FLOOD INSURANCE STUDY

VOLUME 1 OF 2

SAN LUIS OBISPO COUNTY, CALIFORNIA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
ARROYO GRANDE, CITY OF	060305
ATASCADERO, CITY OF	060700
EL PASO DE ROBLES, CITY OF	060308
GROVER BEACH, CITY OF	060306
MORRO BAY, CITY OF	060307
PISMO BEACH, CITY OF	060309
SAN LUIS OBISPO, CITY OF	060310
SAN LUIS OBISPO COUNTY (UNINCORPORATED AREAS)	060304

REVISED:
November 16, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
06079CV001B

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 (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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

Initial Countywide FIS Effective Date: August 28, 2008
Revised Countywide FIS Date: November 16, 2012

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FLOOD INSURANCE STUDY
SAN LUIS OBISPO 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 San Luis Obispo County, including the Cities of Arroyo Grande, Atascadero, El Paso de Robles, Grover Beach, Morro Bay, Pismo Beach, and San Luis Obispo; and the unincorporated areas of San Luis Obispo County (referred to collectively herein as San Luis Obispo County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code for 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.

1.2 Authority and Acknowledgments

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

This FIS was prepared to include the unincorporated areas of, and incorporated communities within, San Luis Obispo County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this countywide FIS, as compiled from their previously printed FIS reports, is shown below.

For this countywide revision, MAP IX-Mainland was contracted, under contract number EMF-2003-CO-0047, by FEMA to apply a countywide Vertical Datum Conversion to North American Vertical Datum 1988 (NAVD 88) from National Geodetic Vertical Datum 1929 (NGVD 29), and to provide a new FIS and Digital Flood Insurance Rate Map (DFIRM) panels that reflect these changes.

Arroyo Grande, City of:	The hydrologic and hydraulic analyses from the FIS report dated March 19, 1984, were performed by the U.S. Army Corps of Engineers (USACE), for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-H-10-77. That study was completed in January 1983.

Atascadero, City of:	The hydrologic and hydraulic analyses from the FIS report dated July 20, 1981, were performed by George S. Nolte and Associates, for the Federal Insurance Administration (FIA), under Contract No. H-4722. That work, which was completed in December 1979, covered all significant flooding sources affecting the City of Atascadero.
El Paso de Robles, City of:	The hydrologic and hydraulic analyses from the FIS report dated March 16, 1981, were performed by George S. Nolte & Associates, for the FIA, under Contract No. H-4722. That work was completed in December 1979.
Grover Beach, City of:	The hydrologic and hydraulic analyses from the FIS report dated August 1, 1984, were performed by the USACE and Tetra Tech, Inc., for FEMA, under Inter-Agency Agreement No. IAA-H-10-77 and Contract No. H-4543. That work was completed in January 1983. The FIS report dated November 5, 1997, incorporated a Letter of Map Revision (LOMR) issued on November 25, 1996. The LOMR showed the effects of revised hydraulic analyses based on updated topographic information along Meadow Creek.
Morro Bay, City of:	The hydrologic and hydraulic analyses from the FIS report dated December 18, 1979, were performed by the U.S. Geological Survey (USGS), for FEMA, under Inter-Agency Agreement Nos. IAA-H-17-75 and IAA-H-8-76, Project Order Nos. 8 and 13, respectively. The hydraulic analyses for this study were completed in June 1977. For the FIS report dated November 1, 1985, the coastal analysis was prepared by Dames & Moore for FEMA, under contract No. C-0970. The work was completed in 1984.
Pismo Beach, City of:	The hydrologic and hydraulic analyses from the FIS report dated February 1, 1984, were performed by the USACE and Tetra Tech, Inc., for FEMA, under Inter-Agency Agreement No. IAA-H-10-77 and Contract No. H-4543. That work was completed in January 1983. The FIS report dated November 5, 1997, incorporated a LOMR issued on November 25,

1996. The LOMR showed the effects of revised hydraulic analyses based on updated topographic information along Meadow Creek and Pismo Creek.

San Luis Obispo, City of: The hydrologic and hydraulic analyses from the FIS report dated October 1978, were performed by the USACE, Los Angeles District, for the FIA, under Inter-Agency Agreement Nos. IAA-H-19-74 and IAA-H-16-75, Project Order Nos. 13 and 22, respectively. That work was completed in June 1977.

San Luis Obispo County (Unincorporated Areas): For the July 5, 1982, FIS, the hydrologic and hydraulic analyses were completed in December 1979, by George S. Nolte and Associates, for FEMA, under Contract No. H-4722.

For the FIS dated July 18, 1985, the hydrologic and hydraulic analyses were completed in September 1982, by USACE, for the FEMA, under Inter-Agency Agreement No. IAA-H-10-77. In coastal areas, the hydrologic analyses for this study were performed by Dames & Moore, for FEMA, under Contract No. C-0970. The coastal work was completed in July 1984.

For the FIS dated June 3, 1991, the revised hydraulic analysis for Arroyo Grande Creek between the Union Pacific Railroad Bridge and the State Highway 1 Bridge was performed by the USACE, Los Angeles District, for FEMA, under Inter-Agency Agreement No. EMW-89-E-2994, Project Order 8. That work was completed in December 1989.

For the FIS dated February 4, 2004, revised hydrologic and hydraulic analyses for Los Berros Creek from El Campo Road to U.S. Highway 101 were performed by the California Department of Water Resources, San Joaquin District, in collaboration with the San Luis Obispo County Department of Engineering, for FEMA. That work was completed in June 2001.

Base map information shown in this study was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency under its National Agriculture Imagery Program (NAIP). This imagery was flown in 2010 and was produced with a 1-meter ground sample distance.

The projection used in the preparation of the DFIRMs was Universal Transverse Mercator (UTM) Zone 10N. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zone used in the production of FIRMs for adjacent jurisdictions may result in slight positional differenced in map features across jurisdiction boundaries. These differences do not affect the accuracy of information shown on the FIRM.

The projected coordinate system used for the production of this study is California State Plane 5 (HARN_Lambert_Conformal_Conic), North American Datum of 1983 (NAD 83).

1.3 Coordination

An initial Consultation Coordination Officer (CCO) meeting was held with representative of FEMA, the community, and the study contractor to explain the nature and purpose of an FIS, and to identify the streams to be studied by detailed methods. A final CCO meeting was held with representatives of FEMA, the community, and the study contractor to review the results of the study. All problems raised in the meeting have been addressed in this study.

For this countywide FIS an initial CCO meeting was held on May 9, 2008, and attended by representatives of FEMA, the community, and the study contractor. The final CCO meeting was held on June 18, 2009, and was attended by representatives of FEMA, the community, and the study contractor.

The dates of the previous initial and final CCO meetings held for San Luis Obispo County and the incorporated communities within its boundaries are shown in Table 1, "Initial and Final CCO Meetings."

Table 1 – Initial and Final CCO Meetings

Community Name	For FIS dated	Initial CCO Meeting	Final CCO Meeting
City of Arroyo Grande	March 19, 1984 August 28, 2008	* June 22, 2004	December 16, 1982 September 22, 2005 January 11, 2008
City of Atascadero	July 20, 1981 August 28, 2008	April 1978 June 22, 2004	January 26, 1981 September 22, 2005 January 11, 2008
City of El Paso de Robles	March 16, 1981 August 28, 2008	April 1978 June 22, 2004	July 10, 1980 September 22, 2005 January 11, 2008
City of Grover Beach	August 1, 1984 August 28, 2008	* June 22, 2004	December 16, 1982 September 22, 2005 January 11, 2008

Table 1 – Initial and Final CCO Meetings

Community Name	For FIS dated	Initial CCO Meeting	Final CCO Meeting
City of Morro Bay	December 18, 1979 August 28, 2008	November 1976 June 22, 2004	November 7, 1978 September 22, 2005 January 11, 2008
City of Pismo Beach	February 1, 1984 August 28, 2008	* June 22, 2004	December 16, 1982 September 22, 2005 January 11, 2008
City of San Luis Obispo	October 1978 August 28, 2008	December 1974 June 22, 2004	February 28, 1978 September 22, 2005 January 11, 2008
San Luis Obispo County (Unincorporated Areas)	July 5, 1982 July 18, 1985 July 3, 1991 August 28, 2008	April 1978 * May 16, 1989 June 22, 2004	June 5, 1981 December 16, 1982 * September 22, 2005 January 11, 2008

*Data not available

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of San Luis Obispo County, California.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. All or portions of the flooding sources listed in Table 2, "Flooding Sources Studied by Detailed Methods," were studied by detailed methods. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1).

Table 2 – Flooding Sources Studied by Detailed Methods

Arroyo Grande Creek	Meadow Creek
Atascadero Creek	Morro Creek
Carpenter Canyon Creek	Mountain Springs Creek
Cayucos Creek	Nipomo Creek
Chorro Creek	Noname Creek
Corbett Canyon Creek	North Fork Los Berros Creek
Deleissigues Creek	North Fork Paloma Creek
Graves Creek	Old Garden Creek
Little Cayucos Creek	Pacific Ocean
Little Morro Creek	Paloma Creek
Los Berros Creek	Peachy Canyon Creek

Pismo Creek	South Branch Unnamed Creek No. 1
Prefumo Creek	Stenner Creek
Prefumo Canyon Creek	Tefft Road Tributary
Salinas River	Tefft Road Tributary East Fork
San Luis Obispo Creek	Toad Creek (Main and North Branch)
Santa Margarita Creek	Toro Creek
Santa Rosa Creek	Unnamed Creek (Alva Paul Creek)
Santa Rosa Creek Split Flow	Unnamed Creek No. 1
See Canyon Creek	Willow Creek
South Branch Toad Creek	Yerba Buena Creek

All or portions of numerous flooding sources in the county were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the communities.

Table 3, "Letters of Map Change," presents Letters of Map Correction (LOMCs) incorporated into this countywide study.

Table 3 – Letters of Map Change

Community	Project Identifier	Effective Date	Case Number
City of Arroyo Grande	Tract 2104 Corbit Canyon Creek	February 28, 2007	06-09-BA92P
San Luis Obispo County (Unincorporated Areas); City of San Luis Obispo	Foothill Boulevard Stenner Creek	January 25, 2007	06-09-BA38P
San Luis Obispo County (Unincorporated Areas)	2345 See Canyon Road See Canyon Creek	July 14, 2008	07-09-1955P
San Luis Obispo County (Unincorporated Areas); City of Atascadero	North Fork Paloma Creek and Paloma Creek	October 6, 2008	08-09-0724P
City of Morro Bay	Morro Creek	December 21, 2011	10-09-3119P

2.2 Community Description

San Luis Obispo County is located along the southern California coast. The western boundary of the county is defined by the Pacific Ocean. The county is bordered by Monterey County to the north, Kern County to the east, and Santa Barbara County to the south. San Luis Obispo County is approximately midway between Los Angeles and San Francisco. The county encompasses an area of 2,122,240 acres.

The region that would ultimately become San Luis Obispo County was inhabited by Indians of the Salinan group. The Salinans were one of two Indians groups inhabiting San Luis Obispo County. South of the Santa Margarita Divide, the Chumash Indians occupied lower San Luis Obispo County as well as Santa Barbara and Ventura Counties and the Channel Islands. North of Santa Margarita, the Salinans were the dominant Indian group. "The Salinans inhabited the Salinas Valley from an unknown point below Soledad to the Santa Margarita Divide…" (Breschini, 1972). However, the Chumash and the Salinans had little to do with each other and were neighbors only at Santa Margarita and along the coast at Cayucos.

Recorded history began in the San Luis Obispo County area with the coming of the Spanish. The earliest account dates back to the year 1542, when Juan Rodriguez Cabrillo, a Portuguese navigator sailing for Spain, briefly visited Morro Bay. There is debate whether or not he actually landed at Morro Rock; however, he has been recognized as naming the rock, spelling it at that time "Moro" (Louisiana Clayton Dart, 1978).

The next recorded visit was by another Portuguese explorer sailing for Spain. Sailing along the California coast, Pedro de Unamuno put in at Morro Bay in 1587, 45 years after Cabrillo.

Unamuno landed with 12 soldiers and some Filipinos and made a short trip inland – coming as far as what we now know as the City of San Luis Obispo. Here he erected a cross and took possession of the land in the name of king Philip of Spain. On a two-day journey further inland, the group was surprised by an Indian attack. One Spaniard, who was not wearing his coat of mail, was killed as well as one Filipino. Unamuno hastily returned to his ship without challenging the Indians. But because of this experience with hostile Indians, he impressed the authorities of the dangers and enjoined subsequent explorers not to journey inland (Louisiana Clayton Dart, 1978).

Two other early explorers also landed on the shores of San Luis Obispo County. These were Sebastian Rodriguez Cermeno, in 1595, and Sebastian Vizcaino, in 1602. However, Don Gaspar de Portola made the definitive land expedition of Alta California, including San Luis Obispo County, in 1769. He and 62 men, including his engineer Miguel Costanso and Franciscan Fathers Crespi and Palou, traveled from San Diego to San Francisco Bay and back, along some of the most rugged portions of the coast.

Two missions were subsequently established in San Luis Obispo County. In September 1772, Father Junipero Serra established Mission San Luis Obispo and 25 years later Father Lasuen founded Mission San Miguel. The missions were very prosperous, Mission San Miguel was said to have had 91,000 cattle and 47,000 sheep, and Mission San Luis Obispo was even wealthier. From 1800 to 1822, Spanish governors conferred land grants, especially to retired soldiers or others who had helped the government. The average land grant was 11 square leagues, or 50,000 acres.

In 1821, Mexico gained independence, an event with far-reaching consequences for all of California. The missions were secularized and, under Mexican law, private citizens were eligible to own lands previously belonging to the missions. Hundreds of large land grants were created throughout the territory.

American interests in California increased steadily. Mexico had little chance in its dispute with the United States and, with the treaty of Guadalupe Hidalgo in 1848, it surrendered all of the California Territory to the United States.

The first State Assembly in California passed an act on February 18, 1850, dividing the state into 27 charter counties and fixing their boundaries. San Luis Obispo was one of the adjusted 27 counties, but its boundaries today do not differ markedly from those set up in 1850. The population of the new county in 1850 was 336, a figure that excluded several hundred Indians. The City of San Luis Obispo, then the only settlement in the county, was the natural choice for the county seat:

> By 1880, the city contained 2,500 people and in 1884, the long anticipated arrival of the Union Pacific Railroad seemed destined to carry the town (and county) to further growth and prosperity (Lee, Leon, & MacDonald, 1977).

San Luis Obispo County was, and continues to be, principally an agricultural county. The growing of wheat, grains, fruits, and nuts, as well as cattle production, are the prime elements of the local economy. The economic activity of World War II, the growth of California Polytechnic State University, and the establishment of state offices, a prison, and a mental hospital gave the county the economic character that it has today, where every third member of the work force is a government employee. Along the coast, tourism is also a very significant aspect of the county economy.

The pattern of growth and current land uses within San Luis Obispo County reflect the changes that have occurred since its organization in 1850:

> San Luis Obispo County has historically been dominated by agriculture and its population growth has been similar to that of many other agriculturally oriented counties. Population growth, although fluctuating occasionally, was relatively slow until 1940, when the population exceeded 33,000. The population grew to 51,417 in 1950 and another 29,627 residents were added by 1960, a substantial increase of 57.6 percent. However, the decade of the 1960s displayed a somewhat declining growth rate, with a 1970 population of 105,690, an increase of 34 percent over 1960 (San Luis Obispo County, 1977).

As of 2000, the county's population was 246,681 according to the U.S. Census Bureau. The major cities within the county are the Cities of San Luis Obispo, Arroyo Grande, Morro Bay, El Paso de Robles, and Atascadero. The coastal communities, including the City of Grover City, continue to grow in response to tourism and second-home demand.

Within the county, there is a difference between development patterns in the north, around the City of El Paso de Robles, and development in the center of the county, where the City of San Luis Obispo is located:

> There is a notable contrast between El Paso de Robles and San Luis Obispo. San Luis Obispo, with its ocean breezes, mission heritage, county seat power base and monopoly of the area's higher education (Cal Poly and Cuesta College), has been struggling to control growth and preserve environment. The political consequences of this struggle are evident in the

> news media daily. North of Cuesta Grade, there is a different ambience. The area is hot in summer, chilling in winter, dry, spacious, rugged, and ambitious. El Paso de Robles has struggled to keep its county airport passenger service and its county airport, to attract industry (with some success), to support real estate development, and to get Salinas River water from the headwaters at Santa Margarita Lake, which San Luis Obispo has legally under its thumb. Although the two cities are hardly heated rivals, their characters are distinctive (Lee, Leon, & MacDonald, 1977).

Growth and development in the county, especially along the coast, will continue to be topics of debate within San Luis Obispo County. The results of this process will determine population concentrations within the county.

San Luis Obispo County is served by an extensive network of highways and local arterials. U.S. Highway 101 connects the Cities of El Paso de Robles and San Luis Obispo with Salinas and San Francisco to the north and Santa Barbara and Los Angeles to the south. State Highway 1, the Cabrillo Highway, runs along the coast, connecting Monterey County with the City of San Luis Obispo. Other state highways and county roads provide easy connection between the major cities within the county.

San Luis Obispo County is also served by rail and air carriers. The Cities of El Paso de Robles and San Luis Obispo have local airports, and the Union Pacific Railroad mainline runs basically parallel to U.S. Highway 101, connecting San Luis Obispo to Los Angeles and San Francisco. Amtrak runs regular train service along this route connecting the City of San Luis Obispo with all points north and south.

San Luis Obispo County is characterized by extremely diverse terrain. Elevations vary from sea level on the coast to over 5,000 feet. The Santa Lucia Range makes a gentle S curve from northwest to southeast, forming a barrier between the wet coastal belt and the dry interior. Other mountain ranges in the county roughly parallel the coastline. The La Panza Range joins the Santa Lucia Range at the southern end and contains many peaks over 3,000 feet, including Black Mountain. The Caliente Range, hot and dry as its name indicates, has the highest peak in the county, Caliente Mountain (5,106 feet). The Tremblor Range runs along the eastern border of the county to wall in the Carissa Plains. The San Andreas Fault runs through these mountains.

Some of the most dramatic topographic features of the county are the nine volcanic peaks that form the beautiful backbone of San Luis Obispo County, running from the Cities of San Luis Obispo to Morro Bay. The last of these peaks is Morro Rock. Valleys are interspersed with these mountain features throughout the county. The elevations in these areas range from 500 to 1,500 feet.

The San Luis Obispo County coastline is approximately 93 miles long and ranges from a rocky shore backed by rocky, eroding, 200- to 500-foot-high cliffs in northern areas to wide, sandy beaches backed by dunes and rolling hills in the southern portions of the county. The coastline includes Morro Bay and San Luis Obispo Bay, both of which have sandy shores backed predominantly by sand dunes. The majority of this coastline is privately owned and undeveloped (USACE, 1971).

The coastal plain from Morro Bay north to Cambria consists primarily of a relatively narrow beach that backs up the Santa Lucia Range. It is cut by numerous stream valleys that empty into the Pacific Ocean. The southern coastal plain between the Cities of Arroyo Grande and Morro Bay is characterized by valleys and mountain ridges that generally trend northwest-southeast, paralleling the directions of the major faults in the area. The lower reaches of the valleys open to the ocean and are formed by broad alluvial plains, frequently penetrated by tidal lagoons. The upper reaches of the valleys are narrow and terminate in steep mountain canyons. The initial 2.5 miles of Meadow Creek is a series of lagoons collectively referred to as Oceana Lake. Pismo Lake, located between River Miles 2.5 and 3.4 of Meadow Creek, is a marshy, shallow depression of minimal storage capacity.

The climate of San Luis Obispo County is influenced by the effects of the Santa Lucia Range and the Pacific Ocean. In the northern portion of the county, where the mountains terminate abruptly at the ocean, rainfall amounts are predominantly heavier than those farther south. The coastal areas have long, generally dry, warm summers, and short, cool, wet winters. During the summer, ocean fog is frequent. Average annual precipitation on the coast is approximately 22 inches. Annual rainfall is nearly 50 inches along the crest of the Santa Lucia Range; south of the Santa Lucia Range, the annual rainfall along the coast decreases to an average of 14 to 16 inches. Temperatures along the coast vary little from summer to winter. The January average temperature is 52 degrees Fahrenheit (°F), and the July average temperature is 59°F. The inland areas are characterized by warm, dry summers and cool, wet winters, with minimum temperatures commonly below 32°F. Average annual rainfall ranges from 18 to 20 inches immediately east of the mountain ranges to less than 10 inches 30 miles inland from the coast. The average January temperature is 45°F, and the July average temperature is 73°F.

Soils in San Luis Obispo County are extremely varied and include sedimentary deposits and volcanic concentrations. Surface soils in the majority of the county tend to be porous sandy soils, including a wide range of loams. Shedd loam, Ayar clay loam, Nacimiento clay loam, and Atascadero sandy loam are some examples.

Vegetation in San Luis Obispo County is extremely varied. The vegetation at higher elevations contains scattered growths of trees and shrubs, often very dense in spots. Low shrub growths, typical of the coastal southern California region, are found in the foothill region. These growths include manzanita, scrub oak, coastal sage, and California lilac. Spring grasses give considerable cover on many of the hillsides. Along the watercourses where moisture is available, sycamore, willows, alders, and laurels are found in appreciable quantities. In the swampy area inland from the beaches near the Cities of Morro Bay and Grover Beach, extensive growths of marsh cover the flats. Oaks predominate in many areas of the county. Throughout the county, there are eucalyptus trees, cypress trees, and varieties of fruits and nuts. Reflecting the climate, almost anything can be grown in San Luis Obispo County, from citrus to palm trees.

Reflecting its varied topography and numerous mountain ranges, San Luis Obispo County has several drainage basins. The primary division in the county occurs at the Santa Margarita Divide. North of Santa Margarita, toward the City of El Paso de Robles, the drainage pattern is from south to north. This is the beginning of the Salinas River drainage basin, running from northern San Luis Obispo County to its discharge into the Pacific Ocean at Monterey Bay. This drainage basin includes the Salinas River, Graves Creek, North Fork Paloma Creek, Paloma Creek, Santa Margarita Creek, South Branch Toad Creek, Toad Creek, Unnamed Creek No. 1, and Yerba Buena Creek. The floodplains of these streams remain essentially undeveloped, except for a few scattered homes and farms. Santa Margarita and Yerba Buena Creeks, however, contain some floodplain development, consisting of a residential area called Garden Farms along Santa Margarita Creek and parts of the community of Santa Margarita along Yerba Buena Creek. All of the remaining streams studied eventually flow through an urbanized area.

Santa Rosa Creek elevations range from sea level to over 2,300 feet at Black Mountain. Santa Rosa Creek enters the Pacific Ocean north of the Town of Cambria, the only area of urbanization within the drainage basin.

Cayucos and Little Cayucos Creek elevations range from sea level to 1,200 feet in the Santa Lucia Range. The only urbanization within the drainage basin is along the immediate coast in the Town of Cayucos.

Morro Creek elevations range from sea level to over 2,800 feet at the Santa Lucia Range. Morro Creek enters the Pacific Ocean south of the City of Morro Bay.

The Arroyo Grande Creek area consists of the drainage basins encompassing Pismo, Meadow, and Arroyo Grande Creeks and their tributaries. All the creeks originate from the Santa Lucia Range (elevation 3,200 feet) and terminate in the Pacific Ocean. Meadow Creek flows through many lagoons before entering the Pacific Ocean. The major urban centers affected by these streams are the City of Pismo Beach at the mouth of Pismo Beach Creek, the City of Grover City at the mouth of Meadow Creek, and the Town of Oceano and the City of Arroyo Grande at the mouth of Arroyo Grande Creek.

2.3 Principal Flood Problems

Streamflow throughout most of San Luis Obispo County is highly seasonal and the runoff from all the streams is very small. Significant streamflows occur only during and immediately following precipitation because climatic and drainage area characteristics are not conducive to continuous runoff. During large storms, streamflow increases rapidly in response to effective precipitation. The floodwaters often contain high debris volumes and cause major flood damage.

The major causes of riverine flooding in the county are undersized channels, the obstructions within them, small bridge openings at several highways, small culverts across local roads, and dense vegetation growth in the channels.

Investigation of flooding from 1911 through 1978 indicates that flood conditions and flood damage were experienced in portions of San Luis Obispo County in March 1911, January 1914, February 1922, November 1926, December 1931, February 1938, March 1941, January 1943, February 1945, January 1952, January 1956, April 1958, February 1962, December 1966, January and February 1969, February 1973, and February 1978. In rural areas, flooding in early years was often viewed as an asset rather than a liability. The need for water to irrigate agricultural crops outweighed the damage done by floodwaters. In later years, as development increased, damage became a more important consideration.

Most of the coastal communities in San Luis Obispo County experienced unprecedented damage as a result of two separate floods occurring in January and February 1969. Not since 1914 had the county experienced any flooding causing significant property damage. In the intervening years, tremendous agricultural, residential, and business development had taken place. Total damage in the county during the 1969 floods was then estimated at approximately $4.5 million (USACE, 1974).

The southern California coastline is exposed to waves generated by winter and summer storms originating in the Pacific Ocean. It is not uncommon for these storms to cause 15-foot breakers. The occurrence of such a storm event in combination with high astronomical tides and strong winds can cause significant wave runup and allow storm waves to reach higher-than-normal elevations along the coastline. When this occurs, shoreline erosion and coastal flooding frequently result in damage to inadequately protected structures and facilities located along low-lying portions of the county shoreline.

In addition to flooding from runup of wind waves and swell generated by meteorological events, the southern California coastline is also susceptible to flooding by tsunamis (tidal waves) generated by large submarine earthquakes. These earthquakes occur along the rim of the Pacific Ocean and have been known to produce devastating effects many hundreds of miles across the Pacific Ocean.

2.4 Flood Protection Measures

Two dams provide some measure of flood protection to northern San Luis Obispo County. Salinas Dam, located on the Salinas River near Santa Margarita, was completed in 1942 as a water-supply facility for Camp San Luis Obispo. The dam is approximately 2 miles upstream from Pilitas Creek and 7.5 miles northwest of the Town of Pozo, and it intercepts runoff from drainage areas of 112 square miles. The reservoir, Lake Santa Margarita, is operated for water conservation purposes only and has an estimated average annual yield of 14,000 acre-feet. The dam impounds a usable water-supply capacity of approximately 26,000 acre-feet to its spillway crest and has a maximum capacity of 44,500 acre-feet to the dam crest (U.S. Department of the Interior, 1978). The only dependable storage for flood control is spillway surcharge. This storage has a minor effect on the 1-percent-annual-chance and 0.2-percent-annual-chance flood elevations through the detailed-study reach. The effect of reservoir operation on the discharge hydrograph near the mouth of the river at Spreckels is negligible.

Nacimiento Dam is located approximately 15 miles northwest of the City of El Paso de Robles and is situated on the Nacimiento River, a major tributary of the Salinas River. The dam was constructed in 1957 by Monterey County and intercepts runoff from a drainage area of 319 square miles. The reservoir impounds 350,000 acre-feet, of which 150,000 acre-feet are for flood control. Ten thousand acre-feet of dead storage lies below the outlet works invert level. The 150,000 acre-foot flood-control storage is equivalent to 8.76 inches of runoff. Two hundred thousand acre-feet (including the 10,000 acre-feet of dead storage) are for water conservation and recreation. The water is stored during periods of relatively high runoff and disreleased during dry periods. Most of the released water percolates into the gravelly streambed and goes into underground storage in the Salinas Valley, from which it is pumped, primarily for irrigation. Storage greater than 200,000 acre-feet occurs in the reservoir only during and just after major storms. Following a flood, the reservoir is drawn down to the 200,000-acre-foot level to provide storage for subsequent floodflows. Nacimiento Dam has spilled twice since being constructed, in April 1958 and February 1969. The larger spill, 3,000 cubic feet per second (cfs), occurred on February 25, 1969, at the same time that 3,770 cfs were being discharged through the outlet works, for a total discharge of 6,770 cfs.

Outside the detail study area, on Arroyo Grande Creek, The San Luis Obispo County Flood Control and Water Conservation District constructed Lopez Dam in 1969 as part of the Lopez Water Supply. The 1-percent-annual-chance flood event is expected to flow out of the reservoir over its ungated spillway.

There are levees on Toad Creek (Main Branch) between the Union Pacific Railroad bridge and the Main Street Bridge. The 1-percent-annual-chance flood event overtops the levees.

In 1958, the Natural Resources Conservation Service (NRCS) constructed trapezoidal earthen channel improvements on the lower 5 miles of Arroyo Grande Creek and the lower 0.6 mile of Los Berros Creek. These channels are subject to severe deposition of sediment during major floods and would not contain a 1-percent-annual-chance flood event. On the lower 2.84 miles of Arroyo Grande Creek, the NRCS has also constructed a perched levee system that is approximately 5 feet above ground. The levees were designed to carry approximately a 2-percent-annual-chance flood event. For floods of greater magnitude, the levees will be overtopped and erode to the natural streambank.

There is a small flood-control retention basin on Meadow Creek just upstream of U.S. Highway 101. This basin has no effect on reducing the 1-percent-annual-chance flood event peak on Meadow Creek.

Flood-control measures in The City of San Luis Obispo primarily consist of bank protection and channel maintenance programs. Specific areas of improvement are listed below.

San Luis Obispo Creek: A 1,200-foot, under-city channel that runs under the downtown business district. Recent improvements were made to the entrance conditions, but the channel still does not have the capacity to carry the 1-percent-annual-chance flood event. In 1979, channel improvements were completed on San Luis Obispo Creek from Holley Street within Silver City Mobile Home Park, downstream past the mouth of Prefumo Creek to the mouth of Froom Creek.

Prefumo Creek: The first, approximately 1,200 feet above the confluence with San Luis Obispo Creek, is a concrete lined trap channel.

Laguna Lake: The outlet structure into Prefumo Creek and spillway has recently been improved to accommodate the 1-percent-annual-chance flood event.

Old Garden Creek: A new concrete block box channel was placed from the downstream side of Broad Street to the upstream side of Lincoln Street.

There is also a concrete block channel between Foothill Boulevard and Felton Way and on a tributary of Old Garden Creek, from its confluence with the main creek to Jeffery Drive.

No other flood-control measures have been constructed on any of the streams contained in this study, and no major flood-control projects are proposed for the immediate future.

Structural measures provide some flood protection to developed areas along the county coastline. Breakwaters have been constructed at the entrance to Morro Bay, at Post San Luis, at Cayucos, and at the site of the Diablo Canyon nuclear powerplant. Timber and concrete seawalls and concrete revetments have been built along a few areas of the coastline, including in the vicinity of Cayucos and Pismo Beach. The seawalls and revetments provide some coastal flood protection from storm swells and wave runup to developed areas.

The National Weather Service (NWS) maintains year-round weather surveillance and issues warnings of impending storms. These warnings are general in nature and do not pinpoint centers of local storm activities. The San Luis Obispo County Flood Control and Water Conservation District has considered flood warnings in conjunctions with the NWS. Such warnings are not feasible for the steep south – coast streams in the study area because of the extremely rapid rate of rise in water surfaces and inaccuracies in rainfall forecasting. Flash flood alarms have also been considered, but they have not been implemented because of insufficient time to react to the warning. There has been concern about false alarms being issued, which would result in complacency when a real alarm is issued.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this FIS. Flood events of a magnitude, which are 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-annual-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, which equals or exceeds the 1-percent-annual-chance flood in any 50-year period, is approximately 40 percent (4 in 10), and, 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 county at the time of completion of this FIS. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding sources studied in detail affecting the county.

Each incorporated community within, and the unincorporated areas of, San Luis Obispo County, has a previously printed FIS report. The hydrologic analyses described in those reports have been compiled and are summarized below.

Flood hydrographs and peak discharges for the 10-, 2-, 1-, and 0.2-percent-annual-chance flood events were based on rainfall-runoff computations for Atascadero Creek, Fern Canyon Creek, Graves Creek, Mountain Springs Creek, North Fork Paloma Creek, Paloma Creek, Peachy Canyon Creek, Salinas River, Santa Margarita Creek, South Branch Toad Creek, South Branch Unnamed Creek No. 1, Toad Creek (Main and North Branch), Unnamed Creek No. 1, Unnamed Creek No. 3, and Yerba Buena Creek. The USACE HEC-1 computer program (USACE, 1973) was used to generate flood hydrographs and calculate floodplain routing effects. The major drainage areas were separated into smaller subbasins, where necessary, and separate hydrographs were generated for each subbasin. The basin parameters used in the model consist of the drainage area of the basin, Clark's unit hydrograph parameters, an infiltration loss rate for the basin, a storm depth for each flood recurrence interval, and a typical rainfall pattern. For detailed-study basins, except the Salinas River, unit hydrograph parameters and basin loss rates were estimated based on reconstitution studies of the January 18-21 and February 23-28, 1969, flood events and calibration of the models to the stream gage peak discharge-frequency analysis results for Santa Rita Creek (USGS gage No. 11147070, 1962-1978) and Jack Creek (USGS gage No. 11147000, 1950-1978). A log-Pearson Type III analysis (U.S. Water Resources Council, 1976) was used to estimate the peak discharges at the gages for each recurrence interval. A 24-hour storm pattern was used based on the maximum 24-hour period of the January 1969 storm event at the City of El Paso de Robles.

Storm precipitation depths were based on a regression analysis of the precipitation gages in the region. Separate regression equations for each recurrence interval were developed for the 24-hour and 72-hour precipitation depths versus the mean annual precipitation.

Floodplain routings between the aforementioned subbasins were conducted using the Muskingum routing method, with the velocity of flow estimated. Capacities of bridges, culverts, and stream channels were considered in developing the final discharge rates for each channel reach. Flows in excess of capacity were routed overland and recombined with channel flows where appropriate. Routing through ponding areas at capacity restrictions were based on volume-discharge relationships and the Modified Puls routing procedure.

Discharge estimates for the Salinas River were developed separately from the discharge-frequency relationships for the smaller basins within the detailed-study reaches. Because of the presence of Salinas Dam upstream, a log-Pearson Type III analysis of the stream gage record for the Salinas River at El Paso de Robles (USGS gage No. 11147500, 1940-1965, 1970-1978) was not considered reliable enough to predict the discharges for rare flood events. A 1-percent-annual-chance flood discharges at the City of El Paso de Robles was estimated, based on the HEC-1 rainfall-runoff model, to test the analysis results of that gage.

The drainage basin above the City of El Paso de Robles was divided into subbasins in the model. The subbasin parameters for the model were based on a reconstitution of the February 8-12, 1978, storm event. The basin loss rates were calibrated for the 1-percent-annual-chance flood discharge estimates based on the frequency discharge relationships for the Salinas River stream gage near Pozo

(USGS gage No. 11144600, 1943-1978), above the dam. A 72-hour storm pattern was used, based on the 1955 storm at Freedom.

Storm precipitation depths were based on the regression analysis described previously. The model estimate was less than 5 percent greater than the gage analysis results for the 1-percent-annual-chance flood. The discharge-frequency relationship at the City of El Paso de Robles was modified to incorporate the model estimate. Discharges upstream of the City of El Paso de Robles were interpolated using the basin model for all the recurrence intervals.
Peak discharges for Arroyo Grande Creek were determined from an analytical frequency curve derived from 28 years of record at USGS gage No. 11141500, at the City of Arroyo Grande. For the other streams, peak discharges were determined by the use of a computed regional frequency curve. For Carpenter Canyon Creek, Corbett Canyon Creek, Los Berros Creek, Meadow Creek, and North Fork Los Berros Creek, peak discharges were determined by the use of a computed regional frequency curve (U.S. Department of the Interior, 1977).

Peak discharges for Pismo and Meadow Creeks were determined by the use of a computed regional frequency curve (U.S. Department of the Interior, 1977).

For Chorro, Morro, Toro, Unnamed (Alva Paul Creek), and Noname Creeks, the peak flow rates for given recurrence intervals were computed by use of the multiple regression equation developed by A. O. Waananen and J. R. Crippen (U.S. Department of the Interior, Magnitude and Frequency of Floods in California: Menlo Park, California, 1977):

$$Q_n = aA^{(bl)(b2)(P)}$$

where Q_n = Peak flow for the n-year recurrence interval
a, b1, b2 = Coefficients
A = drainage area (square miles)
P = mean annual precipitation (inches)

The computed values for each stream were adjusted to give a consistent discharge-per-square-mile relation.

A standard project storm was developed for the San Luis Obispo Creek drainage area including Old Garden, Prefumo, Stenner, and San Luis Obispo Creeks, using rainfall data collected from the storm of January 18, 1973, which occurred in the City of San Luis Obispo area. The storm was transposed from the original centering to the study area by ratios of the 2-year 6-hour precipitation compiled by the National Weather Service. Runoff was computed using synthetic hydrographs derived from S-graphs (USACE, 1974).

Discharge-frequency data were based on a composite frequency curve developed from streamflow gages from nearby drainage basins. The Cottontail Creek Tributary has 14 years of record between 1960 and 1973. Wittenberg Creek and Lopez Creek have been in operation for 8 years, between 1968 and 1975. The composite frequency curve was used to determine what percentage each frequency flood was of the standard project flood. These percentages were then applied to standard project floods computed for each concentration point to determine discharge-frequency curves for each stream studied.

Significant flood retention occurs at one location in the study area; Laguna Lake on Prefumo Creek. Its waters are spread over 156 acres of what was once an intermittent lake marsh. Floods were routed through the lake using the Modified Puls Method. It is assumed that the controlled lake outlet will operate at its full-rated capacity.

The stream gaging station that was used in the initial hydrologic analysis is listed below with its gage number, drainage area, and length of record.

Table 4 – Gage Information

Gage and Location	Gage No.	Drainage Area (Square Miles)	Period of Record (Years)
USGS Gage Sisquoc River at Garey	11140000	471	54

The USGS Gage 11140000 on the Sisquoc River at Garey is an active gage and peak discharge information is available up to the water year 2005. A flood flow frequency analysis was carried out on the annual peak data for this gage (USGS, 2006) to determine the 10-, 2-, 1-, and 0.2-percent-annual-chance flows. The analysis took into account the eight years where no flow was recorded. The zero flows were taken into account through the Conditional Probability Adjustment flood flow frequency procedure for “zero flows” outlined in Chapter 5 and Appendix 12 (Example 4) of Guidelines for Determining Flood Flow Frequency – Bulletin 17B of the Hydrology Subcommittee (USGS, 1982).

The flows of the Cuyama River which join with the Sisquoc River at Fugler’s Point were determined by routing the peak flows from the Cuyama watershed through the Twitchell Dam.

A summary of the drainage area-peak discharge relationships for all the streams studied by detailed methods is shown in Table 5, "Summary of Discharges."

Table 5 – Summary of Discharges

		PEAK DISCHARGES (cfs)			
Flooding Source and Location	Drainage Area (sq. miles)	10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
ARROYO GRANDE CREEK					
At Arroyo Grande Avenue	138.6	2,800	10,000	15,800	41,000
At U.S. Highway 101	109.3	1,900	6,700	10,500	27,800
At Huasna Road	82.5	1,100	5,100	8,700	25,800

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
ATASCADERO CREEK					
At confluence with Salinas River	19.9	2,320	5,400	6,700	8,690
At U.S. Highway 101	18.3	2,290	5,300	6,550	8,490
At Portola Road	16.5	2,250	5,200	6,340	8,230
Approximately 4,300 feet above San Gabriel Road	13.7	2,180	4,880	5,860	7,610
CARPENTER CANYON CREEK					
At confluence with Corbett Canyon Creek	1.0	130	420	600	1,300
CAYUCOS CREEK					
At State Highway 1	9.5	1,500	4,900	7,000	15,200
CHORRO CREEK					
At Mouth	43.9	2,700	11,900	18,900	50,000
CORBETT CANYON CREEK					
At confluence with Arroyo Grande Creek	4.7	580	1,800	2,600	5,700
Above confluence of Poorman Canyon Creek	3.9	500	1,600	2,300	5,000
DELEISSIGUES CREEK					
At confluence with Corbett Canyon Creek	2.5	330	1,000	1,500	3,300
Approximately 800 feet above Merry Hill Road	0.6	70	220	270	360
GRAVES CREEK					
At confluence with Salinas River	15.3	2,050	5,020	6,190	7,990
At Del Rio Road	12.2	1,910	4,500	5,500	6,990
Downstream of Long Valley Tributary, approximately 5,000 feet upstream of Monterey Road	9.8	1,670	3,850	4,660	6,000
At Santa Lucia Road Bridge	6.8	1,440	3,160	3,750	4,820

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
LITTLE CAYUCOS CREEK					
At State Highway 1	1.7	360	1,200	1,700	3,600
LITTLE MORRO CREEK					
At confluence with Morro Creek	5.2	640	2,000	2,800	6,200
LOS BERROS CREEK					
At confluence with Arroyo Grande Creek	26.9	2,400	7,700	11,000	24,000
At Outlet at El Campo Road	22.71	1,030	3,820	6,080	14,340
Above confluence with North Fork Los Berros Creek	22.2	2,200	7,000	10,000	21,700
Approximately 0.3 mile upstream of El Campo Road	20.80	1,000	3,630	5,730	13,420
Approximately 1.8 miles upstream of El Campo Road	17.16	980	3,410	5,200	11,930
At U.S. Highway 101	16.1	1,700	5,400	7,700	16,700
At gaging station approximately 4.1 miles upstream of El Campo Road	15.03	1,012	3,328	5,005	11,255
MEADOW CREEK					
At Pismo Lake	6.5	760	2,400	3,500	7,500
At U.S. Highway 101	4.4	560	1,800	2,600	5,600
MORRO CREEK					
At mouth	24.0	2,200	9,200	14,900	38,000
At State Highway 1	24.0	2,400	7,800	11,200	24,300
MOUNTAIN SPRINGS CREEK					
At intersection of Mountain Springs Road and Paso Robles Road	1.8	180	620	770	1,030
NIPOMO CREEK					
At confluence with Santa Maria River	19.3	1,740	5,600	8,000	17,400
At Tefft Road	10.5	1,290	4,100	5,900	12,800

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
NONAME CREEK					
At Mouth[1]	0.5	100	170	210	390
At Yerba Buena Street[1]	0.5	100	170	210	480
At Tide Avenue[1]	0.5	100	240	340	880
At Panorama Drive[1]	0.5	105	615	1,010	2,600
At Whidbey Way (extended)	0.5	180	700	1,100	2,700
NORTH FORK LOS BERROS CREEK					
At confluence with Los Berros Creek	2.6	270	870	1,200	2,700
NORTH FORK PALOMA CREEK					
At U.S. Highway 101	1.6	160	500	660	830
OLD GARDEN CREEK					
At Lincoln Avenue	1.46	360	860	1,100	2,100
At Northwest of Murray Street	1.08	260	620	800	1,500
At Verde Drive	0.92	220	530	700	1,300
At Cuesta Drive	0.76	180	430	600	1,100
At Tassajara Drive	0.57	140	340	400	830
At Rockview Place	0.33	100	190	250	470
PALOMA CREEK					
At Union Pacific Railroad	5.8	600	1,730	2,290	2,880
At U.S. Highway 101	3.4	440	1,180	1,550	1,940
Approximately 6,400 feet upstream of U.S. Highway 101	1.1	108	450	570	720
PEACHY CANYON CREEK					
Downstream of Vine Street	0.9	65[2]	145[2]	380[2]	560
Upstream of Vine Street	0.9	100	340	420	560
PISMO CREEK					
At U.S. Highway 101	37.9	3,200	10,200	14,700	32,000

[1]Channel flow only; does not include overflow from channel
[2]Reduced or constant flow values due to capacity restriction

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
PREFUMO CANYON CREEK					
At Prefumo Canyon Road	3.4	600	1,400	1,900	3,500
PREFUMO CREEK					
Upstream of confluence of San Luis Obispo Creek	14.3	1,000	2,400	3,100	5,800
SALINAS RIVER					
At USGS gage at Paso Robles	387	16,000	33,000	43,000	66,000
Downstream of Paso Robles Creek	331	15,500	32,000	42,000	62,500
Downstream of Santa Margarita Creek	200	7,800	14,500	21,000	31,000
SAN LUIS OBISPO CREEK					
At Mouth	83.1	4,900	15,300	22,000	50,700
Downstream of confluence of Prefumo Creek	42.60	4,300	10,200	13,400	25,100
Upstream of confluence of Prefumo Creek	26.40	4,100[1]	9,800[1]	12,900[1]	24,200[1]
At intersection of Marsh Street and Archer Street	23.40	4,300	10,300	13,500	25,400
At intersection of Carmel Street and Higuera Street	12.60	25,000	6,000	7,800	14,600
South of U.S. Highway 101	11.50	2,400	5,800	7,600	14,300
SANTA MARGARITA CREEK					
At confluence with Trout Creek	23.2	4,800	11,300	13,800	18,100
At El Camino Real	22.4	3,450	7,850	9,435	12,300
At confluence of Yerba Buena Creek	11.2	2,130	4,580	5,400	7,040
Near El Camino Real, approximately 400 feet southwest of Wilhelmina Avenue	11.2	2,130	4,580	5,400	7,040
SANTA ROSA CREEK					
At Mouth	46.4	3,900	12,500	18,000	39,200
At State Highway 41	20.9	2,900	9,200	13,300	28,800

[1]Reduced or constant flow values due to capacity restriction

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
SANTA ROSA CREEK SPLIT FLOW					
At Cambria Road	--[1]	--[1]	1,800	2,700	7,600
SEE CANYON CREEK					
Approximately 600 feet upstream of confluence with Davis Canyon Creek	3.93	--[1]	--[1]	2,538	--[1]
At confluence with Davis Canyon Creek	6.30	--[1]	--[1]	2,790	--[1]
Approximately 450 feet upstream of Pippin Lane	6.74	--[1]	--[1]	3,222	--[1]
SOUTH BRANCH TOAD CREEK					
Downstream of U.S. Highway 101	1.1	160[2]	290[2]	320[2]	380[2]
Upstream of U.S. Highway 101	1.1	290	600	720	920
SOUTH BRANCH UNNAMED CREEK NO. 1					
At confluence with Unnamed Creek No. 1	1.3	30	240	320	450
STENNER CREEK					
At Broad Street	10.80	2,100	5,100	6,700	12,600
At Dana Street	9.13	1,800	4,200	5,500	10,400
Downstream of confluence of Brizzolari Creek	8.27	1,600	4,000	5,200	9,700
Upstream of confluence of Brizzolari Creek	5.70	1,100	2,700	3,600	6,700
TEFFT ROAD TRIBUTARY					
At Confluence with Nipomo Creek	3.3	440	1,400	2,000	4,400

[1]Data not available
[2]Reduced or constant flow values due to capacity restriction

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
TEFFT ROAD TRIBUTARY, EAST FORK					
At confluence with Tefft Road Tributary	1.4	225	730	1,100	2,300
TOAD CREEK (MAIN AND NORTH BRANCHES)					
At confluence with Salinas River	8.0	910	1,680	1,910	2,270
At Main Street	7.2	880	1,590	1,790	2,090
Downstream of U.S. Highway 101	1.0	180[1]	290[1]	340[1]	390[1]
Upstream of U.S. Highway 101	1.0	270	560	670	860
TORO CREEK					
At Mouth	15.1	1,700	7,200	11,900	29,000
UNNAMED CREEK (Alva Paul Creek)					
At Mouth[2]	1.8	450	850	920	975
At Main Street[2]	0.3	450	1,350	2,200	3,800
At Tide Avenue (extended)[2]	0.3	450	1,800	2,900	7,300
UNNAMED CREEK NO. 1					
At confluence with Salinas River	5.7	190	910	1,180	1,650
At River Road	5.0	120	730	960	1,350
At confluence of South Branch Unnamed Creek No. 1	3.3	100	510	670	930
Approximately 15.7 miles Upstream of Creston Road	2.0	30	300	410	580
UNNAMED CREEK NO. 3					
At River Road	1.0	70	270	330	460

[1]Reduced or constant flow values due to capacity restriction
[2]Decrease in discharge due to overbank storage

Table 5 – Summary of Discharges

Flooding Source and Location	Drainage Area (sq. miles)	PEAK DISCHARGES (cfs) 10-Percent-Annual-Chance	2- Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
WILLOW CREEK					
At Mouth	3.3	490	1,500	2,200	4,800
YERBA BUENA CREEK					
At Union Pacific Railroad	4.4	1,040	2,150	2,570	3,310
Approximately 3,000 feet Upstream of Encina Avenue	3.5	830	1,720	2,050	
Approximately 3,000 feet Upstream of Encina Avenue	3.5				

Discharges for the 0.2-percent-annual-chance floods of all streams were determined by straight line extrapolation of the frequency curves.

Coastal areas subject to inundation by the Pacific Ocean were determined on the basis of water-surface elevations established from regression relations defined by Thomas (FEMA, 1984). These regression relations were defined as a practical method for establishing inundation elevations at any site along the southern California mainland coast. They were defined through analysis of water-surface elevations established for 125 locations in a complex and comprehensive model study by Tetra Tech, Inc. (Tetra Tech, Inc., 1982). The regression relations establish wave runup and wave setup elevations having 10-, 1-, and 0.2-percent-annual-chance of occurring in any year.

Coastal flooding is attributed to the following mechanisms:

1. Swell runup from intense offshore winter storms in the Pacific
2. Tsunamis from the Aleutian-Alaskan and Peruvian-Chilean Trenches
3. Runup from wind waves generated by landfalling storms
4. Swell runup from waves generated off Baja California by tropical cyclones
5. Effects of landfalling tropical cyclones

The influence of the astronomical tides on coastal flooding is also incorporated in each of the above mechanisms. A flood-producing event from any of the above mechanisms is considered to occur with a random phase of the astronomical tide. These mechanisms are considered to act alone. That is, the joint occurrence of any combination of these mechanisms in a flooding event is considered to be irrelevant to the determination of flood elevations with return periods of less than 500 years.

For each mechanism, the frequency of occurrence of causative events as well as the probability distribution of flood elevations at a given location due to the ensemble of events were determined according to the methodology given in "Methodology for Coastal Flooding in Southern California" (Tetra Tech, Inc., 1979).

Winter Swell

The statistics of flooding due to winter swell runup were determined using input data provided by the Navy's Fleet Numerical Weather Center (FNWC). These input data consist of daily values of swell heights, periods, and directions at three deepwater locations beyond the continental shelf bordering the study area. The data span the period from 1951 to 1974 and were computed by the FNWC using input from ship observations, meteorological stations, and synoptic surface meteorological charts of the Pacific Ocean. For this study, the incoming swells provided by the FNWC were classified into 12 direction sectors of 10-degree band width each. (Exposure of the study area to winter swells was confined to a 120-degree band, i.e., swell coming from directions 220º to 340º T.) Within each sector, 10 days at each swell height and period values were selected from the 24 years of FNWC data to represent extreme flood-producing days. The selection criteria were guided by Hunts formula for runup. The 120 days at each of the deepwater stations were merged to obtain a master list of 161 extreme runup-producing days. For each 161 days, the input swell provided by the FNWC was refracted across the continental shelf and converted to runup at selected locations in the study area. The techniques used and data required for this are described in section 3.2. Of the 161 days, a number of groups of consecutive days could be identified.

Each such group of days is considered to represent one event only; the largest runup from each group of days was selected as the maximum runup for that event. As a result of refraction and island sheltering effects, a number of the input swells produced no significant runup at certain locations (depending on location).

Therefore, the number of extreme runup events is less than 161. The average number of events in the study area is approximately 40. For each location in the study area, the runup for the extreme events was fitted to a Weibull distribution to obtain a probability distribution of runup from winter swell. The Weibull distribution was found to be best suited for representing runup statistics (Tetra Tech, Inc., 1979).

Regarding the extreme runup values as a statistical sample only, the influence of the astronomical tides was included by convolving the probability distribution of runup with the probability distribution of runup with the probability distribution of daily high tides. The latter was obtained from standard tide prediction procedures (USDC, 1941) using the harmonic constants at the nearest available tide gage for which such data exists (supplied by the National Oceanic and Atmospheric Administration (NOAA), Tidal Prediction Branch). At each location, the frequency of occurrence of extreme events is determined by the number of runup values used in the Weibull curve fit. The number of years over which these occur is 24. The product of the frequency of occurrence with the complement of cumulative probability distribution of the runup plus tide (convolved) distribution gives the exceedence frequency curve for flood elevations due to winter swell runup.

Tsunamis

Elevation-frequency curves for tsunami flooding were obtained from information supplied by the USACE, Waterways Experiment Station (WES) (USACE, 1980). The use of the results of the WES study was directed by FEMA.

The statistics of tsunami elevations along the coastline were derived in the WES study by synthesizing data on tsunami source intensities, source dimensions, and frequencies of occurrence along the Aleutian-Alaskan and Peru-Chile Trenches. As a result, 75 different tsunamis, each with a known frequency of occurrence, were generated and propagated across the Pacific using a numerical hydrodynamic model of tsunamis. At a number of locations in the study area, these 75 tsunami time signatures were each added to the tidal time signature at the nearest tide gage location for which harmonic constants for tide computations are available. One year of tidal signature was then combined with the tide signature and the maximum of tsunami plus tide for the combination was recorded. To simulate the occurrence of the tsunami at random phases of the tide, the tsunami signature was repeatedly combined to the tide signature starting at random phases over the entire year of tide signature. Each combination produces a maximum tsunami plus tide elevation, with frequency of occurrence equal to the frequency of occurrence of the particular tsunami signature used divided by the total number of such combinations for that particular tsunami. The process was repeated for all 75 tsunamis, and the elevation-frequency curve for tsunami flooding was thus established.

Wind-Waves from Landfalling Storms

The source of data for wind-waves is the same as that for winter swell, namely, the FNWC (1951-1974) data. The stations for which daily height, period, and direction data are available are also the same as for winter swells. The FNWC wind-wave data are directly correlated to local wind speeds. For obtaining runup statistics, the FNWC daily wave data were converted to daily runup data using the method outline din section 3.2 (Tetra Tech, Inc., 1979). The daily runup data were then fitted in the same manner as for winter swells.

Tropical Cyclone Swell

Runup from swell generated by tropical cyclones off Baja, California was computed using the techniques discussed in section 3.2 (Tetra Tech, Inc., 1979). To establish the statistics of hurricane swell runup, the following procedure was used. Data concerning tropical cyclone tracks were obtained from the National Climatic Center (NCC). The data comprise 12-hour positions of Eastern North Pacific tropical cyclones from 1949 to 1974. This was supplemented by data on tropical cyclone tracks during the period from 1975 to 1978 reported in various issues of Monthly Weather Review (USDC, 1976-1979).

Besides position data, storm intensities at each 12-hour position are also given. The intensity classifications are based on estimated maximum wind speeds. The intensity categories are tropical depression (less than 35 knot (kt) winds), tropical storm (less than 65-kt winds), and hurricane (at least 65-kt winds). Storms with tropical depression status were considered to generate negligible swell and omitted from this study. Data on actual maximum wind speeds were available from the NCC only from 1973 to 1977. These data were used as the basis for obtaining values to represent maximum wind speeds from each of the two intensity classifications associated with the track data. Data on storm radii were derived from North American Surface Weather Charts by analysis of pressure fields of tropical cyclones off Baja, California. These were used to define typical radius of maximum winds for each of two relevant intensity classes. For each tropical cyclone between 1949 and 1978, the hurricane wind-waves were computed by using the mean radius and maximum wind speeds established for each intensity class along the track data. The swell and resultant runup were computed using the techniques described in section 3.2 (Tetra Tech, Inc., 1979). For each tropical cyclone and each location of interest in the study area, a time history of swell runup was determined. These were added to time histories of the local astronomical tide in a procedure analogous to that used in determining tsunami-plus tide effects. The exceedence frequencies of tropical cyclone swell runup were computed in a manner to that used for tsunamis.

Landfalling Tropical Cyclones

The frequency of tropical cyclones landfalling in southern California is extremely low. During the years (1949 to 1974) covered by the NCC tape of Eastern North Pacific tropical cyclones, no tropical cyclone hit southern California. A longer period of record was used to estimate eth frequency of an event such as the Long Beach 1939 storm. A study by Pike (Pike, 1972) was used to compile a list of tropical cyclones landfalling along the coast of southern California. The study was a result of extensive investigations of historical records such as precipitation and other weather and meteorological data. The study spanned the period from 1889 to 1977 and showed only five or six identifiable landfalling tropical cyclones, of which the 1939 Long Beach event was the strongest and only one in the tropical storm category. The others were all weak tropical depressions (with maximum winds less than 35 kts). This low-frequency event (once in 105 years over approximately 360 miles of coastline, coupled with an impact diameter of approximately 60 miles) implies that for any given location, the return period of a landfalling tropical cyclone is approximately 600 years. Therefore, landfalling tropical cyclones will not be considered in this study.

At each location within the study area, the exceedence frequencies at a given elevation due to the various flood-producing mechanisms were summed to the total exceedence frequency at the flood elevation.

Wave runup elevations were used to determine flood hazard areas for sites along the open coast that are subject to direct assault by deep-water waves. Runup elevations range with location and local beach slope and were computed at 0.5-mile intervals, or more frequently in areas where the beach profile changes significantly over short distances. Areas with ground elevations 3.0 feet or more below the 1-percent-annual-chance wave runup elevation are subject to velocity hazard.

The stillwater elevations have been determined for the 10-, 2-, 1-, and 0.2-percent-annual-chance floods for the flooding sources studied by detailed methods and are summarized in Table 6, "Summary of Elevations."

Table 6 – Summary of Elevations

Flooding Source and Location	Wave Runup[1] Elevation (feet NAVD 88[2])		
	10-Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
PACIFIC OCEAN			
At Cayucos Creek and Little Cayucos Creek	11.3	14.2	22.8
	7.6[2]	12.7[2]	22.8[2]
At Willow Creek and Toro Creek	10.7	13.2	22.8
	7.6[2]	12.7[2]	22.8[2]
At Toro Creek	10.7	13.3	22.8
Approximately 800 feet south of Toro Creek along beach	11.3	14.2	22.8
Approximately 1,500 feet north of Noname Creek along beach	11.9	15.2	22.8
Approximately 800 feet north of Noname Creek along beach	10.9	13.5	22.8
At Noname Creek	10.4	12.7	22.8
At Morro Creek	9.7	11.5	22.8
Approximately 1,800 feet south of Morro Creek along beach	10.2	12.7	22.8
Approximately 2,600 feet south and west of Morro Creek along beach at Morro Rock	10.9	13.5	22.8
Approximately 2,800 feet north of Beacon along beach at Morro Rock	11.9	15.2	22.8
Approximately 1,800 feet north of Beacon along beach at Morro Rock	11.0	13.7	22.8
Approximately 1,000 feet south of breakwater along beach at Morro Bay State Park	10.4	12.7	22.8
At Chorro Creek and Morro Bay	7.6[2]	12.7[2]	22.8[2]
At Morro Bay State Park	10.4	12.7	22.8
Approximately 1.0 mile north of Hazard Canyon Creek	11.3	14.1	22.8
Approximately 0.6 mile north of Hazard Canyon Creek	12.5	16.2	22.8
Just north of Hazard Canyon Creek	13.7	18.2	22.8
At Islay Creek	16.4	22.8	26.2
	7.6[2]	12.7[2]	22.8[2]
Just north of Coon Creek	18.9	27.1	30.8
At Coon Creek	7.6[2]	12.7[2]	22.8[2]
At Point Buchon	14.8	20.2	23.3
Approximately 1.5 miles northwest of Lion Rock	18.9	27.1	30.8
At Diablo Canyon Creek	17.0	23.9	27.3
Approximately 1.2 miles southeast of	12.0	15.4	22.8
Lion Rock	7.6[2]	12.7[2]	22.8[2]

Table 6 – Summary of Elevations

Flooding Source and Location	Wave Runup[1] Elevation (feet NAVD 88[2]) 10-Percent-Annual-Chance	1- Percent-Annual-Chance	0.2- Percent-Annual-Chance
PACIFIC OCEAN (continued)			
Approximately 2.0 miles southeast of Lion Rock	17.0	23.9	27.3
Approximately 0.8 mile northwest of Deer Canyon Creek	15.7	21.8	24.9
At Deer Canyon Creek	17.0	23.9	27.3
Just northwest of Pecho Creek	15.7	21.8	24.9
Just southeast of Pecho Creek	14.5	19.7	22.8
Just south of Rattlesnake Canyon Creek	13.7	18.2	22.8
Approximately 1.0 mile northwest of Point San Luis	14.8	20.2	23.3
Approximately 0.5 mile northwest of Point San Luis	15.7	21.8	24.9
Approximately 0.5 mile west of San Luis Obispo Creek	17.0	23.9	27.3
Just west of San Luis Obispo Creek	14.5	19.7	22.8
At San Luis Obispo Creek	7.6[2]	12.7[2]	22.8[2]
Approximately 150 feet south of the intersection of Front Street and San Miguel Street, Avila Beach	9.7	12.7	22.8
Approximately 100 feet south of the intersection of Front Street and San Antonio Street, Avila Beach	15.4	21.2	24.4
At Fossil Point	17.0	23.9	27.3
At Shell Beach	9.8	11.8	17.5
At Grover City and Pismo State Beach	8.5	13.3	21.5
At Arroyo Grande Creek and Oso Flaco	9.9	12.7	22.8
Creek	7.6[2]	12.7[2]	22.8[2]
LAGUNA LAKE			
At City of San Luis Obispo	124.1	124.1	129.3

[1]Average elevations given; variations may occur within the area cited
[2]Represents wave setup elevation

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out 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. For construction and/or floodplain management purposes, users are encouraged to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

Each incorporated community within, and the unincorporated areas of, San Luis Obispo County, has a previously printed FIS report. The hydraulic analyses described in those reports have been compiled and are summarized below.

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 (Published Separately).

The hydraulic analyses for this FIS 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.

Unless otherwise noted, water-surface elevations of floods of the selected recurrence intervals were computed through use of the USACE HEC-2 step-backwater computer program (USACE, 1973). For many streams, data for the program had to be modified with manual calculations to account for inlet control recurring at many bridges and culverts.

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.

Cross sections for the backwater analysis of the streams within the Salinas River drainage basin were obtained from aerial photographs, flown in September 1978, at scales of 1:12,000 in rural areas and 1:6,000 in urbanized areas (Earl Pugh and Associates, 1970). All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Starting water-surface elevations for Atascadero Creek, Carpenter Canyon Creek, Corbett Canyon Creek, Deleissigues Creek, Graves Creek, Los Berros Creek, Nipoma Creek, North Branch Los Berros Creek, Paloma Creek, Salinas River, Santa Margarita Creek, Tefft Road Tributary, Tefft Road Tributary East Fork, Toad Creek (Main and North Branches), Unnamed Creek No. 1, and Yerba Buena Creek were calculated using the slope/area method. Starting water-surface elevations for Old Garden, Prefumo, San Luis Obispo, and Stenner were determined by the slope/area method starting one mile downstream of the study reach.

On North Fork Paloma Creek, South Branch Toad Creek, and South Branch Unnamed Creek No. 1, the 1-percent-annual-chance floods coincide with their main stems; therefore, the water-surface elevations in the main stream channels were used for the tributary starting water-surface elevations. Starting water-surface elevations for Cayucos and Little Canyon Creeks were based on known elevations.

Starting water-surface elevations for Arroyo Grande, Carpenter Canyon, Corbett Canyon, Los Berros, and North Fork Los Berros Creeks and the areas of shallow flooding within the City of San Luis Obispo were determined by normal-depth computations, while those for Pismo, Santa Rosa, and San Luis Obispo Creeks were computed using critical-depth calculations. The starting water-surface elevations for South Branch Unnamed Creek No. 1 were set equal to the water-surface elevation at its mouth at Unnamed Creek No. 1. This was done because the peak flows in the two creeks are nearly coincident. The starting water-surface elevations for Mountain Springs Creek and Peachy Canyon Creek were based on the depth of the sheet flow leading away from the lower ends of the reaches studied using HEC-2.

In the reach of Pismo Creek between River Miles 0.5 and 0.8, the left overbank would be inundated by floods equal to or greater than the 2- percent-annual-chance flood. In analyzing those floods, in this reach, flood profile computations were performed assuming the levee is totally destroyed.

Starting water-surface elevations for Corbett Canyon Creek were determined from rating curves developed at the East Branch Road culvert, and those for Willow Creek were determined from rating curves developed at the State Highway 1 culvert.

Starting water-surface elevations for Meadow Creek were taken from reservoir routing computations in Oceano Lake, initially assuming a condition of inflow equals outflow through Pismo Lake upstream.

Stationing of the Salinas River and Santa Margarita Creek were based on the Pacific Southwest Inter-Agency Committee River Mile Index. A correlation was made at the river mile locations described, resulting in some minor distortion between such locations because of scale change and uncertainties in the location of the channel centerline.

For most of the detailed-study reaches within the unincorporated areas of the county, valley channel configurations were modeled. However, the Toad Creek (Main Branch) channel between the Union Pacific Railroad and Main Street bridges was leveed. This reach was modeled as a perched channel with the levee not failing.

Results of the hydraulic analyses for Santa Rosa Creek showed a portion of the 2-, 1-, and 0.2-percent-annual-chance flood flow diverted to the right side of State Highway 1. The right side split flow ponds up behind the embankment formed by Cambria Road and State Highway 1. Profiles are based on backwater analyses and analyses of ponding behind roadway embankments. Santa Rosa Creek Split Flow profiles reflect the ground surface and flood elevations along the path followed by the diverted flow.

Many areas within the Cities of Arroyo Grande, Atascadero, El Paso de Robles, San Luis Obispo, and San Luis Obispo County are subject to sheet flow. Sheet flow is shallow overland flooding generally less than 3 feet deep and unrelated to, or not readily associated with, channel flooding and flood profiles. This flooding is characterized by unpredictable flow paths or is confined to the streets. The water-surface elevations of sheet flow flooding are essentially independent of those along adjacent stream channels and are affected principally by obstructions in the flooded area. The areas of sheet flow were delineated using surveyed and photogrammetric elevations, field investigations by experienced engineers, and hand calculations based on normal depths. Areas where overflow from channels or runoff in excess of storm drain capacity would collect and pond were evaluated as part of the shallow flooding investigations.

Areas where runoff in excess of storm drain capacity would collect and pond were evaluated as part of the sheet flow flooding investigation. Areas studied for sheet flow flooding include the lower ends of Mountain Springs Creek and Peachy Canyon Creek study reaches, the entire Fern Canyon Creek study reach, and the Unnamed Creek No. 3 detailed study reach. For the City of Atascadero, the 0.2-percent-annual-chance floodplains as shown were modified in some urbanized areas to include areas of inadequate drainage.

At the entrance of the culvert under Branch Mill Road, Newsom Canyon Creek produces only sheet flooding; therefore, no profiles are presented for this stream. Downstream of Valley Road, Los Berros Creek produced only sheet flooding; therefore, no profiles are presented for this stream segment.

Due to the configuration of the channel and the right overbank area downstream of River Mile 0.99, the floodflow is diverted from North Fork Los Berros Creek into the Arroyo Grande Creek floodplain. The depths of flooding in this area were determined using the Manning formula. No profiles are presented for this portion of Arroyo Grande Creek.

For Chorro, Morro, Unnamed (Alva Paul Creek), Noname, and Toro Creeks, water-surface elevations of floods of the selected recurrence intervals were computed through use of the USGS backwater analysis program E-431 (U.S. Department of the Interior, 1976).

The culverts and bridges for Chorro, Morro, Unnamed (Alva Paul Creek), Noname, and Toro Creeks studied in detail caused backwater within the City of Morro Bay. The structures were capable of carrying only from 20 to 50 percent of the 1-percent-annual-chance flood discharge. Because of this, flood elevations in the channels upstream will be greatly increased and, for two of the channels, flow will spill over a low divide into an adjacent area, where it will not return to the original channel. This causes some areas of the city to have sheet flow flooding perched above the 0.2-percent-annual-chance flood profile as computed for the nearby channel.

The problem of backwater from structures necessitated making a number of assumptions within the City of Morro Bay. It was assumed that critical depth would occur over the roadway for each road crossing. A level pond was then assumed to occur upstream at the elevation of the critical depth plus a velocity head adjustment. This pond elevation was carried upstream until standard backwater computations could be made. Where the high point at the ends of the road overflow sections were lower than the required water-surface elevation, the section was dog-legged upstream to follow the channel divide until a high enough elevation was reached. The division of the flow through the culvert and the overflow section for each structure was determined such that the same water-surface elevation was used for both the culvert and the overflow, and the computed discharge for that elevation through each, when added together, gave the required discharge.

For Unnamed Creek (Alva Paul Creek), the overflows over the low divide were computed by making a number of trial backwater computations, varying the discharge at each cross section, thus representing losses from the channel between sections. The final profile was determined using the discharge-elevation combination from the backwater computations such that the velocities in the overflow section did not exceed 12 feet per second. This approximate method was chosen rather than a weir or embankment-type overflow method because of the uncertainties in defining a discharge coefficient for the overflow conditions along Unnamed Creek (Alva Paul Creek).

For Noname Creek, a more complex overflow situation exists. Between Tide Avenue and Panorama Drive a condominium complex is adjacent to the channel and has one building over the channel, with a 36-inch culvert to carry the low flows under the building. This building was assumed to be an obstruction to the flow, and its area was removed from the cross section. The flows around the building were proportioned on the basis of the cross-sectional area on each side of the building. These would then flow down Tahiti Street on the left side and down Whidbey Way on the right. These two streets split the flow for Noname Creek. From field inspection, it was estimated that 25 percent of the flow down Tahiti Street would return to the channel and 75 percent would not; and 75 percent of the flow down Whidbey Way would return to the channel in the vicinity of the condominium complex and 25 percent would return to the channel downstream of Tide Avenue. At Tide Avenue, all the road overflow will leave Noname Creek and flow down Tide Avenue, Tahiti Street, Vashon Street, and the areas between them toward Main Street. This shallow flooding would continue downhill in the area between Tide Avenue and Main Street.

Overbank cross-sectional data for Old Garden Creek, Prefumo Creek, San Luis Obispo Creek, and Stenner Creek were determined from topographic maps at a scale of 1:2,400, with a contour interval of 5 feet, provided by the City and County of San Luis Obispo (City of San Luis Obispo, 1974). Channel cross sections on Stenner and Prefumo Creeks, and Old Garden Creek below Foothill Boulevard, were taken from the 5 feet contour mapping.

The water-surface profiles of San Luis Obispo Creek have been revised to include the effects of channelization upstream of the confluence with Froom Creek. Cross

sections were taken from as-built construction drawings (Butler, Chambers, and Hughes, 1979).

Three sources of information – Aerial Topographic Survey, Interferometric Synthetic Aperture Radar (IFSAR), and USGS digital elevation models – were combined to create a TIN representing the ground surface within the floodplain area. Cross-sectional data was obtained from this TIN. In addition, the cross-section data was augmented with field surveying carried out in 2005 (Penfield & Smith, 2007) and 2007 (Penfield & Smith, 2007). Information on the bridge and culvert crossings was obtained from the 2007 survey, as-built plans, and field observations.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the streams and floodplain areas. The channel roughness factors for Salinas River were based on calibration of the HEC-2 model with January 18 through 21 and February 23 through 28, 1969, flooding high-water marks (USACE, 1970). Stage-discharge data for the February 1978 flood event at the stream gage in El Paso de Robles were also used in the calibration (USGS, 1978). This accounted for changes in elevation of the alluvial bed during the flood event, as well as channel roughness. Roughness factors for all streams studied by detailed methods are shown in Table 7, "Manning's "n" Values."

Table 7 – Manning's "n" Values

Stream	Channel "n"	Overbank "n"
Arroyo Grande Creek	0.025-0.100	0.030-0.120
Atascadero Creek	0.030-0.060	0.030-0.070
Bradley Canyon	0.048	0.075
Carpenter Canyon Creek	0.025-0.100	0.030-0.120
Cayucos Creek	0.030-0.060	0.020-0.070
Chorro Creek	0.015-0.040	0.045-0.100
Corbett Canyon Creek	0.025-0.100	0.030-0.120
Deleissigues Creek	0.030-0.070	0.100
Graves Creek	0.030-0.050	0.030-0.050
Little Cayucos Creek	0.040-0.070	0.060-0.090
Little Morro Creek	0.020-0.090	0.100
Los Berros Creek	0.025-0.100	0.030-0.120
Meadow Creek	0.025-0.100	0.030-0.100
Morro Creek	0.015-0.080	0.045-0.100
Mountain Springs Creek	0.030-0.050	0.030-0.040
Nipomo Creek	0.030-0.070	0.100
Noname Creek	0.015-0.040	0.045-0.100
North Fork Los Berros Creek	0.025-0.100	0.030-0.120
North Fork Paloma Creek	0.030-0.050	0.040-0.050
Paloma Creek	0.020-0.040	0.030-0.050
Peachy Canyon Creek	0.024-0.050	0.025-0.050
Pismo Creek	0.025-0.100	0.030-0.100
Prefumo Creek		
Downstream of Laguna Lake	0.030-0.035	0.035-0.080
Upstream of Laguna Lake	0.060	0.060-0.100
Salinas River	0.050-0.060	0.060-0.070
San Luis Obispo Creek	0.030-0.065	0.035-0.065
Santa Margarita Creek	0.030-0.050	0.030-0.080
Santa Rosa Creek	0.048	0.016-0.100
Santa Rosa Creek Split Flow	0.050	0.100-0.200
See Canyon Creek	0.040	0.020-0.050
South Branch Toad Creek	0.040	0.016-0.100
South Branch Unnamed Creek No. 1	0.015-0.050	0.030-0.050
Stenner Creek	0.065	0.040-0.070
Tefft Road Tributary	0.250	0.250
Tefft Road Tributary East Fork	0.070	0.100
Toad Creek (Main and North Branches)	0.020-0.050	0.030-0.060
Toro Creek	0.015-0.040	0.045-0.100
Unnamed Creek (Alva Paul Creek)	0.015-0.040	0.045-0.100
Unnamed Creek No. 1	0.015-0.050	0.030-0.050

Table 7 – Manning's "n" Values

Stream	Channel "n"	Overbank "n"
Willow Creek	0.030-0.070	0.030-0.070
Yerba Buena Creek	0.030-0.050	0.020-0.080

To obtain runup values for the various flood-producing mechanisms, data on offshore bathymetry and beach profiles were obtained from the U.S. Coast and Geodetic Survey and the NOAA bathymetric charts, USGS topographic maps, surveys of beach profiles conducted by the USACE, Los Angeles District, and from aerial photographs of the study area (U.S. Department of Commerce, various dates; U.S. Department of the Interior, 1965, et cetera; USACE, 1980; Abrams Aerial Survey, Inc., 1978).

Refraction

Refraction computations were conducted to trace the evolution of winter swell and tropical cyclone swell from their source to the 60-foot depth contour. A large grid (200 miles by 250 miles) covering the coastal water of southern California with 1,000-foot by 1,000-foot grid spacing was used for the refraction calculations. Standard raytracing procedures were used to trace rays inward from the deep ocean grid boundaries. Ray spacing was chosen at 1,000 feet to provide adequate density of ray coverage. Wave heights at the 60-foot contour were computed using the principle of wave energy flux conservation between neighboring rays. One set of refraction computations was performed for each selected event from the list of extreme winter swells and the list of tropical cyclones off Baja California. The winter swell input values were obtained from the FNWC tape for the selected days of extreme events. The values at the three FNWC stations were the basis for linear interpolation to obtain input values between them. For swell generated by tropical cyclones, the procedure outlined below (tropical cyclone swell) was used to provide input to the refraction program.

Wave Runup

Shoreward of the 60-foot contour, wave runup was determined for each beach profile of interest by adapting to composite beaches the standard empirical runup formulas valid for uniformly sloping beaches. The results of the refraction calculations were used as input. The beach profiles selected were assumed to be locally one-dimensional to apply the empirical runup formulas. However, the influence of incident wave directions, refraction, and shoaling effects was taken into consideration. Wave heights within the surf zone were also computed using empirical formulas to establish the zone where waves exceed 3 feet. This is needed for V-zone designation.

Tsunamis

Tsunamis were computed using numerical models of the long wave equations describing tsunami behavior. The results were taken from the USACE study, which details the method used to compute tsunami behavior (USACE, 1980).

Tropical Cyclone Swells

Waves generated by a tropical cyclone were determined using the JONSWAP spectrum with empirically derived shape and intensity parameters, which were correlated to radial position and wind speed (Y. K. Lee, 1980). A cosine function based on the local wind direction was used for the directional distribution function of the spectrum. The size of the tropical cyclone was defined by the radius at which the wind speed drops below 35 kts.

Bench marks

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.

3.3 Vertical Datum

All FISs 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 in use for newly created or revised FISs and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the finalization of the North American Vertical Datum of 1988 (NAVD 88), many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD 88, with the exception of 10 panels: 06079C1619F, 06079C1638F, 06079C1639F, 06079C1880F, 06079C1885F, 06079C1902F, 06079C1905F, 06079C1906F, 06079C1910F and 06079C1950F. These panels were not updated with this revision and are referenced to NGVD 29. Flooding sources on the non-updated FIRMS include Nipomo Creek and Santa Maria River. Profile 43P is a duplicate of profile 40P provided in NGVD 29 for use only with effective panels 06079C1639F, 06079C1902F, and 06079C1906F. Due to the fact that base flood elevations along Nipomo Creek are depicted on panel 06079C1643G in NAVD 88 and on panels 06079C1639F, 06079C1902F, and 06079C1906F in NGVD 29, differences in base flood elevations may result across panel edges.

As noted above, the elevations shown in the FIS report and on the FIRM for San Luis Obispo County are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor.

The conversion from NGVD 29 to NAVD 88 ranged between 2.71 and 3.17 for this community. Accordingly, due to the statistically significant range in conversion factors, an average conversion factor could not be established for the entire community. The elevations shown in the FIS report and on the FIRM were, therefore, converted to NAVD 88 using a stream-by-stream approach. In this method, an average conversion was established for each flooding source and applied accordingly. The conversion factor(s) for each flooding source in the community may be found in the following Table 8, "Vertical Datum Conversion."

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the stated conversion factor(s) to elevations 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.

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the Spatial Reference System Division, National Geodetic Survey, NOAA, Silver Spring Metro Center, 1315 East-West Highway, Silver Spring, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Table 8 – Vertical Datum Conversion

Stream	Conversion Factor (ft)
Arroyo Grande Creek	2.82
Atascadero Creek	3.15
Carpenter Canyon Creek	2.84
Cayucos Creek	2.76
Chorro Creek	2.79
Corbett Canyon Creek	2.84
Deleissigues Creek	2.77
Graves Creek	3.13
Little Cayucos Creek	2.76
Little Morro Creek	2.80
Los Berros Creek	2.82
Meadow Creek	2.84
Morro Creek	2.80
Mountain Springs Creek	3.13
Nipomo Creek	2.73
Noname Creek	2.78
North Fork Los Berros Creek	2.83
North Fork Paloma Creek	3.15
Old Garden Creek	2.86
Peachy Canyon Creek	3.16
Perfumo Canyon Creek	2.87
Perfumo Creek	2.87
Pismo Creek	2.86
Salinas River	3.15
San Luis Obispo Creek	2.89
Santa Margarita Creek	3.07
Santa Rosa Creek	2.73
Santa Rosa Creek Split Flow	2.71
See Canyon Creek	2.92
South Branch Toad Creek	3.12
South Branch Unnamed Creek No. 1	3.17
Stenner Creek	2.86
Tefft Road Tributary	2.77
Tefft Road Tributary East Fork	2.78
Toad Creek	3.14
Toro Creek	2.77
Unnamed Creek (Alva Paul Creek)	2.78
Unnamed Creek No. 1	3.15
Willow Creek	2.78
Yerba Buena Creek	2.96

Table 8 – Vertical Datum Conversion

Static Elevations	Datum Conversion
Along Arroyo Grande Creek	2.82
Along Paloma Creek	3.17
Along Salina River	3.12
Along Santa Margarita Creek	3.05
Along Toad Creek	3.12
Laguna Lake	2.86
Morro Bay	2.86
Pacific Ocean	2.80

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 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 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS 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 county. For the streams studied in detail, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps, aerial photographs, and grading plans at various scales and contour intervals (Earl Pugh and Associates, 1970; U.S. Department of the Interior, 1948, et cetera; USACE, CA-2470, 1978; USACE, CA-2471, 1978; San Luis Obispo County Department of Roads and Surveyor, 1974; Boyle Engineering, Grading, Fencing, and Miscellaneous Piping Plan, 1971; State of California, Department of Transportation, 1972; San Luis Obispo County Flood Control and Water Conservation District, 1960; State of California, Division of Highways, 1967; AIA and Partners, Architects, 1981; Ghormley Engineering, 1977; Aerial Photometrics, 1971; U.S. Department of the Interior, Arroyo Grande NE, CA, 1965; U.S. Department of the Interior, Oceano, CA, 1965; Boyle Engineering, 1971; Boyle

Engineering, Grading-Channel Sections, 1971; Western Photoair, Inc., 1972; San Luis Obispo County, Department of Roads and Surveyor, 1967; State of California, Department of Transportation, 1958; Kennedy/Jenks Engineers, 1980; USACE, 1980; U.S. Department of Agriculture, 1958; San Luis Obispo County, Department of Roads and Surveyor, 1976; San Luis Obispo County, Department of Roads and Surveyor, 1959).

For Chorro, Morro, Unnamed (Alva Paul Creek), Noname, and Toro Creeks, between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:9,600 (City of Morro Bay, Zoning Map).

Within the City of Pismo Beach, between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:6,000, with a contour interval of 5 feet (Aerial Photometrics, 1971); 1:480, contour interval 1 foot (Boyle Engineering, Grading, Fencing, and Miscellaneous Piping Plan, 1971); 1:600, contour interval 1 foot (State of California, 1972); 1:2,400, contour interval 10 feet (State of California, 1967); 1:600, contour interval 5 feet (AIA and Partners, Architects, 1981); 1:240, contour interval 2 feet (Ghormley Engineering, 1977); 1:1,200 reduced to 1:2,400, contour interval 2 feet (City of Arroyo Grande, Topographic Maps); 1:1,200 reduced to 1:2,400, contour interval 2 feet (San Luis Obispo County Flood Control and Water Conservation District, 1959). The flood boundaries were then refined through the use of field investigations, drainage plans and street plans (Boyle Engineering, 1971; State of California, 1958).

For Old Garden Creek, Prefumo Creek, San Luis Obispo Creek, and Stenner Creek, the boundaries of the 1- and 0.2-percent-annual-chance floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2,400, with a contour interval of 5 feet (City of San Luis Obispo, 1974).

Within the City of San Luis Obispo, the boundaries for areas of shallow flooding were determined using the elevations determined in the hydraulic analyses in conjunction with topographic maps (City of San Luis Obispo, 1974) and field inspection.

The 1- and 0.2-percent-annual-chance floodplain boundaries 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, AE, AH, AO, V, and VE), 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 the flooding sources studied by approximate methods, 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 San Luis Obispo County.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM.

Coastal floodplain boundary delineations were done using the wave runup or wave setup elevations computed at each 0.5-mile interval. Between these points, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with contour intervals of 20 and 40 feet (U.S. Department of the Interior, 1965; U.S. Department of the Interior, 1965, et cetera).

For coastal areas studied in detail within the City of Grover Beach, the boundaries of the 1- and 0.2-percent-annual-chance floods have been delineated using the flood elevations developed photogrammetrically using orthophoto-topographic maps at a scale of 1:4,800, with a contour interval of 2 feet (Abrams Aerial Survey, Inc., 1978).

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 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this FIS 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.

Unless otherwise indicated, the floodways presented in this study were computed on the basis of equal-conveyance reduction from each side of the floodplain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed.

Overbank and channel velocities were a major factor in determining floodways. Excessive velocities were minimized where floodways were designated. However, slope projection measures against high velocities should be considered in any development of the floodway fringe.

For the entire detailed-study reach of Graves Creek, the 1-percent-annual-chance floodflow remains within the channel, resulting in no difference between the floodway and 1-percent-annual-chance floodplain boundaries.

Because of the sandy bed material comprising the Salinas River/Salinas Creek, floodway velocities were of primary concern in the determination of the floodway boundaries. Care was taken to minimize excessive velocities in the channel under encroached conditions. Where velocities in the channel were in excess of 6 feet per second, floodway velocities were held to a maximum increase of 0.5 foot per second. For 1-percent-annual-chance flood velocities less than 6 feet per second, a maximum increase of 1 foot per second in floodway velocities was observed. In no case was more than a 1-foot rise in the 1-percent-annual-chance water-surface elevation allowed.

On Santa Margarita Creek, from 800 feet downstream of Chestnut Avenue to 50 feet upstream of Linden Avenue, the designated floodway boundary approximated the 1-percent-annual-chance floodplain boundary. This was necessary to avoid further encroachment into the 1-percent-annual-chance floodplain and because of a spill at the confluence with Yerba Buena Creek, the limit of detailed study. Containment of the spill at Yerba Buena Creek or encroachment into the 1-percent-annual-chance floodplain results in a rise of more than 1 foot in water-surface elevation.

On Santa Rosa Creek, the entire 1-percent-annual-chance floodplain was designated as a floodway in the vicinity of the split flow. The State Highway 1 embankment has already caused a significant increase in the 1-percent-annual-chance flood elevations. If the split flow is contained, forcing the entire flow into the main channel, the resulting flood elevations will increase by more than 1 foot across the floodplain.

On Toad Creek (Main and North Branches), when channel velocities were in excess of 6.0 feet per second, the encroachments were set such that these velocities did not increase by more than 0.5 foot per second. In no case did the water-surface elevation change by more than 1.0 foot. The reach between the Union Pacific Railroad and Main Street bridges is leveed. The 1-percent-annual-chance flood flow could not be contained without exceeding a 1-foot rise in water-surface elevation. No floodway was designated in this reach.

No floodway was designated for Arroyo Grande Creek in the downstream channelized portion of the creek because a significant portion of the 1-percent-annual-chance flood leaves the main channel and does not return.

No floodway was designated for Little Cayucos Creek upstream of State Highway 1 because of ponding behind the highway embankment.

No floodway was designated for Little Morro Creek downstream of RM 1.05 because a breakout occurs along the right overbank, causing shallow flooding downstream.

No floodway was designated for Morro Creek downstream of River Mile 1.61 because a breakout occurs along the left overbank, causing shallow flooding downstream.

No floodway was designated for Santa Rosa Creek Split Flow because the area is already extensively developed and flooding is caused by the inadequate State Highway 1 bridge. Encroachment at any place other than Cambria Road will not increase flood elevations on the mainstream or the split flow. However, it is important to realize that blocking off the split flow at Cambria Road will result in increased flood elevations on the mainstream.

No floodways have been determined for See Canyon Creek.

No floodway was designated for the entire study of Tefft Road Tributary reach because a number of breakout flows, caused by low capacity culverts and bridges, occur.

No floodway was designated for the entire study of Tefft Road Tributary East Fork reach because the 1-percent-annual-chance flood is well contained within the channel section.

Floodways could not be designated for Yerba Buena Creek from El Camino Real upstream to J Street. The channel and overbanks could not contain the 1-percent-annual-chance flood without exceeding the 1-foot rise in water surface.

Within the City of Arroyo Grande, it was determined that a floodway designation was not appropriate for Los Berros Creek and North Fork Los Berros Creek. Therefore, no floodway has been computed for these streams within the city. Also, no floodways were computed for Old Garden Creek, Prefumo Creek, and Stenner Creeks within the City of San Luis Obispo and the streams within the City of Morro Bay.

Within the City of Pismo Beach, a breakout occurs along Pismo Creek in the vicinity of U.S. Highway 101. This area is subject to flooding that is broad and flows overland; therefore, a floodway was not computed in this area.

The floodways presented in this FIS 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. The results of the floodway computations are tabulated for selected cross sections (Table 9). The computed floodways are shown on the FIRM (Published Separately). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

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 9, "Floodway Data." In order 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 of the 1-percent-annual-chance flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

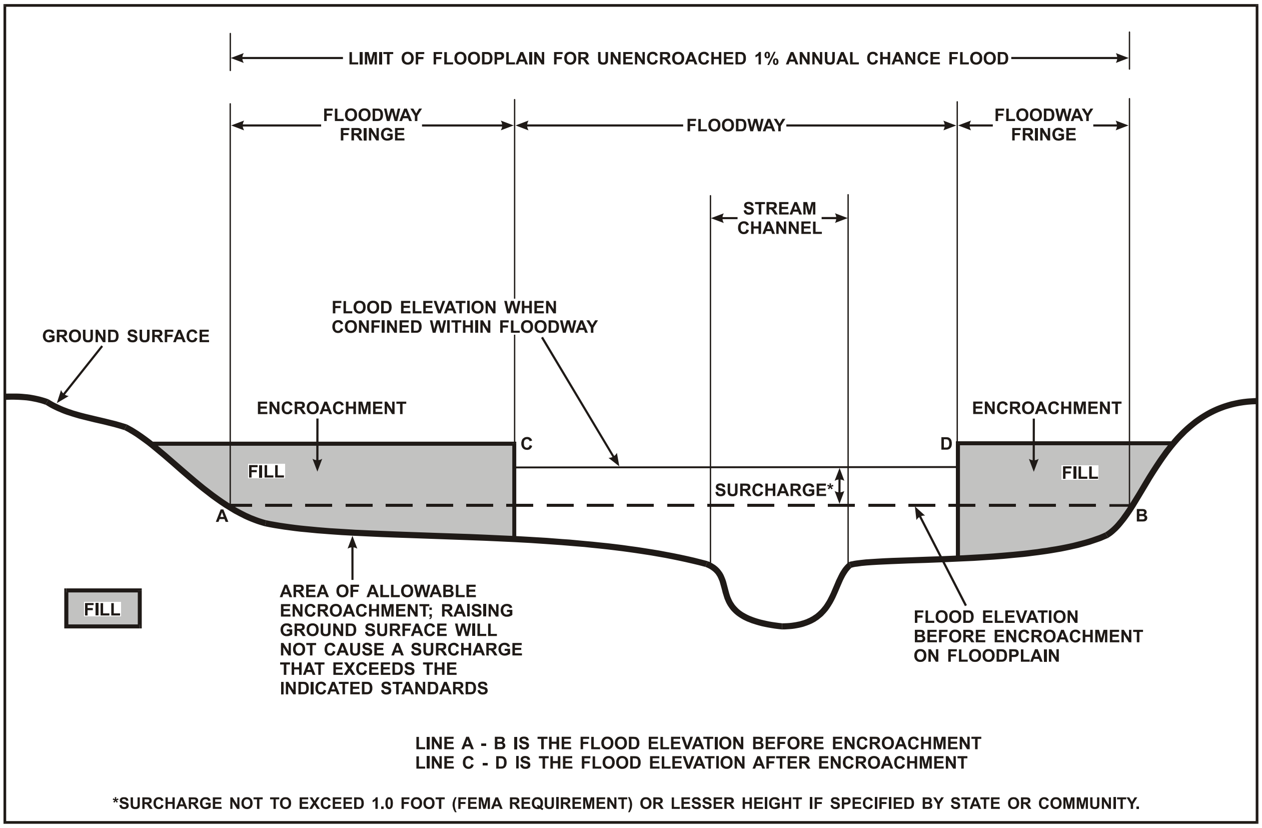

Figure 1. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Arroyo Grande Creek								
A-H*								
I	14,599	134	1,204	13.1	61.3	61.3	61.3	0.0
J	15,000	149	1,611	6.5	64.2	64.2	64.2	0.0
K	15,470	209	1,853	5.7	68.0	68.0	68.7	0.7
L	15,803	224	1,674	6.3	69.8	69.8	70.3	0.5
M	16,474	173	1,747	6.0	73.0	73.0	73.4	0.4
N	17,794	106	1,286	8.2	78.3	78.3	78.9	0.6
O	18,480	143	1,859	5.6	82.5	82.5	82.9	0.4
P	19,013	121	1,446	7.3	84.2	84.2	84.4	0.2
Q	19,800	128	1,183	8.9	89.3	89.3	89.3	0.0
R	20,830	177	2,128	4.9	93.6	93.6	93.6	0.0
S	24,204	102	1,286	8.2	115.3	115.3	115.3	0.0
T	24,816	78	854	12.3	119.9	119.9	119.9	0.0
U	26,083	93	1,490	7.0	128.8	128.8	129.4	0.6
V	27,657	120	1,358	7.7	133.7	133.7	134.6	0.9
W	29,325	71	883	11.9	145.6	145.6	145.6	0.0
X	30,371	138	1,623	6.5	149.0	149.0	149.6	0.6
Y	31,442	190	1,703	6.2	152.9	152.9	153.3	0.4
Z	33,026	276	1,590	6.6	160.5	160.5	160.7	0.2
AA	34,162	206	1,579	6.7	166.6	166.6	166.9	0.3
AB	35,772	269	2,173	4.8	173.4	173.4	173.7	0.3
AC	37,752	124	1,558	5.6	198.0	198.0	198.0	0.0

[1]Feet above Pacific Ocean
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

ARROYO GRANDE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Atascadero Creek								
A	1,168	76	985	6.8	827.5	827.5	827.6	0.1
B	1,625	129	1,514	4.4	829.2	829.2	829.3	0.1
C	2,158	144	1,270	5.3	829.7	829.7	829.8	0.1
D	2,682	71	669	10.0	834.5	834.5	834.5	0.0
E	3,832	134	705	9.4	839.1	839.1	839.1	0.0
F	4,728	101	1,226	5.4	842.2	842.2	842.2	0.0
G	5,325	67	625	10.6	845.4	845.4	845.4	0.0
H	6,265	101	1,035	6.4	852.8	852.8	852.8	0.0
I	7,081	152	1,162	5.6	854.2	854.2	854.2	0.0
J	7,544	148	1,397	4.6	856.3	856.3	856.4	0.1
K	8,224	137	1,538	4.2	864.3	864.3	864.3	0.0
L	9,091	74	589	10.8	870.1	870.1	870.1	0.0
M	10,348	63	709	9.0	877.9	877.9	878.1	0.2
N	11,133	85	581	10.7	880.4	880.4	881.4	1.0
O	12,117	111	846	7.5	891.9	891.9	891.9	0.0
P	13,199	136	656	9.6	896.4	896.4	896.4	0.0
Q	14,384	153	891	7.1	902.8	902.8	903.0	0.2
R	15,213	140	911	6.8	907.3	907.3	907.3	0.0
S	16,214	223	1,645	3.7	908.3	908.3	909.1	0.8
T	17,124	188	1,238	4.9	909.3	909.3	909.9	0.6
U	18,023	128	1,363	4.3	916.1	916.1	916.1	0.0
V	19,067	110	1,433	4.1	916.4	916.4	916.4	0.0
W	20,027	84	831	7.1	916.2	916.2	916.7	0.5
X	20,872	159	749	7.8	922.2	922.2	922.2	0.0
Y	21,936	141	572	10.1	933.4	933.4	933.5	0.1

[1]Feet above confluence with Salinas River

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

ATASCADERO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Carpenter Canyon Creek								
A	290[1]	30	111	5.4	163.8	163.8	164.8	1.0
B	407[1]	30	69	8.7	165.6	165.6	165.6	0.0
C	528[1]	90	99	6.1	168.9	168.9	168.9	0.0
Cayucos Creek								
A	438[2]	88	581	12.1	12.9	12.9	12.9	0.0
B	671[2]	283	858	8.2	14.8	14.8	14.8	0.0
C	898[2]	256	1,346	5.2	15.9	15.9	16.6	0.7
D	1,082[2]	218	1,348	5.2	16.2	16.2	17.0	0.8
E	1,309[2]	154	1,009	6.9	16.7	16.7	17.2	0.5
F	1,542[2]	95	960	7.3	17.9	17.9	18.6	0.7
G	1,758[2]	139	1,113	6.3	19.0	19.0	19.7	0.7
H	2,107[2]	305	1,653	4.2	20.4	20.4	21.0	0.6
I	2,413[2]	320	1,025	6.8	20.8	20.8	21.4	0.6
J	2,598[2]	329	1,488	4.7	24.0	24.0	24.7	0.7
K	2,904[2]	298	982	7.1	24.2	24.2	24.8	0.6

[1]Feet above confluence with Corbett Canyon Creek
[2]Feet above Pacific Ocean

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

CARPENTER CANYON CREEK – CAYUCOS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Corbett Canyon Creek								
A	348	249	2,961	0.9	122.5	122.5	123.5	1.0
B	544	225	2,481	1.0	122.5	122.5	123.5	1.0
C	834	83	973	2.7	122.5	122.5	123.5	1.0
D	1,024	102	1,013	2.6	122.6	122.6	123.6	1.0
E	1,225	219	1,634	1.6	122.9	122.9	123.9	1.0
F	1,563	208	1,333	2.0	123.3	123.3	124.3	1.0
G	1,922	106	438	9.4	124.3	124.3	125.0	0.7
H	2,123	100	512	6.8	127.0	127.0	127.7	0.7
I	2,724	205	837	4.9	131.9	131.9	132.9	1.0
J	3,564	81	456	5.7	137.1	137.1	137.7	0.6
K	3,865	58	268	9.0	139.8	139.8	140.0	0.2
L	4,166	375	962	3.6	144.4	144.4	145.3	0.9
M	4,404	256	762	3.4	145.8	145.8	146.0	0.2
N	5,074	138	298	9.3	151.9	151.9	152.5	0.6
O	5,618	49	204	11.3	157.5	157.5	157.8	0.3
P	6,146	95	252	9.1	162.9	162.9	163.4	0.5
Q	6,574	92	271	8.5	169.3	169.3	170.2	0.9

[1]Feet above confluence with Arroyo Grande Creek

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

CORBETT CANYON CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Deleissigues Creek								
A	1,056	40	155	8.4	315.0	315.0	315.0	0.0
B	1,320	65	264	4.9	319.3	319.3	319.4	0.1
C	1,980	80	192	6.8	325.1	325.1	325.1	0.0
D	2,820	70	365	3.6	334.5	334.5	334.9	0.4
E	3,823	89	166	7.8	339.8	339.8	339.8	0.0
F	4,208	70	316	4.1	344.8	344.8	344.8	0.0
G	4,404	21	162	8.0	347.4	347.4	347.4	0.0
H	4,504	65	148	8.8	348.4	348.4	348.4	0.0
I	5,095	125	681	1.9	354.3	354.3	354.7	0.4

[1]Feet above confluence with Nipomo Creek

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

DELEISSIGUES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Graves Creek								
A	626	104	714	8.6	774.1	774.1	774.2	0.1
B	936	101	747	8.3	776.4	776.4	776.4	0.0
C	1,351	73	727	8.5	777.5	777.5	777.5	0.0
D	1,482	65	539	11.2	777.8	777.8	777.8	0.0
E	2,198	120	1,027	5.9	781.1	781.1	781.1	0.0
F	2,315	97	786	7.7	781.1	781.1	781.1	0.0
G	3,020	107	811	7.2	782.6	782.6	782.6	0.0
H	3,515	78	439	13.5	783.5	783.5	783.5	0.0
I	4,527	95	700	8.5	794.2	794.2	794.2	0.0
J	4,835	96	857	6.9	795.3	795.3	795.3	0.0
K	5,954	84	548	10.5	798.5	798.5	798.5	0.0
L	6,554	82	591	9.6	806.5	806.5	806.5	0.0
M	7,490	106	745	7.3	809.9	809.9	809.9	0.0
N	7,667	117	1,058	5.2	814.4	814.4	814.4	0.0
O	8,634	72	602	9.0	815.7	815.7	815.7	0.0
P	9,242	67	382	13.4	819.1	819.1	819.1	0.0
Q	9,847	94	639	8.2	825.6	825.6	825.6	0.0
R	10,625	64	380	13.7	830.2	830.2	830.2	0.0
S	11,175	74	569	9.2	836.7	836.7	836.7	0.0
T	12,105	133	999	5.2	843.3	843.3	843.3	0.0
U	12,803	81	522	9.8	844.5	844.5	844.5	0.0
V	13,193	107	851	6.3	847.2	847.2	847.2	0.0
W	13,955	153	1,307	4.0	848.6	848.6	848.7	0.1
X	14,440	79	695	7.1	859.3	859.3	859.3	0.0
Y	14,915	109	679	6.9	860.9	860.9	861.3	0.4
Z	15,881	113	978	6.2	862.9	862.9	863.0	0.1

[1]Feet above confluence with Salinas River

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

GRAVES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Graves Creek (continued)								
AA	16,893	130	540	8.6	867.1	867.1	867.1	0.0
AB	17,798	67	398	11.6	875.0	875.0	875.0	0.0
AC	18,228	125	624	7.4	880.2	880.2	880.2	0.0
AD	18,907	89	560	8.2	882.7	882.7	882.7	0.0
AE	19,286	79	416	10.9	885.1	885.1	885.1	0.0
AF	20,071	80	616	7.0	893.5	893.5	893.5	0.0
AG	21,051	77	542	7.9	897.7	897.7	897.7	0.0
AH	21,766	76	353	12.1	904.0	904.0	904.0	0.0
AI	22,098	70	398	10.9	909.4	909.4	909.4	0.0
AJ	22,753	64	316	12.5	915.7	915.7	915.7	0.0
AK	22,948	53	363	10.8	919.0	919.0	919.0	0.0
AL	23,974	104	511	7.8	925.3	925.3	925.3	0.0
AM	24,742	204	876	4.5	934.2	934.2	934.2	0.0
AN	25,742	98	458	8.7	939.3	939.3	939.3	0.0
AO	26,420	105	633	6.3	947.3	947.3	947.3	0.0
AP	27,477	107	374	10.5	951.1	951.1	951.1	0.0
AQ	27,848	95	730	5.1	959.4	959.4	959.4	0.0
AR	28,499	90	446	7.1	963.9	963.9	963.9	0.0
AS	29,202	190	530	5.0	967.3	967.3	967.3	0.0
AT	30,391	100	269	5.8	975.9	975.9	975.9	0.0
AU	31,515	85	444	6.9	987.7	987.7	987.7	0.0
AV	32,327	74	352	8.6	994.3	994.3	994.3	0.0
AW	33,052	62	310	10.0	1,001.5	1,001.5	1,001.5	0.0
AX	34,475	96	302	10.0	1,017.2	1,017.2	1,017.2	0.0

[1]Feet above confluence with Salinas River

TABLE 9	FEDERAL EMERGENCY MANAGEMENT AGENCY SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS	FLOODWAY DATA GRAVES CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Little Cayucos Creek								
A	269[1]	47	158	7.3	12.7	12.7	12.7	0.0
B	401[1]	70	553	2.1	20.6	20.6	21.6	1.0
C	634[1]	28	223	5.1	20.6	20.6	21.6	1.0
D	792[1]	47	183	6.3	22.0	22.0	22.2	0.2
E	1,088[1]	47	233	4.9	25.2	25.2	25.2	0.0
F	1,373[1]	51	204	5.6	27.1	27.1	27.2	0.1
G	1,742[1]	61	267	4.3	30.1	30.1	30.2	0.1
H*								
I*								
Little Morro Creek								
A	5,523[2]	40	249	9.6	82.4	82.4	83.4	1.0
B	6,103[2]	140	658	3.6	88.1	88.1	88.7	0.6
C	6,494[2]	50	235	10.2	90.2	90.2	90.3	0.1
D	6,721[2]	80	338	7.1	95.3	95.3	96.0	0.7
E	7,054[2]	200	897	2.7	97.8	97.8	98.6	0.8
F	7,424[2]	50	213	11.3	100.7	100.7	101.3	0.6
G	7,582[2]	160	837	2.9	106.5	106.5	107.2	0.7
H	7,920[2]	70	293	8.2	108.0	108.0	108.4	0.4
I	8,078[2]	310	1,326	1.8	111.3	111.3	112.1	0.8
J	8,459[2]	350	477	5.0	112.9	112.9	113.2	0.3
K	9,018[2]	270	830	2.9	118.8	118.8	119.4	0.6
L	9,282[2]	162	346	6.9	120.3	120.3	120.6	0.3
M	9,689[2]	60	219	10.9	130.2	130.2	130.3	0.1
N	10,359[2]	230	756	3.2	138.3	138.3	138.6	0.3

[1]Feet above Pacific Ocean
[2]Feet above confluence with Morro Creek
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

LITTLE CAYUCOS CREEK – LITTLE MORRO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[2]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Los Berros Creek								
A	3,062	276	1,424	7.0	72.5	72.5	73.5	1.0
B	4,435	459	3,119	3.2	76.2	76.2	77.0	0.8
C	6,178	451	1,899	5.3	87.2	87.2	88.0	0.8
D	7,286	465	2,252	4.4	94.5	94.5	95.4	0.9
E	9,082	324	1,012	6.0	106.2	106.2	106.4	0.2
F	9,805	359	1,198	10.8	111.5	111.5	112.3	0.8
G	10,291	113	743	7.7	117.5	117.5	117.5	0.0
H	11,806	136	650	8.0	131.0	131.0	131.6	0.6
I	13,765	148	652	8.0	149.7	149.7	149.8	0.1
J	15,069	61	411	12.7	164.3	164.3	164.6	0.3
K[1]	16,753	*	*	*	185.0	*	*	*
L	18,142	56	565	9.2	195.5	195.5	195.9	0.4
M	20,096	153	886	5.7	209.6	209.6	210.0	0.4
N	20,418	67	571	8.8	212.0	212.0	212.3	0.3
O	21,410	149	1,047	4.8	221.5	221.5	221.9	0.4
P	22,139	83	904	5.5	225.9	225.9	226.9	1.0
Q	24,964	182	526	9.5	247.7	247.7	248.5	0.8
R[1]	25,603	*	*	*	258.5	*	*	*
S[1]	26,727	*	*	*	262.4	*	*	*

[1] Floodway not calculated
[2] Stream distance in feet above confluence with Arroyo Grande Creek
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

LOS BERROS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Meadow Creek								
A-B	*	*	*	*	*	*	*	*
C	17,952[1]	379	3,191	1.1	27.7	27.7	28.7	1.0
D	19,008[1]	380	2,056	1.7	28.4	28.4	29.3	0.9
E	20,011[1]	55	274	12.8	36.8	36.8	36.8	0.0
F	20,191[1]	163	849	4.1	40.3	40.3	40.7	0.4
G	20,750[1]	199	1,353	2.6	42.9	42.9	43.8	0.9
H	21,162[1]	102	479	7.3	44.9	44.9	45.8	0.9
I	21,305[1]	223	1,800	1.9	49.0	49.0	50.0	1.0
J	22,403[1]	74	758	3.4	63.9	63.9	64.0	0.1
K	22,730[1]	67	620	4.2	63.9	63.9	64.0	0.1
L	22,994[1]	201	2,044	0.9	64.2	64.2	64.3	0.1
M	23,274[1]	150	1,456	1.3	64.2	64.2	64.3	0.1
N	23,417[1]	248	1,616	1.2	66.8	66.8	66.8	0.0
O	23,897[1]	120	270	7.0	67.2	67.2	67.2	0.0
P	24,288[1]	87	216	8.8	71.4	71.4	72.2	0.8
Q	24,922[1]	99	339	5.6	76.3	76.3	77.3	1.0
R	25,782[1]	140	249	7.6	82.6	82.6	83.0	0.4
S	26,822[1]	100	249	7.6	95.5	95.5	95.8	0.3
Morro Creek								
A-H	*	*	*	*	*	*	*	*
I	8,506[2]	176	1,746	6.4	67.4	67.4	67.4	0.0
J	9,240[2]	110	972	11.5	73.1	73.1	73.1	0.0
K	10,032[2]	100	1,172	9.6	84.7	84.7	84.8	0.1
L	10,270[2]	109	1,051	10.7	90.0	90.0	90.1	0.1
M	11,030[2]	199	2,372	4.7	94.2	94.2	94.2	0.0

[1] Feet above confluence with Arroyo Grande Creek
[2] Feet above Pacific Ocean
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

MEADOW CREEK – MORRO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Morro Creek (continued)								
N	11,774[1]	100	715	15.7	104.8	104.8	104.8	0.0
O	12,313[1]	120	1,523	7.4	113.6	113.6	114.2	0.6
P	12,545[1]	197	3,020	3.7	114.8	114.8	115.3	0.5
Q	12,883[1]	110	1,661	6.7	116.2	116.2	116.5	0.3
R	13,364[1]	118	1,109	10.1	118.2	118.2	119.1	0.9
S	14,235[1]	179	2,156	5.2	124.8	124.8	124.9	0.1
T	14,847[1]	125	1,266	8.8	127.1	127.1	127.1	0.0
U	15,682[1]	121	1,341	8.4	134.6	134.6	134.6	0.0
V	16,368[1]	104	1,332	8.4	139.6	139.6	139.6	0.0
Mountain Springs Creek								
A	40[2]	45	170	4.5	766.1	766.1	766.1	0.0
B	195[2]	70	110	7.0	767.3	767.3	767.5	0.2
C	752[2]	60	110	7.0	783.4	783.4	783.4	0.0
D	812[2]	50	200	3.8	786.8	786.8	787.8	1.0
E	1,375[2]	50	100	7.7	804.0	804.0	804.0	0.0
F	1,473[2]	60	110	6.9	812.0	812.0	812.4	0.4
G	1,533[2]	70	180	4.2	813.1	813.1	813.9	0.8

[1]Feet above Pacific Ocean

[2]Feet above centerline of Vine Street

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

MORRO CREEK – MOUNTAIN SPRINGS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD 29)[2]			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Nipomo Creek								
A	686	425	2,320	3.4	206.5	206.5	207.5	1.0
B	1,320	415	3,791	2.1	207.5	207.5	208.3	0.8
C	2,255	170	1,087	7.4	207.5	207.5	208.3	0.8
D	2,355	140	809	9.9	208.9	208.9	209.6	0.7
E	2,508	290	4,006	2.0	215.4	215.4	216.2	0.8
F	3,326	300	4,423	1.8	215.6	215.6	216.5	0.9
G	3,511	190	2,752	2.9	215.7	215.7	216.5	0.8
H	3,775	61	681	11.8	215.8	215.8	216.5	0.7
I	4,066	110	1,279	6.3	218.3	218.3	218.6	0.3
J	4,462	230	2,871	2.8	219.1	219.1	219.7	0.6
K	4,963	310	3,534	2.0	220.0	220.0	220.7	0.7
L	5,217	340	4,125	1.7	220.1	220.1	220.8	0.7
M	5,333	280	1,965	3.7	220.1	220.1	220.8	0.7
N	5,887	300	3,003	2.4	220.9	220.9	221.8	0.9
O	6,468	440	4,348	1.7	221.2	221.2	222.1	0.9
P	6,917	720	8,497	0.8	221.3	221.3	222.2	0.9
Q	7,471	690	7,273	0.9	221.4	221.4	222.3	0.9
R	8,026	810	6,488	1.0	221.5	221.5	222.4	0.9
S	8,501	580	3,970	1.7	221.6	221.6	222.5	0.9
T	9,187	820	5,201	1.3	221.9	221.9	222.9	1.0

[1]Feet above confluence with Santa Maria River

[2]This table is provided in NGVD 29 for use with the following FIRM panels: 06079C1639F, 06079C1902F, and 06079C1906F.

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

NIPOMO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Nipomo Creek								
A	686	425	2,320	3.4	209.2	209.2	210.2	1.0
B	1,320	415	3,791	2.1	210.2	210.2	211.0	0.8
C	2,255	170	1,087	7.4	210.2	210.2	211.0	0.8
D	2,355	140	809	9.9	211.6	211.6	212.3	0.7
E	2,508	290	4,006	2.0	218.1	218.1	218.9	0.8
F	3,326	300	4,423	1.8	218.3	218.3	219.2	0.9
G	3,511	190	2,752	2.9	218.4	218.4	219.2	0.8
H	3,775	61	681	11.8	218.5	218.5	219.2	0.7
I	4,066	110	1,279	6.3	221.0	221.0	221.3	0.3
J	4,462	230	2,871	2.8	221.8	221.8	222.4	0.6
K	4,963	310	3,534	2.0	222.7	222.7	223.4	0.7
L	5,217	340	4,125	1.7	222.8	222.8	223.5	0.7
M	5,333	280	1,965	3.7	222.8	222.8	223.5	0.7
N	5,887	300	3,003	2.4	223.6	223.6	224.5	0.9
O	6,468	440	4,348	1.7	223.9	223.9	224.8	0.9
P	6,917	720	8,497	0.8	224.0	224.0	224.9	0.9
Q	7,471	690	7,273	0.9	224.1	224.1	225.0	0.9
R	8,026	810	6,488	1.0	224.2	224.2	225.1	0.9
S	8,501	580	3,970	1.7	224.3	224.3	225.2	0.9
T	9,187	820	5,201	1.3	224.6	224.6	225.6	1.0
U	23,971	120	1,021	5.8	290.0	290.0	291.0	1.0
V	24,367	75	435	13.6	292.5	292.5	292.6	0.1
W	24,816	95	849	7.0	298.5	298.5	298.5	0.0
X	25,302	81	554	10.7	301.6	301.6	301.6	0.0
Y	25,529	55	513	11.5	305.9	305.9	306.2	0.3
Z	25,819	120	1,007	5.9	309.5	309.5	310.1	0.6

[1]Feet above confluence with Santa Maria River

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

NIPOMO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Nipomo Creek (continued)								
AA	26,136[1]	95	972	6.1	310.8	310.8	311.2	0.4
AB	26,252[1]	95	934	6.3	311.1	311.1	311.7	0.6
AC	26,690[1]	163	1,579	3.7	314.1	314.1	315.0	0.9
AD	27,034[1]	140	1,329	4.7	314.8	314.8	315.6	0.8
AE	27,245[1]	230	2,730	1.1	315.3	315.3	316.2	0.9
AF	27,984[1]	528	3,936	0.5	315.3	315.3	316.3	1.0
AG	28,380[1]	230	1,489	1.3	315.3	315.3	316.3	1.0
AH	29,251[1]	125	533	3.6	316.6	316.6	317.3	0.7
AI	30,360[1]	200	581	3.3	321.8	321.8	321.8	0.0
AJ	30,994[1]	190	668	2.8	324.1	324.1	324.2	0.1
North Fork Paloma Creek								
A	895[2]	90	187	3.7	884.8	884.8	885.8	1.0
B	1,708[2]	58	143	4.7	888.6	888.6	889.3	0.7
C	2,400[2]	75	196	3.5	895.4	895.4	896.3	0.9
D	2,949[2]	285	1,720	0.4	901.2	901.2	901.7	0.5
E	3,446[2]	42	138	4.8	901.4	901.4	901.9	0.5
F	4,062[2]	58	277	2.5	908.1	908.1	908.2	0.1
G	4,510[2]	63	224	3.0	908.1	908.1	908.5	0.4
H	5,053[2]	74	164	4.1	908.5	908.5	909.5	1.0

[1]Feet above confluence with Santa Maria River
[2]Feet above confluence with Paloma Creek

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

NIPOMO CREEK – NORTH FORK PALOMA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Paloma Creek								
A	100	90	354	6.4	872.0	869.6[2]	869.6	0.0
B	719	36	284	7.9	873.5	873.5	873.5	0.0
C	965	50	454	5.0	881.7	881.7	881.7	0.0
D	1,859	185	678	3.4	881.7	881.7	882.1	0.4
E	2,660	60	330	6.9	883.7	883.7	883.9	0.2
F	3,276	40	194	7.8	885.2	885.2	885.8	0.6
G	3,838	42	190	8.2	888.4	888.4	888.5	0.1
H	4,402	37	152	9.7	891.3	891.3	891.4	0.1
I	5,068	38	204	7.4	896.8	896.8	897.0	0.2
J	5,389	47	219	7.0	898.3	898.3	898.6	0.3
K	5,671	76	368	4.2	899.5	899.5	899.7	0.2
L	5,935	106	583	2.7	904.3	904.3	904.4	0.1
M	6,706	125	588	2.6	904.6	904.6	904.9	0.3
N	7,256	50	178	8.7	905.4	905.4	905.7	0.3
O	8,507	69	342	4.5	910.0	910.0	910.9	0.9
P	9,660	46	391	3.9	918.2	918.2	918.3	0.1
Q	10,435	61	371	4.2	918.1	918.1	918.6	0.5
R	10,989	37	85	8.4	918.9	918.9	919.0	0.1
S	11,275	70	233	3.2	921.6	921.6	921.8	0.2
T	12,067	56	136	5.4	926.5	926.5	927.0	0.5
U	12,791	126	124	4.4	931.7	931.7	931.7	0.0
V	13,588	76	95	5.7	939.4	939.4	939.7	0.3
W	14,353	30	67	8.1	950.2	950.2	950.2	0.0
X	15,200	37	72	7.1	959.9	959.9	959.9	0.0

[1]Feet above confluence with Salinas River
[2]Elevation computed without consideration of backwater effects from Salinas River

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

PALOMA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Peachy Canyon Creek								
A	60[1]	35	90	4.4	750.9	750.9	750.9	0.0
B	144[1]	30	120	3.3	751.0	751.0	751.0	0.0
C	598[1]	70	90	4.4	756.8	756.8	757.0	0.2
D	723[1]	50	70	5.7	760.0	760.0	760.0	0.0
E	899[1]	75	1,140	0.4	783.5	783.5	783.5	0.0
F	1,185[1]	35	500	0.8	783.5	783.5	783.5	0.0
Pismo Creek								
A	2,772[2]	506	8,066	1.8	33.9	33.9	34.5	0.6
B	3,126[2]	782	12,486	1.2	33.9	33.9	34.5	0.6
C	3,432[2]	432	6,836	2.2	33.9	33.9	34.5	0.6
D	3,738[2]	510	7,837	1.9	34.0	34.0	34.6	0.6
E	4,250[2]	144	2,401	6.1	34.8	34.8	35.5	0.7
F	4,731[2]	748	8,592	1.7	35.9	35.9	36.5	0.6
G	5,755[2]	566	5,499	2.7	36.2	36.2	36.8	0.6
H	6,547[2]	504	3,780	3.9	37.1	37.1	37.8	0.7
I	7,339[2]	364	2,191	6.7	39.6	39.6	40.5	0.9

[1]Feet above centerline of Spring Street
[2]Feet above confluence with Pacific Ocean

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

PEACHY CANYON CREEK – PISMO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salinas River								
A	634,853	575	5,622	7.6	675.7	675.7	676.1	0.5
B	635,864	464	5,841	7.4	678.0	678.0	678.7	0.3
C	636,894	428	5,264	8.2	680.1	680.1	681.0	0.9
D	637,915	486	5,887	7.3	682.8	682.8	683.7	0.9
E	638,993	665	8,878	4.8	684.8	684.8	685.8	1.0
F	640,022	612	7,162	6.0	686.1	686.1	686.9	0.8
G	641,032	691	9,310	4.6	687.9	687.9	688.4	0.5
H	642,121	679	8,165	5.3	689.2	689.2	689.9	0.7
I	643,287	542	6,796	6.3	691.1	691.1	691.3	0.2
J	644,867	463	6,656	6.6	694.1	694.1	694.2	0.1
K	646,192	488	7,187	5.8	696.8	696.8	697.5	0.7
L	647,232	909	11,493	3.7	698.1	698.1	698.8	0.7
M	648,377	868	8,578	4.9	699.1	699.1	699.7	0.6
N	649,465	782	7,416	5.7	700.7	700.7	701.6	0.9
O	650,707	765	7,944	5.3	703.1	703.1	704.0	0.9
P	652,714	605	6,973	6.0	707.3	707.3	708.2	0.9
Q	654,878	628	6,889	6.1	711.2	711.2	711.7	0.5
R	657,043	1,401	9,514	4.4	715.3	715.3	715.9	0.6
S	658,997	1,360	8,196	5.1	717.9	717.9	718.6	0.7
T	661,214	1,417	11,694	3.6	721.4	721.4	722.2	0.8
U	663,326	1,129	9,090	4.6	724.1	724.1	725.0	0.9
V	665,544	739	6,517	6.4	729.6	729.6	729.8	0.2
W	668,131	1,069	8,111	5.2	735.0	735.0	735.8	0.8
X	670,138	1,063	9,666	4.3	738.4	738.4	739.3	0.9
Y	672,197	761	6,214	6.8	741.3	741.3	742.1	0.8
Z	673,147	773	7,917	5.3	743.7	743.7	744.5	0.8

[1]Feet above confluence with Pacific Ocean

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salinas River (continued)								
AA	675,206	1,044	10,595	4.0	746.8	746.8	747.2	0.4
AB	677,477	956	8,871	4.7	750.7	750.7	750.9	0.2
AC	679,536	677	6,314	6.6	755.8	755.8	756.1	0.3
AD	681,437	565	7,228	5.8	759.6	759.6	760.3	0.7
AE	682,334	499	5,627	7.5	761.3	761.3	761.9	0.6
AF	684,288	588	7,265	5.8	766.8	766.8	767.3	0.5
AG	686,347	760	8,918	4.7	770.1	770.1	771.1	1.0
AH	688,090	779	8,499	4.9	773.1	773.1	773.7	0.6
AI	689,832	685	5,727	5.9	776.0	776.0	776.4	0.4
AJ	691,944	923	6,900	4.9	780.9	780.9	781.2	0.3
AK	694,056	612	5,182	6.4	787.7	787.7	787.9	0.2
AL	696,432	1,325	9,468	3.4	792.9	792.9	793.0	0.1
AM	698,597	1,408	8,305	3.7	797.1	797.1	797.2	0.1
AN	700,498	1,107	6,762	4.5	801.1	801.1	802.0	0.9
AO	702,451	946	6,472	4.7	808.0	808.0	808.9	0.9
AP	704,299	852	6,310	4.7	814.1	814.1	814.4	0.3
AQ	705,989	664	5,661	5.2	817.7	817.7	818.2	0.5
AR	708,048	932	5,965	4.9	821.0	821.0	821.4	0.4
AS	709,685	590	4,521	6.2	826.4	826.4	826.4	0.0
AT	712,114	358	4,118	6.8	834.2	834.2	834.5	0.3
AU	713,856	224	2,910	9.6	841.3	841.3	841.6	0.3
AV	716,179	505	4,940	5.4	845.7	845.7	846.1	0.4
AW	718,661	1,810	8,443	3.1	849.9	849.9	850.0	0.1
AX	721,776	390	3,932	5.9	861.7	861.7	861.7	0.0
AY	724,099	1,267	7,793	3.0	865.6	865.6	865.6	0.0
AZ	726,211	1,356	7,241	3.1	869.0	869.0	869.0	0.0

[1]Feet above confluence with Pacific Ocean

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Salinas River (continued)								
BA	728,534[1]	764	4,959	4.5	874.1	874.1	874.1	0.0
BB	730,805[1]	783	4,775	4.4	880.4	880.4	880.5	0.1
BC	733,286[1]	806	5,583	3.8	885.6	885.6	885.8	0.2
BD	736,190[1]	639	4,775	4.4	892.7	892.7	892.8	0.1
BE	738,197[1]	490	4,289	4.9	898.0	898.0	898.0	0.0
San Luis Obispo Creek								
A	143[1]	426	3,148	7.0	13.4	13.4	14.4	1.0
B	2,154[1]	295	3,690	6.0	15.5	15.5	16.2	0.7
C	2,640[1]	360	4,558	4.8	16.0	16.0	16.9	0.9
D	38,016[2]	241	3,231	4.1	101.7	101.7	102.5	0.8
E	38,886[2]	144	1,492	9.0	104.3	104.3	104.6	0.3
F	40,128[2]	206	2,020	6.6	111.9	111.9	112.0	0.1
G	41,184[2]	183	1,740	7.7	114.9	114.9	114.9	0.0
H	42,082[2]	163	1,564	8.6	118.5	118.5	118.5	0.0
I	42,768[2]	192	1,923	7.0	121.3	121.3	121.3	0.0
J	43,718[2]	80	804	16.7	126.8	126.8	126.9	0.1
K – AO*								

[1]Feet above Pacific Ocean
[2]Feet above mouth
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SALINAS RIVER - SAN LUIS OBISPO CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Santa Margarita Creek								
A	545[1]	142	1,227	11.2	896.6	896.3[2]	896.7	0.4
B	1,745[1]	195	1,541	9.0	902.0	902.0	902.0	0.0
C	3,503[1]	119	1,552	8.8	911.8	911.8	912.3	0.5
D	4,030[1]	189	2,344	4.1	913.8	913.8	914.2	0.4
E	5,458[1]	88	751	12.4	921.9	921.9	921.9	0.0
F	6,545[1]	133	919	10.2	930.8	930.8	930.8	0.0
G	7,717[1]	148	1,535	6.1	939.7	939.7	939.7	0.0
H	9,021[1]	108	1,027	9.1	943.6	943.6	943.7	0.1
I	10,083[1]	91	783	11.8	947.6	947.6	947.6	0.0
J	11,333[1]	141	1,320	5.4	953.9	953.9	954.8	0.9
K	12,469[1]	104	703	10.0	956.5	956.5	956.8	0.3
L	13,459[1]	136	1,333	5.5	965.4	965.4	965.4	0.0
M	21,799[1]	224	733	7.5	1,003.8	1,003.8	1,004.1	0.3
N	22,195[1]	267	792	6.9	1,005.2	1,005.2	1,005.3	0.1
O	22,818[1]	143	650	8.4	1,005.4	1,005.4	1,006.3	0.9
P	24,091[1]	101	526	10.2	1,011.0	1,011.0	1,011.2	0.2
Q	24,973[1]	117	624	8.6	1,015.3	1,015.3	1,015.3	0.0

[1]Feet above confluence with Salinas River
[2]Elevation computed without consideration of backwater effects from Salinas River

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SANTA MARGARITA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Santa Rosa Creek								
A	1,536	300	1,512	11.9	14.1	14.1	14.1	0.0
B	2,191	350	2,737	6.6	16.9	16.9	17.9	1.0
C	2,666	201	1,357	13.3	18.1	18.1	18.1	0.0
D	3,168	265	1,587	11.3	21.3	21.3	21.3	0.0
E	3,353	338	2,532	6.0	24.3	24.3	24.3	0.0
F	3,865	250	1,999	7.7	25.6	25.6	25.6	0.0
G	4,467	237	1,622	9.4	27.9	27.9	27.9	0.0
H	4,974	236	1,845	8.3	31.1	31.1	31.1	0.0
I	5,449	245	2,082	7.3	33.4	33.4	33.4	0.0
J	5,940	512	3,433	3.8	34.7	34.7	34.7	0.0
K	6,574	389	2,355	5.5	35.5	35.5	35.5	0.0
L	7,080	220	1,596	8.1	36.5	36.5	36.5	0.0
M	7,593	400	4,069	4.4	40.7	40.7	41.4	0.7
N	7,968	505	3,634	5.0	41.2	41.2	42.1	0.9
O	8,564	340	3,493	5.2	42.4	42.4	43.4	1.0
P	9,071	201	1,231	14.6	43.9	43.9	43.9	0.0
Q	9,504	350	3,092	5.8	47.8	47.8	48.8	1.0
R	9,926	160	1,934	9.3	49.2	49.2	50.1	0.9
S	10,307	175	2,453	7.3	50.6	50.6	51.6	1.0
T	10,676	124	1,683	10.7	51.2	51.2	52.1	0.9
U	11,088	115	1,540	11.7	53.3	53.3	54.0	0.7
V	11,906	90	1,564	11.5	59.3	59.3	59.3	0.0
W	12,302	145	2,049	8.8	60.7	60.7	61.3	0.6
X	12,672	155	2,064	8.7	61.5	61.5	62.5	1.0
Y	13,174	275	3,060	5.9	63.9	63.9	64.8	0.9
Z	13,781	224	2,246	8.0	65.3	65.3	65.9	0.6

[1]Feet above Pacific Ocean

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SANTA ROSA CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Santa Rosa Creek (continued)								
AA	14,177[1]	218	2,590	6.9	66.9	66.9	67.3	0.4
AB	14,546[1]	80	1,416	12.7	67.3	67.3	67.3	0.0
AC	14,942[1]	215	3,825	4.7	72.0	72.0	73.0	1.0
AD	15,418[1]	274	4,073	4.4	72.5	72.5	73.5	1.0
AE	15,956[1]	255	2,973	6.1	72.9	72.9	73.9	1.0
AF	16,400[1]	228	3,391	5.3	73.7	73.7	74.5	0.8
AG	16,658[1]	229	3,448	5.2	74.0	74.0	74.8	0.8
AH	17,350[1]	410	2,126	8.5	74.6	74.6	75.0	0.4
AI	17,905[1]	128	1,241	14.5	77.8	77.8	78.8	1.0
AJ	18,464[1]	172	1,804	10.0	85.3	85.3	85.3	0.0
AK	18,929[1]	184	2,318	7.8	87.5	87.5	87.5	0.0
AL	19,209[1]	115	1,951	9.2	87.8	87.8	87.9	0.1
AM	19,483[1]	111	1,036	17.4	92.1	92.1	92.1	0.0
AN	20,117[1]	162	1,824	9.9	100.7	100.7	100.7	0.0
South Branch Toad Creek								
A	927[2]	42	90	3.6	799.5	799.5	799.5	0.0
B	1,536[2]	40	82	3.9	811.1	811.1	811.1	0.0
South Branch Unnamed Creek No. 1								
A	350[3]	35	60	5.3	773.8	773.8	774.1	0.3
B	1,040[3]	45	120	2.7	778.6	778.6	779.3	0.7
C	1,820[3]	30	70	3.9	785.1	785.1	785.1	0.0
D	2,850[3]	15	30	7.7	789.6	789.6	789.6	0.0

[1]Feet above Pacific Ocean
[2]Feet above confluence with Toad Creek
[3]Feet above confluence with Unnamed Creek No. 1

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

SANTA ROSA CREEK – SOUTH BRANCH TOAD CREEK - SOUTH BRANCH UNNAMED CREEK NO. 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Toad Creek (Main and North Branch)								
A	100	54	190	10.1	740.7	735.1[2]	735.0	0.0
B	655	50	180	10.6	740.7	739.1[2]	739.0	0.0
C	1,849	95	460	3.9	752.1	752.1	752.1	0.0
D	2,289	35	110	9.8	752.1	752.1	752.1	0.0
E	*	*	*	*	*	*	*	*
F	*	*	*	*	*	*	*	*
G	4,903	122	210	3.1	761.1	761.1	761.4	0.3
H	5,790	86	150	4.4	766.1	766.1	766.1	0.0
I	6,744	60	150	4.4	770.6	770.6	770.8	0.2
J	7,459	59	300	2.2	777.6	777.6	777.8	0.2
K	8,195	30	130	5.1	779.1	779.1	779.8	0.7
L	8,892	53	160	4.1	784.6	784.6	784.9	0.3
M	9,867	52	230	2.9	792.5	792.5	792.6	0.1
N	10,067	73	320	2.1	792.7	792.7	792.9	0.2
O	10,783	19	41	8.4	796.1	796.1	796.1	0.0
Unnamed Creek No. 1								
A	1,850	37	206	4.6	724.8	724.8	725.8	1.0
B	2,205	46	255	3.7	725.9	725.9	726.5	0.6
C	3,285	30	100	9.6	740.8	740.8	740.8	0.0
D	4,375	50	190	5.1	751.0	751.0	751.0	0.0
E	5,334	40	230	4.2	756.0	756.0	756.1	0.1
F	6,401	35	130	7.4	758.9	758.9	759.8	0.9
G	7,418	45	160	6.0	763.1	763.1	763.9	0.8
H	8,308	50	170	5.6	767.3	767.3	767.8	0.5

[1]Feet above confluence with Salinas River
[2]Elevation computed without consideration of backwater effects from Salinas River
*Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

TOAD CREEK (MAIN AND NORTH BRANCH) - UNNAMED CREEK NO. 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Unnamed Creek No. 1 (continued)								
I	9,048	65	190	5.1	771.1	771.1	771.2	0.1
J	10,038	30	150	4.5	775.5	775.5	775.7	0.2
K	10,968	65	230	2.9	779.7	779.7	779.7	0.0
L	11,728	50	170	3.9	785.6	785.6	785.6	0.0
M	12,753	35	80	8.4	791.1	791.1	791.1	0.0
N	13,198	30	130	5.2	796.2	796.2	796.5	0.3
O	13,353	85	260	2.5	801.1	801.1	801.8	0.7
P	14,190	75	230	2.3	801.2	801.2	802.1	0.9
Q	15,005	75	140	3.7	804.2	804.2	804.3	0.1
R	15,725	40	140	3.7	807.0	807.0	807.1	0.1
S	16,370	80	310	1.7	808.0	808.0	808.2	0.2
T	16,700	60	270	1.8	811.0	811.0	811.3	0.3
U	17,736	50	210	2.3	811.2	811.2	811.5	0.3
V	18,750	20	80	5.8	815.9	815.9	816.8	0.9
W	19,445	30	120	3.9	820.0	820.0	820.4	0.4
X	20,641	30	80	5.8	823.7	823.7	823.9	0.2
Y	21,466	35	60	7.3	828.4	828.4	828.4	0.0
Z	22,271	30	110	4.0	831.3	831.3	832.0	0.7

[1]Feet above confluence with Salinas River

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

UNNAMED CREEK NO. 1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Willow Creek								
A	792[1]	111	1,049	2.1	38.6	38.6	39.4	0.8
B	950[1]	75	538	4.1	38.7	38.7	39.4	0.7
C	1,109[1]	70	526	4.2	39.0	39.0	39.8	0.8
D	1,320[1]	39	179	12.3	40.4	40.4	40.4	0.0
E	1,573[1]	66	453	4.9	45.0	45.0	45.0	0.0
Yerba Buena Creek								
A	6,241[2]	170	364	6.9	993.8	993.8	994.0	0.2
B	6,923[2]	155	582	4.4	997.2	997.2	997.8	0.6
C	7,083[2]	152	1,298	2.0	1,000.9	1,000.9	1,001.6	0.7
D	*	*	*	*	*	*	*	*
E	*	*	*	*	*	*	*	*
F	9,608[2]	49	197	10.3	1,010.1	1,010.1	1,010.1	0.0
G	10,536[2]	59	222	8.9	1,014.6	1,014.6	1,014.6	0.0
H	11,626[2]	77	301	6.8	1,021.3	1,021.3	1,021.3	0.0
I	12,076[2]	63	266	7.6	1,022.9	1,022.9	1,023.0	0.1

[1]Feet above Pacific Ocean
[2]Feet above confluence with Santa Margarita Creek
* Data not available

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

WILLOW CREEK – YERBA BUENA CREEK

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. The 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 by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations 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 by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations 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 depths derived from the detailed hydraulic analyses are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals 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, and to 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, and areas protected from the 1-percent-annual-chance flood by levees. No base flood elevations 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.

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 base flood elevations or average depths. Insurance agents use the zones and base flood elevations 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 are shown where applicable.

The countywide FIRM presents flooding information for the entire geographic area of San Luis Obispo 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 10, "Community Map History."

7.0 OTHER STUDIES

Two previous reports concerning Meadow Creek were used in this study. Specifically, the studies involved Oceano Lake and vicinity. The first report is entitled South San Luis Obispo County Sanitation District, Project No. C-06-1118-110, K/J 9021-X, and was prepared by Kennedy/Jenks Engineers, Palo Alto, California (Kennedy/Jenks Engineers, 1980). The second report is entitled Flood Hazard No. C-11-147, Review of Proposed Expansion of Sewage Treatment Plant Adjacent to Arroyo Grande Creek, Vicinity of Grover City, California, and was prepared by USACE (USACE, 1980).

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Arroyo Grande, City of	June 7, 1974	October 10, 1975 February 6, 1979	September 19, 1984	None
Atascadero, City of	September 16, 1980	None	January 20, 1982	None
El Paso De Robles, City of	February 15, 1974	July 23, 1976	September 16, 1981	None
Grover Beach, City of	June 21, 1974	September 26, 1975	August 1, 1984	November 5, 1997
Morro Bay, City of	May 31, 1974	December 5, 1975	December 18,1979	November 1, 1985
Pismo Beach, City of	March 26, 1976	None	August 1, 1984	November 5, 1997
San Luis Obispo, City of	October 26, 1973	May 21, 1976	April 16, 1979	July 7, 1981
San Luis Obispo, County (Unincorporated Areas)	January 3, 1975	November 22, 1977	July 5, 1982	February 4, 2004 June 3, 1991 July 18, 1985

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN LUIS OBISPO COUNTY, CA AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

FISs have been prepared for Kern County (FEMA, 2008), Kings County (FEMA, Unpublished(a)), Monterey County (FEMA, 2009), Santa Barbara County (FEMA, Unpublished(b)) and Ventura County (FEMA, Unpublished(c)). All DFIRM data for San Luis Obispo County is compatible with the data in these contiguous counties.

Information pertaining to revised and unrevised flood hazards for each jurisdiction within San Luis Obispo County has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS Reports, FHBMs, FBFMs, and FIRMs for all of the incorporated and unincorporated jurisdictions within San Luis Obispo County.

This is a multivolume FIS. Each volume may be revised separately, in which case it supersedes the previously printed version. Users should refer to the Table of Contents for the current date of each volume; volumes bearing these dates contain the most up-to-date flood hazard data.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Federal Insurance and Mitigation Division, FEMA, 1111 Broadway Street, Suite 1200, Oakland, California 94607-4052.

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