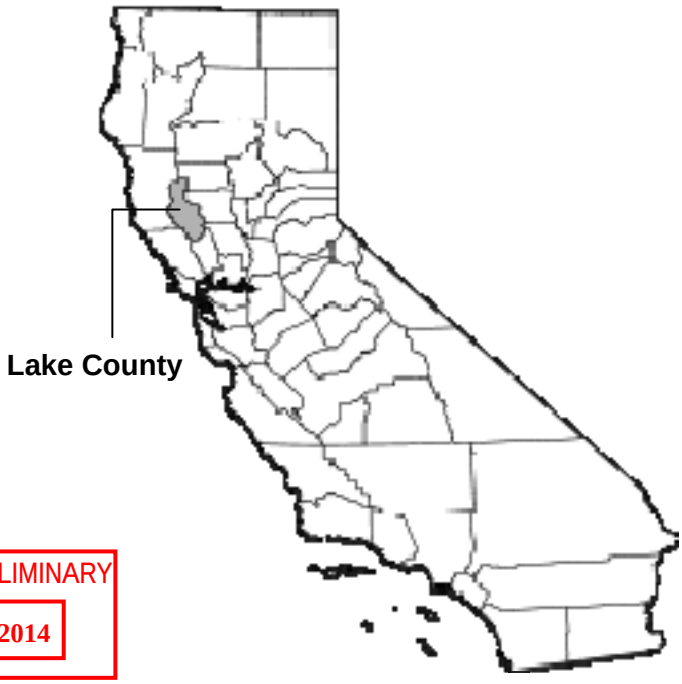
FLOOD INSURANCE STUDY

VOLUME 1 OF 2

LAKE COUNTY, CALIFORNIA

AND INCORPORATED AREAS

Community Name	Community Number
BIG VALLEY BAND OF POMO INIDANS	060397
CLEARLAKE, CITY OF	060714
LAKE COUNTY (UNINCORPORATED AREAS)	060090
LAKEPORT, CITY OF	065038



REVISED PRELIMINARY

JUNE 18 2014

REVISED

Month Day, Year

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER

06033CV001B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This preliminary revised Flood Insurance Study contains profiles presented at a reduced scale to minimize reproduction costs. All profiles will be included and printed at full scale in the final published report.

Part or all of this Flood Insurance Study may be revised and republished at any time. In addition, part of this Flood Insurance Study may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the Flood Insurance Study. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current Flood Insurance Study components.

Initial Countywide FIS Effective Date: September 30, 2005

First Revised Countywide FIS Date: Month xx, 201x

TABLE OF CONTENTS

Volume 1 – Month Day, Year

Page

1.0 INTRODUCTION 1

1.1 Purpose of Study 1
1.2 Authority and Acknowledgments 1
1.3 Coordination 5

2.0 AREA STUDIED 6

2.1 Scope of Study 6
2.2 Community Description 9
2.3 Principal Flood Problems 16
2.4 Flood Protection Measures 19

3.0 ENGINEERING METHODS 21

3.1 Hydrologic Analyses 21
3.2 Hydraulic Analyses 39
3.3 Vertical Datum 47

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS 49

4.1 Floodplain Boundaries 50
4.2 Floodways 51

5.0 INSURANCE APPLICATIONS 53

6.0 FLOOD INSURANCE RATE MAP 81

7.0 OTHER STUDIES 81

8.0 LOCATION OF DATA 83

9.0 BIBLIOGRAPHY AND REFERENCES 83

10.0 REVISION DESCRIPTIONS 85

10.1 First Revision (Revised Month Day, Year) 86

FIGURES

Figure 1: Frequency Discharge, Drainage Area Curves 29
Figure 2. Floodway Schematic 52

TABLE OF CONTENTS (continued)

Page

TABLES

Table 1: Summary of Flooding Sources Presented in Current Study 5
Table 2: Initial and Final CCO Meetings 6
Table 3: Flooding Sources Studied by Detailed Methods 7
Table 4: Letters of Map Correction Incorporated into Current Study 9
Table 5: Contributing Drainage Areas 13
Table 6: Stream Gradients 14
Table 7: Flood Stages for Clear Lake since 1915 17
Table 8: Stream Gage Locations used for Flow Frequency Curves 22
Table 9: Summary of Lake Stages for Pre-Countywide FIS Reports 24
Table 10: Summary of Discharges 25
Table 11: Summary of Stillwater Elevations for First Countywide FIS Report 39
Table 12: Summary of Roughness Coefficients 43
Table 13: Stream-by-Stream Datum Conversion Factors 47
Table 14: Floodway Data 54
Table 15: Community Map History 82

VOLUME 2
Month Day, Year

EXHIBITS

Exhibit 1 – Flood Profiles

8th Avenue Drain – North Tributary	Panels	01P-02P
8th Avenue Drain – South Tributary	Panel	03P
17th Avenue Drain	Panels	04P-05P
Adobe Creek	Panels	06P-08P
Anderson Creek	Panels	09P-11P
Blue Lakes Tributary	Panels	12P-13P
Burns Valley Creek	Panels	14P-15P
Burns Valley Creek Overflow	Panels	16P
Butts Canyon Creek	Panels	17P-19P
Cache Creek	Panels	20P-21P
Clover Creek	Panels	22P-23P
Cole Creek	Panels	24P-26P

VOLUME 2
Month Day, Year

TABLE OF CONTENTS (Continued)

Exhibit 1 – Flood Profiles (continued)

Copsey Creek	Panel	27P-28P
Coyote Creek	Panels	29P
Dry Creek	Panels	30P-31P
Forbes Creek	Panels	32P-35P
Gallagher Creek	Panels	36P
Herndon Creek	Panels	37P-38P
Highland Creek	Panels	39P
Kelsey Creek	Panels	40P-42P
Long Valley Creek	Panels	43P-45P
Long Valley Creek – Right Overbank Splitflow	Panel	46P
Manning Creek	Panels	47P-48P
Middle Creek	Panels	49P-52P
Molesworth Creek	Panel	53P
Morrison Creek	Panels	54P-55P
North Branch Forbes Creek	Panel	56P
Pier 1900 Drain	Panels	57P-58P
Pool Creek	Panel	59P-60P
Putah Creek	Panels	61P-66P
Putah Creek – Left Overbank	Panel	67P
Scotts Creek	Panels	68P-75P
Seigler Canyon Creek	Panel	76P
St. Helena Creek	Panels	77P-81P
Tenth Street Drain	Panel	82P
Thurston Creek	Panels	83P-86P
Todd Road Drain	Panel	87P
Wolf Creek	Panels	88P-89P

Exhibit 2 – Flood Insurance Rate Map Index (Published Separately)
Flood Insurance Rate Maps (Published Separately)

FLOOD INSURANCE STUDY

LAKE COUNTY, CALIFORNIA, AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Lake County, including the Big Valley Band of Pomo Indians, cities of Clearlake and Lakeport and the unincorporated areas of Lake County (referred to collectively herein as Lake County).

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This FIS has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates. This information will also be used by Lake County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP), and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain management requirements for participation in the NFIP are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS Report for this countywide study have been produced in digital format. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and geographic information standards and is provided in a digital format so that it can be incorporated into a local Geographic Information System and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

For this revision of the countywide FIS, new approximate hydrologic and hydraulic analyses were prepared by BakerAECOM, LLC, for FEMA under Contract No. HSFEHQ-09-368 Task Order HSFE09-09-J-001. This revised study was completed in November 2010.

The following streams were included in this approximate study:

- Hartley Drain
- Middle Creek
- North Branch Forbes Creek

- North Branch Forbes Creek Tributary 1
- North Branch Forbes Creek Tributary 2
- Pier 1900 Drain
- Rumsey Bay North Drain
- Rumsey Bay South Drain

Lake County (Unincorporated Areas)

The hydrologic and hydraulic analyses for the 1974 study were performed by the U.S. Army Corps of Engineers (USACE), Sacramento District, for the Federal Insurance Administration (FIA), under Interagency Agreement Nos. IAA-H-19-74 and IAA-H-7-76, Project Order Nos. 22 and 4, respectively. That work, which was completed in April 1976, covered all significant flooding sources affecting the City of Lakeport and the unincorporated areas of Lake County. Pertinent data from a 1986 restudy of the City of Lakeport, Lake County, were incorporated into the FIS report dated March 2, 1998.

The hydrologic and hydraulic analyses for the 1986 restudy were performed by the USACE, Sacramento District (the study contractor) for FEMA, under Interagency Agreement EMW-86-E-2226, Project Order No. 11. That work was completed in January 1988.

The hydrologic and hydraulic analyses for the first revision were performed by Michael Baker Jr., Inc. That study was completed September 30, 1992, and included Cache Creek from Clear Lake Dam to approximately 1,500 feet upstream of Lake Street.

Hydrologic and hydraulic analyses for the second revision were performed by Schaaf and Wheeler, Inc., for FEMA, under Contract No. EMW-92-C-4071. That study was completed in December 1994. It included applying FEMA levee policy to portions of Putah, Coyote, and Gallagher Creeks at their confluence and adding floodplain information for Butts Canyon, Copsey, Herndon, Long Valley, Wolf, and Morrison Creeks, 8th and 17th Avenue Drains, and Thurston Creek.

Clearlake, City of

The hydrologic and hydraulic analyses from the FIS report dated August 3, 1992, were performed by the USACE, Sacramento District, for the FIS reports for the City of Lakeport and Unincorporated Areas of Lake County, California (U.S. Department of Housing and Urban Development, 1978).

Revisions to the flooding information along Burns Valley Creek and Burns Valley Creek Overflow were based on information obtained from the USACE, Sacramento District, as part of the Limited Map Maintenance Program. The studies for those flooding sources

were completed on October 27, 1987. As a result of those studies, the study limit for Burns Valley Creek at Ogulin Canyon was extended to the upstream corporate limit, and the flooding information along Burns Valley Creek was revised to reflect the construction of a shopping center and channel improvement work.

That study was revised on August 3, 1992, to include the revision of hydrologic and hydraulic conditions along Cache Creek from Clear Lake Dam to approximately 1,500 feet upstream of Lake Street.

The analysis of flooding along Cache Creek between Clear Lake and Clear Lake Dam is complicated by the operation of outlet gates on the dam. The gates are usually held closed until Clear Lake has reached the 7.56-foot Rumsey Gage level, or the other levels defined in the currently effective Gopcevic Decree. When the gates are closed, flow past the dam must occur over spillways of very limited hydraulic capacity. Although the dam can pass flows greater than the 0.2-percent-annual-chance storm through the gated outlets and spillways, the spillwaters alone have limited hydraulic capacity until they are substantially overtopped.

When a rainstorm occurs over the Seigler Canyon Creek and Copsey/Herndon Creek areas while the gates at the dam are closed, some flow from these creeks will be stored in the Cache Creek channel. With limited flow possible over the dam spillways, tributary floods can exceed the available channel storage capacity and cause a flow reversal back through the Cache Creek channel and over the Grigsby Riffle (the outlet of Clear Lake) into Clear Lake. Differences in water-surface elevations of up to 4 feet above water-surface elevations on the main body of Clear Lake have been observed between the dam and the lake.

That study was revised on September 30, 1992, to include the revision of hydrologic and hydraulic conditions along Cache Creek from Clear Lake Dam to approximately 1,500 feet upstream of Lake Street.

The analysis of flooding along Cache Creek between Clear Lake and Clear Lake Dam is complicated by the operation of outlet gates on the dam. The gates are usually held closed until Clear Lake has reached the 7.56-foot Rumsey Gage level, or the other levels defined in the currently effective Gopcevic Decree. When the gates are closed, flow past the dam must occur over spillways of very limited hydraulic capacity. Although the dam can pass flows greater than the 0.2-percent-annual-chance storm through the gated outlets and spillways, the spillwaters alone have limited hydraulic capacity until they are substantially overtopped.

When a rainstorm occurs over the Seigler Canyon and Copsey/ Herndon Creek areas while the gates at the dam are closed, some flow from these creeks will be stored in the Cache Creek channel. With limited flow possible over the dam spillways, tributary floods can exceed the available channel storage capacity and cause a flow reversal back through the Cache Creek channel and over the Grigsby Riffle (the outlet of Clear Lake) into Clear Lake. Difference in water-surface elevations of up to 4 feet above water-surface elevations on the main body of Clear Lake have been observed between the dam and the lake.

The FIRM was updated to reflect new digital base map data. New base map information was derived from USGS digital quadrangles produced at a scale of 1:24,000 from photography dated 1996 or later.

Methodology for the digital conversion of the effective FIRM involved georeferencing raster images of the most recent FIRMs to the new base map, then on-screen digitizing and labeling of hydrologic, hydraulic, physiographic, and political features using ESRI ArcMap 8.3 and 9.0.

No new flood hazard data were reflected on the preliminary FIRM. The 1- and 0.2-percent-annual-chance annual chance flood hazard areas, floodways, and coastal high-hazard areas (V-zones) on the current FIRM for Lake County and the incorporated communities of the City of Lakeport and the City of Clear Lake may have been adjusted. In addition, the FIRM has been updated to incorporate two Letters of Map Revision (Case #00-09-577P, May 25, 2000, and Case #99-09-1129P, March 13, 2000).

Lakeport, City of

The hydrologic and hydraulic analyses for the 1974 study were performed by the USACE, Sacramento District, for the FIA, under Interagency Agreement Nos. IAA-H-19-74 and IAA-H-7-76, Project Order Nos. 22 and 4, respectively. That work, which was completed in April 1976 covered all significant flooding sources affecting the City of Lakeport and the unincorporated areas of Lake County.

The hydrologic and hydraulic analyses from the FIS report dated September 28, 1990, were performed by the USACE, Sacramento District, for FEMA, under Interagency Agreement No. IAA-EMW-86-E-2226, Project Order No. 11. That study was completed in January 1988.

In addition, the FIRM has been updated to incorporate a Letter of Map Revision (Case #94-09-155P).

Table 1 below provides a summary of the flooding sources within Lake County included in this current study.

Table 1: Summary of Flooding Sources Presented in Current Study

8th Avenue Drain	Herndon Creek
10th Street Drain	Highland Creek
10th Street Drainage Ditch	Kelsey Creek
17th Avenue Drain	Lake Pillsbury
Adobe Creek	Long Valley Creek
Anderson Creek	Manning Creek
Blue Lakes Tributary	Middle Creek
Burns Valley Creek	Molesworth Creek
Burns Valley Creek Overflow	North Branch Forbes Creek
Butts Canyon Creek	Pier 1900 Drain
Cache Creek	Pool Creek
Clear Lake	Putah Creek
Clover Creek	Scotts Creek
Cole Creek	Seigler Canyon Creek
Copsey Creek	St. Helena Creek
Coyote Creek	Thurston Creek
Dry Creek	Todd Road Drain
Forbes Creek	Wolf Creek
Gallagher Creek	Various Zone A Streams
Hartley Drain	

Base map information shown on this Flood Insurance Rate Map (FIRM) were derived from multiple sources. Base map information for Lake County and all incorporated communities were provided in digital format by Lake County, United States Geological Survey (USGS), the Bureau of Land Management, National Geodetic Survey (NGS), the United States Department of Agriculture (USDA) and the US Census Bureau.

The coordinate system used for producing this FIRM is NAD 1983 State Plane California II FIPS 0402. The horizontal datum was NAD 83, GRS 1980 spheroid. The Corner coordinates shown on the FIRM are in latitude and longitude referenced to the UTM projection, NAD 83. Differences in the datum and spheroid used in the production of FIRMs for adjacent counties may result in slight positional differences in map features at the county boundaries. These differences do not affect the accuracy of information shown on the FIRM (BakerAECOM, 2010).

1.3 Coordination

Consultation Coordination Officer's (CCO) meetings may be held for each jurisdiction in this countywide FIS. An initial CCO meeting (also occasionally referred to as the Scoping meeting) is held with representatives of the communities, FEMA, and the study contractors to explain the nature and purpose of the FIS and to identify the streams to be studied by detailed methods. A final CCO (often referred to as the Preliminary DFIRM Community Coordination, or PDCC, meeting) is held with representatives of the communities, FEMA, and the study contractors to review the results of the study.

For this revision of the countywide FIS, the initial CCO meeting was held on February 19, 2010, and attended by representatives of FEMA Region 9, community officials, BakerAECOM, LLC, and private engineering companies.

The final CCO meeting was held on _____ to review and accept the results of this FIS. Those who attended this meeting included representatives of_____, BakerAECOM (the Study Contractor), FEMA, and the communities. All problems raised at that meeting have been addressed in this study.The dates of the historical initial and final CCO meetings held for the communities within the boundaries of Lake County are shown in Table 2, "Initial and Final CCO Meetings."

Table 2: Initial and Final CCO Meetings

Community Name	Initial CCO Date	Final CCO Date
Lake County and Incorporated Areas	*	*
Lake County (Unincorporated Areas)	October 21, 1974	January 26, 1977
City of Clearlake	June 18, 1984	*
City of Lakeport	May 28, 1975	January 26, 1977

*Date not available

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Lake County, California, including the incorporated communities listed in Section 1.1. The scope and methods of this study were proposed to, and agreed upon, by FEMA and Lake County.

Adobe Creek upstream of Ben Hill Rd and all of Highland Creek were studied by detailed methods, and none of the remainder of streams that were previously studied by detailed methods were restudied. All the flooding sources except Adobe Creek and Highland Creek listed in Table 3, therefore, represent streams whose analyses were performed as part of a previous study.

Floodplain boundaries of 1.6 miles of stream were studied by detailed methods and 125 miles of streams that had been previously studied by detailed methods were redelineated based on more detailed and up-to-date topographic mapping for this revised FIS report. For this revision, a Vertical Datum Conversion from NGVD29 to NAVD88 and boundary adjustment was applied.

The areas studied by detailed methods were selected with priority given to all known flood hazards and areas of projected development or proposed construction. The flooding sources studied by detailed methods are presented in Table 3.

Table 3: Flooding Sources Studied by Detailed Methods

Flooding Source	Reach Length (miles)	Study Limits
8th Ave Drain North Tributary	0.49	Confluence of Clear Lake
8th Ave Drain South Tributary	3.49	Country Club Lane
10th Street Drain	0.5	Confluence of Clear Lake
17th Ave Drain	0.56	Confluence of Clear Lake
Adobe Creek	6.7	Confluence of Clear Lake
Anderson Creek	1.0	Confluence of Putah Creek
Blues Lakes Tributary	2.6	Confluence with Scotts Creek
Burns Valley Creek	3.5	Confluence of Clear Lake
Burns Valley Creek Overflow	1.93	Confluence of Clear Lake
Butts Canyon Creek	3.44	Confluence of Putah Creek
Cache Creek	3.44	Confluence of Clear Lake Dam
Clear Lake	N/A	N/A
Clover Creek	3.9	Confluence of Middle Creek
Cole Creek	4.6	Confluence of Clear Lake
Copsey Creek	1.42	Confluence of Cache Creek
Coyote Creek	1.95	Confluence of Putah Creek
Dry Creek	2.55	Confluence of Putah Creek
Forbes Creek	1.91	Confluence of Clear Lake
Gallagher Creek	0.3	Confluence of Coyote Creek
Hartley Drain	0.5	Confluence of Clear Lake
Herndon Creek	1.55	Confluence of Cache Creek
Highland Creek	0.6	Confluence of Adobe Creek
Kelsey Creek	6.2	Confluence of Clear Lake
Lake Pillsbury	N/A	N/A
Long Valley Creek	2.85	Confluence of North Fork Cache Creek

Table 3: Flooding Sources Studied By Detailed Methods

Flooding Source	Reach Length (miles)	Study Limits
Long Valley Creek – Right Overbank Splitflow	0.64	Confluence of Long Valley Creek
Manning Creek	3.7	Confluence of Clear Lake
Middle Creek	8.61	Confluence of Clear Lake
Molesworth Creek	1.2	Confluence of Clear Lake
Morrison Creek	0.6	Mouth of Clear Lake
North Branch Forbes Creek	0.47	Confluence of Forbes Creek
Pier 1900 Drain	0.64	Confluence of Clear Lake
Pool Creek	2.5	Confluence of Scotts Creek
Putah Creek	12.3	Above County Boundary
Putah Creek –Left Overbank	1.1	Confluence of Putah Creek
Scotts Creek	18.0	Confluence of Middle Creek
Seigler Canyon Creek	1.8	Confluence of Cache Creek
St. Helena Creek	5.5	Confluence of Putah Creek
Thurston Creek	5.6	Confluence of Thurston Lake
Todd Road Drain	0.4	Confluence of Manning Creek
Wolf Creek	1.8	Confluence of North Fork Cache Creek

All or portions of numerous flooding sources in the county were studied by approximate methods. For this revision, approximately 7.5 miles of Zone A flooding sources have been refined and re-established. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

This countywide FIS also incorporates the determination of letters issued by FEMA resulting in Letters of Map changes (Letter of Map Revision [LOMR], Letter of Map Revision – based on Fill [LOMR-F], and Letter of Map Amendment [LOMA]), as shown in Table 4.

Table 4: Letters of Map Correction Incorporated into Current Study

Case Number	Flooding Source(s)	Communities Affected	Effective Date	Type
00-09-577P	8th Avenue Drain, 17th Avenue (corrected hydrologic and hydraulic analyses)	Lake County, Unincorporated Area	May 25, 2000	LOMR
99-09-1129P	8th Avenue Drain, 17th Avenue (corrected hydrologic and hydraulic analyses)	Lake County, Unincorporated Area	March 13, 2000	LOMR

2.2 Community Description

Lake County is located in the west-central portion of the northern half of California. By principal highways, Lake County is approximately 100 miles north of San Francisco and 80 miles northwest of Sacramento. The closest major urban center is Santa Rosa, a city of 109,000 inhabitants in 1988 located approximately 50 miles (by principal highways) to the south. The county is generally situated between two main, north-south trending spurs of the Coast Range and lies midway between the Pacific Ocean on the west and the Sacramento Valley on the east.

Lake County was established in 1861 by setting it off from adjoining Napa County. The general region was originally inhabited by Pomo Indians, mainly because of an abundant source of food and large deposits of obsidian rock, which were used to make tools and weapons. The first non-Indian visitors to the region were Russo-American Fur Company hunters and trappers in 1811. A group of Oregon hunters spent the winter of 1824 in the area near present-day Lakeport. Permanent settlement started in the 1830s in conjunction with raising cattle in the Big Valley area by Salvadore and Juan Vallejo. Anglo-American occupancy started in the 1840s and dry farming was widely developed in the 1850s.

Favorable soils and climate led to cultivation of a variety of fruits in the 1860s, and fruit production became the dominant agricultural activity following introduction of the Bartlett pear in 1885. Borax was discovered in Lake County in 1856, and sulfur was obtainable in large quantities. Commercial operations for these minerals continued until rich deposits of cinnabar (mercury) were found. By 1856, mercury mines in Lake County formed the fourth largest source of supply in North America and so continued during their 40-50 year span of active production. Lumbering was also very important during the last few decades of the 19th century. Lumbering and mining have now significantly declined and have largely been replaced in the economic base of the county by the recreation and resort industries.

Early resorts were built around some of the mineral springs well before the turn of the century. The resort industry gained great impetus as better access from metropolitan areas was provided. Lake County offers exceptional opportunities for water-oriented activities and has attracted vacationers for many years.

The recreation-vacation industry is the most significant segment of Lake County's economy. Emphasis on tourism continues to grow as the demand for summer residences increases. Also, a decided trend has developed in which retired people are taking up permanent residence in the county.

Agriculture still forms a highly important segment of the economy, with over half the area under cultivation in pear and walnut orchards. Production of wine grapes has recently been introduced, and some walnut orchards are being converted to vineyards. Mining, lumbering, and other traditional extractive industries now form a relatively minor segment of the economy; however, the existence of geothermal resources in the county has resulted in exploratory drilling and the expectation of significant development activities.

Lake County had a permanent resident population of 22,000 to 23,000 people in the early 1970's. The seasonal population far exceeds the resident population during the vacation period, when the average daily population totals approximately 45,000. From 1940 to 1970, resident population increased at a rate of 3 percent annually, whereas the State average was 3.6 percent. The current annual rate of increase is approximately 4.5 percent, with people of retirement age comprising the majority of in-migration. The 1988 population estimate is 51,000.

In the year 2000, the population of the County, including the two cities, was 58,309 (U.S. Census Department).

The principal urban centers are located along the rim of Clear Lake. While these urban centers are not large, approximately two-thirds of the permanent residents live in them. The rate of population growth in lakeshore areas is (and is projected to be) greater than for the county as a whole. The larger communities along the lakeshore are Lakeport, Clearlake Highlands, Clearlake Oaks, Lucerne, Upper Lake, and Kelseyville. Middletown, which is located in the Putah Creek drainage, is the only other urban area within the county.

Commercial development in Lake County is largely concentrated along the rim of Clear Lake and is dominated by enterprises serving the needs of recreationists and vacationers who either stay in resorts or use trailer parks, campgrounds, and picnic areas. Fishing and boating are the most significant recreational activities, and an important portion of the commercial community is concerned with providing boats and motors (sales, rentals, services, and fuel), fishing tackle and bait, and water ski equipment. Another important segment of the commercial community serves the needs of farms, orchards, and vineyards.

Lake County is served by four State highways and a network of county roads. There are three small-aircraft airports around Clear Lake and a Forest Service landing strip at Lake Pillsbury. Float planes may land and take off from a fairway off Lakeport. Due to high construction costs resulting from the rugged topography of the region, railroads have not been extended into Lake County, and the nearest railroad connection is at Calistoga, approximately 16 miles south of Middletown.

Lake County is characterized by diversified topography. Its southern portion is typical California foothill country, with rolling hills and level valleys; the central portion is dominated by the Clear Lake depression; and its northern sector is mostly rugged mountains. Elevations range from approximately 600 feet, where Putah Creek crosses the southeastern county boundary, to over 7,000 feet at Snow Mountain on the eastern boundary. Much of the terrain in headwater areas, especially in the northern sector, is quite precipitous.

As noted earlier, drainage from the northern part of Lake County is westward, directly to the ocean, and drainage in the central and southern sectors is eastward, to the Sacramento River. A small headwater area in the northern sector also drains east, but the stream is not included in this study. The approximate drainage areas of the major hydrographic subdivisions are shown in Table 5.

The City of Clearlake was incorporated in November 1980. It is located on the southeastern shore of Clear Lake, in south-central Lake County, in the west- central portion of the northern half of California.

The climate of the Clearlake area is classified as temperate and semiarid. Summers are dry and warm, and winters are wet and mild. Average monthly temperatures vary from the 80°F range in July to the 40°F range in January. Annual precipitation averages 25 inches in the Clearlake vicinity; more than 50 percent of the annual precipitation normally occurs from December through February.

According to City of Clearlake Planning Department estimates, the present population is approximately 13,000. The area s economy is based primarily on agriculture and water-oriented recreation. Tourism is increasing. The seasonal population is often more than twice the permanent resident population and the demand for services increases accordingly.

Floodplains in the City of Clearlake are heavily developed, with commercial and residential buildings, public utilities, and agricultural improvements. Commercial development is concentrated on the Clear Lake floodplain, with residential development both on the floodplain and along the lower reaches of Burns Valley Creek and Overflow and Molesworth Creek. There is limited residential and recreational development along Cache Creek in the study area.

Continuing economic development within the study area is expected, and pressures leading to intensified floodplain use will undoubtedly accompany such development.

The City of Lakeport is located on the western shore of Clear Lake, in west- central Lake County, in northwestern California. It is approximately 7 miles northwest of Kelseyville, 9 miles south of Upper Lake, and 45 miles north of Santa Rosa, the closest major metropolitan area. San Francisco is approximately 90 miles to the south and Sacramento, the State Capital, is approximately 80 miles to the southeast.

Lakeport was established in 1856, approximately 5 years prior to the formation of Lake County. Originally known as Forbestown, the Lakeport townsite developed around a 40-

acre tract deeded for the location of the county seat from 160 acres owned by William Forbes at the time the county was formed. Forbes Street in Lakeport now commemorates his name. The community was renamed Lakeport when the county was established. It was incorporated in 1888. The community has always been the principal trading center for agricultural, industrial, and more recently, recreational interests.

Clear Lake offers exceptional opportunities for water-oriented activities and has attracted many vacationers and recreationists for years. The recreation/vacation industry has been and remains a most significant segment of the city's economic base. Although development in the study area is mainly residential, a substantial number of water-oriented commercial facilities exist. Emphasis on tourism continues to grow and the demand for summer residences increases.

The seasonal population exceeds the resident population during the vacation period. The resident population of Lakeport has increased slowly over the past several years. The population in 1980 was 3,675, whereas in 1987 it had increased only to 4,240, an average yearly increase of less than 2 percent (California Department of Finance, 1987).

The climate of the Lakeport area is classified as temperate semiarid and is characterized by hot, dry summers and mild, wet winters. Normal annual precipitation for the area is approximately 28 inches, and over 90 percent of it occurs between October and April. Snowfall is negligible and does not affect runoff. The temperature ranges from winter lows slightly below freezing to summer highs above 100 degrees Fahrenheit (°F). The average monthly temperature varies from approximately 40°F in January to approximately 80°F in July.

The original vegetation in the area (a ground cover of hardy native grasses and stands of large valley oak trees) has been drastically modified, initially by agricultural operations and subsequently by residential expansion and commercial development. In the foothill and lower mountain areas west of Lakeport, where most of the streams studied originate, dense brush and open grasslands are interspersed with some pine and oak trees. The city is bordered by low foothills on the north, west, and south, and by the waters of Clear Lake on the east.

All flows in the study areas drain easterly to Clear Lake, either directly or, in the case of North Branch Forbes Creek, indirectly via Forbes Creek. Headwater elevations of the streams studied are not very high and stream slope ranges from moderate to gradual. The channels of the streams studied are fairly well defined in the foothill areas; however, downstream from the foothills, the stream channels are less distinct and the stream gradients are quite flat. Also, the carrying capacity of the streams in the lower areas is reduced due to debris buildup and vegetative growth in the channels. The streams are intermittent and their highest flows normally occur between mid-fall and late winter.

As previously noted, runoff for the study streams (except Rumsey Bay North Drain, which begins at a small reservoir approximately 0.33 mile east of State Highway 29) originates in the foothills west of State Highway 29.

Ground and air access to the area is limited. The area is served principally by State Highway 29, some county roads, and a network of city streets. Small-aircraft services are available in the immediate area. Due to high construction costs resulting from the rugged topography of the region, railroads have not been extended into Lake County. The nearest point for major railroad and air service connections is at the City of Ukiah, approximately 30 miles to the northwest. The San Francisco Bay/San Pablo Bay area, from 70 to 90 miles to the south, provides world-wide shipping connections.

Table 5: Contributing Drainage Areas

Stream	Contributing Drainage Area		Maximum Elevation (feet)	Average Gradient in Study Area[1]
	Index Point	Square Miles		
Cache Creek	*	310[3]	*	*
Clear Lake	*	460[2]	*	*
Eel River	*	300	*	*
Forbes Creek	At Mouth	3.18	1,760	12.3
Hartley Drain	At Mouth	0.48	1,480	4.7
North Fork Cache Creek		220	*	*
North Branch Forbes Creek	Near Russell Street	0.35	1,500	5.3
Pier 1900 Drain	Near Main Street	0.91	2,180	12.6
Putah Creek		200	*	
Rumsey Bay North Drain	At Mouth	0.15	1,360	10.7
Rumsey Bay South Drain	At Mouth	0.24	1,440	11.9
Tenth Street Drain	At Mouth	0.56	1,520	5.5

* Data not available
[1] Feet per 1,000 feet
[2] Excludes the water-surface area of the lake
[3] Excludes Clear Lake tributaries; includes the drainage area of the north fork

The tributary areas of the principal streams under study show pronounced dendritic patterns, and the streamways are steep and well defined. Stream gradients near Clear Lake, however, are quite flat, and floods produce high peak flows that exceed channel capacities and spread overland. Stream gradients in feet per mile under study are shown in Table 6.

Table 6: Stream Gradients

Stream and Reach	Average Gradient (feet per mile)
Cache Creek	
From Clear Lake Dam to mouth of North Fork Cache Creek	40
From mouth of North Fork Cache Creek to county line	20
Eel River	
From Lake Pillsbury to county line	20
Kelsey Creek	
Headwater area	70
Near mouth	10
Middle Creek	
Near gaging station near Upper Lake	20
Near mouth	3
North Fork Cache Creek	
Below Indian Valley Dam	70
Near mouth	20
Putah Creek	
From vicinity of Middletown to county line	30
Scotts Creek	
Near Lakeport Lake damsite	20
Near mouth	3

Clear Lake, Lake Pillsbury, and Indian Valley Reservoir are the principal bodies of water in Lake County. Clear Lake, the largest freshwater lake entirely in California, covers an area of 64 square miles at a normal lake level of 1,320 feet. Its principal tributaries are Scotts, Middle, Clover, Kelsey, and Adobe Creeks. The creeks enter the north end of the lake by way of Rodman Slough, Kelsey, and Adobe Creeks. Outflow from the lake is controlled by a small dam on Cache Creek. Active storage capacity is defined by a court decree that sets upper and lower stages. Within these decree limits, storage capacity is approximately 315,000 acre-feet.

Lake Pillsbury, a power and irrigation project in the Eel River drainage, is situated in the northwest corner of the county. The reservoir has a surface area of approximately 3 square miles, a lake level of approximately 1,800 feet, and a storage capacity of 87,000 acre-feet.

Indian Valley Reservoir is a multiple purpose project located 11 miles upstream from the mouth of North Fork Cache Creek. It has a surface area of approximately 6 square miles, a storage capacity of 300,000 acre-feet, and a gross pool elevation of 1,485 feet.

Other, less important bodies of water in Lake County are Upper and Lower Blue Lakes, Thurston Lake, Borax Lake, Little Borax Lake, and Highland Lake. Some of the lakes at the higher elevations are intermittent.

The climate in Lake County is classified as temperate semi-arid and is characterized by dry, rainless summers with high daytime temperatures and warm nights. Winters are wet, with moderate temperatures. Mean annual precipitation ranges from 25 inches around Clear Lake to 80 inches in the highest areas of the Putah Creek basin. More than half the annual precipitation normally occurs from December through February. Average monthly temperature varies from the forties in January to the eighties in July, but extremes of 12°F in winter and 114°F in summer have been recorded. Precipitation occurs almost entirely as rain.

Snow occurs almost every winter in the higher elevations, but it usually either melts as it falls or lasts for only a few days. Killing frosts may occur from November through April, and provisions have been made for orchard heating.

Vegetation in Lake County is quite varied. The foothill and lower mountain areas are covered by dense brush, interspersed with some pine and oak trees and open grasslands. The northern mountainous areas are largely covered with dense conifer forests. In valley floor areas, especially around the perimeter of Clear Lake, original vegetation (stands of large valley oak trees and ground cover of hardy native greases) has been drastically modified by agricultural operations that involve clearing almost all of the native trees.

Floodplain development in the Eel River sector of the study area is very limited. Floodplains around Clear Lake abound with commercial and residential developments, public utilities, and agricultural improvements. Numerous residential streets, several county roads, and four state highways are either located in or traverse the floodplains of Clear Lake and the tributary streams, and there are approximately 200 resort-type installations, excluding trailer parks and campgrounds, located here. Water-oriented recreational facilities, such as docks, launching ramps, beaches, boat repair shops, and parks, are located along the lakeshore. Development along the tributaries of Clear Lake is largely residential and confined to the lower reaches except in Scotts, Bachelor, Middle Creek, Clover, and Big Valleys, where there are extensive agricultural improvements.

With the exception of residential and recreational improvements along Cache Creek near Clear Lake, floodplain development in the Cache Creek Sector of the study area is presently insignificant due to limited access.

Floodplain development in the Putah Creek area is mostly agricultural except for the portion of Middletown subject to overflow from Putah Creek tributaries.

Continuing economic development within the study area is expected, and pressures leading to intensified floodplain use will undoubtedly accompany such development.

2.3 Principal Flood Problems

Flooding in Lake County results from prolonged heavy rainfall over tributary areas during the period from November through March. Flooding is more severe either when antecedent rainfall has caused saturated ground conditions or when the ground is frozen in the higher elevations and infiltration is minimal. On rare occasions, melting snow could augment runoff from general rain. Rain flooding on streams is characterized by high peak flows with durations of 2 to 3 days. On Clear Lake, stage could continue above flood level for many days. In the northern sector of the county, floods in the Eel River drainage would be extremely rare events and, due to the lack of development, damage potential is minimal. The outlets of Lake Pillsbury are normally open during the winter and closed during spring to store for power and irrigation. The channel downstream is capable of containing all high flows that could reasonably be expected.

Of the streams, tributaries to Clear Lake, Scotts, Cole, Kelsey, and Adobe Creeks have the most serious flooding problems. These streams also contribute significantly to high lake stages and lakeshore flooding. Windset may increase the depth and extent of shoreline flooding, but the most important factor is inadequate outlet capacity, which increases and prolongs high lake stages. Clear Lake Dam is capable of impounding water in the lake to an elevation of 10.3 feet on the Rumsey gage (located on the city wharf in Lakeport) or approximately 1,329 feet above the National Geodetic Vertical Datum 1929 (NGVD). The gage datum is 1318.26, and lake stages are converted to elevations above NGVD by adding this figure.

Orders of the Superior Court of the State of California in and for the County of Mendocino set limits to raising the level of Clear Lake (M.M Gopcevic et. al. versus Yolo Water and Power Company, a corporation et. al., October 7, 1920). These orders prohibit raising Clear Lake above 7.56 feet above zero on the Rumsey Gauge; the level may be raised above 7.56 feet but not above 9.00 feet for a period not exceeding ten successive days during storms. It is not physically possible to operate within these limits because outflow is restricted by the Grigsby Riffle, a natural restriction on the outlet channel upstream of the dam. In order to reduce flooding, efforts were made in 1938 to reduce the restriction at the Grigsby Riffle. However, the courts stopped these actions. The Superior Court of the State of California in and for the County of Yolo prohibited changing the outlet of Clear Lake to increase the flow of waters from Clear Lake into Cache Creek (Mary E. Bemmerly and Agnes H. Bemmerly versus the County of Lake et. al., December 18, 1940). In essence, the effect of the court orders is to prolong flood stages and prevent their rapid reduction. Flood conditions along the lakeshore may continue for as long as 90 days.

Flood problems along Cache Creek downstream from Clear Lake are largely confined to the main stem reach in the vicinity of Lower Lake and along the lower reaches of North Fork Cache Creek. In the Putah Creek basin, the principal flood problems are in Coyote and Collayami Valleys and in Middletown.

Clear Lake, its tributaries, and other streams in Lake County have a long history of flooding. Several flood periods are documented during the last half of the 20' Century, and many severe floods have occurred since 1900. Stage recordings for Clear Lake have

been maintained since 1874. These records show that a 7.56-foot stage on the Rumsey Gage has been exceeded 54 times and a 9-foot stage on the Rumsey Gage has been exceeded 27 times. Some of the most damaging floods of recent times have occurred in 1937-38, 1940, 1956, 1958, 1964-65, 1970, 1974, 1983, and 1986.

The maximum known stage on Clear Lake, 13.66 feet, occurred in January 1890. The next highest stage, 13.38 feet, occurred in February 1909. Some of the higher lake stages that have occurred since construction of Clear Lake Dam in 1915 are shown below. The elevation figure represents a combination of lake stage and appropriate gage elevation datum; gage datum (feet NGVD): 1,318.59 feet through 1947; 1,318.65 feet 1947 through 1982; 1,318.26 feet to present (U.S. Department of the Interior, Water Resources Data, Gage No. 11450000).

Table 7: Flood Stages for Clear Lake since 1915

Date	Stage (feet)	Elevation (feet NGVD)
February 1938	10.25	1,328.84
February 1942	9.60	1,328.19
February 1956	9.53	1,328.18
February 1958	10.86	1,329.51
January 1965	9.03	1,327.68
January 1970	10.37	1,329.02
April 1974	9.10	1,327.75
February 1980	9.61	1,328.26
April 1982	9.17	1,327.82
March 1983	11.32	1,329.58
February 1986	11.34	1,329.60
March 1995	10.73	1328.99
February 1998	11.44	1329.70

In 1958, the lake level exceeded decree level (7.56 feet) on February 4, was 10.2 feet at the time of peak tributary inflow on February 24, and reached its maximum in 50 years (10.88 feet) on February 27. After slowly receding to 8.0 feet on March 20, the lake again rose to 10.0 feet on April 6 and did not recede to decree level until early June. The maximum possible release from the lake happened during the entire period.

In general, major floods inundate highly developed agricultural lands and urban-suburban residential and commercial properties and create high lake stages and resultant flooding along lakeshores. Flooding kills or damages orchards, vineyards, and pasture; destroys

livestock; keeps land out of production; damages farm and ranch improvements; erodes farmland; and overtops and washes out roads, bridges, and flood control improvements. High lake stages result in damage to lakeside dwellings and business structures, developed recreational areas, piers, and boats. In 1958, the entire lakeshore area was rendered inactive for recreational use for 3 months.

Flooding in the summer and early fall may result from localized cloudburst storms over one or more of the drainage areas, or in the fall, winter, and spring from severe sequences within a general rainstorm. Also, it may occur along the lakefront area due to high lake stages and windset, either coincidentally with the cloudburst storms or as a separate event in the winter or spring.

Cloudburst storms sometimes lasting as long as 3 hours can occur in the study area practically anytime during the year and, as noted above, may occur as an extremely severe sequence within a general rainstorm. Cloudbursts are high- intensity storms that can produce floods characterized by high peak flows, short duration of floodflows, and small volume of runoff. In small drainage basins, such as those in this study, cloudbursts can produce peak flows substantially larger than those of general rainstorm runoff. Cloudburst storms usually cover small areas; however, since the combined drainages in this study collectively are less than 7 square miles, a cloudburst could cover the entire drainage area.

Windset is a condition consisting of high-velocity winds that cause wave buildup on the lake and, consequently, higher lake stages in the downwind direction.

There are no streamflow records for the study streams. Due to the absence of such records, the relatively rural nature of the study area, sparse newspaper accounts, and the scarcity of contemporary accounts of floods in the area, little definitive data are available for specific floods. Information on past floods is based essentially on brief newspaper articles and a few published and unpublished reports. However, Clear Lake and its tributaries reportedly have a long history of flooding.

In the last 50 years, Lakeport has experienced six stream bank overflow flood events. The flooding occurred in December 1937, February 1940, December 1964, January 1970, January 1983, and February 1986.

A downpour in mid-December 1937 caused Forbes Creek to overflow its banks and flood easterly along Martin Street for several blocks and then northerly along Main Street. Flooding also occurred along Tenth Street from Tenth Street Drain overflow. Residential, commercial, and agricultural properties were flooded and damaged. Substantial streambank erosion was caused and roads throughout the area were closed due to inundation by floodwaters and the deposition of debris.

The February 1940 floodwaters inundated property at several locations in Lakeport, especially along Martin Street from Forbes Creek to Main Street and along Tenth Street. The floodwaters inundated agricultural, residential, and commercial properties, and overflowed roads causing short-term closures.

During the December 1964 cloudburst, flooding on Martin Street looked like a full-fledged river. Main Street was flooded and some businesses were inundated. Others were sandbagged to prevent flooding. City crews worked many hours pumping water and sandbagging. Numerous streets were closed by floodwaters, and south of the city, much of State Highway 29 was covered by floodwaters and debris.

In January 1970, extensive rainfall caused flooding of 1- to 2-foot depths in lower, eastern parts of the city. Resort areas, trailer parks, and campgrounds were inundated, and traffic on some roads was diverted. Residential and commercial areas and public facilities suffered damages.

In January 1983, floodwaters forced the closure of streets and roads in various locations around town for indefinite periods of time. Several blocks of Martin and Armstrong Streets were closed as were Main Street at Tenth and Eleventh Streets and portions of major county and state highways northwest and south of the city. Flood fighting and sandbagging efforts took place on Martin and South Main Streets.

In February 1986, flooding affected practically all sections of Lakeport. In the northeastern section, city firefighters sandbagged in the Lakeshore Boulevard area and helped in evacuation work there. In the east-central section, floodwaters covered much of Tenth Street. In the west-central section, Compton and Spun Streets were flooded. In the southeastern section, portions of Martin and South Main Streets were impassable and along Esplanade, city firemen evacuated some residents. In the eastern section (the lakefront), water was in the front yards of lakeside homes and much sandbagging was done to prevent further damage. Sandbagging activities were accomplished throughout the city to protect residences and businesses. Sewer pumps in many areas were working 24 hours a day for an extended period to alleviate further problems.

Major floods in Lakeport, caused by cloudbursts and high lake stages, generally inundate residential and commercial properties and recreation/vacation facilities. Agricultural land is inundated causing erosion, damaged or destroyed crops, and loss of production. Streets, roads, and highways are either overtopped, washed out, or covered with debris causing the temporary cessation of traffic flow. Flood- fighting activities (such as sandbagging) are necessary, and the evacuation of flooded areas is sometimes required.

2.4 Flood Protection Measures

There are no flood control projects in the Eel River sector of the study area. However, Lake Pillsbury provides incidental flood protection to downstream areas if the reservoir is low at the beginning of a flood-producing storm.

The Middle Creek Improvement Project, completed by the USACE in 1967, protection for the community of Upper Lake and approximately 4,000 acres of agricultural land. The project consists of levees and incidental channel improvement work on Middle Creek, a diversion from Clover Creek to Middle Creek, and levees along lower Scotts Creek (USACE, 1967). Small flood-control reservoirs have been built on Adobe and Highland Creeks and a 5 mile segment of the Adobe Creek channel has been improved by the SCS under the authority of the Watershed Protection and Flood Prevention Act

(Public Law 83-566). These facilities, which are maintained by Lake County, provide 10-year flood protection to portions of Big Valley (U.S. Department of Agriculture, 1963 and 1967). Local interests have done some localized channel improvement work on Kelsey and Adobe Creeks, and extraction of sand and gravel from the channel of Kelsey Creek has improved its carrying capacity in the vicinity of Kelseyville. Clear Lake Dam (which was built across the channel of Cache Creek in 1919 for regulation of irrigation water) and court orders issued to stabilize the level of Clear Lake have changed historical flood conditions, but do not prevent damaging stages even during moderate floods.

Indian Valley Dam and Reservoir, a multiple purpose project on North Fork Cache Creek, became operational for the 1975-76 flood season. This 300,000 acre-foot project was authorized under the Small Reclamation Projects Act of 1956 (Public Law 84-984). A total of 40,000 acre-feet of storage space dedicated to flood control is to be operated according to rules and regulations prescribed by the Secretary of the Army to limit maximum controlled releases to 10,000 cubic feet per second (cfs) insofar as practical. The project will provide a high degree of flood protection along North Fork Cache Creek and mainstem Cache Creek downstream from the mouth of the North Fork Cache Creek. There are no flood control improvements in the Putah Creek sector of the study area.

Lakeport Lake is a 55,000 acre-foot multiple purpose project on Scotts Creek, approximately 4 miles west of Lakeport. The project also provides for flowage easements along the creek downstream from the dam (USACE, 1972). To date, this project has not been constructed. If completed, Lakeport Lake will protect agricultural lands in Scotts Valley and lessen the impact of some floods along the shoreline of Clear Lake. The City of Clearlake is also investigating the feasibility of a channel improvement project on the Burns Valley Creek system.

A subsequent USACE Reconnaissance Report, dated October 1992 (USACE, 1992), concluded that only non-structural measures were economically feasible. The USACE also studied flood problems in the upper Putah Creek basin (USACE, Feasibility Report, Unpublished). The study was completed in 1976 and concluded that no improvements in this watershed were economically feasible.

No flood control projects affect the City of Clearlake. No flood-control projects exist that affect the City of Lakeport. Clear Lake Dam (which was built across the channel of Cache Creek in 1915 for regulation of irrigation water) and court orders were issued in 1929 and 1940 to stabilize the level of Clear Lake have changed historical flood conditions, but they do not prevent damaging stages even during moderate floods.

The USACE has prepared a study of flood and related water resource problems affecting the Clear Lake and Cache Creek basins (USACE, *Social and Economic Assessment*, unpublished). The study includes consideration of modifying the existing outlet channel of Clear Lake, which would improve the lakeshore flood situation and benefit water conservation and recreation.

Lake County has adopted a floodplain zoning ordinance that provides for preliminary and secondary floodplain zones along watercourses and describes limitations on land use. The

basic intent of the ordinance is to guide future development of floodplain lands toward optimum uses commensurate with the flood hazard.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

For this revision of the countywide study, new approximate hydrologic analyses were completed for existing Zone A streams in Lakeport and in a portion of the unincorporated areas. The first countywide study revised the hydrologic analyses that had been carried out for the communities within, and the unincorporated areas of, Lake County.

Hydrologic analyses were carried out to establish peak discharge frequency relationships for each flooding source studied by detailed methods affecting the community.

Precountywide Analyses

Prior to the first countywide FIS, FIS reports were prepared for each of the incorporated communities within, and the unincorporated areas of, Lake County. The hydrologic analyses described in those reports have been compiled and are summarized below.

Flood hydrographs and peak flows for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods for streams studied by detailed methods were based on rainfall-runoff computations and statistical analysis of stage and discharge records at gaging stations. The USACE standard project rainfall and flood concept and the unit hydrograph method of analysis were used in making rainfall-runoff computations. Standard project rainfall was based on criteria presented in two reports (USACE, 1958; USACE, 1971). The general rain-type storm produced the more severe flood conditions for most of the smaller drainage areas. Unit hydrographs were based on reconstitutions of historical flood events.

Computed standard project floods were used in conjunction with log-Pearson Type HI method statistical analysis (U.S. Water Resources Council, 1976) of available stream flow data to develop flow-frequency curves at the stream gage locations shown in Table 8.

Table 8: Stream Gage Locations used for Flow Frequency Curves

Gage	Approximate Drainage Area (miles)	Period of Record Used in Analysis
Burns Valley Creek Near Clearlake Highlands	4	1963-1975
Clover Creek Bypass Near Upper Lake	27	1962-1972
Dry Creek Near Middletown	8	1960-1972
Kelsey Creek Near Kelseyville	37	1947-1971
Middle Creek Near Upper Lake	48	1963-1973
North Fork Cache Creek Near Lower Lake	197	1930-1971
Putah Creek Near Guenoc	112	1931-1970
Scotts Creek Near Lakeport	54	1949-1968
Seigler (Canyon) Creek Near Lower Lake	13	1966-1973

Ratios (of the computed standard project flood to the computed 10-, 2-, 1-, and 0.2-percent-annual-chance floods at the gage sites) developed from the flow-frequency curves were used to determine flood events of the selected recurrence intervals in areas where stream gage data were not available.

Standard project floods for some of the smaller drainage areas were developed on the basis of local cloudburst-type storms. Rainfall amounts for computation of cloudburst floods other than the standard project flood were developed from a precipitation-frequency analysis of the Hopland 8 Northeast precipitation station (period of record, 26 years).

The 1-percent-annual-chance lake stage elevation at Lakeport was derived from a maximum annual stage-frequency curve that was developed for Clear Lake in 1985. The curve is based on maximum daily lake stages at Lakeport for a 70-year period (1914 through 1984) and a Standard Project Flood (SPF) lake stage of 13.4 feet. The SPF lake stage of 13.4 feet is assumed to have a 500-year recurrence interval.

Windset was considered in determining the flood stage. Frequency data for Lake Pillsbury were based on statistical analysis of lake stage records for the period from 1923 to 1974. The analysis was made by the USACE, San Francisco District.

Approximate 1-percent-annual-chance peak discharges were developed for areas studied by approximate methods. These flows were based on a drainage area-peak discharge curve prepared from computed standard project floods throughout the county. Standard project floods from the curve were reduced by appropriate percentages to approximate the 1-percent-annual-chance flood event.

The computational methods and techniques used are generally accepted for hydrologic analysis and produced results considered reasonable for the Lake County area. Unexpected findings were not encountered in carrying out the hydrologic analyses for this study.

Frequency data for Clear Lake stages were based on statistical analysis of records of the Rumsey Cage from 1913 to 1972. Windset was considered in determining the 10-, 2-, 1-, and 0.2-percent-annual-chance flood stages.

For the 1986 restudy around the City of Lakeport, flood hydrographs and peak flows for the 1-percent-annual-chance flood for the streams studied by detailed methods were based on rainfall-runoff computations and statistical analysis of synthetic localized cloudburst storms of a 3-hour duration. Procedures used included the unit hydrograph method of analysis and the USACE HEC-1 computer program (USACE, 1981). Streamflow routings were based on storage-discharge relationships developed for reaches along each stream.

There are no flow records for the streams included in this restudy. Therefore, the unit hydrographs computed for this study were based on a 1972 S-curve that was developed for Scotts Creek near the Lakeport gaging station.

Hourly rainfall records are not available for Lakeport; only daily records are maintained. Therefore, rainfall-runoff computations for the 3-hour storm in the area were based on precipitation-frequency data derived from the National Oceanic and Atmospheric Administration (NOAA) precipitation-frequency atlas for California (U.S. Department of Commerce, 1973) and the unit hydrograph method of analysis.

The California Department of Water Resources developed short-duration precipitation-frequency curves for climate stations near the City of Lakeport. These curves compare closely with data in the NOAA precipitation-frequency atlas (U.S. Department of Commerce, 1973). Consequently, precipitation- frequency amounts and aerial reduction factors for the 3-hour localized cloudburst storms for all the drainage basins in this study were derived from the NOAA data (U.S. Department of Commerce, 1973).

Loss rates for the 3-hour storms on the streams in the study area were derived from loss rate data developed for the December 1971 FIS for Lake County (U.S. Department of Housing and Urban Development, 1971). The loss rates were also based on the initial and uniform loss concept and on analyses of soil cover and land uses including impervious ratios.

The hydrologic analysis for this revision was performed by Michael Baker, Jr., Inc. (MBJ). For the hydrologic analysis, streamflow records from local, nearby streams and

Clear Lake stage records were analyzed to define long-term, synthetic floodflow records for sites on Cache Creek below the main body of the lake, and below the mouths of Seigler Canyon Creek and Copsey/Herndon Creeks. The synthetic records were based on a stage-discharge relationship for the outlet of Clear Lake (Grigsby Riffle) (California Department of Water Resources, 1985).

A log-Pearson Type III analysis of the synthetic floodflow records was used to estimate the 10-, 2-, 1-, and 0.2-percent-annual-chance peak flow rates for sites along Cache Creek.

Stage-frequency relationships for Clear Lake and Lake Pillsbury are summarized in Table 9. Drainage area-peak discharge relationships for streams studied by detailed methods in the City of Clear Lake are shown in Figure 1, “Frequency-Discharge, Drainage Area Curves.”

Table 9: Summary of Lake Stages for Pre-Countywide FIS Reports

Flooding Source	Stage (feet NAVD88)			
	10-percent-annual-chance	2-percent-annual-chance	1-percent-annual-chance	0.2-percent-annual-chance
Clear Lake	1,331.1	1,332.8	1,333.4	1,334.9
Lake Pillsbury	1,829.2	1,832.7	1,833.9	1,836.9

First Countywide FIS

Information on the methods used to determine peak discharge-frequency relationships for the streams restudied as part of the first countywide FIS is shown below.

A summary of peak discharge-drainage area relationships for streams studied by detailed methods is shown in Table 10, "Summary of Discharges." Drainage area-peak discharge relationships not presented in Table 10 are presented in in Figure 1, "Frequency-Discharge, Drainage Area Curves."

Table 10: Summary of Discharges

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
8TH AVENUE DRAIN					
North Tributary approximately 1,700 feet upstream of Lakeview Avenue	0.6	*	*	335	*
North Tributary upstream of Lakeview Avenue	0.68	*	*	398	*
South Tributary approximately 1,500 feet upstream of Lakeview Avenue	0.9	*	*	425	*
South Tributary upstream of Lakeview Avenue	0.98	*	*	486	*
At downstream confluence with tributaries	1.66	*	*	882	*
At Clear Lake	1.22	*	*	889	*
17TH AVENUE DRAINAGE					
Approximately 900 feet upstream of Lakeview Avenue	1.2	*	*	502	*
At Clear Lake	1.22	*	*	517	*
BUTTS CANYON CREEK					
Approximately 4,000 feet upstream of Butts Canyon Road	1.7	*	*	690	*
At road bend at Bidwell Avenue	6.8	*	*	2,610	*

*Data not available

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
COPSEY CREEK					
Approximately 900 feet upstream of Morgan Road	16.8	*	*	4,420	*
At confluence with Cache Creek	17.62	*	*	4,680	*
COYOTE CREEK					
At Hidden Valley Dam	5.4	*	*	1,640[1]	*
Below Hidden Valley Dam	6.4	*	*	1,980[1]	*
Below confluence of Gallagher Creek	9.83	*	*	2,860[1]	*
At confluence with Putah Creek	10.75	*	*	2,980[1]	*
FORBES CREEK					
At mouth	3.2	*	*	1,050	*
At State Highway 29	2.4	*	*	670	*
HARTLEY DRAIN					
At mouth	0.5	*	*	320	*
HERNDON CREEK					
Approximately 2,000 feet downstream of Morgan Road	3.0	*	*	1,140	*
At confluence with Cache Creek	4.9	*	*	1,730	*

*Data not available

[1] Estimated by the USACE, Sacramento District

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
LONG VALLEY CREEK					
Approximately 2.6 miles upstream of North Fork Cache Creek	34.1	*	*	8,880	*
At confluence with North Fork Cache Creek	39.0	*	*	10,170	*
MORRISON CREEK					
Approximately 900 feet upstream of Lakeview Avenue	1.7	*	*	680	*
At Clear Lake	1.9	*	*	750	*
NORTH BRANCH FORBES CREEK					
At mouth	0.35			220	*
PIER 1900 DRAIN					
At mouth	0.9	*	*	470	*
At State Highway 29	0.8	*	*	410	*
PUTAH CREEK					
Above Coyote Creek	92.92	*	*	36,460[1]	*
Below Coyote Creek	103.67	*	*	39,440[1]	*
At Guenoc Gage	112.4	*	*	40,000[1]	*
RUMSEY BAY NORTH DRAIN					
At mouth	0.15	*	*	130	*

*Data not available

[1] Estimated by the USACE, Sacramento District

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
RUMSEY BAY SOUTH DRAIN					
At mouth	0.24	*	*	170	*
TENTH STREET DRAIN					
At mouth	0.6	*	*	340	*
THURSTON CREEK					
At Lower Lake Road	4.9	*	*	1,630	*
Approximately 5,600 feet downstream of Northern Soda Bay Drive	11.6	*	*	3,390	*
TODD ROAD DRAIN					
At mouth	1.1	*	*	520	*
WOLF CREEK					
At Doe Canyon confluence	16.1	*	*	5,790	*
At confluence with North Fork Cache Creek	18.8	*	*	6,620	*
CACHE CREEK					
Outlet of Clear Lake (Grigsby Riffle)	447	3,866	5,049	5,551	6,912
Clear Lake Dam	484	5,326	7,407	8,371	10,539

*Data not available

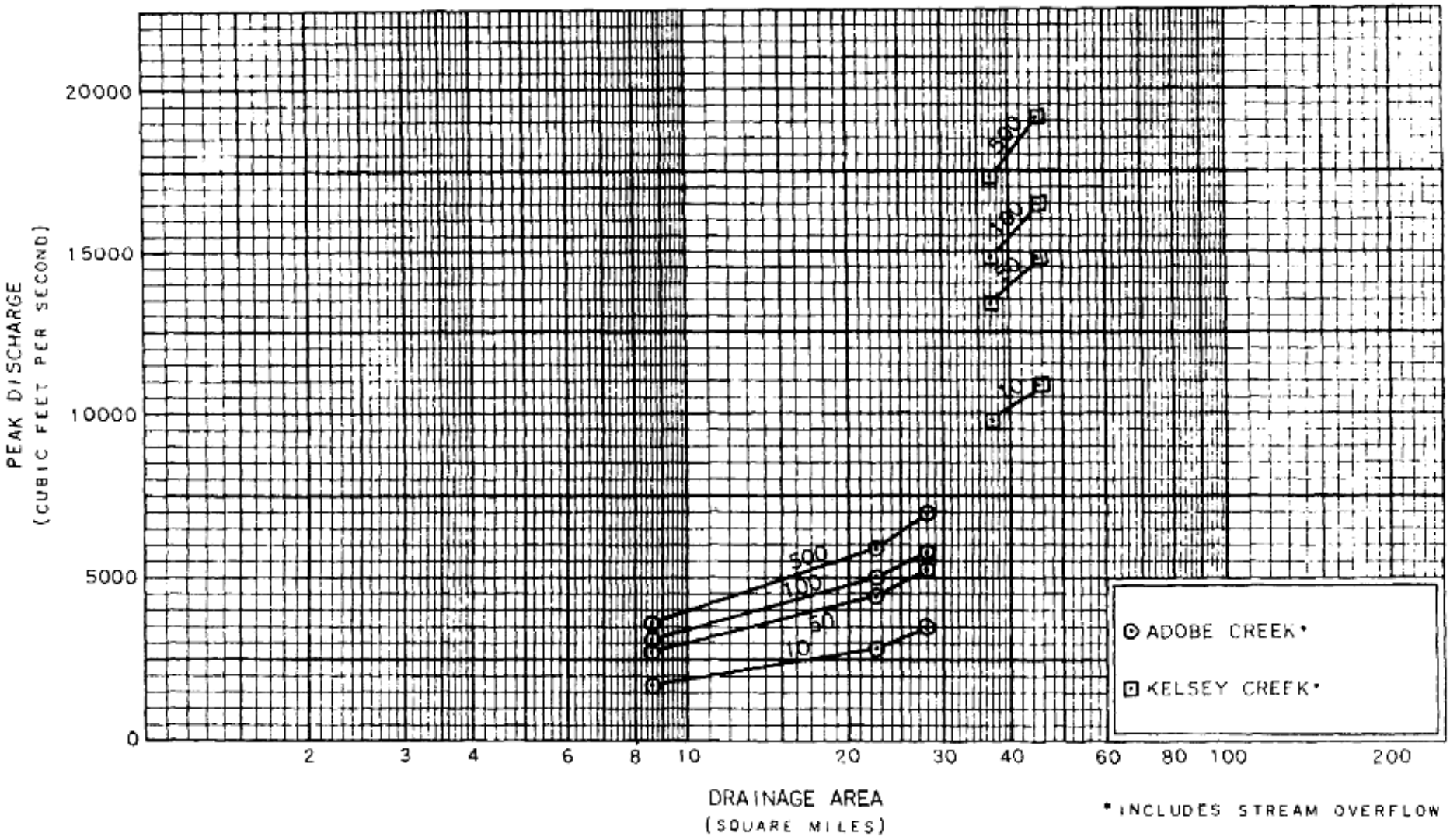


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

ADOBE CREEK AND KELSEY CREEK

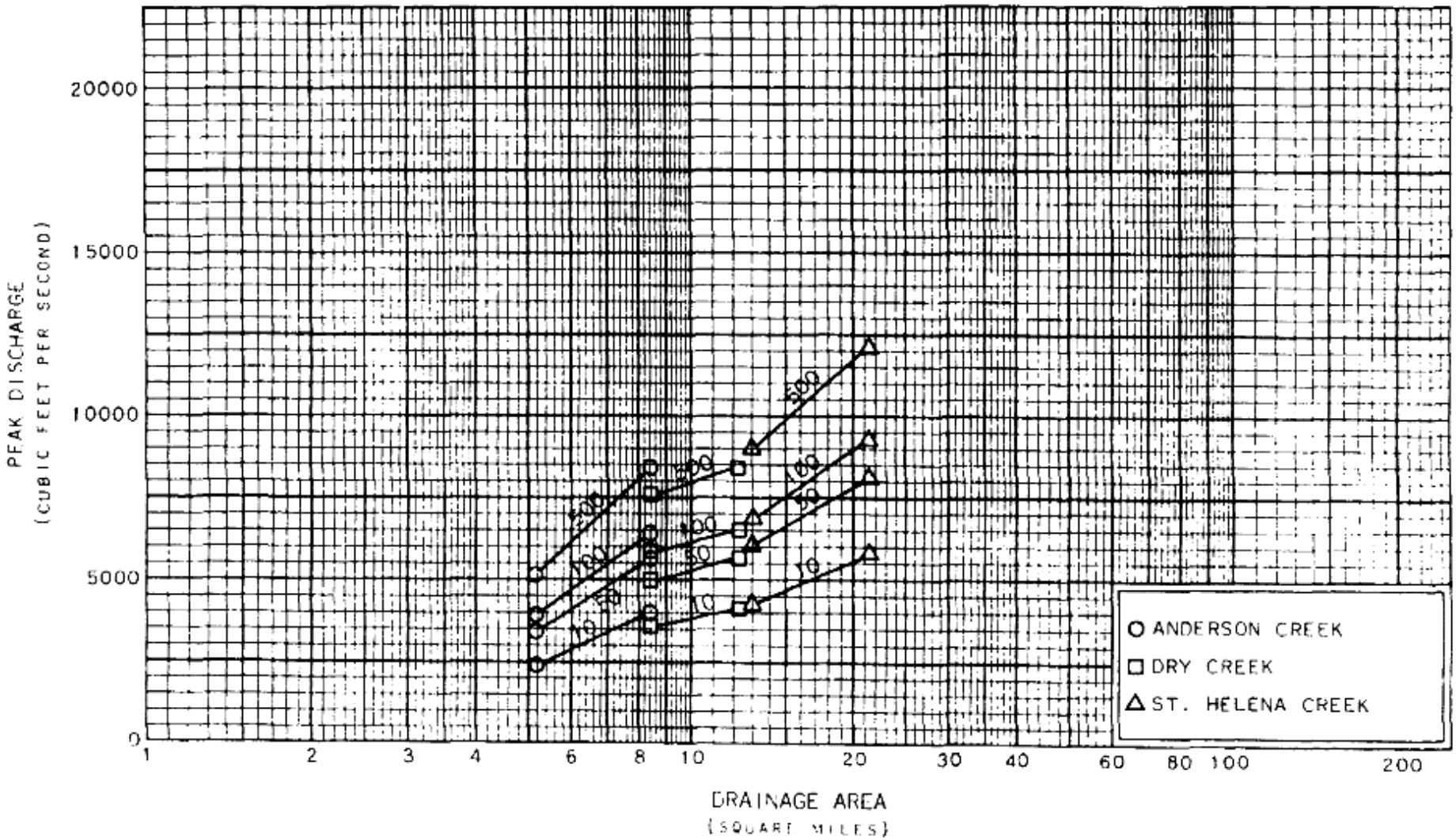


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

ANDERSON, DRY, AND ST. HELENA CREEKS

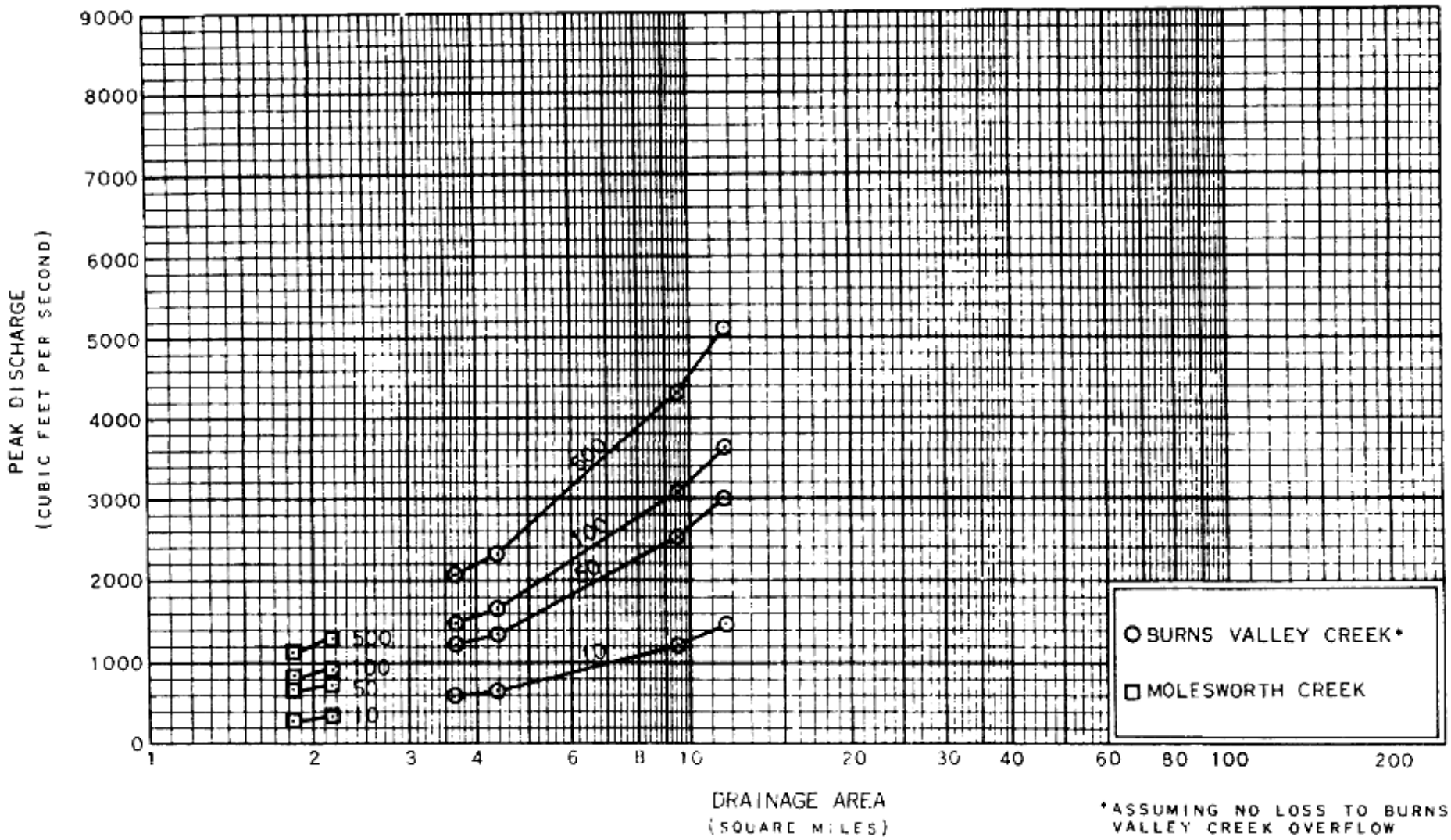


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

BURNS VALLEY CREEK AND MOLESWORTH

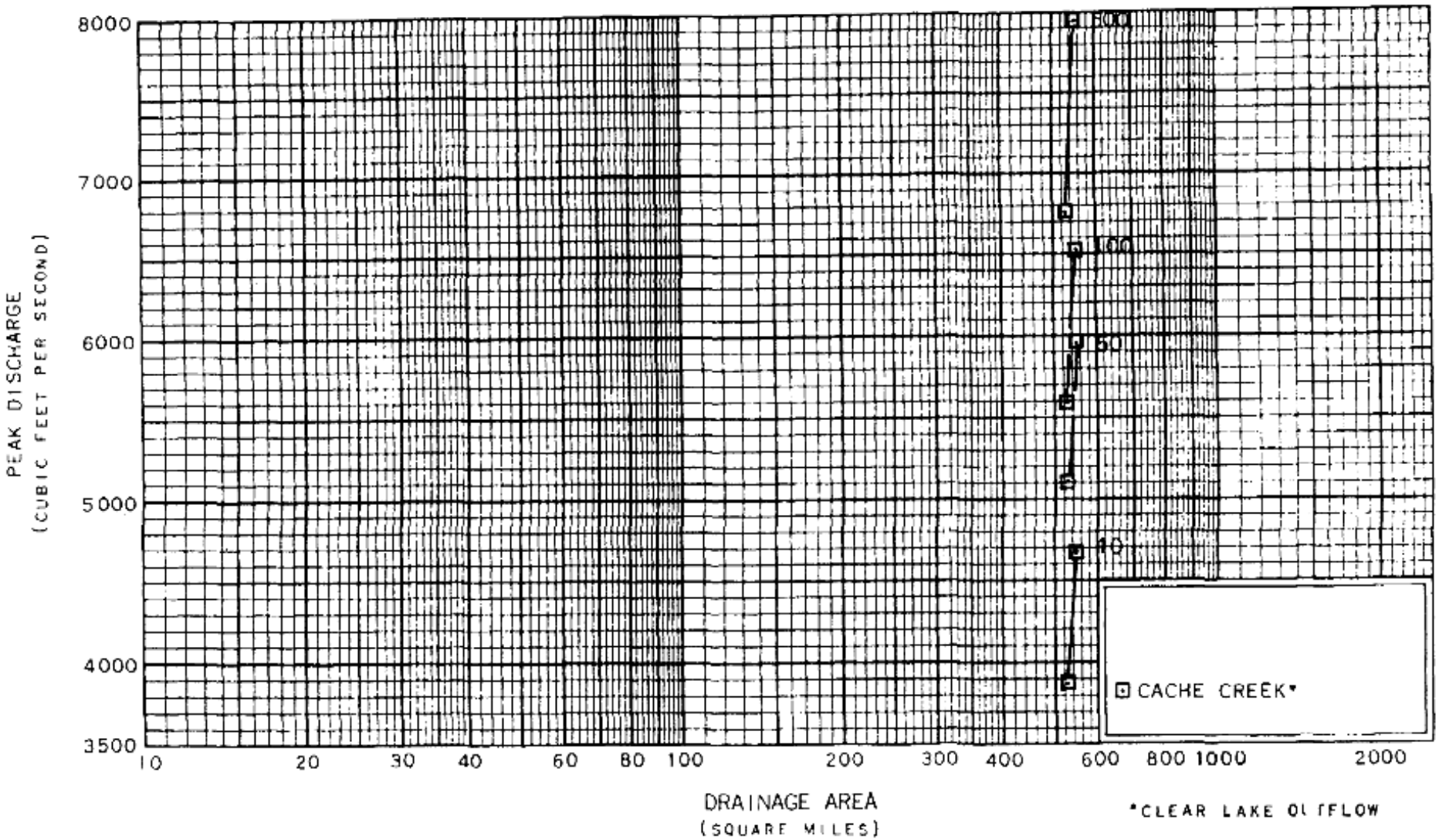


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

CACHE CREEK

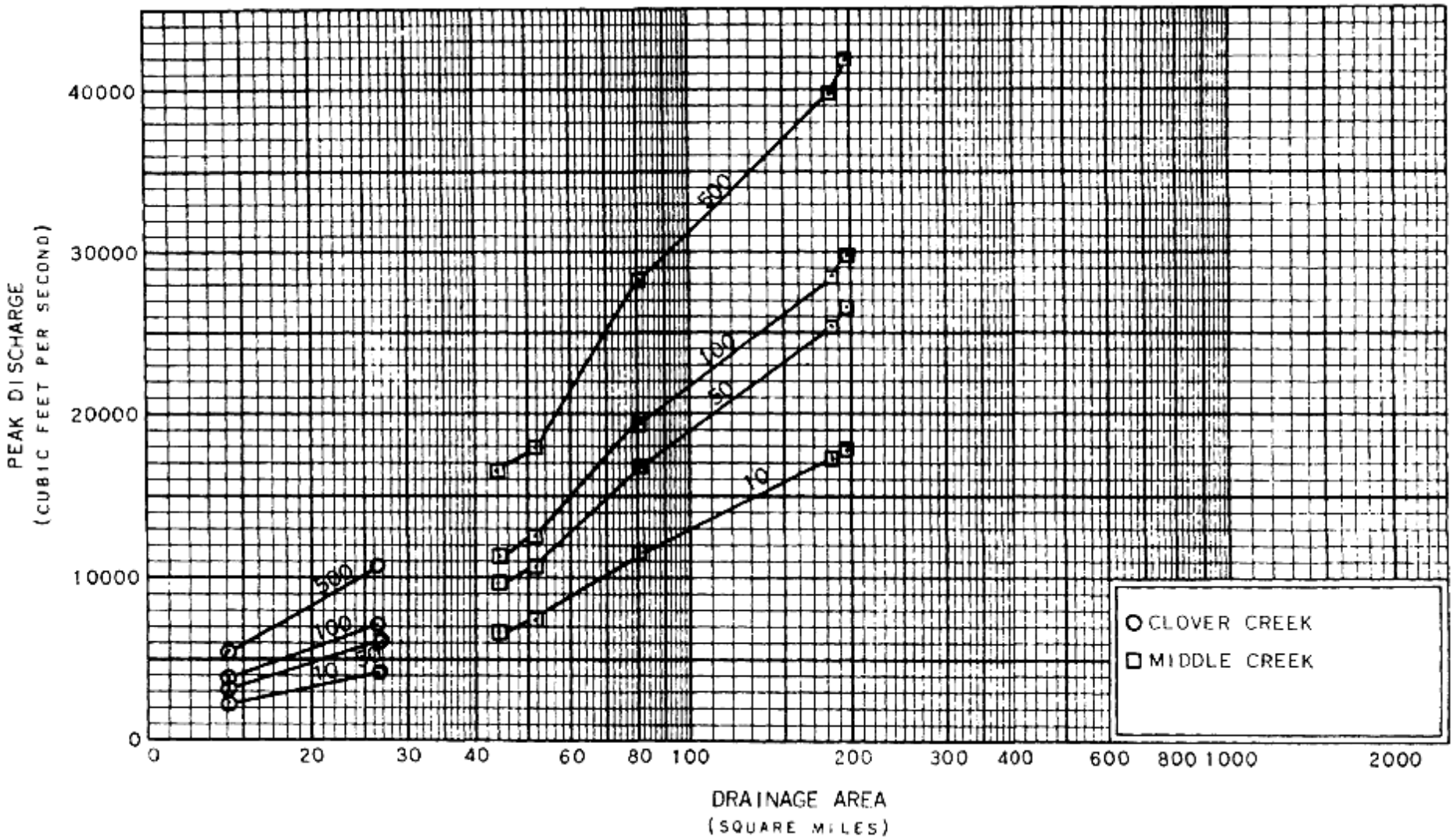


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

CLOVER CREEK AND MIDDLE CREEK

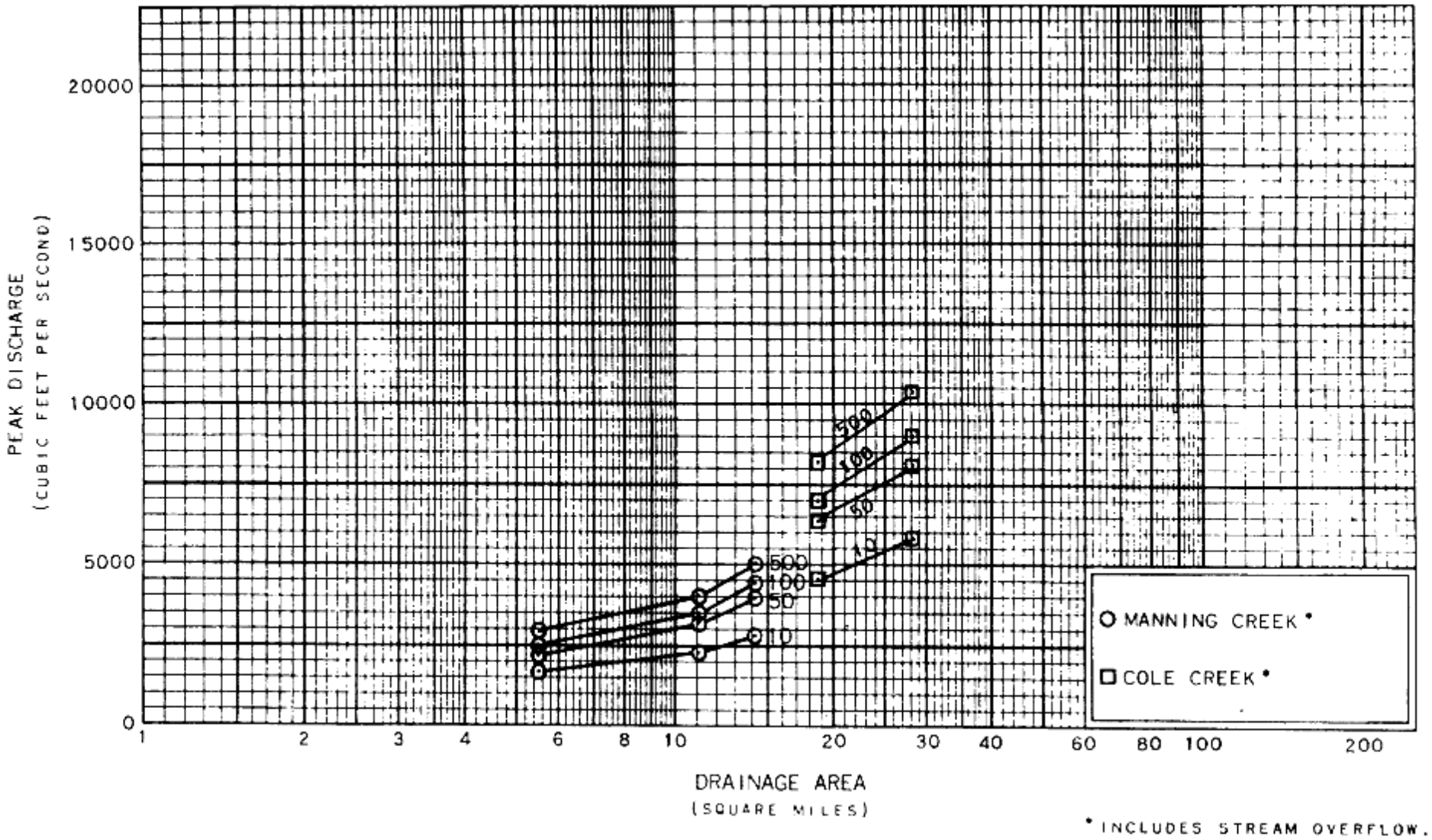


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

COLE CREEK AND MANNING CREEK

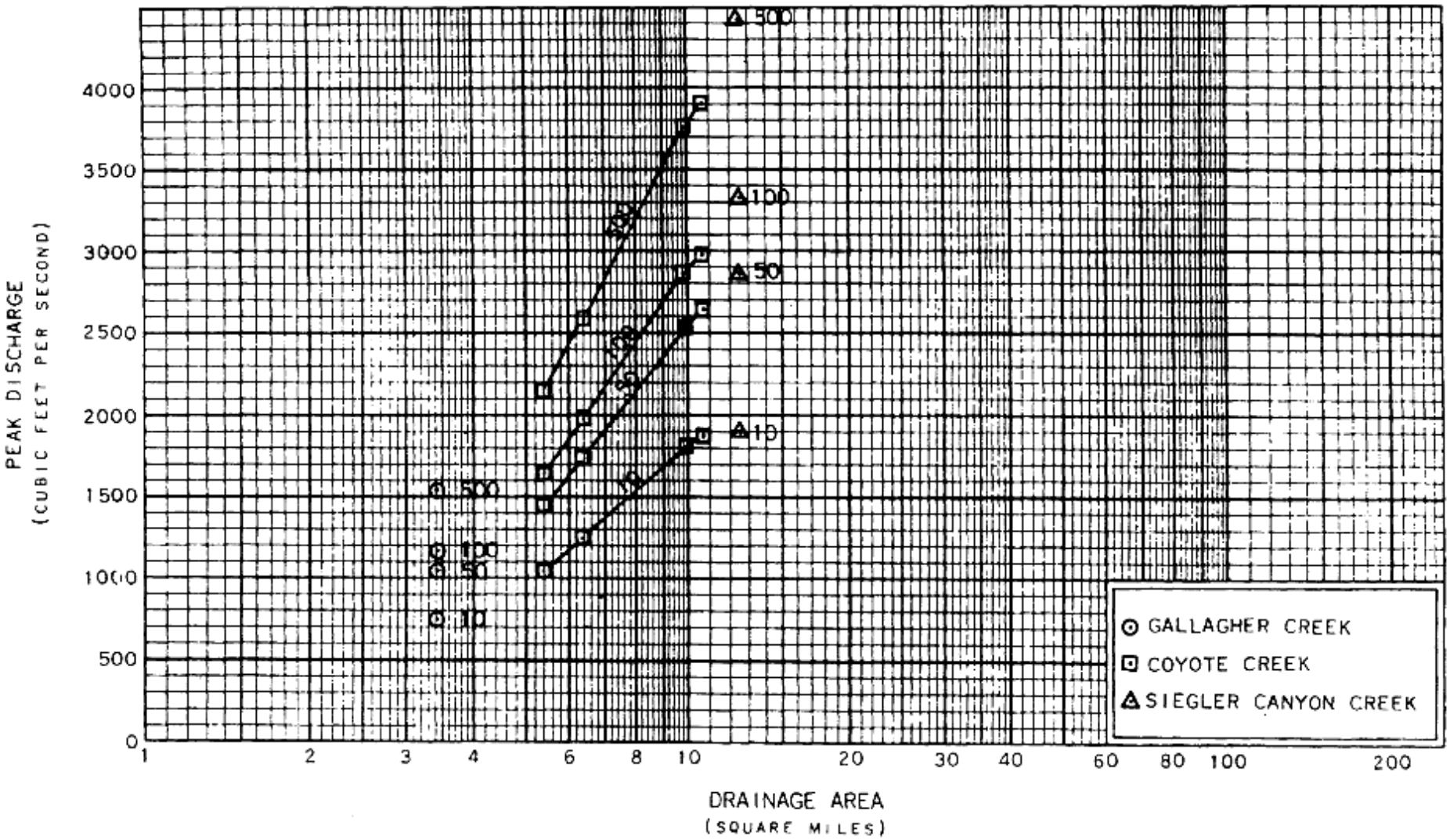


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

COYOTE, GALLAGHER AND SIEGLER CANYON CREEKS

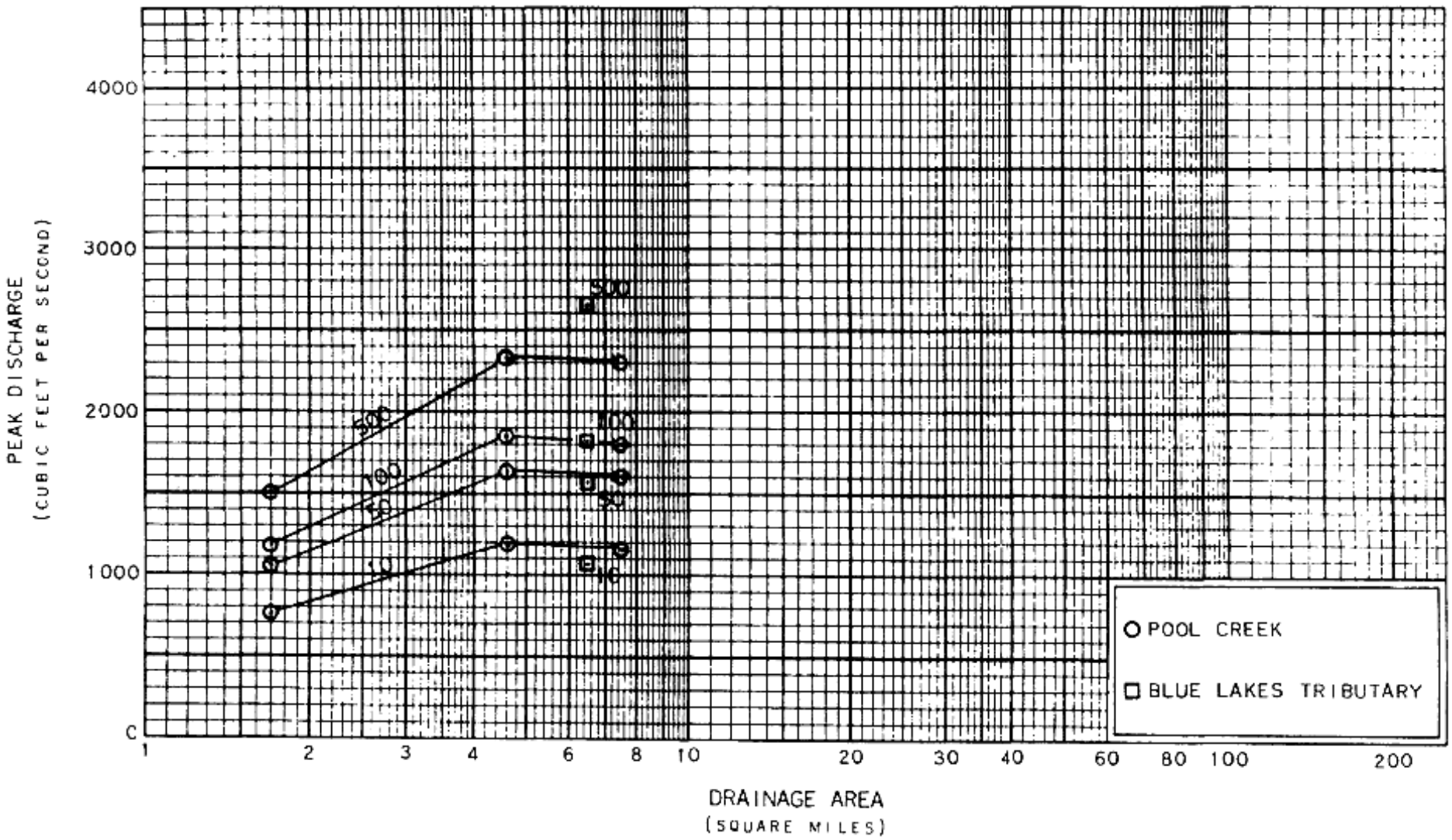


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

POOL CREEK AND BLUE LAKES TRIBUTARY

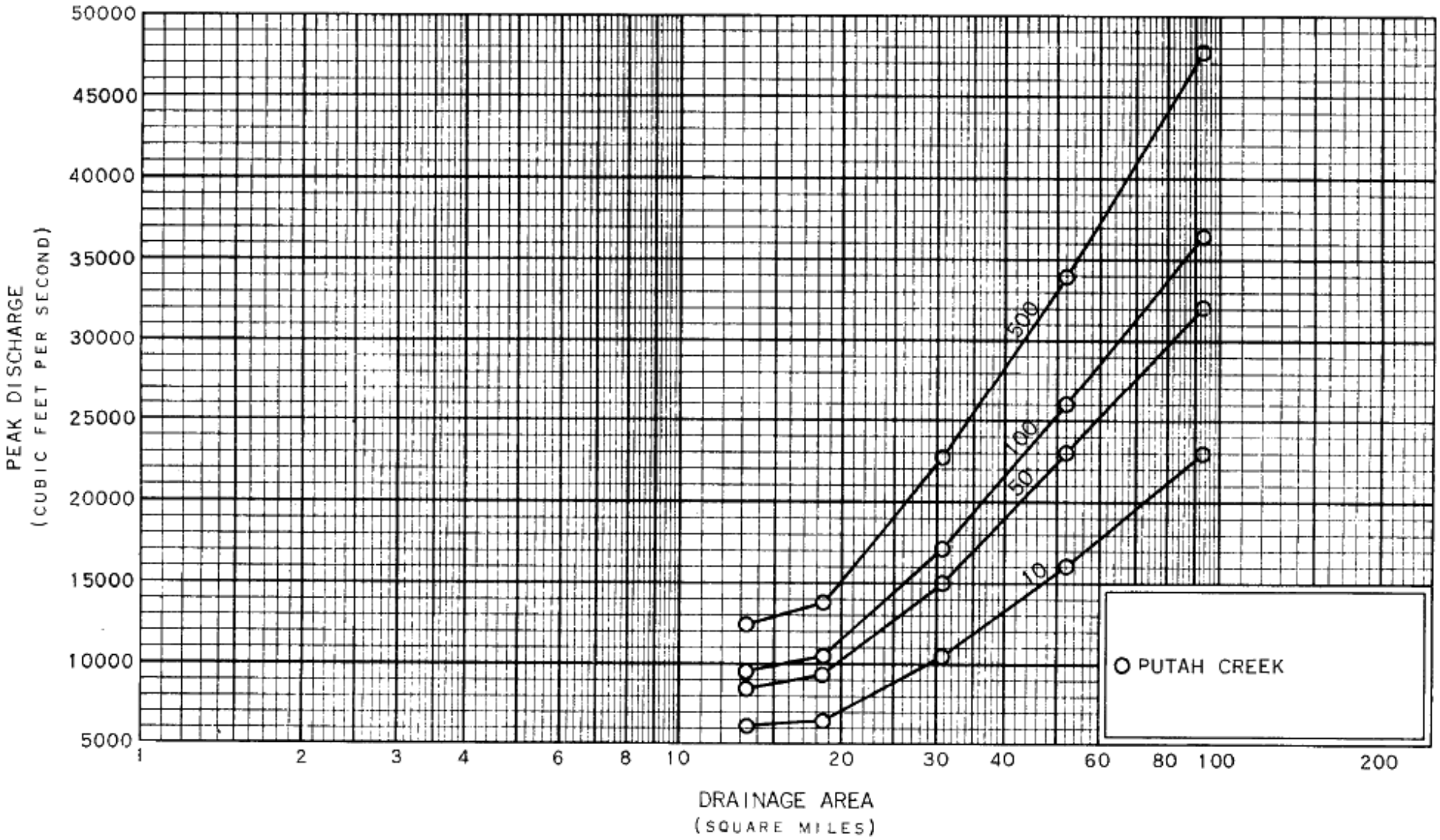


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

PUTAH CREEK

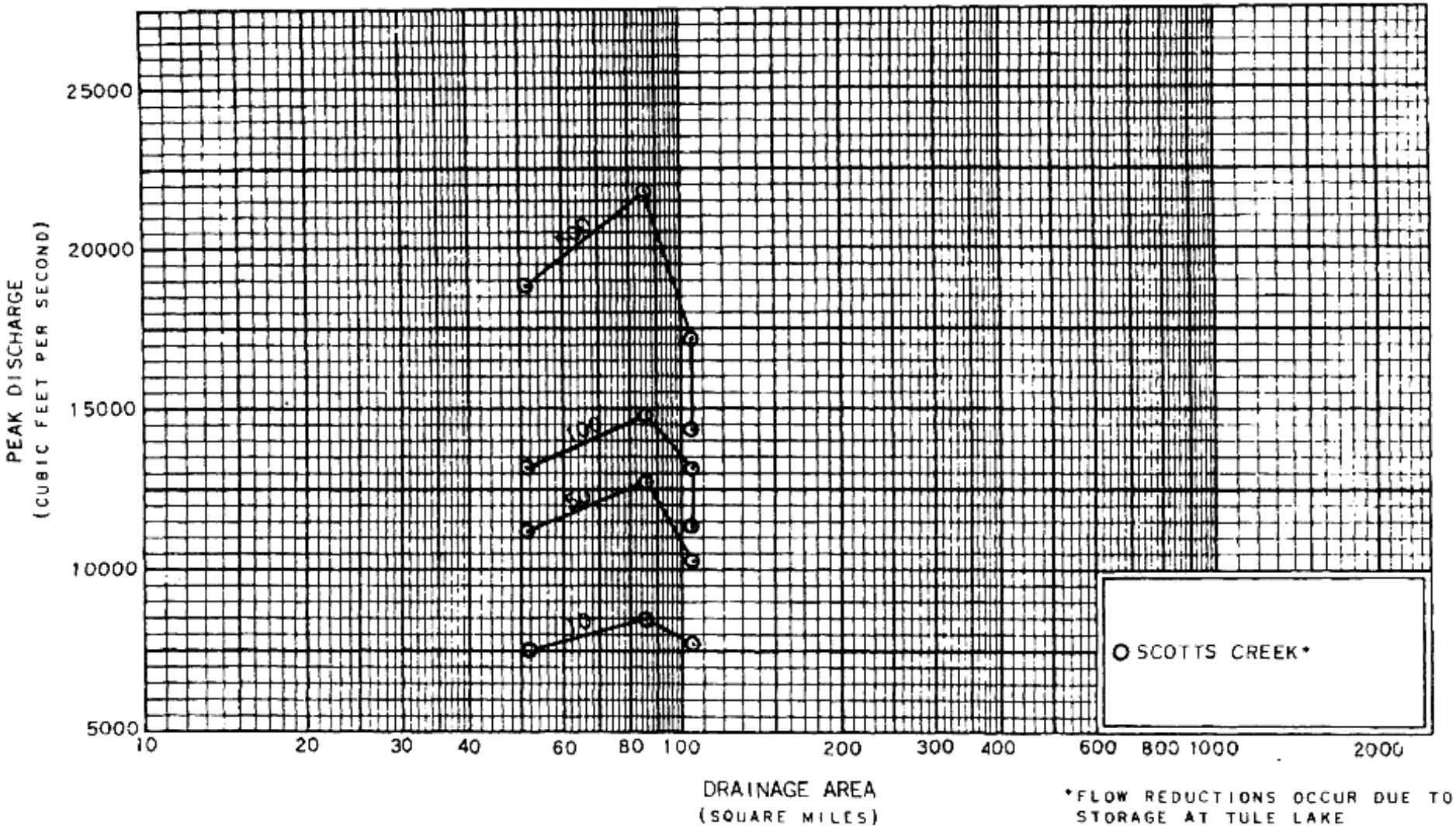


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FREQUENCY DISCHARGE, DRAINAGE AREA CURVES

SCOTTS CREEK

The stillwater elevations were determined for the 10-, 2-, 1-, and 0.2-percent chance floods for the flooding sources studied by detailed methods and are summarized in Table 11, "Summary of Stillwater Elevations."

Table 11: Summary of Stillwater Elevations for First Countywide FIS Report

Flooding Source	Elevation (feet NAVD88)*			
	10-percent-annual-chance	2-percent-annual-chance	1-percent-annual-chance	0.2-percent-annual-chance
Clear Lake	1,331.1	1,332.8	1333.4	1334.9
Lake Pillsbury	1,829.2	1,832.7	1,833.9	1,836.9

* North American Vertical Datum of 1988

3.2 Hydraulic Analyses

For this countywide revision, new approximate hydraulic analyses were completed for existing Zone A streams within the City of Lakeport and portions of unincorporated areas of Lake County. The first countywide study used hydraulic analyses carried out for the communities within, and the unincorporated areas of, Lake County.

Analyses of the hydraulic characteristics of flooding from the streams studied were completed to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Cross sections were determined from topographic maps and field surveys. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry. All topographic mapping used to determine cross sections is referenced in Section 4.1.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM (Exhibit 2).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the Flood Profiles (Exhibit 1) are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6- character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)
- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutment)
- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)
- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post)

In addition to NSRS bench marks, the FIRM may also show vertical control monuments established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site at www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

Precountywide Analyses

Each incorporated community within, and the unincorporated areas of, Lake County, had a previously printed FIS report. The hydraulic analyses described in those reports were compiled and are summarized below.

Water-surface elevations for the 1-percent-annual-chance flood were computed through use of the USACE HEC-2 step-backwater computer program (USACE, 1982). Starting water-surface elevations for the streams studied were derived by the slope-area method. Where pertinent, the 1-percent-annual-chance lake stage was superimposed on the stream profiles. Flood elevations for Clear Lake and Lake Pillsbury were computed on the basis of historical stage-frequency relationships.

Cross sections for backwater analyses were located at close intervals upstream and downstream from bridges, culverts, and other hydraulically significant features in order

to establish the backwater effect of such structures in areas presently urbanized or subject to development. Additional cross sections were located at other representative locations in the study area. Cross-section data were derived from topographic information, USGS quadrangles, photogrammetric maps compiled from aerial photographs, and supplemental field observations (USACE, *Lakeport, Photogrammetric Cross Sections*). All culverts were surveyed to obtain elevation and structural data.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments where a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM (Exhibit 2). A field reconnaissance was conducted to obtain land-use and land-cover data and to visually inspect the study area for the City of Lakeport.

To model the flooding along Cache Creek, MBJ performed the hydraulic analysis using two distinctly different modeling approaches. One is centered around the USACE HEC-2 step-backwater computer program (USACE, 1982). The second makes use of the USACE *Flood Hydrograph Package HEC-1* (USACE, 1981).

Floodways were defined after both downstream and upstream flow possibilities were considered. For the downstream flooding situation, using the HEC-2 hydraulic model, equal conveyance losses were assumed for the overbanks with a possible floodway defined between the channel banks for the reach from approximately 0.5 mile above Route 53 to Clear Lake Dam. Channel banks are identified as the contour of elevation 1,320.65 feet National Geodetic Vertical Datum of 1929 (NGVD). A rise in water-surface elevations of less than 1 foot was computed by the model.

For the reverse flow flooding condition, the loss of storage volume in the overbank areas, as modeled for the downstream flooding condition, will control the change in the water-surface elevation. Using the 1,320.65-foot elevation contour to define the channel banks, and omitting all storage capacity in the overbank area beyond the defined channel banks, a water-surface elevation rise of less than 0.3 foot was calculated using the HEC-1 model. It was thus concluded that a satisfactory floodway can be established as the area between the 1,320.65- foot contours on each bank in the reach between Clear Lake Dam and the Grigsby Riffle.

Therefore, a floodway similar to that shown in the 1978 Lake County FIS was established from approximately 700 feet upstream of Route53 to approximately 7,000 feet downstream of Route 53. (Note that this Cache Creek situation is not the typical situation for which floodways are defined. The concept of a floodway usually does not apply in areas of flooding from lakes or reservoirs, or for reaches of streams with elevations controlled by backwater. Therefore, since lake elevations cause the 1-percent-annual-chance flooding in Cache Creek upstream from a point above Route 53, no floodway is provided above that point. However, downstream from Route 53 elevations are controlled by backwater for the unique flooding situation only. This condition can occur only during periods of time when the dam gates are closed and intense local rainfall is also occurring and does not occur during the typical flooding situation in which the main lake is at flood stage. Therefore, the establishment of a floodway to maintain conveyance in the existing

narrow channel from approximately 700 feet upstream of Route 53 to approximately 7,000 feet downstream of Route 53 is appropriate).

Modifications to the 1- and 0.2-percent-annual-chance floodplain boundaries, floodway boundaries and base flood elevations have been made along Cache Creek on FIRM Panel 0715. Topographic maps with a scale of 1" = 50' and a contour interval of 1 foot, produced by the USACE, Sacramento District, were utilized by MBJ to produce these new boundaries. The Floodway Data Table and Flood Profiles have been revised to reflect the effects of these analyses. The frequency-discharge, drainage area curves for Cache Creek were replaced by Summary of Discharges (Table 10).

The community description of the text was revised to correct errors in the previously effective text and revised to be in agreement with the FIS for Lake County, California.

The hydraulic analyses for these studies were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were determined by engineering judgment and were based on field observations of the streams and floodplain areas. In the Lake County (unincorporated areas) FIS, the factors used ranged from 0.040 to 0.100 for overbank areas and from 0.030 to 0.060 for channels. The factors used in the City of Clearlake FIS ranged from 0.030 to 0.100 for overbank areas and from 0.030 to 0.060 for channels. In the City of Lakeport FIS, channel n values for the seven stream reaches ranged from 0.03 to 0.09, and the overbank n values ranged from 0.06 to 0.10.

Flood profiles for the Lake County (unincorporated areas) FIS were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Starting elevations for tributaries to Clear Lake were taken from flood elevations on the lake. For other streams, starting elevations were taken from the flood elevations of the streams to which they are tributary, or were developed by the slope-area method. Water-surface elevations on Cache Creek are controlled by backwater from Clear Lake Dam.

Roughness coefficients (Manning's “n”) used in the hydraulic computations were chosen by engineering judgment and based on field observation of the streams and floodplain areas Table 12, Roughness factors for all streams studied by detailed methods are shown in Table 12,“Summary of Roughness Coefficients.”

Table 12: Summary of Roughness Coefficients

Flooding Source	Channel	Overbanks
Seven streams	0.030–0.060 0.030–0.060 0.03–0.09	0.030–0.100 0.040–0.100 0.06–0.01

The FIS for the unincorporated areas of Lake County was revised in 1998 to update floodplain information for portions of Putah, Coyote, and Gallagher Creeks at their confluences and to add floodplain information for Butts Canyon, Copsey, Herndon, Long Valley, and Morrison Creeks, 8th and 17th Avenue Drains, and Thurston Creek.

Selected reaches were restudied to apply FEMA policy to a levee built around a subdivision and golf course within the old Coyote Creek floodplain. Coyote Creek diverts around the development before emptying into Putah Creek. An 8-foot-high levee exists on the left banks of both Coyote Creek and Putah Creek. This levee is not certified by any governmental agency. Levee freeboard is less than 3 feet between River Mile (RM) 10.28 and RM 10.46, as well as in the vicinity of RM 11.07. Irrespective of inadequate freeboard, since no public agency maintains the levee system, the hydraulic analysis assumed that the left-bank levee along Putah and Coyote Creeks will fail under the 1-percent-annual-chance flood.

Following FEMA guidelines, levees without adequate freeboard are assumed not to exist when mapping flood elevations on the protected side of the levee. The worst-case water-surface profile for the left overbank (i.e., within the subdivision) occurs when the levee fails upstream of RM 11.07, while the levee downstream of this river remains intact. Water in the left overbank must weir back over the downstream levee, which controls the left overbank water-surface profile. Coyote Creek is perched above the subdivision, even when there is no left-bank levee. Any water in excess of channel capacity must flow away from Coyote Creek through the subdivision, where it could be trapped behind the downstream levee. In the levee-failure mode, the peak rate of water leaving Coyote Creek is less than 1,000 cfs over the entire reach. The resulting inundation adjacent to Coyote Creek is less than 1 foot deep and is mapped as Zone X.

Butts Canyon Creek is a natural channel that flows westward through moderately flat terrain. High natural ground to the north and south would contain the flow and direct it westward. Butts Canyon Road runs alongside the creek and is elevated a few feet above natural ground. Where it passes over the creek, the existing culvert is inadequate for the 1-percent-annual-chance flow rate and causes flow to pond behind the road. In order to generate the worst-possible flooding situation, it was necessary to analyze Butts Canyon Road for two scenarios: first, assuming it would hold in place and, second, assuming it would fail. The two scenarios were analyzed separately and the higher water-surface elevations were mapped.

In order to model the case in which Butts Canyon Road held, the road was used as the boundary to prevent flow from passing from one side to the other. New flow rates were

calculated based on the revised drainage areas to model the flow on each side. A weir was modeled along Butts Canyon Road to measure any flow that would escape over the road. Since the size of the channel decreases upstream of the Butts Canyon Road culvert, the majority of the flow would spill into the overbank and travel westward rather than pass through the culvert. In order to calculate the amount of flow that would pass through the culvert opening (three 72-inch by 44-inch arch corrugated metal pipes), a trial-and-error procedure was performed.

Based on outlet control conditions and an approximate headwater surface elevation of 1,095.5 feet NGVD at the culvert, it was determined that 135 cfs would pass through the Butts Canyon Road culvert. The backwater analysis was then rerun with the correct flow rates and the results were checked to ensure that all initial assumptions were accurate.

The next step in analyzing the road-holding case was to run a backwater analysis for the flow north of Butts Canyon Road. There are undersized culverts located at Loconomi and Eureka Roads which would create additional flooding. However, the flow would be contained by natural high ground in the overbank.

The scenario in which Butts Canyon Road failed was analyzed next by disregarding the road above natural ground elevation. A water- surface elevation of 1,081.0 NGVD was used from the existing downstream study for the starting condition. Drainage basin areas were recalculated to incorporate flows from tributaries in the north and south.

The case where the road fails created only slight differences in the floodplain boundary and water-surface elevations. The results of the two cases are similar from the downstream study limit to Loconomi Road. Upstream of Loconomi Road, the road-holding and road-failing cases use different tributary drainage areas, resulting in different flow rates. The road-holding case north of Butts Canyon Road uses only the northern drainage areas, while the road-failing case assumes that the road does not exist and, therefore, uses a larger drainage basin to calculate the amount of flow. As a result, the road-failing case would generate a wider floodplain north of Butts Canyon Road between Loconomi Road and Eureka Road.

On the southern side of Butts Canyon Road, the water-surface elevations generated from the road-failing case would be lower than the water-surface elevations from the road-holding case until Cross Section 14927. Near Cross Section 13500, the floodplain from the road-failing case bows further outward since it uses modified cross sections in the analysis. The cross sections were modified as a result of the different methods used to analyze the two flow cases. For the road-holding case south of Butts Canyon Road, the original aerial Cross Section 13500 was used in the analysis in order to maintain greater accuracy. However, for the road-failing case, it was necessary to generate new cross sections from the Aelyteck topography maps in order to model the culvert beneath Eureka Road. These manually generated cross sections extend for the full length of the section and replace Cross Section 13500. Due to the limited amount of elevation information that can be taken from the topography maps, slight differences are noticeable which contribute to the difference in the floodplains. Upstream of Cross Section 14927, the two cases display identical water-surface elevations. The 1-percent-annual-chance

profile for Butts Canyon Creek shows the highest water-surface elevations for the creek. The floodway was computed based on equal conveyance on each side of the floodplain.

Once the floodway limits were determined, the velocities at these limits were checked for hazardous velocities based on the flow distribution for the natural run. If the velocities were greater than 5 feet per second, the floodway limits were moved outward to areas with lower velocities.

Copsey Creek was studied using detailed methods, from the confluence with Cache Creek to roughly 900 feet upstream of Morgan Valley Road. The total length of the study is approximately 1.4 miles. The 1-percent-annual-chance flow rate was calculated as being 4,680 cfs. However, a portion of the Herndon Creek overbank flow was assumed to enter Copsey Creek. For determination of the floodplain and floodway, certain areas were considered to be ineffective due to expansion or contraction of flow from channel constrictions. These areas have been excluded from the floodway. The hydraulic analysis was begun with a water-surface elevation of 1,331.0 feet NGVD, which was obtained from the existing study of Cache Creek. The backwater created upstream remains confined within the channel.

The total length of the studied reach of Herndon Creek is approximately 1.6 miles. The 1-percent-annual-chance flow rate at the downstream limit was calculated as being 1,730 cfs. The flow rate decreases to 1,140 cfs for the remainder of the study reach at Cross Section 4394. The hydraulic analysis was begun at the downstream limit with a water-surface elevation of 1,331.0 feet NGVD, which was obtained from an existing study of Cache Creek. The upstream backwater raises the water surfaces above the channel banks and forces flow into the left overbank. A side-channel weir measures a total of 365 cfs leaving the channel and escaping into the left overbank. It is assumed that the escaped flow returns to the channel.

Another HEC-2 model was created to analyze the flow in the left overbank. This model was begun at normal depth and the flow rate varies depending on the amount of flow escaping the channel at each cross section. The overbank was determined to have sufficient capacity to hold the entire amount of escaped flow. Water-surface elevations were generated for these overbank sections. Although the HEC-2 model assumes the overbank flow returns to the creek, it is impossible to determine the exact location where it returns. As a result, portions of the left overbank are shown wet, in the likelihood that portions of the flow remain in the overbank. This area is labeled Zone B (less than 0.7 foot in depth).

The 1-percent-annual-chance flow rates for Long Valley Creek were determined to be 10,170 cfs at North Fork Cache Creek. Upstream of the main tributaries at Cross Section 6030, the flow changes to 8,880 cfs. Long Valley Creek is a natural channel that was analyzed by dividing the study into three separate reaches. The first reach begins at North Fork Cache Creek and extends upstream to where the flow becomes divided due to high ground in the overbank. The second reach analyzes the left and right divided portions of the flow and matches water-surface elevations. The final reach tracks the total flow to the upstream limit of study.

The first downstream reach is begun at normal depth since there is no existing study of North Fork Cache Creek. The Long Valley Road bridge displays pressure flow at the upstream face, but the flow remains contained within the channel.

The second study reach begins at the area of divided flow, with a starting water-surface elevation of 1,144.63 NGVD. The high ground in the overbank splits the flow, necessitating separate HEC-2 decks to analyze both left and right sides of this reach. It was determined that the divided flow would rejoin to form one channel. Thus, various amounts of flow were assumed to flow down *each* side until matching water-surface elevations were reached at this location.

It was found that with 7,580 cfs traveling in the left creek and 1,300 cfs in the right creek, a matching water-surface elevation of 1,166.15 NGVD was obtained.

The next study reach was begun with a starting water-surface elevation of 1,166.15 NGVD and continued upstream to the study limit. The first floodway reach was begun at the downstream limit with a water-surface elevation of 1 foot above the natural floodplain run.

For the reach where the flow split occurs, an attempt was first made to confine the floodway to the main creek. However, it was not possible to confine the flow to the main creek and still maintain the increase in water-surface elevation at less than 1 foot. Therefore, two separate floodways were computed for this section of Long Valley Creek.

The total length of the Wolf Creek study reach is approximately 1.8 miles. The study was divided into two reaches, with the first downstream reach extending from the confluence with North Fork Cache Creek to the spillway. The second study reach began at the spillway and continued to the upstream study limit. Hydrologic calculations determined the flow rate to be 6,620 cfs at the confluence with North Fork Cache Creek and 5,790 cfs at the confluence with Doe Canyon Creek. The first downstream subcritical reach was begun at normal depth, with a calculated slope of 0.00214. The backwater passes below the low chord of the downstream crossing of Wolf Creek Road and remains confined within the channel up to the Spring Valley spillway. The second study reach analyzed the flow upstream of the Spring Valley spillway. This model used a starting water-surface elevation of 1,186.21 NGVD, which was computed using weir calculations.

The length of the Morrison Creek studied reach is approximately 0.6 mile. Morrison Creek is a natural channel with heavy vegetative growth. The Manning's "n" values used in the model were 0.06 and 0.07, respectively, for the channel and overbanks.

The starting condition for the backwater analysis was the 1-percent-annual-chance water-surface elevation at Clear Lake, 1,330.6 feet NGVD, obtained from the 1990 FIS for Lake County, California (U.S. Department of Housing and Urban Development, September 28, 1990). A side-channel weir was defined with the split-flow option upstream of Country Club Lane to track flows that would spill out of the creek. The flow lost to the left overbank would be approximately 60 cfs. The remaining 690 cfs in the creek continues toward Clear Lake without further spillage. The 60 cfs that spilled from the creek was split between Country Club Lane and First Street. Depths of 0.6 foot were

computed for each street. Past this intersection, the ground slopes generally south, away from Morrison Creek, and west toward Clear Lake. Due to this topography, the entire area between Morrison Creek and 8th Avenue was shown as Zone B.

Hand calculations based on normal depth criteria were done in the overbank areas to determine the extent of shallow flooding. Flow was traced in the overbank areas, assuming effective flow in the streets only. Manning's equation ("n" values of 0.025 and a street crown of 0.5 foot) was used to compute flow splits at intersections of streets, assuming a constant water-surface elevation across the intersection. Both normal and critical depth were computed. Where normal depth was supercritical, the streetflow was assumed to flow at critical depth.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD 88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. It is important to note that adjacent counties may be referenced to NGVD 29. This may result in differences in base flood elevations across county lines.

To compare structure and ground elevations to 1-percent-annual-chance flood elevations shown in the FIS and on the FIRM, the subject structure and ground elevations must be referenced to datum values as NAVD. The BFE values shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 feet will appear as 102 feet on the FIRM and 102.6 feet will appear as 103 feet. Users who wish to convert the elevations in this FIS to NGVD should apply the stated conversion factor(s) shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot. An average conversion factor could not be established for the entire community due to the statistically significant range in conversion factors. The conversion factors used in the conversion from NGVD 29 to NAVD 88 are presented below in Table 13.

Table 13: Stream-by-Stream Datum Conversion Factors

Flooding Source	Conversion Factor
8th Avenue Drain North Tributary	2.84 ft
8th Avenue Drain South Tributary	2.84 ft
17th Avenue Drain	2.84 ft
Adobe Creek	2.84 ft

Table 13: Stream-by Stream Datum Conversion Factors

Flooding Source	Conversion Factor
Anderson Creek	3.02 ft
Blues Lake Tributary	2.76 ft
Burns Valley Creek	2.79 ft
Burns Valley Creek Overflow	2. 78 ft
Butts Canyon Creek	2.84 ft
Cache Creek	2.82 ft
Clear Lake	2.78 ft
Clover Creek	2.84 ft
Cole Creek	2.87 ft
Copsey Creek	2.80 ft
Coyote Creek	2.81 ft
Dry Creek	2.90 ft
Forbes Creek	2.79 ft
Gallagher Creek	2.80 ft
Herndon Creek	2.76 ft
Highland Creek	2.84 ft
Kelsey Creek	2.88 ft
Lake Pillsbury	2.93 ft
Long Valley Creek	2.80 ft
Long Valley Creek –Right Overbank Split flow	2.79 ft
Manning Creek	2.82 ft
Middle Creek	2.78 ft
Molesworth Creek	2.80 ft
Morrison Creek	2.84 ft
North Branch Forbes Creek	2.78 ft
Pier 1900 Drain	2.80 ft
Pool Creek	2.77 ft
Putah Creek (Downstream)	2.80 ft
Putah Creek (Upstream)	2.90 ft
Putah Creek Left Overbank	2.84 ft

Table 13: Stream-by Stream Datum Conversion Factors

Flooding Source	Conversion Factor
Scotts Creek	2.79 ft
Siegler Canyon Creek	2.82 ft
St. Helena Creek	2.89 ft
Tenth Street Drain	2.77 ft
Thurston Creek	2.95 ft
Todd Road Drain	2.81 ft
Wolf Creek	2.81 ft

For more information regarding conversion between the NGVD and NAVD, see the FEMA publication entitled *Converting the National Flood Insurance Program to the North American Vertical Datum of 1988* (FEMA, 1992), visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed or limited detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

Some areas are subject to sheetflow; that is, broad, shallow, overland flooding that is generally less than 3 feet deep and characterized by unpredictable flow paths. The water-surface elevations of flooding in these areas are essentially independent of those along the adjacent streamway and are affected principally by obstructions in the flooded area. There are major and minor levee systems that affect floodplain boundaries at numerous locations in the study area. Where pertinent, these levees are shown on the FIRMs (Exhibit 2). Also, many roadfills crossing floodplain areas alter the natural patterns of floodflows. These varying flow patterns can be seen on the FIRMs (Exhibit 2) in the form of confinement of streamways, ponding behind roadways, and lateral distribution of floodflows.

Topographic data used in determining floodplain boundaries varied from 7.5- minute quadrangle sheets with contour intervals ranging from 10 to 40 feet to detailed topographic maps with 2-foot contour intervals and a scale of 1:9,600. Information on topographic mapping used for the Lake County (unincorporated areas) FIS report ((USACE, 1967; USACE, 1970, 1968, 1970; U.S. Department of Housing and Urban Development, 1972; USACE, 1974; USACE, 1971; U.S. Department of the Interior, 1958, et cetera; U.S. Department of the Interior, 1960)) is further detailed, except for USGS quadrangles, as follows:

General Area Covered	Scale	Contour Interval (feet)	Source
Big Valley	1:2,400	10	State of California
Clearlake Highlands	1:9,600 and 1:2,400	2 and 5	Lake County
Lakeport	1:2,400	10	State of California
Lower Lake	1:9,600	2	Lake County
Middletown	1:2,400	5	USACE
Scotts Valley	1:2,400	5	USACE

In addition to topographic data, other information useful in making flooded area determination was obtained from previously completed Flood Insurance Studies and Flood Plain Information reports ((USACE, 1967; USACE, 1970, 1968, 1970; U.S. Department of Housing and Urban Development, 1972; USACE, 1974; USACE, 1971; U.S. Department of the Interior, 1958, et cetera; U.S. Department of the Interior, 1960)) and from a variety of documents pertaining to existing projects as follows:

Area of Project	Source	Application
Adobe Creek Watershed	SCS	Big Valley
Indian Valley Dam	Yolo County	North Fork Cache Creek
Middle Creek Improvement	USACE	Upper Lake
Scott Dam	Pacific Gas and Electric Company	Lake Pillsbury

The 1- and 0.2-percent-annual-chance floodplain boundaries for streams studied by detailed methods are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2). For the these flooding sources, the boundaries of the 1-percent-annual-chance floodplains were delineated using topographic maps taken from the previously printed FIS reports, FHBMs, and/or FIRMs for all of the incorporated and unincorporated jurisdictions within Lake County.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. In some areas, floodway widths have been adjusted slightly for smooth transitions but are similar to the previously established floodways. The results of the

floodway computations are tabulated for selected cross sections and provided in Table 14, “Floodway Data.” The computed floodway is shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown on the FIRM.

No floodways were computed for Forbes Creek, from confluence with Clear to approximately 4,750 feet upstream of confluence.

Encroachment into areas subject to inundation by floodwaters having hazardous velocities aggravates the risk of flood damage and heightens potential flood hazards by further increasing velocities. A listing of stream velocities at selected cross sections is provided in Table 14, "Floodway Data." To reduce the risk of property damage in areas where the stream velocities are high, the community may wish to restrict development in areas outside the floodway.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

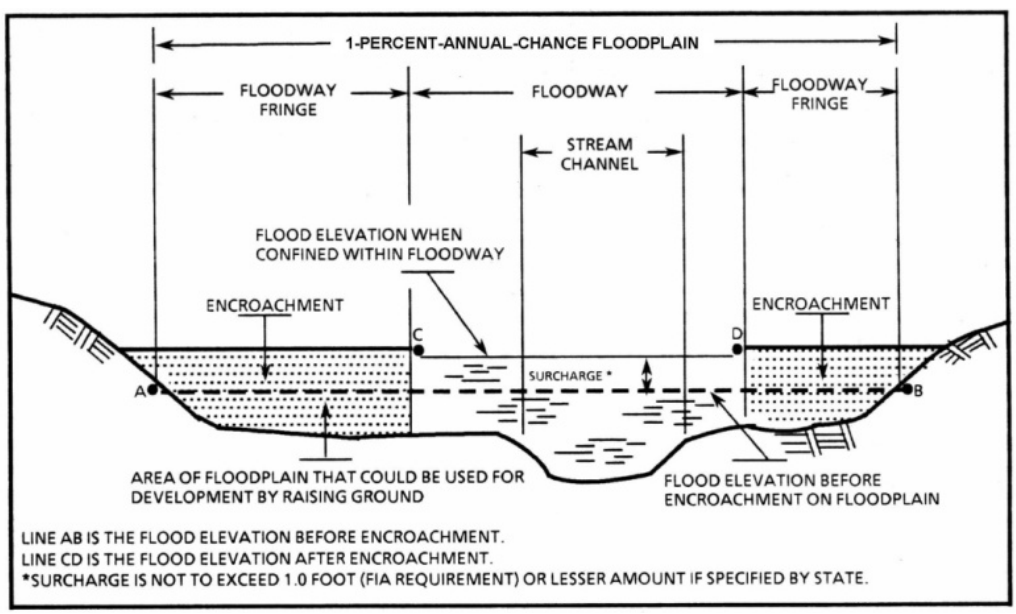


Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Adobe Creek								
A-AB*								
AC	29,568	290	1,971	1.7	1,408.1	1,408.1	1,409.1	1.0
AD	29,972	232	1,101	3.1	1,411.1	1,411.1	1,411.4	0.3
AE	30,759	360	1,141	3.0	1,412.4	1,412.4	1,412.5	0.1
AF	31,346	251	606	5.7	1,414.5	1,414.5	1,414.8	0.3
AG	31,747	196	984	3.5	1,416.1	1,416.1	1,416.4	0.3
AH	32,252	266	1,336	2.6	1,416.7	1,416.7	1,416.9	0.2
AI	32,630	180	674	3.4	1,417.1	1,417.1	1,417.3	0.2
AJ	33,246	89	294	7.8	1,418.7	1,418.7	1,418.7	0.0
AK	33,763	124	472	4.8	1,421.7	1,421.7	1,421.7	0.0
AL	34,541	96	363	6.3	1,424.5	1,424.5	1,424.5	0.0
AM	35,056	140	439	5.2	1,426.9	1,426.9	1,426.9	0.0
AN	35,564	88	416	5.5	1,428.7	1,428.7	1,428.7	0.0

[1] Feet above confluence with Clear Lake
* No Floodway Computed

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

ADOBE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Anderson Creek								
A	2,957[1]	40	410	9.5	1,324.8	1,324.8	1,325.8	1.0
B	4,066[1]	30	450	8.7	1,356.2	1,356.2	1,356.8	0.6
C	5,122[1]	40	440	90	1,379.5	1,379.5	1,380.5	1.0
D	6,494[1]	40	400	9.8	1,424.6	1,424.6	1,425.3	0.7
E	7,920[1]	70	490	8.0	1,471.4	1,471.4	1,472.0	0.6
Blue Lakes Tributary								
A	1,320[2]	40	570	2.9	1,357.1	1,357.1	1,358.1	1.0
B	5,544[2]	40	380	4.4	1,357.1	1,357.1	1,358.1	1.0
C	6,494[2]	40	230	3.7	1,366.0	1,366.0	1,366.1	0.1

[1] Feet above mouth
[2] Feet above confluence with Scotts Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

ANDERSON CREEK - BLUE LAKES TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Burns Valley Creek								
A	634	50	200	8.1	1,335.1	1,335.1	1335.1	0.0
B	1,478	70	500	3.2	1,339.1	1,339.1	1339.6	0.5
C	2,534	320	370	5.7	1,347.2	1,347.2	1347.2	0.0
D	3,538	500	520	4.3	1,348.5	1,348.5	1349.5	1.0
E	4,646	480	540	4.2	1,352.8	1,352.8	1353.8	1.0
F	5,808	240	610	3.7	1,359.8	1,359.8	1360.8	1.0
G	6,653	180	400	5.6	1,362.8	1,362.8	1363.8	1.0
H	7,498	400	710	3.2	1,366.7	1,366.7	1367.7	1.0
I	8,395	330	750	3.0	1,370.7	1,370.7	1370.7	0.0
J	9,821	120	280	8.0	1,378.3	1,378.3	1379.3	1.0
K	10,560	80	250	6.7	1,381.6	1,381.6	1381.6	0.0
L	11,563	40	200	8.3	1,384.9	1,384.9	1384.9	0.0
M	12,514	40	200	8.3	1,390.3	1,390.3	1390.3	0.0
N	13,517	30	210	7.0	1,402.5	1,402.5	1402.5	0.0
O	14,678	100	1,200	0.8	1,408.7	1,408.7	1409.7	1.0
P	15,946	102	268	5.5	1,411.0	1,411.0	1411.3	0.3
Q	17,160	101	472	3.1	1,418.6	1,418.6	1419.3	0.7
R	18,163	40	207	7.1	1,424.7	1,424.7	1425.0	0.3

[1]Feet above mouth at Clear Lake

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Burns Valley Creek Overflow								
A	211	110	250	6.3	1,333.4	1,333.4	1,334.1	0.1
B	1,214	80	350	4.2	1,340.2	1,340.2	1,341.2	1.0
C	2,323	100	580	1.6	1,345.2	1,345.2	1,345.4	0.2
D	3,538	130	260	3.6	1,347.1	1,347.1	1,347.1	0.0
E	4,541	220	630	1.9	1,351.0	1,351.0	1,352.0	1.0
F	5,438	200	490	1.9	1,353.0	1,353.0	1,353.8	0.8
G	6,494	70	160	6.1	1,357.5	1,357.5	1,357.6	0.1
H	7,603	60	110	3.9	1,363.0	1,363.0	1,363.5	0.5
I	8,765	120	60	4.5	1,370.0	1,370.0	1,370.2	0.2
J	9,874	10	20	7.5	1,378.3	1,378.3	1,379.0	0.7

[1]Feet above mouth at Clear Lake

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Butts Canyon Creek (Road-Failing Case)								
A	4,950	731	3,236	0.8	1,083.8	1,083.8	1,084.8	1.0
B	6,520	371	1,462	1.7	1,084.0	1,084.0	1,085.0	1.0
C	8,145	229	910	2.7	1,084.8	1,084.8	1,085.8	1.0
D	9,045	300	696	3.5	1,085.5	1,085.5	1,086.4	0.9
E	9,905	435	543	4.5	1,089.0	1,089.0	1,089.3	0.3
F	10,745	350[2]	1,099	2.2	1,091.1[4]	1,091.1	1,091.9	0.8
G	11,855	320[2]	568	2.8	1,091.5[4]	1,091.5	1,092.5	1.0
H	12,770	290[2]	379	1.8	1,093.6[4]	1,093.6	1,094.2	0.6
I	13,676	340[2]	400	1.7	1,096.6[4]	1,096.6	1,097.6	1.0
J	14,927	328	99	7.0	1,100.8	1,100.8	1,101.1	0.3
K	15,867	27	116	5.9	1,106.9	1,106.9	1,107.6	0.7
L	16,717	49	200	3.5	1,109.1	1,109.1	1,109.5	0.4
M	18,237	45	145	4.7	1,118.0	1,118.0	1,118.0	0.0
Butts Canyon Creek (Road-Holding Case)								
F	10,745	409[3]	930	2.0	1,091.5	1,091.5	1,091.7	0.2
G	11,855	814[3]	845	0.9	1,091.8	1,091.8	1,092.3	0.5
H	12,770	794[3]	338	2.1	1,093.7	1,093.7	1,094.2	0.5
I	13,676	785[3]	434	1.7	1,096.9	1,096.9	1,097.3	0.4

[1] Feet above confluence with Putah Creek
[2] Width north of Butts Canyon Road
[3] Width south of Butts Canyon Road
[4] Regulatory elevations higher based on road-holding analysis

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

BUTTS CANYON CREEK (ROAD-FAILING/HOLDING CASE)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Cache Creek								
A	528	---[3]	---[3]	---[3]	1,333.4[2]	---[3]	---[3]	---[3]
B	1,954	---[3]	---[3]	---[3]	1,333.4[2]	---[3]	---[3]	---[3]
C	3,590	---[3]	---[3]	---[3]	1,333.4[2]	---[3]	---[3]	---[3]
D	4,963	---[3]	---[3]	---[3]	1,333.4[2]	---[3]	---[3]	---[3]
E	6,442	---[3]	---[3]	---[3]	1,333.4[2]	---[3]	---[3]	---[3]
F	7,867	---[3]	---[3]	---[3]	1,333.4[2]	---[3]	---[3]	---[3]
G	9,874	104	1,543	3.6	1,333.4[2]	1,333.3	1,333.6	0.3
H	10,718	82	1,368	4.1	1,333.4[2]	1,333.3	1,333.7	0.4
I	12,566	93	1,504	3.7	1,333.4[2]	1,333.3	1,333.7	0.4
J	14,150	139	2,099	2.6	1,333.4[2]	1,333.3	1,333.8	0.5
K	15,734	94	1,336	4.1	1,333.4[2]	1,333.3	1,333.9	0.6
L	17,582	95	1,582	3.5	1,333.4[2]	1,333.3	1,334.0	0.7

[1] Feet above mouth
[2] Based on backwater effects from Clear Lake Dam
[3] Not applicable

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

CACHE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Copsey Creek								
A	270[1]	262	1,474	3.3	1,333.8	1,333.8	1,334.8	1.0
B	1,130[1]	119	1,077	4.5	1,334.7	1,334.7	1,335.7	1.0
C	2,280[1]	97	1,010	4.6	1,336.6	1,336.6	1,337.1	0.5
D	2,940[1]	67	698	6.7	1,337.7	1,337.7	1,338.1	0.4
E	3,648[1]	86	776	6.0	1,340.4	1,340.4	1,340.6	0.2
F	4,368[1]	112	1,101	4.3	1,341.9	1,341.9	1,342.0	0.1
G	4,968[1]	91	613	7.6	1,342.8	1,342.8	1,342.9	0.1
H	5,908[1]	108	814	5.7	1,347.0	1,347.0	1,347.0	0.0
I	6,722[1]	129	806	5.8	1,350.9	1,350.9	1,350.9	0.0
J	7,572[1]	91	660	7.1	1,353.9	1,353.9	1,353.9	0.0
Coyote Creek								
A	581[2]	70	378	7.1	960.1	960.1	960.1	0.0
B	1,162[2]	70	510	5.8	961.8	961.8	962.2	0.4
C	2,165[2]	90	540	3.6	965.8	965.8	965.9	0.1
D	3,168[2]	130	580	7.2	966.2	966.2	967.2	1.0
E	4,013[2]	30	90	8.1	968.0	968.0	968.3	0.3
F	4,699[2]	30	140	6.9	970.8	970.8	971.7	0.9
G	5,702[2]	40	150	6.3	973.2	973.2	974.0	0.8
H	6,600[2]	60	180	8.6	976.4	976.4	976.6	0.2
I	7,762[2]	80	300	5.1	980.0	980.0	981.0	1.0
J	8,818[2]	40	180	10.0	984.0	984.0	984.1	0.1
K	9,398[2]	30	150	12.1	988.8	988.8	989.3	0.5
L	9,979[2]	90	220	7.5	994.3	994.3	994.8	0.5

[1] Feet above confluence with Cache Creek
[2] Feet above confluence with Putah Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

COPSEY CREEK - COYOTE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Dry Creek								
A	1,373	120	540	11.9	1,090.8	1,090.8	1,091.7	0.9
B	2,587	230	1,370	4.7	1,098.5	1,098.5	1,099.3	0.8
C	3,538	100	600	10.8	1,103.4	1,109.4	1,104.1	0.7
D	4,488	130	770	8.4	1,107.9	1,107.9	1,108.9	1.0
E	5,491	160	670	9.7	1,114.6	1,114.6	1,115.6	0.7
F	6,547	110	620	10.5	1,120.7	1,120.7	1,121.7	1.0
G	7,498	60	410	14.8	1,126.6	1,126.6	1,127.6	1.0
H	8,448	50	400	15.4	1,132.8	1,132.8	1,133.8	1.0
I	9,504	40	400	15.4	1,140.4	1,140.4	1,141.4	1.0
J	10,454	50	460	13.2	1,148.1	1,148.1	1,149.1	1.0
K	11,774	50	480	12.7	1,157.0	1,157.0	1,158.0	1.0
L	13,464	50	460	13.2	1,171.1	1,171.1	1,172.1	1.0

[1]Feet above confluence with Putah Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

DRY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Forbes Creek								
A-F*								
G	6,750[1]	28	120	5.6	1,359.9	1,359.9	1,360.2	0.3
H	7,880[1]	117	353	1.8	1,368.9	1,368.9	1,369.6	0.7
I	8,950[1]	45	284	2.0	1,377.2	1,377.2	1,378.2	1.0
J	9,590[1]	14	53	11.0	1,381.3	1,381.3	1,381.3	0.0
Gallagher Creek								
A	158[2]	30	182	6.3	965.1	965.1	965.5	0.4
B	950[2]	30	150	7.8	968.9	968.9	969.2	0.3
C	1,267[2]	30	110	10.9	972.1	972.1	972.1	0.0

[1] Feet above confluence with Clear Lake
[2] Feet above confluence with Coyote Creek
*No floodway computed

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

FORBES CREEK - GALLAGHER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Herndon Creek								
A	160	93	451	3.8	1,333.8	1,333.8	1,334.8	1.0
B	960	51	226	7.6	1,336.4	1,336.4	1,336.9	0.5
C	1,770	67	312	5.5	1,340.9	1,340.9	1,341.4	0.5
D	2,515	56	331	5.2	1,343.1	1,343.1	1,343.9	0.8
E	2,935	51	188	9.2	1,344.6	1,344.6	1,344.8	0.2
F	4,394	75	251	6.9	1,350.5	1,350.5	1,351.3	0.8
G	5,249	42	208	5.5	1,357.0	1,357.0	1,356.8	-0.2
H	6,424	63	236	4.8	1,360.8	1,360.8	1,361.2	0.4
I	7,374	32	121	9.4	1,367.4	1,367.4	1,367.0	-0.4
J	8,214	80	261	4.4	1,373.7	1,373.7	1,373.9	0.2

[1]Feet above confluence with Cache Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

HERNDON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Highland Creek								
A	262[1]	162	732	2.7	1,417.1	1,417.1	1,417.3	0.2
B	1,128[1]	113	351	5.6	1,419.0	1,419.0	1,419.0	0.0
C	1,975[1]	130	502	3.9	1,423.1	1,423.1	1,423.1	0.0
D	2,704[1]	69	414	4.7	1,425.0	1,425.0	1,425.0	0.0
E	3,183[1]	81	536	3.6	1,433.5	1,433.5	1,434.1	0.6

[1] Feet above confluence with Adobe Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

HIGHLAND CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Long Valley Creek								
A	140	188	1,600	6.4	1,101.6	1,101.6	1,102.6	1.0
B	1,000	133	1,445	7.0	1,111.0	1,111.0	1,111.3	0.3
C	1,800	120	1,399	7.3	1,115.6	1,115.6	1,116.0	0.4
D	3,790	274	2,087	4.9	1,129.7	1,129.7	1,129.8	0.1
E	4,550	81	672	15.1	1,133.3	1,133.3	1,133.4	0.1
F	6,030	222	1,168	7.6	1,143.0	1,143.0	1,143.7	0.7
G	6,840	246	1,899	4.7	1,147.4	1,147.4	1,147.7	0.3
H	7,550	344	1,820	4.2	1,148.4	1,148.4	1,148.8	0.4
I	8,030	160	810	9.4	1,150.6	1,150.6	1,150.6	0.0
J	9,020	194	1,491	5.1	1,159.1	1,159.1	1,159.4	0.3
K	9,820	127	1,087	7.0	1,163.8	1,163.8	1,163.8	0.0
L	10,735	318	1,442	5.3	1,169.0	1,169.0	1,169.0	0.0
M	11,495	193	1,345	6.6	1,171.9	1,171.9	1,172.4	0.5
N	11,960	262	2,004	4.4	1,173.7	1,173.7	1,174.6	0.9
O	13,480	244	1,386	6.4	1,177.9	1,177.9	1,178.3	0.4
P	14,930	255	1,472	6.2	1,184.1	1,184.1	1,184.8	0.7

[1]Feet above confluence with North Fork Cache Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

LONG VALLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Long Valley Creek Right Bank Split-flow								
J	0	246	1,899	4.7	1,147.4	1,147.4	1,147.7	0.3
K	430	252	833	1.6	1,148.3	1,148.3	1,148.9	0.6
L	620	204	169	7.7	1,149.8	1,149.8	1,150.3	0.5
M	1,450	201	268	4.8	1,157.4	1,157.4	1,157.6	0.2
N	2,200	282	220	5.9	1,165.2	1,165.2	1,165.2	0.0
O	2,970	279	487	2.7	1,169.0	1,169.0	1,170.0	1.0
P	3,315	193	1,346	6.6	1,171.9	1,171.9	1,172.4	0.5

[1]Feet above confluence with North Fork Cache Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Middle Creek								
A	2,006	450	7,940	3.7	1,333.6	1,333.6	1,334.6	1.0
B	3,326	570	8,730	3.4	1,334.2	1,334.2	1,335.1	0.9
C	4,330	610	8,940	3.3	1,334.5	1,334.5	1,335.4	0.9
D	5,122	520	8,190	3.6	1,334.6	1,334.6	1,335.5	0.9
E	5,966	700	12,040	2.4	1,334.8	1,334.8	1,335.7	0.9
F	6,758	800	10,640	2.8	1,335.0	1,335.0	1,335.9	0.9
G	7,762	880	9,150	3.1	1,335.0	1,335.0	1,335.9	0.9
H	8,818	600	8,370	3.5	1,335.6	1,335.6	1,336.4	0.8
I	9,926	950	10,920	2.6	1,336.1	1,336.1	1,337.0	0.9
J	10,877	1,080	11,260	2.6	1,336.6	1,336.6	1,337.5	0.9
K	11,827	1,100	13,180	2.2	1,337.0	1,337.0	1,337.8	0.8
L	12,777	900	9,390	3.1	1,337.6	1,337.6	1,338.3	0.7
M	13,676	550	6,150	4.7	1,338.0	1,338.0	1,338.8	0.8
N	14,573	350	4,730	6.2	1,339.1	1,339.1	1,340.0	0.9
O-AP*								

[1]Feet above confluence with Clear Lake
*Floodway data not available

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

MIDDLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Molesworth Creek								
A	0	30	90	10.3	1,333.4	1,333.4	1,333.4	0.0
B	370	30	80	11.5	1,336.1	1,336.1	1,336.1	0.0
C	739	30	80	11.5	1,339.3	1,339.3	1,339.3	0.0
D	1,162	30	90	10.1	1,343.2	1,343.2	1,343.2	0.0
E	1,584	40	140	6.4	1,346.2	1,346.2	1,346.9	0.7
F	2,112	60	270	3.3	1,350.6	1,350.6	1,350.8	0.2
G	2,534	60	240	3.7	1,351.9	1,351.9	1,352.1	0.2
H	3,168	60	190	4.6	1,355.7	1,355.7	1,356.2	0.5
I	3,696	50	110	7.8	1,360.5	1,360.5	1,360.9	0.4
J	4,277	30	120	7.1	1,366.3	1,366.3	1,366.6	0.3
K	4,752	90	250	3.4	1,372.9	1,372.9	1,372.9	0.0
L	5,808	90	2,400	0.3	1,414.4	1,414.4	1,414.4	0.0
Pier 1900 Drain								
A*								
B	1,965	30	99	4.2	1,352.4	1,352.4	1,353.3	0.9
C	2,335	48	141	2.0	1,355.1	1,355.1	1,355.9	0.8
D	3,110	25	87	3.3	1,363.3	1,363.3	1,363.3	0.0

[1]Feet above confluence with Clear Lake
*Floodway data not computed

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

MOLESWORTH CREEK - PIER 1900 DRAIN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Pool Creek								
A	4,646	450	350	3.4	1,409.0	1,409.0	1,410.0	1.0
B	5,491	300	550	2.2	1,410.3	1,410.3	1,411.1	0.8
C	7,392	250	150	7.9	1,413.2	1,413.2	1,413.8	0.6
D	8,765	200	350	3.4	1,414.6	1,414.6	1,415.0	0.4
E	9,610	150	300	4.0	1,717.7	1,717.7	1,418.1	0.4
F	11,510	150	400	3.0	1,427.3	1,427.3	1,427.6	0.6

[1]Feet above confluence with Clear Lake

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

POOL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Putah Creek								
A	45,408	160	3,030	13.2	934.7	934.7	935.5	0.8
B	46,464	470	9,540	4.2	938.3	938.3	939.0	0.7
C	47,520	310	5,770	6.9	938.5	938.5	939.1	0.6
D	48,576	280	4,990	8.0	939.1	939.1	939.8	0.7
E	50,688	230	2,910	13.7	942.9	942.9	943.1	0.2
F	52,272	800	8,690	4.6	949.0	949.0	949.7	0.7
G	53,539	690	6,480	6.2	950.9	950.9	951.9	1.0
H	54,278	550	6,080	6.6	953.0	953.0	953.5	0.5
I	55,229	960	10,390	3.9	954.1	954.1	955.0	0.9
J	56,126	1,020	10,260	3.9	955.0	955.0	955.8	0.8
K	57,446	620	7,130	5.6	956.5	956.5	957.0	0.5
L	58,450	550	6,360	6.3	958.3	958.3	958.9	0.6
M	60,034	550	5,940	6.1	960.9	960.9	961.9	1.0
N	61,195	620	3,880	9.4	963.6	963.6	964.4	0.8
O	62,251	620	6,950	5.2	967.2	967.2	968.1	0.9
P	63,466	850	6,640	5.5	970.7	970.7	971.0	0.3
Q	64,733	640	4,610	7.9	972.5	972.5	973.2	0.7
R	66,106	490	4,600	7.9	975.7	975.7	976.7	1.0
S	67,373	900	4,480	8.1	979.1	979.1	980.0	0.9
T	69,062	450	4,570	8.0	985.5	985.5	986.5	1.0
U	72,118	260	3,200	11.4	995.3	995.3	996.3	1.0

[1] Feet above County Boundary.

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

PUTAH CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Putah Creek (continued)								
V	96,941	740	8,770	3.2	1,081.8	1,081.8	1,082.8	1.0
W	97,680	420	6,250	4.5	1,082.5	1,082.5	1,083.4	0.9
X	98,736	770	7,200	3.6	1,083.1	1,083.1	1,084.0	0.9
Y	99,950	680	3,890	4.4	1,083.9	1,083.9	1,084.7	0.8
Z	100,954	390	3,310	5.2	1,085.5	1,085.5	1,086.4	0.9
AA	102,274	210	1,980	8.7	1,088.5	1,088.5	1,089.5	1.0
AB	103,118	340	2,400	4.3	1,093.5	1,093.5	1,094.5	1.0
AC	104,016	500	3,620	2.9	1,094.8	1,094.8	1,095.8	1.0
AD	105,125	260	1,010	10.3	1,100.7	1,100.7	1,101.5	0.8
AE	106,022	320	1,860	5.6	1,105.6	1,105.6	1,106.5	0.9
AF	107,026	450	1,270	8.2	1,110.0	1,110.0	1,110.7	0.7
AG	107,976	650	3,040	3.4	1,117.0	1,117.0	1,118.0	1.0
AH	108,662	270	1,190	8.7	1,120.5	1,120.5	1,120.6	0.1
AI	109,930	170	920	11.6	1,129.7	1,129.7	1,130.6	0.9
AJ	110,880	110	830	12.6	1,139.3	1,139.3	1,139.9	0.6
AK	112,464	90	880	11.8	1,150.0	1,150.0	1,150.8	0.8
AL	113,520	80	710	14.7	1,158.7	1,158.7	1,159.1	0.4
AM	114,576	90	890	11.8	1,167.6	1,167.6	1,168.3	0.7
AN	116,160	90	820	12.7	1,178.0	1,178.0	1,178.9	0.9
AO	117,216	90	770	13.5	1,188.1	1,188.1	1,189.1	1.0
AP	118,219	70	820	12.7	1,200.9	1,200.9	1,201.9	1.0

[1] Feet above County Boundary.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Scotts Creek								
A	792	*	*	*	1,340.0	1,340.0	*	*
B	1,584	*	*	*	1,340.4	1,340.4	*	*
C	3,274	*	*	*	1,341.3	1,341.3	*	*
D	4,541	*	*	*	1,342.0	1,342.0	*	*
E	5,755	250	4,100	3.6	1,345.4	1,345.4	1,345.5	0.1
F	7,022	530	8,770	1.7	1,345.4	1,345.4	1,345.5	0.1
G	8,606	530	8,540	1.7	1,345.4	1,345.4	1,345.6	0.2
H	9,715	530	8,300	1.8	1,345.4	1,345.4	1,345.6	0.2
I	11,088	530	8,070	1.8	1,345.4	1,345.4	1,345.8	0.4
J	12,830	530	7,860	1.9	1,345.4	1,345.4	1,345.9	0.5
K	14,467	530	7,660	1.9	1,345.4	1,345.4	1,346.0	0.6
L	15,470	520	7,430	2.0	1,345.4	1,345.4	1,346.1	0.7
M	16,421	530	7,490	2.0	1,345.4	1,345.4	1,346.2	0.8
N	17,794	520	7,280	2.0	1,345.4	1,345.4	1,346.3	0.9
O	19,536	520	7,400	2.0	1,345.4	1,345.4	1,346.4	1.0
P	21,648	410	5,650	2.6	1,345.4	1,345.4	1,346.4	1.0
Q	22,651	490	5,340	2.8	1,345.6	1,345.6	1,346.6	1.0
R	23,602	430	4,790	3.1	1,346.0	1,346.0	1,347.0	1.0
S	24,552	630	5,970	2.5	1,346.3	1,346.3	1,347.3	1.0
T	26,664	630	5,360	2.7	1,348.6	1,348.6	1,349.6	1.0
U	27,667	1,070	7,020	2.1	1,349.0	1,349.0	1,350.0	1.0
V	28,882	200	1,920	7.6	1,349.3	1,349.3	1,350.1	0.8
W	29,832	270	2,300	6.4	1,352.3	1,352.3	1,353.0	0.7

[1] Feet above mouth
* Data not available

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

SCOTTS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Scotts Creek (continued)								
X	31,627	290	3,040	4.8	1,357.1	1,357.1	1,357.6	0.5
Y	32,525	380	3,140	4.6	1,358.0	1,358.0	1,358.5	0.5
Z	33,422	410	3,040	4.7	1,358.6	1,358.6	1,359.1	0.5
AA	34,373	390	2,920	4.9	1,360.0	1,360.0	1,360.4	0.4
AB	35,376	340	2,750	5.2	1,361.2	1,361.2	1,361.7	0.5
AC	36,696	300	1,860	7.7	1,362.3	1,362.3	1,362.9	0.6
AD	38,650	460	4,050	3.5	1,367.8	1,367.8	1,368.7	0.9
AE	39,706	430	3,140	4.6	1,368.7	1,368.7	1,369.5	0.8
AF	40,8,67	510	3,760	3.8	1,370.0	1,370.0	1,370.8	0.8
AG	41,870	340	2,090	6.8	1,370.7	1,370.7	1,371.5	0.8
AH	42,768	410	3,850	3.8	1,375.4	1,375.4	1,376.4	1.0
AI	43,666	590	5,580	2.6	1,375.9	1,375.9	1,376.9	1.0
AJ	44,933	530	3,670	4.0	1,376.3	1,376.3	1,377.3	1.0
AK	45,989	350	2,460	6.0	1,377.0	1,377.0	1,378.0	1.0
AL	48,682	620	3,650	3.8	1,380.1	1,380.1	1,381.0	0.9
AM	49,685	700	4,400	3.1	1,381.6	1,381.6	1,382.3	0.7
AN	50,899	780	4,260	3.2	1,382.4	1,382.4	1,383.0	0.6
AO	52,114	850	4,760	2.9	1,384.6	1,384.6	1,385.2	0.6
AP	53,064	720	3,090	4.5	1,385.5	1,385.5	1,385.9	0.4
AQ	54,067	660	2,950	4.7	1,387.9	1,387.9	1,388.2	0.3
AR	55,070	660	3,300	4.2	1,389.6	1,389.6	1,390.1	0.5
AS	56,654	300	2,050	6.7	1,393.0	1,393.0	1,393.5	0.5
AT	57,922	740	4,200	3.3	1,394.8	1,394.8	1,395.4	0.6

[1] Feet above mouth

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Scotts Creek (continued)								
AU	58,925	510	2,300	6.0	1,395.6	1,395.6	1,395.1	0.5
AV	59,928	700	3,660	3.8	1,398.0	1,398.0	1,398.5	0.5
AW	60,931	540	2,830	4.9	1,399.4	1,399.4	1,399.9	0.5
AX	62,093	400	1,940	6.9	1,402.4	1,402.4	1,403.4	1.0
AY	63,149	210	1,300	3.9	1,405.8	1,405.8	1,406.8	1.0
AZ	64,258	270	1,540	3.3	1,408.6	1,408.6	1,409.3	0.7
BA	65,314	260	1,580	3.2	1,410.6	1,410.6	1,411.1	0.5
BB	66,422	380	1,960	2.6	1,412.6	1,412.6	1,413.3	0.7
BC	67,690	200	1,400	3.6	1,415.0	1,415.0	1,415.5	0.5
BD	68,640	270	900	5.6	1,417.6	1,417.6	1,418.3	0.7
BE	69,696	*	*	*	1,420.6	1,420.6	*	*
BF	70,963	*	*	*	1,423.6	1,423.6	*	*
BG	72,336	*	*	*	1,425.8	1,425.8	*	*
BH	73445	*	*	*	1,426.5	1,426.5	*	*
BI	74,554	*	*	*	1,429.3	1,429.3	*	*
BJ	75,821	*	*	*	1,432.5	1,432.5	*	*
BK	76,771	*	*	*	1,434.6	1,434.6	*	*
BL	77,774	*	*	*	1,437.1	1,437.1	*	*
BM	78,883	200	1,320	10.8	1,440.1	1,440.1	1,440.2	0.1
BN	79,939	130	1,330	10.7	1,443.8	1,443.8	1,443.8	0.0
BO	81,206	120	1,520	9.4	1,449.2	1,449.2	1,449.2	0.0
BP	82,421	120	1,260	11.3	1,452.2	1,452.2	1,452.2	0.0

[1] Feet above mouth
* Data not available

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Scotts Creek (continued)								
BQ	83,688	140	1,230	11.6	1,456.5	1,456.5	1,456.5	0.0
BR	84,533	240	2,220	6.7	1,459.9	1,459.9	1,460.9	1.0
BS	85,536	290	2,420	5.3	1,465.0	1,465.0	1,465.1	0.1
BT	86,539	280	2,050	6.3	1,466.1	1,466.1	1,466.1	0.0
BU	87,701	250	1,730	7.5	1,468.5	1,468.5	1,469.1	0.6
BV	88,915	230	2,810	4.6	1,473.2	1,473.2	1,473.3	0.1
BW	89,971	150	1,190	10.7	1,475.4	1,475.4	1,475.4	0.0
BX	91,344	290	2,060	16.2	1,478.7	1,478.7	1,478.8	0.1
BY	92,242	260	1,510	8.4	1,480.2	1,480.2	1,480.5	0.3
BZ	93,192	260	2,300	5.5	1,487.1	1,487.1	1,487.6	0.5
CA	94,406	210	1,520	8.4	1,495.3	1,495.3	1,495.3	0.0
CB	95,410	240	1,830	6.9	1,498.7	1,498.7	1,498.7	0.0

[1] Feet above mouth

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Siegler Canyon Creek								
A	1,795	100	790	4.8	1,338.6	1,338.6	1,339.3	0.7
B	2,693	150	640	6.0	1,342.9	1,342.9	1,343.0	0.1
C	4,118	100	610	6.3	1,353.5	1,353.5	1,354.3	0.8
D	4,858	120	660	5.8	1,358.6	1,358.6	1,359.3	0.7
E	5,755	50	370	10.5	1,360.8	1,360.8	1,361.7	0.9
F	6,917	60	390	9.7	1,370.6	1,370.6	1,370.8	0.2
G	7,973	60	370	10.3	1,379.1	1,379.1	1,379.8	0.7
H	8,606	100	300	13.0	1,384.3	1,384.3	1,384.4	0.1

[1]Feet above confluence with Cache Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
St. Helena Creek								
A	1,320	150	920	9.9	1,083.3	1,083.3	1,083.8	0.5
B	2,429	200	1,620	5.6	1,088.8	1,088.8	1,089.7	0.9
C	3,010	120	940	9.8	1,091.3	1,091.3	1,092.2	0.9
D	4,066	120	1,160	8.0	1,096.0	1,096.0	1,096.4	0.4
E	5,280	180	1,010	9.2	1,100.4	1,100.4	1,100.9	0.5
F	6,283	300	1,930	4.8	1,105.2	1,105.2	1,106.0	0.8
G	7,181	150	730	12.7	1,110.4	1,110.4	1,110.8	0.4
H	8,184	340	1,960	4.8	1,119.4	1,119.4	1,120.3	0.9
I	10,085	430	2,360	3.9	1,133.1	1,133.1	1,133.8	0.7
J	11,088	200	1,140	8.2	1,138.9	1,138.9	1,139.6	0.7
K	12,408	210	1,474	6.3	1,149.3	1,149.3	1,150.0	0.7
L	15,259	130	1,140	7.1	1,174.5	1,174.5	1,174.8	0.3
M	19,800	100	960	8.4	1,209.2	1,209.2	1,210.0	0.8
N	22,440	80	800	10.1	1,232.2	1,232.2	1,233.1	0.9
O	24,605	90	1,040	7.8	1,250.9	1,250.9	1,251.9	1.0
P	25,344	90	1,090	7.4	1,258.7	1,258.7	1,259.0	0.3
Q	27,456	50	510	13.7	1,276.2	1,276.2	1,277.2	1.0
R	29,093	100	1,320	5.2	1,302.6	1,302.6	1,303.3	0.7

[1]Feet above mouth

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Thurston Creek								
A	9,085	55	316	10.7	1,767.9	1,767.9	1,768.9	1.0
B	10,630	120	636	5.3	1,795.0	1,795.0	1,795.5	0.5
C	11,510	95	478	7.1	1,796.2	1,796.2	1,797.1	0.9
D	12,400	85	402	8.4	1,799.2	1,799.2	1,800.1	0.9
E	13,330	70	522	6.5	1,802.4	1,802.4	1,802.7	0.3
F	14,330	238	1,612	2.1	1,803.3	1,803.3	1,804.1	0.8
G	15,080	340	2,484	1.4	1,805.5	1,805.5	1,805.8	0.3
H	15,750	267	1,569	2.2	1,805.5	1,805.5	1,805.9	0.4
I	16,285	465	2,911	1.2	1,805.6	1,805.6	1,806.1	0.5
J	16,960	566	2,515	1.3	1,805.7	1,805.7	1,806.3	0.6
K	17,315	514	1,932	1.8	1,805.7	1,805.7	1,806.5	0.8
L	17,670	457	1,083	3.1	1,806.3	1,806.3	1,807.2	0.9
M	17,930	361	1,043	2.6	1,808.1	1,808.1	1,808.5	0.4
N	18,815	179	651	4.2	1,809.0	1,809.0	1,809.6	0.6
O	19,860	156	527	5.2	1,811.3	1,811.3	1,812.3	1.0
P	21,400	181	337	8.2	1,819.6	1,819.6	1,819.8	0.2
Q	22,285	181	387	7.1	1,829.3	1,829.3	1,829.7	0.4
R	23,125	202	427	6.4	1,840.7	1,840.7	1,841.0	0.3
S	23,835	303	584	4.7	1,849.1	1,849.1	1,849.6	0.5
T	24,735	125	380	7.2	1,861.7	1,861.7	1,862.0	0.3

[1]Feet above confluence with Thurston Lake

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

THURSTON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Thurston Creek (continued)								
U	25,365	238	1,522	1.8	1,868.9	1,868.9	1,869.0	0.1
V	26,010	154	1,243	1.3	1,868.9	1,868.9	1,869.1	0.2
W	26,735	359	3,108	0.5	1,868.9	1,868.9	1,869.2	0.3
X	27,500	256	1,698	1.0	1,868.9	1,868.9	1,869.2	0.3
Y	28,120	283	1,397	1.2	1,868.9	1,868.9	1,869.2	0.3
Z	28,810	301	586	2.8	1,869.0	1,869.0	1,869.4	0.4
AA	29,500	196	266	6.1	1,871.8	1,871.8	1,872.4	0.6

[1]Feet above confluence with Thurston Lake

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (NAVD)	WITHOUT FLOODWAY (NAVD)	WITH FLOODWAY (NAVD)	INCREASE
Wolf Creek								
A	80	216	1,574	4.2	1,131.7	1,131.7	1,132.7	1.0
B	441	129	863	7.7	1,135.7	1,135.7	1,135.7	0.0
C	991	119	725	9.1	1,140.6	1,140.6	1,140.8	0.2
D	1,901	191	949	7.0	1,148.4	1,148.4	1,148.9	0.5
E	2,706	52	889	7.4	1,149.0	1,149.0	1,149.3	0.3
F	2,977	150	2,394	2.8	1,190.2	1,190.2	1,190.2	0.0
G	3,577	398	3,866	1.7	1,190.3	1,190.3	1,190.3	0.0
H	4,507	364	2,552	2.3	1,190.3	1,190.3	1,190.3	0.0
I	5,457	369	1,300	4.5	1,190.6	1,190.6	1,190.6	0.0
J	6,267	249	689	8.4	1,192.5	1,192.5	1,192.5	0.0
K	6,962	51	374	15.5	1,196.9	1,196.9	1,196.9	0.0
L	7,657	57	389	14.9	1,209.5	1,209.5	1,209.5	0.0
M	8,139	104	866	6.7	1,224.5	1,224.5	1,224.5	0.0
N	8,629	290	819	7.1	1,225.5	1,225.5	1,225.5	0.0
O	9,439	148	529	10.9	1,232.7	1,232.7	1,232.7	0.0

[1]Feet above confluence with North Fork Cache Creek

TABLE 14

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

WOLF CREEK

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Lake County. Previously, FIRMs were prepared for each incorporated community and the unincorporated areas of the County identified as flood-prone. This countywide FIRM also includes flood-hazard information that was presented separately on Flood Boundary and Floodway Maps (FBFMs), where applicable. Historical data relating to the maps prepared for each community are presented in Table 15, "Community Map History."

7.0 OTHER STUDIES

Other published material dealing with flood problems in Lake County include two earlier FIS reports (U.S. Department of Housing and Urban Development, 1971; U.S. Department of Housing and Urban Development, 1972); a Flood Plain Information report, hydrologic studies, hydraulic analyses, floodplain delineations for existing or authorized flood control improvements, and floodplain inundation maps issued by the California Office of Emergency Preparedness.

A FIS of Lake County (U.S. Department of Housing and Urban Development, 1971) was prepared by the USACE, Sacramento District, in 1971. The study included the perimeter of Clear Lake; portions of Scotts, Pool, Burns Valley, Molesworth, and Cole Creeks; and Burns Valley Creek Overflow. Basic data used for Scotts, Pool, Molesworth, and Cole Creeks for the earlier report were checked, found to be accurate, and used in this FIS. Since publication of the earlier report, the State of California found the datum of the Rumsey gage to be incorrect. That gage and estimated lake inflows were used to determine flood levels of Clear Lake for the earlier study. Detailed study of inflow and lake stages, using a corrected datum for the Rumsey Gage, resulted in adjusted lake levels that were used in the original study.

The General Design Memorandum for the Lakeport Lake Project on Scotts Creek was prepared by the USACE, Sacramento District, in 1973 (USACE, 1972). It included floodplain delineations along Scotts Creek from the dam site downstream to the mouth of the creek. These delineations were for the purpose of determining project flowage easement areas, and minor, very frequent (less than 10-year) overflows were delineated in the reach from Tule Lake upstream to the lower end of Scotts Valley. The remaining reaches were delineated by approximate methods; therefore, the earlier floodplain delineations are incompatible and not comparable with those made for Scotts Creek for this report.

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Big Valley Band of Pomo Indians	September 30, 2005	---	September 30, 2005	---
Clearlake, City of	January 10, 1975	---	October 17, 1978	August 3, 1992 September 30, 2005
Lake County (Unincorporated Areas)	January 10, 1975	---	October 17, 1978	March 12, 1998 September 30, 2005
Lakeport, City of	November 19, 1976	---	September 1, 1978	September 28, 1990 September 30, 2005

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

LAKE COUNTY, CA

AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

Pursuant to the provisions of Section 8589.5, Government Code of California, emergency procedures must be established for the evacuation and control of areas of potential flooding in the event of sudden failure of dams. Inundation maps are prepared to show the areas subject to flooding. Such maps for dams on Highland Creek, Adobe Creek, and the North Fork Cache Creek have been issued by the California Office of Emergency Preparedness; however, they were of no value in the FIS because they only show areas that would be inundated as a result of sudden and complete dam failure.

A FIS for the City of Lakeport and the unincorporated areas of Lake County, California, was published in 1978 (U.S. Department of Housing and Urban Development, 1978). The results of this study, due to updated hydrology, more detailed and recent topography, and the incorporation of recent structural changes within the floodplain boundaries, supersede the results for corresponding areas of consideration that were shown in that study. The City of Clearlake FIS is in agreement with this study, except along Cache Creek, where water-surface profiles were revised to show consistent elevations in the backwater from Clear Lake Dam.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Lake County has been compiled into this FIS. This FIS report supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the NFIP.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region IV, Koger-Center — Rutgers Building, 3003 Chamblee Tucker Road, Atlanta, GA 30341.

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10.0 REVISION DESCRIPTIONS

This section has been added to provide information regarding significant revisions made since the original FIS was printed. Future revisions may be made that do not result in the republishing of the FIS report. To assure that the user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data located at:

- Big Valley Band of Pomo Indians
  Environmental Protection Department
  2726 Mission Rancheria Road
  Lakeport, California 95453

- City of Clearlake City Hall
  14360 Lakeshore Drive
  Clearlake, California 95422

- Lake County Department of Public Works
  255 North Forbes Street
  Room 309
  Lakeport, California 95453

- City of Lakeport City Hall
  255 Park Street
  Lakeport, California 95453

10.1 First Revision (Revised Month Day, Year)

This Month Day, year revision was performed in support of the FEMA Risk MAP Program.

This revision includes a Vertical Datum Conversion from NGVD29 to NAVD88 and boundary adjustment for approximately 126.6 miles of flooding sources currently mapped as detailed study. The boundaries of approximately 7.5 miles of Zone A and 20.6 miles of Zone AE flooding sources have been refined and re-established. The Zone AE areas have been re-delineated within the extents of two-foot contours provided by Lake County and the City of Lakeport and new Zone A boundaries for Hartley Drain, Middle Creek, Pier 1900 Drain, North Branch Forbes Creek, North Branch Forbes Creek Tributary 1, North Branch Forbes Creek Tributary 2, Rumsey Bay South Drain, and Rumsey Bay North Drain were also refined.

Levees that were shown as providing protection on the 2005 DFIRM Panels and were eligible, were offered the Provisionally Accredited Levee (PAL) option. Levee accreditation data was not provided by Lake County and therefore levees along the following flooding sources were de-accredited in this revision:

- Middle Creek
- Clover Creek and Clover Creek Diversion
- Scotts Creek

As a result of the de-accreditation, approximate hydraulic methods were used to determine the extent of SFHA landward of the levee. The hydraulic models were created using the best available topographic data and analyzed the extent of flooding resulting from removal of the levee within the model. The resulting water surface elevation was mapped as a Zone A on the revised DFIRM panels.