8 Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)
Various homes around Malibu Lake have experienced property loss or damage due to repetitive flood events. Each property is relatively small in area and is characterized by individual site conditions. The existing environments are primarily the residential structures, but include yards and landscaping, as well as driveways and other hardscaped areas. Adjacent streets and hillsides are part of the exiting environment for some properties.
Proposed site improvements include: (1) converting flood-prone living space and replacing with a new story; (2) constructing or modifying retaining walls with proper drainage and trash capacity; and (3) storm sewer improvement.
- 9 Surrounding land uses and setting: Briefly describe the project's surroundings:
Surrounding land uses are residential development and open space. The general setting is a low density residential development centered on Malubu Lake.
- 10 Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.) - Not applicable to FMP

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

Aesthetics - The proposed improvements require raising the houses. This may affect the visual character and quality of the various homesites and the neighborhood in general.

Biological - The proposed improvements, if not confined to the house and surrounding properties, could affect flows in adjacent drainages, including alteration of the drainages. Improvements outside landscape and hardscape areas could also potentially affect sensitive species.

Cultural - The proposed improvements could result in the alteration of potentially historical homes.

- | | | |
|--|---|---|
| <input type="checkbox"/> Aesthetics | <input type="checkbox"/> Agriculture Resources | <input type="checkbox"/> Air Quality |
| <input type="checkbox"/> Biological Resources | <input type="checkbox"/> Cultural Resources | <input type="checkbox"/> Geology /Soils |
| <input type="checkbox"/> Hazards & Hazardous Materials | <input type="checkbox"/> Hydrology / Water Quality | <input type="checkbox"/> Land Use / Planning |
| <input type="checkbox"/> Mineral Resources | <input type="checkbox"/> Noise | <input type="checkbox"/> Population / Housing |
| <input type="checkbox"/> Public Services | <input type="checkbox"/> Recreation | <input type="checkbox"/> Transportation/Traffic |
| <input type="checkbox"/> Utilities / Service Systems | <input type="checkbox"/> Mandatory Findings of Significance | |

DETERMINATION: (To be completed by the Lead Agency). On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature

Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

- 1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
- 2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
- 3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
- 4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).
- 5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
 - a) Earlier Analysis Used. Identify and state where they are available for review.
 - b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
 - c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

- 6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
- 7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
- 8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
- 9) The explanation of each issue should identify:
 - a) the significance criteria or threshold, if any, used to evaluate each question; and
 - b) the mitigation measure identified, if any, to reduce the impact to less than significance

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| I. AESTHETICS -- Would the project: | | | | |
| Have a substantial adverse effect on a scenic vista? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Substantially degrade the existing visual character or quality of the site and its surroundings? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project: | | | | |
| Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Conflict with existing zoning for agricultural use, or a Williamson Act contract? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project: | | | | |
| a) Conflict with or obstruct implementation of the applicable air quality plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Expose sensitive receptors to substantial pollutant concentrations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Create objectionable odors affecting a substantial number of people? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|---|---|---|----------------------|
|--|---|---|---|----------------------|

IV. BIOLOGICAL RESOURCES: Would the project:

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

V. CULTURAL RESOURCES: Would the project:

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Cause a substantial adverse change in the significance of a historical resource as defined in 115064.5? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to 115064.5? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|--------------------------|
| d) Disturb any human remains, including those interred outside of formal cemeteries? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

VI. GEOLOGY AND SOILS: Would the project:

| | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ii) Strong seismic ground shaking? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| iii) Seismic-related ground failure, including liquefaction? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| iv) Landslides? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Result in substantial soil erosion or the loss of topsoil? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

VII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|--------------------------|
| c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) For a project located within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

VIII. HYDROLOGY AND WATER QUALITY: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Violate any water quality standards or waste discharge requirements? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| or off-site? | | | | |
| d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Otherwise substantially degrade water quality? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| j) Inundation by seiche, tsunami, or mudflow? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

IX. LAND USE AND PLANNING: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Physically divide an established community? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Conflict with any applicable habitat conservation plan or natural community conservation plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| X. MINERAL RESOURCES: Would the project: | | | | |
| a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| XI. NOISE: Would the project result in: | | | | |
| a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Exposure of persons to or generation of excessive groundbome vibration or groundborne noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| XII. POPULATION AND HOUSING: Would the project: | | | | |
| a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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|---|--------------------------------|--|------------------------------|--------------------------|
| b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XIII. PUBLIC SERVICES

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fire protection? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Police protection? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Schools? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Parks? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other public facilities? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XIV. RECREATION

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

| | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

| | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|

XV. TRANSPORTATION/TRAFFIC: Would the project:

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?

| | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|--------------------------|
| b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Result in inadequate emergency access? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Result in inadequate parking capacity? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XVI. UTILITIES AND SERVICE SYSTEMS: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the provider: s existing commitments? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|---|---|---|--------------------------|
| g) Comply with federal, state, and local statutes and regulations related to solid waste? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

| | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| FACTOR | RLP ID NUMBER | | | | | | | | | | | | | | | | | | | | | |
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| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 25 | 46 | | | |
| I | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
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| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| II | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
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| III | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
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| IV | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
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| | f | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| V | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
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| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| VI | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | a.i | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | a.ii | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | a.iii | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | a.iv | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| VII | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
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| VIII | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | e | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| | g | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | h | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | i | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | j | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| IX | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| X | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| XI | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | e | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | f | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| XII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| XIII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| XIV | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | e | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| XV | f | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | g | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | e | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| XVI | f | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | g | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | d | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | e | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| XVII | f | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |
| XVIII | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D | D |

| RLP ID | REPETITIVE LOSS NO. |
|--------|---------------------|
| 1 | 0046576 |
| 2 | 0047197 |
| 3 | 0001165 |
| 4 | 0039962 |
| 5 | 0028487 |
| 6 | 0040087 |
| 7 | 0012820 |
| 8 | 0049496 |
| 10 | 0014896 |
| 11 | 0028444 |
| 12 | 0071413 |
| 13 | 0073653 |
| 14 | 0072406 |
| 15 | 0071417 |
| 16 | 0035727 |
| 17 | 0052974 |
| 18 | 0093872 |
| 25 | 0057971 |
| 46 | 0091232 |

| FACTOR KEY | |
|------------|---------------------------------------|
| A | Potentially Significant Impact |
| B | Less than Significant with Mitigation |
| C | Less than Significant |
| D | No Impact |

COUNTY OF LOS ANGELES

MALIBU LAKE
REPETITIVE LOSS PROPERTIES

APPENDIX D

Public Involvement Process

JULY 2007
REVISED DECEMBER 2009

PUBLIC INVOLVEMENT PROCESS

The public involvement process and procedure for this FMP included informing and involving the public by interviewing RLP owners during site visits, distributing a questionnaire survey, and conducting a public meeting.

This appendix provides a summary of the public involvement process, including the following:

1. 2002 Public Involvement Activities Summary and HMGP Grant Status Page 2
2. Public Involvement Process Summary Page 5
3. Notice Letter Page 8
4. Repetitive Loss Property Questionnaire and Response Page 9
5. Initial Public Outreach Mailing List Page 16
6. Second Public Outreach Mailing List Page 18
7. Meeting Notice by John Medina's E-mail Page 20
8. 03/26/2007 Public Outreach Mailing List Page 22
9. Public Meeting Notice and Agenda Page 23
10. Public Meeting Sign-In Sheet Page 25
11. 03/26/2007 Public Meeting Minutes Page 26

2002 PUBLIC INVOLVEMENT ACTIVITIES SUMMARY AND HMGP GRANT STATUS

County and WRC staff have been working with Malibu Lake RLP owners since 2000. As part of the 2002 FMP process, nineteen properties were visited and several property owners were interviewed (see Appendix B of 2002 FMP). Additionally, three public meetings were hosted (see Appendix D of 2002 FMP). These meetings were supported by the County Building and Safety Division (Calabasas Office), Ms. Susan Nissman (3rd District Board Senior Field Deputy) and the Malibu Lake Mountain Club.

County and WRC staff further assisted the public with participation in the HMGP, which provides funding from FEMA. Meetings with state representatives were held and both mitigation alternatives and benefit-cost analyses were presented. This process resulted in an increase in the total funding amount available to all eligible RLP owners.

The County continued to work with both the state and Malibu Lake Mountain Club, and obtained the final funding approval. In addition, the County has provided extensive support to RLP owners who expressed an interest in receiving the HMGP grant. The interested RLP owners are identified in Table 1.

For eligibility under current HMGP funding, construction must be completed by the end of 2007 and County approval must be received. In order to receive grading and building permits, RLP owners must submit architectural and engineering plans with a soil engineering report to the County. New sewer service must also be in place before construction begins. The construction of new sewer lines, and the implementation of new sewer service, has been facilitated by the Malibu Lake Mountain Club. In order to assist RLP owners, the County has expedited the approval process of their improvement plans.

The current status of the sewer project already allows three homeowners to begin construction on their properties, as shown in Table 1.

Public Involvement Process Summary

WRC developed a questionnaire designed to understand each RLP owner's concerns, damages, causes of damages, and improvements made to reduce damages. The questionnaire was mailed to all 19 RLPs on December 27, 2006. Table 2 provides further details and shows that the mail for RLP Nos. 2, 10, 13, 15, and 16 were returned as "unable to deliver." A copy of the questionnaire is attached. Most owners did not respond to survey requests or meeting inquiries. Many RLP owner names identified in the FEMA database appear to be outdated. The questionnaire was mailed again on January 16, 2007 and addressed to "Owner/Current Resident" in lieu of the owner name on file. Table 2 provides further details and shows that the mailings for RLP Nos. 2, 10, 13, 15, 16, and 17 were returned as "unable to deliver." Three RLP owners responded to the questionnaire. Two properties: 29067 S. Lakeshore Drive and 2310 Laguna Circle Drive, were not listed in the FEMA RLP database, but participated in the HMGP grant application.

Individual meetings were intended to allow the RLP owners to voice their concerns and to volunteer to participate in the County's floodplain management planning efforts. WRC's Project Manager and Engineer met with the owners of RLP Nos. 14 and 46 on March 26, 2007. WRC successfully interviewed the owner of RLP No. 46 and identified the historical flood problems and the improvements made to date for flood reduction. This property owner believes that he has fixed the flood problems. However, the property is still subject to future flood damages based on WRC's investigation and technical analysis (see Table 4.2, main FMP report). Additional measures are needed to avoid future claims (see Section 10, main FMP report). WRC also met with the owner of RLP No. 14 to review and verify the proposed mitigation plan, which is being implemented. Additional street runoff control at the property entrance was recommended by WRC.

A public meeting was held on March 26, 2007 at the Malibou Lake Mountain Club. Notices for the meeting were emailed by Mr. John Medina on March 12, 2007 and mailed by WRC on March 21, 2007. These efforts resulted in the attendance of more than 20 owners in the general session and nine owners in the RLP discussion session. The meeting notices, attendee sign-in record, and meeting minutes are attached.

Table 2 Public Involvement Questionnaire

| PUBLIC INVOLVEMENT QUESTIONNAIRE | | | | | |
|---|--------------------------|--|----------------------------------|---|----------------------------------|
| Malibu Lake Area RLPs | | | | | |
| RLP ID | Repetitive Loss # | Initial Notice Letter and Questionnaire | | Second Notice Letter and Questionnaire | |
| | | 12/27/06 Mailing | Mailing Returned Unopened | 1/16/07 Mailing | Mailing Returned Unopened |
| 1 | 46576 | Yes | No | Yes | No |
| 2 | 47197 | Yes | Yes | Yes | Yes |
| 3 | 1165 | Yes | No | Yes | No |
| 4 | 39962 | Yes | No | Yes | No |
| 5 | 28487 | Yes | No | Yes | No |
| 6 | 40087 | Yes | No | Yes | No |
| 7 | 12820 | Yes | No | Yes | No |
| 8 | 49496 | Yes | No | Yes | No |
| 9** | 14896 | | | | |
| 10 | 28444 | Yes | Yes | Yes | Yes |
| 11 | 71413 | Yes | No | Yes | No |
| 12 | 73653 | Yes | No | Yes | No |
| 13 | 72406 | Yes | Yes | Yes | Yes |
| 14 | 71417 | Yes | No | Yes | No |
| 15 | 35727 | Yes | Yes | Yes | Yes |
| 16 | 52974 | Yes | Yes | Yes | Yes |
| 17 | 93872 | Yes | No | Yes | Yes |
| 18 | 57971 | Yes | No | Yes | No |
| 25 | 91232 | Yes | No | Yes | No |
| 46* | 137792 | Yes | No | Yes | No |
| * New RLP for 2007 FMP | | | | | |
| ** Mitigated RLP | | | | | |

Table 3 Public Meeting

| PUBLIC MEETING ACTIVITIES | | | | | | | |
|----------------------------------|--------------------------|------------------------------------|-----------|--------------------------------|-----------|---------------------------------|------------------------|
| Malibu Lake Area RLPs | | | | | | | |
| RLP ID | Repetitive Loss # | On-Site Interview Conducted | | Attended Public Meeting | | Notice to Public Meeting | |
| | | Yes | No | Yes | No | E-mail | 3/21/07 Mailing |
| 1 | 46576 | | √ | | √ | √ | √ |
| 2 | 47197 | | √ | | √ | √ | √ |
| 3 | 1165 | | √ | √ | | √ | √ |
| 4 | 39962 | | √ | | √ | √ | √ |
| 5 | 28487 | | √ | | √ | √ | √ |
| 6 | 40087 | | √ | | √ | √ | √ |
| 7 | 12820 | | √ | √ | | √ | √ |
| 8 | 49496 | | √ | √ | | √ | √ |
| 9** | 14896 | | | | | | |
| 10 | 28444 | | √ | | √ | √ | √ |
| 11 | 71413 | | √ | | √ | √ | √ |
| 12 | 73653 | | √ | √ | | √ | √ |
| 13 | 72406 | | √ | | √ | √ | √ |
| 14 | 71417 | 3/26/07 | | √ | | √ | √ |
| 15 | 35727 | | √ | √ | | √ | √ |
| 16 | 52974 | | √ | | √ | √ | √ |
| 17 | 93872 | | √ | √ | | √ | √ |
| 18 | 57971 | | √ | | √ | √ | √ |
| 25 | 91232 | | √ | | √ | √ | √ |
| 46* | 137792 | 3/26/07 | | | √ | √ | √ |
| * New RLP for 2007 FMP | | | | | | | |
| ** Mitigated RLP | | | | | | | |

NOTICE LETTER

Dear Property Owner,

I am writing to you regarding the assistance that the County of Los Angeles is offering to individual owners of property identified as Repetitive Loss Properties (RLP) by the Federal Emergency Management Agency (FEMA). A RLP is defined as a property for which two or more claims of \$1,000 or more have been paid by the National Flood Insurance Program (NFIP) within any given 10-year period since 1978. According to FEMA records, your property has been identified as such.

WRC Consulting Services, Inc. has been contracted by the County of Los Angeles to prepare a Floodplain Management Plan (FMP) for RLPs. This plan will help the RLP owners to understand the specific flooding problems related to their flood damages. The plan will also provide possible mitigation measures for owners to consider for future mitigation. The background of the NFIP is described as follows:

Los Angeles County has been a voluntary participant in the National Flood Insurance Program (NFIP) since 1980. This program allows the flood-prone-property owners to obtain federally backed flood insurance for their properties. The County's efforts have also allowed policyholders to receive a 10-percent discount on insurance premiums in recent years.

The development of a Floodplain Management Plan (FMP) is an important part of the NFIP to further reduce flood losses. The Plan will identify existing problems and recommend actions for reducing the hazard to structures. Any recommended actions will be entirely voluntary by the property owners. Please be assured that development of this plan is not to repeat the county's previous efforts in flood mapping and ordinance enforcement, rather to provide updates on the previous plan and emphasis on the public outreach and involvement in the following planning process:

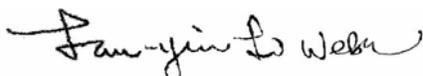
- Flood Hazard Assessment
- Problems Identification
- Goal Setting
- Alternative Plan Development
- Plan Preparation

We are scheduled to visit your neighborhood during the weeks of January 8 and January 15 to inspect the area. A personal review of your property relating to possible cause of the previous flood hazards and current improvements can be arranged at this time by calling our office at (949) 833-8388 ext 102.

In addition to the property visit a questionnaire is enclosed inquiring about the specifics and nature of the flood damages of your property. This questionnaire is important to the development of a functional FMP, and we hope you can spare a few moments of your time to fill-out the questionnaire and return it to us with the enclosed envelope by February 1, 2007.

Your information will be strictly confidential, and there will be no cost to you. Your participation and input during the development of the final FMP is essential for the development of a practical plan.

Sincerely,
WRC Consulting Services, Inc.



Lan-Yin Li Weber, Ph.D., President

Malibu Lake Floodplain Management Plan

Public Meeting Minutes

Date/Time: March 26 7:00-9:00 PM

Location: Malibu Lake Mountain Club, Cornel Road, Agoura Hills

Attendees: See Sign-In Sheet

Prepared by: Lan Weber

General Session

Malibu Lake Home Owner Association gathers a general meeting before the RLP meeting. Mr. Geoffrey Owu representing Los Angeles County Public Works Department and Dr. Lan Weber of WRC Consulting Services, Inc. representing County's consultant, were introduced.

Dr. Weber reviewed the floodplain management process by following the Activity 510 (Floodplain Management Planning) of the CRS Coordinator's Manual (2006 Edition). In addition to flood hazard assessment and problem identification, public involvement is an essential step to understanding the site specific issues and to promote the flood awareness and assist RLP owners in flood mitigation. For Malibu Lake, we visited the properties, provided general recommendations for improvement, estimated B/C ratios, and assisted in grant funding.

Mr. Owu provided a review of the Hazard Mitigation Grant Program status report.

RLP Owner Session

Geoffrey restated the funding total of \$1,404,658 from FEMA to elevate 18 homes has been received by the County in January 2005. District 3 Field Supervisor Susan Nissman made significant contribution to the funding. Total costs were estimated at 1,872,877 with \$900,000 appropriated in the County 2004-2005 Flood Control District budget, and the

The sewer construction near their houses was completed. Construction start is pending on the sewer service connection. Edison company's power service expect to delay to April 2007 seems to be the critical problem. Geoffrey said that the County is helping to expedite the project.

Since the 2005 grant eligibility requires construction due by the end of 2007, the remaining phase of funding (three homes including Dickenson, Thoran, and Challed) may be jeopardized due to construction delay.

Owners were asking why FEMA can not fund sewer construction, Dr. Weber said that HMGP only applies to emergency and disaster assistance. Sewer is for public works requirements, not for hazard mitigation U.S. Army Corps of Engineers involves more infrastructure repair funding.

Patricia said that the program has been working for the RLP owners. Dr. Weber stated that, even the grant provided mitigation to the dwelling, street and on site flow diversion to prevent flows entering the property and structure must be considered.

Some owners complained that the County changed the building permit requirements several times and the OES mitigation plans were not consistent with the FMP recommendation. For those who can not construct timely and those who have interests in future grant participation, the County will continue to work with OES and FEMA on future funding.

There are no additional meetings planned as most the issues are related to sewer service and construction schedule.

Just for record, out of the grant recipients, Dickinson and Ozzimo were not listed in the RLP database. The new RLP No. 46 owner (Barker) did not showed up.

COUNTY OF LOS ANGELES

MALIBU LAKE
REPETITIVE LOSS PROPERTIES

APPENDIX E

Economic Assessment of Damages and Mitigation Measures

JULY 2007
REVISED DECEMBER 2009

INTRODUCTION

The economic assessments of damages and the cost-effectiveness of potential measures for the Repetitive Loss Properties (RLPs) of the Malibu Lake area are constructed to closely follow the analysis procedures employed in examining Federal water resources projects by the U.S. Army Corps of Engineers (USACOE). The underlying purpose of the USACOE analytical procedures is to convert the random nature of flood related damages to an expression of equivalent annual damage for comparison to the amortized cost of mitigation. The fundamental factors behind USACOE's determinations of structural related damages are (1) depreciated structure replacement value, (2) content-to-structure value relationships, (3) inundation levels, (4) inundation depth-to-damage percentages, and (5) cleanup cost relationship to the amount of inundated surface. The results of the analysis of these factors are ultimately incorporated into the USACOE Hydrologic Engineering Center's (HEC) Flood Damage Analysis Package, HEC-FDA, for the determination of equivalent annual damages. The following paragraphs will discuss the how the above factors are determined and analyzed for this assessment in greater detail.

DEPRECIATED STRUCTURE REPLACEMENT VALUE

The basic premise behind the use of depreciated structure replacement value in damage assessments is that damage should be measured by the worth of the existing structure, noting its age and condition, and not by the current cost of the replacement of damage to avoid the creation of a betterment for the property owner and the overestimation of damage. To calculate depreciated structure replacement value many USACOE Districts, including the Los Angeles District, employ the Marshall & Swift's valuation service. This service categorizes structures through a vast array of building types and construction classifications. Combining these construction costs with the service's localized cost factor adjustments yields thousands of cost combinations to virtually estimate any type of structure. In this assessment the Marshall Valuation Service is utilized for the determination of depreciated structure replacement value.

CONTENT-TO-STRUCTURE VALUE RELATIONSHIP

In keeping with common procedures utilized with Federal water resources projects, the content-to-structure ratio for residential structures is set at 50 percent of depreciated replacement value. Non-residential content-to-structure ratios are determined in relationship to the work conducted by CH2M Hill, Inc. for the New Orleans District, Planning Division, Economic and Social Analysis Branch as shown in the output data for the Lake Pontchartrain Hurricane Protection Plan.

INUNDATION LEVELS

The determination of inundation levels for the RLPs in this analysis is an interpolation of the Malibu Lake water surface elevation and the reported structure base first floor elevation. The

water surface elevation is based on the Los Angeles County Department of Public Works' reservoir routing data for the capital storm and a base lake level of spillway crest.

INUNDATION DEPTH-TO-DAMAGE PERCENTAGES

This economic assessment employs the Federal Emergency Management Agency's (FEMA) Depth Percent Damage data from its Flood Insurance Rate Review – 1997. These depth/damage percentages are shown in Appendix E1.

CLEANUP COSTS AND OTHER COSTS

Flooding not only causes damage to structures and contents but floodwaters present a significant cost in their aftermath clean up. Floodwaters leave debris, sediment and the dangers of diseases and mycotoxins throughout flooded structures. The cleaning of these structures is a necessary post-flood activity. Clean-up cost estimates are based on studies of the USACOE's Los Angeles and Seattle Districts. Clean-up costs for the extraction of floodwaters, dry-out, and decontamination range from \$1 to \$4.75 per square foot. Mean cleanup cost is estimated at \$3.65 per square foot, with heavily sediment-laden waters increasing costs by 75 percent.

The principal cost represented by other costs is FEMA's Temporary Relocation Assistance (TRA) to damaged properties. Flood studies by Stanislaus County, California and the USACOE Districts of Seattle and St. Paul indicate FEMA expends \$1,537 per damaged property on average. In this analysis TRA costs are set at \$1,537 for each damaged property.

DAMAGE MITIGATION MEASURES - ECONOMIC ASSESSMENT METHODOLOGY

The cost effectiveness of a potential mitigation measure is assessed on two levels for this study. The first level is the common benefit-to-cost (B/C) ratio method and the second being an investment recovery approach. The two approaches are necessary in that employing the B/C ratio method an assumption regarding the interest rate and amortization period must be made for the participants, which may or may not apply to all. In the B/C ratio method, the current Federal water resources projects rate of 6? percent and a 30-year amortization schedule is utilized. The investment recovery approach examines the length of time required to recover the cost of the mitigation measure given the equivalent annual damage reduction for various interest rates.

SUMMARY OF THE ECONOMIC ASSESSMENT OF MALIBU LAKE RLPS

Table 1 presents the economic findings of this assessment. Following Table 1 are the individual property assessments for each RLP structure in the Malibu Lake study area. Nine of the eighteen proposed primary solutions are economically justified on a B/C ratio basis. The nine RLPS are numbers 1, 2, 3, 8, 9, 10, 16, 17, and 25.

References

Marshall & Swift, L.P., Marshall Valuation Service, ©1998.

Stanislaus County, Orestimba Creek, Baseline Economic Analysis, prepared by Tetra Tech, Inc., December 2000.

US Army Corps of Engineers, Granite Falls, MN, Draft Economic Assessment, St. Paul District, December 1999.

Skagit River, Mount Vernon, WA, Draft Economic Assessment, Seattle District, June 2001.

City of Huntington Beach - Infrastructure Restoration Study, Los Angeles District, September 1998.

Lake Pontchartrain Hurricane Protection Plan, Output Data for Additional Contract Requirements, New Orleans District, October 1980.

Engineering Regulation, ER 1105-2-100, Planning Guidance Notebook, CECW-P, April 2000.

Engineering Regulation, ER 1105-2-100, Planning Guidance, CECW-P, December 1990.

“HEC-FDA: Flood Damage Analysis Package,” Version 2.1, Hydrologic Engineering Center, April 1994.

APPENDIX E1

REPORT: BROOKLYN
 RUNDATE: MAR 20 1997
 RUNTIME: 18.21.06

FEDERAL EMERGENCY MANAGEMENT AGENCY
 NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1997
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

BUILDING COVERAGE - CONSOLIDATED
 ONE FLOOR - NO BASEMENT

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1996 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY | |
|----------------|--|---------------------------------|---------------|---|---------------------------------------|---------|
| | | PERCENT | NO. OF CLAIMS | | PERCENT | PERCENT |
| -4 | | 15.28 | 286 | 45710 | | .63 |
| -3 | | 14.94 | 321 | 51932 | | .62 |
| -2 | | 14.37 | 696 | 46476 | | 1.50 |
| -1 | | 9.91 | 3040 | 54218 | | 5.61 |
| 0 | 7 | 17.28 | 80931 | 43675 | 100.00 | 17.28 |
| 1 | 10 | 16.33 | 72992 | 32172 | 100.00 | 16.33 |
| 2 | 14 | 24.56 | 25586 | 20153 | 100.00 | 24.56 |
| 3 | 26 | 28.23 | 13089 | 17791 | 73.57 | 27.64 |
| 4 | 38 | 31.36 | 7718 | 17672 | 43.67 | 29.47 |
| 5 | 49 | 36.21 | 3898 | 16289 | 23.93 | 30.73 |
| 6 | 41 | 33.32 | 2957 | 19649 | 15.05 | 39.84 |
| 7 | 43 | 39.90 | 1303 | 14932 | 8.73 | 42.73 |
| 8 | 44 | 37.61 | 1780 | 17376 | 10.24 | 43.36 |
| 9 | 45 | 40.00 | 649 | 15230 | 4.28 | 44.79 |
| 10 | 46 | 42.81 | 1043 | 15730 | 6.63 | 45.79 |
| 11 | 47 | 48.35 | 235 | 10907 | 2.15 | 46.98 |
| 12 | 48 | 38.37 | 1065 | 20124 | 5.29 | 47.38 |
| 13 | 49 | 41.45 | 154 | 13678 | 1.13 | 48.91 |
| 14 | 50 | 35.39 | 382 | 17700 | 2.05 | 49.70 |
| 15 | 50 | 45.88 | 218 | 14718 | 3.49 | 49.94 |
| 16 | 50 | 33.47 | 248 | 20317 | 1.22 | 49.80 |
| 17 | 50 | 32.08 | 90 | 19778 | .46 | 49.92 |
| 18 | 50 | 33.05 | 3226 | 18270 | 17.66 | 47.01 |

RUNDATE: MAR 20 1997
 RUNTIME: 10.22.17

NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1997
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

CONTENTS COVERAGE - CONSOLIDATED
 RESIDENTIAL - FIRST FLOOR ONLY

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1996 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY | |
|----------------|--|---------------------------------|---------------|---|---------------------------------------|---------|
| | | PERCENT | NO. OF CLAIMS | | PERCENT | PERCENT |
| -4 | | 28.87 | 61 | 26914 | .20 | |
| -3 | | 25.84 | 59 | 34227 | .17 | |
| -2 | | 22.60 | 112 | 37596 | .30 | |
| -1 | | 15.77 | 561 | 37294 | 1.50 | |
| 0 | 10 | 20.41 | 7844 | 37004 | 20.66 | 12.15 |
| 1 | 17 | 24.20 | 24805 | 25448 | 97.47 | 24.02 |
| 2 | 23 | 36.16 | 11176 | 15196 | 73.55 | 32.68 |
| 3 | 29 | 42.20 | 5702 | 13407 | 43.50 | 34.74 |
| 4 | 35 | 43.17 | 3124 | 13145 | 23.77 | 36.94 |
| 5 | 40 | 46.17 | 1421 | 12235 | 11.61 | 40.72 |
| 6 | 45 | 42.86 | 846 | 14974 | 5.65 | 44.88 |
| 7 | 50 | 46.04 | 427 | 12686 | 3.44 | 49.86 |
| 8 | 55 | 47.16 | 513 | 13153 | 3.90 | 54.69 |
| 9 | 60 | 49.19 | 172 | 11582 | 1.49 | 59.84 |
| 10 | 60 | 50.51 | 306 | 11937 | 2.56 | 59.76 |
| 11 | | 57.64 | 63 | 7203 | .87 | |
| 12 | | 50.90 | 197 | 11699 | 1.68 | |
| 13 | | 55.13 | 43 | 9050 | .48 | |
| 14 | | 48.25 | 46 | 14257 | .32 | |
| 15 | | 53.97 | 61 | 9689 | .83 | |
| 16 | | 46.22 | 27 | 14502 | .19 | |
| 17 | | 38.40 | 7 | 18190 | .04 | |
| 18 | | 53.16 | 240 | 8853 | 2.71 | |

RUNDATE: MAR 20 1997
 RUNTIME: 18.22.17

FEDERAL EMERGENCY MANAGEMENT AGENCY
 NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1987
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

CONTENTS COVERAGE - CONSOLIDATED
 COMMERCIAL - FIRST FLOOR ONLY

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1986 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY PERCENT | |
|----------------|--|---------------------------------|---------------|---|---|-------|
| | | PERCENT | NO. OF CLAIMS | | | |
| -4 | | 25.36 | 20 | 27665 | .07 | |
| -3 | | 24.88 | 14 | 49052 | .03 | |
| -2 | | 23.59 | 17 | 15991 | .11 | |
| -1 | | 17.52 | 93 | 41795 | .22 | |
| 0 | 10 | 22.44 | 1557 | 42025 | 3.70 | 10.46 |
| 1 | 17 | 21.31 | 4557 | 33944 | 13.43 | 17.58 |
| 2 | 23 | 29.44 | 2329 | 21792 | 10.69 | 23.69 |
| 3 | 29 | 35.71 | 1330 | 18094 | 7.35 | 29.49 |
| 4 | 35 | 39.40 | 972 | 15369 | 6.33 | 35.28 |
| 5 | 40 | 40.48 | 474 | 15621 | 3.03 | 40.01 |
| 6 | 45 | 45.97 | 261 | 12231 | 2.13 | 45.02 |
| 7 | 50 | 48.51 | 137 | 11362 | 1.21 | 49.98 |
| 8 | 55 | 53.68 | 146 | 8808 | 1.66 | 54.98 |
| 9 | 60 | 57.60 | 70 | 8274 | .84 | 58.98 |
| 10 | 60 | 56.35 | 102 | 7699 | 1.32 | 59.95 |
| 11 | | 47.17 | 16 | 12424 | .13 | |
| 12 | | 54.86 | 66 | 8755 | .78 | |
| 13 | | 64.56 | 5 | 4711 | .11 | |
| 14 | | 56.59 | 16 | 8530 | .19 | |
| 15 | | 44.33 | 11 | 12582 | .09 | |
| 16 | | 31.30 | 10 | 17048 | .06 | |
| 17 | | 79.36 | 1 | | | |
| 18 | | 48.73 | 81 | 10112 | .80 | |

Y

REPORT: ARCCRED
 RUNDATE: MAR 20 1997
 RUNTIME: 18.22.17

FEDERAL EMERGENCY MANAGEMENT AGENCY
 NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1997
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

CONTENTS COVERAGE - CONSOLIDATED
 RESIDENTIAL - FIRST FLOOR AND ABOVE

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1996 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY PERCENT | |
|----------------|--|---------------------------------|---------------|---|---|---------|
| | | PERCENT | NO. OF CLAIMS | | CREDIBILITY | PERCENT |
| -4 | | 23.06 | 71 | 30038 | .24 | |
| -3 | | 27.41 | 48 | 24274 | .20 | |
| -2 | | 20.28 | 74 | 41529 | .18 | |
| -1 | | 17.90 | 238 | 35242 | .68 | |
| 0 | 7 | 20.81 | 2134 | 37829 | 5.64 | 7.78 |
| 1 | 9 | 18.78 | 6539 | 32708 | 19.98 | 10.96 |
| 2 | 17 | 26.28 | 3295 | 23014 | 14.32 | 18.33 |
| 3 | 22 | 30.30 | 1661 | 19394 | 8.68 | 22.71 |
| 4 | 28 | 31.13 | 1192 | 19037 | 6.28 | 28.20 |
| 5 | 33 | 34.94 | 595 | 16239 | 3.66 | 33.07 |
| 6 | 39 | 35.84 | 423 | 16334 | 2.59 | 38.92 |
| 7 | 44 | 38.28 | 244 | 14596 | 1.67 | 43.90 |
| 8 | 50 | 35.74 | 283 | 16923 | 1.67 | 49.76 |
| 9 | | 38.10 | 116 | 14042 | .83 | |
| 10 | 58 | 48.73 | 113 | 10453 | 1.08 | 57.90 |
| 11 | | 45.40 | 42 | 12556 | .33 | |
| 12 | | 48.21 | 98 | 11662 | .85 | |
| 13 | | 53.01 | 32 | 8625 | .37 | |
| 14 | | 51.09 | 36 | 10315 | .35 | |
| 15 | | 55.64 | 40 | 10209 | .39 | |
| 16 | | 65.16 | 21 | 6044 | .35 | |
| 17 | | 66.35 | 8 | 6108 | .13 | |
| 18 | | 43.79 | 159 | 14148 | 1.12 | |

RUNDATE: MAR 20 1997
 RUNTIME: 18.21.06

FEDERAL EMERGENCY MANAGEMENT AGENCY
 NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1997
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

BUILDING COVERAGE - CONSOLIDATED
 TWO FLOORS - NO BASEMENT

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1996 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY PERCENT | |
|----------------|--|---------------------------------|---------------|---|---|-------|
| | | PERCENT | NO. OF CLAIMS | | | |
| -4 | | 9.96 | 163 | 75613 | .22 | |
| -3 | | 10.18 | 159 | 71861 | .22 | |
| -2 | | 10.74 | 273 | 75800 | .36 | |
| -1 | | 8.78 | 734 | 86548 | .85 | |
| 0 | 5 | 14.45 | 21799 | 61440 | 35.48 | 8.35 |
| 1 | 9 | 12.10 | 13238 | 49957 | 26.50 | 9.82 |
| 2 | 13 | 15.50 | 9330 | 36030 | 14.79 | 13.37 |
| 3 | 18 | 17.51 | 3168 | 31501 | 10.06 | 17.95 |
| 4 | 20 | 19.83 | 2110 | 30364 | 6.95 | 19.99 |
| 5 | 22 | 22.22 | 1182 | 28542 | 4.14 | 22.01 |
| 6 | | 22.77 | 1022 | 28017 | 3.85 | |
| 7 | 26 | 27.31 | 440 | 22107 | 1.99 | 26.03 |
| 8 | | 26.91 | 584 | 24588 | 2.38 | |
| 9 | | 34.22 | 222 | 17042 | 1.30 | |
| 10 | 38 | 32.57 | 331 | 19906 | 1.66 | 37.91 |
| 11 | | 40.83 | 91 | 13570 | .67 | |
| 12 | | 29.10 | 316 | 27285 | 1.16 | |
| 13 | | 41.31 | 65 | 13493 | .48 | |
| 14 | | 38.05 | 112 | 16863 | .67 | |
| 15 | | 40.95 | 83 | 15834 | .52 | |
| 16 | | 27.22 | 82 | 28540 | .29 | |
| 17 | | 32.55 | 30 | 23306 | .13 | |
| 18 | | 19.44 | 1266 | 31896 | 3.97 | |



COUNTY OF LOS ANGELES Floodplain Management Plan

Santa Monica Mountains,
San Gabriel Mountains,
Lancaster, Rowland Heights
and Quartz Hill Areas

WRC Consulting Services, Inc.

July, 2007

Revised December 2009



County of Los Angeles

Floodplain Management Plan
for
Repetitive Loss Properties
in Los Angeles County

Santa Monica Mountains,
San Gabriel Mountains,
Lancaster, Rowland Heights
and Quartz Hill Areas

July 2007
Revised December 2009

Prepared for
County of Los Angeles
900 S. Fremont Avenue
Alhambra, California 91803-1331

Prepared by
WRC Consulting Services, Inc.
1800 E, Garry Avenue, Suite 213
Santa Ana, California 92705
(949) 833-8388

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ACKNOWLEDGEMENTS

Repetitive Loss Properties (RLP) are most susceptible to flood damages; therefore, they have been the focus of flood hazard mitigation. Unlike a countywide program, the floodplain management plan for RLPs involves highly diversified property profiles, drainage issues and property owners' interests. It also requires public involvement processes unique to each RLP area. This Floodplain Management Plan (FMP) intends to serve as a living document for future reference to the flooding problems and mitigation potentials, and as implementation guidelines for all mitigation activities. The ultimate goal of this FMP is to protect flood-prone residences, reduce flood hazards, and eliminate future flood insurance claims.

The 2007 FMP, an update to the 2002 FMP, was prepared under the direction of the Los Angeles County (County) Watershed Management Division (Division). Assistance from the County Project Manager, Mr. Geoffrey Owu, P.E., as well as the participation of other County Departments and the State Office of Emergency Services (OES), are highly appreciated.

Lan Weber, P.E, Ph.D.
WRC Consulting Services, Inc.
Project Manager

1. INTRODUCTION

1.1 Project Objectives

The objective of this Floodplain Management Plan (FMP) is to provide specific mitigation measures and activities with continued compliance with the National Flood Insurance Program (NFIP) to best address the community's flood problems and needs associated with repetitive loss properties (RLPs). A RLP is one for which two or more claims of \$1,000 or more have been paid by the National Flood Insurance Program (NFIP) within a given ten-year period since 1978.

The prior FMP identified nine RLPs within the unincorporated areas of Santa Monica Mountains, San Gabriel Mountains, and Quartz Hill (four in Santa Monica Mountains, three in San Gabriel Mountains, and two in Quartz Hill). Six additional RLPs are identified in this FMP (see Figure 1.1) based on additional flood insurance claim data which is current through February 20, 2005. Based on this update, there are 15 RLPs, geographically distributed as follows: seven in Santa Monica Mountains (Figure 1.2), one in Lancaster (Figure 1.3), one in Rowland Heights (Figure 1.4), three in San Gabriel Mountains (Figure 1.5) and three in Quartz Hill (Figure 1.6). Table 1.1 provides a list of the 15 RLPs and a summary of the flood insurance claims filed for each property, based on currently available (February 20, 2005) data. The FMP is also applicable to other "high risk properties" adjacent to the RLPs, which are subject to similar flood hazards.

The FMP was developed following the general requirements of the NFIP and specific procedures outlined in the Community Rating System (CRS) Coordinator's Manual (2006). Implementation of this plan will result in lower flood losses and improved protection of natural and beneficial floodplain functions. This plan will assist the community and repetitive loss property owners in understanding the flood hazards, identifying the problems, and deriving cost-effective and integral solutions for flood protection, stormwater management, and environmental protection.

As follow up to our Community Assistance Visit on June 8, 2005, we will continue to coordinate our floodplain management activities with the Federal Emergency Management Agency, State Department of Water Resources, and State Office of Emergency Services to provide better flood protection and mitigation measures to those homes located within flood hazard areas and identified RLPs. In addition, we will closely monitor and evaluate those properties identified during your visit and will continue to pursue any corrective actions necessary for the County to remain in good standing within the NFIP.

1.2 Previous Repetitive Loss Property Plan

Since October 1990, the County has been a voluntary participant in the CRS established by FEMA (Federal Emergency Management Agency). This program provides a discount on flood insurance premiums for property owners who are participating in the flood insurance program including those properties located within the designated Special Flood Hazard Areas defined by the Flood Insurance Rate Maps (FIRMS).

On March 31, 1992, the Los Angeles County Board of Supervisors adopted the "Repetitive Loss Plan for the National Flood Insurance Program CRS" for Los Angeles County, Community No. 065043. The plan was approved by FEMA for CRS Activity No. 510. The development and implementation of a "Floodplain Management Plan" is one of many recommended activities under the CRS. FEMA requires that FMPs be updated every five years. This plan provides an update of the prior version, which was approved by FEMA on March 8, 2002.

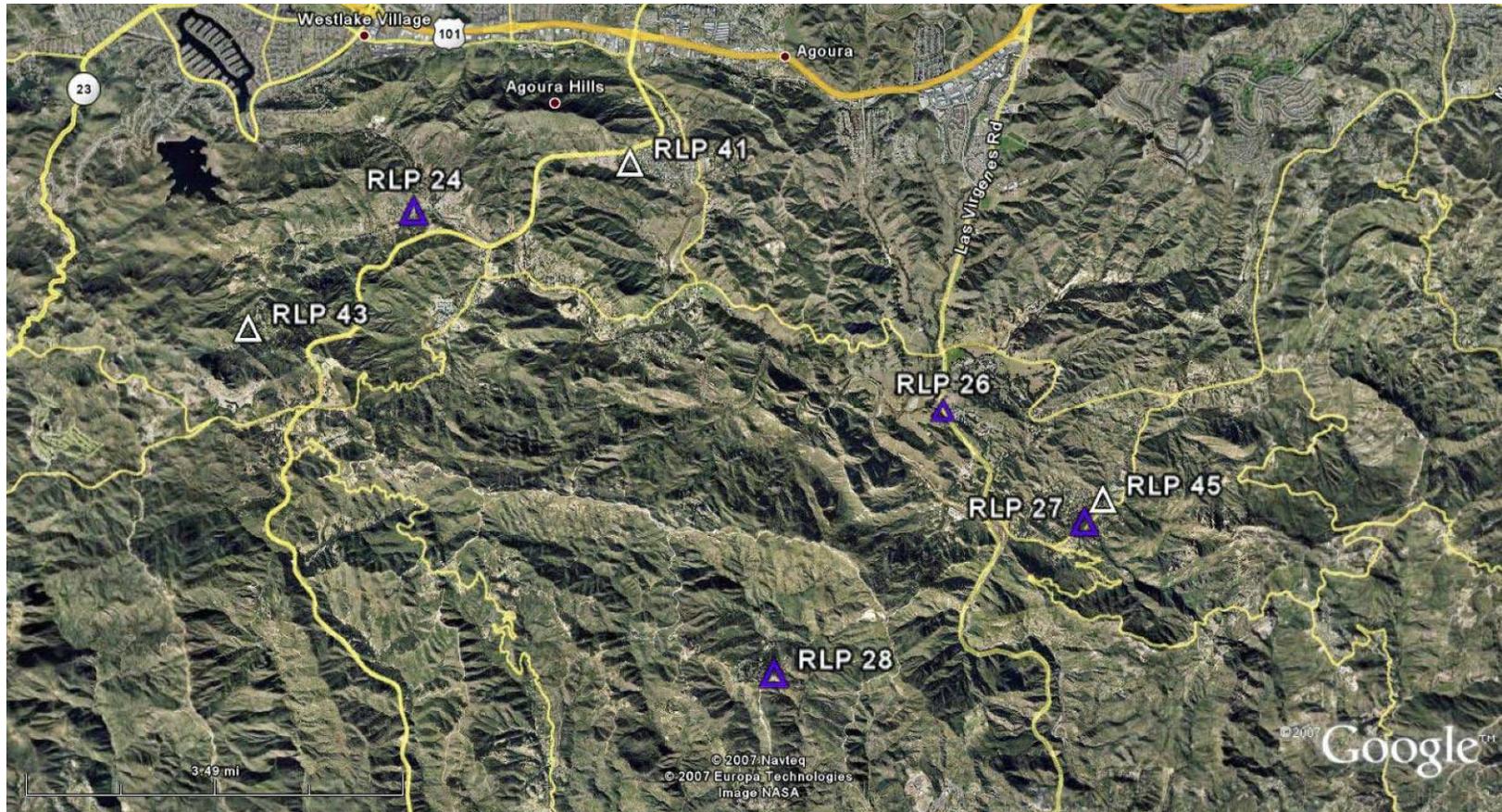


Figure 1.2
Location of RLPs – Santa Monica Mountains

| | | |
|------|---|----------------------------|
| Key: | △ | New RLP for 2007 FMP |
| | ▲ | RLP identified in 2002 FMP |

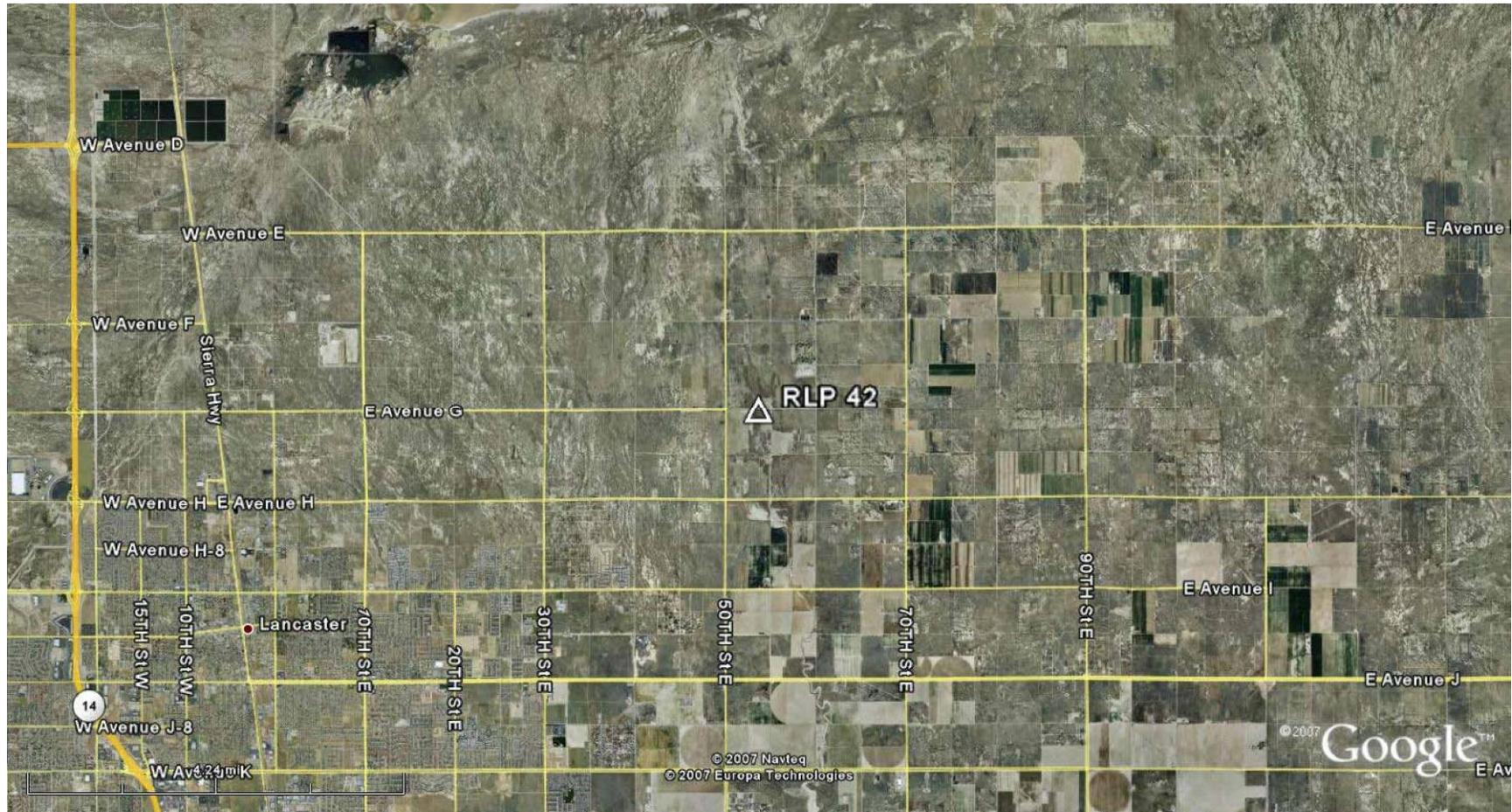


Figure 1.3
Location of RLPs – Lancaster

Key: △ New RLP for 2007 FMP
 △ RLP identified in 2002 FMP

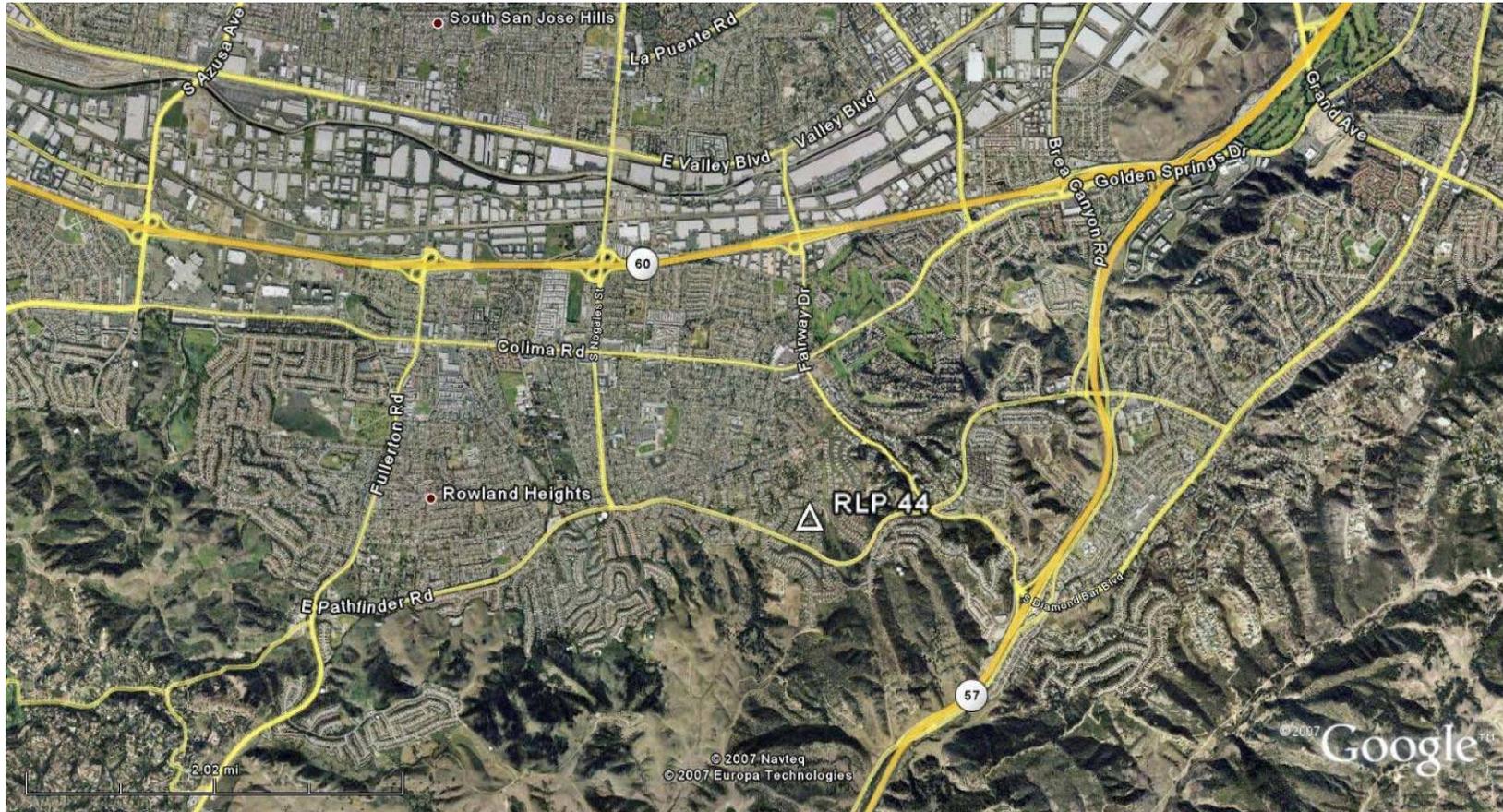


Figure 1.4
Location of RLPs – Rowland Heights

Key: △ New RLP for 2007 FMP
 △ RLP identified in 2002 FMP

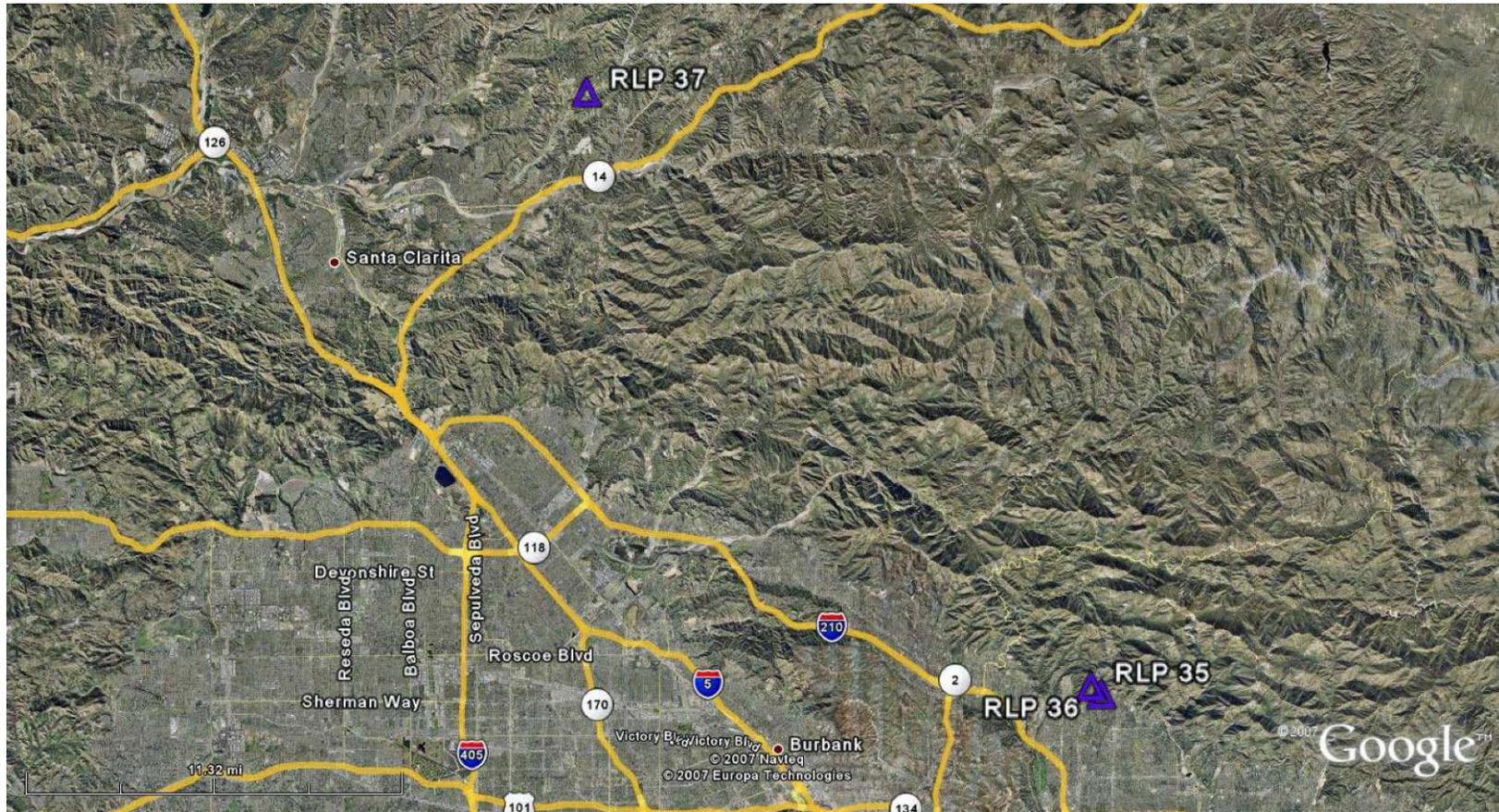


Figure 1.5
Location of RLPs – San Gabriel Mountains

Key: △ New RLP for 2007 FMP
 △ RLP identified in 2002 FMP

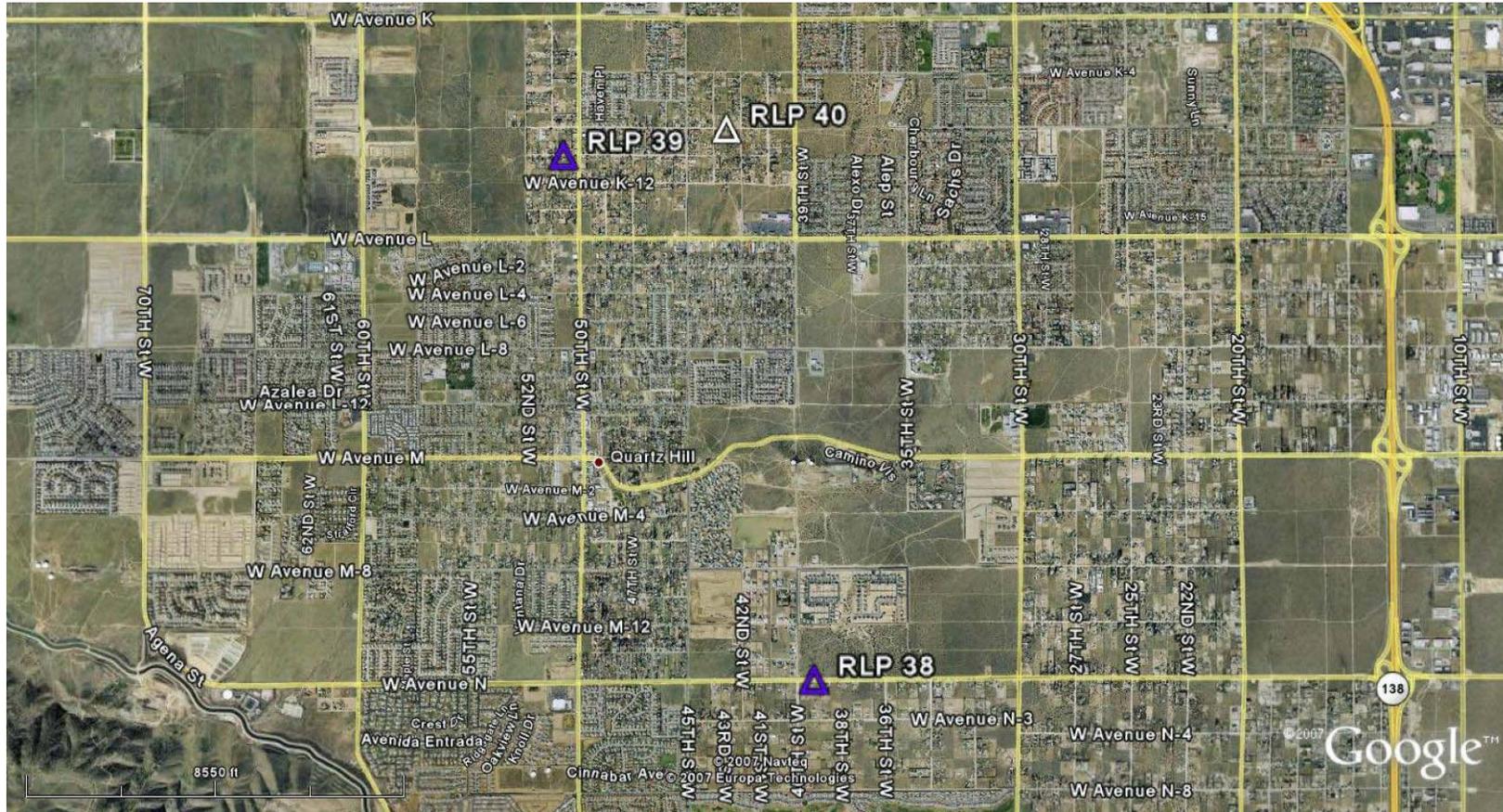


Figure 1.6
Location of RLPs – Quartz Hill

Key: △ New RLP for 2007 FMP
 △ RLP identified in 2002 FMP

| Table 1.1 | | | | |
|---|--------------------------|------------------|-----------------------------------|--------------------------|
| Repetitive Loss Properties Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill | | | | |
| RLP ID | Repetitive Loss # | City/Area | Flood History (Month/Year) | Total Claims Paid |
| Santa Monica Mountains (7) | | | | |
| 24 | 0095737 | Agoura | 1/95, 2/98 | \$46,907 |
| 26 | 0072498 | Calabasas | 2/92, 1/95, 1/95, 2/98 | \$25,743 |
| 27 | 0071255 | Calabasas | 2/92, 1/93 | \$47,967 |
| 28 | 0070079 | Malibu | 2/92, 1/95, 3/98, 3/00 | \$22,098 |
| 41* | 0136718 | Agoura Hills | 2/98, 12/04 | \$8,209 |
| 43* | 0137793 | Agoura Hills | 2/98, 1/05 | \$26,946 |
| 45* | 0148768 | Calabasas | 12/04, 2/05 | \$16,124 |
| Lancaster (1) | | | | |
| 42* | 0137354 | Lancaster | 1/05, 2/05 | \$34,296 |
| Rowland Heights (1) | | | | |
| 44* | 0138651 | Rowland Heights | 3/01, 2/05 | \$19,469 |
| San Gabriel Mountains (3) | | | | |
| 35 | 0056933 | Altadena | 2/91, 2/92 | \$5,450 |
| 36 | 0091348 | Altadena | 3/95, 2/98 | \$8,642 |
| 37 | 0091339 | Santa Clarita | 2/93, 2/98 | \$27,805 |
| Quartz Hill (3) | | | | |
| 38 | 0057385 | Quartz Hill | 1/92, 1/92, 2/92, 12/92 | \$45,685 |
| 39 | 0091087 | Quartz Hill | 2/92, 12/97 | \$5,566 |
| 40* | 0131222 | Lancaster | 2/04, 10/04, 12/04, 1/05, 2/05 | \$30,929 |
| * New RLP for 2007 FMP | | | | |

1.3 Review of NFIP and CRS Community Participation

The NFIP provides federally supported flood insurance in communities that regulate developments in their floodplains. The CRS was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. The CRS reduces flood insurance premiums in those communities that do more than implement the minimum regulatory requirements.

The CRS encourages comprehensive planning to address the community's flooding problems and provides credit for preparing, adopting, implementing, evaluating, and updating a comprehensive FMP. The CRS does not specify what activities the FMP must recommend, but rather the process used to prepare the FMP.

Depending on the credit points received during CRS certification, a community can fall into one of ten classes: Class 1 requires the most credit points and gives the largest premium reduction, while Class 10 receives no premium reduction. The County's current CRS classification is 8. For Class 8, the credit points earned are 1,000 to 1,499 and the premium reduction is 10 percent. Preparation of the FMP will help the community to retain or improve the CRS classification.

Community application for the CRS is voluntary. Communities apply for a CRS classification and are given credit points that reflect the impact of their activities on reducing flood losses, improving the insurance rating, and promoting the awareness of flood insurance. Floodplain management planning is a principal activity of the County's compliance with the CRS. The CRS encourages programs and projects that preserve or restore the natural state of floodplains and protect these functions. The CRS also encourages communities to coordinate their flood loss reduction programs with Habitat Conservation Plans and other public and private activities that preserve and protect natural and beneficial floodplain functions. CRS credit criteria, scoring, and documentation requirements are described in the CRS Coordinator's Manual.

1.4 Overview of the FMP Procedure and Process

The FMP for the RLPs located within the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas of unincorporated Los Angeles County was prepared according to the process described in Activity 510 (Floodplain Management Planning) of the CRS Coordinator's Manual (2006 Edition). The FMP planning process involves review, research, investigation, discussion, interview, and consensus building. It includes receiving input from all parties involved and collaborating with existing and future regional programs that relate to flood hazard mitigation, such as land use plans, capital improvement plans, neighborhood redevelopment plans, floodplain ordinances, and environmental preservation/enhancement plans. The FMP for RLPs intends to address the site-specific problems and possible resolutions, under the authority of individual homeowners and/or their homeowner associations.

CRS credit is provided for preparing, adopting, implementing, evaluating, and updating a comprehensive floodplain management plan. Credit is not based on the activities the FMP recommends, but rather on the process that is used to prepare the FMP. To ensure compliance with the CRS program for flood reduction and to achieve the flood insurance premium credits, the subject FMP was prepared following the ten-step planning process described in Section 511,

Credit Points, of the CRS Coordinator's Manual. A credit point summary, including the maximum credit points for a full FMP (community-wide and RLP FMPs), is provided in Figure 1.7 for reference. Note that the FMP for RLPs only will receive 25% of the maximum credits shown below.

1.5 FMP Committee

The development, modification, and revision of the FMP are accomplished through the direction and oversight of an FMP Committee. FEMA places a high priority on the establishment of a committee that consists of residents, businesses, and property owners that are most affected by flood hazards. The County has maximized the involvement of the public throughout the FMP process.

Since this FMP was specifically developed for the Repetitive Loss Properties in the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas, the FMP committee was formed from the property owners as the external FMP Committee members and the County staff as the internal FMP Committee members. The internal FMP Committee members are composed of various divisions of the Los Angeles County Department of Public Works including Water Resources, Watershed Management, Land Development, Regional Planning, Building and Safety, and Program Development.

Mr. Frank Williams, P.E., a senior watershed planner of the Los Angeles County Public Works Department, chaired the FMP Committee in 2002. The 2007 FMP update was prepared by senior planners and engineers of WRC Consulting Services, Inc. under the guidance of Dr. Lan Weber, the “Qualified Planner”. Dr. Weber provides expertise in watershed analysis, floodplain management, and flood hazard mitigation. She has more than 25 years of related project experience. The FMP process was supervised by Mr. Geoffrey Owu of Los Angeles County Watershed Management Division, who is currently the NFIP Coordinator of the County. Mr. Owu has participated in the 2002 FMP development and implementation and has served as the liaison between the County FMP Committee members and the RLP owners and communities.

2. BACKGROUND

2.1 Watershed and Drainage

The Los Angeles River Watershed covers a land area of over 834 square miles, including the eastern portions of Santa Monica Mountains and portions of the San Gabriel Mountains in the west.

The Santa Monica Mountains are located in the western area of Los Angeles County and the southeastern area of Ventura County (Figure 1.2). The Santa Monica Mountains cover 250 square miles, rising out of the Pacific Ocean to a height over 3,000 feet. The mountain range was

511 Credit Points. Up to 359 points are provided for three elements.

- a. Up to 294 points are provided for adopting and implementing a floodplain management plan (FMP) that was developed using the following standard planning process. There must be some credit for each of the 10 planning steps.

| <u>Step</u> | <u>Max points</u> |
|-------------------------------------|-------------------|
| 1. Organize to prepare the plan | 10 |
| 2. Involve the public | 85 |
| 3. Coordinate with other agencies | 25 |
| 4. Assess the hazard | 20 |
| 5. Assess the problem | 35 |
| 6. Set goals | 2 |
| 7. Review possible activities | 30 |
| 8. Draft an action plan | 70 |
| 9. Adopt the plan | 2 |
| 10. Implement, evaluate, and revise | 15 |

- b. Up to 50 points are provided for conducting repetitive loss area analyses (RLAA).
c. Up to 15 points are provided for adopting and implementing a Habitat Conservation Plan (HCP).

**Figure 1.7
Credit Summary**

Source: 2006 CRS Coordinator's Manual

driven up from the sea over 10 million years ago. Weathering has created rugged landscapes of canyons up to 2,000 feet deep with unique rock formations. Numerous watercourses drain the Santa Monica Mountains directly to the Pacific Ocean.

The San Gabriel Mountains are located on the northern area of Los Angeles (Figure 1.5). This mountain range has several peaks over 9,000 feet, the highest being Mount San Antonio (locally know as Mount Baldy) at 10,064 feet. The San Gabriel Mountains and the surrounding Angeles National Forest encompass nearly 700,000 acres of quite scenic wilderness on the northern edge of the Los Angeles metropolis.

The foothills (starting at just 1,300 feet) are grassy and rather barren; the land becomes rockier and forested with oak, pine and cedar at higher elevations. There are clear mountain streams and reservoirs, small lakes, waterfalls, old mines and steep canyons. The Los Angeles River and San Gabriel River are the two major watercourses that drain the San Gabriel Mountains.

The San Gabriel River Watershed is located in the eastern portion of Los Angeles County. It is bound by the San Gabriel Mountains to the north, most of San Bernardino/Orange County to the east, the division of the Los Angeles River from the San Gabriel River to the west, and the Pacific Ocean to the south. The watershed is composed of approximately 640 square miles of land spanning over 37 cities with 26% of its total area developed. Rowland Heights is located in the San Gabriel River watershed.

Rowland Heights is comprised of approximately 9 square miles of unincorporated Los Angeles County near the boundaries of where the Los Angeles County, Orange County and San Bernardino County meet (Figure 1.4). The elevation is 540 feet above sea level. It is loosely bounded by the Puente Hills to the south and San Jose Hills to the north-northeast. The area is approximately 10 miles north of Anaheim and 34 miles east-southeast of Los Angeles.

The Antelope Valley Watershed straddles the Los Angeles-Kern County Line and encompasses approximately 1,200 square miles of Los Angeles County. Numerous streams originating in the mountains and foothills surrounding the valley flow across the valley floor and eventually pond in the dry lakes adjacent to the County line. The valley lacks defined natural channels outside of the foothills and is subject to unpredictable sheet flow patterns. Both Lancaster and Quartz Hill are located in the Antelope Valley Watershed.

Lancaster is located approximately 70 miles north of the City of Los Angeles in Southern California's Antelope Valley (Figure 1.3). It is separated from the Los Angeles Basin by the San Gabriel Mountain Range to the south and from Bakersfield and the San Joaquin Valley by the Tehachapi Mountain Range to the north. Lancaster's elevation is 2,500 feet above sea level on a high, flat valley surrounded by mountain ranges.

Quartz Hill, a 390-square-mile, high desert community, is located in the westernmost part of the Mojave Desert (Figure 1.6) north of the San Gabriel Mountains. It is approximately 80 miles northwest of Palmdale and 55 miles southwest of Lancaster.

2.2 Population and Land Use Cover

The County of Los Angeles has an estimated 2006 population of about 9.9 million people and covers about 4,061 square miles. The land uses in the Santa Monica Mountains and San Gabriel Mountains consist of mostly undeveloped mountain ranges and scattered development along the watercourses. Since the early 1900s, a predominantly rural community has developed into the present population. The Quartz Hill and Lancaster areas are urban, but most surrounding areas are sparsely developed. Rowland Heights is highly urbanized with only a low percentage of land remaining undeveloped.

3. HAZARD ASSESSMENT

3.1 Sources of Flooding

Sources of flooding in the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas consist of storm runoff in local watershed areas and associated storm drainage facilities. The sources of flooding for the RLPs in these areas are summarized below:

Lobo Canyon: RLP 24 is located within the floodplain of Lobo Canyon, approximately 900 feet upstream of its confluence with Triunfo Canyon.

Mint Canyon: RLP No. 37 is located within the floodplain of Mint Canyon, approximately 23,500 feet upstream of its confluence with Santa Clara River.

Little Red Rock Wash: RLP No. 42 is located within the floodplain of Little Red Rock Wash.

Local Watersheds: RLP No. 36 is located adjacent to a private channel within a private residential community. The flooding sources for RLP Nos. 26, 27, 28, 35, and 43 are the storm runoffs generated from the hillside areas adjacent to each property.

Others: The flooding source for RLP No. 38 is the overflow runoff from the detention basin (now relocated) southeast of the property. RLP No. 38 is also possibly subject to the sheet-flow along the “Antelope Valley Drainage Corridor No. 9” (see section 4.4). The flooding source for RLP No. 39 is the street runoff that breaks out from “Antelope Valley Drainage Corridor No. 7” along 50th and 52nd streets.

RLP 40 is located within an alluvial fan which contributes flows to the property via surrounding streets. This RLP is located at the low point of the street where flows can concentrate and enter the property. RLP 41 is located at the low point of the street and flows entering the front yard can be trapped and cause damages to the house, including foundation cracks.

RLP 45 is located on the bank of Cold Canyon Creek; however, the owner stated that historical damages were not associated with the main creek but were caused by street flow concentration at the property. RLP 44 is located next to a steep street; however, the neighboring property’s runoff (rather than street flow) is the likely flooding source. The house pad seems to be high enough relative to the street flows.

3.2 Flooding History

There has been a history of flooding in the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas. Table 1.1 shows the flooding events (with insurance claims) at most properties since 1991. The flood events occurred in 1990/91, 1991/92, 1992/93, 1994/95, 1997/98, 1999/2000, 2000/01, 2003/04 and 2004/05 rainy seasons. During this time, 11 properties suffered flooding damages twice, 3 properties suffered flood damages four times, and one property suffered flood damages five times. RLP No. 40 suffered flood damages a total of five times - the most frequently damaged of the 15 RLPs in these areas. For this analysis, only flood damages for which an insurance claim was made are counted.

Flood frequency analysis for historical floods occurring in Los Angeles County was conducted using United States Geological Survey (USGS) gaging station data. A USGS gaging station is located at Topanga Canyon near Topanga Beach (Station No. 11104000) for the Santa Monica Mountains area, but only maintains streamflow records from 1930 to 1979. A USGS gaging station is also located at Estates Canyon near Quartz Hill (Station No. 0264555) for the Quartz Hill area, but its streamflow records are only from 1989 to 1995. The USGS gaging station at Arroyo Seco near Pasadena (Station No. 11098000) for San Gabriel Mountains area was operated from 1914 to the present. Since this gaging station is the only nearby station in the project vicinity which has long-term and recent flood measurements, the annual peak data of this station was used to identify the return periods of the past flood events shown in Table 1.1. Log Pearson Type III method was applied. The flood frequency analysis is included in Appendix A.

Table 3.1 provides a summary of the flood frequency for the peak discharge during the relevant flooding incidents and the number of properties that claimed flood damages. Note that the number of claims did not correspond to the magnitude of the flood.

| Rain Season | Flooding Frequency* | No. of RLP Claims |
|--|---------------------|---|
| 1977/78 | 20-yr storm | 0 |
| 1979/80 | 10-yr storm | 0 |
| 1982/83 | 9-yr storm | 0 |
| 1990/91 | 4-yr storm | 1 (San Gabriel Mountains) |
| 1991/92** | 5-yr storm | 3 (Santa Monica Mountains), 1 (San Gabriel Mountains), 4 (Quartz Hill) |
| 1992/93 | 5-yr storm | 1 (Santa Monica Mountains), 1 (San Gabriel Mountains), 1 (Quartz Hill) |
| 1994/95* | 5-yr storm | 4 (Santa Monica Mountains), 1 (San Gabriel Mountains) |
| 1997/98 | 18-yr storm | 5 (Santa Monica Mountains), 2 (San Gabriel Mountains), 1 (Quartz Hill) |
| 1999/2000 | 2-yr storm | 1 (Santa Monica Mountains) |
| 2000/01 | 2-yr storm | 1 (Rowland Heights) |
| 2003/04 | 3-yr storm | 1 (Quartz Hill) |
| 2004/05** | 13-yr storm | 4 (Santa Monica Mountains), 4 (Quartz Hill), 2 (Lancaster), 1 (Rowland Heights) |
| 1978/79, 80-82, 83-91, 93/94, 95-97 | Below 3-yr storm | 0 |
| * Based on USGS Gaging Station 11098000 (1914 to 2006 data) | | |
| ** Some of RLPs filed multiple claims within the same rainy season (See Table 1.1) | | |

3.3 Recent Problems

According to the insurance claims filed by the RLP owners, the most recent flood event was in 2004/05 when 11 claims were filed. Table 1.1 shows flooding events experienced by each RLP in the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas. The questionnaires returned by the 2002 RLP owners included in Appendix D did not address new problems or mitigation/repair status. These RLP owners did not file claims related to the recent floods (see Table 1.1)

4. PROBLEM IDENTIFICATION

4.1 FEMA Floodplains/County Capital Floodplain

Flood studies of Lobo Canyon near RLP No. 24 in the Santa Monica Mountains have shown that this area is a Zone "A-4," a very high risk flood zone on FEMA's Flood Insurance Rate Map (FIRM) No. 065043-0756B (revised December 2, 1980). According to the Flood Insurance Study (FIS), published by FEMA, the Flood Insurance Zone "A-4" is the Special Hazard Area, inundated by the 100-year flood, with base flood elevations (BFE) determined by the detailed study. The Flood Hazard Factor (FHF) of the area was determined to be 4, which is the difference between water surface elevations of the 10-year and 100-year floods, multiplied by

10. A copy of the FIRM is presented as Figure 4.1.

Flood studies of the Santa Monica Mountains show that RLP Nos. 26, 27, 28, 41, 43 and 45 are located within Flood Hazard Zone C, an area of minimal flooding: RLP Nos. 26, 27 and 45 are on FIRM No. 065043-0778B and RLP No. 28 is on FIRM No. 065043-0767B. RLP No. 41 is on FIRM No 065043-0757B and RLP No. 43 is on FIRM No 065043-0756B. Flood Insurance Zone C is a designation for an area of minimal flood hazard. Copies of the FIRMs are attached as Figures 4.2, 4.3, 4.4, 4.5 and 4.6.

Flood studies of the Lancaster area show that RLP No. 42 is located within Flood Hazard Zone A. Flood Insurance Zone A is the Special Hazard Area inundated by the 100-year flood with no BFEs or FHF determined. A copy of the FIRM for RLP No. 42 is attached as Figure 4.7.

Flood studies of the Rowland Heights area show that RLP No. 44 is located within Flood Hazard Zone C, an area of minimal flooding (see FIRM No. 065043-0960B). Flood studies of the San Gabriel Mountains show that RLP Nos. 35 and 36 are located within Flood Hazard Zone C, an area of minimal flooding (see FIRM No. 065043-675B). The printed copies of the FIRMs for RLP Nos. 44, 35 and 36 were not available from FEMA.

Flood studies of Mint Canyon near RLP No. 37 in the San Gabriel Mountains show Flood Hazard Zone A. a high risk flood zone, on FIRM No. 065043-0365B (revised December 2, 1980). A copy of the FIRM is attached as Figure 4.8.

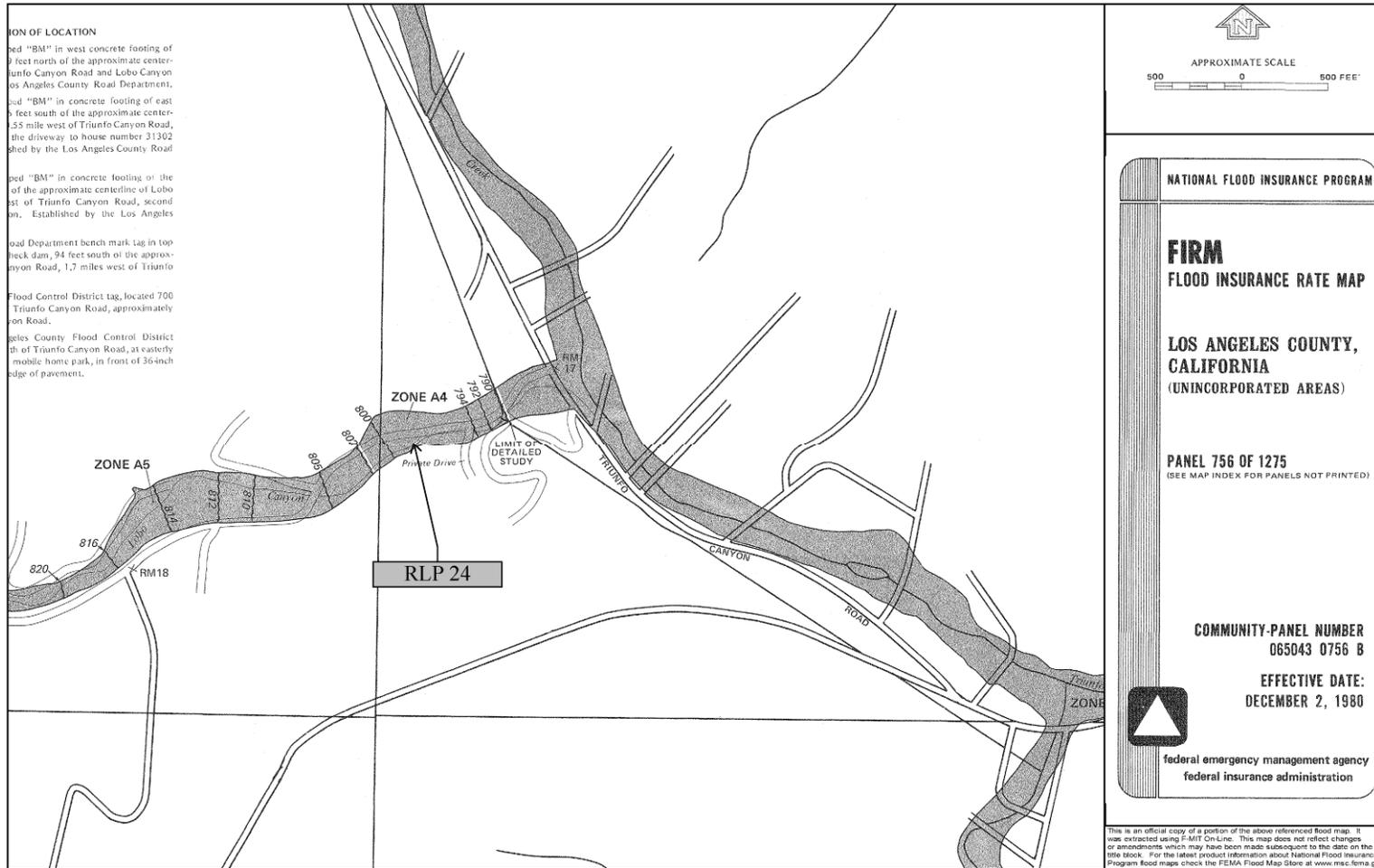
Flood studies of the Quartz Hill area show that RLP No. 38 is located within Flood Hazard Zone C, an area of minimal flooding, and RLP Nos. 39 and 40 are located within Flood Hazard Zone B (see FIRM No. 065043-0230B, revised December 2, 1980). Flood Insurance Zone B is the area inundated by a 500-year flood, with the 100-year flood depth less than one foot, with drainage area less than one square mile, or protected by a levee from the 100-year flood. RLP No. 38 was flooded by overflow from an upstream retention basin, which has been modified and relocated; the flooding problem has been eliminated (See Figures 4.9 and 4.10.)

4.2 Field Investigation

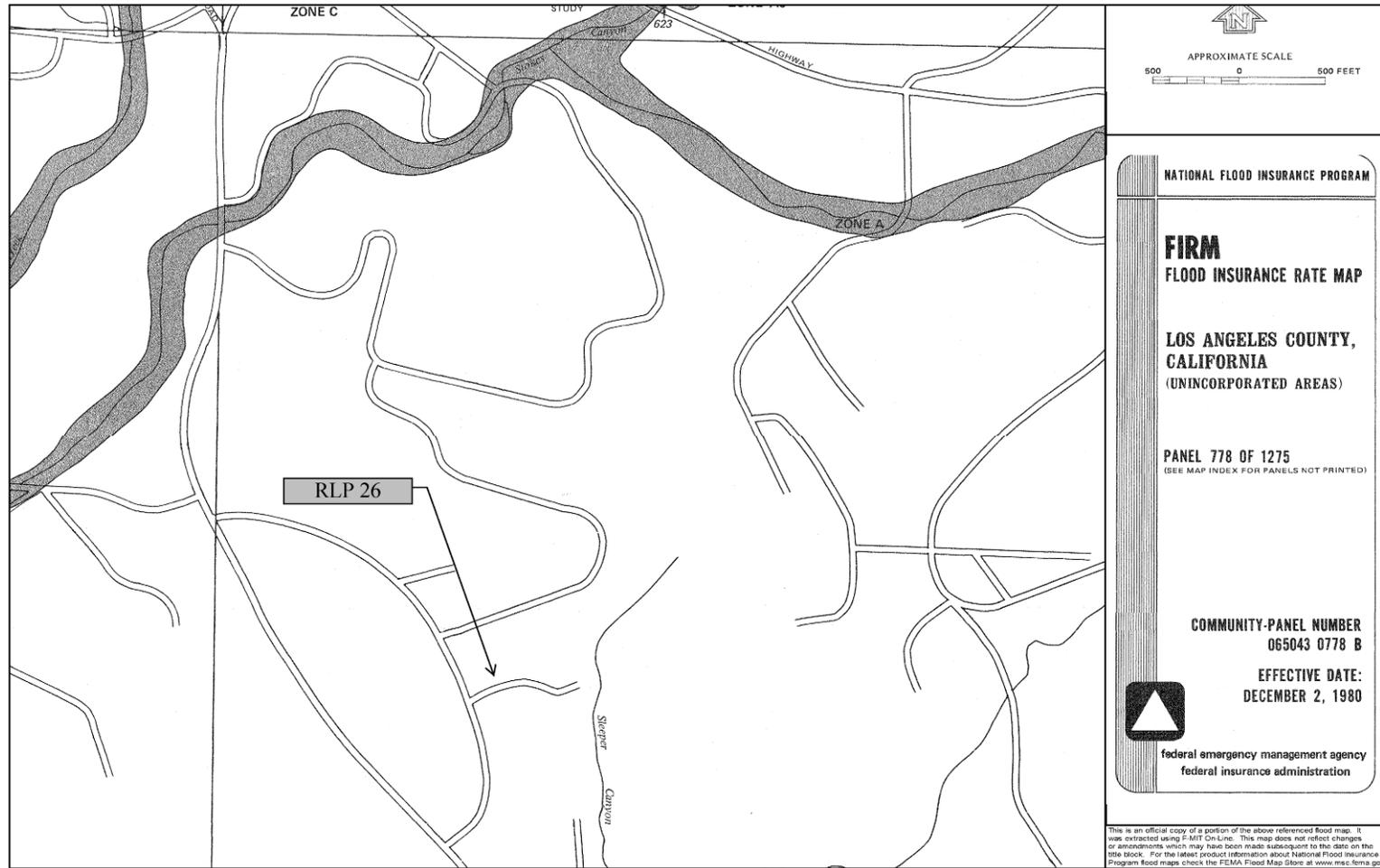
To identify specific flood problems associated with each RLP, the 2002 RLPs (RLP Nos. 24, 26-28, and 35-39) were visited in 2001 and documented in Appendix A of the 2002 FMP for Santa Monica Mountains, San Gabriel Mountains, and Quartz Hill areas. RLP Nos. 40, 42, and 44 were investigated on March 22, 2007 and RLP Nos. 41, 43, and 45 were investigated on March 26, 2007. Field photographs and descriptions of problem observations are documented in Appendix B of this FMP. Field investigation data for RLP No. 43 are not available because the lot was inaccessible during the WRC site visit. Accordingly, site information for RLP No. 43 was obtained by WRC staff from aerial photographs and other research sources.

Specifically, the following issues were investigated during the field visits: location of each property, contributing drainage area, grading and drainage pattern, problems contributing to previous damages, physical conditions of the structures, and surrounding environments. The elevation of structures relative to inflows (including those from neighboring properties and streets) was investigated in detail. Appendix B provides field photographs, topographic features, adjacent creeks/channels, and key findings of the field investigation. Residents were interviewed

*Floodplain Management Plan for Repetitive Loss Properties
 Santa Monica Mountains, San Gabriel Mountains, Lancaster,
 Rowland Heights and Quartz Hill*

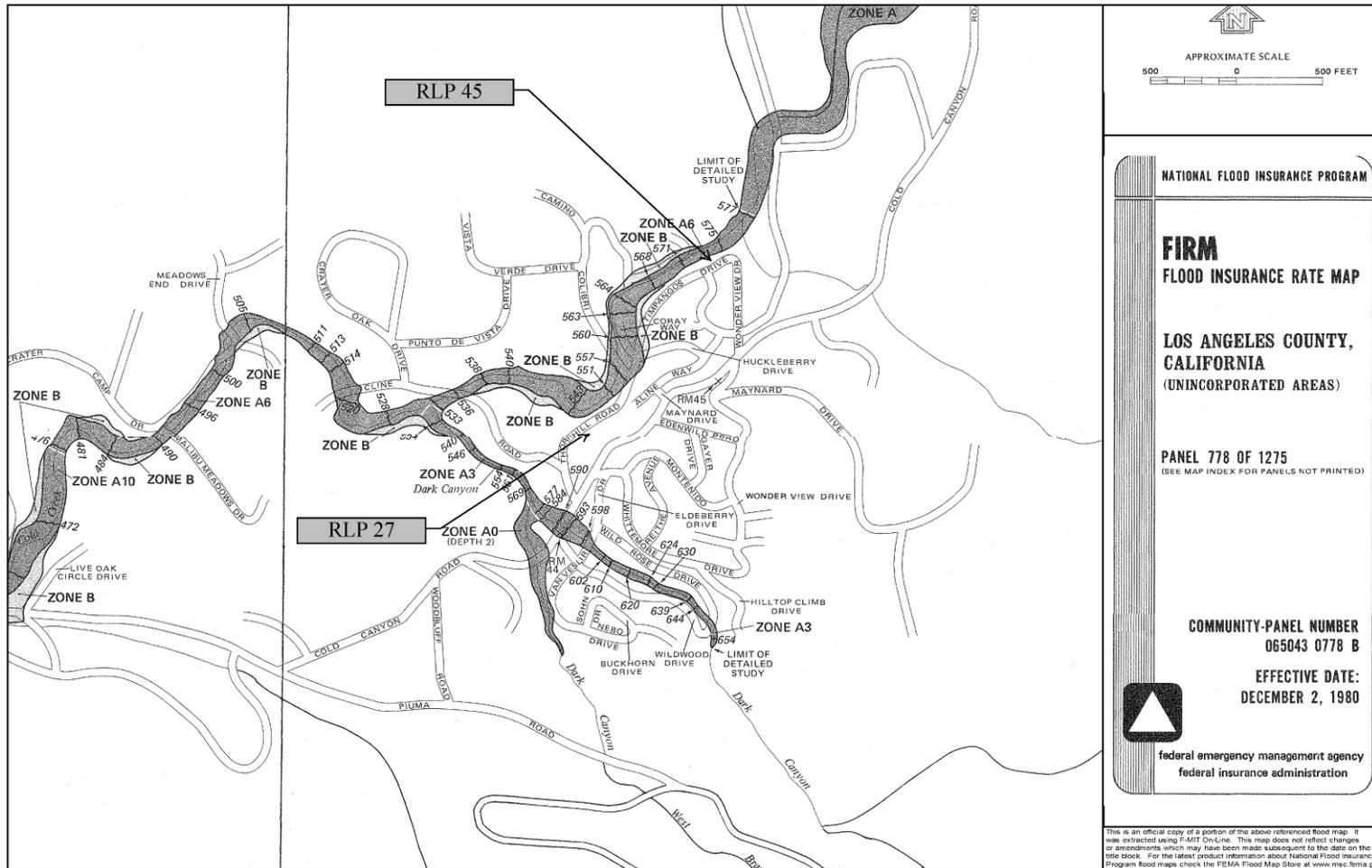


**Figure 4.1
 FEMA FIRM – RLP No. 24**

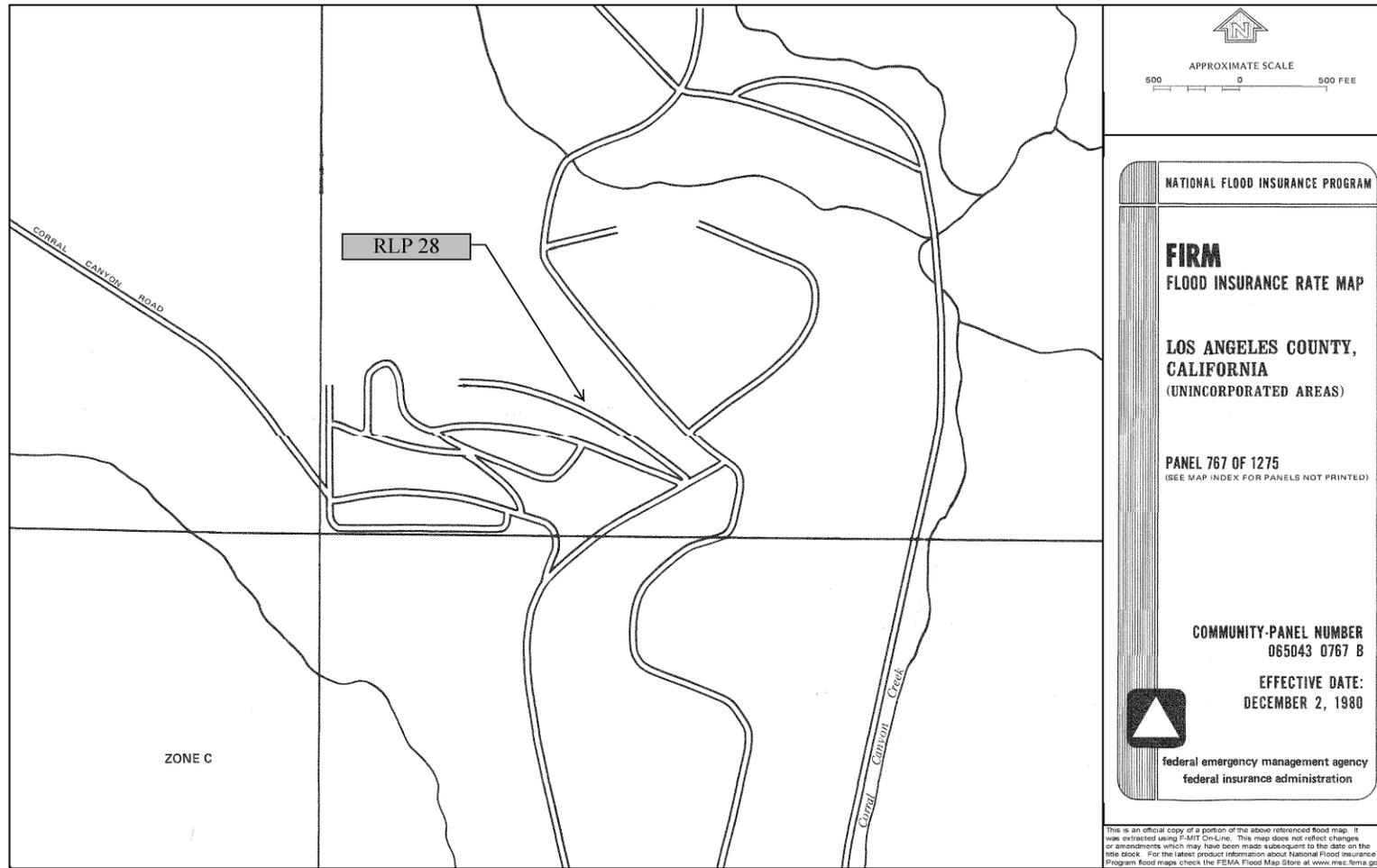


**Figure 4.2
 FEMA FIRM – RLP No. 26**

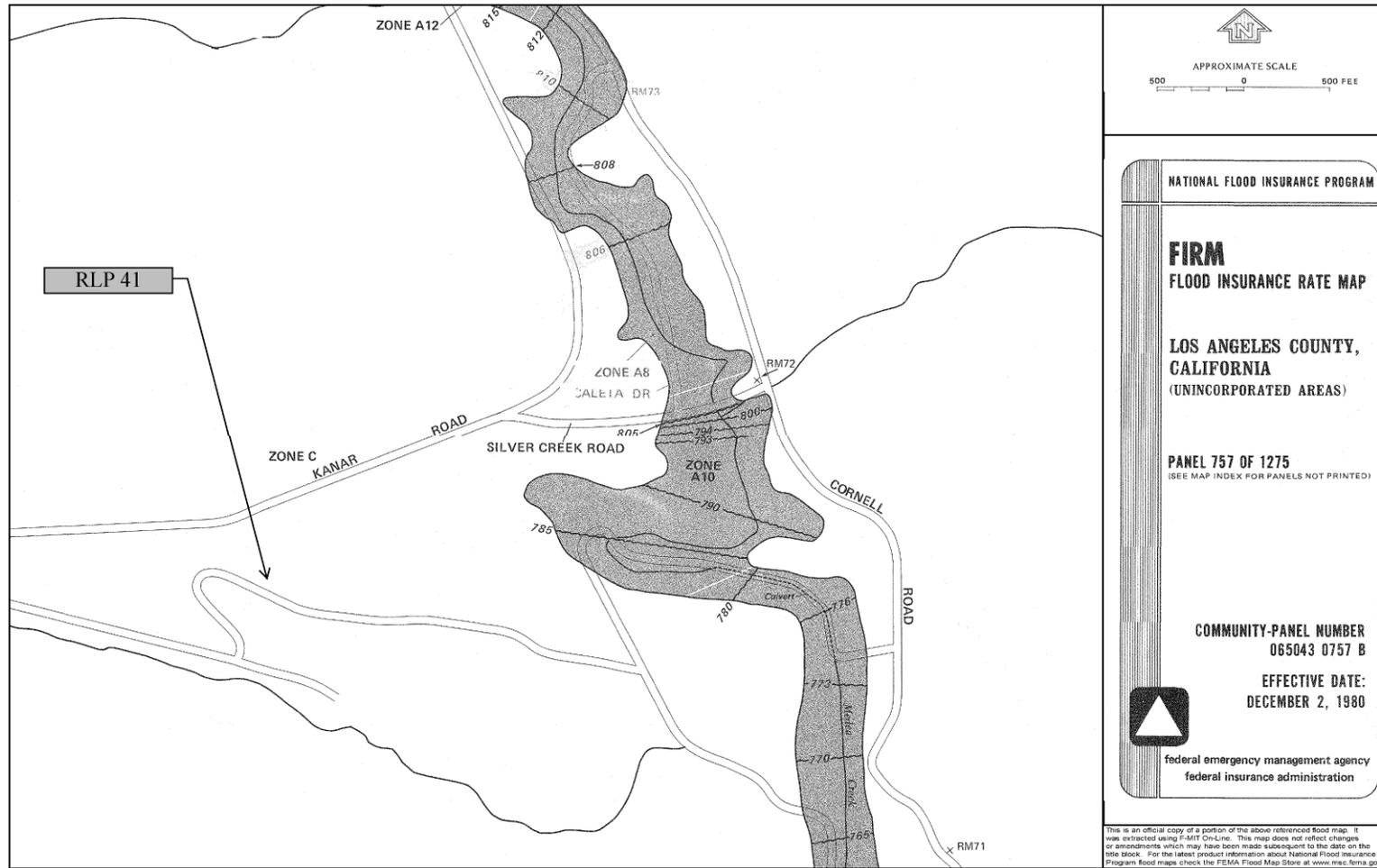
*Floodplain Management Plan for Repetitive Loss Properties
 Santa Monica Mountains, San Gabriel Mountains, Lancaster,
 Rowland Heights and Quartz Hill*



**Figure 4.3
 FEMA FIRM – RLP Nos. 27 & 45**

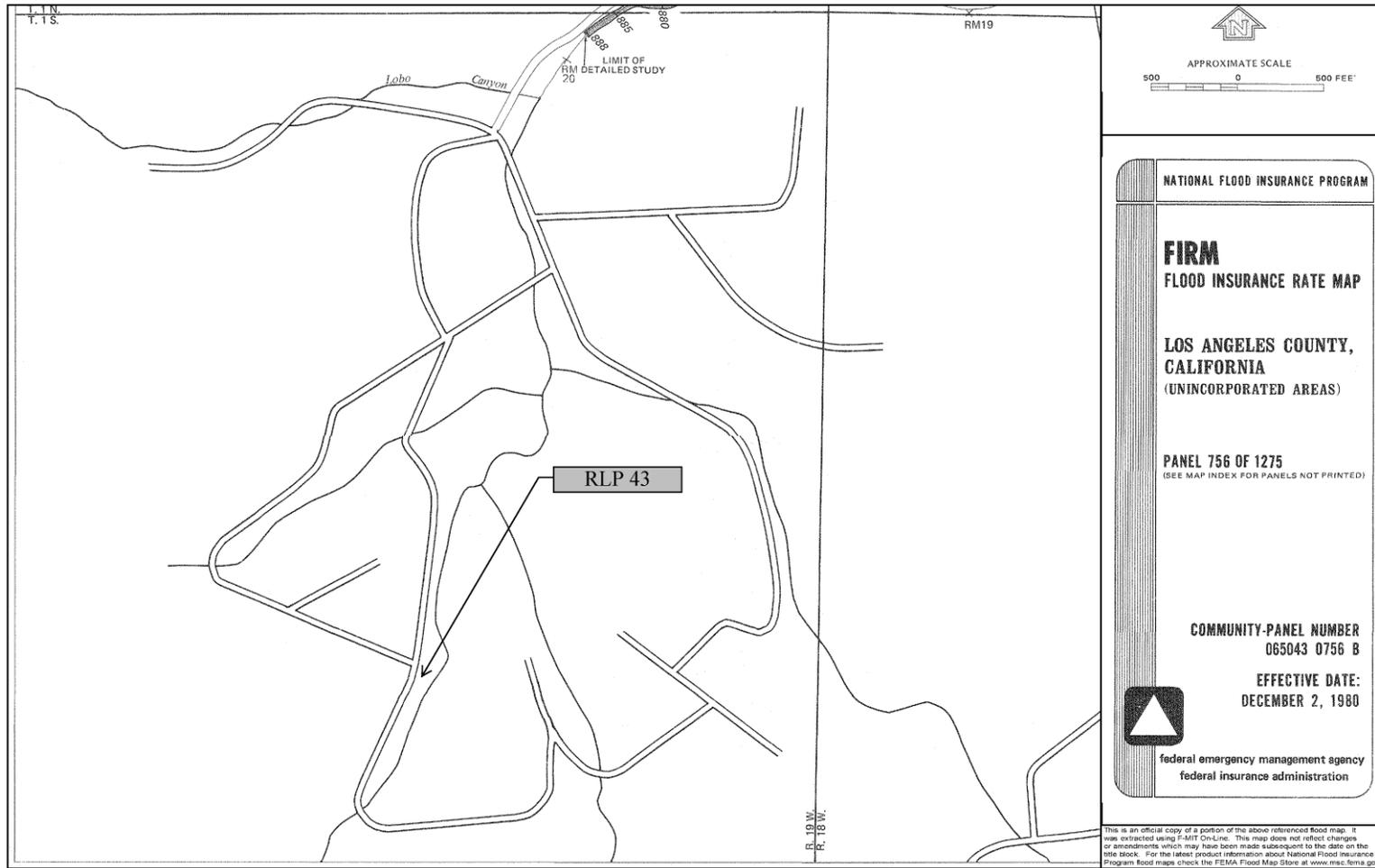


**Figure 4.4
 FEMA FIRM – RLP No. 28**

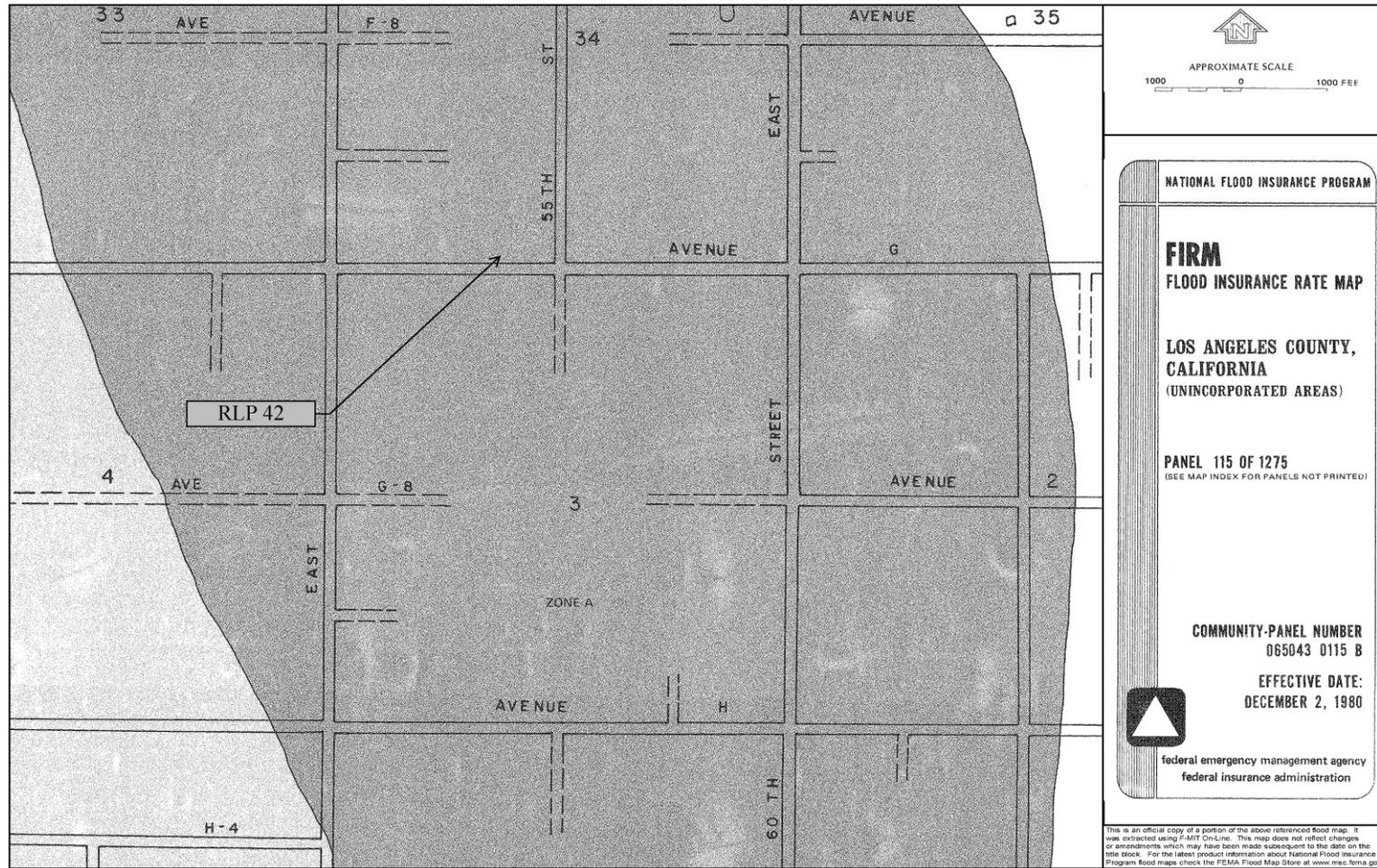


**Figure 4.5
 FEMA FIRM – RLP No. 41**

*Floodplain Management Plan for Repetitive Loss Properties
 Santa Monica Mountains, San Gabriel Mountains, Lancaster,
 Rowland Heights and Quartz Hill*

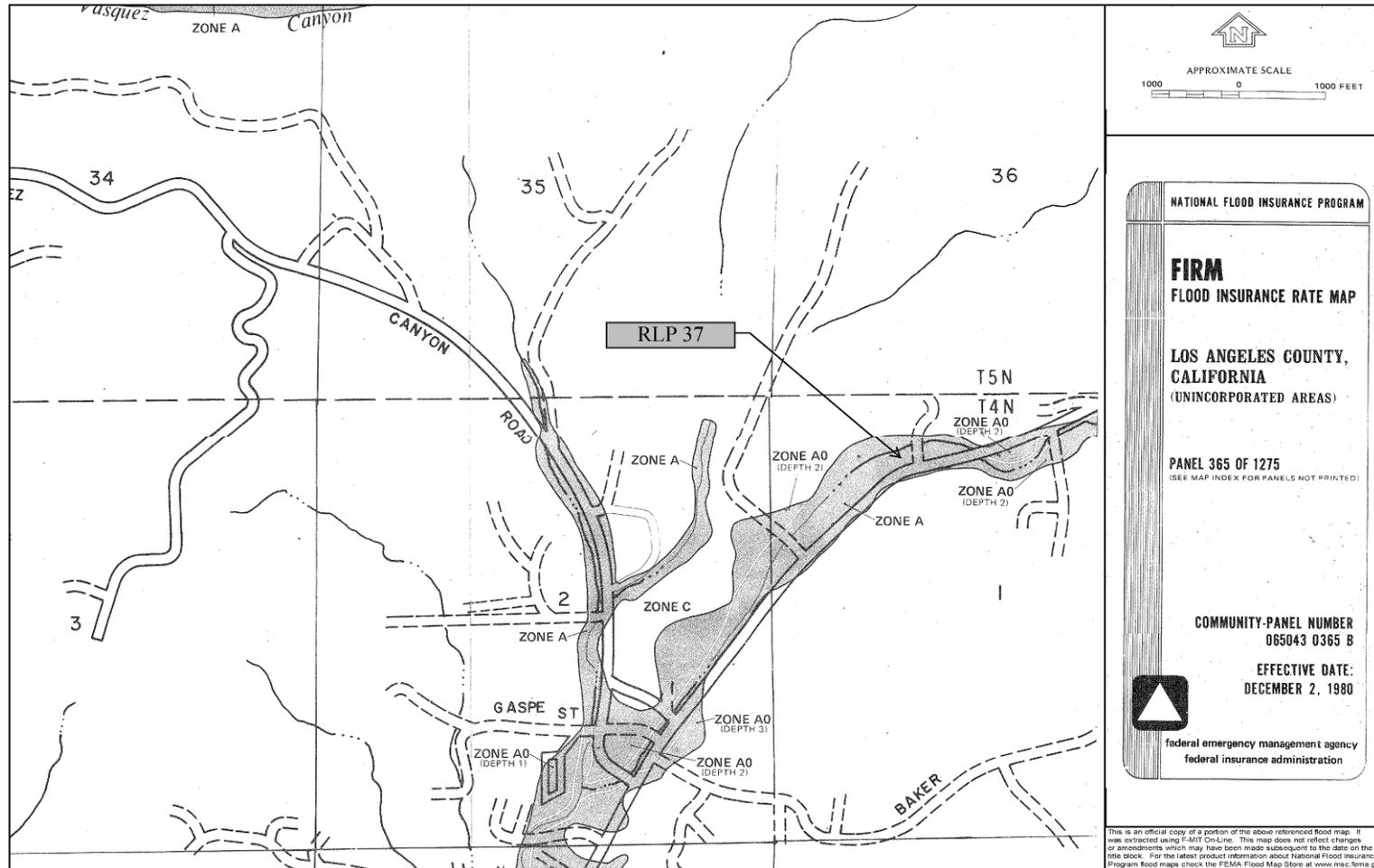


**Figure 4.6
 FEMA FIRM – RLP No. 43**



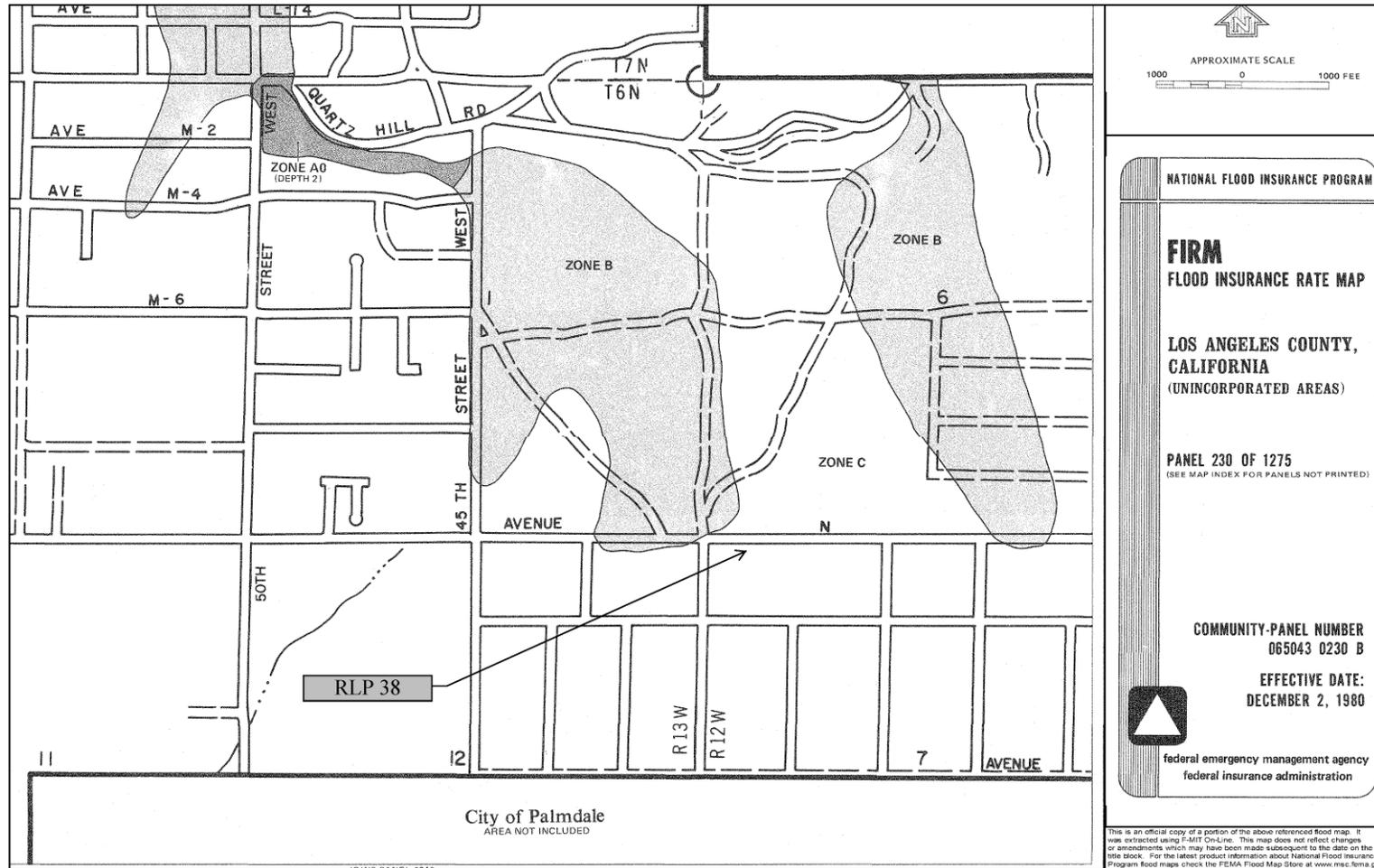
**Figure 4.7
 FEMA FIRM – RLP No. 42**

*Floodplain Management Plan for Repetitive Loss Properties
 Santa Monica Mountains, San Gabriel Mountains, Lancaster,
 Rowland Heights and Quartz Hill*



**Figure 4.8
 FEMA FIRM – RLP No. 37**

*Floodplain Management Plan for Repetitive Loss Properties
 Santa Monica Mountains, San Gabriel Mountains, Lancaster,
 Rowland Heights and Quartz Hill*



**Figure 4.9
 FEMA FIRM – RLP No. 38**

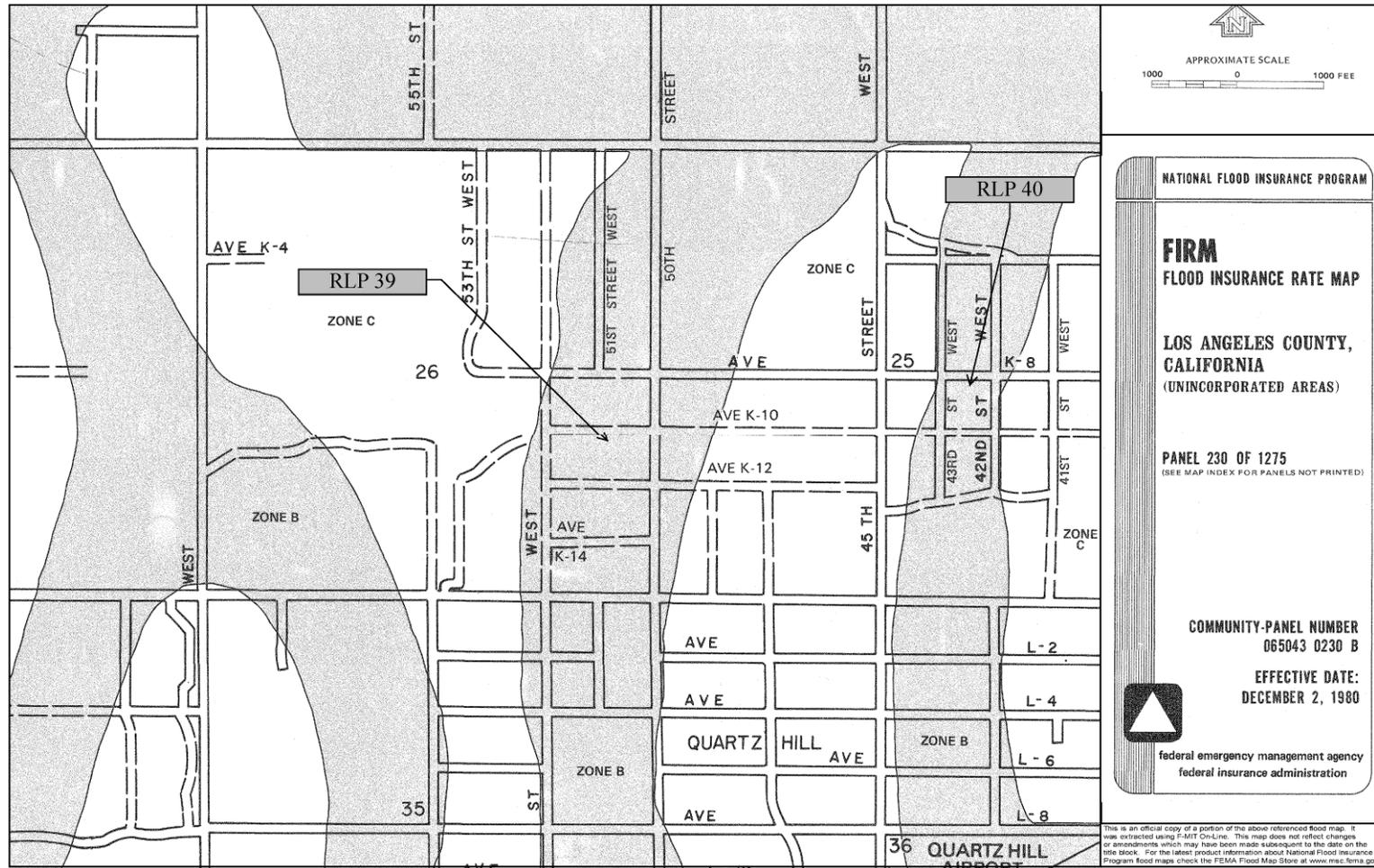


Figure 4.10
FEMA FIRM – RLP Nos. 39 & 40

during the visits and the interview results were incorporated to update and supplement the information obtained from field observation.

4.3 Causes of Flood Damages

Causes of flood damages to RLPs in the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas were analyzed based on field investigation, data review, interviews with homeowners, and engineering analysis. The contributing drainage area to each RLP is included in Appendix A. The results of findings are summarized in Table 4.1 and described in the following paragraphs.

A. Santa Monica Mountains

RLP No. 24 is located within the floodplain of Lobo Canyon, which runs behind the house. The property is in Zone A-4, which has significant risk from a 100-year flood and Capital flood (Capital flood is much more significant than the 100-year flood, see Section 4.4). Many of the small private bridges and culverts in the creek used to be clogged with debris, causing water to overflow onto the street in front of the subject house and to flood the property. The owner has privately constructed retaining walls along the creek.

RLP No. 26 is the camping ground owned by the University of Pepperdine and located at the bottom of a hillside area. The steep hill at the west corner, or the highest point of the property, was prone to mudflow from the hill whenever it rains. The flow then runs along the private road across the camping ground between the camp housing facilities to the natural creek located at the east property boundary. Currently, the owner placed sandbags in some locations to temporarily protect the housing facilities near the bottom of the hill. The owner claimed that the sandbags were strategically placed to protect the housing facilities, and if the pattern of hillside runoff changes as it did in 1996 after the brush fire, his property would again be at the risk.

RLP No. 27 is located at the high grounds and flooded by the excessive storm runoffs from surrounding hills. It was also determined from the FEMA FIRM in Figure 4.3 that the property was not in the floodplain of Cold Canyon, adjacent to the property.

RLP No. 28 is located at the lowest point of the street. The first floor of the house was built lower than the street level, and street runoff can enter the house through the driveway. The RLP owner built a 6-inch berm in front of the driveway to divert the water. This, however, may not have relieved the flood problem associated with major floods.

RLP No. 41 is located adjacent to a higher neighboring property and receives runoff that can seep into the subject property. A former problem is that when it rains runoff from the roof enters the planters in front of the house. The owner already installed pipes and drains in the planters and repaired foundation cracks. However, this temporary fix may not resolve the problem.

RLP No. 43 is located at the base of a hillside and receives runoff from the adjacent hills.

RLP No. 45 is lower than the street in front of the property. The owner stated that he did not have problems with the creek. The owner installed a pipe and a drain in the side yard to discharge flows to the creek. In addition, he installed a small ditch next to the front side of his garage to convey flows to the side yard. Also, he pumped the basement flow out to the side yard

| Table 4.1 Flooding Causes – Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill Areas RLPs | | | |
|--|--|----------------|-------------------|
| RLP ID | Causes | Problem | No Problem |
| Santa Monica Mountains (7) | | | |
| 24 | Offsite drainage problem: The property is located in the floodplain and Flood Hazard Zone A4. Small private bridges and culverts in the creek, running behind the house, clogged with debris, and water overflowed to and ran along the Lobo Canyon Road in front of the subject property. | X | |
| 26 | Mudflow from the hillside at east end of the property (University of Pepperdine campground) and along the private road within the property. | X | |
| 27 | Hillside drainage problem: The property backyard at the bottom of hill; the house is well above the street level | X | |
| 28 | The house is located at the low point of the street. | X | |
| 41 | The house is located at the low point of the street and flows entering the front yard can be trapped and cause damages to the house, including foundation cracking. The owner has fixed the roof and planter drain system; however, problems may continue with larger floods unless source flows are diverted. | X | |
| 43 | There is no house on the subject property. Based on topography, the property is subject to runoff from the hillside behind the property. There is no evidence of potential structural damage as it is an empty lot. Assuming proper grading, drainage, erosion control, and foundation elevation design during construction, it should not have a future claim. | | X |
| 45 | The problem with this property is that the property is lower than the adjacent street where flows concentrate during a rainstorm. Property was damaged when street flows entered the property. The property is located adjacent to the Cold Creek designated as Zone B in the FEMA Firm (see Figure 4.3). The owner, however, claimed that no issues were caused by the creek flows. The owner claimed that he has provided catch basins and handled the flows. However, without proper diversion and control of the flooding source from the streets, damages from future floods may occur. | X | |

| Table 4.1 Flooding Causes – Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill Areas RLPs | | | |
|--|---|----------------|-------------------|
| RLP ID | Causes | Problem | No Problem |
| Lancaster (1) | | | |
| 42 | RLP No. 42 is located within Special Flood Hazard Zone A of Little Red Rock Wash. There is no house on this property. Being in Zone A, the property is subject to inundation during a 100-year flood. The lot has dirt berms surrounding the three boundaries receiving alluvial fan floods. However, the lot receives street flows as it is at the low point of the street and is lower than the street. Street flows will be trapped inside the property once enter the lot during the rain storms. There is no evidence of potential damage, however, as it is an empty lot. Assuming proper grading, drainage, erosion control, and foundation elevation design during construction, it should not have a future claim. | | X |
| Rowland Heights (1) | | | |
| 44 | The property is a single dwelling within a hillside development generally situated high above the floodplain. It was observed that the possible flooding source is the storm and irrigation runoff from the adjoining property. The neighboring property to the east is much higher than the subject property. The property may receive significant excess runoff from the elevated neighboring property, especially during large storms. There is also a possibility of slope erosion due to the high and steep nature of the slope. The flooding problem seems to have been partially fixed with a small toe wall. However, a more comprehensive wall and drain system will be required to prevent future claims. | X | |
| San Gabriel Mountains (3) | | | |
| 35 | Hillside drainage problem. | X | |
| 36 | (1) Flooding in the channel in front of the property after the brush fire in 1993. (2) Flooding of the basement due to backyard drainage deficiency (the owner put drain pipe and 6" berm at the backyard since). | | X |

| Table 4.1 Flooding Causes – Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill Areas RLPs | | | |
|--|---|----------------|-------------------|
| RLP ID | Causes | Problem | No Problem |
| 37 | The property is located within the floodplain. | X | |
| Quartz Hill (3) | | | |
| 38 | Overflow from detention basin, which has been relocated since | | X |
| 39 | The subject property is located within Flood Hazard Zone B and is located in Antelope Drainage corridor | X | |
| 40 | The subject property is located within Flood Hazard Zone B and is located in Antelope Drainage corridor. The property is subject to significant flooding. The corridor flows may be conveyed to this property through streets and low lying areas and trapped at the property (which is lower than the streets). The first floor elevation is also lower than the streets and has been damaged frequently by historical floods. The owner has constructed berms at the entry gate and prepared a pump pit. Without a comprehensive and reliable berm and on-site pump system, however, this property may continue to experience flood damage and submit future claims. In addition, the interior household flows are being discharged to the side yard, but should be disposed via sanitary sewer or County approved drywell. | X | |

to the first floor of the house then to the side yard.

B. Lancaster

RLP No. 42 is located within Flood Hazard Zone A and within the floodplain of Little Red Rock Wash. It is lower than the street in front of this undeveloped lot. In addition, the lot has berms on the sides. The water flows from both sides of the street and may enter and be trapped in the lot.

C. Rowland Heights

RLP No. 44 is significantly lower in elevation than the neighboring property. Without insurance records, we suspect that flows from the neighboring property to the side yard can be sufficient to cause damage. Additionally, the slope may be eroded and contribute debris. Street flows may tend to collect in front of the property before moving down the steep street. The finished floor elevation, however, seems to be high enough to prevent damage by street flow.

D. San Gabriel Mountains

RLP No. 35 is located at the bottom of the hill and possibly impacted by the storm runoffs from surrounding hills. There is a two-foot-wide and one-foot-deep dry earthen ditch running west of but outside of the property. The property is located at higher grounds compared to the bank elevations of the ditch.

RLP No. 36 is located near the privately constructed channel within the private hillside residential community. According to the RLP owner who resides in the community, the channel has a concrete bottom but is not engineered. After the brush fire in 1993, the hillside storm runoff in the channel destroyed the private studio in the floodplain and eroded the bank protections, which were restored and improved later. In a separate incident, the basement was flooded due to a backyard drainage deficiency, which was improved with a 6-inch berm.

RLP No. 37 is located within the floodplain of Mint Canyon. The property is in Zone A, which has significant risk from a 100-year flood and Capital flood (Capital flood is much more significant than the 100-year flood, see Section 4.4). The culvert under Sierra Highway at approximately 250 feet upstream from the RLP is undersized and often clogged with debris. Insufficient culvert capacity resulted in street flooding and inundation at the subject property. In addition to the culvert capacity issue, the property owner claimed the upstream neighbor improperly altered the natural creek and encroached on the floodplain and caused flow breakout from the channel. Mint Canyon borders the RLP, eroding and flooding its backyard. The property owner placed the log retaining walls around the street side property entrance. The County also built a berm on top of the channel bank near the culvert under the Sierra Highway in an effort to contain the water inside the channel. The owner claimed that the property continued to be flooded during recent storm events.

E. Quartz Hill

RLP No. 38 is no longer subject to flood damages from the flooding source that the property initially filed the claim for. The property is located within Antelope Valley Drainage Corridor No.9, which is designated as Flood Zone C on the FEMA FIRM. According to the owner, the

property was flooded when the retention basin, located a couple of blocks to the south, could not hold the storm water, and the gate was forced to open. The overland runoff entered his property across empty lots, causing flooding at the property. The basin has been replaced by a golf course and relocated one half mile to the northwest, further downstream from the property, which eliminated further flooding problems.

RLP No. 39 is located in Zone B on the FEMA FIRM (Figure 4.10). The sheet flow from Antelope Valley Drainage Corridor No.7 flooded the property, displacing retaining walls. The property currently has a private earthen ditch and small berms along it to route the water through the property boundaries.

RLP No. 40 is located in Zone B on the FEMA FIRM (Figure 4.10) and is subject to similar alluvial fan breakout flows as RLP 39. This property has significant potential of damage by future floods. The property has been frequently inundated by alluvial fan flows conveyed through streets and the owner has submitted several claims (see Table 1.1 and 4.1).

4.4 Hydrology Related to Flood Damaged Properties

The estimated FEMA 100-year flood and County Capital flood discharges, as provided by the County of Los Angeles, are listed in Table 4.2 at different locations in the watershed.

The discharge rates affecting RLP Nos. 26, 27, 28, 35 and 36 were estimated by applying the Rational Method as described in the Hydrology Manual of the Los Angeles County Department of Public Works. The same method was applied to the 2007 RLP Nos. 40 to 45. The methodology primarily depends on three factors: total drainage area, runoff coefficient of the area, and rainfall intensity. The runoff coefficient and rainfall intensity were determined from the Hydrology Manual, drainage map, and data gathered from field visits. The drainage area was obtained using the topographic features of the area, the existing street conveyance, and storm drain interception. Table 4.2 summarizes the estimated discharges.

Based on the hydrology information provided by the County, RLP No. 39 is affected by breakout water from the Antelope Valley Drainage Corridor No.7, which runs from the south along 50th Street all the way to the Mira Loma detention facility (approximately 2 miles north of the RLP). The drainage corridor collects street and hill runoff from south of Quartz Hill and incorporates a huge contributing watershed area, including the hillside area, which contributes runoff to Antelope Valley Drainage Corridor No. 9 (where RLP No. 38 is located).

The contributing drainage areas, as well as FEMA 100-year and Los Angeles County Capital Flood rates for RLP Nos. 24 and 37 are summarized in Table 4.2. The estimated discharges for Antelope Valley Drainage Corridor Nos. 9 and 7 near RLP Nos. 38 and 39 by FEMA are also shown in the table.

Appendix A of the 2002 FMP includes detailed hydrology information for the 2002 RLPs (RLP Nos. 24, 26-28, and 35-39). This report presents additional hydrology calculations, as well as drainage area delineation and rainfall isohyetograph maps in Appendix A for RLP Nos. 40 to 45.

Note that 50 year storm data produce Capital Flood discharges.

| Table 4.2 | | | | | |
|--|-----------------------|---------------------------|----------------------|------------------|----------------------------|
| 100-yr FEMA and County Capital Discharges*** | | | | | |
| RLP ID | Watershed Area | | FEMA 100-yr Q | Capital Q | 50-yr Capital Storm |
| | (acres) | (mile²) | | | |
| Santa Monica Mountains (7) | | | | | |
| 24* | 2,424.0 | 3.7875 | 4,640 | 8,240 | |
| 26** | 17.1 | 0.0267 | N/A | N/A | 88 |
| 27** | 7.1 | 0.0110 | N/A | N/A | 36 |
| 28** | 8.5 | 0.0133 | N/A | N/A | 44 |
| 41** | 5.0 | 0.0078 | N/A | N/A | 18 |
| 43** | 4.6 | 0.0072 | N/A | N/A | 19 |
| 45** | 4.9 | 0.0077 | N/A | N/A | 20 |
| Lancaster (1) | | | | | |
| 42** | 194 | 0.303 | N/A | N/A | 73 |
| Rowland Heights (1) | | | | | |
| 44** | 0.23 | 0.0004 | N/A | N/A | 0.8 |
| San Gabriel Mountains (3) | | | | | |
| 35** | 5.7 | 0.0089 | N/A | N/A | 15 |
| 36** | 55.6 | 0.0868 | N/A | N/A | 148 |
| 37* | | | 6,470 | 16,700 | |
| Quartz Hill (3) | | | | | |
| 38* | 1200+/- | 1.875 | 1,200 | N/A | |
| 39* | | | 2,100 | N/A | |
| 40** | 405.5 | 0.634 | N/A | N/A | 193 |
| <p>* FEMA Discharge rates & County's Capital Qs were provided by the County of Los Angeles and prorated based on the drainage areas, if necessary.</p> <p>** 50-yr & 100-yr Q for the concentration points near the RLP sites were determined based on the Rational Method of the Los Angeles County Department of Public Works Hydrology Manual. The TC values for RLP Nos. 40 and 42 were determined using the maximum applicable drainage area of 40 acres.</p> <p>*** Hydrology estimates presented in this table are for mitigation needs assessment only and can not be used for design or other study documentation without consultation with WRC and the County.</p> | | | | | |

4.5 Buildings

The buildings are either one- or two-story residential houses on concrete slab, raised foundation, or a combination of the two. Since this is a rural residential area, no critical facilities or buildings are located here.

In addition to RLPs, there are other residential properties that may have been affected by the historical flooding or are subject to future flooding damages. Although these properties did not file claims more than twice within any given 10-year period since 1978 as the RLPs did, they will be included as the "high risk properties" to be monitored by the County of Los Angeles for future flood damage reduction (see Section 10).

In the areas of the San Gabriel Mountains, Lancaster, Rowland Heights, Santa Monica Mountains, and Quartz Hill the floodplain boundaries of the FIRMs were compared to aerial photographs for investigation of other buildings in the vicinity of RLPs. The boundary comparisons are approximate because the elevation contour intervals are not available on either recent aerial photography or topographic maps. In the Santa Monica Mountain area, approximately eight (8) "high risk properties" were identified near RLP No. 24 in the same floodplain (see Figure 4.11). In the San Gabriel Mountain area, nearly twenty (20) other properties may be affected by similar flooding problems as RLP No. 37 (see Figure 4.12). In the Quartz Hill area, approximately five (5) "high risk properties" were identified near RLP No. 39 and twenty (20) were identified near RLP No. 40 to experience the similar flooding problem (see Figure 4.13). In the Lancaster area, approximately ten (10) "high risk properties" were identified near RLP No. 42 to experience similar flooding problems (see Figure 4.14).

The summary of the numbers of "high risk properties" in the San Gabriel Mountains, Lancaster, Rowland Heights, Santa Monica Mountains, and Quartz Hill is shown in Table 4.3.

4.6 Insurance Claims and Disaster Assistance Applications

The flood insurance claim history has been presented and summarized in Table 1.1. There are no known disaster assistance applications filed by the property owners and/or the County of Los Angeles.

4.7 Flood Warning and Emergency Management

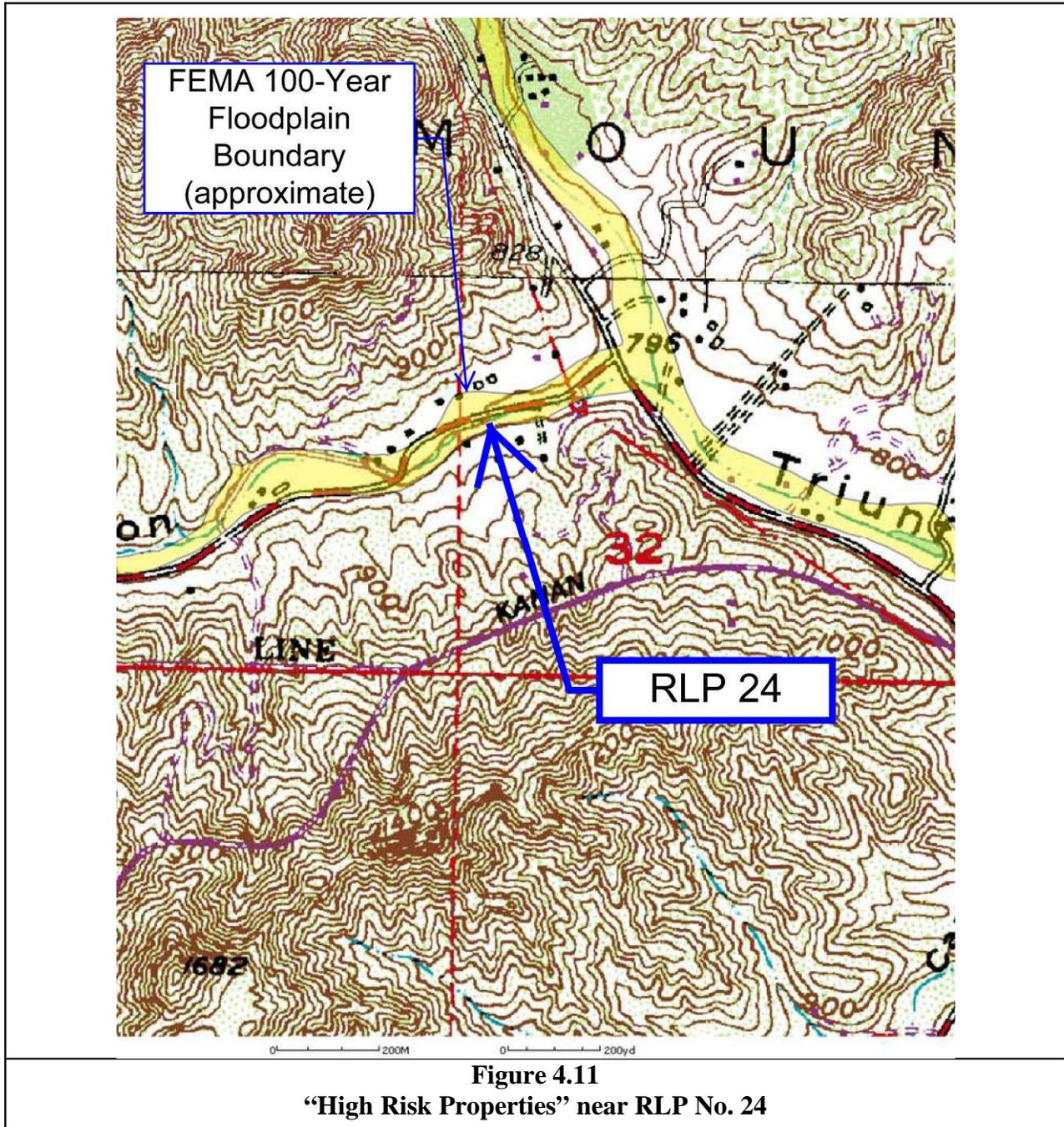
Currently there are no flood warning devices or emergency management programs for the Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, or Quartz Hill areas.

4.8 Critical Facilities

There are no critical facilities in the Repetitive Loss Areas of the Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, or Quartz Hill.

4.9 Development (Land Use) and Growth Trends

The population of Los Angeles County increased almost 270% between 1940 and 1990, and it



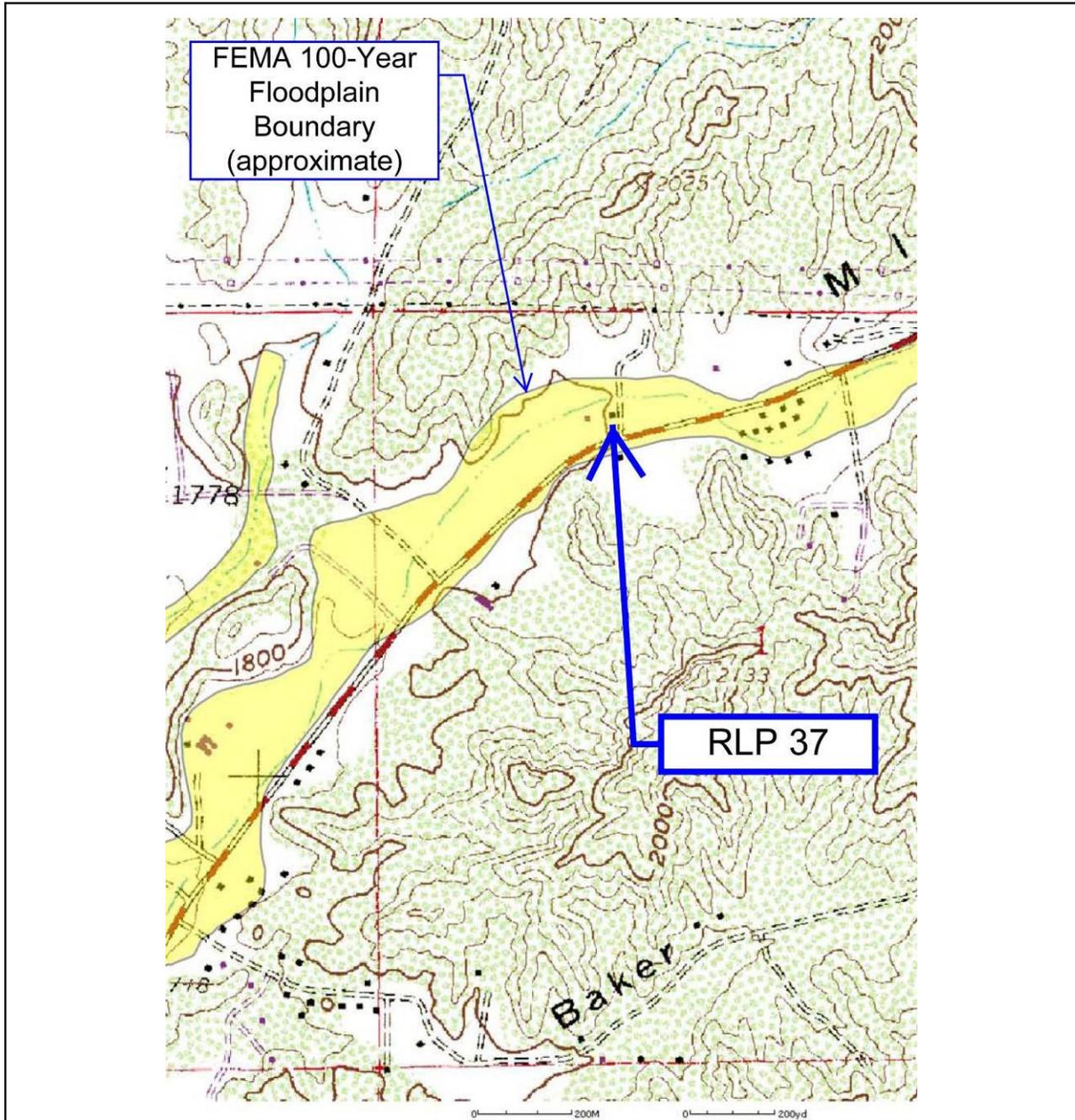


Figure 4.12
“High Risk Properties” near RLP No. 37

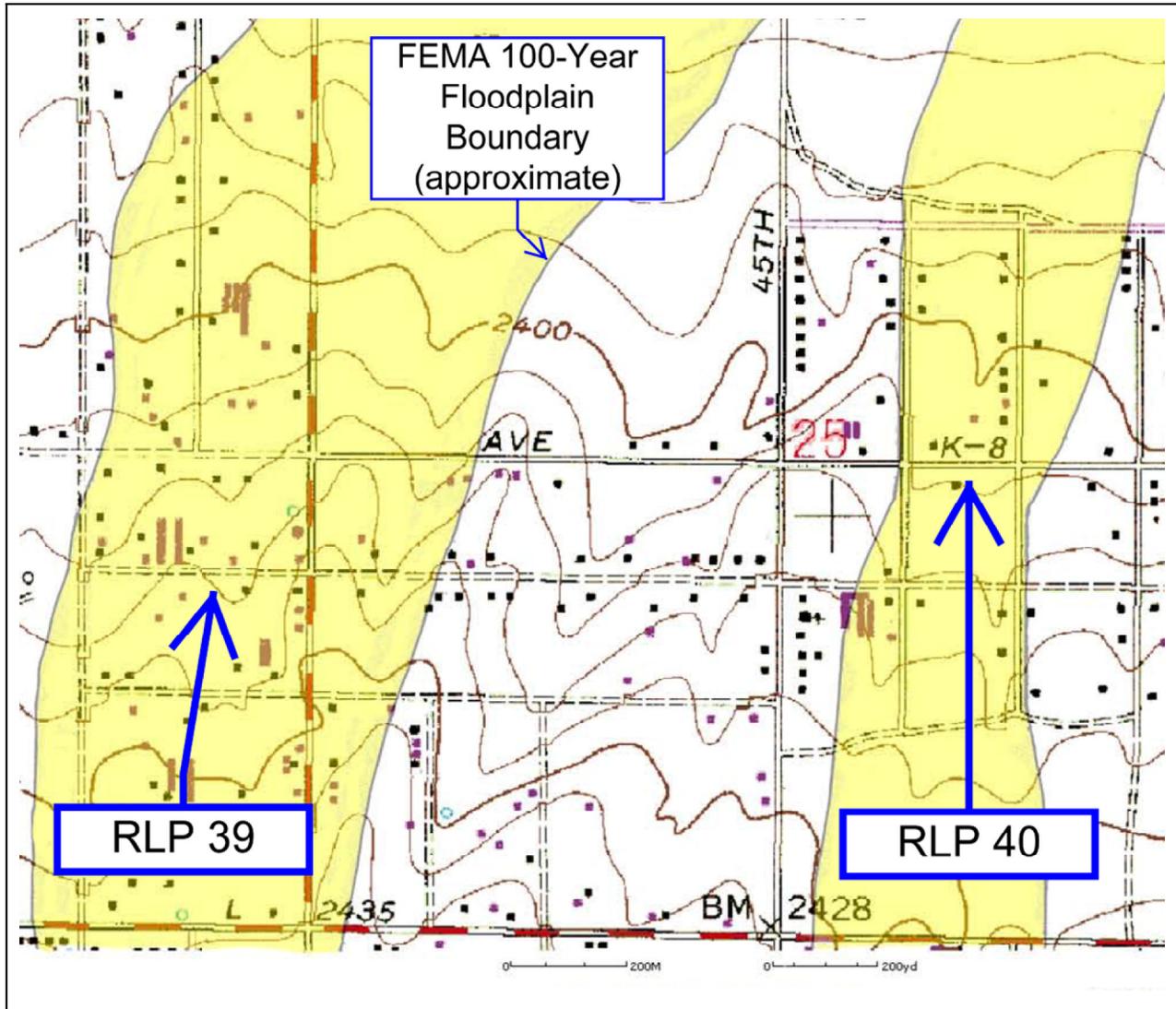
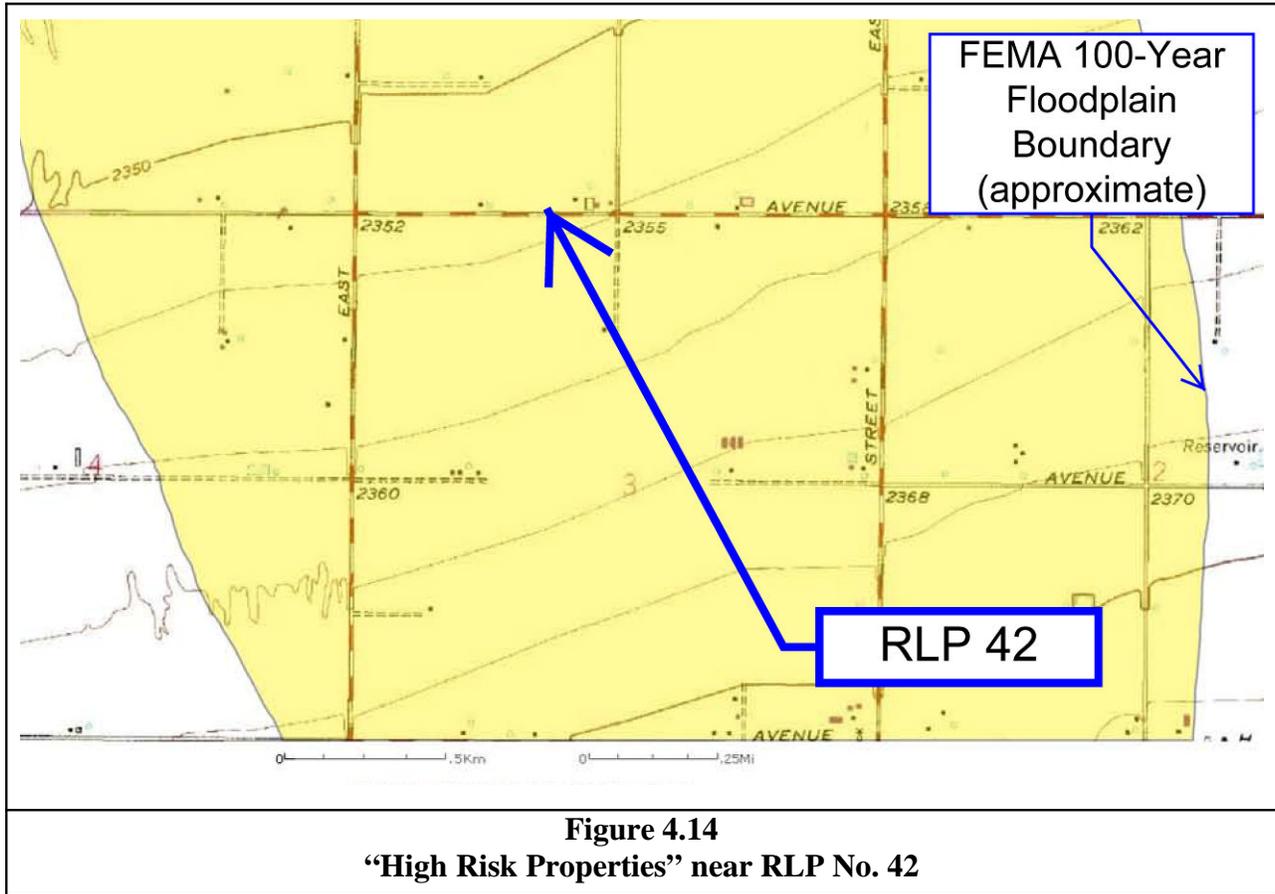


Figure 4.13
“High Risk Properties” near RLP Nos. 39 & 40



| Table 4.3 | | | | |
|---|------------------------------------|-----------|---|---|
| Number of “High Risk Properties” – Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains and Quartz Hill | | | | |
| RLP ID | Localized Source of Problem | | Number of Other Properties Possibly Affected by Same Problem | Description of Problem (non-localized problem sites only) |
| | Yes | No | | |
| Santa Monica Mountains (7) | | | | |
| 24 | | X | 8 | Based on the USGS topographic map, the properties are in the FEMA 100-year floodplain boundary. |
| 26 | X | | 0 | |
| 27 | X | | 0 | |
| 28 | X | | 0 | |
| 41 | X | | 0 | |
| 43 | X | | 0 | |
| 45 | X | | 0 | |
| Lancaster (1) | | | | |
| 42 | | X | 10 | Based on the USGS topographic map, the properties are in the FEMA 100-year floodplain boundary. |
| Rowland Heights (1) | | | | |
| 44 | X | | 0 | |
| San Gabriel Mountains (3) | | | | |
| 35 | X | | 0 | |
| 36 | X | | 0 | |
| 37 | | X | 20 | Based on the USGS topographic map, the properties are in the FEMA 100-year floodplain boundary. |
| Quartz Hill (3) | | | | |
| 38 | X | | 0 | |
| 39 | | X | 5 | Sheet flow problems along Drainage Corridor No. 7, based on USGS topographic map. |
| 40 | | X | 20 | Based on the USGS topographic map, the properties are in the FEMA 100-year floodplain boundary. |

continues to grow. This level of growth and urbanization has increased stormwater runoff by creating impermeable surfaces. The density and land use patterns have led to a deficiency in the capacity of the flood control system.

4.10 Community and Economic Impact Assessment

The economic impacts associated with the RLPs are limited to individual homeowners. Impacts include sediment/trash removal after the flood, non-usable living spaces, and health problems caused by contaminated floodwater. The overall community economic impacts are considered insignificant.

5. ENVIRONMENTAL SETTING AND HABITAT CONSERVATION PLAN

Per the CEQA Guidelines, an initial study was prepared for the RLPs and is attached here for reference. The environmental issues investigated include the following:

- Aesthetics
- Air quality
- Cultural resources
- Hazards & hazardous materials
- Land use and planning
- Noise
- Public services
- Transportation/traffic
- Mandatory findings of significance
- Agriculture resources
- Biological resources
- Geology and soils
- Hydrology and water quality
- Mineral resources
- Population and housing
- Recreation
- Utilities and service systems

The CEQA Guidelines and the summary of findings are presented in Appendix C. The environmental impacts were categorized into four levels of significance: "Potentially significant impact", "Less than significant with mitigation", "Less than significant", and "No impact".

No significant impacts are expected of possible improvements within the RLPs, assuming minor changes to the physical condition of the property. However, temporary construction impacts must be minimized and mitigated. Although improvements to individual RLPs may be exempted, construction permit issuance should ensure compliance with all environmental requirements.

6. PUBLIC INVOLVEMENT

6.1 Public Involvement Process and Procedure

Unlike other FMP areas in the County of Los Angeles, no community-scale public meetings were held for the 15 RLPs in the Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill areas. The locations of these RLPs are scattered over the County, with some of the RLPs more than 80 miles apart from each other.

The public involvement process and procedure for this FMP includes informing and involving the public by interviewing RLP owners at the site visits, questionnaire survey, and follow-up site

visits. A copy of the questionnaire and meeting summaries are included in Appendix D.

6.2 Questionnaires

WRC developed a questionnaire designed to understand each RLP owner's concerns, damages, causes of damages, and improvements made to reduce damages. The questionnaire was mailed to all 15 RLPs on December 27, 2006. A copy of the questionnaire is included in Appendix D. The owners did not respond to survey requests or meeting inquiries. The questionnaires were sent again on January 16, 2007 and addressed to "Owner/Current Resident" in lieu of the owner name on file. Appendix D provides further details and shows that the mail for RLP 38 was returned as "unable to deliver." It is possible that the property has been sold and the owner name has been changed.

6.3 Individual Meeting Invitation

Along with each questionnaire mailed, a letter inviting each owner to an individual meeting at his or her own home and property was also sent. A copy of the invitation letter is included in Appendix D.

6.4 Meeting Attendance

The individual meetings were intended to allow the RLP owners to voice their concerns and to volunteer to participate in the County's floodplain management planning efforts. WRC's Project Manager and Engineer met with the owner of RLP No. 40 on March 22, 2007. Meetings with the owners of RLP Nos. 41 and 45 occurred on March 26, 2007. WRC successfully interviewed the owners and identified the historical flood problems and the improvements made to date for flood reduction. These three property owners believe that they have fixed their flood problems. However, these properties are still subject to future flood damages based on WRC's investigation and technical analysis (see Table 4.1). Additional measures are needed to avoid future claims (see Section 10).

7. AGENCY COORDINATION

Since this FMP does not involve actual implementation or construction, no permit coordination was performed during plan preparation. Correspondences and telephone logs between WRC Consulting Services, Inc., and State of California Department of Water Resources, FEMA, State of California Department of Fish and Game, Los Angeles Regional Water Quality Control Board, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and NFIP Coordinator are included in Appendix D. When the FMP is complete, copies will be sent to these agencies.

8. GOAL SETTING

8.1 Floodplain Management Goal Definition

Goals were established to define the floodplain management plan based on the specific needs of the Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill RLP owners. The overall goal for this FMP is to create a safe environment for individual

owners or lessees by reducing flood hazards without significant environmental impacts. Specifically, the following goals were defined for development of this FMP:

- Understand the flood hazard and past mitigation activities.
- Conduct site inspection and data research to identify drainage problems.
- Identify the environmental settings at problem sites.
- Evaluate the structural integrity and assess the potential for elevating structures.
- Formulate non-structural and structural alternatives.
- Evaluate feasibility of each alternative.
- Evaluate environmental impacts and mitigation requirements.
- Outreach property residents (owners or lessees) to promote flood awareness and assist in hazard mitigation measures.
- Promote working relationship of the County with the local citizens and watershed management group.
- Develop a functional and realistic plan that provides balanced solutions for flood hazard mitigation within the sensitive environmental area.

8.2 Compatibility with Other Community FMP Goals

This FMP is in concurrence with the goals and objectives set forth in the County of Los Angeles Repetitive Loss Plan for Community No. 065043 (reviewed in March 1992 and reconfirmed in March 2007).

9. REVIEW OF POSSIBLE MITIGATION ACTIVITIES

9.1 Floodplain Management Objective Overview

The flood hazard to RLPs in the Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill areas is principally related to property construction within a floodplain. This construction prior to the County's development of a Floodplain Management Program and participation in the NFIP has resulted in clusters of repetitive loss properties within these areas. Thirteen of fifteen RLPs are covered within these clusters. The specific hazard association between property damage and channel overflow for these areas differs from most other FMPs for RLPs where the hazard-damage relationship is spread amongst many factors. Repetitive Loss Properties manifest a unique separation between public and private hazard mitigation. Recurrent damages to these properties carry public concern and cost; yet the damage forces and solutions are of a private nature and financial responsibility. Thus, the FMP for RLPs is of a dual character, requiring the attention of both public agencies and private RLP owners. The FMP must first identify the problem(s) associated with each RLP, assess solutions that can be provided by RLP owners and public agencies; and, at the same time, communicate with RLP owners the critical information and awareness to encourage the voluntary participation in private solutions. The following discussion centers on the private programs, measures, and activities to address the problems and needs associated with RLPs.

In keeping with the goals of the FMP to ensure that all possible mitigation measures are

explored, the review of possible mitigation activities starts with the six activities presented in Section 511-g of the CRS Coordinators Manual and its six categories. These activities are (1) preventive, (2) property protection, (3) natural resource protection, (4) emergency services, (5) structural projects, and (6) public information.

The following sections detail the application of these six activities to the affected RLPs by a division between essentially public versus private activities. Note that the division between private versus public activities is for easy reference only. Implementation responsibility may be shared by both parties as shown in Section 10.1. Property protection activities are discussed under "Private Activities" since most protection measures will be implemented within the private property rights-of-way. Major structural improvements such as elevating the entire house may be costly and may be qualified for governmental funding assistance. Under these circumstances, the private owners may participate in the protection measures, NFIP administrator (County), and other entities involved in funding application approval and reimbursement. Conversely, natural resources protection activities are primarily through the watershed management efforts of the public agencies and are listed under "Public Activities". However, the private owners are encouraged to apply environmentally friendly materials and to provide environmental protection during design and construction of property protection measures.

9.2 Public Activities

Of the six activities of the CRS Coordinators Manual, five are essentially governmental in nature. These five are preventive, natural resource protection, emergency services, structural projects, and public information. Implementation of any activity contained in these categories is dependent upon the priorities and funding capabilities of the responsible governing agencies.

9.2.1 Preventive Activities

The list below identifies potential preventive activities that have the potential to reduce flood damage potential for RLPs and "high risk properties" and aid in the mitigation of damages to RLPs and in many instances to non-RLP properties.

- 1.a Designate staff from planning, building/safety, development, and environmental divisions who will be responsible for working with RLPs during the permitting process.
- 1.b Update the RLP list and annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs.
- 1.c Maintain the County's Emergency Operations Master Plan and Procedures.
- 1.d Maintain regular coordination efforts with surrounding cities, the Los Angeles County Department of Public Works, State and Federal agencies regarding flood hazard mitigation, and the National Flood Insurance Program.
- 1.e Participate in organizations such as the Association of State Floodplain Managers and the National Association of Flood and Stormwater Management Agencies to

- network with other agencies and remain current in the field of floodplain management.
- 1.f Conduct annual National Flood Insurance Program seminars for County personnel responsible for applying and enforcing floodplain management regulations.
 - 1.g Update operational procedures and training materials for staff that apply and enforce floodplain management regulations and provide annual training.
 - 1.h Post "No Dumping" signs at points of entry to the stormwater system.
 - 1.i Refine the use of the Plan Check and Inspection System (PCIS) to track "high risk properties" and ensure that flood safety is adequately addressed through the plan check process.
 - 1.j Incorporate floodplain management information into the Zoning Information and Map Access System (ZIMAS).
 - 1.k The Flood Hazard Mitigation Coordinator shall flag repetitive loss properties in the PCIS database for review and approval of building permit applications.
 - 1.l Identify and maintain a list of "high risk properties" that could be acquired for conversion into open space.
 - 1.m Establish standards and/or incentives for the use of structural and non-structural techniques that mitigate flood hazards and manage stormwater pollution.

9.2.2 Natural Resource Protection Activities

The guidance of the CRS Coordinators Manual typically places natural resource protection activities within the scope of a broad watershed, which is well beyond the scope of an individual RLP. Typically, ecosystem restoration activities benefit from stormwater volume reduction through infiltration and flood peak decrease through increased ground cover density and resistance. However, these large-scale restoration activities can be performed through the coordinated efforts of the County and local entities. Limited mitigation measures are also available to the RLP through the use of bioengineering solutions within the RLP right-of-way. The implementation and financing of these activities is normally the property owner's responsibility. Potential natural resource protection activities identified are as follows.

- 2.a Continue to require environmental review in the development process to provide for the protection of natural resources.
- 2.b Encourage the application of biological resource measures for the control stormwater and erosion to the best of their applicable limits with regards to other safety factors such as fire control.
- 2.c Establish standards and/or incentives for the use of structural and non-structural techniques that mitigate flood-hazards and manage stormwater pollution.
- 2.d Ensure awareness of RLP owners on environmental sensitivities specific to their area.

- 2.e Establish standards and procedures for mitigation of temporary construction impacts.
- 2.f Develop and implement a watershed ecosystem restoration program.

9.2.3 Emergency Services Activities

Emergency services activities are taken during a flood to minimize its impacts. These measures are normally the responsibility of county emergency management staff. Under some special circumstances, private entities, including homeowner associations, can undertake emergency services activities. A highly organized and committed private entity, like a homeowners association, may be capable of providing limited emergency services activities.

- 3.a Identify flood-warning systems for properties situated where such systems can benefit.
- 3.b Routinely check and evaluate the safety and readiness of Emergency Operations and Procedures.
- 3.c Make sand and sand bags available to flood risk property owners during the wet season, provide notifications of the availability of these materials, and track the distribution of the materials.

9.2.4 Structural Activities

Section 510 of the CRS Coordinators Manual employs this category for large-scale projects providing protection to groups, rather than the more individually based category of Property Protection Activities. Large-scale projects are, by their nature, public facilities and are thus designed and maintained by public works staff. In the examination of RLPs, a limited number of large-scale projects are potentially suited for controlling the hazards of RLPs. These potential structural activities are as follows.

- 4.a Storm sewer improvements.
- 4.b Channel modifications.
- 4.c Street drainage modifications.
- 4.d Levee or floodwall construction to divert lake runoff.
- 4.e Dam / debris removal with lake modifications.

9.2.5 Public Information Activities

Information transfers to RLP owners, potential property owners, and visitors about the hazards and ways to protect people and property from the hazards are effective activities that can lead to the mitigation of the hazards. The following public information activities have been identified for RLPs.

- 5.a Identify possible sources of funding including Cost of Compliance funds and mitigation grant funds among others and provide this information to RLP owners.

- 5.b Continue to investigate RLPs as they are identified by FEMA and update the RLP and high-risk property list. Annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs.
- 5.c Develop and distribute flood protection information and materials to property owners and developers in high-risk areas.
- 5.f Provide public education about maintaining the stormwater system free of debris.
- 5.g Maintain the County's web page to provide emergency preparedness information to the general public and media.
- 5.h Distribute information regarding flood prevention and flood insurance at emergency operations and emergency preparedness events.
- 5.i Continue implementing the County's Annual Emergency Preparedness Fair.

9.3 Private Property Protection Activities

Property protection activities for RLP are generally in the nature of small-scale measures undertaken by property owners on a structure-by-structure or parcel basis. As these measures are usually carried out by the property owner, implementation and financing of these measures are normally at the discretion of the property owner.

- 6.a Construct or modify retaining walls with proper drainage and trash capacity.
- 6.b Construct berms to divert water flows.
- 6.c Install debris fences or traps.
- 6.d Install yard inlets to drain water flows to the street.
- 6.e Construct on-site detention basins.
- 6.f Improve headwalls for water conveyance.
- 6.g Floodproof structures and retaining walls.
- 6.h Floodproof entrances.
- 6.i Add sump pump to drainage systems and drain to nearest storm drain.
- 6.j Construct terrace drain and plant slope to reduce erosion.
- 6.k Plant slopes to reduce erosion and water flows.
- 6.l Improve on-site grading and add french-drain.
- 6.m Convert flood-prone living space and replace with new story.
- 6.n Lift entire house including floor slab and build a new foundation to elevate the house.
- 6.o Waterproof lower level.

6.p Extend the walls of the house upward and raise the lowest floor.

10. ACTION PLAN

Section 9 concluded with the identification of alternatives that have the potential to mitigate the flood hazards experienced by the RLPs. In this section, where the goal is to identify actions to be taken by RLPs, the alternatives were examined for their technical appropriateness, affordability, ability to be implemented, and their regulatory compliance by local, state, and federal regulations at the RLP level.

10.1 Final Alternative Activity Plans

The alternatives carried forward from Section 9 can be divided into two: (1) activities requiring action at the "public" level; i.e., they require a governmental action and (2) actions that can be pursued by the individual property owner. The basic responsibility for each activity is presented in Table 10.1, with the possible exceptions being noted. As noted earlier, the main focus of the FMP for RLPs is the identification of hazard mitigation activities that the property owner can undertake. Given this focus, the activity categories that are basically governmental are left to the appropriate governmental entities to be implemented, with the noted exceptions of Table 10.1 being applied to RLPs where applicable.

| Table 10.1 Mitigation Activity Basic Responsibility | |
|--|---|
| Category | Basic Responsibility |
| Preventive Activities | Public |
| Natural Resource Protection Activities | Public (primary) and Private (secondary) |
| Emergency Services Activities | Public |
| Structural Activities | Public |
| Public Information Activities | Public |
| Proper Protection Activities | Private (primary) and Public (funding assistance) |

10.2 Selection Factors for RLPs

The selection factors to be carried out by the RLP owners are focused on alternatives that are economically, environmentally, and technically (from an engineering perspective) feasible for the RLP owners. Specifically, this selection factor directs the focus of activities to those actions that can be carried out by the individual property owner.

10.3 RLP Action Plan for Property Protection Activities

The initial survey of the RLPs indicated that 15 properties meet the criteria of an RLP. Further field examination of these properties indicated two properties (RLP Nos. 36 and 38) no longer

required flood protection attention. The remaining 13 RLPs have potential solutions based on preliminary hydrologic and hydraulic data and engineering analysis as shown in Table 10.2. Depictions of some of the primary solutions are shown in Figures 10.1 through 10.3.

As shown in Table 10.2 and 10.3, RLP Nos. 24 and 37 may require governmental participation in action for funding assistance. RLP Nos. 26, 39, 40 and 43 require public activities to modify channels and/or retention basins.

Environmental Considerations

The implementation of the potential primary solution at a given RLP has been analyzed according to the County of Los Angeles CEQA Guidelines.

No significant impacts are expected of possible improvements within the RLPs, assuming minor changes to the physical condition of the property. However, temporary construction impacts must be minimized and mitigated. Although improvements to individual RLPs may be exempted, construction permit issuance should ensure compliance with all environmental requirements. The storm drain/retention system, which may be implemented as a public activity, will require an additional environmental impact evaluation to ensure CEQA compliance.

However, the permitting process and construction oversight should ensure compliance with all applicable environmental regulations.

Financial Viability

The recommended solutions have been analyzed for their technical appropriateness, ability to be implemented, and their regulatory compliance.

Economic analysis was conducted to assess the annual damages. Damages are governed by the guidelines and regulations for Federal water resources projects as expressed in the U.S. Army Corps of Engineers' Planning Guidance Manual (Engineering Regulation [ER] 1105-2-100). The underlying purpose of the analytical procedures outlined in ER 1105-2-100 is to convert the random nature of flood related damages to an expression of equivalent annual damage for comparison to the amortized cost of flood mitigation. The fundamental factors behind determinations of structural related damages under the Federal guidance are (1) depreciated structure replacement value, (2) content-to-structure value relationships, (3) inundation levels, (4) inundation depth-to-damage functions, (5) emergency costs relationships to structure inundation, and (6) cleanup cost relationship to the amount of inundated surface. The results of the analysis of these factors are ultimately incorporated into the USACOE Hydrologic Engineering Center's (HEC) Flood Damage Analysis Package, HEC-FDA, for the determination of equivalent annual damages.

The final factor for their possible implementation is affordability. Every recommended solution was economically analyzed on a Benefit-to-Cost (B/C) basis (see Table 10.4) and on an investment recovery period method to check if implementation makes economic sense (complete details are presented in Appendix E). Implementation costs range from \$6,000 to \$40,000 for the recommended solutions. B/C ratios for the RLPs varied from approximately 0.5 to 11.8 with eight properties being justified on a B/C ratio basis (greater than 1.0).

Table 10.2
Los Angeles County
Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill Areas RLPs

| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|----------------------------|--|----------------|-------------------|--|--|
| Santa Monica Mountains (7) | | | | | |
| 24* | Offsite drainage problem: The property is located in the floodplain and Flood Hazard Zone A4. Small private bridges and culverts in the creek, running behind the house, clogged with debris, and water overflowed to and ran along the Lobo Canyon Road in front of the subject property. | X | | Lift the entire house with the floor slab attached; build retaining wall higher along the creek and perform better maintenance of the private bridge openings. | Improve creek capacity. |
| 26 | Mudflow from the hillside at east end of the property and along the private road within the property. | X | | Construct a debris basin at the bottom of the hill and a ditch along the private road. | Street grading and drainage improvement. |
| 27 | Hillside drainage problem; the property backyard is at the bottom of hill and the house is well above street level. | X | | Grading/drainage and construct retaining wall and ditch at the toe. | Construct terrace drain and plant slope to reduce erosion. |

Table 10.2
Los Angeles County
Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill Areas RLPs

| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|---------------|--|----------------|-------------------|--|---|
| 28 | The house is located at the low point of the street. | X | | Construct a berm in front of driveway to divert the water. | Street grading and drainage improvement. |
| 41 | Front yard is lower than the streets. On-site and off-site flows can accumulate in the front yard and seep into foundation cracks. | X | | Construct a berm to prevent off-site flows from entering the property. Provide grading and drainage to avoid water impoundment near the structure. Convert planter to pavement near the problem area. Continue to inspect the foundation for cracks and repair. | Grading and drainage improvement. Construct a v-ditch system to redirect flows away from the structure. |
| 43 | There is no house on the subject property. Based on topography, the property is subject to runoff from the hillside behind the property. | X | | For new construction: Grade and drain properly to divert flows. Construct retaining wall and ditch to prevent slope failure. | N/A |
| 45 | The property is significantly lower than the streets. No flooding from the backyard creek was claimed. The problem is when it rains the water enters the subject property from the street. | X | | Construct perimeter berms and ditches along the streets. Divert as much street flows as possible. Collect and convey the flows to the creek through the side yard. Properly design catch basin and ditch to convey flows from the front yard to the side yard. Continue to monitor repaired foundation cracks and pumping system for the basement. | Abandon use of basement if problem continues. |
| Lancaster (1) | | | | | |
| 42 | RLP No. 42 is located within Flood Hazard Zone A and | X | | For new construction: | N/A |

Table 10.2
Los Angeles County
Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill Areas RLPs

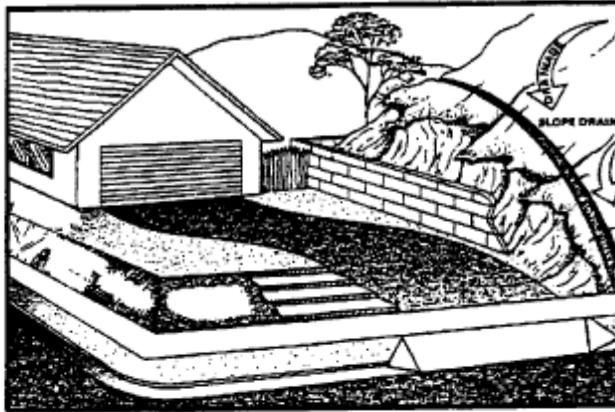
| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|----------------------------------|---|----------------|-------------------|---|--|
| | within the floodplain of Little Red Rock Wash. There is no house on this property. The existing lot is lower than the street and may trap floodwater. | | | Grade and drain properly. Fill to raise the first floor elevation to prevent any future pumping needs. Construct berms to prevent offsite flows from entering the property. | |
| Rowland Heights (1) | | | | | |
| 44 | Neighboring property much higher than the subject property. Steep slope. | X | | Extend existing side wall and provide ditch to convey flows from the slope. Construct terraced wall to avoid slope failure. (Construction will require neighbor's consent) | N/A |
| San Gabriel Mountains (3) | | | | | |
| 35 | Hillside drainage problem. | X | | Hillside problem, possibly with grading/drainage and retaining wall at the toe. | Construct terrace drain and plant slope to reduce erosion. |

**Table 10.2
 Los Angeles County
 Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill Areas RLPs**

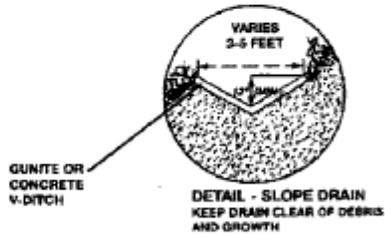
| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|------------------------|---|----------------|-------------------|---|---------------------------|
| 36 | 1. Flooding in the channel in front of the property after the brush fire in 1993. 2. Flooding of the basement due to backyard drainage deficiency (the owner subsequently installed drain pipe and 6" berm at the backyard.) | | X | | |
| 37 | The property is located within the floodplain. | X | | Lift the entire house with the floor slab attached. | Property acquisition |
| Quartz Hill (3) | | | | | |
| 38 | Overflow from detention basin, which has been relocated. | | X | | |
| 39* | The property is located in Antelope Drainage corridor. | X | | (1) Improve private ditch. (2) Construct an area-wide stormdrain and flood retention system. | N/A |

**Table 10.2
 Los Angeles County
 Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill Areas RLPs**

| RLP ID | Causes | Problem | No Problem | Primary Potential Solution | Alternate Solution |
|--|---|----------------|-------------------|--|---|
| 40* | The subject property is located within Flood Hazard Zone B. The lot is a local sump for on-site flows and any off-site flows entering the property due to its relatively low elevation. | X | | (1) Construct an area-wide stormdrain and flood retention system. (2) Construct a permanent berm where off-site flows enter the property. (3) Install dry well or diversion to sewer to discharge interior dry weather flows. (4) Install a sump pump with proper design. | Elevate the house if problem continues. |
| *Properties require public agency participation. | | | | | |



A retaining wall at the bottom of slope to prevent slope failure

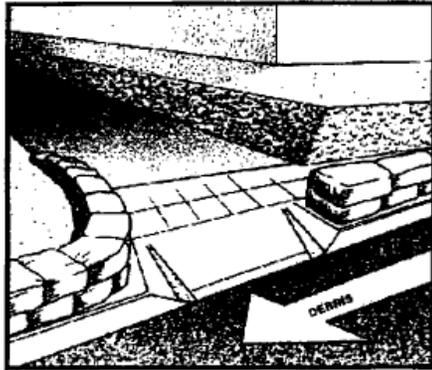


A small ditch close to the upper edge of the property to drain into a natural water course or onto street pavement or to a well-vegetated area

ON-SITE GRADING/DRAINAGE PROBLEM
NFIP REPETITIVE LOSS CORRECTION WORKSHEET
6a. Construct/Modify Retaining Wall and V-Ditch to Drain

Figure 10.1
Retaining Wall and Drainage Layout

Source: County of Los Angeles Floodplain Management Plan for Santa Monica Mountains, San Gabriel Mountains and Quartz Hill, September 2001.



Construct berm at driveway
 Divert surface water away

SUBMERSIBLE SUMP PUMPS

In cases where water has flooded a basement, garage, or any low-lying area, a submersible sump pump is recommended. If flooding is a recurring problem, a permanent pump should be installed in a sump with a floatation device for automatic on/off operation (see Fig.13).

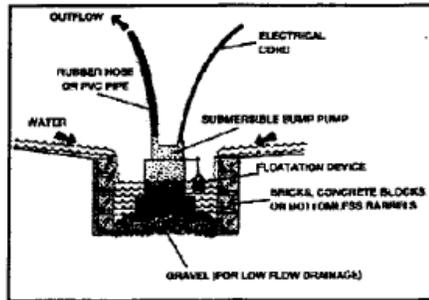


Fig.13 SUBMERSIBLE SUMP PUMP

PROPERTY LOWER THAN STREET OR SURROUNDING
 NFIP REPETITIVE LOSS CORRECTION WORKSHEET
**6b. Construct Berm at Driveway
 and Sump Pump at Low Point**

**Figure 10.2
 Berm and Sump Layout**

Source: County of Los Angeles Floodplain Management Plan for Santa Monica Mountains, San Gabriel Mountains and Quartz Hill, September 2001.

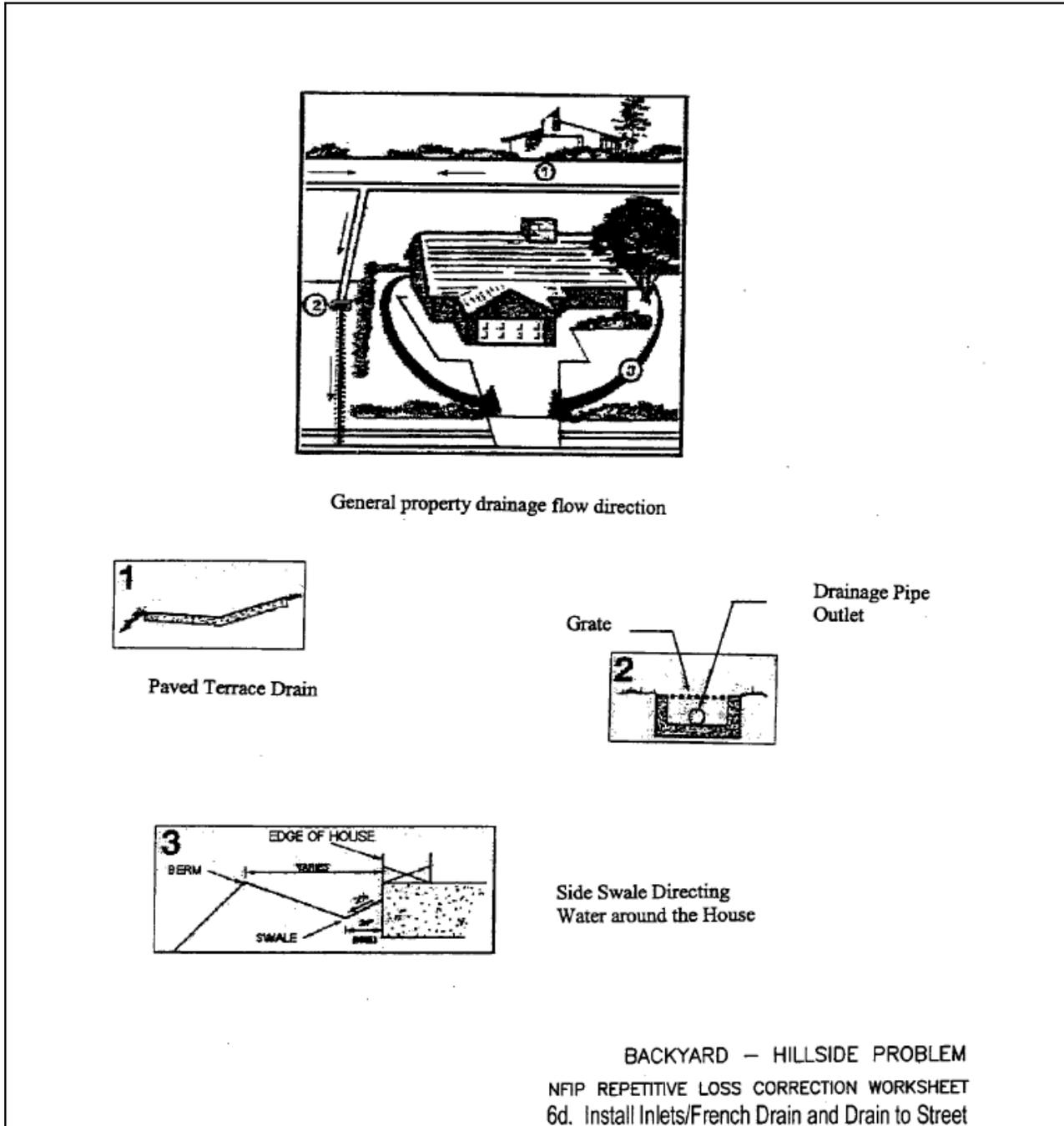


Figure 10.3
Inlet/French Drain and Drainage Layout

Source: County of Los Angeles Floodplain Management Plan for Santa Monica Mountains, San Gabriel Mountains and Quartz Hill, September 2001.

| Table 10.3 Summary of Recommended Solutions for RLPs | | |
|---|---|-------------------|
| Activities | Recommended Solution | RLPs |
| 6.a | Construct or modify retaining walls with proper drainage and trash capacity. | 27, 35, 43 and 44 |
| 6.b.1 | Construct berms to prevent flows from entering the property. | 28, 40, 42 and 45 |
| 6.b.2 | Install sump pumps to extract water from the low lying area. | 40 |
| 6.d | Construct ditches, grate inlets, french drains, and terrace drains to divert water away from the structure. | 41, 44 and 45 |
| 6.e | Construct/modify diversion channels within RLP. | 26, 39,40 and 42 |
| 6.n | Lift entire house including floor slab and build a new foundation to elevate the house. | 24 and 37 |
| 6.e and 4.b to 4.e | Improve private ditch. Construct an area-wide stormdrain and flood retention system. | 39, 40 and 42 |

10.4 RLP Action Plan Related to Public Activities

Table 10.5 displays the Action Plan and its activities that are or will be implemented in order to meet the Goals, Objectives, and Policies outlined in Chapter 9. The primary responsible agencies and schedule for each activity are listed in Table 10.5. Monitoring, evaluating, and updating steps and schedule for the Action Plan in Table 10.5 are listed in Table 10.6.

| RLP # | 100-Year Event Damage | | | Equivalent Annual Damage | Mitigation Cost | B/C Ratio |
|--------------|------------------------------|----------------|----------------|---------------------------------|------------------------|------------------|
| | Structure | Content | Cleanup | | | |
| 24 | \$23,130 | \$15,388 | \$5,840 | \$2,050 | \$40,000 | 0.68 |
| 26 | \$87,357 | \$60,715 | \$52,721 | \$25,514 | \$30,000 | 11.25 |
| 27 | \$33,605 | \$23,356 | \$12,060 | \$8,898 | \$10,000 | 11.77 |
| 28 | \$16,691 | \$11,600 | \$5,990 | \$4,573 | \$10,000 | 6.05 |
| 35 | \$11,717 | \$8,144 | \$4,205 | \$3,229 | \$6,000 | 7.52 |
| 36 | - | - | - | - | - | - |
| 37 | \$17,896 | \$11,246 | \$4,015 | \$1,549 | \$40,000 | 0.51 |
| 38 | - | - | - | - | - | - |
| 39 | \$28,479 | \$14,903 | \$10,220 | \$2,462 | \$10,000 | 3.26 |
| 40 | \$8,671 | \$7,267 | \$3,752 | \$1,234 | \$41,000 | 0.40 |
| 41 | \$56,406 | \$47,274 | \$9,686 | \$6,753 | \$16,000 | 5.58 |
| 42 | \$31,330 | \$26,258 | \$5,380 | \$3,788 | \$0 | - |
| 43 | \$66,214 | \$55,495 | \$11,370 | \$7,912 | \$0 | - |
| 44 | \$25,263 | \$21,173 | \$4,338 | \$2,877 | \$23,000 | 1.65 |
| 45 | \$11,184 | \$9,373 | \$4,840 | \$1,481 | \$15,000 | 1.31 |

Table 10.5
Action Plan of the FMP for RLPs

| Activity | Responsible Department | | | | | | | | | | | | Schedule |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|--------------|-----------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | Local Groups | |
| Maintain Emergency Operations Master Plan and Procedures | X | | | X | | | | | X | | | | Ongoing |
| Designate staff responsible for working with RLPs during the permitting process from planning, building/safety, development, and environmental divisions | | | | X | X | | | | | | | | Completed |
| Ensure awareness of RLP owners on environmental sensitivities specific to their area | | X | | X | | | | | | | | X | Ongoing |
| Establish standards and procedures for mitigation of temporary construction impacts | | X | | X | X | | | | | | | | Completed |
| Develop and implement a joint watershed ecosystem restoration program | | X | | X | | | | | | | | | Ongoing |
| Identify flood-warning systems for properties situated where such systems can be beneficially employed | X | X | | X | | | | X | X | X | | X | Ongoing |
| Conduct a stormwater facilities condition assessment program to identify the physical and hydraulic condition of the system and to support infrastructure management needs | | | | X | | | | X | | X | | | Ongoing |

Table 10.5
Action Plan of the FMP for RLPs

| Activity | Responsible Department | | | | | | | | | | | | Schedule |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|--------------|----------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | Local Groups | |
| Develop and maintain a list of priority maintenance-related flood problem sites | | | | X | | | | | | | | | Ongoing |
| Conduct annual maintenance at priority maintenance-related flood problem sites prior to the wet season | | | | X | | | | | | | | | Ongoing |
| Refine the use of the Plan Check and Inspection System (PCIS) to track "high risk properties" and ensure that drainage is adequately addressed through the plan check process | | | | X | X | | | | | | X | | Ongoing |
| The Flood Hazard Mitigation Coordinator shall flag Repetitive Loss Properties in the PCIS database for review and approval of building permit applications | | | | X | | | | | | | | | Ongoing |
| Investigate RLPs and annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs | | | | X | X | | | | | | | | Ongoing |
| Identify and maintain a list of "high risk properties" that could be acquired for conversion into open space | | X | X | X | | | | | | | | | Ongoing |

**Table 10.5
 Action Plan of the FMP for RLPs**

| Activity | Responsible Department | | | | | | | | | | | | Schedule |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|--------------|----------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | Local Groups | |
| Establish standards and/or incentives for the use of structural and non-structural techniques that mitigate flood-hazards and manage stormwater pollution | | | | X | | | | | | | | | Ongoing |
| Continue to require environmental review in the development process to provide for the protection of natural resources | | X | | X | | | X | | | | | | Ongoing |
| Encourage the application of biological resource measures for the control of stormwater and erosion to the best of their applicable limits with regards to other safety factors such as fire control | | X | | X | | | X | | | | | | Ongoing |
| Make sand bags available to flood risk property owners during the wet season, provide notifications of the availability of these materials, and track the distribution of the materials | X | | | X | | | | | | | | | Ongoing |
| Storm drain, open channel, and flood retention basin improvements | | | | X | | X | X | X | | X | | X | Ongoing |
| Identify possible sources of funding and provide this information to RLP owners | | | X | X | | | | | | | | X | Ongoing |

Table 10.5
Action Plan of the FMP for RLPs

| Activity | Responsible Department | | | | | | | | | | | Schedule | |
|--|------------------------------------|-------------------------------------|-----------------------------|-------------------------------|----------------------------|-----------------|------------------------------|----------------------------|---------------------------|--------------------------|---------------------------|----------|--------------|
| | Public Works Department | | | | | | | | | | | | |
| | County Emergency Operations Center | County Regional Planning Department | County Parks and Recreation | Watershed Management Division | Building & Safety Division | Design Division | Program Development Division | Flood Maintenance Division | Disaster Assistance Group | Water Resources Division | Land Development Division | | Local Groups |
| Continue to investigate RLPs as they are identified by FEMA and update the RLP and high-risk property list. Annually notify RLP owners regarding local flood hazards and proper protection activities, provide technical advice regarding flood protection and flood preparedness, and distribute a revised RLP questionnaire to new RLPs. | | | | X | | | | | | | | X | Ongoing |
| Develop and distribute flood protection information and materials to property owners and developers in high-risk areas. | | | | X | | | | | | | | X | Ongoing |
| Provide public education about maintaining the stormwater system free of debris. | | | | X | | | | X | | | | X | Ongoing |
| Maintain the County's web page to provide emergency preparedness information to the general public and media | | | | X | | | | | | | | X | Ongoing |
| Distribute information regarding flood prevention and flood insurance at emergency operations and emergency preparedness events. | X | | | X | | | | | | | | X | Ongoing |
| Continue implementing the County's Annual Emergency Preparedness Fair. | X | | | X | | | | | | | | X | Annual |

**Table 10.6
 Monitoring, Evaluating, and Updating the Plan**

Monitoring

Public Works Department

- Send out RLP outreach letters annually prior to October 15
- Visit RLP sites annually by end of October
- Meetings and phone calls to RLPs to be conducted on an as needed basis
- Prepare quarterly monitoring reports

Evaluating

Public Works Department

- Evaluate any change in the nature or magnitude of risk outcomes that have occurred annually prior to October 15
- Check for changed watershed characteristics affecting hydrology and hydraulics annually prior to October 15
- Assess review of goals and objectives for continued applicability by the end of October
- Prepare evaluation reports annually by the end of October

Updating

Public Works Department

- Collect monitoring and evaluation reports annually at the end of October
- Determine effectiveness and revise as needed
- Update Plan and initiate monitoring and evaluation as needed

COUNTY OF LOS ANGELES

SANTA MONICA MOUNTAINS,
SAN GABRIEL MOUNTAINS,
LANCASTER, ROWLAND HEIGHTS
AND QUARTZ HILL AREAS
REPETITIVE LOSS PROPERTIES

APPENDIX A

Hydrology

JULY 2007
REVISED DECEMBER 2009

HYDROLOGY

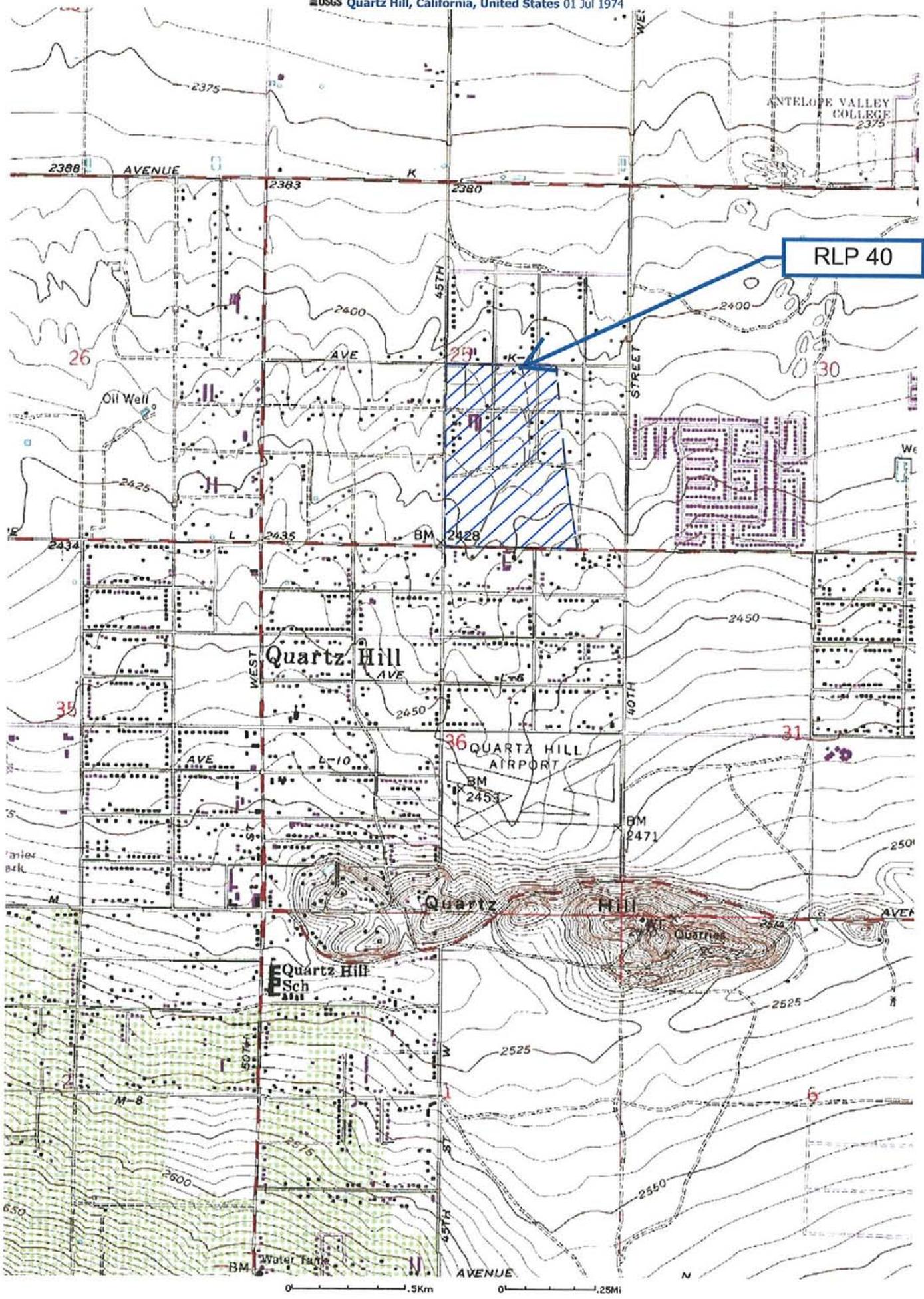
To support the FMP update, WRC conducted hydrology analyses for RLP Nos. 40, 41, 42, 43, 44 and 45. The analyses were performed because these RLPs were not identified in the prior FMP for the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas of Los Angeles County; therefore, existing hydrology analyses were not available.

The primary purpose of the analysis was to determine the County of Los Angeles Capital Flood discharge in the watershed sub-area (drainage area) of each RLP. The methodology used primarily depends on three factors: (1) drainage area, (2) runoff coefficient of the area and (3) rainfall intensity. The drainage area was delineated on the United States Geological Survey (USGS) topographic map of the area. The runoff coefficient and rainfall intensity were determined from the Hydrology Manual of the Los Angeles County Department of Public Works, drainage area map and data gathered from field visits. The results of the analysis are included in Table 4.2 of the FMP update.

Additionally, a flood flow frequency analysis was performed for the RLPs using the methodology described in USGS Bulletin #17B, Guidelines for Determining Flood Flow Frequency. Data from the USGS gaging station at Arroyo Seco (Station No. 11098000) was used to support the analysis. The results of the flood frequency analysis are included in Table 3.1 of the FMP update.

The following analysis results and interim results are included in the remainder of this appendix:

| | | |
|---------------------|---|---------|
| RLP 40 | Drainage Map | Page 2 |
| | 50-year, 24-hour Isohyet Map | Page 3 |
| | Tc (Time of Concentration) Calculation Result | Page 4 |
| RLP 41 | Drainage Map | Page 5 |
| | 50-year, 24-hour Isohyet Map | Page 6 |
| | Tc (Time of Concentration) Calculation Result | Page 7 |
| RLP 42 | Drainage Map | Page 8 |
| | 50-year, 24-hour Isohyet Map | Page 9 |
| | Tc (Time of Concentration) Calculation Result | Page 10 |
| RLP 43 | Drainage Map | Page 11 |
| | 50-year, 24-hour Isohyet Map | Page 12 |
| | Tc (Time of Concentration) Calculation Result | Page 13 |
| RLP 44 | Drainage Map | Page 14 |
| | Parcel Map (Office of the Assessor) | Page 15 |
| | 50-year, 24-hour Isohyet Map | Page 16 |
| | Tc (Time of Concentration) Calculation Result | Page 17 |
| RLP 45 | Drainage Map | Page 18 |
| | 50-year, 24-hour Isohyet Map | Page 19 |
| | Tc (Time of Concentration) Calculation Result | Page 20 |
| RLP Nos. 40 - 45 | Flood Flow Frequency Analysis | Page 21 |



RLP 40

34° 45' 00"

ROSAMOND 1-HI.77

-118° 15' 00"

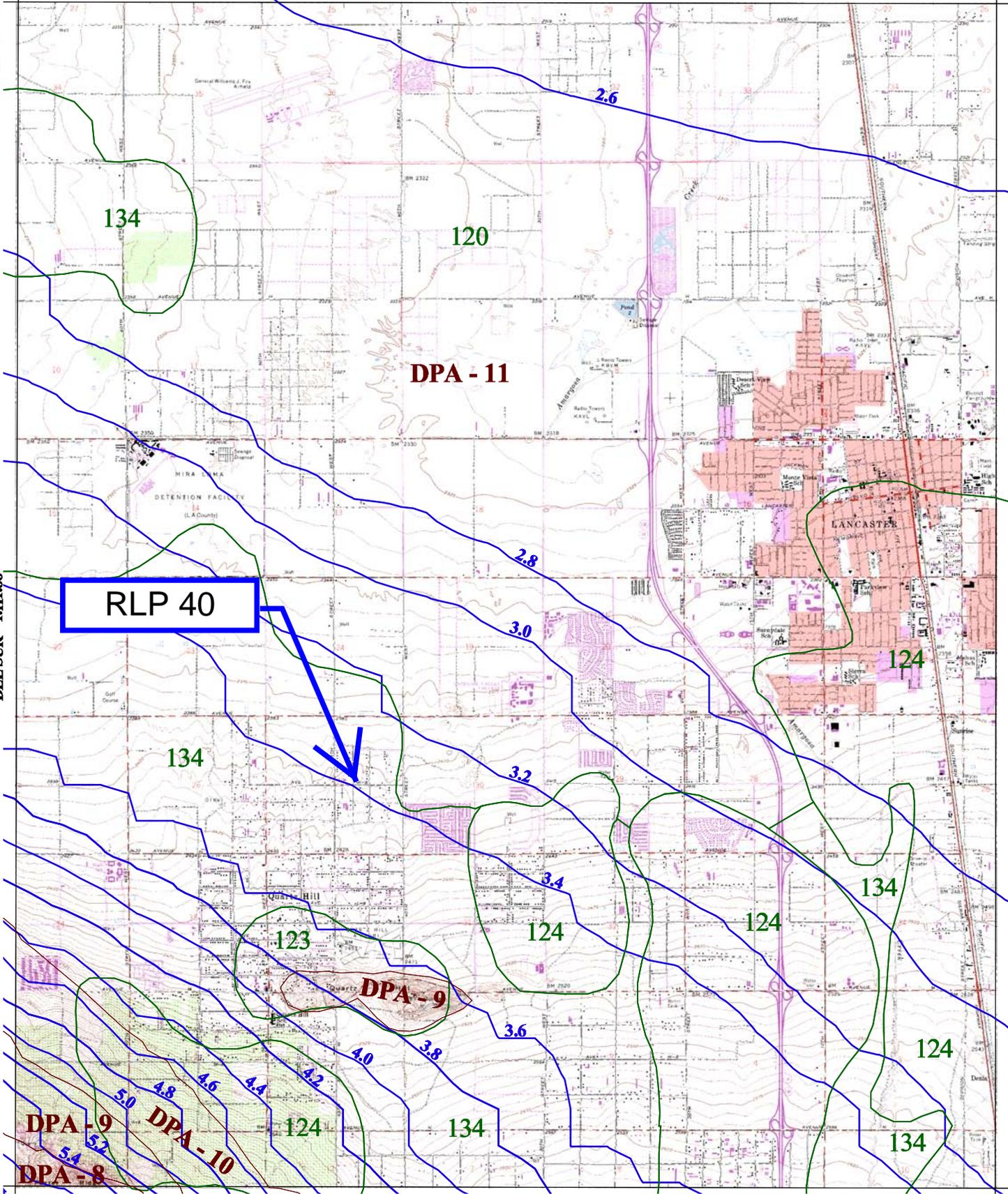
DEL SUR 1-HI.66

LANCASTER EAST 1-HI.68

-118° 07' 30"

RITTER RIDGE 1-HI.57

34° 37' 30"



016

SOIL CLASSIFICATION AREA

7.2

INCHES OF RAINFALL

DPA - 6

DEBRIS POTENTIAL AREA



25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
 10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

LANCASTER WEST 50-YEAR 24-HOUR ISOHYET

1-HI.67



Tc Calculator [?] [X]

| Subarea Parameters Manual Input | | | Subarea Parameters Selected | | |
|---------------------------------|------------------------|-----------------|-----------------------------|------------------------|-----------------|
| Subarea Number | | | Subarea Number | | |
| 40r | | | | | |
| Area (Acres) | Proportion Impervious | Soil Type | Area (Acres) | Proportion Impervious | Soil Type |
| 40 | 0.42 | 134 | 40 | 0.42 | 134 |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope | Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| 3.4 | 555 | 0.005 | 3.4 | 555 | 0.005 |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Import "tcdata.xls" File

Calculate Single Tc From Subarea Parameters Provided In Input File

Calculate Tc's For Multiple Subareas And Create Tc Results File

Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|----------------|-----------|-------------------------------------|-----------------------------------|
| 40r | 1.06 | 0.1 | 0.44 |

Tc Equation

$Tc = (10)^{-0.507} * (Cd * I)^{-0.519} * (L)^{0.483} * (S)^{-0.135}$

Tc Value (min.) Flowrate (cfs)

20 19

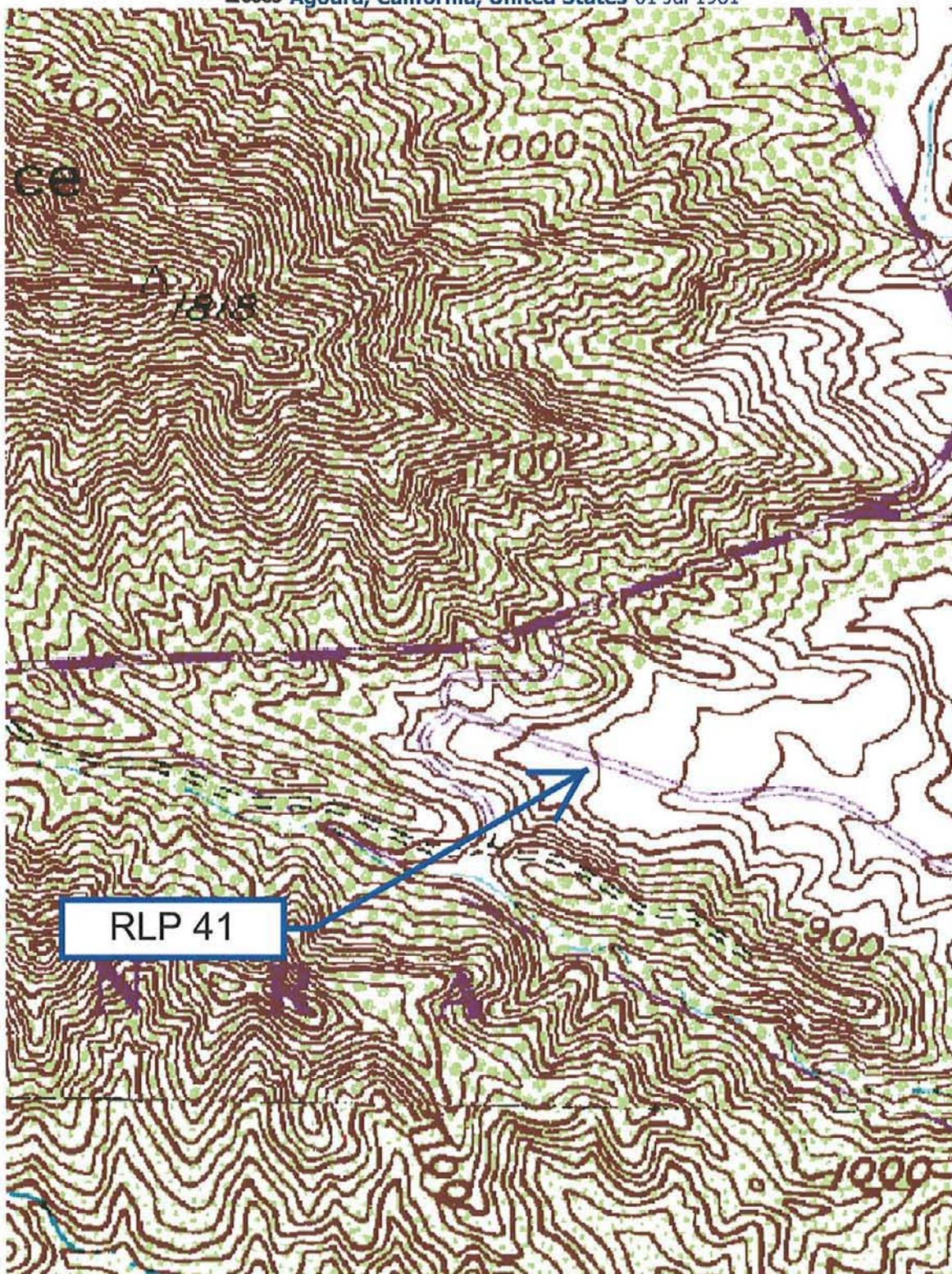
Calculate Tc

Cancel

Concentration Point near RLP 40

Area= 405.5 acres

$Q = 19 \text{ cfs} / 40 \text{ acres} * 405.5 \text{ acres} = 193 \text{ cfs}$



RLP 41

0 200M

0 200yd

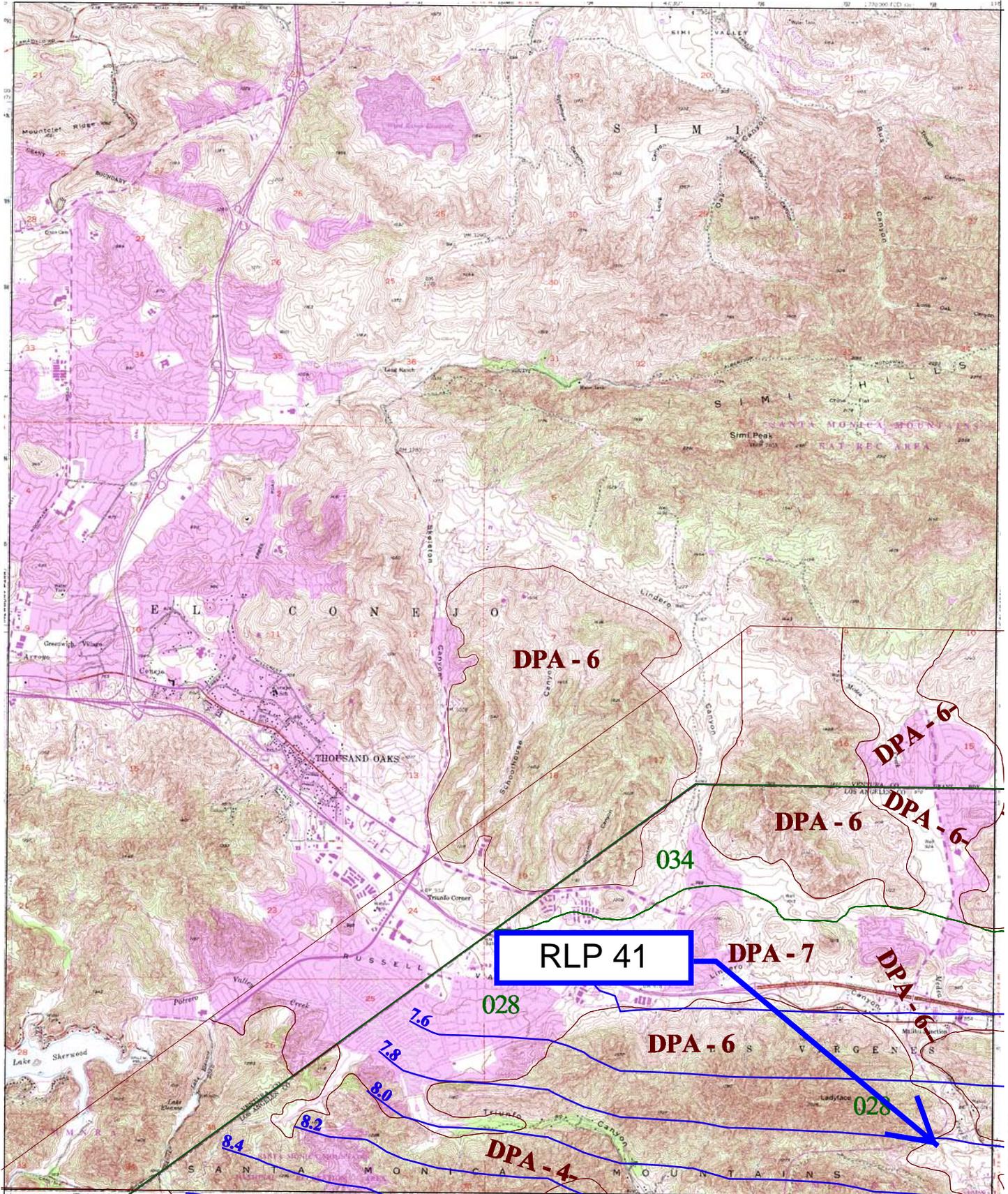
34° 15' 00"

SIMI

-118° 52' 30"

NEWBURY PARK 1-HI.24A

CALABASAS 1-HI.25



-118° 45' 00"

POINT DUME 1-HI.14

34° 07' 30"



016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
 10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

**THOUSAND OAKS
 50-YEAR 24-HOUR ISOHYET**

1-HI.24



Tc Calculator ✖

Subarea Parameters Manual Input

Subarea Number:

| | | |
|-----------------------------------|----------------------------------|------------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="5"/> | <input type="text" value=".42"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="7.83"/> | <input type="text" value="600"/> | <input type="text" value=".2333"/> |

Subarea Parameters Selected

Subarea Number:

| | | |
|-----------------------------------|-----------------------------------|-------------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="5"/> | <input type="text" value="0.42"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="7.83"/> | <input type="text" value="600"/> | <input type="text" value="0.2333"/> |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Calculate Single Tc From Subarea Parameters Provided In Input File

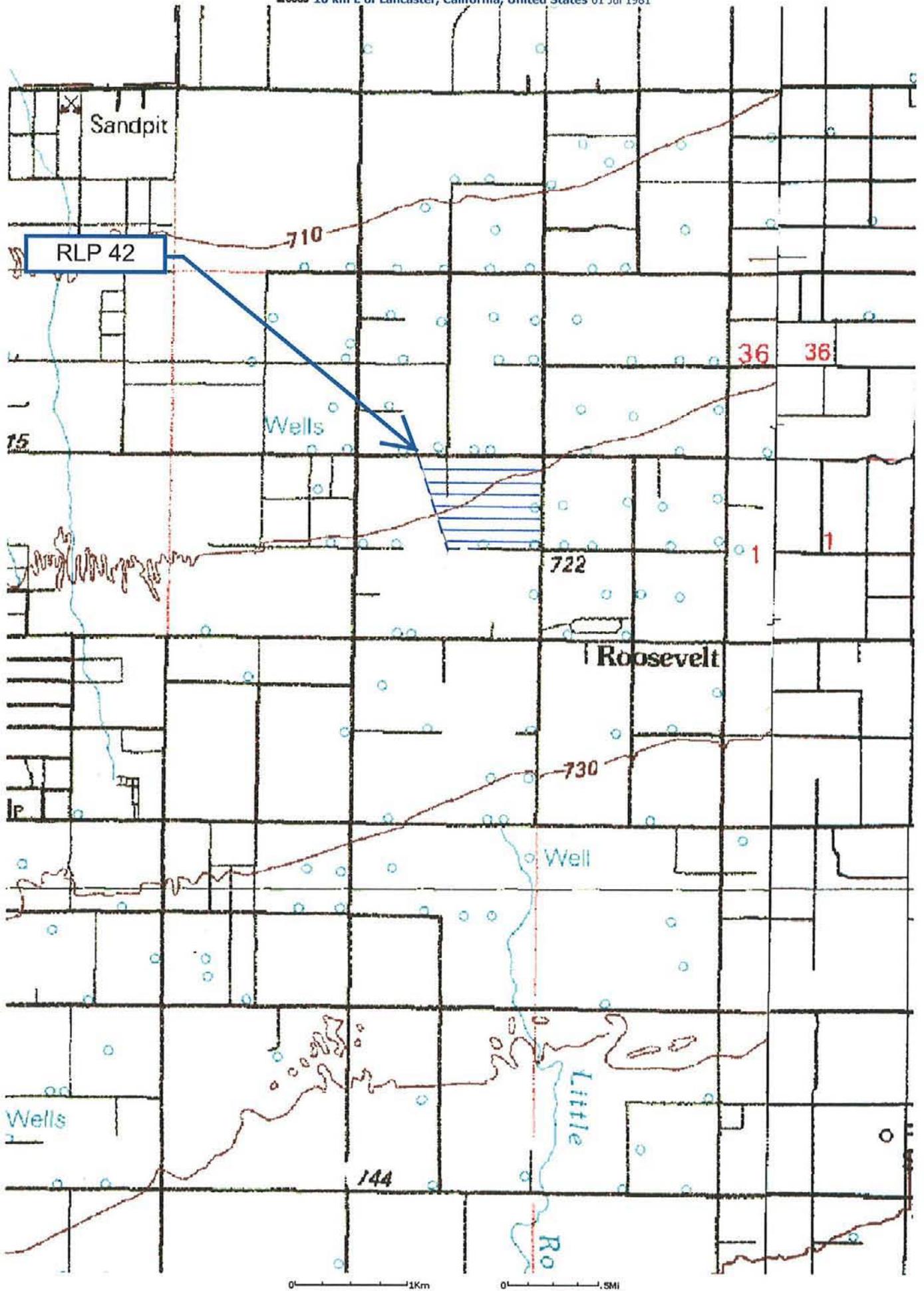
Calculate Tc's For Multiple Subareas And Create Tc Results File

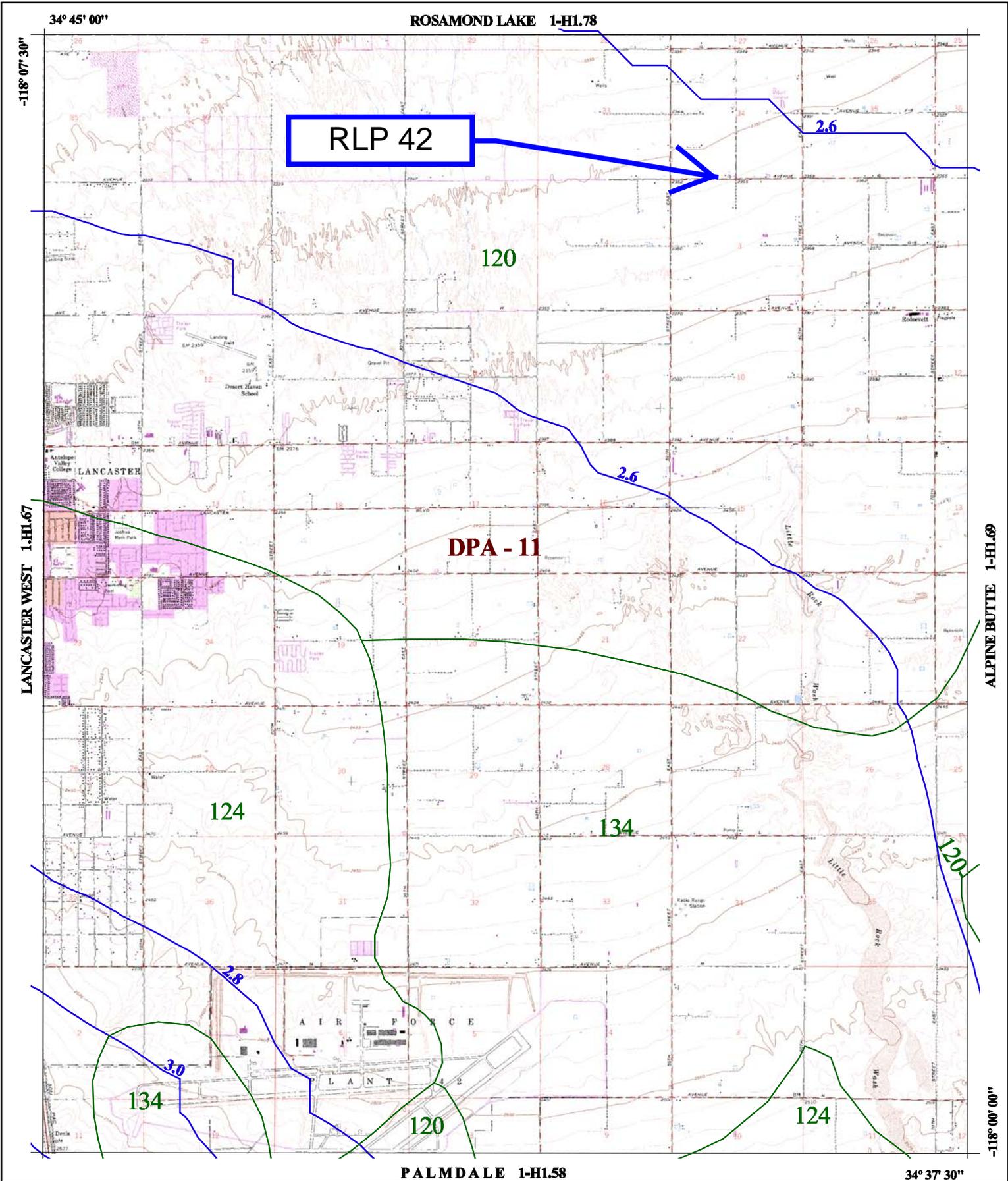
Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|---------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
| <input type="text" value="41"/> | <input type="text" value="4.67"/> | <input type="text" value="0.7"/> | <input type="text" value="0.78"/> |

Tc Equation

| | |
|--------------------------------|------------------------------------|
| Tc Value (min.) | Flowrate (cfs) |
| <input type="text" value="5"/> | <input type="text" value="18.21"/> |





- 016** SOIL CLASSIFICATION AREA
- 7.2** INCHES OF RAINFALL
- DPA - 6** DEBRIS POTENTIAL AREA



25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
 10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

LANCASTER EAST 50-YEAR 24-HOUR ISOHYET

1-H1.68



Tc Calculator [?] [X]

| Subarea Parameters Manual Input | | | Subarea Parameters Selected | | |
|---------------------------------|------------------------|-----------------|-----------------------------|------------------------|-----------------|
| Subarea Number | | | Subarea Number | | |
| 42r | | | | | |
| Area (Acres) | Proportion Impervious | Soil Type | Area (Acres) | Proportion Impervious | Soil Type |
| 40 | 0.42 | 120 | 40 | 0.42 | 120 |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope | Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| 2.6 | 545 | 0.005 | 2.6 | 545 | 0.005 |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Import "tcddata.xls" File

Calculate Single Tc From Subarea Parameters Provided In Input File

Calculate Tc's For Multiple Subareas And Create Tc Results File

Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|----------------|-----------|-------------------------------------|-----------------------------------|
| 42r | 0.77 | 0.17 | 0.48 |

Tc Equation

$Tc = (10)^{-0.507 * (Cd * I)^{-0.519 * (L)^{0.483 * (S)^{-0.135}}$

Tc Value (min.) Flowrate (cfs)

22 15

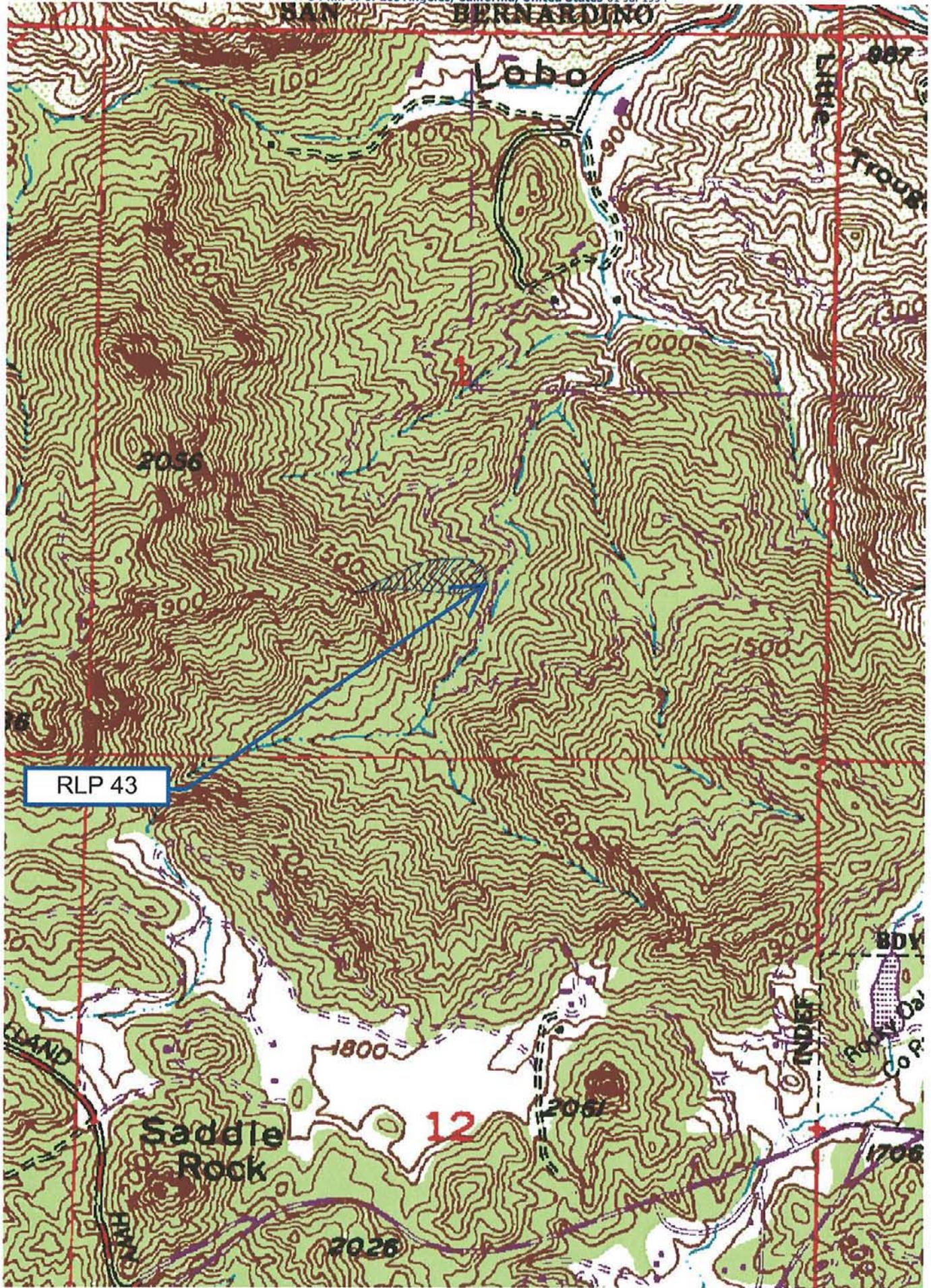
Calculate Tc

Cancel

Concentration Point near RLP 42

Area= 194 acres

$Q = 15 \text{ cfs} / 40 \text{ acres} * 194 \text{ acres} = 73 \text{ cfs}$



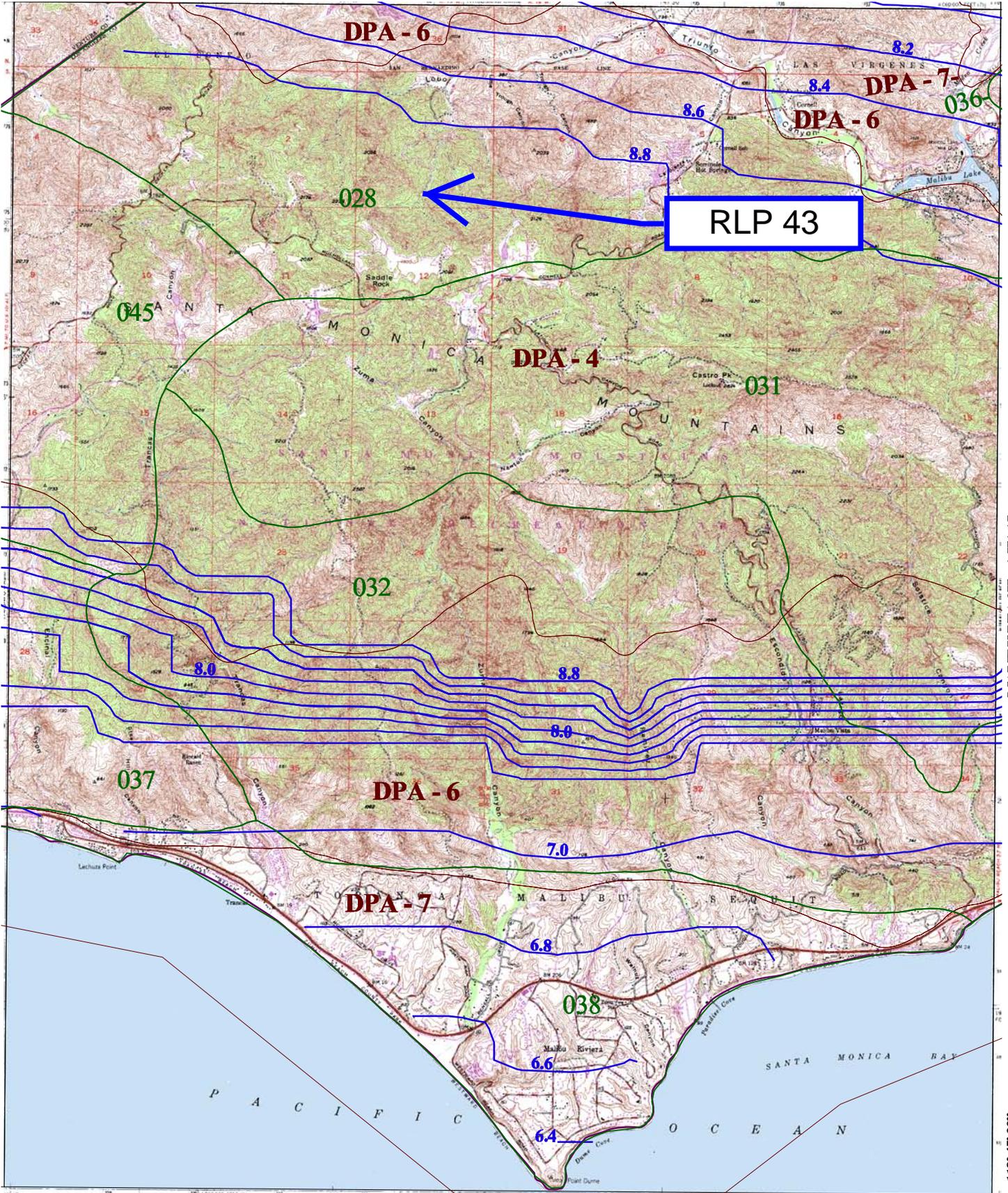
34° 07' 30"

THOUSAND OAKS 1-H1.24

-118° 52' 30"

TRIUNFO PASS 1-H1.13

MALIBU BEACH 1-H1.15



-118° 45' 00"

34° 00' 00"



016

SOIL CLASSIFICATION AREA

7.2

INCHES OF RAINFALL

DPA - 6

DEBRIS POTENTIAL AREA

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

POINT DUME 50-YEAR 24-HOUR ISOHYET

1-H1.14



Tc Calculator

Subarea Parameters Manual Input

Subarea Number:

| | | |
|----------------------------------|-----------------------------------|-----------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="4.6"/> | <input type="text" value=".42"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="8.8"/> | <input type="text" value="1000"/> | <input type="text" value=".375"/> |

Subarea Parameters Selected

Subarea Number:

| | | |
|----------------------------------|-----------------------------------|------------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="4.6"/> | <input type="text" value="0.42"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="8.8"/> | <input type="text" value="1000"/> | <input type="text" value="0.375"/> |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Calculate Single Tc From Subarea Parameters Provided In Input File

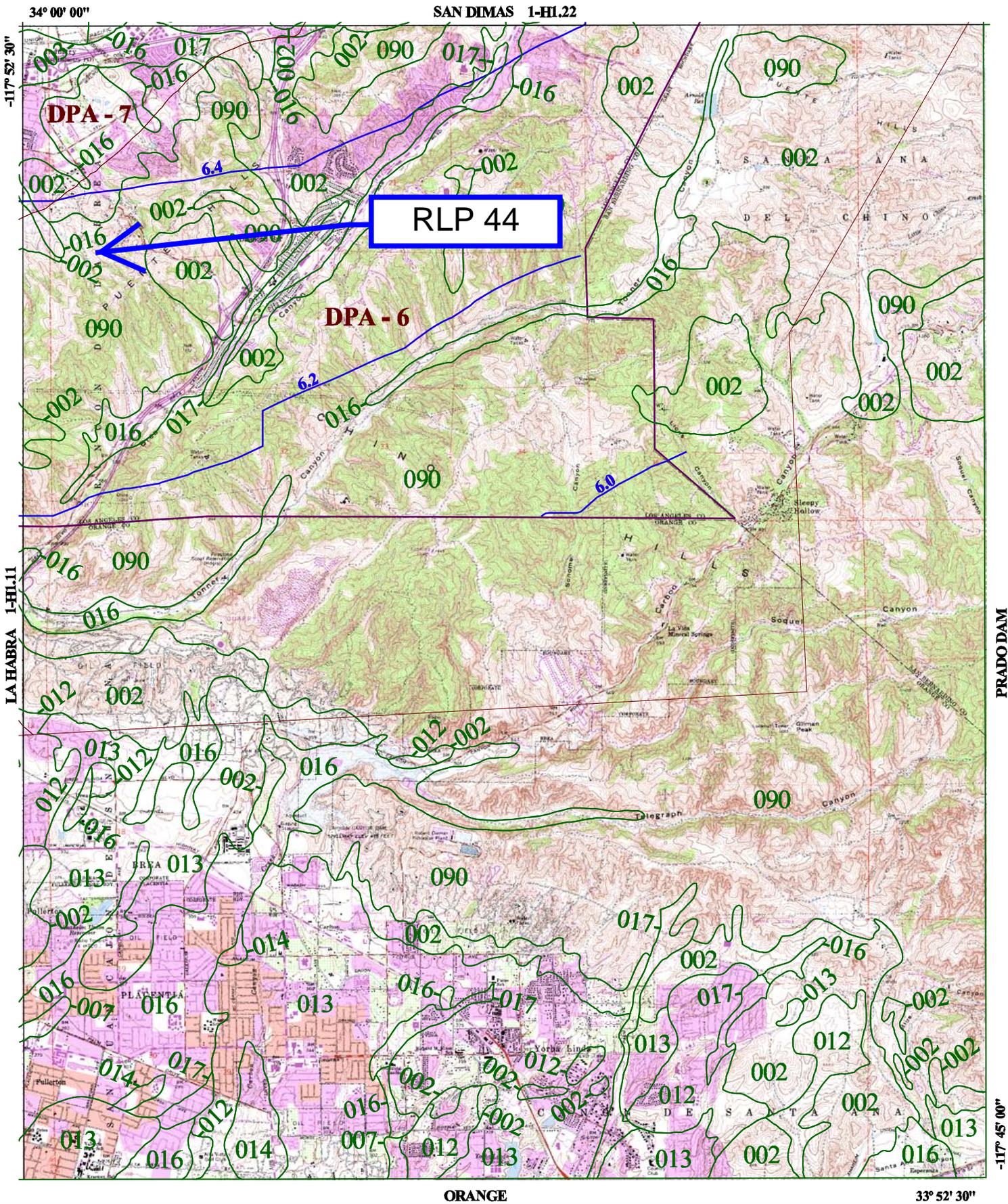
Calculate Tc's For Multiple Subareas And Create Tc Results File

Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|---------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
| <input type="text" value="43"/> | <input type="text" value="5.25"/> | <input type="text" value="0.72"/> | <input type="text" value="0.8"/> |

Tc Equation:

Tc Value (min.): Flowrate (cfs):



- 016 SOIL CLASSIFICATION AREA
- 7.2 INCHES OF RAINFALL
- DPA - 6 DEBRIS POTENTIAL AREA



25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
 10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

YORBA LINDA 50-YEAR 24-HOUR ISOHYET

1-H1.12



Tc Calculator

Subarea Parameters Manual Input

Subarea Number:

| | | |
|-----------------------------------|----------------------------------|----------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="0.23"/> | <input type="text" value=".42"/> | <input type="text" value="90"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="6.35"/> | <input type="text" value="100"/> | <input type="text" value=".02"/> |

Subarea Parameters Selected

Subarea Number:

| | | |
|-----------------------------------|-----------------------------------|-----------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="0.23"/> | <input type="text" value="0.42"/> | <input type="text" value="90"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="6.35"/> | <input type="text" value="100"/> | <input type="text" value="0.02"/> |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Calculate Single Tc From Subarea Parameters Provided In Input File

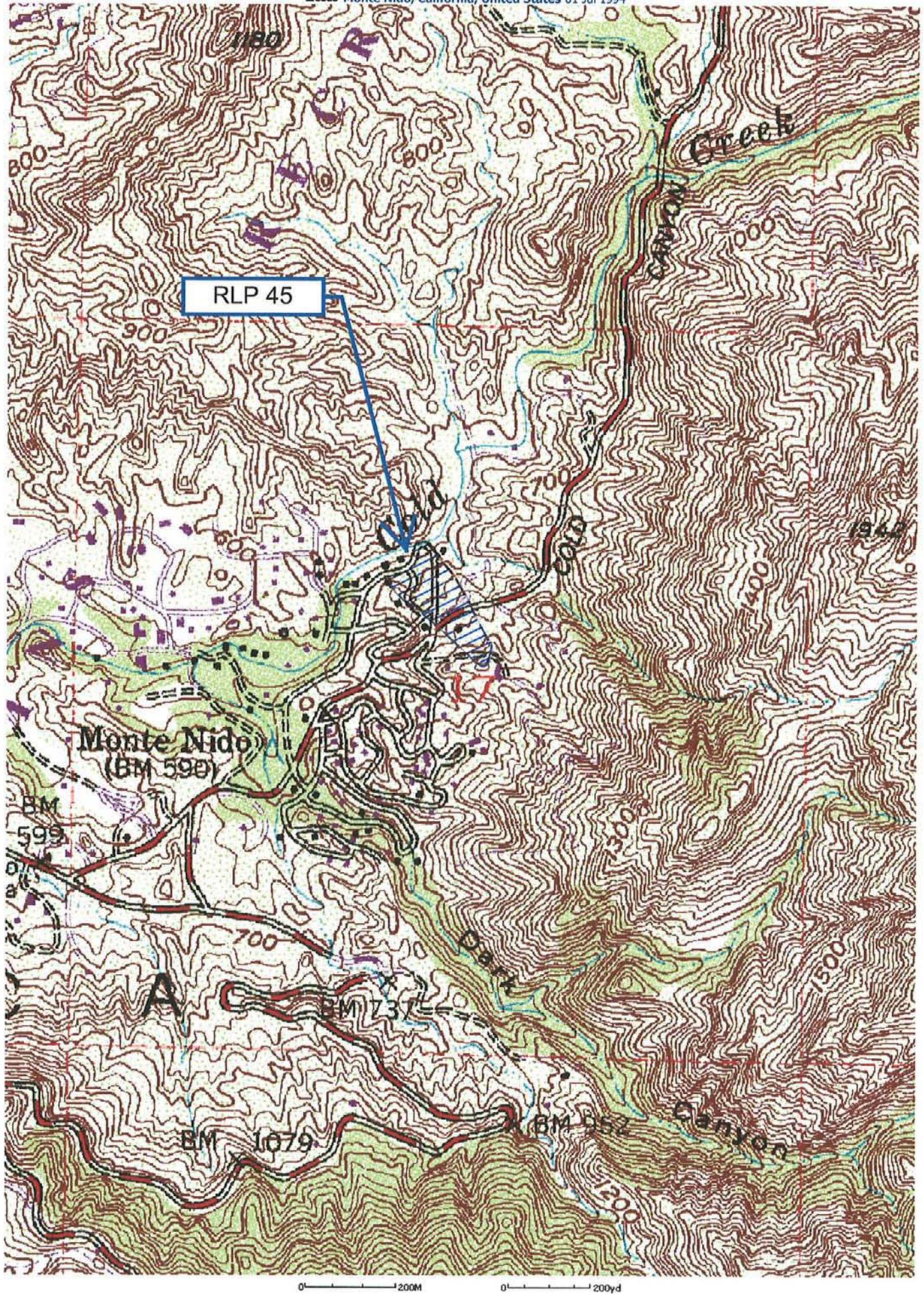
Calculate Tc's For Multiple Subareas And Create Tc Results File

Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|---------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|
| <input type="text" value="44"/> | <input type="text" value="3.79"/> | <input type="text" value="0.86"/> | <input type="text" value="0.88"/> |

Tc Equation:

Tc Value (min.): Flowrate (cfs):



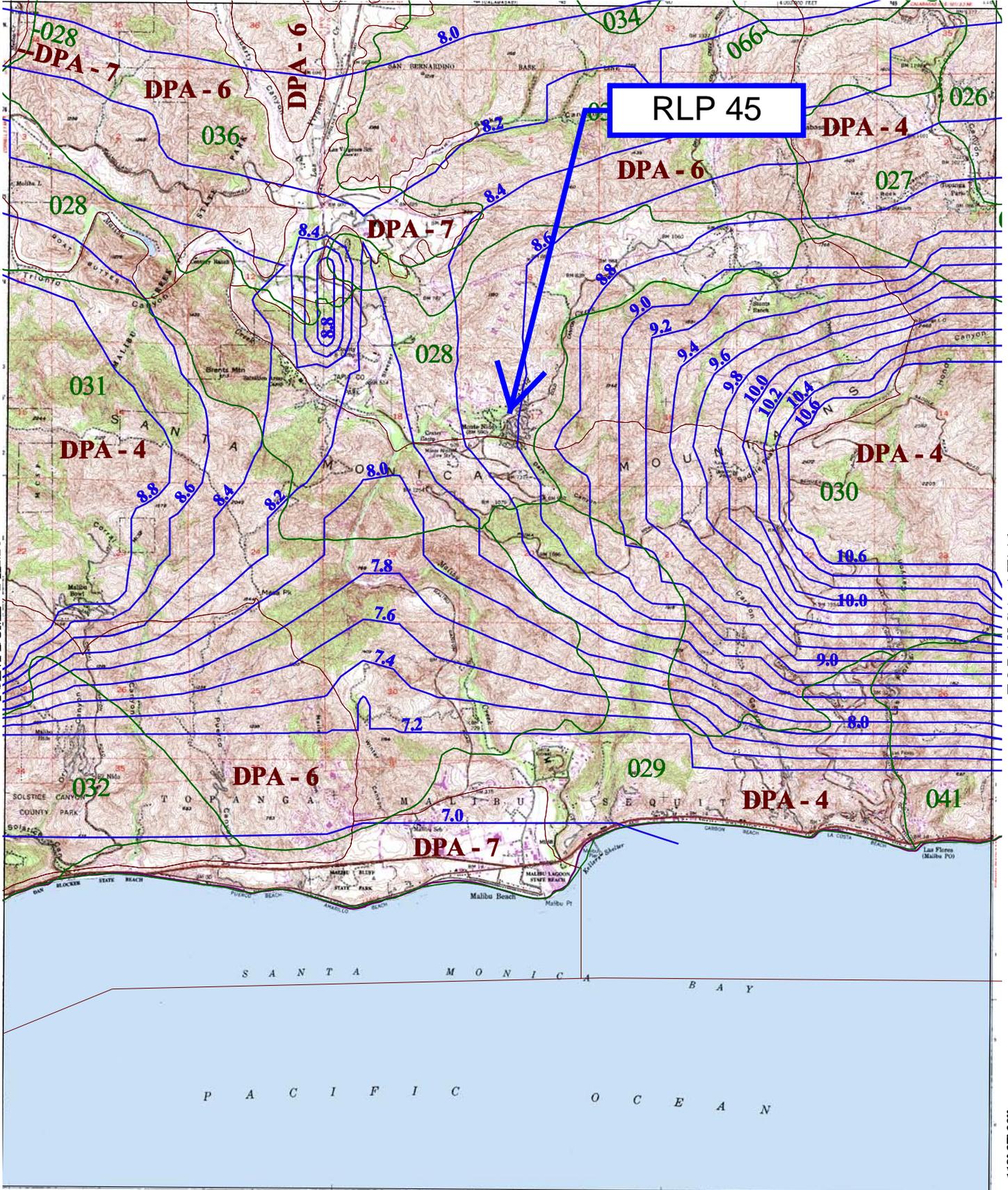
34° 07' 30"

CALABASAS 1-HI.25

-118° 45' 00"

POINT DUME 1-HI.14

TOPANGA 1-HI.16



-118° 37' 30"

34° 00' 00"



016

SOIL CLASSIFICATION AREA

7.2

INCHES OF RAINFALL

DPA - 6

DEBRIS POTENTIAL AREA

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

MALIBU BEACH 50-YEAR 24-HOUR ISOHYET

1-HI.15



Tc Calculator

Subarea Parameters Manual Input

Subarea Number:

| | | |
|-----------------------------------|----------------------------------|----------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="4.9"/> | <input type="text" value=".42"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="8.55"/> | <input type="text" value="460"/> | <input type="text" value=".38"/> |

Subarea Parameters Selected

Subarea Number:

| | | |
|-----------------------------------|-----------------------------------|-----------------------------------|
| Area (Acres) | Proportion Impervious | Soil Type |
| <input type="text" value="4.9"/> | <input type="text" value="0.42"/> | <input type="text" value="28"/> |
| Rainfall Isohyet (in.) | Flow Path Length (ft.) | Flow Path Slope |
| <input type="text" value="8.55"/> | <input type="text" value="460"/> | <input type="text" value="0.38"/> |

Input File

Check Here If Subarea Parameters Are Defined In An Input File

Calculate Single Tc From Subarea Parameters Provided In Input File

Calculate Tc's For Multiple Subareas And Create Tc Results File

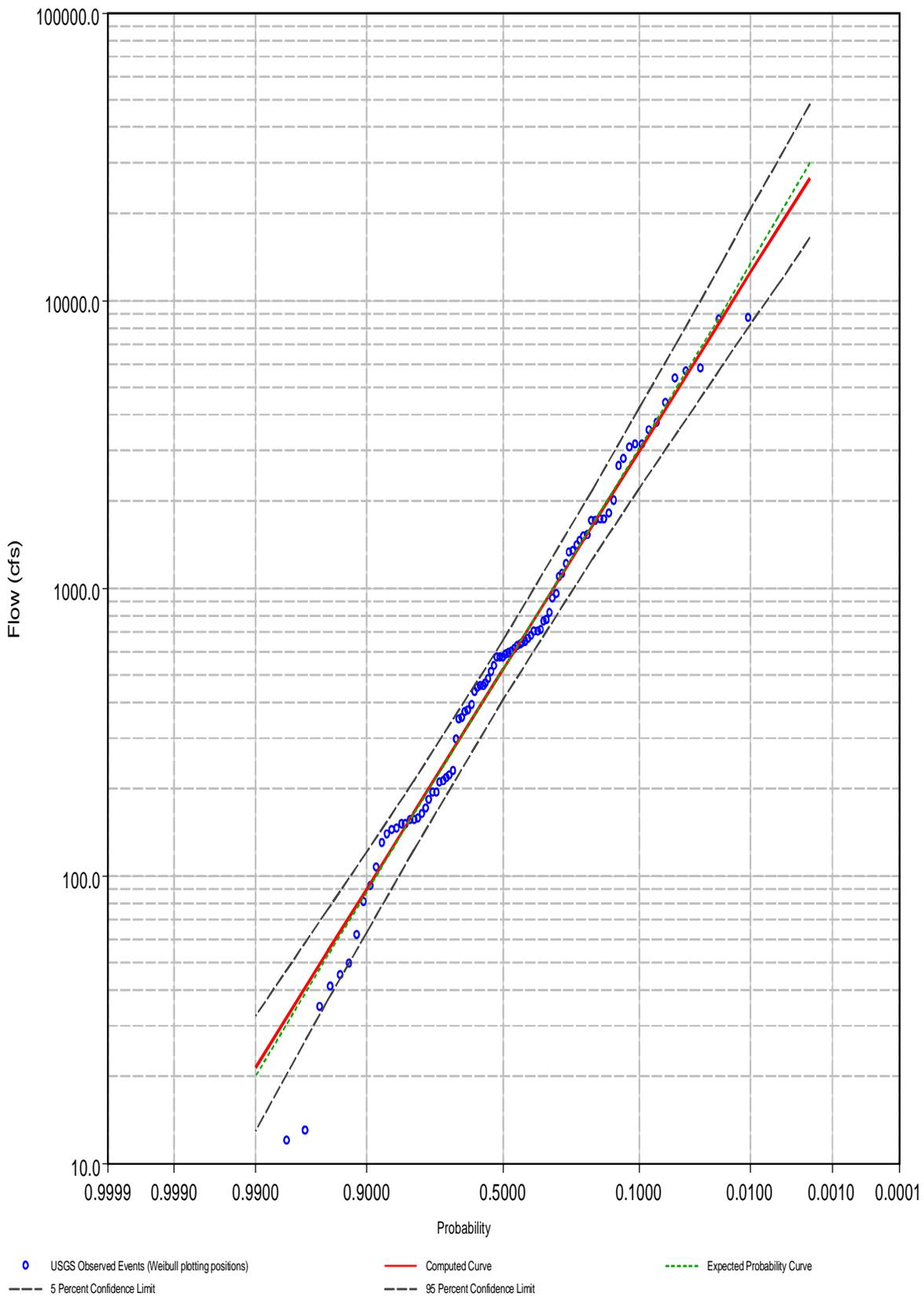
Calculation Results

| Subarea Number | Intensity | Undeveloped Runoff Coefficient (Cu) | Developed Runoff Coefficient (Cd) |
|---------------------------------|----------------------------------|-------------------------------------|-----------------------------------|
| <input type="text" value="45"/> | <input type="text" value="5.1"/> | <input type="text" value="0.72"/> | <input type="text" value="0.8"/> |

Tc Equation:

Tc Value (min.): Flowrate (cfs):

Exceedance Probability for Arroyo Seco



 Bulletin 17B Frequency Analysis
 06 Jul 2007 08:08 AM

--- Input Data ---

Analysis Name: Arroyo Seco
 Description:

Data Set Name: Arroyo Seco
 DSS File Name: X:\WRC\LA RLP\FFF 11098000\FFF_11098000.dss
 DSS Pathname: /ARROYO SECO/PASADENA CA/FLOW-ANNUAL PEAK/01jan1900/IR-CENTURY/USGS/

Report File Name: X:\WRC\LA RLP\FFF 11098000\Bulletin17bResults\Arroyo_Seco\Arroyo_Seco.rpt
 XML File Name: X:\WRC\LA RLP\FFF 11098000\Bulletin17bResults\Arroyo_Seco\Arroyo_Seco.xml

Skew Option: Use Weighted Skew
 Regional Skew: 0.0
 Regional Skew MSE: 0.302
 Round adopted skew to nearest tenth

Plotting Position Type: Weibull
 Upper Confidence Level: 0.05
 Lower Confidence Level: 0.95

Round ordinate values to 3 significant digits
 Display ordinate values using 0 digits in fraction part of value

--- End of Input Data ---

--- Preliminary Results ---

Note: Adopted skew equals station skew and preliminary frequency statistics are for the conditional frequency curve because of zero or missing events.

<< Frequency Curve >>

Arroyo Seco

| Computed Curve | Expected Probability | Percent Chance Exceedance | Confidence Limits | |
|-----------------------|----------------------|---------------------------|-------------------|--------|
| | | | 0.05 | 0.95 |
| FLOW-ANNUAL PEAK, CFS | | | | |
| 16,700 | 18,200 | 0.2 | 28,600 | 10,700 |
| 12,200 | 13,100 | 0.5 | 20,200 | 8,110 |
| 9,370 | 9,930 | 1.0 | 15,000 | 6,370 |
| 6,960 | 7,280 | 2.0 | 10,800 | 4,860 |
| 4,380 | 4,520 | 5.0 | 6,450 | 3,180 |
| 2,860 | 2,910 | 10.0 | 4,020 | 2,140 |
| 1,660 | 1,680 | 20.0 | 2,240 | 1,280 |
| 554 | 554 | 50.0 | 702 | 437 |
| 168 | 166 | 80.0 | 217 | 125 |
| 87 | 84 | 90.0 | 117 | 61 |
| 49 | 47 | 95.0 | 69 | 33 |
| 16 | 15 | 99.0 | 25 | 9 |

<< Conditional Statistics >>

Arroyo Seco

| Log Transform: | | Number of Events | |
|-----------------------|---------|------------------|---|
| FLOW-ANNUAL PEAK, CFS | | | |
| Mean | 2.7150 | Historic Events | 0 |
| Standard Dev | 0.5941 | High Outliers | 0 |
| Station Skew | -0.2846 | Low Outliers | 0 |
| Regional Skew | 0.0000 | Zero Events | 0 |
| Weighted Skew | --- | Missing Events | 1 |

| | | | |
|--------------|---------|-------------------|----|
| Adopted Skew | -0.2846 | Systematic Events | 93 |
|--------------|---------|-------------------|----|

<< Conditional Probability Adjusted Ordinates >>

<< Frequency Curve >>

Arroyo Seco

| Computed Curve FLOW-ANNUAL PEAK, CFS | Expected Probability PEAK, CFS | Percent Chance Exceedance | Confidence Limits | |
|---|-----------------------------------|------------------------------|-------------------------------|-------------------|
| | | | 0.05 FLOW-ANNUAL PEAK, CFS | 0.95 PEAK, CFS |
| 16,600 | --- | 0.2 | --- | --- |
| 12,200 | --- | 0.5 | --- | --- |
| 9,330 | --- | 1.0 | --- | --- |
| 6,930 | --- | 2.0 | --- | --- |
| 4,360 | --- | 5.0 | --- | --- |
| 2,840 | --- | 10.0 | --- | --- |
| 1,650 | --- | 20.0 | --- | --- |
| 543 | --- | 50.0 | --- | --- |
| 160 | --- | 80.0 | --- | --- |
| 79 | --- | 90.0 | --- | --- |
| 41 | --- | 95.0 | --- | --- |
| --- | --- | 99.0 | --- | --- |

--- End of Preliminary Results ---

--- Final Results ---

<< Plotting Positions >>

Arroyo Seco

| Events Analyzed | | | Ordered Events | | | | |
|-----------------|-----|------|----------------|------|---------------|-------------|---------------------|
| Day | Mon | Year | FLOW CFS | Rank | Water Year | FLOW CFS | Weibull Plot Pos |
| 20 | Feb | 1914 | 5,800 | 1 | 1938 | 8,620 | 1.06 |
| 03 | Feb | 1915 | 634 | 2 | 1969 | 8,540 | 2.13 |
| 17 | Jan | 1916 | 3,150 | 3 | 1914 | 5,800 | 3.19 |
| 24 | Dec | 1916 | 760 | 4 | 1943 | 5,660 | 4.26 |
| 10 | Mar | 1918 | 570 | 5 | 1978 | 5,360 | 5.32 |
| 11 | Feb | 1919 | 92 | 6 | 1998 | 4,380 | 6.38 |
| 02 | Mar | 1920 | 450 | 7 | 1973 | 3,740 | 7.45 |
| 13 | Mar | 1921 | 650 | 8 | 2005 | 3,540 | 8.51 |
| 19 | Dec | 1921 | 2,800 | 9 | 1966 | 3,160 | 9.57 |
| 13 | Dec | 1922 | 370 | 10 | 1916 | 3,150 | 10.64 |
| 26 | Mar | 1924 | 81 | 11 | 1980 | 3,080 | 11.70 |
| 04 | Apr | 1925 | 210 | 12 | 1922 | 2,800 | 12.77 |
| 07 | Apr | 1926 | 1,450 | 13 | 1983 | 2,640 | 13.83 |
| 16 | Feb | 1927 | 1,400 | 14 | 1935 | 2,000 | 14.89 |
| 04 | Feb | 1928 | 298 | 15 | 1944 | 1,800 | 15.96 |
| 04 | Apr | 1929 | 155 | 16 | 1995 | 1,730 | 17.02 |
| 03 | May | 1930 | 143 | 17 | 1968 | 1,720 | 18.09 |
| 03 | Feb | 1931 | 151 | 18 | 1993 | 1,710 | 19.15 |
| 28 | Dec | 1931 | 480 | 19 | 1992 | 1,710 | 20.21 |
| 19 | Jan | 1933 | --- | 20 | 1967 | 1,530 | 21.28 |
| 01 | Jan | 1934 | 950 | 21 | 1962 | 1,500 | 22.34 |
| 17 | Oct | 1934 | 2,000 | 22 | 1926 | 1,450 | 23.40 |
| 12 | Feb | 1936 | 706 | 23 | 1927 | 1,400 | 24.47 |
| 06 | Feb | 1937 | 640 | 24 | 1941 | 1,340 | 25.53 |
| 02 | Mar | 1938 | 8,620 | 25 | 1971 | 1,330 | 26.60 |
| 18 | Dec | 1938 | 375 | 26 | 1945 | 1,210 | 27.66 |
| 08 | Jan | 1940 | 452 | 27 | 2006 | 1,120 | 28.72 |
| 20 | Feb | 1941 | 1,340 | 28 | 1952 | 1,090 | 29.79 |
| 10 | Dec | 1941 | 146 | 29 | 1934 | 950 | 30.85 |
| 23 | Jan | 1943 | 5,660 | 30 | 1991 | 921 | 31.91 |
| 22 | Feb | 1944 | 1,800 | 31 | 1956 | 815 | 32.98 |
| 11 | Nov | 1944 | 1,210 | 32 | 1961 | 769 | 34.04 |
| 30 | Mar | 1946 | 680 | 33 | 1917 | 760 | 35.11 |
| 25 | Dec | 1946 | 600 | 34 | 1958 | 715 | 36.17 |
| 29 | Apr | 1948 | 45 | 35 | 1936 | 706 | 37.23 |

| | | | | | |
|-------------|-------|----|------|-----|-------|
| 20 Jan 1949 | 35 | 36 | 2004 | 705 | 38.30 |
| 10 Nov 1949 | 150 | 37 | 1946 | 680 | 39.36 |
| 29 Apr 1951 | 12 | 38 | 1970 | 668 | 40.43 |
| 16 Jan 1952 | 1,090 | 39 | 1921 | 650 | 41.49 |
| 02 Dec 1952 | 49 | 40 | 1937 | 640 | 42.55 |
| 24 Jan 1954 | 571 | 41 | 1915 | 634 | 43.62 |
| 30 Apr 1955 | 107 | 42 | 1981 | 627 | 44.68 |
| 26 Jan 1956 | 815 | 43 | 1982 | 615 | 45.74 |
| 23 Feb 1957 | 158 | 44 | 1947 | 600 | 46.81 |
| 03 Apr 1958 | 715 | 45 | 1976 | 590 | 47.87 |
| 16 Feb 1959 | 351 | 46 | 1996 | 584 | 48.94 |
| 12 Jan 1960 | 170 | 47 | 1954 | 571 | 50.00 |
| 06 Nov 1960 | 769 | 48 | 1918 | 570 | 51.06 |
| 11 Feb 1962 | 1,500 | 49 | 1997 | 569 | 52.13 |
| 09 Feb 1963 | 464 | 50 | 1975 | 535 | 53.19 |
| 21 Jan 1964 | 182 | 51 | 2000 | 509 | 54.26 |
| 09 Apr 1965 | 194 | 52 | 1932 | 480 | 55.32 |
| 22 Nov 1965 | 3,160 | 53 | 1963 | 464 | 56.38 |
| 06 Dec 1966 | 1,530 | 54 | 1988 | 457 | 57.45 |
| 19 Nov 1967 | 1,720 | 55 | 1940 | 452 | 58.51 |
| 25 Jan 1969 | 8,540 | 56 | 1920 | 450 | 59.57 |
| 28 Feb 1970 | 668 | 57 | 2003 | 433 | 60.64 |
| 29 Nov 1970 | 1,330 | 58 | 1974 | 390 | 61.70 |
| 24 Dec 1971 | 222 | 59 | 1939 | 375 | 62.77 |
| 11 Feb 1973 | 3,740 | 60 | 1923 | 370 | 63.83 |
| 08 Mar 1974 | 390 | 61 | 1959 | 351 | 64.89 |
| 06 Mar 1975 | 535 | 62 | 2001 | 348 | 65.96 |
| 09 Feb 1976 | 590 | 63 | 1928 | 298 | 67.02 |
| 09 May 1977 | 230 | 64 | 1977 | 230 | 68.09 |
| 04 Mar 1978 | 5,360 | 65 | 1972 | 222 | 69.15 |
| 21 Feb 1979 | 193 | 66 | 1984 | 217 | 70.21 |
| 16 Feb 1980 | 3,080 | 67 | 1986 | 213 | 71.28 |
| 29 Jan 1981 | 627 | 68 | 1925 | 210 | 72.34 |
| 17 Mar 1982 | 615 | 69 | 1965 | 194 | 73.40 |
| 02 Mar 1983 | 2,640 | 70 | 1979 | 193 | 74.47 |
| 25 Dec 1983 | 217 | 71 | 1964 | 182 | 75.53 |
| 16 Dec 1984 | 139 | 72 | 1960 | 170 | 76.60 |
| 30 Jan 1986 | 213 | 73 | 1990 | 163 | 77.66 |
| 05 Jan 1987 | 13 | 74 | 1957 | 158 | 78.72 |
| 29 Feb 1988 | 457 | 75 | 1989 | 155 | 79.79 |
| 16 Dec 1988 | 155 | 76 | 1929 | 155 | 80.85 |
| 17 Feb 1990 | 163 | 77 | 1931 | 151 | 81.91 |
| 01 Mar 1991 | 921 | 78 | 1950 | 150 | 82.98 |
| 11 Feb 1992 | 1,710 | 79 | 1942 | 146 | 84.04 |
| 17 Jan 1993 | 1,710 | 80 | 1930 | 143 | 85.11 |
| 07 Feb 1994 | 129 | 81 | 1985 | 139 | 86.17 |
| 10 Jan 1995 | 1,730 | 82 | 1994 | 129 | 87.23 |
| 21 Feb 1996 | 584 | 83 | 1955 | 107 | 88.30 |
| 22 Dec 1996 | 569 | 84 | 1919 | 92 | 89.36 |
| 23 Feb 1998 | 4,380 | 85 | 1924 | 81 | 90.43 |
| 09 Feb 1999 | 62 | 86 | 1999 | 62 | 91.49 |
| 20 Feb 2000 | 509 | 87 | 1953 | 49 | 92.55 |
| 13 Feb 2001 | 348 | 88 | 1948 | 45 | 93.62 |
| 28 Jan 2002 | 41 | 89 | 2002 | 41 | 94.68 |
| 12 Feb 2003 | 433 | 90 | 1949 | 35 | 95.74 |
| 26 Feb 2004 | 705 | 91 | 1987 | 13 | 96.81 |
| 09 Jan 2005 | 3,540 | 92 | 1951 | 12 | 97.87 |
| 02 Jan 2006 | 1,120 | 93 | 1933 | 0 | 98.94 |

<< Outlier Tests >>

<< Low Outlier Test >>

Based on 92 events, 10 percent outlier test value $K(N) = 2.989$
 0 low outlier(s) identified below test value of 9

Based on statistics after 0 zero events and 1 missing events were deleted.

<< High Outlier Test >>

Based on 92 events, 10 percent outlier test value $K(N) = 2.989$
 0 high outlier(s) identified above test value of 30,953

<< Skew Weighting >>

 Based on 93 events, mean-square error of station skew = 0.071
 Default or input mean-square error of regional skew = 0.302

<< Frequency Curve >>

Arroyo Seco

| Computed Curve FLOW-ANNUAL PEAK, CFS | Expected Probability FLOW-ANNUAL PEAK, CFS | Percent Chance Exceedance | Confidence Limits | |
|--|--|---------------------------------|-------------------------------|-------------------------------|
| | | | 0.05 FLOW-ANNUAL PEAK, CFS | 0.95 FLOW-ANNUAL PEAK, CFS |
| 26,600 | 30,100 | 0.2 | 48,300 | 16,500 |
| 17,600 | 19,300 | 0.5 | 30,400 | 11,300 |
| 12,500 | 13,500 | 1.0 | 20,700 | 8,300 |
| 8,610 | 9,100 | 2.0 | 13,600 | 5,910 |
| 4,920 | 5,100 | 5.0 | 7,320 | 3,540 |
| 2,990 | 3,060 | 10.0 | 4,230 | 2,230 |
| 1,640 | 1,660 | 20.0 | 2,200 | 1,270 |
| 519 | 519 | 50.0 | 656 | 410 |
| 164 | 162 | 80.0 | 212 | 123 |
| 90 | 88 | 90.0 | 120 | 64 |
| 55 | 53 | 95.0 | 76 | 37 |
| 22 | 20 | 99.0 | 32 | 13 |

<< Conditional Statistics >>

Arroyo Seco

| Log Transform: FLOW-ANNUAL PEAK, CFS | | Number of Events | |
|---|---------|-------------------|----|
| Mean | 2.7150 | Historic Events | 0 |
| Standard Dev | 0.5941 | High Outliers | 0 |
| Station Skew | -0.2846 | Low Outliers | 0 |
| Regional Skew | 0.0000 | Zero Events | 0 |
| Weighted Skew | -0.2301 | Missing Events | 1 |
| Adopted Skew | 0.0000 | Systematic Events | 93 |

COUNTY OF LOS ANGELES

SANTA MONICA MOUNTAINS,
SAN GABRIEL MOUNTAINS,
LANCASTER, ROWLAND HEIGHTS
AND QUARTZ HILL AREAS
REPETITIVE LOSS PROPERTIES

APPENDIX B

RLP Site Information

JULY 2007
REVISED DECEMBER 2009

COUNTY OF LOS ANGELES

SANTA MONICA MOUNTAINS,
SAN GABRIEL MOUNTAINS,
LANCASTER, ROWLAND HEIGHTS
AND QUARTZ HILL AREAS
REPETITIVE LOSS PROPERTIES

APPENDIX C

Environmental Overview - CEQA Checklist

JULY 2007
REVISED DECEMBER 2009

Environmental Checklist Form

- 1 Project title: The County of Los Angeles Floodplain Management Plan for Repetitive Loss Properties
- 2 Lead agency name and address:
The County of Los Angeles - Department of Public Works
900 S. Fremont Ave.
Alhambra, CA 91803
- 3 Contact person and phone number: Lan Weber
WRC Consulting Services, Inc.
1800 E. Garry Avenue, Suite 213
Santa Ana, California 92705
(949) 833-8388
- 4 Project location: Malibu Lake, Agoura, CA
- 5 Project sponsor's name and address:
The County of Los Angeles - Department of Public Works
900 S. Fremont Ave.
Alhambra, CA 91803
- 6 General plan designation:
- 7 Zoning:
- 8 Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)
Various homes in the Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill areas have experienced property loss or damage due to repetitive flood events. Each property is relatively small in area and is characterized by individual site conditions. The existing environments are primarily the residential structures, but include yards and landscaping, as well as driveways, streets, other hardscaped areas, and adjacent hillsides.
Proposed site improvements include construction of v-ditches and small berms; vertical extension of retaining walls; clean up and maintenance of v-ditches, open channels, trash racks, storm drains and similar structures. Some sites may require regrading of manufactured slopes or construction of ground-level water conveyance structures..
- 9 Surrounding land uses and setting: Briefly describe the project's surroundings:
Santa Monica Mountains - Surrounding land uses are residential development and open space. The general setting is the slopes and upland areas of the Santa Monica Mountains.

San Gabriel Mountains - Surrounding land uses are residential development and open space. The general setting is the slopes and upland areas of the San Gabriel Mountains.

Quartz Hill - Surrounding land uses are residential development and open space. The general setting is the high desert near Palmdale.

Lancaster - Surrounding land uses are residential development and open space. Lancaster's elevation is 2,500 feet above sea level on a high, flat valley surrounded by mountain ranges.

Rowland Heights - Surrounding land uses are residential development and open space. The elevation is 540 feet above sea level. It is loosely bounded by the Puente Hills to the south and San Jose Hills to the north-northeast.

- 10 Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.) - Not applicable to FMP

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

Aesthetics - The proposed improvements require raising the houses. This may affect the visual character and quality of the various homesites and the neighborhood in general.

Biological - The proposed improvements, if not confined to the house and surrounding properties, could affect flows in adjacent drainages, including alteration of the drainages. Improvements outside landscape and hardscape areas could also potentially affect sensitive species.

Cultural - The proposed improvements could result in the alteration of potentially historical homes.

- | | | |
|--|---|---|
| <input type="checkbox"/> Aesthetics | <input type="checkbox"/> Agriculture Resources | <input type="checkbox"/> Air Quality |
| <input type="checkbox"/> Biological Resources | <input type="checkbox"/> Cultural Resources | <input type="checkbox"/> Geology /Soils |
| <input type="checkbox"/> Hazards & Hazardous Materials | <input type="checkbox"/> Hydrology / Water Quality | <input type="checkbox"/> Land Use / Planning |
| <input type="checkbox"/> Mineral Resources | <input type="checkbox"/> Noise | <input type="checkbox"/> Population / Housing |
| <input type="checkbox"/> Public Services | <input type="checkbox"/> Recreation | <input type="checkbox"/> Transportation/Traffic |
| <input type="checkbox"/> Utilities / Service Systems | <input type="checkbox"/> Mandatory Findings of Significance | |

DETERMINATION: (To be completed by the Lead Agency). On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature

Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

- 1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
- 2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
- 3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
- 4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).
- 5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
 - a) Earlier Analysis Used. Identify and state where they are available for review.
 - b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
 - c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

- 6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
- 7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
- 8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
- 9) The explanation of each issue should identify:
 - a) the significance criteria or threshold, if any, used to evaluate each question; and
 - b) the mitigation measure identified, if any, to reduce the impact to less than significance

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| I. AESTHETICS -- Would the project: | | | | |
| Have a substantial adverse effect on a scenic vista? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Substantially degrade the existing visual character or quality of the site and its surroundings? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project: | | | | |
| Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Conflict with existing zoning for agricultural use, or a Williamson Act contract? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project: | | | | |
| a) Conflict with or obstruct implementation of the applicable air quality plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Expose sensitive receptors to substantial pollutant concentrations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Create objectionable odors affecting a substantial number of people? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|-----------|
|--|--------------------------------|--|------------------------------|-----------|

IV. BIOLOGICAL RESOURCES: Would the project:

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

V. CULTURAL RESOURCES: Would the project:

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Cause a substantial adverse change in the significance of a historical resource as defined in 115064.5? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to 115064.5? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|--------------------------|
| d) Disturb any human remains, including those interred outside of formal cemeteries? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

VI. GEOLOGY AND SOILS: Would the project:

| | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| ii) Strong seismic ground shaking? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| iii) Seismic-related ground failure, including liquefaction? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| iv) Landslides? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Result in substantial soil erosion or the loss of topsoil? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

VII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|--------------------------|
| c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) For a project located within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

VIII. HYDROLOGY AND WATER QUALITY: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Violate any water quality standards or waste discharge requirements? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| or off-site? | | | | |
| d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Otherwise substantially degrade water quality? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| j) Inundation by seiche, tsunami, or mudflow? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

IX. LAND USE AND PLANNING: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Physically divide an established community? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Conflict with any applicable habitat conservation plan or natural community conservation plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| X. MINERAL RESOURCES: Would the project: | | | | |
| a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| XI. NOISE: Would the project result in: | | | | |
| a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Exposure of persons to or generation of excessive groundbome vibration or groundborne noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| XII. POPULATION AND HOUSING: Would the project: | | | | |
| a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|--------------------------------|--|------------------------------|--------------------------|
| b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XIII. PUBLIC SERVICES

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

| | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Fire protection? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Police protection? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Schools? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Parks? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other public facilities? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XIV. RECREATION

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

| | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

| | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|

XV. TRANSPORTATION/TRAFFIC: Would the project:

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?

| | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--------------------------|--------------------------|--------------------------|--------------------------|

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|--|--------------------------------|--|------------------------------|--------------------------|
| b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Result in inadequate emergency access? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Result in inadequate parking capacity? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XVI. UTILITIES AND SERVICE SYSTEMS: Would the project:

| | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the provider: s existing commitments? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Potentially Significant Impact | Less than Significant with Mitigation Incorporated | Less than Significant Impact | No Impact |
|---|---|---|---|--------------------------|
| g) Comply with federal, state, and local statutes and regulations related to solid waste? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

| | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| FACTOR | RLP ID NUMBER | | | | | | | | | | | | | | | |
|--------|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| | 24 | 26 | 27 | 28 | 41 | 43 | 45 | 42 | 44 | 35 | 36 | 37 | 38 | 39 | 40 | |
| I | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| II | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| III | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| IV | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| V | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| VI | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | a.i | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | a.ii | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | a.iii | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | a.iv | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| VII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| VIII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| IX | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| X | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| XI | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| XII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| XIII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| XIV | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| XV | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| XVI | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
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| | g | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| XVII | a | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | b | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |
| | c | D | D | D | D | D | D | D | D | D | D | D | D | D | D | |

| FACTOR KEY | |
|------------|---------------------------------------|
| A | Potentially Significant Impact |
| B | Less than Significant with Mitigation |
| C | Less than Significant |
| D | No Impact |

| RLP ID | REPETITIVE LOSS NO. |
|------------------------|---------------------|
| Santa Monica Mountains | |
| 24 | 0095737 |
| 26 | 0072498 |
| 27 | 0071255 |
| 28 | 0070079 |
| 41 | 0136718 |
| 43 | 0137793 |
| 45 | 0148768 |
| Lancaster | |
| 42 | 0137354 |
| Rowland Heights | |
| 44 | 0138651 |
| San Gabriel Mountains | |
| 35 | 0056933 |
| 36 | 0091348 |
| 37 | 0091339 |
| Quartz Hill | |
| 38 | 0057385 |
| 39 | 0091087 |
| 40 | 0131222 |

COUNTY OF LOS ANGELES

SANTA MONICA MOUNTAINS,
SAN GABRIEL MOUNTAINS,
LANCASTER, ROWLAND HEIGHTS
AND QUARTZ HILL AREAS
REPETITIVE LOSS PROPERTIES

APPENDIX D

Public Involvement Process

JULY 2007
REVISED DECEMBER 2009

PUBLIC INVOLVEMENT PROCESS

Unlike other FMP areas in the County of Los Angeles, no community-scale public meetings were held for the 15 RLPs in the Santa Monica Mountains, Lancaster, Rowland Heights, San Gabriel Mountains, and Quartz Hill areas. The locations of these RLPs are scattered over the County, with some of the RLPs more than 80 miles apart from each other.

The public involvement process and procedure for this FMP included informing and involving the public by interviewing RLP owners at the site visits, questionnaire survey, and follow-up site visits. This appendix provides a summary of the public involvement process and includes the following:

| | |
|--|--------|
| Public Involvement Process Summary Table | Page 2 |
| Notice Letter | Page 3 |
| Questionnaire | Page 4 |
| Initial Public Outreach Mailing List | Page 6 |
| Second Public Outreach Mailing List | Page 8 |

PUBLIC INVOLVEMENT PROCESS SUMMARY
Santa Monica Mountains, San Gabriel Mountains, Lancaster, Rowland Heights and Quartz Hill Area RLPs

| RLP ID | Repetitive Loss # | Initial Notice Letter and Questionnaire | | Second Notice Letter and Questionnaire | | Field Activities | |
|-------------------------------|-------------------|---|---------------------------|--|---------------------------|---------------------|--------------------|
| | | 12/27/06 Mailing | Mailing Returned Unopened | 1/16/07 Mailing | Mailing Returned Unopened | Field Investigation | Meeting with Owner |
| Santa Monica Mountains | | | | | | | |
| 24 | 0095737 | Yes | No | Yes | No | No | No |
| 26 | 0072498 | Yes | No | Yes | No | No | No |
| 27 | 0071255 | Yes | No | Yes | No | No | No |
| 28 | 0070079 | Yes | No | Yes | No | No | No |
| 41* | 0136718 | Yes | No | Yes | No | 3/26/07 | Yes |
| 43* | 0137793 | Yes | No | Yes | Yes | 3/26/07 | No |
| 45* | 0148768 | Yes | No | Yes | No | 3/26/07 | Yes |
| Lancaster | | | | | | | |
| 42* | 0137354 | Yes | No | Yes | Yes | 3/22/07 | No |
| Rowland Heights | | | | | | | |
| 44* | 0138651 | Yes | No | Yes | No | 3/22/07 | No |
| San Gabriel Mountains | | | | | | | |
| 35 | 0056933 | Yes | No | Yes | No | No | No |
| 36 | 0091348 | Yes | No | Yes | No | No | No |
| 37 | 0091339 | Yes | No | Yes | No | No | No |
| Quartz Hill | | | | | | | |
| 38 | 0057385 | Yes | No | Yes | No | No | No |
| 39 | 0091087 | Yes | No | Yes | No | No | No |
| 40* | 0131222 | Yes | No | Yes | Yes | 3/22/07 | Yes |
| * New RLP for 2007 FMP | | | | | | | |

TEXT OF NOTICE LETTER

Dear Property Owner,

I am writing to you regarding the assistance that the County of Los Angeles is offering to individual owners of property identified as Repetitive Loss Properties (RLP) by the Federal Emergency Management Agency (FEMA). A RLP is defined as a property for which two or more claims of \$1,000 or more have been paid by the National Flood Insurance Program (NFIP) within any given 10-year period since 1978. According to FEMA records, your property has been identified as such.

WRC Consulting Services, Inc. has been contracted by the County of Los Angeles to prepare a Floodplain Management Plan (FMP) for RLPs. This plan will help the RLP owners to understand the specific flooding problems related to their flood damages. The plan will also provide possible mitigation measures for owners to consider for future mitigation. The background of the NFIP is described as follows:

Los Angeles County has been a voluntary participant in the National Flood Insurance Program (NFIP) since 1980. This program allows the flood-prone-property owners to obtain federally backed flood insurance for their properties. The County's efforts have also allowed policyholders to receive a 10-percent discount on insurance premiums in recent years.

The development of a Floodplain Management Plan (FMP) is an important part of the NFIP to further reduce flood losses. The Plan will identify existing problems and recommend actions for reducing the hazard to structures. Any recommended actions will be entirely voluntary by the property owners. Please be assured that development of this plan is not to repeat the county's previous efforts in flood mapping and ordinance enforcement, rather to provide updates on the previous plan and emphasis on the public outreach and involvement in the following planning process:

- Flood Hazard Assessment
- Problems Identification
- Goal Setting
- Alternative Plan Development
- Plan Preparation

We are scheduled to visit your neighborhood during the weeks of January 8 and January 15 to inspect the area. A personal review of your property relating to possible cause of the previous flood hazards and current improvements can be arranged at this time by calling our office at (949) 833-8388 ext 102.

In addition to the property visit a questionnaire is enclosed inquiring about the specifics and nature of the flood damages of your property. This questionnaire is important to the development of a functional FMP, and we hope you can spare a few moments of your time to fill-out the questionnaire and return it to us with the enclosed envelope by February 1, 2007.

Your information will be strictly confidential, and there will be no cost to you. Your participation and input during the development of the final FMP is essential for the development of a practical plan.

Sincerely,
WRC Consulting Services, Inc.



Lan-Yin Li Weber, Ph.D., President

REPETITIVE LOSS PROPERTY QUESTIONNAIRE – 2007

Address: _____

Name: _____

Contact Number: _____

*Please, circle yes or no and fill-in the blank spaces where appropriate. Please, return the completed questionnaire using the self-address stamped envelope, **no later than February 1, 2007.***

1. Is this an owner occupied building? Yes No

2. Do you have flood insurance? Yes No

3. Did you notice any drainage problems in or around your residence/property during the past rain season? Yes No

4. If you did notice any drainage problems, please describe the problem as specifically as you can. Please, also specify whether the problem is within private or public property.

5. Have there been any fires in the area surrounding your property? Yes No

6. Have there been any improvements made to the site drainage? Yes No

If yes, please explain. Are these improvements adequate?

7. Please describe the nature of the damage for each of the NFIP damage claim filed before and specify the date of damage occurrence (month/year).

8. Is there a natural watercourse nearby? Yes No

9. Is there a drainage easement? Yes No

10. Are there any drainage structures nearby, such as a storm drain channel?
If so, please be specific. Yes No

11. Are there any other obvious problems? If so describe. Yes No

COUNTY OF LOS ANGELES

SANTA MONICA MOUNTAINS,
SAN GABRIEL MOUNTAINS,
LANCASTER, ROWLAND HEIGHTS
AND QUARTZ HILL AREAS
REPETITIVE LOSS PROPERTIES

APPENDIX E

Economic Assessment of Damages and Mitigation Measures

JULY 2007
REVISED DECEMBER 2009

INTRODUCTION

The economic assessments of damages and the cost-effectiveness of potential measures for the Repetitive Loss Properties (RLPs) of the Topanga Canyon area are constructed to closely follow the analysis procedures employed in examining Federal water resources projects by the U.S. Army Corps of Engineers (USACOE). The underlying purpose of the USACOE analytical procedures is to convert the random nature of flood related damages to an expression of equivalent annual damage for comparison to the amortized cost of mitigation. The fundamental factors behind USACOE's determinations of structural related damages are (1) depreciated structure replacement value, (2) content-to-structure value relationships, (3) inundation levels, (4) inundation depth-to-damage percentages, and (5) cleanup cost relationship to the amount of inundated surface. The results of the analysis of these factors are ultimately incorporated into the USACOE Hydrologic Engineering Center's (HEC) Flood Damage Analysis Package, HEC-FDA, for the determination of equivalent annual damages. The following paragraphs will discuss the how the above factors are determined and analyzed for this assessment in greater detail.

DEPRECIATED STRUCTURE REPLACEMENT VALUE

The basic premise behind the use of depreciated structure replacement value in damage assessments is that damage should be measured by the worth of the existing structure, noting its age and condition, and not by the current cost of the replacement of damage to avoid the creation of a betterment for the property owner and the overestimation of damage. To calculate depreciated structure replacement value many USACOE Districts, including the Los Angeles District, employ the Marshall & Swift's valuation service. This service categorizes structures through a vast array of building types and construction classifications. Combining these construction costs with the service's localized cost factor adjustments yields thousands of cost combinations to virtually estimate any type of structure. In this assessment the Marshall Valuation Service is utilized for the determination of depreciated structure replacement value.

CONTENT-TO-STRUCTURE VALUE RELATIONSHIP

In keeping with the procedures utilized with Federal water resources projects and in accordance with USACOE Engineering Regulation (ER) 1105-2-100, dated 28 Dec 90, the content-to-structure ratio for residential structures is set at 50 percent of depreciated replacement value. Non-residential content-to-structure ratios are determined in relationship to the work conducted by CH2M Hill, Inc. for the New Orleans District, Planning Division, Economic and Social Analysis Branch as shown in the output data for the Lake Pontchartrain Hurricane Protection Plan.

INUNDATION LEVELS

The determination of inundation levels for the RLPs of this analysis is based on hydraulic estimation of the potential concentration of water flow to the subject property from its source. The estimation of the frequency of flow is based on the historical record for the Arroyo Seco, USGS site 11098000, near Pasadena for its proximity and near unregulated flow. The non-

damaging event is based on the reported instances for a RLP and the estimated frequencies given by the frequency analysis of the Arroyo Seco.

INUNDATION DEPTH-TO-DAMAGE PERCENTAGES

This economic assessment employs the Federal Emergency Management Agency's (FEMA) Depth Percent Damage data from its Flood Insurance Rate Review – 1997. These depth/damage percentages are shown in Appendix E1.

CLEANUP COSTS AND OTHER COSTS

Flooding not only causes damage to structures and contents but floodwaters present a significant cost in their aftermath clean up. Floodwaters leave debris, sediment and the dangers of diseases and mycotoxins throughout flooded structures. The cleaning of these structures is a necessary post-flood activity. Clean-up cost estimates are based on studies of the USACOE's Los Angeles and Seattle Districts. Clean-up costs for the extraction of floodwaters, dry-out, and decontamination range from \$1 to \$4.75 per square foot. Mean cleanup cost is estimated at \$3.65 per square foot, with heavily sediment-laden waters increasing costs by 75 percent.

The principal cost represented by other costs is FEMA's Temporary Relocation Assistance (TRA) to damaged properties. Flood studies by Stanislaus County, California and the USACOE Districts of Seattle and St. Paul indicate FEMA expends \$1,537 per damaged property on average. In this analysis TRA costs are set at \$1,537 for each damaged property.

DAMAGE MITIGATION MEASURES - ECONOMIC ASSESSMENT METHODOLOGY

The cost effectiveness of a potential mitigation measure is assessed on two levels for this study. The first level is the common benefit-to-cost (B/C) ratio method and the second being an investment recovery approach. The two approaches are necessary in that employing the B/C ratio method an assumption regarding the interest rate and amortization period must be made for the participants, which may or may not apply to all. In the B/C ratio method, the current Federal water resources projects rate of 6? percent and a 30-year amortization schedule is utilized. The investment recovery approach examines the length of time required to recover the cost of the mitigation measure given the equivalent annual damage reduction for various interest rates.

SUMMARY OF THE ECONOMIC ASSESSMENT OF RLPs

Table 1 presents the economic findings of this assessment. Following Table 1 are the individual property assessments for each RLP structure in the study area.

APPENDIX E1

REPORT: BROOKED
 RUNDATE: MAR 20 1997
 RUNTIME: 18.21.06

FEDERAL EMERGENCY MANAGEMENT AGENCY
 NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1997
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

BUILDING COVERAGE - CONSOLIDATED
 ONE FLOOR - NO BASEMENT

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1996 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY | |
|----------------|--|---------------------------------|---------------|---|---------------------------------------|---------|
| | | PERCENT | NO. OF CLAIMS | | PERCENT | PERCENT |
| -4 | | 15.28 | 286 | 45710 | | .63 |
| -3 | | 14.94 | 321 | 51932 | | .62 |
| -2 | | 14.37 | 696 | 46476 | | 1.50 |
| -1 | | 9.91 | 3040 | 54218 | | 5.61 |
| 0 | 7 | 17.28 | 80931 | 43675 | 100.00 | 17.28 |
| 1 | 10 | 16.33 | 72992 | 32172 | 100.00 | 16.33 |
| 2 | 14 | 24.56 | 25586 | 20153 | 100.00 | 24.56 |
| 3 | 26 | 28.23 | 13089 | 17791 | 73.57 | 27.64 |
| 4 | 38 | 31.36 | 7718 | 17672 | 43.67 | 29.47 |
| 5 | 49 | 36.21 | 3898 | 16289 | 23.93 | 30.73 |
| 6 | 41 | 33.32 | 2957 | 19649 | 15.05 | 39.84 |
| 7 | 43 | 39.90 | 1303 | 14932 | 8.73 | 42.73 |
| 8 | 44 | 37.61 | 1780 | 17376 | 10.24 | 43.36 |
| 9 | 45 | 40.00 | 649 | 15230 | 4.28 | 44.79 |
| 10 | 46 | 42.81 | 1043 | 15730 | 6.63 | 45.79 |
| 11 | 47 | 48.35 | 235 | 10907 | 2.15 | 46.98 |
| 12 | 48 | 38.37 | 1065 | 20124 | 5.29 | 47.38 |
| 13 | 49 | 41.45 | 154 | 13678 | 1.13 | 48.91 |
| 14 | 50 | 35.39 | 382 | 17700 | 2.05 | 49.70 |
| 15 | 50 | 45.88 | 218 | 14718 | 3.49 | 49.94 |
| 16 | 50 | 33.47 | 248 | 20317 | 1.22 | 49.80 |
| 17 | 50 | 32.08 | 90 | 19778 | .46 | 49.92 |
| 18 | 50 | 33.05 | 3226 | 18270 | 17.66 | 47.01 |

RUNDATE: MAR 20 1997
 RUNTIME: 10.22.17

NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1997
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

CONTENTS COVERAGE - CONSOLIDATED
 RESIDENTIAL - FIRST FLOOR ONLY

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1996 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY | |
|----------------|--|---------------------------------|---------------|---|---------------------------------------|---------|
| | | PERCENT | NO. OF CLAIMS | | PERCENT | PERCENT |
| -4 | | 28.87 | 61 | 26914 | .20 | |
| -3 | | 25.84 | 59 | 34227 | .17 | |
| -2 | | 22.60 | 112 | 37596 | .30 | |
| -1 | | 15.77 | 561 | 37294 | 1.50 | |
| 0 | 10 | 20.41 | 7844 | 37004 | 20.66 | 12.15 |
| 1 | 17 | 24.20 | 24805 | 25448 | 97.47 | 24.02 |
| 2 | 23 | 36.16 | 11176 | 15196 | 73.55 | 32.68 |
| 3 | 29 | 42.20 | 5702 | 13407 | 43.50 | 34.74 |
| 4 | 35 | 43.17 | 3124 | 13145 | 23.77 | 36.94 |
| 5 | 40 | 46.17 | 1421 | 12235 | 11.61 | 40.72 |
| 6 | 45 | 42.86 | 846 | 14974 | 5.65 | 44.88 |
| 7 | 50 | 46.04 | 427 | 12686 | 3.44 | 49.86 |
| 8 | 55 | 47.16 | 513 | 13153 | 3.90 | 54.69 |
| 9 | 60 | 49.19 | 172 | 11582 | 1.49 | 59.84 |
| 10 | 60 | 50.51 | 306 | 11937 | 2.56 | 59.76 |
| 11 | | 57.64 | 63 | 7203 | .87 | |
| 12 | | 50.90 | 197 | 11699 | 1.68 | |
| 13 | | 55.13 | 43 | 9050 | .48 | |
| 14 | | 48.25 | 46 | 14257 | .32 | |
| 15 | | 53.97 | 61 | 9689 | .83 | |
| 16 | | 46.22 | 27 | 14502 | .19 | |
| 17 | | 38.40 | 7 | 18190 | .04 | |
| 18 | | 53.16 | 240 | 8853 | 2.71 | |

RUNDATE: MAR 20 1997
 RUNTIME: 18.22.17

FEDERAL EMERGENCY MANAGEMENT AGENCY
 NATIONAL FLOOD INSURANCE PROGRAM
 ACTUARIAL INFORMATION SYSTEM

FLOOD INSURANCE RATE REVIEW - 1987
 DEPTH PERCENT DAMAGE - NON-VELOCITY ZONES

CONTENTS COVERAGE - CONSOLIDATED
 COMMERCIAL - FIRST FLOOR ONLY

| WATER DEPTH | DAMAGE RATIO BASED ON 1973 STUDY | ACTUAL CLAIMS DATA 1978-1986 | | CLAIMS NEEDED FOR FULL CREDIBILITY | CALCULATED 1% / 95% CREDIBILITY PERCENT | |
|----------------|--|---------------------------------|---------------|---|---|-------|
| | | PERCENT | NO. OF CLAIMS | | | |
| -4 | | 25.36 | 20 | 27665 | .07 | |
| -3 | | 24.88 | 14 | 49052 | .03 | |
| -2 | | 23.59 | 17 | 15991 | .11 | |
| -1 | | 17.52 | 93 | 41795 | .22 | |
| 0 | 10 | 22.44 | 1557 | 42025 | 3.70 | 10.46 |
| 1 | 17 | 21.31 | 4557 | 33944 | 13.43 | 17.58 |
| 2 | 23 | 29.44 | 2329 | 21792 | 10.69 | 23.69 |
| 3 | 29 | 35.71 | 1330 | 18094 | 7.35 | 29.49 |
| 4 | 35 | 39.40 | 972 | 15369 | 6.33 | 35.28 |
| 5 | 40 | 40.48 | 474 | 15621 | 3.03 | 40.01 |
| 6 | 45 | 45.97 | 261 | 12231 | 2.13 | 45.02 |
| 7 | 50 | 48.51 | 137 | 11362 | 1.21 | 49.98 |
| 8 | 55 | 53.68 | 146 | 8808 | 1.66 | 54.98 |
| 9 | 60 | 57.60 | 70 | 8274 | .84 | 58.98 |
| 10 | 60 | 56.35 | 102 | 7699 | 1.32 | 59.95 |
| 11 | | 47.17 | 16 | 12424 | .13 | |
| 12 | | 54.86 | 66 | 8755 | .78 | |
| 13 | | 64.56 | 5 | 4711 | .11 | |
| 14 | | 56.59 | 16 | 8530 | .19 | |
| 15 | | 44.33 | 11 | 12582 | .09 | |
| 16 | | 31.30 | 10 | 17048 | .06 | |
| 17 | | 79.38 | 1 | | | |
| 18 | | 48.73 | 81 | 10112 | .80 | |

Y